FOOD FOR THOUGHT:

A MULTIDIMENSIONAL APPROACH TO

PREDICTING STATE RESPONSES TO FOOD INSECURITY

by

LEAH LANGFORD CARMICHAEL

(Under the Direction of Brock Tessman)

ABSTRACT

This project addresses five key challenges to examining food insecurity. First, it offers a clearer definition of food insecurity than the ones currently offered, by including the four dimensions of food insecurity offered by the FAO– availability, access, utilization, and stability – as key aspects in the process by which food is produced until it is consumed. Second, this project creates five original measurements for food insecurity. One serves to capture the overall level of food insecurity in a given state in a given year, and the other four serves to capture the level of each of the four dimensions of food insecurity. These five measurements allow researcher to begin to take a more nuanced look at the different types of food insecurity that can occur. Third, this project situates the topic of food insecurity firmly within the field of international relations by studying how non-military threats to individual lives require a strong state response. Fourth, it offers theoretical explanations for when state leaders will choose to respond to food insecurity and which strategies they will choose. Finally, this project offers strong empirical support to these theoretical claims.

INDEX WORDS: Human Security Studies, Food Insecurity, Domestic Food Production Subsidies, Food Trade, Trade Protectionism, Sustainable Food Policies, Food Aid, Foreign Direct Investment (FDI), Consumer Food Subsidies, Food Rationing Systems, Resource Conflicts, Population Control Policies.

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DEDICATION

I would like to dedicate this project to my family. To my father, thank you for instilling in me a deep desire to understand my world. To my mother, thank you for your unyielding support. To Wilson, thank you for bringing such warmth and happiness into our lives (and for being such a good napper those afternoons I needed to write). Finally, to Taylor: thank you for the countless pep talks, for your patience during this long journey, and most of all for your love.

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PART I

UNDERSTANDING FOOD INSECURITY

CHAPTER 1

INTRODUCTION

Food is so much a part of each of our daily lives that it is hard sometimes to see its political nature. For 842 million food insecure people in this world (or about one in eight people), however, the process by which food is grown domestically or imported, transported, sold, prepared, distributed, and consumed can be disrupted in a myriad of ways.[1] Further, of these 842 million individuals, ninety-eight percent live within regions considered to be developing and about one in four children under the age of five are considered to be affected due to lack of food, poor quality food, and inadequate water, sanitation and health services.[2] Thus, though food insecurity is a global issue, its affects are unevenly distributed.

The Food and Agricultural Organization (FAO) of the United Nations defines food insecurity as a situation that exists when people lack "physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."[3] Put differently, if food *security* is considered an ideal process by which food is produced until it is consumed, food *in*security occurs when there are disturbances in, disruptions of, or damages to this food production-to-consumption process.

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[1] Food and Agricultural Organization. (2013b). *State of Food Insecurity in the World*. Rome, Italy: United Nations, 1. These numbers do not consider individuals who may be temporarily affected by food insecurity due to seasonal droughts or instability of work.
[2] United Nations. (2010). *The Millennium Development Goals Report*. New York, 4.
[3] Food and Agricultural Organization. (1996). *Rome Declaration on World Food Security*. United Nations. Rome, Italy: United Nations, 1.

Though food insecurity is an international phenomenon, the literatures in international relations and comparative politics are relatively silent on the topic, with a few notable exceptions.[4] This project asserts that there are five sizeable challenges that make scholarship of the politics behind food insecurity quite difficult. This introductory chapter will summarize these challenges briefly and then outline how this project addresses each of these challenges in turn.

1.1. Challenges Inherent in Studying Food Insecurity in International Affairs

Though food insecurity affects millions worldwide, a topic is not covered extensively in either international relations or comparative politics sub-fields of international affairs. This project suggests that there are at least five reasons for this omission.

The first challenge to studying food insecurity is that the term food insecurity has various definitions and dimensions. In addition to the definition used most commonly by the FAO, scholars have observed over two hundred definitions that seek to explain the concept of food insecurity.[5] In addition, the authority on the subject, the FAO, has offered a multidimensional view of food insecurity that includes four interrelated, essential dimensions of food insecurity: availability, access, utilization, and stability. Each dimension is meant to explain some essential part of any food insecurity story. There is no consensus, however, on whether these dimensions are all necessarily present in each of the story, if they all are equally important, or if one should examine these temporally. These ambiguities confound policymakers and academics alike.

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[4] E.g. McMichael, Philip. (2013). Land Grabbing as Security Mercantilism in International Relations. *Globalizations*, 10(1): 47-64; Mihalache-O'keef, Andreea and Quan Li. (2011). Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries. *International Studies Quarterly*, 55(1): 71–93.

[5] Food and Agricultural Organization. (2003). *Trade Reforms and Food Security: Conceptualizing the Linkages*. Rome, Italy: United Nations, 25.

The second challenge to studying food insecurity is one of operationalization. Though there are numerous measurements for food insecurity offered, some seem far removed from the definition presented by the FAO, while others seem to include some of these dimensions components and not others. Still others attempt to explain the complexity of the term, but are so multifarious they are non-operationalizable.

The third challenge to examining food insecurity is that there is no natural home for it in the in international affairs literature. The field of international relations and comparative politics each largely focuses on the role of states. Moreover, international relations has focused more on traditional security threats, largely ignoring non-traditional threats such as issues related to the environment, health, or food.

There have, however, been some more exceptions to this claim. The still nascent human security paradigm offers an extended focus on security issues that includes non-military threats (sometimes in conjunction with military ones) and focuses on how these threats affect individual s. Still, this area of study has faced more criticism than success. One of the main criticisms facing human security studies is that it is dominated by normative scholarship that focuses on how states *should* care about protecting individuals against threats, rather than explaining systematically when and why they do or do not. This criticism can be extended to the sub-field of human security studies that examines the role states play in addressing food insecurity when it affects their citizens.[6]

Though there is a strong normative camp within human security studies and food insecurity scholarship, there is also a positivist camp as well that examines both the causes and effects of food

[6] E.g. Mechlem, Kerstin. (2004). Food Security and the Right to Food in the Discourse of the United Nations. *European Law Journal*, 10(5): 631-648.

insecurity within a state.[7] These studies, however, often focus only on one or two causes or one or two strategic responses to food insecurity. Thus none present a systematic theoretical explanation for which factors may cause food insecurity or how states may (or may not) respond when it occurs. Thus the fourth challenge to studying food insecurity is that a theoretical framework for understanding its causes or its effects is embryonic at best.

Finally, a related challenge is that with an underdeveloped theoretical framework, there has necessarily also been limited empirical examinations to test theories surrounding food insecurity. As a result, scholars and policymakers are left with minimal understanding as to why food insecurity remains prevalent and what actions may or may not be taken by states to alleviate the problem.

1.2. Outline of the Project

This project will unfold in four parts. The purpose of Part I, "Understanding Food Insecurity," is to acclimate the reader to the topic of food insecurity. Chapter two illustrates the challenge of accurately defining food insecurity. Specifically, it discusses how scholars and policymakers offer such a multitude of conflicting definitions of food insecurity that the term is wrought with ambiguity and is often misused. To address this challenge, chapter two ends with a clear, concise definition of food insecurity that improves those currently offered.

Chapter three uses this original definition to address the challenge of operationalizing food insecurity. This chapter surveys currents measurements of food insecurity and then offers original measurements for food insecurity that are both easy to interpret and yet include the complexity and nuance of the term.

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[7] Hendrix, C. S. (2011). Markets vs. Malthus: Food Security and the Global Economy. *Peterson Institute for International Economics*, Policy Brief 11-12.

Part II, "Food Insecurity in International Affairs," locates this project within the human securities studies paradigm and organizes the research on state responses to food insecurity that are scattered throughout the international affairs literature. Chapter four offers human security as an appropriate, if still emerging, research area within which to conduct an analysis of state strategic responses to food insecurity.

Chapter five organizes the disparate areas of study within international relations and comparative policies that focus on strategic responses to food insecurity to present eleven possible strategic responses states may take to address food insecurity within their borders. These strategies are: to increase domestic production subsidies, to lower trade barriers on food imports, to implement sustainable agricultural policies, to engage in resource conflicts to secure food inputs, to implement food rationing systems, to increase trade barriers to encourage domestic food production, to enact population control policies (e.g. immigration or fertility policies) to control demand on the food supply, to receive food aid, to engage in outward foreign direct investment for food production, and to offer consumer food subsidies.

Chapter six examines possible explanations for political outcomes that are offered in the domestic politics literature and could be extended to explain when states choose to respond to issues of food insecurity and which strategies they choose when they do so. The key explanations this project will focus on are: the size of a leader's winning coalition, the presence of agricultural interests within a state, and the income level of a given state.

Part III, "State Responses to Food Insecurity," incorporates the original measurements for food insecurity offered in chapter three, the possible strategic responses to food insecurity offered in chapter five, and the possible theoretical explanations offered in chapter size to answer four central research questions: (1) What factors best explain when a state responds to food insecurity and when

it does not?, (2) What factors best explain whether a state's strategic responses to food insecurity will be cooperative, quasi-cooperative, or conflictual in nature?, (3) What role (if any) do agricultural interest groups play in shaping state responses?, and (4) Does the level of income of a state help to explain its response to food insecurity?

Chapter seven extends Bueno de Mesquita et al.'s selectorate theory[8] to explain a leader's decision to respond or not to food insecurity within his or her borders. It posits that large-coalition leaders will be more likely to respond to food insecurity within their borders than small-coalitions leaders based on the higher likelihood that they will have winning coalition members who are affected by food insecurity. The empirical results presented in this chapter support these theoretical assertions.

Chapter eight theorizes that there are different kinds of responses to food insecurity: cooperative, quasi-cooperative, and conflictual. Cooperative strategies focus on mitigating the effects of food insecurity for all those affected within a state. Conflictual strategies focus on alleviating the suffering for only a targeted few, and quasi-conflictual strategies are those that can be used either to assist all or only a few affected individuals within a state.

This chapter examines the relationship between the size of a leader's winning coalition and the nature of strategies he or she will choose. It asserts that leaders with large winning coalitions will be more likely to choose strategies when responding to food insecurity that alleviate suffering for all in a state, while small winning-coalition leaders will choose strategies that alleviate suffering only for those within their winning coalition. These assertions are supported empirically.

[8] Bueno De Mesquita et al. (2003). *The Logic of Political Survival.* Cambridge: MIT Press.

Chapter nine describes how the presence of strong agricultural interests may affect which strategies are chosen, and chapter ten describes how the income level of a state may affect which strategies leaders choose. Each of these relationships is tested empirically.

The fourth and final part of this project, "Predicting Strategic Responses to the Four Dimensions of Food Insecurity," incorporates the original measurements for each of the four dimensions of food insecurity offered in chapter three to predict which strategies a state will choose given the type of food insecurity it is facing.

Chapters eleven examines the strategies chosen when a state is faced with food availability issues, chapter twelve examines strategic responses to food access issues, chapter thirteen examines strategies in response to food utilization issues, and chapter fourteen focuses on strategic responses to address issues of food stability. Each chapter presents predicts strategic responses and then empirically tests these predictions. Chapter fifteen will offers remarks on the strengths and weaknesses of this project, including suggestions for future research on food insecurity within international affairs.

CHAPTER 2

WHAT IS FOOD INSECURITY?

2.1. Existing Definitions of Food Insecurity

There is little consensus, and even contradictory perspectives, on what food insecurity means. Scholars have identified more than two hundred definitions for food (in)security used in various literatures.[9] Various definitions tend to differ in two main respects: their level of analysis and the characteristics of food insecurity upon which they focus.

As an example, Ballenger and Mabbs-Zeno (1990) offer a global definition for food insecurity. They define food insecurity as a situation that exists when there is not enough food to feed the entire world. Alternatively, Adelman and Berck's (1991)[10] present a country-level definition of food insecurity. They argue that food insecurity exists when there is a high probability that a country's citizens may fall below a minimal level of food consumption. Further, Alamgir and Arora's (1991)[11] provide a household-level definition of food insecurity. They suggest that it occurs when there is a lack of food available to ensure the minimum required amount by all household members. Though each of these definitions focus on a different level of analysis, they share a common focus on food availability.

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[9] Food and Agricultural Organization. (2003). *Trade Reforms and Food Security: Conceptualizing the Linkages*. Rome, Italy: United Nations, 25.
[10] Adelman, I., & Berck, P. (1990). Food Security Policy in a Stochastic World. *Journal of Development Economics*, 34(1), 25-55.
[11] Alamgir M. and P. Arora. (1991). *Providing Food Security for All*. London: ITDG Publishing.

Some definitions offer the same levels of analysis but different foci. For example, Barraclough and Scott (1988)[12] offer a sub-state-level definition of food insecurity. They describe food insecurity as occurring when there is "a failure… to be able to access food that is adequate in quantity and quality to meet nutritional needs."[13] Unlike the definitions above, this definition focuses not only on whether food is present, but also whether the group has access to it. Further, this definition distinguishes between the amount of food being access and its quality. The current discussion concerning food desserts highlights this distinction. That is, because on had access to high-caloric foods (e.g. fast food) does not mean that he or she is equally able to access food that is high in macro- or micronutrients.

2.2. The FAO's Definition of Food Insecurity

Though there are a myriad of definitions for food insecurity, the most widely-accepted one was first used by the United Nations' Food and Agricultural Organization (FAO) in 1996 at the World Food Summit. There the FAO defined food insecurity as "a situation that exist when people lack physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."[14]

This project asserts that, though this definition has been used increasingly within academic and policy circles, it is conceptually lacking. By the FAO's own admission there are four key dimensions to food insecurity – availability, access, utilization, and stability – that it argues are both essential to understanding food insecurity and yet only one of these dimensions (i.e. access) is mentioned

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[12] Scott, M. F. (1988). The Role of Non-Government Organizations in Famine Relief and Prevention. *Drought and Hunger in Africa*. New York: Cambridge University Press.
[13] Maxwell, S. and T. Frankenberger. (1992). *Household Food Security: Concepts, Indicators, and Measurements: A Technical Review*. New York and Rome: UNICEF/IFAD, 141.
[14] Food and Agricultural Organization. (1996). *Rome Declaration on World Food Security*. United Nations. Rome, Italy: United Nations, 1.

explicitly in the above definition. When examining the FAO's focus on food insecurity throughout the 20th and 21st century, it appears that the definition reflects political shifts in the international food regime rather than a definition whose purpose is to provide greater conceptual clarity.

This chapter will proceed by examining the historical events that have led the FAO's to define food insecurity as it presently does. Doing so serves two purposes: (1) to demonstrate that each of the four dimensions of food insecurity became a central focus of the international food regime at different points in the 20th and 21st century, and (2) to assert that the definition of food insecurity evolved as a reaction to these shift in foci rather than for the purpose of clarifying this term.

2.2.1. Era of Availability (1940s to mid-1970s)

The FAO offers four dimensions: availability, access, utilization, and stability. The first of these dimensions, food availability, is meant to represent the issues concerning the amount of food that is present within a household, region, state, or globally. Arguably, the first era of food insecurity lasted four decades, from the interwar period to the mid-1970s, and focused exclusively on issues of food availability.

The first formal mention of food related issues on the global state occurred in the interwar period when Yugoslavia requested that the League of Nations begin disseminating information about states' food issues for the purpose of ensuring proper food nutrition for all individuals.[15]

Though no action was taken before the League of Nations disbanded, upon the establishment of the United Nations, its member-states agreed to form an organization to discuss

[15] Simon, G. (2012). *Food Security: Definition, Four Dimensions, History*. Rome, Italy: Food and Agricultural Organization, 10. The term food insecurity was not coined by the FAO until the United Nations World Food Conference in 1974.

food related issues and the Food and Agricultural Organization (FAO) was created in 1945.[16] As the name suggests, the United Nations member states saw issues of food availability early on as linked to issues of agricultural yields. This linkage was made explicit in the FAO's inaugural publication of its "World Food Survey," which estimated that nearly one-third of the world's population would not get sufficient amounts of energy needed because of insufficient global agricultural output.[17]

The solution offered in this report was to address availability issues in developing states by exporting agricultural products from the developed world. The report reasoned that developed states' technological advancements in agricultural production meant that they could yield ten times more than developing states. The report concluded by suggesting that it "is inescapable that food for the world can be produced in much greater abundance with fewer hands."[18]

This report helped usher in a trend by developed states to increase agricultural production for the purpose of addressing food insecurity globally. Aided by the UN's assessment of need, an increase in domestic agricultural subsidies, and new technological advancements borrowed from the industrial sector, North American and European food producers began to increase their productive capacity exponentially.[19]

A more recent report by the USDA illustrates that as the number of farms in the U.S. began to decline in the late 1940s the average size of each farm increased.[20] Moreover, this study shows that

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[16] Ibid.
[17] Food and Agricultural Organization. (1946). *World Food Supply*. Rome, Italy: United Nations, 375.

[18] Ibid.
[19] Friedmann, H. (1993). The Political Economy of Food: A Global Crisis. *New Left Review*, 197(1): 29.
[20] Dimitri et al. (2005). The 20th Century Transformation of U.S. Agriculture and Farm Policy. *Economic Information Bulletin*, 3(17): 203. Though this study does not offer data for agricultural productivity before and during WWII as a comparison, it does note that after World War II, rising productivity, driven by the rapid adoption of mechanical and chemical technology, led to growing surpluses even as the number of farms and production agriculture's share of economic activity

agricultural productivity increased on average by 1.9% from 1948 to 1999.[21] As early as 1947, the overwhelming success of these production efforts led some to warn that agricultural overproduction would lead to depressed domestic food prices in these developed states and thus less profit for farmers in developed states.

Initially depressed food prices were not a concern for U.S. producers as they were able to export food to Europe as part of the Marshall Plan. In fact, in 1948 and 1949, an estimated half of the funds allocated for the Marshall Plan for that year (approximately $4.8 billion) were used to purchase food from American farmers to be redistributed throughout Europe.[22]

By the mid-1950s, however, the European markets had revitalized and European farmers were pressuring their governments to protect against U.S. food imports. As a result, the U.S. and soon European states with strong agricultural interests were exporting their food products to developing states. In many cases, these exports were offered as food aid. These exports should be understood as a means for protecting the interest of strong domestic agricultural groups as well as a means for addressing food availability issues throughout the developing world. These exports should also be understood as a foreign policy within the Cold War context. By the 1960s, many developing states relied on food imports. Food aid represented between 40 and 60 percent of the total imports of developing countries.[23]

The perspective that food insecurity was primarily an issue of availability was held by the FAO well into the 1970s. At the World Food Summit of 1974, the FAO defined food insecurity as the

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continued to decline(9). This suggests that this increase in productivity in the late 1940s was a marked change.

[21] Ibid, 6.

[22] Wexler, I. (1983). *The Marshall Plan Revisited: The European Recovery Program in Economic Perspective*. Westport, CT: Greenwood Press, 249.

[23] Simon, G. (2012). *Food Security: Definition, Four Dimensions, History*. Rome, Italy: Food and Agricultural Organization, 16.

lack of "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices."[24] By the late 1970s, however, this exclusive focus came under criticism by scholars like Amartya Sen, who argued that the presence of food within a state did not ensure that all individuals in that state had equal access to it.

2.2.2. Era of Access (Late-1970s to Mid-1990s)

Even when food is available, there are still cases in which individuals may or may not have access to it. The evolution in the concept of food insecurity to include issues of food access (and most essentially food affordability) mirrors larger political changes in the international food regime. Though the definition of food insecurity formally accepted at the World Food Summit in 1974 reflected an exclusive focus on availability issues, the two impetuses for the summit to be held were reasons that extended beyond issues of food availability.

In 1972 abrupt climatic changes resulted in the U.S.S.R. and several other states facing severe food shortages. Estimates suggest that cereal production decreased up to thirty percent in these states. As the U.S. and the U.S.S.R were in the initial stages of détente, the U.S. agreed in 1973 to export surplus grain to its Cold War rival. Estimates suggest that the Soviet Union purchased 30 million metric tons of grain, which was the equivalent of seventy-five percent of all commercially traded grain in the world.[25] The scale of such a sale created shortages and led to price hikes on grain throughout the rest of the world.

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[24] Food and Agricultural Organization. (1975). *State of Food and Agriculture* (Resolution 1/64). Rome, Italy: United Nations.

[25] Friedmann, H. (1993). The Political Economy of Food: A Global Crisis. *New Left Review*, 197(1): 29.

A second impetus for the summit was the oil embargo on the United States by the Organization of Petroleum Exporting Countries (OPEC) in 1973. OPEC decided to impose the oil embargo because the U.S. supported Israel in the Yom Kippur War with Egypt and Syria that same year. As the price of petroleum rose to unprecedented record levels, the price of food also increased due to increased transportation costs. With both a decrease in supply of staples worldwide an increase in the price of transportation costs driving up prices on food items, the FAO chose to convene the summit in Rome to address issues of food affordability.

Though the focus of the summit was on the issues of food prices, the solutions reflected the same solutions posed since 1945: increase food availability. The underlying assumption was that increasing food supplies would in turn help drive down food prices.

It was not until after Amartya Sen published his work on food entitlements in 1981 that issues of access became a central focus of food insecurity for the FAO. Based on qualitative studies of starvation and famines, Sen observed that low-income individuals suffered at higher rates than those with high-incomes during such periods of food insecurity, suggesting that food availability within a state is not a sufficient explanation for whether or not a person will be food secure.[26] Instead, he argued that existing legal and social systems may offer populations entitlements, while denying them to others. In 1983, FAO expanded its concept to include the access of food insecurity. In its "World Food Security" report, it defined food security as "ensuring that all people at all times have both physical and economic access to the basic food that they need."[27]

2.2.3. Era of Utilization (Mid-1990s)

[26] Sen, A. (1982). *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Oxford University Press.
[27] Food and Agricultural Organization. (1983). *World Food Security: A Reappraisal of the Concepts and Approaches*. Rome, Italy: United Nations.

Though consuming food is an essential part of the human experience, the process of how food is utilized by the body is quite complex. Moreover, the utilization of food varies considerable among individuals based on factors such as each individual's height, weight, age, basal metabolism, thermogenetic processes, physical activity level, genetics, overall health, and a myriad of other factors.[28]

When examining food insecurity, food utilization issues may be grouped into two general categories. The first category is undernourishment. As noted previously, undernourishment occurs when an individual or population lacks sufficient amounts of kilocalories (i.e. calories from food).[29] Issues of hunger and starvation occur because of undernourishment. The second category into which food utilization problems may be grouped is malnourishment. Malnourishment occurs when individuals lack certain macro- or micronutrients essential for one's health.

Though the Food and Agricultural Organization has included an implicit focus on food utilization issues in its attempts to understand and address food insecurity issues throughout its history, the mid-1990s ushered in greater focus on developing quantitative measurements for food insecurity. As a result, food utilization became a more prominent focus as is the dimension that addresses the biological conversion of food to energy. As it is arguably the most scientifically-based of the four dimensions, many quantitatively-focused scholars focused on this dimension over the others.

At the World Food Summit in 1996, the FAO tweaked the definition of food security to read: "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and

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[28] Food and Agricultural Organization. (2001). *Human Energy Requirements*. Rome, Italy: United Nations., 8.

[29] This project acknowledges that the amount of calories considered to be sufficient varies among individuals and within one individual's life span.

active life."[30] Though the focus on access and availability (i.e. sufficient quantities) of food had been made explicit in the previous definitions, this new definition added a focus on food that was both safe and nutritious.

Following this summit, literature from the FAO included the two modifiers, "safe" and "nutritious," as components of food utilization.[31] Subsequent literature, however, seems to acknowledge, however, that food safety issues have more to do with access than utilization.[32] The reasoning behind this is that poor sanitation and water infrastructure in a state or region are causes of unsafe food. By 2008, documents on food insecurity had divorced the food safety component from the concept of food utilization altogether, and instead describes this dimension as "commonly understood [to be]… the way the body makes the most of various nutrients."[33]

Current data and the literature from the FAO tend to rely on this dimension of food insecurity as the primary means for measuring food insecurity levels worldwide (a detailed discussion of FAO measurements of food insecurity is in chapter three).

2.2.4. Era of Stability (2000s)

Throughout the 2000s, the FAO yet again expanded the definition of food insecurity to include a fourth dimension: stability. In 2001, the FAO published a white paper following a summit in Rome. It defined food insecurity as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary

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[30] Food and Agricultural Organization. (1996). *Rome Declaration on World Food Security*. United Nations. Rome, Italy: United Nations, 1.
[31] E.g. Food and Agricultural Organization. (2008a). *Impact of Climate Change and Bioenergy on Nutrition*. Rome, Italy: United Nations, 14.
[32] Food and Agricultural Organization. (2004). *Guidelines for Consumer Organizations to Promote National Food Safety Systems*. Rome, Italy: United Nations, 1.
[33] Food and Agricultural Organization. (2008b). *An Introduction to the Basic Concepts of Food Security*. Rome, Italy: United Nations, 1.

needs and food preferences for an active and healthy life."[34] This definition added focuses on social aspects of food as well as the temporal clarification that food security ensures consistency of availability, access, and utilization of food.

Since this white paper, the FAO has offered at least five different definitions for the stability dimension of food insecurity.[35] Two different publications from the FAO in 2006 define stability as "the access to adequate food at all times"[36] and the freedom from the risk of losing "access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity).[37]A third definition of stability, originally published as part of the EC-FAO Food Security Information for Action Program in 2008, defines stability as both the situation in which the other "three dimensions should remain stable over time" and suggest that this dimension captures how the other dimensions should "not be affected negatively by natural, social, economic or political factors."[38] The fifth definition, from a white paper published in 2010, emphasizes the role of this dimension in reducing "the risk of adverse effects on the other three dimensions: food availability, access or utilization."[39]

There is a sense from each of these definitions that stability serves to undergird the other three dimensions in some fashion. Further, this dimension appears to have an essential temporal quality to it as two of the above definitions focus on providing stability over time, while another suggests that

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[34] Food and Agricultural Organization. (2002). *The State of Food Insecurity in the World*. Rome, Italy: United Nations.
[35] It is not clear why the FAO presents multiple conceptual definitions for the stability dimension.
[36] Food and Agricultural Organization. (2006). *Food Security* (Policy Brief 2). Rome, Italy: United Nations, 1.
[37] Ibid.
[38] European Commission and FAO. (2008). *EC-FAO Food Security Information for Action Programme: Food Security Concepts and Frameworks*. EC-FAO Food Security Information for Action Programme. Rome, Italy: United Nations, 7.
[39] Napoli, Marion. (in press). *Towards a Food Insecurity Multidimensional Index (FIMI)*. Rome, Italy: Food and Agricultural Organization.

stability can be undermined by interruptions that are either sudden or cyclical. Finally, it appears that factors within the stability dimensions could be natural, social, economic and political in nature.[40]

As noted in the previous subsection, food utilization became a central focus of the FAO partly in response to improvements in statistical measurements and data collection. The same can be said for an increase in focus on stability issues in response to improvements in geospatial mapping and data analysis, specifically that which focused on climate change and its effects on food production.

Since 2000, the FAO's Spatial Information Management for Food and Agriculture has collected geo-referenced data on land, forest, and water resources and uses, livestock production systems, and agricultural systems (e.g. crop characteristics, ecology, and management). Further, it has used this data to make long-term projections about land use, freshwater access, biodiversity, and climate change, and agricultural sustainability.

As noted previously, the widely-accepted definition for food insecurity offered by the FAO is the result of shifts in the focus of the international food regime and less a process of refinement of a conceptual definition. As are result, there are important aspects of each of the four dimensions implied within this definition, but they appear pasted together haphazardly rather than part of a lager conceptual framework. The next section of this chapter will attempt to conceptualize food insecurity and its four dimensions as key steps along the process by which food is produced until the time it is consumed.

[40] European Commission and FAO. (2008). *EC-FAO Food Security Information for Action Programme: Food Security Concepts and Frameworks*. EC-FAO Food Security Information for Action Programme. Rome, Italy: United Nations, 7.

2.3. Creating A More Intuitive Definition of Food Insecurity

The four dimensions of food insecurity should be seen as essential components of a conceptual framework for food insecurity. This project presents the four dimensions as integral components of the process by which food is produced to when it is consumed.

As the first dimension of food insecurity captures the availability of food, it may be helpful to imagine this step as the initial process by which food is grown domestically or imported and then gathered into a figurative food basket for a state (Figure 2.1). Once food is within a state, the next step in the process is for individuals to access it. Thus the access dimension can be understood as the extended part of the food production-to-consumption process in which food is transported, purchased, stored, prepared, and distributed within a given household to individuals.

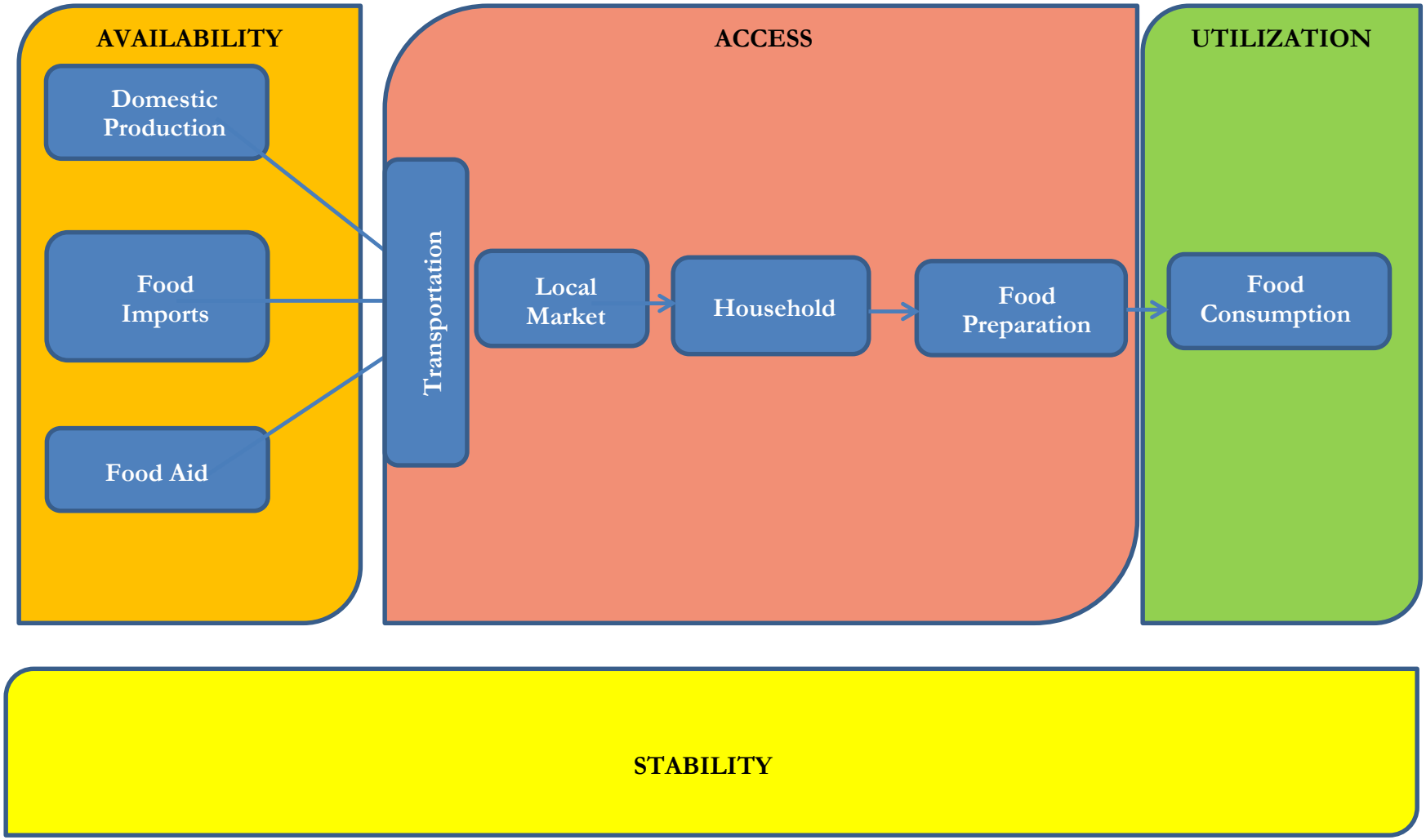
Once food is distributed, the utilization dimension is the last step in this process. In this step, individuals consume food, converting it into energy. The stability dimension is unlike the other dimensions in that it does not reflect a step in this process. Instead, it reflects the resiliency of this process to outside factors.

Based on this conceptual view of the four dimensions of food insecurity, this project redefines food security to be: an uninterrupted, ideal version of this process by which food is produced until it is consumed. As a result, the new definition of food insecurity put forth in his project is: a situation in which either any or many parts of a process by which food is produced until it is consumed are made vulnerable and/or have been interrupted.

This definition of food insecurity improves upon existing one by including the four dimensions within the concept of food insecurity. Doing so resolves some of the ambiguities and contradictions of the existing definitions. This will have even greater significance when this project begins to discuss the weaknesses of current operationalizations as many rely on measurements that reflect only

one of the dimensions of food insecurity. By creating clearer definition of food insecurity, this project presents the possibility of clearer, more accurate measurements.

Figure 2.1 The Food Production to Consumption Process



CHAPTER 3

AN ORIGINAL MEASUREMENT OF FOOD INSECURITY

This chapter will both survey the existing measurements of food insecurity used by scholars and policymakers and provide a method for operationalizing food insecurity that improves on these measurements in at least two ways. First, this project operationalizes food insecurity based upon the intuitive definition and conceptual framework of food insecurity offered in chapter two. As noted in chapter two, this project conceptualizes the four dimensions of food insecurity offered by the FAO act as integral parts of the food production-to-consumption process. In doing so, food security can be more easily understood as the ideal version of this food production-to-consumption process, or a process in which there are no interruptions or even vulnerabilities. In contrast, food insecurity is when one or more of these parts weaken or collapse. Thus, a measurement of food insecurity captures the extent of interruptions to this process.

Second, this project offers relatively simple measurements for each of the four dimensions of food insecurity in addition to one overall measurement of food insecurity. In doing so, this project allows food insecurity scholars to begin theorizing and empirically testing how each of the types of food insecurity are caused and (as is the central focus of this project) when, why, and how state's address each of the types of food insecurity when they occur within their borders.

3.1. Existing Measurements of Food Insecurity

As the policymakers and scholars disagree on the best means to operationalize food insecurity, this section discusses the strengths and weaknesses of contemporary measurements used. There are two categories of measurements: those that are easy to use, but capture only one dimension (or at times only one aspect of one dimension) of food insecurity and those that capture the complexity of food insecurity, but are non-operationalizable.

3.1.1. Elegant, Yet Incomplete, Measurements of Food Insecurity

One category of food insecurity measurements fail to address the full conceptual definition of food insecurity but instead focus only on one particular aspect or one dimension. Often these measurements focus on the utilization dimension of food insecurity exclusively. There are two key measurements of food insecurity that fall within this category: the FAO's "Intensity of Food Deprivation" measurement[41] and the International Food Policy Research Institute's "Global Health Index."[42]

FAO's "Intensity of Food Deprivation" Measurement. The FAO's "Intensity of Food Deprivation indicator is one of the most commonly used measurements of food insecurity.[43] It measures the

[41] The FAO's Depth of Food Deprivation indicator has previously been referred to as the Depth of Hunger index or the Severity of Food Deprivation indicator.
[42] Grebmer et al. (2012). *Global Hunger Index*. Washington, D.C.: International Food Policy Research Institute.
[43] E.g. Kick et al. (2011). Intensity of Food Deprivation: The Integrative Impacts of the World System, Modernization, Conflict, Militarization and the Environment. *International Journal of Comparative Sociology*, 52(6): 478-502; Austin et al. (2012). Agricultural Trade Dependency and the Threat of Starvation: A Cross-National Analysis of Hunger as Unequal Exchange. *International Journal of Sociology*, 42(2): 68-89; Shandra et al. (2009). Ecologically Unequal Exchange, World Polity, and Biodiversity Loss. *International Journal of Comparative Sociology*, 50(3-4): 285–310.

depth of hunger within the undernourished population in a state.[44] The FAO defines the undernourished population as those individuals within a state believed to lack the food calories they need to engage in "necessary and desirable physical activity consistent with long-term good health."[45] This measurement captures the extent to which the undernourished population in one state fails to meet these requirements as compared to the undernourished population in another state. Put simply, this indicator measures how undernourished the undernourished population in a state is.

The "Intensity of Food Deprivation" indicator is calculated in four steps. In the first step, the FAO determines the average daily energy requirement (ADER) for a state. To do so, the FAO uses measurements of ADERs from a sample of individuals. There are four key components to a daily energy requirement for an individual: (1) the amount of energy required for the body when at rest, (1) the amount of energy required to consume food and absorb its nutrients, (3) the amount of energy required to engage in physical activity, and (4) the amount of energy used to conduct tasks specific to a subsector of the population (e.g. breastfeeding for lactating women).

As each individual varies in these four basic components,[46] and it would be cost prohibitive, time prohibitive, and arguably impossible to measure each of these four components in every individual, the FAO has determined that individual energy requirements may be aggregated into five categories based on age and life phase – infants, children and adolescents, adults, pregnant women, and lactating women . Thus the FAO assumes that: (1) individuals within these groups have significantly similar energy requirements, and (2) the groups have significantly different energy

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[44] The literature uses these terms interchangeably. This project chooses to use the term undernourished as the terms underfed and food deprived appear to imply a sense of responsibility on the part of actors (including the one undernourished) to rectify this problem. Though there may be a very strong case made in favor of the right to food for all, this project attempts to be non-normative in its tone.

[45] Food and Agricultural Organization. (2001). *Human Energy Requirements*. Rome, Italy: United Nations, 4.

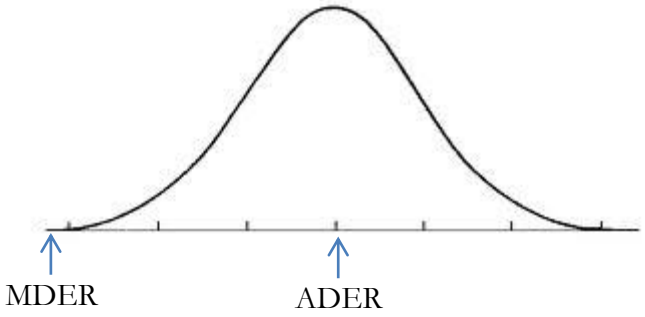
[46] Ibid.

requirements from one another. To illustrate a difference among these groups, infants (i.e. zero to less than 12 months) are found to allocate approximately forty percent of their energy requirements to energy disposition, the process necessary for developing tissues and organs, whereas energy disposition comprises less than one percent in children and adolescents. For details of how each of these subsector's energy requirements differ.

Once the FAO has aggregated the individual energy requirement measurements for each individual into groups, it uses these measurements to make projections for similar subsectors in other states. Specifically, the FAO used median weight-to-age and median weight-to-height from the World Health Organization to predict the average daily energy requirements for each subsector within a population not sampled. Once the ADER is predicted for each subsector of a population, the overall ADER is calculated by weighting the ADER for each subsector by the percentage of the population of which that subsector comprises.

Once the state ADER is estimated, the next step in determining this indicator is to estimates the minimum daily energy requirement (MDER) for a state. Were one to place the ADER as the mean of a normal distribution curve, the MDER would be the point one standard deviation below the ADER (Figure 3.1). The MDER is an important indicator in itself as it is considered by the FAO to be the threshold below which individuals are considered to be undernourished.

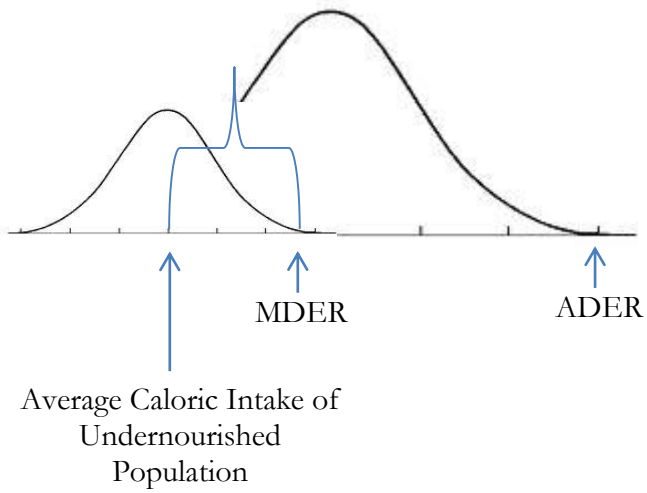
Figure 3.1 Average Daily Energy Requirement



Once the MDER is determined for a state, the third step in calculating the "Intensity of Food Deprivation" measurement is to estimate the average amount of food that is consumed daily by the undernourished population within a state (i.e. those individuals who consume or consume less than MDER). Household survey data, gathered by various national statistics offices, are used to estimate this information.

The fourth and final step in calculating the "Intensity of Food Deprivation" measurement is to find the difference between the amount of calories needed to meet the minimum daily energy requirement and the average daily calories consumed by the undernourished population. This amount helps one to understand how far the undernourished population fall under the threshold of optimal daily energy requirement levels (Figure 3.2).

Figure 3.2 Intensity of Food Deprivation



The greatest strength of this measurement is that the theoretical definition and empirical measurement are both from FAO, and for this reason this data tend to be the most commonly used in food insecurity studies at the state level. This measurement, however, it is far from ideal.

First, there are methodological issues with the samples used to measure ADERs in individual. All of the studies the FAO included in its calculation of individual ADERs used sample populations of "healthy" individuals from developed states. For example, for the studies on children and adolescents, 56 percent of the boys and 68 percent of the girls samples were from the United States or the United Kingdom, 18 percent of the boys and 18 percent of the girls were from Canada, Denmark, Italy, Sweden or the Netherlands, and 26 percent of the boys and 14 percent of the girls were from Brazil, Chile, Colombia, Guatemala or Mexico.[47] Thus generalizations are being made based on a narrow representation of individuals.

Moreover, the only variation allowed when predicting other populations' ADERs based on these samples is the varying levels of physical activity (i.e. sedentary, moderate, and vigorous). The distinctions between the three levels of physical activity, however, are described relative to each other rather than using objective standards. For example, when defining a moderate activity levels, the FAO used the descriptor, "more energy expenditure than that described for sedentary lifestyles" rather than suggesting the range of acceptably energy expense that qualifies as moderate.[48] Though it gives some examples for each activity level, these are also unclear. As an example, the FAO suggests that individuals with moderate physical activity levels might engage in "one hour…of moderate to vigorous exercise, such as jogging/running, cycling, aerobic dancing or various sports activities."[49] Individuals with vigorous physical activity level might be "non-mechanized agricultural labourers [sic] who work with a machete, hoe or axe for several hours daily and walk long distances over rugged terrains, often carrying heavy loads."[50] The distance between these two levels of physical

[47] Ibid., 20.
[48] Ibid., 38.
[49] Ibid., 39.
[50] Ibid.

activity is vast, and yet there is no objective unit of measurement used. Thus scholars are allowed much freedom in determining a group's general activity level.

A second criticism of this measurement is that focuses on the extent of undernourished within the undernourished population but explains little about how prevalent this issue is in the state. Though a state may have a deeply undernourished population, from this measurement it would be unclear as to whether ten or ten thousand people suffered from such profound food deprivation. To illustrate, state A may have ten people undernourished and state B may have ten-thousand people, yet these two states have identical "Intensity of Food Deprivation" measurements.

Third, though substantively this measurement is meaningful, it fails to capture the conceptual definition of food insecurity. Specifically, it focuses on only one dimension of food insecurity – the utilization of food – but does not indicate whether this insecurity is due to a lack of availability, access, or stability, or some combination thereof. In addition, it fails to explain an issue of food utilization fully. Though this indicator measures the amount of calories being consumed, it does not explain the quality of these categories. That is, it explained how *under*nourished a population might be but not how *mal*nourished it is.

The IFPRI's Global Health Index (GHI). Another commonly used indicator for capturing food insecurity is the Global Hunger Index (GHI).[51] Developed by the International Food Policy Research Institute (IFPRI), this indicator includes three equally-weighted measurements: the prevalence of undernourished in a population, the prevalence of underweight in children under age five, and the mortality rate in children under five years of age.

The first part of this indicator, the prevalence of undernourished in a population, provides some of the missing information from the "Intensity of Food Deprivation" measurement

[51] Grebmer et al. (2012). *Global Hunger Index*. Washington, D.C.: International Food Policy Research Institute.

mentioned above. It, however, omits the extent to which this population is suffering. As noted above, both measurements should be included to explain the breadth and depth of food deprivation within a state.

The second part of this measurement highlights the proportion of children younger than the age of five who are underweight for their age. This includes children who are suffering from stunting (i.e. a height-to weight index that is less than -2 Z-scores), those who are suffering from wasting (i.e. a weight-to height index that is less than -2 Z-scores), or those who are suffering from both.[52]

The third part of this measurement is the child mortality rate in children under five years of age. This measurement is the number of deaths annually of children under five as compared to the number of children under five at risk of dying during that same year.[53] The IFPRI suggests that by including the child mortality rate, the GHI captures a broader relationship that exists within a state between "inadequate dietary intake and unhealthy environments." [54]

The IFPRI suggests that there are two key advantages to this measurement.[55] First, by including measurements that focus on children as well as adults, the IFPRI suggests that this index offers a picture of the entire population and a picture of a particularly vulnerable subset (i.e. children). Second, by including independently-collected data into one index, the IFPRI hopes to reduce the effects of random measurement errors that could occur within each of these measurements. A third strength of this measurement is that it is both parsimonious (i.e. including

[52] World Health Organization. (2011). *World Health Statistics*. Rome, Italy: United Nations.
[53] Ibid.
[54] Ibid, 7.
[55] Grebmer et al. (2012). *Global Hunger Index*. Washington, D.C.: International Food Policy Research Institute.

only a small number of indicators) and provides details about several different aspects of food utilization among both adult and children populations in a state.

By choosing to use the average of these three closely-related measurements as an indicator, however, the IFPRI loses much detail about each of the individual measurements. For example, if one state has a high mortality rate in children under five and a low prevalence of undernourishment in adults and another state has the reverse, the GHI treats these states as relatively similar. Thus the inclusion of information about children and adults is thus loss if these measurements are simply averaged. Moreover, though it is clear that certain populations are at risk, it is unclear if it is due to undernourishment (i.e. not enough calories) or malnourishment (i.e. a poor quality of nutrition).Finally, though this measurement adds relatively more detail than the FAO's "Intensity of Food Deprivation" indicator, it focuses exclusively on the utilization dimension of food insecurity. Thus this measurement adds more information than the "Intensity of Undernourishment" indicator from the FAO, but it is far from sufficient in capturing the full nature of the concept of food insecurity. A more comprehensive measurement of food insecurity must consider issues of availability, access, and stability as well. The next section will explore indicators that successfully capture more dimensions of food insecurity but are extremely difficult to operationalize.

3.1.2. Multi-Dimensional, Yet Non-Operationalizable, Measurements

Whereas the two measurements mentioned above capture only (aspects of) one dimension of food insecurity, the measurements mentioned below suffer from the opposite problem: each captures the complexity, or multidimensionality of the concept, but none is operationalizable.

The first is the International Food Security Classification Phase (IPC).[56] This classification framework is a joint effort of the FAO, WFP, USAID-funded FEWS NET, Oxfam GB, CARE, Save the Children UK, Save the Children US, and the Joint Research Center of the European Union. The main purpose of this framework is to provide a common means for policymakers to assess whether food insecurity exists in a specific situation and, if so, to what extent. To do so, the IPC distinguishes five phases of food insecurity, ranging from "generally food secure" to "famine/humanitarian crisis."[57] It also presents thirteen indicators that it suggests are key to assessing in which phase a situation of food insecurity may fall and suggests how each indicator plans to be operationalized (for a complete list, see Appendix A).

The classification system, however, offers little methodological guidance. Instead, it includes "multiple methods and data sources" and suggests that policymakers should rely on a "consensus-based" evaluation of the data by "technical" experts to determine what type of food insecurity is present in a given situation.[58] To represent the concept of food insecurity more effectively, however, the system must include one data source and measurement for each indicator to allow each to be compared across cases. Once each indicator is thus operationalized, this classification system should offer a clear methodology for examining and combining the thirteen indicators (e.g. presenting an index, ranking system, etc.).

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[56] Food and Agricultural Organization. (2008c). *Integrated Food Security Phase Classification Technical Manual* (Version 1.1.). Rome, Italy: United Nations. The data are being compiled for the International Food Security Classification Phase and should become available to the public soon at www.ipcinfo.org.

[57] The five phases of food insecurity in the IPC are: (1) generally food secure, (2) moderately/borderline food insecure, (3) acute food and livelihood crisis, (4) humanitarian emergency, and (5) famine/humanitarian crisis.

[58] Food and Agricultural Organization. (2008c). *Integrated Food Security Phase Classification Technical Manual* (Version 1.1.). Rome, Italy: United Nations, 14.

Finally, the classification system, however, fails to mention either the conceptual definition of food insecurity or its four dimensions and does not appear to have used these concepts to inform its decision of indicators, and it gives no explanation for why these thirteen indicators were chosen over others. Though many of these indicators offer the potential to provide a rich description of food insecurity and certain indicators could arguably reflect important aspects of each dimension of food insecurity, this classification system would benefit from stating explicitly how these thirteen indicators is both necessary and sufficient in explaining food insecurity crises.[59]

The FAO's "Food Security Indicators" (2012). In the fall of 2012, the FAO published a dataset called the "FAO: Food Security Indicators." This dataset includes twenty-six indicators based on recommendations from experts at the Committee on World Food Security (CFS) Round Table on Hunger hosted at the FAO headquarters in September 2011. The inclusion of each indicator was based on three stated parameters. First, each indicator included was based on the recommendation of experts at the round table and was meant to improve upon existing measurements of food insecurity. Second, each indicators included had sufficient data "coverage to enable meaningful comparisons across regions and over the years."[60] Finally, the indicators included reflect a desire by experts to introduce new indicators to address the recognized gaps in food security information systems.[61]

In the supplemental notes attached to the dataset, the FAO introduces a new conceptual framework that uses two overlapping systems to organize these indicators. One system of organization groups the indicators into four categories: determinants (or inputs), outcomes,

[59] This project acknowledges that this classification system has yet to be completed; thus the criticisms states here focus only on the stated purposes of and uses for the classification system.
[60] Food and Agricultural Organization. (2013a). *Food Security Dataset*. Rome, Italy: United Nations.
[61] Ibid.

vulnerabilities/stability, and additional useful statistics.[62] The second system of organization groups the indicators along the four dimensions of food insecurity. Appendix B demonstrates which indicators fit into which categories.

For the first organizational framework, the category called determinants includes indicators that when absent or present only in an insignificant amount may worsen a food insecurity situation.[63] The determinants category is also divided into four sub-categories that somewhat mirror the four dimensions of food insecurity: availability, economic access, physical access, and utilization.

The second category of indicators in this dataset is referred to as "outcomes." Indicators within this category seek to capture the effects of "inadequate food consumption or anthropometric failures" on food insecurity.[64] Some of these indicators (i.e. prevalence of undernourishment and percentage of children under five who are underweight) are seen within the global health index. The depth of the food deficit is the same indicator as the "Intensity of Food Deprivation" indicator mentioned above. The outcomes category is divided into two categories: inadequate access to food and utilization.

The third category of indicators in this dataset is referred to as "vulnerabilities/stability."[65] The vulnerabilities category is not sub-divided but the title is vulnerabilities/stability, suggesting that each of the indicators within this category is also considered to be an indicator associated with the stability dimension.[66] The fourth category, additional useful statistics, includes two indicators: number of people undernourished and total population.

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[62] Ibid.
[63] Ibid.
[64] Ibid.
[65] Ibid.
[66] Ibid.

There are several strengths to this dataset as a resource for measuring food insecurity. First, it includes the four conceptual dimensions of food insecurity as a means for organizing empirical measurements of food insecurity. This strategy allows users to examine the relationship between the concept of food insecurity and the operationalized measurements the FAO is suggesting represent this concept.

Second, this dataset successfully includes socioeconomic dimensions of food insecurity. For example, indicators within this dataset examine the economic affordability of food both at the farm gate (e.g. average value of food production) and in the local market (e.g. share of food expenditure of the poor). This dataset also incorporates social elements. For example, it includes indicators for diets based primarily on starches (e.g. share of dietary energy supply derived from cereals, roots and tubers) as well as those that include meat (e.g. average supply of protein of animal origin). Such indicators that capture a broader picture of food insecurity, the FAO may highlight possible policies that can alleviate its deleterious effects.

This dataset, however, is not without its weaknesses. First, though it includes the four conceptual dimensions of food insecurity as one means by which to organize the indicators, it does not use the conceptual dimensions to inform which indicators are included and it includes no explanation as to why these indicators were chosen over others either in the note section or in supplemental materials.[67]

Second, it appears to distinguish different aspects within the four dimensions without explanation and to haphazardly group the indicators under these aspects. For example, the access dimension can be found within the first category, determinants, as two sub-headings - economic access and physical access – and it can also be found as an ambiguously-titled sub-category within

[67] Ibid.

the outcomes category "inadequate access to food." Utilization can be found as its own sub-category in both determinants and outcomes. Thus this dataset lacks is a clear system of organizing the indicators that uses the four dimensions purposively rather than includes them in an ad hoc manner. Finally, it fails to offer guidance for how these variables may relate to one another (e.g. how they may be compiled into a larger measurement of food insecurity).

None of the current measurements of food insecurity adequately capture the concept of food insecurity in its entirety. Some focus on only one dimension (and at times only one aspect of one dimension), while others include indicators for multiple dimensions that are operationalizable. The next chapter will outline five measurements – one for each of the four dimensions and one for an overall indicator of food insecurity. Each of these measurements improves upon current operationalizations of food insecurity offered.

The next chapter will reexamine the process of food production to consumption and argue that each of the dimensions of food insecurity highlight key vulnerabilities in this process. Further, it will introduce five original measurements that improve on existing measurements of food insecurity. Four of these measurements will gauge variation in each of the four dimensions of food insecurity. The fifth measurement will use factor analysis to combine these four measurements in a complex, yet manageable way.

A key purpose of this dissertation is to create five original measurements for food insecurity based on the definition and conceptual framework developed in chapter two. To do so, this project must first examine the dimensions of food insecurity more closely.

3.2. An Original, Multidimensional Measurement for Food Insecurity

The difficulty for many scholars who study food insecurity is that, whereas there is agreed upon conceptual definition of food insecurity, there is no consensus as to its empirical operationalization. This dissertation develops five original measurements for food insecurity: one general measurement for examining the level of food insecurity in a state and four specific measurements each meant to illustrate the level of each type of food insecurity within each state (i.e. food availability, food access, food utilization, and food stability). The next section will explain the existing measurements of food insecurity in the literature and the challenges of each of the systems. The second part of the chapter will then introduce key measurements that best capture the conceptual definition of food insecurity. The chapter will end by explaining how these measurements will be combined into five measurements of food insecurity using factor analysis.

3.2.1. Measuring Availability

There are two key means by which food is made available within a state: it is either grown or imported. The FAO provides two measurements that can be used to represent each of steps. The first measurement is the total amount of food grown for domestic consumption in a state in a given year. This data is measured as kilograms of good per food group. The second measurement from the FAO is the total amount of food imported into a state in a given year. This data are also measured in kilograms of food by food group, and these data represent food imported either as food aid or to be sold in a state. Table 3.1 below includes the proxy measurements and sources used in this dissertation to capture domestic food production and food import indicators for each state.

For simplicity this project has combined the following food groups: animal fats, aquatic products (e.g. seaweed), eggs, fish & seafood, meat, milk, offals, oilcrops, pulses, treenuts, and

vegetable oils are all regrouped as high protein foods and cereals, fruit, spices, starches, sugars, and vegetables are all regrouped as high protein foods.

Table 3.1: Measurements for the Availability Dimension of Food Insecurity		
Indicator	Measurement Explained	Source(s)
Domestic Food Production	Quantity (in kilograms) of food (organized by main food groups) per person grown domestically each year	FAO "Food Production: Group Quantity" Index (1990 to 2007)[68]
Food Imports (Including Aid) Food Aid	Quantity (in kilograms) of food (organized by main food groups) imported per person each year. Numbers include food aid imports as well.	FAO "Food Trade: Group Quantity" Index (1990 to 2007)[69]

3.2.2. Measuring Availability

Indicators within the access dimension highlight the step by which food is transported throughout the state, it is sold, the steps by which it is prepared, and the steps by which it is distributed within a household. The first indicator for the access dimension for food insecurity measures the step in the process by which food is transported. Specifically, there may be situations in which enough food is available in a state to feed the entire population, but the transportation infrastructure may not be in place to deliver food to each individual. Food may be grown domestically but there is no dependable transportation network to deliver it to towns or cities to be sold. Conversely, though food may be imported regularly, there may be no dependable road, rail, or air networks to transport it to the rural population beyond the city limits in which transportation hubs tend to be located. Thus, the access dimension should include an indicator that seeks to measure the presence of adequate transportation of food within a state.

[68] Quantities for this data are given in tons. To convert these values to kilograms per capita, this project divided each ton by 907.105 and then divided this value by the total population for each state in a given year.

[69] Food and Agricultural Organization. (2011). *Trade Indices Dataset*. Rome, Italy: United Nations.

Transportation Infrastructure. Though there is not a measurement available that represents how much food is transported in a state in a given year, there are measurements from the FAO and World Bank that measure transportation infrastructure. The recently released dataset from the FAO noted above, "Food Security Indicators," includes measurements of transportation. Specifically, it includes the percentage of roads in a state that are paved, the density of rail lines (measured as the number of kilometers of track laid for every one-hundred square kilometer in a state), and the density of roads (measured as the number of kilometers of road laid for every one-hundred square kilometer in a state). Substantively, these measurements seek to capture the quantity and quality of roads and the quantity of rail in a given state.

Though these measurements are also compiled by the World Bank, they are inferior to other measurements offered by this organization. Specifically, the World Bank offers data one the amount of goods (in kilotons) transported per kilometer by road, train, and air within a state in a given year. This indicator improves on the FAO's measurement as it addressed the intensity of use of the transportation infrastructure and not simply the quantity or quality of its rail and road networks. Further, these data offer a measurement for goods being transported by air as well. Thus the transportation infrastructure indicator included in this project improves on the existing one offered by the FAO (Table 3.2).

Affordability. The second access indicator measures the affordability of food in a state. Again, the assumption is that no individuals will have access to food simply because it is available in a state. Even if the food has been transported and is readily available in a local market, one must also examine the cost to acquire food.

The most common measurement of food affordability is the percentage of total expenditure spent on food. This measurement is estimated by first assuming that each state has a

theoretical basket of goods and services that each household in a state will purchase or acquire within a given year. The measurement for share of food expenditure is taken by estimating the percentage of that basket that is filled with food.

There are four data sources, each of which measures the share of total expenditure spent on food by the population. First, the FAO offers a dataset that does not attempt to represent indicators for food insecurity in general but instead targets the share of total expenditure spent on food at the state level and for the urban and rural sectors from 1990 to 2007.[70] Data for this measurement were gathered from household surveys. In addition to asking respondents to consider the amount of money they spend on food directly (including food in restaurants and other vendors), the surveys also asked respondents to consider the monetary value for food they obtained via their own-production, as gifts, and as in-kind payments. Thus, this indicator presents a more nuanced view of food acquisition by incorporating the informal economy as well. There are, however, very few observations included in this dataset.

The FAO has a second measurement included within the recent "Food Security" dataset that measures the percentage of total expenditure that was spent on food, but this measurement focuses only on the households considered to be in the lowest-income quartile in a state. The FAO states that the focus of this measurement was due to Engel's law, which assumes that the "higher the income of a household, the lower the proportion of income spent on food."[71] If households with a higher income tend to spend less on food, then it can be assumed that the lower-income households may spend more on food. Thus, when the price of food increased in a state, this population may be the most vulnerable to these increases. If one adopts this assumption, this indicator should be higher

[70] Food and Agricultural Organization. (2013a). *Food Security Dataset*. Rome, Italy: United Nations.
[71] Ibid.

than the national measurement offered in the dataset mentioned above. This dataset, however, also has few observations.

A third source for food affordability data is the International Labor Organization (ILO).[72] It offers a dataset, which includes data for most states. These data, however, are collected from various surveys. Some states only have data for one or two years, and these years are not the same across states, and some states have observations at the national level only while others include data for rural and urban subsectors. This raises issue of comparability. Overall, however, this data sources provides more observations that the two offered by the FAO.

A fourth source for data on food affordability is the USDA.[73] The USDA provides a dataset that includes national level data for many states between 2008 and 2010. This dataset includes only food eaten at home, however, and thus excludes restaurants and other vendors. As a result, these measurements may be lower than those of the FAO and ILO.

For this indicator, this project will include data from all four sources at the national level only. Though it would provide greater detail to include data at the sub-national level (i.e. urban vs. rural sectors or separate deciles or quartiles), there is too little data available at this time. In the case that there are two different measurements for the same country and year, this project will include the more conservative (i.e. lower) measurement.

Intra-household Access to Food. The above indicators within the access dimension focus on physical access (i.e. transportation, water, and sanitation infrastructure) and economic access (i.e. affordability of food). There is also a cultural component to access. The final indicator included within the accessibility dimension examines the disparities in intra-household access to food. In

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[72] International Labor Organization. (2013). *Household Income and Expenditure Statistics*. Geneva, Switzerland: United Nations.
[73] United States Department of Agriculture. (2012). *Food Expenditures Dataset*. Washington, D.C.: United States Government.

certain situations, intra-household food allocation may be the result of cultural norms. For example, some households may prioritize children in cases of food scarcity. Others may prioritize members of the house required to work for the well-being of the household or those who are pregnant or ill. Still others may prioritize members of one gender over the other.

Cultural norms are difficult to operationalize, as there are potentially endless norms around food that could be examined. Further, many of them may vary considerably from one culture to the next or, at times, within cultures. For example, some cultures may prioritize children when considering who should obtain access within a household to limited food. Others may prioritize women, especially those who are pregnant, while others may prioritize laborers or the elderly who are more prone to illness. This project does not examine each of these norms in turn. Instead, when examining intra-household access to food, it includes an indicator that measures the average number of members in a household. The choice of this measurement is based on one key underlying assumption - the greater the number of individuals within one household, the greater the likelihood that there will be a choice made within the household as to how food will be distributed. These data are collected by the International Labour Organization (ILO) "Household Income and Expenditure Statistics" (1998-2012) dataset and the United Nations.[74]

Clean Water Sources & Sanitation Facilities. Once food is obtained, the next step in the food production to consumption process is its preparation.[75] Once food is obtained for a household,

[74] United Nations Statistical Division. (2014). *Households by Age and Sex of Reference Person and by Size of Household*. New York, New York: United Nations.

[75] The process of properly storing food prior to retail and after is also a step in the process that could lead to food waste. The FAO takes waste into account, however, in its estimations of food production and import. Thus it is not included as a separate indicator in this project.

ensuring access to clean water and proper sanitation are effective means for preventing food-borne illnesses in a population.[76] Thus the third and fourth indicators within the accessibility dimensions

Table 3.2: Measurements for the Access Dimension of Food Insecurity		
Indicator	Measurements Explained	Source(s)
Transportation Infrastructure	The total amount of goods (in millions of kilotons) traveled per kilometer of good delivered by road, railroad, or air in a state in a given year.	World Bank's "Infrastructure" Data (1980-2011)[1]
Affordability of Food	Percentage of total consumption expenditure (i.e. the monetary value food and non-food acquired items) consumed by members of household spent on food and beverages (including alcohol).	FAO, ILO, & USDA[1]
Intra-Household Access to Food	Average number of members within a household.	International Labour Organization (ILO) "Household Income and Expenditure Statistics" (1998-2012) dataset and the United Nations "Household Size" Dataset[1]
Access to Clean Water	The percentage of population using an improved drinking water source that can provide at least 20 liters of water per person per day and is accessible from within a kilometer from an individual's dwelling. An improved drinking water source, by nature of its construction and design, is likely to protect the source from outside contamination, in particular from fecal matter (e.g. protected spring, protected dug well, or stand pipe). This data can be divided by rural and urban sub-sector.	WHO "Water, Sanitation, and Hygiene" data (1990-2010)[1]
Access to Maintained Sanitation Facilities	Percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewage connection. To be effective, facilities must be correctly constructed and properly maintained.	WHO "Water, Sanitation, and Hygiene" data (1990-2010)[1]

[76] Ashbolt, N. J. (2004). Microbial Contamination of Drinking Water and Disease Outcomes in Developing Regions. *Toxicology*, 198(1): 229-238.

measure populations' access to clean water sources and maintained sanitation facilities. Both indicators include data from the World Health Organization.[77]

The indicator for clean water is the percentage of the total population within a state that has access to an improved water source. Improved water sources are constructed in a way that is "likely to protect the source from outside contamination, in particular from fecal matter."[78] Examples of such water sources include a household connection, a public standpipe, a borehole, a protected well or spring, and rainwater collection. Unimproved sources include water vendors, tanker trucks, and unprotected wells and springs. Individuals within a population are considered to have access to an improved water source if it is within one kilometer of their home and if the source provides at least 20 liters of water per person per day.

Percentage of the population with access to improved sanitation facilities is another indicator included in this project. An improved sanitation facility is one that effectively disposes of excreta so as to prevent human, animal, and insect contact with it. Examples of improved sanitation facilities range from protected pit latrines to flush toilets with a sewage connection. Effectiveness of such facilities depends on how well they are constructed and whether they are properly maintained. In some states, access to improved water sources and sanitation facilities may be more likely to occur in part of the state but not others. As a result, the project includes indicators the national level as well as urban and rural measurements.

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[77] World Health Organization. (2012). *Water Sanitation Health Data*. Geneva, Switzerland: United Nations.
[78] Ibid.

3.2.3. Measuring Utilization

Once food has been made available and individuals gain access and prepare it, the last step in the process is when an individual's consumes it. When examining food insecurity, food utilization issues may be grouped into two general categories. The first category is undernourishment. As noted previously, undernourishment occurs when an individual or population lacks sufficient amounts of kilocalories (i.e. calories from food).[79] Issues of hunger and starvation occur because of undernourishment. The second category into which food utilization problems may be grouped is malnourishment. Malnourishment occurs when individuals lack certain macro- or micronutrients essential for one's health.

Prevalence of Undernourishment. There are two common measurements included when studying undernourishment in food insecurity situations, both of which are offered by the FAO (Table 3.3).[80] The first indicator in the utilization dimension looks at the prevalence of undernourishment, or the percentage of the population whose caloric intake is at or below the minimum daily requirement for that state. Though this measurement explains how many people in a state may be lacking sufficient amounts of food, it does not tell us how much they lack or even what kinds of food they are lacking. Thus the prevalence of undernourishment is one of several important measures of food utilization.

Intensity of Food Deprivation. A second indicator of undernourishment is the FAO's measurement that captures the intensity of food deprivation, or how far under the minimum daily energy requirement the undernourished population's caloric intake falls. This indicator portrays the comparative depth of the undernourishment problem in each state. Together these two indicators provide much detail about the nature of undernourishment within a state.

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[79] This project acknowledges that the amount of calories considered to be sufficient varies among individuals and within one individual's life span. Thus undernourishment has an element of normativity.

[80] Food and Agricultural Organization. (2013a). *Food Security Dataset*. Rome, Italy: United Nations.

Though an individual who is undernourished may also suffer from malnourishment, these two problems are not inextricably linked. That is, an individual may have obtained insufficient quantities of food (i.e. undernourishment), sufficient quantities of food, or may have even eaten more than sufficient quantities of food (i.e. overnourishment) and also be malnourished. Thus malnourishment measurements provide little detail as to the amount of calories consumed.

Table 3.3: Measurements for the Utilization Dimension of Food Insecurity

Category	Indicator	Measurement Explained	Sources
Undernourishment in Population	Prevalence of Undernourishment (i.e. Food Deprivation)	The proportion of the population considered undernourished or food deprived (i.e. far under the minimum daily energy requirement level).	FAO "Prevalence of Undernourishment in Total Population" data (1990-2009)[81]
	Depth of Undernourishment (i.e. Food Deprivation)	The difference between the average energy consumption per undernourished person and the average daily consumption requirements (ADER).	FAO "Intensity of Food Deprivation" data (1990-2009)[82]

Malnutrition can occur when there is a deficiency in macronutrients or micronutrients. Macronutrients are the components in food that provide energy.[83] These include proteins, carbohydrates, and fats. The healthy ranges of macronutrients intake in proportion to overall energy intake is 55-75 percent for carbohydrates, 15-35 percent for fats, and 10-15 percent for proteins.[84] The lack of protein in a diet, or protein-energy malnutrition (PEM), is considered by the United

[81] Ibid.
[82] Ibid.
[83] Food and Agricultural Organization. (2000). *State of Food Insecurity in the World*. Rome, Italy: United Nations.
[84] The FAO offers data on the average percentage of intake for each of these types of macronutrients by state. This indicator, however, is far from ideal for two reasons. First, the range of acceptable intake is varies so much for each type of macronutrient that it is difficult to truly understand if a population may be suffering from malnutrition based on this data. Second, these data are estimates based on production trends and not actual measurements of consumption. As this project has already included the FAO's production data, these two measurements would be almost perfectly correlated. It is for these reasons this measurement is not included in this study.

Nations to be the most lethal form of malnutrition as "protein is necessary for key body functions including provision of essential amino acids and development and maintenance of muscles."[85]

The World Health Organization (WHO) finds that malnourishment is measured most directly measured in the growth assessments of children as "health and nutrition, regardless of their etiology, invariably affect child growth."[86] Moreover, based on the United Nations' "Hunger Notes," malnutrition is most often measured by stunting in children. The WHO improved upon this measurement in 1993 when it published the "Global Database on Child Growth."[87] This dataset includes nationally representative cross-sectional data on our growth assessments in children under five years of age that include stunting, wasting, and data on how many children in this age-range are underweight and overweight. These four growth assessment indicators included within this dataset and this project are: wasting in children under five, stunting in children under five, children under five who are underweight. The data were gathered between 1980 and 1992 in 79 developing countries within Africa, Asia, Latin America, and Oceania. The WHO estimates that they cover 87% of the total population of under-5-year olds within these regions.[88]

Wasting & Stunting in Children Under Five Years of Age. As noted previously in this project, wasting in children under five can be measured as the percentage of the population of children under five that has a weight-for-height index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.

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[85] Klein S. (2011). Protein-Energy Malnutrition. In L. Goldman and A. I. Schafer (Eds.). *Goldman's Cecil Medicine* (24th ed.). Philadelphia, PA: Saunders Elsevier, 222. This deficiency is also referred to in the medical field as kwashiorkor.

[86] World Health Organization. (2013). *Global Database on Child Growth and Malnutrition*. Geneva, Switzerland: United Nations.

[87] Data gathered included observations from 1990 to 1992, 1995 to 1997, 2000 to 2002, and 2005 to 2007. Data compiled from 1993 to 1994, 1998 to 1999, and 2003 to 2004 are based on averages taken from adjacent years.

[88] World Health Organization. (2013). *Global Database on Child Growth and Malnutrition*. Geneva, Switzerland: United Nations.

Stunting in children under five can be measured as the percentage of the population of children under five that has a height-for-age index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.

Table 3.3 (Cont'd) Measurements for the Utilization Dimension of Food Insecurity

Malnourishment	Prevalence (& Depth) of Macronutrient Deficiency	Children Under Five who are Suffering from Stunting	Percentage of the population of children under five that has a weight-for-height index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.	WHO's "Global Database on Child Growth and Malnutrition (1986-2012)[89]
		Children Under Five who are Suffering from Wasting	Percentage of the population of children under five that has a height-for-age index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.	
		Children Under Five who are Underweight	Percentage of the population of children under five that has a weight-for-age index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.	
		Children Under Five who are Overweight.	Percentage of the population of children under five that has a weight-for-height index of more than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.	
	Micronutrient Deficiency	Prevalence of Iron Deficiency	Proportion of the population with iron deficiency.	WHO's VMNIS[90]
		Prevalence of Iodine Deficiency	Proportion of the population with iodine deficiency.	
		Prevalence of Vitamin-A Deficiency	Proportion of the population with Vitamin-A deficiency.	
		Depth of Vitamin-A Deficiency	Number of deaths in a state in a given year due to Vitamin-A deficiency.	

[89] Ibid.
[90] World Health Organization. (2014). Micronutrients Database. *United Nations.*

Weight of Children Under Five Years of Age. Children under five who are underweight can be measured as the percentage of the population of children under five that has a weight-for-age index of less than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median.

There is a measurement that captures the number of children under five who are overweight. It is measured as the percentage of the population of children under five that has a weight-for-age index of more than two standard deviations from the recommended index for that population based on the WHO Child Growth Standards median. Current research on malnourishment has considered obesity, or the state of being chronically overweight, as a form of nutrient deficiency if and when individuals are consuming more than sufficient amount of calories from food but are failing to obtain the proper amount of nutrients needed. There is much reluctance, however, to assume that all cases of obesity are correlated to cases of malnutrition as there is the possibility that an individual may be obtaining the nutrients he or she needs as well as additional calories that provide no necessary nutrients. As a result, this project is including this indicator within the dataset with no a priori assumptions made as to the significance of this measurement on explaining food insecurity in greater detail.

Each of these data offered by the WHO also includes supplemental information as to the depth of these problems. That is, each includes observations that are two or more standard deviations from the child-growth-standards medians. These data, however, are not compiled in an easily usable way (e.g. each state has an individual report with this data in paragraph format). Future studies may include these measurements as well to capture the depth of protein-energy malnutrition. For this project, however, four indicators will represents the prevalence of these issues only.

In addition to macronutrients, the body also needs micronutrients, or minerals and vitamins needed for proper growth, development, and function.[91] The World Health Organization estimates that one in three individuals within developing states is deficient in one or more micronutrients.[92] It considers iron, iodine, and vitamin A to be the three most important minerals and vitamins to one's health.[93]

Vitamin-A Deficiency. A deficiency in Vitamin-A can "cause night blindness and reduces the body's resistance to disease," and the WHO estimates that between one-hundred and one-hundred-and-forty million children are vitamin A deficient. Of that number, approximately 250,000 to 500,000 children become blind every year due to vitamin A deficiency, and half of those children die within twelve months of losing their sight. [94]

Iron Deficiency. Iron deficiency is considered to be a principal cause of anemia (the WHO suggest that thirty percent of the world's population is anemic due to iron deficiency).[95] Anemia in children accounts for health consequences such as premature birth, low birth weight, infections, and elevated risk of death. Physical and cognitive development impairments later on are found to correlate with iron deficiency at birth.

Iodine Deficiency. Iodine deficiency disorders (IDDs) are correlated with increased cases of mental impairment. Physically, IDD during pregnancy may result in stillbirths, abortions, and congenital abnormalities. IDD affects over 13 percent of the world's population, or 740 million people.

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[91] Food and Agricultural Organization. (2013a). *Food Security Dataset.* Rome, Italy: United Nations.
[92] World Health Organization. (2014). *Micronutrient Deficiencies.* Geneva, Switzerland: United Nations.
[93] Food and Agricultural Organization. (2000). *State of Food Insecurity in the World.* Rome, Italy: United Nations.
[94] World Health Organization. (2014). *Micronutrient Deficiencies.* Geneva, Switzerland: United Nations.
[95] Ibid.

To measure the prevalence of deficiency for of each of these micronutrients, this project will use county-level statistics for the three micronutrient deficiencies located in its Vitamin and Mineral Nutritional Information System (VMNIS).[96] Each of these indicators represents the number of individuals from different sectors of the population that are affected by each of these deficiencies.

3.2.4. Measuring Stability

The previous dimensions mentioned above capture the process by which food is produced, transported, purchased, prepared, distributed within a household, and consumed. In addition, the indicators chosen for each of these dimensions represent how this process might vary (e.g. domestic production yields make remain, increase, or decrease).

There is a sense from each of the definitions of stability that, rather than being a part of the food production to consumption process, the stability dimension serves to undergird the other three dimensions in some fashion. This is an important distinction as it implies that stability indicators should not measure internal changes that may occur in this process (e.g. a decrease in domestic production of food from one year to the next). Instead, stability indicators act as secondary effects, or external factors, that shape the internal processes by which food is production until the point at which it is consumed. As an example, if a conflict may occurs within a state border, it may not have been a part of the food production-to-consumption process but it may serve to undermine it nonetheless. Thus, the stability dimension should include indicators that originate outside the food production-to-consumption process and yet have the potential to make this process more vulnerable.

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[96] Ibid.

Further, this dimension appears to have an essential temporal quality to it as two of the above definitions focus on providing stability over time, while another suggests that stability can be undermined by interruptions that are either sudden or cyclical. Finally, it appears that factors within the stability dimensions could be natural, social, economic and political in nature.[97]

Another aspect that appears to be important to the conceptual definitions of stability is its temporal nature. Two of the definitions for the stability dimension offered by the FAO mention time explicitly (i.e. "the access to adequate food at all times" and the other "three dimensions should remain stable over time").[98] Another definition adds yet another layer of complexity to the temporal aspect of the stability dimension. It states that "risks to stability may either occur as sudden shocks or cyclical events."[99] Thus stability is seen as a constant, and instability is viewed as an interruption that is either sudden or recurring.

The FAO indicates that the stability dimension includes natural, social, economic, and political factors. Though it is difficult to determine a comprehensive list of those factors considered to be most essential to this dimension and still keep the number of indicators low, in keeping with the definition posited above, this project offers eight indicators that it argues would make the food production to consumption process more vulnerable (Table 3.4). Though these indicators by no means encompass all the possible threats posed to the food production to consumption process, they serve as an initial step in generating theoretically and testing empirically what this project argues

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[97] European Commission and FAO. (2008). *EC-FAO Food Security Information for Action Programme: Food Security Concepts and Frameworks*. EC-FAO Food Security Information for Action Programme. Rome, Italy: United Nations, 7.
[98] Napoli, Marion. (in press). *Towards a Food Insecurity Multidimensional Index (FIMI)*. Rome, Italy: Food and Agricultural Organization; European Commission and FAO. (2008). *EC-FAO Food Security Information for Action Programme: Food Security Concepts and Frameworks*. EC-FAO Food Security Information for Action Programme. Rome, Italy: United Nations, 3.
[99] Food and Agricultural Organization. (2006). *Food Security* (Policy Brief 2). Rome, Italy: United Nations, 1.

are key natural, social, economic, and political factors that may serve to interrupt or maintain the other three dimensions.

To capture the temporal nature of the stability dimension (i.e. factors that can influence the other dimensions either through sudden shocks or cyclical events), the broad categories of natural, social, economic, and political will each include two indicators: one that is meant to measure a more sudden shift and the other to measure a more gradual one. An additional requirement for the inclusion of each of these indicators is that it has received attention in recent scholarly literature on food insecurity.

Proportion of Arable Land in a State. This project includes two natural indicators for stability. The first one, the proportion of arable land in a state, is meant to measure gradual changes in a state's food insecurity levels. Academic research has focused on the correlation between climate change, the proportion of arable land in a state, and food insecurity in that state.[100]

For example, Cai et al. (2010) project that agricultural land will either decrease overall by almost two percent or increase nearly 4.5 percent globally depending on different emission scenarios implemented.[101] These authors argue that this change will not be uniform, however, but may affect

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[100] There is extensive research available on the relationship between climate change, portions of arable land, and food insecurity. For a discussion of how climate change and the conversion of existing cropland to biofuel production may affect the food insecurity levels in a state see Cai et al. (2011). Land Availability for Biofuel Production. *Environmental Science Technology*, 45(1): 334–339. For a policy discussion of the role that water politics play in a discussion of maintaining agricultural land in the face of climate change see Hanjra, M.A. and M.E. Qureshi. (2010). Global Water Crisis and Future Food Security in an Era of Climate Change. *Food Policy*, 35(1): 365-377. For a discussion of innovative agricultural techniques to meet the increasing demand population growth, arable land, fresh water limits, and climate change have and will place on food supplies see Fedoroff et al. (2010). Radically Rethinking Agriculture for the 21st Century. *Science*, 327(1): 833. Finally, for a discussion of both the need for and limitations of a global strategy to ensure sustainable and equitable food security in response to climate change, see Godfray et al. (2010). Food Security: The Challenge of Feeding 9 Billion People. *Science*, 327(5967): 812-818.

[101] Cai et al. (2010). Land Availability for Biofuel Production. *Environmental Science & Technology*, 45(1): 334-339.

growing seasons in various regions differently. They suggest that this change may be positive for states like Russia, China, and the United States that have relatively high latitudes. These states will benefit from higher temperatures and humidity levels. Such characteristics are conducive for extending growing seasons, which in turn will increase domestic food production potential. In contrast, Cai et al. argue that tropical and sub-tropical regions closer to the equator may lose anywhere from one to eighteen percent of their arable land as temperatures become too hot for optimal plant growth. Thus the increase of aggregate temperatures associated with climate change may have an effect on food insecurity levels in states (specifically food availability via domestic production). Moreover, this effect may be dependent on a state's latitudinal location.

An indicator included will measure the proportion of land area considered to be arable within the state. Arable land is defined as that which is either: under temporary agricultural, temporary meadows for mowing or pasture, land under market and kitchen gardens, and land that has lain fallow for less than five years.[102] Thus arable land does not indicate the amount of land that is potentially cultivable. The indicator used will be calculated as a ratio of the total arable land area as compared to the total land area for that state (measured in 1000 hectares). Both of these measurements are offered by the Food and Agricultural Organization's "Food Security" database.[103]

Occurrence of Natural Disasters. The second indicator to be included in the stability dimension is the occurrence of natural disaster(s). Whereas climate change may have a slower, more gradual effect on domestic production levels in a state, natural disasters have the potential to disrupt production almost immediately. Further, if disasters are significant in magnitude, they may interrupt imports to a state, destroy transportation infrastructure, drive up the price for foodstuffs on the local market,

[102] Food and Agricultural Organization. (2013a). *Food Security Dataset*. Rome, Italy: United Nations.
[103] Ibid.

compromise access to clean water and sanitation facilities, etc. Thus the occurrence of natural disaster may have an effect on multiple dimensions of food insecurity.

Table 3.4 Measurements for the Stability Dimension of Food Insecurity			
	Indicator	Measurement Explained	Source(s)
Natural	Percentage of Land that is Arable	The proportion of land area in a state that is considered to be arable.	FAO's "Food Security" Database
	Occurrence of Natural Disasters	Total number affected by disaster type by country by year	EMDAT "The International Disaster Database" (1900 to 2011)
Health	General Life Expectancy	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same during the infant's lifespan.	World Bank "World Development Indicators" (1980-2011)
	Presence of Epidemics	Number of cases of "epidemic-prone" diseases (e.g. influenza, cholera, and meningococcal meningitis)	WHO'S "Epidemic Prone Diseases" dataset (1965 to 2010)
		Prevalence of HIV/AIDs, TB, or malaria among adults age 15 to 49	WHO'S "Health Related Millennium Development Goals" dataset (1990 to 2009)
Economic	Trade Dependency	Relative Comparative Advantage for Certain Food Exports	USDA's "Agricultural Trade Trends" datasets for various commodities
	Price Hikes in Major Foodstuffs	Price Elasticities for Certain Food Commodities	USDA's "International Evidence on Food Consumption Patterns."
Political	Durability of Regime	The stability of a regime's authority for at least three years	Polity IV from the Correlates of War
	Presence of a Conflict	Presence of conflict within state boundaries.	COW's "Intra-state War" and "Interstate War" Data (1818-2007) and World Bank's "Index of Political Stability and Absence of Violence" (1996-2011)

Extensive research has been published concerning the relationship between natural disasters and food insecurity.[104] For example, Simelton (2011) includes data from China's domestic agricultural production and historical occurrences of floods and droughts to examine the food insecurity levels for 31 provinces in China from 1995 to 2008. Simelton's results show that if natural disasters were to lead to crop failures within these provinces, China's food production could potentially drop by 140 million tons. The data for this indicator are gathered from an Emergency Events Database (EM-DAT) created through a collaboration between the Belgian government and the World Health Organization. This indicator measures the number of natural disasters and the number of deaths from natural disasters in a given year.

As noted in the other systems of measuring or classifying food insecurity, there is undoubtedly a social aspect to food stability. Some have suggested, for example, the inclusion of coping strategies or the aspects of livelihood (e.g. social/cultural emphases on saving or conserving food) present in a population. Inclusion of these broadly-defined indicators, however, would make operationalization and interpretation of results more difficult. For example, though education level would potentially affect income level and thus in turn the potential food insecurity level for an individual, its impact is spurious. As a result, broad social indicators will not be included in the

[104] For a discussion of the relationship between the increase in frequency of extreme weather events such as cyclones, floods and bushfires and food production and distribution for Australia and New Zealand, see Tapsell et al. (2011). Food and Nutrition Security in the Australia-New Zealand Region: Impact of Climate Change. *World Review of Nutrition and Dietetics*, 102: 192-200. For a case study of food insecurity in Haiti following the earthquake in 2011 see Kolbe et al. (2010). Mortality, Crime, and Access to Basic Needs Before and After the Haiti Earthquake: A Random Survey of Port-au-Prince Households. *Medicine, Conflict and Survival,* 26(4): 281-297. For a discussion of the relationship between rainfall variability in sub-Saharan Africa (e.g. droughts and floods) and severe food shortage see Ali, M. and M. Yenenew (2011). State of Food Insecurity and Socio-Economic Sustainability in Drought Prone North Wollo Zone, Ethiopia: A Case Study. *Asia-Pacific Journal of Social Sciences*, 3(2): 78-98. For a study of the proneness to natural disasters of small island states and varying policies and social coping mechanisms in place to respond to increasing food insecurity following disasters, see Pelling, M. and J. Uitto. (2001). Small Island Developing States: Natural Disaster Vulnerability and Global Change. *Environmental Hazards*, 3(1):49-62.

stability dimension. In lieu of broadly-defined social indicators, this project will include specific public health indicators, which it argues may more directly influence food stability levels within a state.

General Life Expectancy & Prevalence of Disease. There are two key health indicators this project will include: general life expectancy at birth and prevalence of disease. General life expectancy at birth is defined as the number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same during the infant's lifespan.[105] Data for this indicator are from the World Bank's "World Development Indicators" dataset.

As noted above, both the Global Health Index and the multi-agency classification system, IPC include the child mortality rate. This measure is similar to the life expectancy at birth measurement in that each compares the impact of living in one state on an individual's life expectancy versus living in another. The life expectancy at birth indicator, however, improves upon the child mortality rate indicator in several key ways.

First, the life expectancy at birth is a more intuitive measurement. As noted above, the child mortality rate captures the number of deaths of children under five during a specific time period divided by the number of children under five at risk of dying during that period multiplied by that time period. In other words, the child mortality rate represents the number of children that did die within compared with the larger population of children at risk to die in a given year. In contrast, the life expectancy indicator uses previous mortality rates from all ages of the population to estimate the number of years a newborn may live within that state. It serves to compare the number of years a newborn in one state is likely to survive as compared to another state. Thus the end result is easily understood.

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[105] World Bank. (2011). *World Development Indicators Databases*. Washington, D.C.

Second, the life expectancy at birth indicator provides a richer analysis for each state because it uses past mortality rates from all age groups to make future projections. By doing so, this measurement may capture more subtle forms of deprivation that are not captured in the child mortality rate indicator. For example, imagine two states with similarly-aged populations, one state has a significant number of its population dying between 15 and 25 years of age and another does not; in addition, each state had only a small number of deaths in its under-five population. If one chose to use the child mortality rate to capture some perceived hardship each population may be facing, this indicator would represent these two states as the same. In contrast, the life expectancy at birth measurement for the first state should be shorter than for the second state, showing that the state with a larger number of people dying may be experiencing more hardship than the other state.

The second health indicator included in this study measures a more immediate, sudden health concerns. This indicator is the prevalence of disease. The World Health Organization measures the number of observed cases of HIV/AIDS, tuberculosis, malaria, influenza, cholera, and meningococcal meningitis in a state within a given year.

Trade Dependency. This project includes two economic indicators for stability: trade dependency and commodity price hikes. Trade dependency is often defined as the extent to which one state depends on trade from other states. It can either be measured monadically (i.e. one state's trade patterns with all other states) or dyadically (i.e. a specific trade pattern between two states or groups of states). Research has explored the link between high levels of agricultural trade dependency and food insecurity issues.[106] For example, Austin et al. (2012) measure trade dependency between high-income and low-income states. They hypothesize that increases exports

[106] Austin et al. (2012). Agricultural Trade Dependency and the Threat of Starvation: A Cross-National Analysis of Hunger as Unequal Exchange. *International Journal of Sociology*, 42(2): 68-89; Shandra et al. (2009). Ecologically Unequal Exchange, World Polity, and Biodiversity Loss. *International Journal of Comparative Sociology*, 50(3-4): 285–310.

of food from low-income to high-income states may be correlated with increased hunger for the low-income exporting state.

For this indicator, this project will use monadic trade ratios based on research developed by Vollrath (1991).[107] In this research, Vollrath determined that though there are multiple means for comparing relative trade relationships, focusing on ratios that compare exports by commodity for each state to the total exports of this commodity worldwide produces the clearest picture of which states have certain trade advantages or disadvantages relative to other states. Though many argue that data on imports are needed as well, Vollrath and others argue that these data are often skewed by domestic policies that affect import levels (e.g. subsidies and quotas).

To calculate the relative trade advantages for each state based on its exports by commodity, this project used the formula in Figure 3.3, in which X is the total number of exports in metric tons, superscript *r* refers to the world minus the state *i*, and subscript *n* refers to all traded commodities minus commodity *a*.

Figure 3.3

$$Relative\ Trade\ Advantage = Ln\left(X_a^i / X_n^i\right) / \left(X_a^r / X_n^r\right)$$

The relative trade advantage is expressed using logarithms so as to present a revealed-competitive-advantage in which states that enjoy a relative advantage in a particular commodity have a positive relative trade advantage index and those with a relative disadvantage in a particular commodity have a negative relative trade advantage index. The export by food commodity data is from the USDA's "Agricultural Trade Trends" datasets. Indicators for each of the following food commodities are included in this study: meat, offals, animal fat, fish, other seafood, aquatic

[107] Vollrath, Thomas L. (1991). A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage. *Review of World Economics*. 127(2): 265-280.

miscellany (e.g. seaweed), milk, eggs, fruit, vegetables, cereals, pulses, starchy roots, treenuts, oilcrops (e.g. olive oil, peanut oil, etc.), vegetable oils, spices, sugar and sweeteners.

Commodity Price Hikes. Economic impacts on the food production to consumption process can be more sudden than long-term trends in agricultural trade illustrate. For example, in 2008, worldwide food hikes led to research that attempted to correlate price hikes and nutritional attainments.[108] The impact, however, of food prices on food insecurity depends upon which types of commodities are affected and how consumers respond to price hikes. Demand price elasticities attempt to measure how individual consumers respond to changes in the price of commodities, or how a one percent change in price of good *j* may affect the quantity demanded for good *i*. There are several types of price elasticities one may include in a study on how price hikes affect purchasing. First there are two broad types of price elasticities, conditional and unconditional. Conditional price elasticities assume that the consumer will choose to purchase at least some quantity of a food commodity (i.e. it is a necessity). In contrast, unconditional elasticity makes no assumption about the purchasing decisions of the consumer. Instead, it bases into calculation on how a change in price affected the demand in that price as compared to observed mean of the demand for that commodity prior to the price hike. This project prefers an unconditional elasticity as it allows for the situation in which an individual may substitute one commodity for another in response to an increase price of the initial commodity being purchased.

In addition to conditional and unconditional elasticities, there are three prominent types of price elasticities that make different assumptions about an individual's income level after a price change. These three types are Cournot, Slutsky, and Frisch price elasticities. Cournot price elasticity

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[108] Anríquez et al. (2010). *Rising Food Prices and Undernourishment: A Cross-Country Inquiry. The FAO's Agricultural Development Economics* (Working Paper No. 10-01). Rome, Italy: Food and Agricultural Organization.

assumes that an individual's real income remains constant after a price hike, Slutsky price elasticity assumes that an individual's nominal income remains constant after a price hike, and Frisch price elasticity assumes that an individual's marginal income remains constant after a price hike. This project includes Frisch price elasticities because (1) Cournot tends to overestimate the effects of a price change on an individual's purchasing power, (2) Slutsky tends to underestimate the effects of a price change on an individual's purchasing power, and (3) Frisch measures the share of an individual's income that he or she can contribute and allows this to vary across states. This results in a more accurate view of price elasticity and incorporates Engel's Law at the state level (i.e. it allows for the possibility that individuals in lower-income states may spend more on food than in higher-income states).

This project will use data on unconditional Frisch elasticities for 114 countries from the USDA's "International Evidence on Food Consumption Patterns."[109] This data is divided into eight food sub-categories: beverages & tobacco, cereal, meat, fish, dairy, oils and fats, fruits & vegetables, and other food.

Durability of a Regime. This project includes two political indicators for stability as well: the general durability of a regime and the presence of a conflict. As this project is assuming that the role of the state is key in responding to food insecurity, then a measurement should be included which addresses the capability of a state to do so. This portion of the project does not make any assumptions about the type of regime, only that the regime is to considered to be durable. To measure this, the project will use the durability indicator from Polity IV from the Correlates of War

[109] Muhammad et al. (2011). *International Evidence on Food Consumption Patterns: An Update Using 2005 International Comparison Program Data USDA* (Technical Bulletin No. TB-1929). Washington, D.C.: United States Department of Agriculture.

project.[110] This indicator measures the number of years since the last substantive change in authority characteristics (defined as a 3-point change in the polity score). Thus, whether a state is considered a democracy or a non-democracy is not important for this measurement. It only seeks to change how the characteristics of the regime type have remained constant or shifted.[111]

Presence of a Conflict. A conflict has the potential to interrupt many parts of the process of food production to consumption. To measure presence of conflict in a state, this study will combine two measurements from the Correlates of War datasets: the occurrences of intrastate conflict within a state's territory or the occurrence of interstate conflict that takes place, at least in part, within a state's territory.[112] This indicator will be expressed as a number of conflicts that occurred within a state's territory in a given year.

As is the nature of a worldwide, large-n study in international relations, data are often unavailable for every state in every year. As a result, once the original dataset was compiled for food insecurity, this project used Amelia for the R-package to systematically compute missing data.

3.3. Creating Five Food Insecurity Measurements

This project has introduced twenty-one indicators that are key components of explaining food insecurity. Each of these indicators is borne out of the conceptual definition of food insecurity, specifically its multidimensionality. Twenty-one separate indicators, however, presents a clunky, complex view of food insecurity. Though each measurement is able to capture an aspect of food insecurity, there is no sophisticated understanding as to how each aspect may contributes to an overall assessment of food insecurity in a given state.

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[110] Sarkees, M. R. and F. W. (2010). *Resort to War: 1816 - 2007*. Thousand Oaks: CQ Press.
[111] Ibid.
[112] Ibid.

There are several manners by which a scholar could impose relationships among independent variables. One solution could be to develop an index. If one were to want to provide a basic composite measurement for these twenty-one indicators of food insecurity, he or she might weight each of these indicators equally and provide a weighted average as an index score. In this solution, one is making no a priori assumptions as to the importance of each indicator but instead treats them all equally. The possibility of combining these twenty-one indicators in this way, however, is unappealing as it would lead to a loss of explanatory power that this project is attempting to maintain.

Alternatively, one could assign relative importance to each of the indicators and then weight each indicator based on its relative importance. Though this approach would provide more information than the first option, the information would not have arisen organically from the data. For example, if one scholar argues that domestic food production is more important than imports in lessening food insecurity, this index would look very different from a scholar who may have reversed the order of these indicators. In addition, were one to assign relative weights to each indicator, the next question would be how much more important is one indicator than the next and to what extent? Practically, such as debate as to the appropriate weights for each indicator may distract from the usability of such an index.

A third solution is to develop a scale rather than an index. In contrast to an index, a scale has a pre-established logical or empirical structure.[113] Put differently, instead of simply assigning weights to each indicator, various weights are explored and confirmed empirically. In social sciences, one of the more sophisticated methods for developing a scale is through the use of factor analysis.

[113] Babbie, E. (2001). *The Practice of Social Research* (9th Edition). Belmont, CA: Wadsworth Thomson.

There is a family of closely-related statistical analyses used to detect structure in the relationship among observed variables. The practical purpose of each of these techniques is to find a means for representing many observed variables with a fewer number of hypothetical variables, while still maintaining essential information about each observed variables and their relationship to other observed variables. There are different analyses that can be run depending on what information one is wishing to obtain about both observed and hypothetical variables.[114]

Before running any factor analysis, many argue that it is necessary to adjust the data so that all the observed variables are either increasing or decreasing toward either food insecurity. It does not matter whether the statistician chooses to have all values decreasing or increasing toward some preconceived (e.g. if all values are increasing, they are each representing an increase in food insecurity or vice versa). It only matters that all the variables are similarly increasing or decreasing toward to same substantive point. This project has chosen not to adjust the value of the observed variables, however, but instead to take into account whether the factor loadings are positive or negative values so as to accurately assess the relationship among the observed variables and factors.

3.3.1. Deciding the Number of Factors

To determine the number of factors that can be extracted from the original data, this project chose a parallel analysis. Parallel analyses compares eigenvalues from a dataset of observed variables with parallel eigenvalues constructed from random data that have the same sample size and number

[114] There are two types of hypothetical variables: components and factors. Components are hypothetical variables that represent the covariance (i.e. strength of correlation) among the observed variables in a dataset. In contrast, factors are hypothetical dependent variables with which observed variables are correlated. As an example, if there were six observed variables in a dataset (Y_1 though Y_6), separate statistical techniques could reveal both a component (C) and a factor (F). In this case, C represents that some of the observed variables (e.g. Y_1, Y_2, and Y_3) are dependent on each other. In contrast, F suggests that observed variables may be statistically explained using the factor F (e.g. . Y_4, Y_5, and Y_6), though these variables may be completely independent from one another.

of variables. These analyses determine how many factors in the dataset of observed variables can account for more variance than those in generated from the random data.[115] Evidence suggests that parallel analysis is a superior method than other methods used for determining factor retention.

The results of the parallel analysis determine that eight factors are sufficient to accurately represent the twenty-one observed variables in the original food insecurity dataset. Figure 3.4 illustrates the Scree plot and Table 3.5 includes the eigenvalues for the eight factors.

Figure 3.4 Parallel Analysis Scree Plots

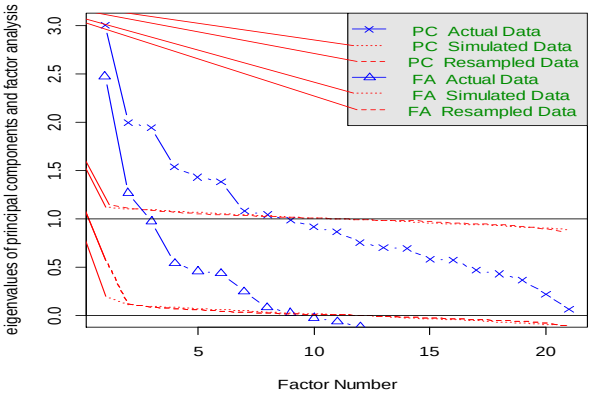

Table 3.5 Parallel Analysis Eigenvalues

Factor	Eigenvalue
1	3.01
2	1.99
3	1.94
4	1.53
5	1.43
6	1.38
7	1.08
8	1.04

Though parallel analysis is best used to determine the number of factors that represent observed variables within a dataset, it does not offer answers to more interesting questions such as: (1) which observed variables are represented by factors and (2) to what extent? To answer these questions, additional analyses must be run. Exploratory and confirmatory factor analyses can both be used for this purpose. Exploratory factor analyses, as the name suggests, is used to examine and uncover relationships among the observed variables and factors. In contrast, the purpose of

[115] Hayton et al. (2004). Factor Retention Decisions in Exploratory Factor Analysis: A Tutorial on Parallel Analysis. *Organizational Research Methods*, 7(2): 191-205, 194.

confirmatory factor analysis is to confirm existing relationships among observed variables and factors as highlighted in theoretical literature and previously empirical studies. For the latter, the scholar would determine which observed variables are represented by which factors, and use the analysis to confirm these existing expectations.

This project will run an exploratory factor analysis for two reasons. First, this project is using an original dataset and thus no previous empirical record exists that supports the determined structural relationship among the observed variables. This is not to say that there are no preconceived notions as to which structures that may be uncovered within the data. Already, the parallel analysis has shown that eight factors may accurately represent these data. Moreover, as noted previously, this project has theorized that the four dimensions of food insecurity are parts of the food production-to-consumption, and specific observed variables have been chosen that represent key components of each of these dimensions. It further hypothesizes that the variables with high factor loadings[116] that load on the same factor will likely be variables that are of the same dimension of food insecurity. Thus this project asserts that four factors will be statistically supported in the dataset. That said, this project does not yet assert which observed variables best represent the dimensions. As a result, the second reason for choosing an exploratory factor analysis to explore a possible structure among the observed variables within each dimension.

3.3.2. Which Factors Represent Which Observed Variables?

The exploratory factor analysis used in this project will include four factors (as eight are the maximum specified by the parallel analysis and four is the number of factors supported in the

[116] Factor loadings are the correlation coefficients between variables and the underlying factors that they have in common. The value of the factor loadings can be understood as the percent of variance in that variable that can be explained by the factor.

theoretical literature). It will also use a type of rotation called variance maximizing, which allows the observed variables the ability to vary, but minimizes the variance around the new variables or factors. There is much discussion as to what value of factor loadings is considered to be sufficient to include the variable in a factor scale. Some suggest that a factor is statistically meaningful if the factor loading is over 0.3. This project will include a slightly more conservative requirement, including only factor loadings above 0.40.

Observed variables with high factor loading indicate that there is an empirical relationship between these variables and the factor upon which they load. As Table 3.6 illustrates, the results of the exploratory analysis empirically support to theoretical positions. First, these four factors were found to explain all of the variance in the dataset.[117] Second, as noted previously this project has theorized that certain observed variables explain important aspects of the four dimensions of food insecurity. These results reinforce this point. The observed variables with high factor loadings that are supposed to be grouped into a certain dimensions also group around the same factor. Thus in addition to having four statistically meaningful factors, it appears that each of these factors explains a dimension of food insecurity.

Both of the observed variables meant to explain issues of food availability have high factor loadings, and they group around a single factor. Three of the five observed variables meant to explain issues of food access have high factor loadings, and they also group around a single factor. Three of the four observed variables meant to explain issues of food utilization have high factor loadings, and they group around a single factor. Finally, three of the ten observed variables meant to

[117] The first factor has a proportion of variance of 0.32, the second factor has a proportion of variance of 0.29, the third factor has a proportion of variance of 0.22, and the fourth factor has a proportion of variance of 0.17.

explain issues of food stability have high factor loadings and group around a single factor. Thus each of these factors can be understood as representatives of the four dimensions of food insecurity.

Table 3.6 Exploratory Factor Analysis Results for the Four Dimensions							
	Indicator	**PA 1**	**PA 2**	**PA 3**	**PA 4**	**h2**	**u2**
Avail.	High Protein Domestic Production	0.84	0.07	0.04	-0.05	0.7140	0.286
	Low Protein Domestic Production	0.46	-0.07	-0.03	0.16	0.2442	0.756
	High Protein Imports	0.63	0.09	0.02	0.16	0.4255	0.574
	Low Protein Imports	0.71	0.01	-0.04	0.18	0.5398	0.460
	High Protein Exports	-0.74	-0.08	-0.01	0.08	0.5620	0.438
	Low Protein Exports	-0.51	-0.07	-0.08	-0.17	0.3018	0.698
Access	Infrastructure (i.e. roads, rail, & air)	0.00	0.18	0.00	0.05	0.0350	0.965
	Percentage of Income Spent on Food	0.17	0.16	0.05	0.42	0.2320	0.768
	Percentage of Population with Access to Clean Water	-0.07	-0.06	-0.10	-0.71	0.5227	0.477
	Percentage of Population with Access to Improved Sanitation	-0.13	-0.03	-0.12	-0.70	0.5185	0.481
	Average Members of a Household	0.03	0.02	0.02	0.13	0.0195	0.980
Utilization	Prevalence of Undernourishment	0.03	0.05	0.83	0.03	0.6973	0.303
	Depth of Undernourishment	0.08	0.12	0.84	0.07	0.7380	0.262
	% of Children that are Underweight, Overweight, Wasting, & Stunted	0.03	0.01	0.45	0.07	0.2076	0.792
	Percentage of Population with Iodine Deficiency	0.01	0.06	0.03	0.00	0.0044	0.996
Stability	Percentage of Land that is Non-Arable	-0.07	0.06	-0.01	0.11	0.0215	0.979
	Number of Natural Disasters	0.11	-0.22	0.04	-0.01	0.0645	0.935
	Number of Epidemics	-0.05	-0.03	0.07	0.05	0.0108	0.989
	General Life Expectancy	0.10	0.17	0.21	0.25	0.1413	0.859
	Durability of Regime	0.25	0.43	0.17	0.16	0.2995	0.701
	Number of Armed Conflicts	-0.26	-0.24	-0.24	-0.17	0.2149	0.785
	Price Hike Elasticity on Demand for High Protein Food Items	0.17	0.91	-0.03	0.09	0.8636	0.136
	Price Hike Elasticity on Demand for Low Protein Food Items	0.16	0.93	0.03	0.13	0.9037	0.096
	Revealed Comparative Advantage on High Protein Food Items	-0.22	0.00	-0.23	-0.08	0.1087	0.891
	Revealed Comparative Advantage on Low Protein Food Items	-0.34	-0.08	-0.16	0.04	0.1495	0.850

These findings have important implications for the food insecurity literature as heretofore there have been no empirical studies that support the claim made by the Food and Agricultural

Organization that there are four dimensions to food insecurity. This research also supports the claim made by this project that the observed variables included here are statistically meaningful representatives of levels of food insecurity in a state.

3.3.3. Creating Scales for Food Insecurity & Its Four Dimensions

The final purpose of this part of the project is to calculate five scales to measure food insecurity, one for each of the four dimensions and one overall food insecurity scale. These scales will then be used to answer the research questions posed in Parts III and IV.[118] To do so, this project will create four factor scores (i.e. one for each factor) for each state-year.

If a factor can be understood as a hypothetical variable that represents an empirical relationship among observed variables, then a factor score can be understood as measurement of the hypothetical variable for each state-year.

This project will produce four sets of factor scores from the data using the Bartlett approach. For a complete discussion on the choice of approach, please see Appendix C. For this project, Bartlett is the best approach as it produces standardized scores (i.e. Mean =0, Variance = squared multiple correlation), it produces unbiased estimates, if a solution is orthogonal it does not correlate this with other solutions, and it produces high validity estimates between factor scores and factors. This project will normalize the data on a zero to one scale for easier interpretability. For each of these scales, one represents the highest level of food availability, access, utilization, or stability observed across all state-years (4158 observations) and zero represents the lowest level of food availability, access, utilization, or stability observed across all state-years. Figures 3.5 through 3.8 below illustrate the average scores each state for each of the four dimensions from 1990 to 2011.

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[118] DiStefano et al. (2009). Understanding and Using Factor Scores: Considerations for the Applied Researcher. *Practical Assessment, Research and Evaluation*, 14(20): 1-11.

There is some difficulty in creating an overall scale for food insecurity using factor analysis. Though it may seem intuitive to find the summation or average of the four dimensional scores, this is not possible as factors scores are measures by which the observed variables correlate to the factor but give no information as to how well the factors correlate to one another.

The best option is to run a factor analysis on the four factors already determined. In essence, this second exploratory factor analysis examines whether there is one hypothetical variable, or new factor, that can represent the four factors. The result of this is very positive with high loadings on all four of the factors (Table 3.7). Interestingly, this second exploratory factor analysis suggests that there is a statistically meaningful latent variable that can represent these four factors. The availability factor has a high factor loading at 1.00. This offers an improvement over measurements of food insecurity that are not chosen empirically. This project ran a Bartlett's approach to calculate factor scores for each state-year. Figure 3.9 illustrates the average overall food insecurity scores for each state from 1990 to 2011.

Table 3.7 Exploratory Factor Analysis Results for An Overall Food Insecurity Scale

Indicator	PA 1	h2	u2
Availability Scale	0.40	0.157	0.84
Access Factor	0.17	0.028	0.97
Utilization Factor	0.15	0.023	0.98
Stability Factor	-0.25	0.063	0.94

The second part of this project will examine the literature on food insecurity within international affairs, isolating key explanatory variables in the domestic politics literature that best explain state responses to food insecurity. The third part of this project will generate hypotheses for the likelihood of a state responding to food insecurity, the general nature of the response (i.e. is the response meant to assist all in a state or only a select few). It will also examine the role agricultural interests group and a state income level plays in shaping a state response. The fourth part of this

project will then include each of these domestic politics variables in a systematic study of the specific strategies a state will choose given the types of food insecurity it is facing (i.e. issues of availability, access, utilization, or stability). For these last two parts, this project will include the measurements for food insecurity calculated above. For an extended discussion of how these original measurements improve upon the existing ones, please see Appendix D.

Figure 3.5 Food Availability Issues

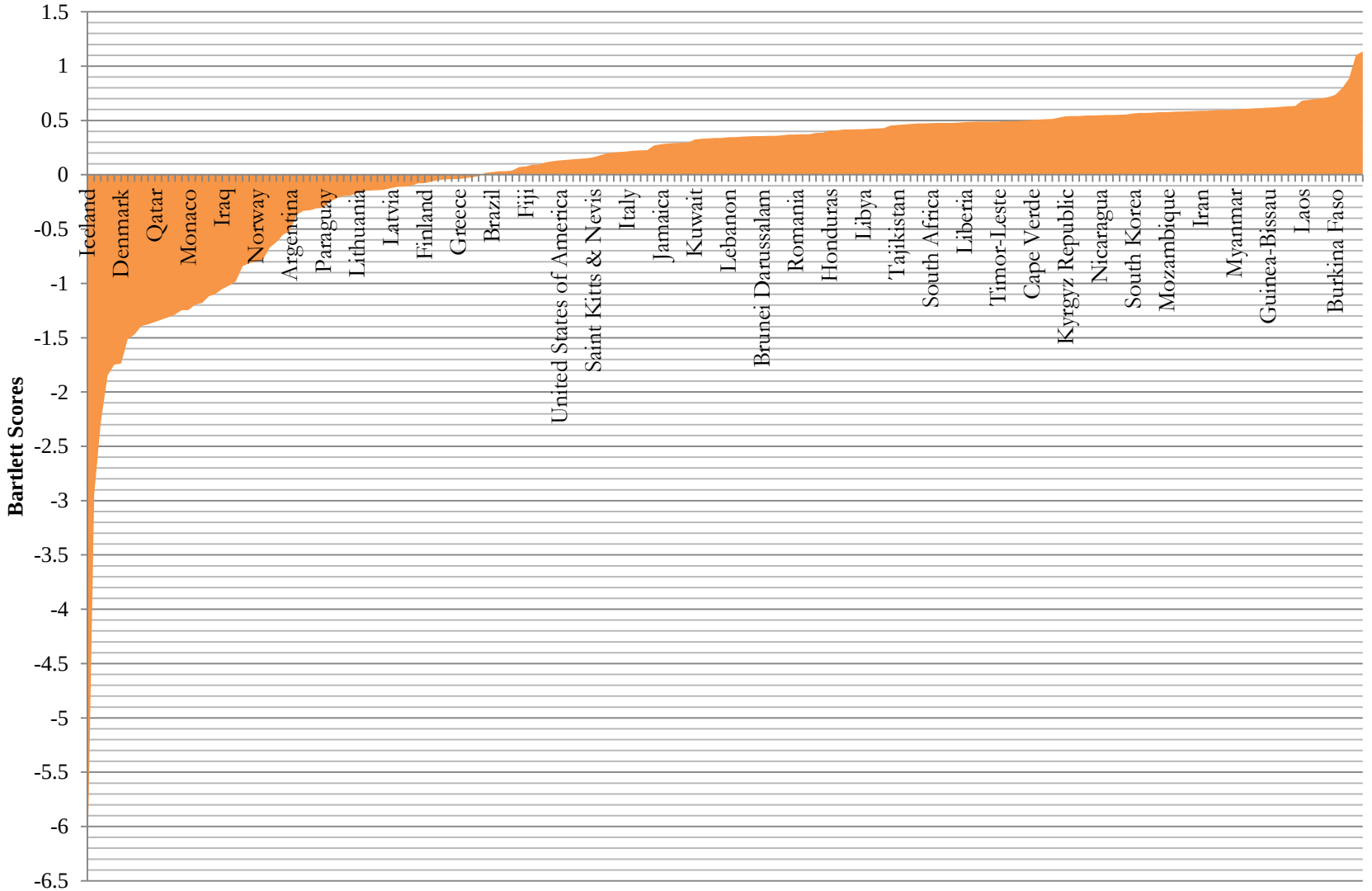


Figure 3.6 Food Access Issues

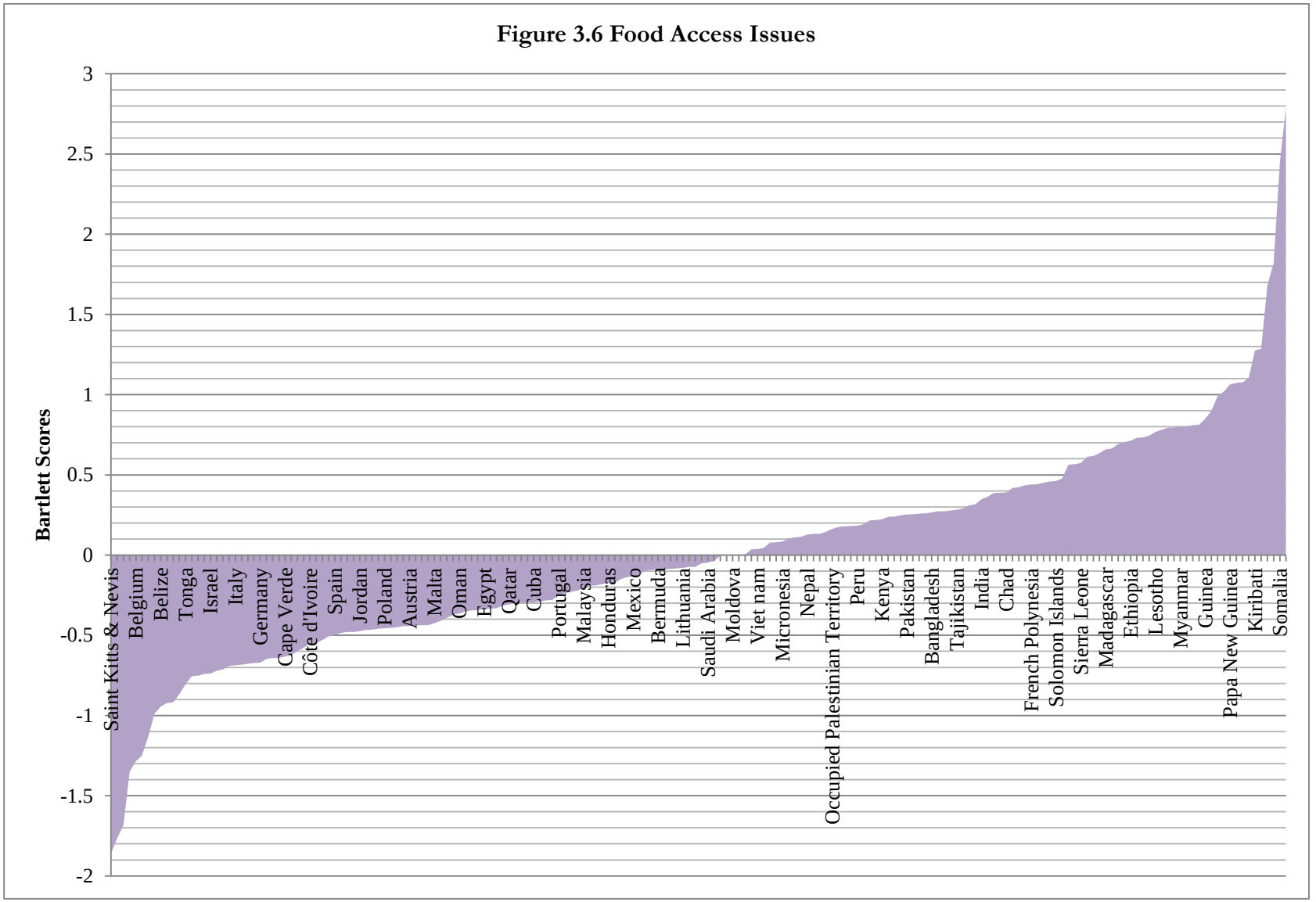


Figure 3.7 Food Utilization Issues

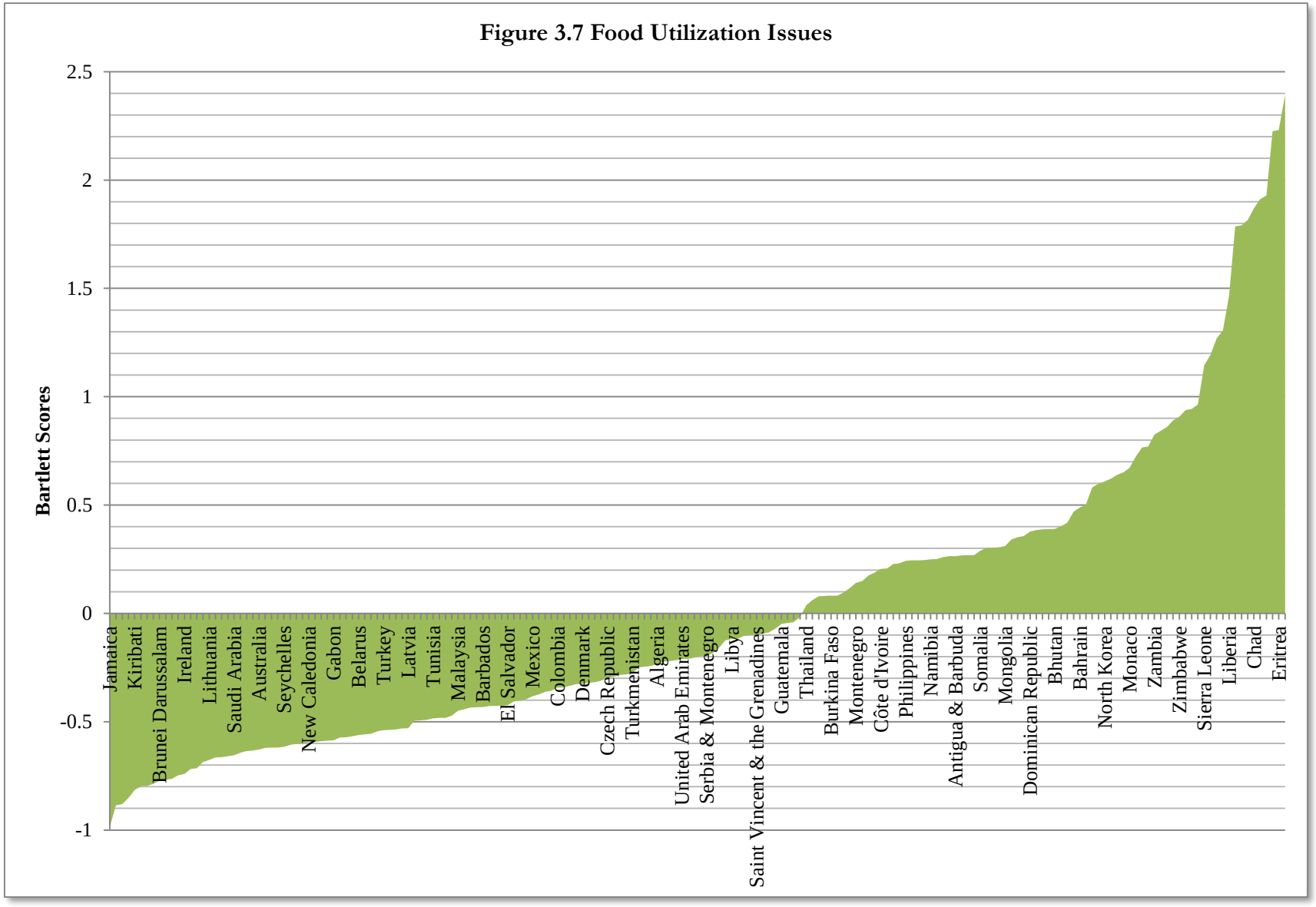


Figure 3.8 Food Stability Issues

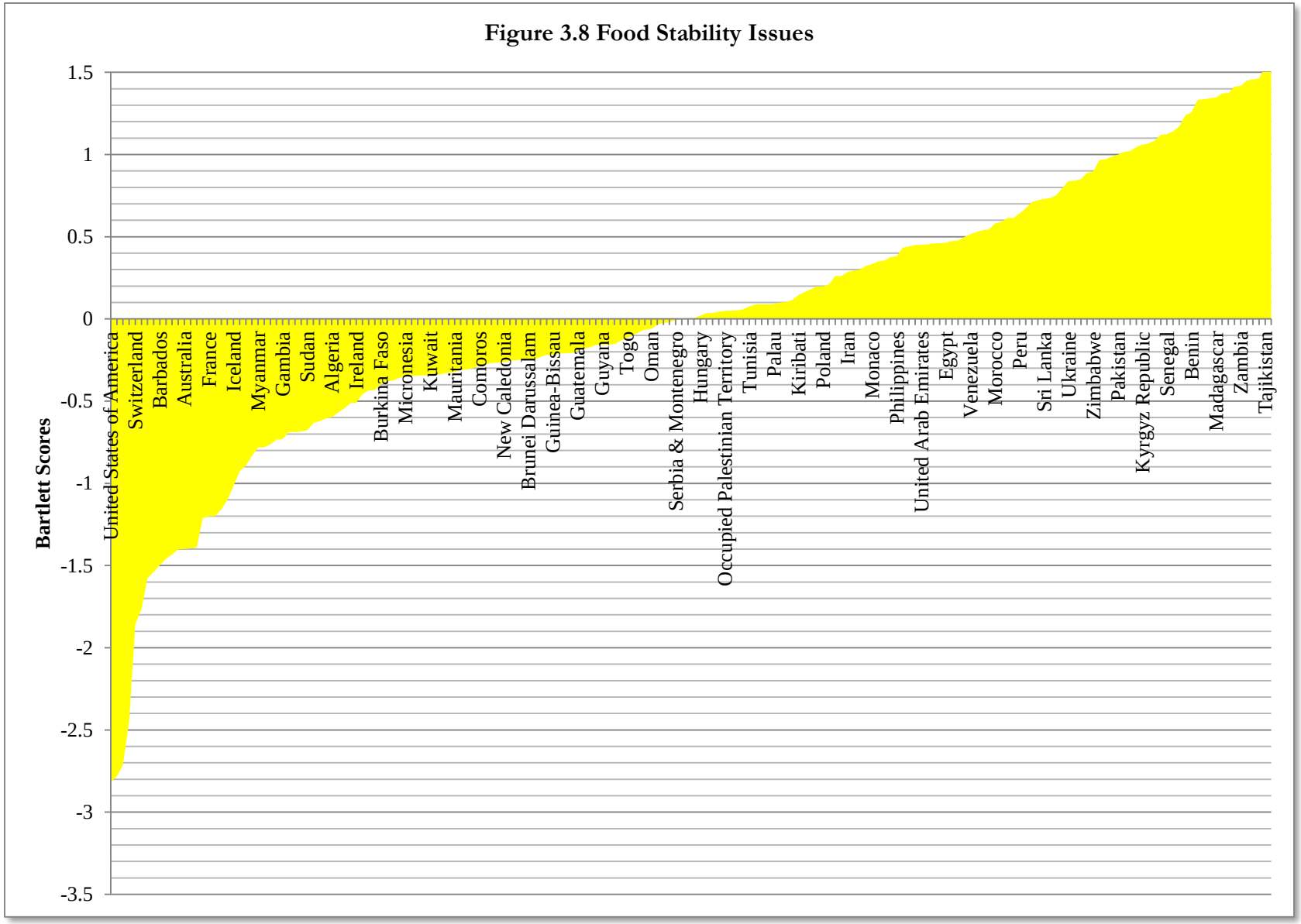
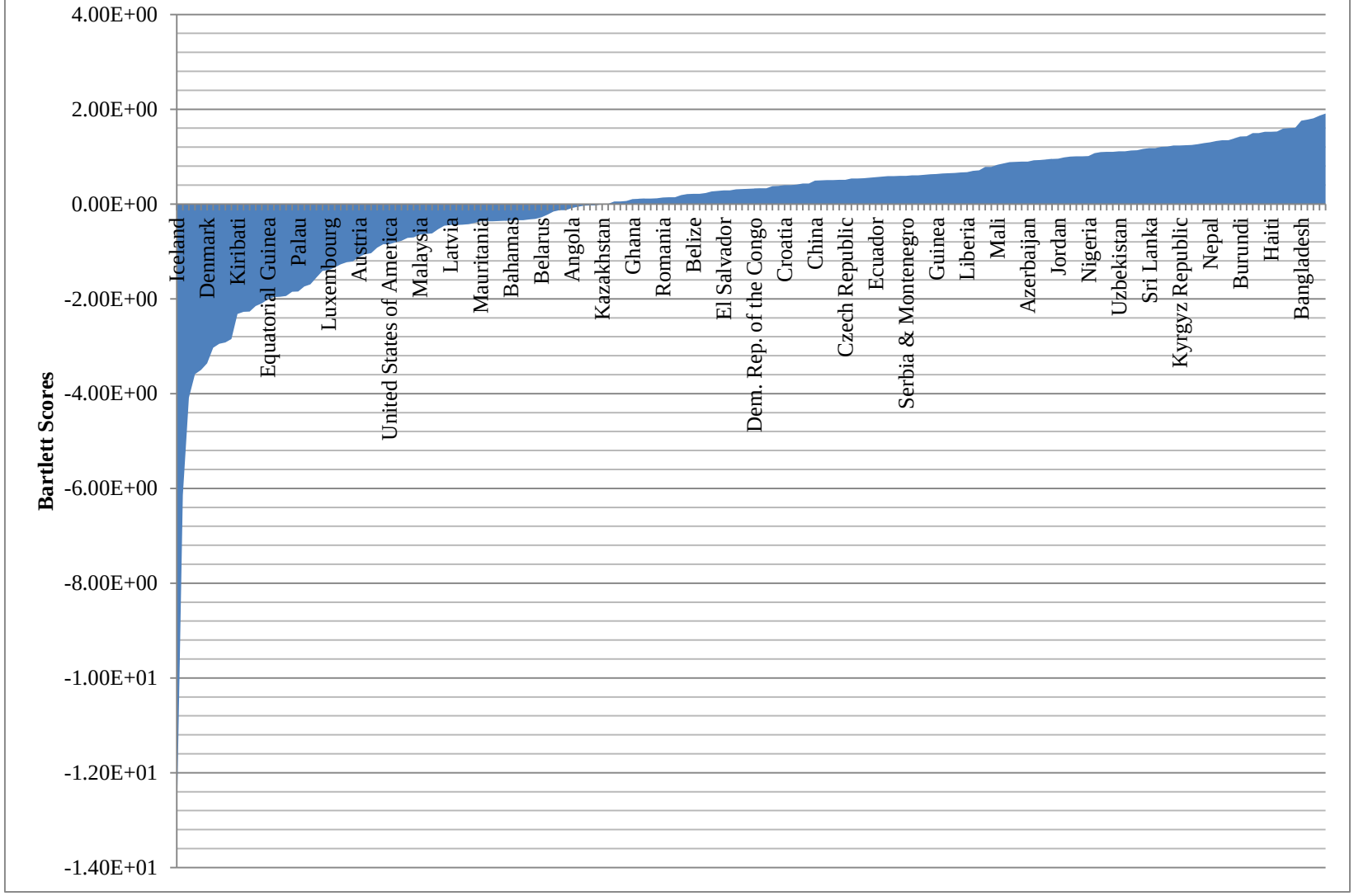


Figure 3.9 Food Insecurity Issues



PART II

FOOD INSECURITY IN INTERNATIONAL AFFAIRS

CHAPTER 4

THE HUMAN SECURITY PARADIGM

Human security is a natural, albeit still nascent, research area within which to conduct an analysis of state strategic responses to food insecurity. Further, food insecurity scholarship not only has a natural home in human security studies, but it could serve to address some of the problems associated with human security studies in general.

4.1. Human Security Studies

Human security studies is a broadened area of security studies that focuses on non-military (or a combination of non-military and military) threats toward societies, groups, and individuals.[119] Though the security studies sub-field within International Relations has historically focused on state survival through military means, two significant trends have broadened this area of scholarship: the end of the Cold War and globalization. Specifically, these trends have changed the actors being considered within this literature, the nature of the threats, and the means used to address both new and familiar threats.

The end of the Cold War quieted the threat of war between two superpowers and ushered in a period in which states and populations no longer under the influence of Cold War politics became embroiled in more localized conflicts. Though some of these conflicts involved familiar interstate threats, others included civil war (i.e. internal threats to the state), democide (i.e. threats from a

[119] Paris, R. (2001). Human Security or Hot Air? *International Security*, 26(2): 87-102; King, Gary and C. Murray. (2002). Rethinking Human Security. *Political Science Quarterly*, 116(4): 585-610; Iqbal, Zaryab. (2006). Health and Human Security: The Public Health Impact of Violent Conflict. *International Studies Quarterly*, 50(3): 631-649.

state), and ethnic conflicts (i.e. threats between or among populations either within a state or across state boundaries). In response, security studies scholarship broadened to include a greater focus on non-state actors.

Globalization is the second trend in the 1990s that broadened the focus in security studies. Though there are various definitions for globalization, this project views it as the rapid increase of economic interaction facilitated by technological advances that has resulted in increasing interdependence with economic, cultural, and political implications. Within security scholarship, those that focus on interstate conflicts have seen a shift in the cost-benefit calculus by states more economically, culturally, and politically intertwined.[120] In addition to this, some security scholars have focused more on non-military strategies for addressing traditional military threats.[121] Finally, there has been a third shift in which scholars have increasingly considered non-military threats (e.g. natural disasters and infectious diseases) to individuals and groups within a state or territory.

This third area is known as human security studies. The concept of human security was first introduced in the United Nations' Human Development Report (1994).[122] Here, the United Nations Development Program's (UNDP) suggests that human security encompasses two components: the freedom from fear that is integral to the traditional security studies paradigm and the freedom from want that is focused on more in the development literature.

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[120] An example of this perspective can be seen in Keohane & Nye's complex interdependence theory. A logical premise of this theory is that conflict has the potential to interrupt trade. Thus, the more states benefit from trade form each other, the less likely they are to choose to engage in conflict. The complex interdependence theory suggests that as global networks of trade, social interaction, and political fraternity continue to spread, there will be increasingly less conflict worldwide.

[121] E.g. Nye, J. S. (2004). *Soft Power: The Means to Success in World Politics*. New York: Public Affairs.

[122] United Nations Development Program. (1994). *Human Development Report*. Washington, D.C.: United Nations, Ch. 2: 22.

The report states that the Cold War tilted the concerns of states toward freedom from fear and away from the concern of securing freedom from want. The United Nations acknowledges within the report that "with the dark shadows of the cold war receding," states need to broaden the concept of security from an exclusively territorial focus as issues within human security may spill across borders. Moreover, it suggests that the focus should be on "people's security" rather than states' security. Finally, it suggests that strategies to address these threats may be either military or non-military in nature.[123]

4.2. A Home for Food Insecurity Studies

The UN report[124] highlights that food insecurity is one of seven components of human security.[125] The scholarship that studies the causes of food insecurity have focused on two main non-military threats facing individuals worldwide: environmental changes[126] and population growth.[127]

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[123] Ibid. A distinction is drawn within the report between human security and human development. Whereas human development is used to define the process by which an individual's range of choices are widened, human security is the state in which an individual is able to exercise these choice safely and freely (23). One can further distinguish human security from human rights, the latter being customary or formal agreements of universally applicable rights that many argue should be protected via the rule of law.

[124] Ibid.

[125] Ibid. The other six components of human security are (1) personal security (i.e. security from physical violence, (2) community security (i.e. protection from oppressive practices such as slavery sometimes accepted within a given community, (3) political security (i.e. the assurance of protection of human rights within a society), (4) economic security (i.e. the assurance of an income either from productive work, remunerative work, or as a last resort from some publicly financed safety net), (5) health security, and (6) environment security.

[126] Garcia, D. (2010). Warming to a Redefinition of International Security: The Consolidation of a Norm Concerning Climate Change. *International Relations*, 24(3): 271-292 Barnett, J. (2007). Climate Change, Human Security, and Violent Conflict. Political Geography, 26(6): 639–655.

[127] Hendrix, C. S. (2011). *Markets vs. Malthus: Food Security and the Global* Economy (Policy Brief 11-12). Washington, D.C.: Peterson Institute for International Economics; Mihalache-O'keef, Andreea and Quan Li. (2011). Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries. *International Studies Quarterly*, 55(1): 71–93; McMichael, Philip. (2013). Land Grabbing as Security Mercantilism in International Relations.

Globally, environmental changes have mixed effects on agricultural food availability. To illustrate, the United Nations' Intergovernmental Panel on Climate Change (IPCC) found that increases in average temperatures associated with global climate change should lead to overall benefits in the production of food as areas potentially suitable for cropping will expand, the length of the growing period will increase, and crop yields may rise. The IPCC also predicts that higher carbon dioxide concentrations, a second factor associated with global climate change, will have mostly positive effects on many crops in terms of enhancing biomass accumulation and final yield, though they may yield lower levels of nutritional quality (i.e. nutritional quality does not increase in line with higher yields) as some cereal and forage crops, for example, show lower protein concentrations under elevated carbon dioxide conditions.[128]

Though the effects of environmental changes globally may bring some benefits to food availability, the effects on individual food insecurity levels are largely negative. The same IPCC report suggests that, though global estimations show an increase in cultivable land, developed countries are estimated to gain one over 160 million hectares of cultivable cropland, while developing countries are estimated to lose more than 110 million hectares of cultivable cropland. Specifically, the report predicts that Central Asia and the Russian Federation will be the biggest benefiters of cropland, while the biggest losses in suitable cropland are likely to be in Africa. There is also a drastic decrease in the quality of cultivable cropland. For example, in sub-Saharan Africa land for "double cropping" is projected to decline by 10 to 20 million hectares.

Globalizations, 10(1): 47-64; Zagema, B. (2011). *Land and Power: The Growing Scandal Surrounding the New Wave of Investments in Land*. (Briefing Paper). Oxford, UK: Oxfam International; Weis, T. (2007). *The Global Food Economy: The Battle for the Future of Farming*. London and New York: Zed Press; Parenti, C. (2011). *Tropic of Chaos. Climate Change and the New Geography of Violence*. New York: Nation Books.

[128] Intergovernmental Panel on Climate Change, Working Group II. (2001). *Climate Change: Impacts, Adaptation and Vulnerability*. Geneva, Switzerland: United Nations.

Further, environmental changes are also expected to affect food stability, access, and utilization. Global and regional weather conditions lead analysts to predict an increase in the frequency and severity of extreme events such as cyclones, floods, hailstorms, and droughts, which in turn undermine the stability of annual or biannual crop yields and thus local food supplies.[129]

Though environmental changes are predicted to have a minimal impact on the price of food globally (as total cropland area is projected to increase going forward), these changes will affect income levels of agricultural producers within regions losing cropland. In the case of sub-Saharan Africa, this largely food-insecure region will also expect to suffer the largest contraction of agricultural incomes (estimated between two to nine percent of overall gross domestic product). This loss of income for producers could lead to greater food insecurity. In addition to a loss of agricultural incomes in certain areas, less cropland and greater instability in weather conditions can also lead to less domestic production levels and thus higher prices for domestically-grown food.

Finally, environmental changes are predicted to alter the conditions for food safety for individuals. As an example, higher temperatures will increase the frequency of water and food-borne diseases, such as salmonellosis.[130]

Population increases are also noted to have increase food insecure. The United Nations estimates that 80 million people are likely to be added to the world's population every year so that by

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[129] Intergovernmental Panel on Climate Change, Working Group II. (2007). *Climate Change: Impacts, Adaptation and Vulnerability*. Geneva, Switzerland: United Nations.

[130] D'Souza et al. (2004). Does Ambient Temperature Affect Foodborne Disease? *Epidemiology*, 15(1): 86-92; Kovats et al. (2004). The Effect of Temperature on Food Poisoning: A Time-Series Analysis of Salmonellosis in Ten European Countries. *Epidemiology and Infection*, 132(3): 443-453; Fleury, M. et al. (2006). A Time Series Analysis of the Relationship of Ambient Temperature and Common Bacterial Enteric Infections in Two Canadian Provinces. *International Journal of Biometeorology*, 50(6): 385–391.

2020 the world's population will be about 7.67 billion.[131] More than 95 percent of this population growth is projected to be concentrated in developing countries so that 84 percent of the world's population will reside in developing states by 2020.[132]

Neo-Malthusian scholars argue that food insecurity is the "inevitable consequence" of sharp population increases and the resulting increases in demand for resources.[133] These scholars argue that population increases have led to an increase in the demand for food, while urbanization and rising income levels have led to an increase in demand for certain kinds of food. The United Nations supports this claim by showing that increase urbanization in states is accompanied by shifts from basic staples such as sorghum, millet, and maize to other cereals such as rice and wheat that require less preparation and to milk and livestock products, fruits and vegetables, and processed foods.[134] Neo-Malthusian arguments predict that agricultural production will not be able to keep up with increases in per capita demand for food. Further, they predict that this shortage will lead to

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[131] Yu et al. (2010). *Toward a Typology of Food Security in Developing Countries* (No. 945). Washington, D.C.: International Food Policy Research Institute.

[132] Over this period the absolute population increase will be highest in Asia (i.e. more than 11 billion), but the relative increase will be greatest in Sub-Saharan Africa where the population is expected to almost double to 1 to 2 billion by 2020.

[133] Hendrix, C. S. (2011). Markets vs. Malthus: Food Security and the Global Economy. Peterson Institute for International Economics, Policy Brief 11-12.; Lahart et al. (2008). New Limits to Growth Revive Malthusian Fears. *The Wall Street Journal*. Retrieved from http://online.wsj.com/news/articles/SB120613138379155707; Cribb, J. (2009). *The Coming Famine: The Global Food Crisis and What We Can Do to Avoid It*. Berkeley: University of California Press; Hartmann, Thom. (2009). *Threshold: The Crisis of Western Culture*. New York: Penguin Books; Roberts, P. (2008). *The End of Food*. New York: Houghton Mifflin Harcourt.; Runge, C. F. and C. P. Runge. (2010). Against the Grain: Why Failing to Complete the Green Revolution Could Bring the Next Famine. *Foreign Affairs*, 89(1): 8-14; Jeffrey D. Sachs. (2008). Are Malthus's Predicted 1798 Food Shortages Coming True? *Scientific American*. Retrieved from http://www.scientificamerican.com/article/are-malthus-predicted-1798-food-shortages/?page=1; Ferguson, Niall. (2007). Don't Count Out Malthus. Los Angeles Times. Retrieved from http://articles.latimes.com/2007/jul/30/news/OE-FERGUSON30.

[134] Yu et al. (2010). *Toward a Typology of Food Security in Developing Countries* (No. 945). Washington, D.C.: International Food Policy Research Institute.

"distributional conflicts, and widespread, chronic food insecurity."[135] In response, critics of the Neo-Malthusian perspective have suggested that population growth is not an unanticipated pressure. As on scholar noted, "No one was surprised that the world added 77 million people between 2006 and 2007."[136] Instead, these scholars suggest that global food production levels can consistently meet the demand of slow, structural changes like population increases. Instead, chronic food insecurity they argue has more to do with local access, stability, and utilization.

Though the effects of food insecurity threats tend to be examined at the individual level of analysis, many argue that it is the role of states is essential to respond to these threats.[137] Within this literature, some scholars focus on the normative concerns of state when responding to such threats.

As an example, Mechlem (2004) argues that UN member-states have obligated themselves legally and normatively to ensuring that all individuals have a basic right to food through a large number of binding and nonbinding instruments.[138]

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[135] Hendrix, C. S. (2011). Markets vs. Malthus: Food Security and the Global Economy. Peterson Institute for International Economics, Policy Brief 11-12.
[136] Ibid.
[137] Tadjbakhsh et al. (2007). *Human Security: Concepts and Implications*. New York: Routledge.; Sato, Y. and M. Asano. (2008). Humanitarian and Diplomatic Norms in Japan's ODA Distributions. In *Norms, Interests, and Power in Japan's Foreign Policy*. New York: Palgrave Macmillian; Garcia, D. (2010). Warming to a Redefinition of International Security: The Consolidation of a Norm Concerning Climate Change. *International Relations*, 24(3): 271-292; Brysk, A. and A. Mehta. (2012). Does Global Good Citizenship Begin at Home? Domestic Gender Equity and Humanitarian Foreign Policy. Available at SSRN: http://ssrn.com/abstract=2064394; Lowe et al. (2010). Introduction: Greening the Countryside? Changing Frameworks of EU Agricultural Policy. *Public Administration*, 88(2): 287; Yoshimatsu , H. (2012). Political Leaders' Preferences and Trade Policy: Comparing FTA Politics in Japan and South Korea. *Asian Politics and Policy*, 4(2): 193-212.; Chandler, D. (2008). Human Security: the Dog that Didn't Bark. Security Dialogue, 39(1): 427; Barnett, Jon and W. Neil Adger. (2007). Climate Change, Human Security and Violent Conflict. *Political Geography. 26(6):* 639–655.
[138] E.g. Food and Agricultural Organization. (1996). *Rome Declaration on World Food Security*. United Nations. Rome, Italy: United Nations, 1; United Nations. (1979). *Convention on the Elimination of All Forms of Discrimination Against Women*. New York, Article 12; United Nations. (1989). *Convention on the Rights of the Child*. New York, Articles 24 and 27; United Nations. (1948). *Declaration of Human Rights*. New York. Article 25 of the United Nations' Declaration of Human Rights states that everyone has

Others argue that a state's response to food insecurity can be explained either exclusively or primarily by state's material interests.[139] [140] As an example, Hendrix argues that there has been a renewed interest in food sovereignty, the intention of a state to reduce its dependence on food imports and instead encouraging domestic production, in response to growing concerns about food access in the mid-2000s.[141] He argues that, though developing states were net food exporters in the 1960s, by the beginning of the 21st century 48 of 63 lower-income countries 45 out of 46 of the least-developed countries were net food importers.[142] Hendrix suggests that even high-income states with minimal agricultural land, such as Qatar, are interested in increasing domestic production levels and decreasing dependence on imports. In the next decade, Qatar plans to increase cultivated land by over 140 percent using water from solar-powered desalinization plants and invest in cropland overseas.[143] Qatar's officials have said that both of these actions are intended to serve as food insurance policies.

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the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing.

[139] Lowe et al. (2010). Introduction: Greening the Countryside? Changing Frameworks of EU Agricultural Policy. *Public Administration*, 88(2): 287; Yoshimatsu , H. (2012). Political Leaders' Preferences and Trade Policy: Comparing FTA Politics in Japan and South Korea. *Asian Politics and Policy*, 4(2): 193-212.; Chandler, D. (2008). Human Security: the Dog that Didn't Bark. Security Dialogue, 39(1): 427.

[140] Sato, Y. and M. Asano. (2008). Humanitarian and Diplomatic Norms in Japan's ODA Distributions. In *Norms, Interests, and Power in Japan's Foreign Policy*. New York: Palgrave Macmillian, 111-128; Garcia, D. (2010). Warming to a Redefinition of International Security: The Consolidation of a Norm Concerning Climate Change. *International Relations*, 24(3): 271-292; Brysk, A. and A. Mehta. (2012). Does Global Good Citizenship Begin at Home? Domestic Gender Equity and Humanitarian Foreign Policy. Available at SSRN: http://ssrn.com/abstract=2064394.

[141] Hendrix, C. S. (2011). Markets vs. Malthus: Food Security and the Global Economy. Peterson Institute for International Economics, Policy Brief 11-12.

[142] Ibid.

[143] England, A. (2010). Qatar Gets Taste for Food Self-Sufficiency, *Financial Times*. Retrieved from http://www.ft.com/cms/s/0/6f3519ca-82dc-11df-b7ad-00144feabdc0.html.

Though evidence suggests that states may be motivated, for material or normative reasons, to respond to food insecurity within their borders, a third group of scholars examines the role domestic politics plays in shaping a state's decision to respond to food security threats.[144]

[144] Hendrix, C. S. (2011). *Markets vs. Malthus: Food Security and the Global* Economy (Policy Brief 11-12). Washington, D.C.: Peterson Institute for International Economics; Barrett et al. (eds.). (2012). *Uniting on Food Assistance: The Case for Transatlantic Cooperation*. New York, NY: Routledge; Lundsgaarde, Erik. (2012). *The Domestic Politics of Foreign Aid*. New York: Routledge; Beeson, Mark. (2010). The Coming of Environmental Authoritarianism. *Environmental Politics*, 19(2): 276-294.

CHAPTER 5

POSSIBLE STRATEGIC RESPONSES

TO FOOD INSECURITY

Though food insecurity is an international issue that affects millions of individuals, there is relatively little attention paid to issues of food in the literatures of international relations and comparative politics.[145] This project asserts that one of the key reasons for this lack of focus on food insecurity is that there are theoretical pockets within international relations and comparative politics that address food insecurity, as well as extensive literature beyond the discipline, but there is little cross pollination across these areas. As a result, food insecurity scholars have a laundry list of possible explanations within different sub-fields for when and how states choose to respond to food insecurity, but little work has been done to present a theoretical argument for which factors best explain a state's strategic response(s) to food insecurity.

This chapter addresses this problem by gathering the literature on strategic responses to food insecurity in one place. As these strategies are currently offered in disparate areas of study within international relations, comparative policies, and beyond, presenting these strategies in one place is a necessary first step toward examining under which conditions states may choose certain strategies over others. The eleven strategies examined in this chapter are: (1) to choose, maintain, or increase

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[145] E.g. Zha, D. and H. Zhang. (2013). Food in China's International Relations. *The Pacific Review*, 1(1): 1-25; Shepherd, J. (2011). The Self-Reliant Country: Sustainable Agricultural Policy for Australia? In *Global Food Insecurity*. Dordrecht, Netherlands: Springer Netherlands; Margulis, M. E. (2013). The Regime Complex for Food Security: Implications for the Global Hunger Challenge. *Global Governance: A Review of Multilateralism and International Organizations*, 19(1): 53-67.

domestic food production subsidies, (2) to lower trade barriers on food imports, (3) to enact sustainable agricultural policies that promote long-term conservation of natural resources used in food production, (4) to request and receive food aid, (5) to engage in outward foreign direct investment in food production, (6) to choose, maintain, or increase consumer food subsidies, (7) to raise trade barriers on food imports, (8) to implement or maintain a food rationing system, (9) to implement, maintain, or increase population restriction policies (i.e. immigration or fertility policies) to decrease pressures on the domestic food supply, and (10) to engage in resource conflicts to obtain or maintain access to resources used in food production. There is, of course, an eleventh strategy states can choose: to do nothing. This will be discussed and tested in Parts III and IV of this project.

5.1. Domestic Food Production Subsidies

The demand for food products within a state may increase for four reasons. First, there may be greater demand for food due to an increase in the population in a state, or an increase in demand relative to the available supply for a growing population. Second, there may be greater demand because a shift in the income level and resulting preferences of groups within a state. This may not lead to an overall increase in demand across products, but rather an increase in demand for products that are more expensive than those previously purchased. Third, there may be an increasing demand of food due to issues of food availability. This can be the result of short-term factors, such as weather patterns that ruin harvests, or long- term factors, such as desertification of arable land. In these cases, the increase in demand does results from a decrease in supply. Finally, there may be an increasing demand of food due to issues of affordability. Some food affordability issues may be directly linked to issues of availability as lower food quantities will drive up the price per unit of food items. Other food affordability issues, however, have to do with factors outside of food production

quantities such as the costs of inputs, labor, transportation (e.g. fuel prices), and taxes. In such cases, one would expect to see an increasing demand for cheaper, substitutable goods.

In theory, when demand increases for a given product, producers will be motivated to increase their supply to meet that demand. In practice, some producers may be unwilling or unable to produce additional items at a level of efficiency that will ensure they will be competitive enough to receive a (large) profit. In these cases, producers will need additional incentives to increase production. States may choose to encourage domestic food production by offering producer supports.[146]

There are two types of producer support policies states can implement to encourage domestic production. The first type includes trade protection policies (i.e. tariffs). Tariffs are custom duties on imported food. As these imports may compete with domestically grown food, tariffs increase the cost of these goods for the consumer. As a result, the domestically produced goods are relatively more attractive to the consumer as they are cheaper than the imported good. These will be explained in greater detail below.

The second type of producer supports are those paid directly to the producers. These can take many forms. Most commonly, states will implement producer supports in agriculture that lower the prices producers pay for food inputs (e.g. seeds, equipment, etc.), direct monetary transfers,[147] or

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[146] Though we are assuming states are implementing these policies in response to an increase in food insecurity (i.e. an increase in demand), there may also be times in which states may also offer producer supports when there is no increase in demand. In these cases, state leaders choose to implement these policies in return for the political support from producers.

[147] Organization of Economic Cooperation and Development. (2010). *Agricultural Policies and Support: The PSE Manual*. Paris, France. The OECD discerns that there are four categories of direct monetary transfers: single commodity transfers are based on whether a producer harvests a certain crop (e.g. corn), group commodity transfers are based on whether a producer harvests a group of crop (e.g. starches), all commodity transfers are based on the quantity a producer harvests of any crops, and other transfers that do not require any harvested crops at all.

monetary compensation for the loss of crops due to either natural or man-made factors.[148] These types of supports are chosen less often by states than market-based supports such as tariffs, in part because they require a large amount of state revenue to implement such subsidies. For example, the OECD estimates that these types of producer supports accounted for only 19 percent of the average total supports to producers in OECD member-states, whereas market-based supports like tariffs accounted for 81 percent of the total supports to producers.[149] Further, this same report found that emerging economies, where overall supports to agricultural producers tend to be rising, are choosing market-based supports.[150] The negative of these supports is that they effectively indirectly tax their own consumers by increasing the price for food imports.[151]

There are multiple options for measuring domestic food producer subsidies. One option is the Statistics for Public Expenditure for Economic Development (SPEED) dataset from the Food Policy Research Institute (IFPRI).[152] This dataset provides state expenditures on agricultural sectors for most states between 1980 and 2007.[153] The original data is compiled at the national level and listed in local currency. The data is then converted into the amount of state expenditure on agriculture in billions of international dollars, into percent of overall GDP, and as percentage of

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[148] Peterson, E. W. F. (2009). *A Billion Dollars a Day: The Economics and Politics of Agricultural Subsidies*. Hoboken, NJ: John Wiley and Sons, 98.
[149] There is strong divergence within these states. Japan, for example, allocates 56 percent of its support for agricultural producers as farm-based supports, whereas the United States currently allocates only seven percent of its support for agricultural producers as farm-based supports
[150] There are strong differences within emerging states as well. For example, China allocates 17 percent of its support for agricultural producers as farm-based supports, whereas Brazil only allocates three percent of its support for agricultural producers as farm-based supports.
[151] There are strong differences within emerging states as well. For example, China allocates 17 percent of its support for agricultural producers as farm-based supports, whereas Brazil only allocates three percent of its support for agricultural producers as farm-based supports.
[152] International Food Policy Research Institute. (2010). *SPEED Public Expenditure Data*. Washington, D.C.
[153] Ibid.

contribution as compared to contributions by state to other sectors (e.g. education, health, defense, etc.). Though this data offers key insight into the perceived importance of the agriculture sector by the state leaders (based on the amount of contributions made to this sector relative to overall GDP and other sectors), it explains only the overall level of support for agriculture. Thus it does not distinguish between a state that supports farmers directly and one that supports sector-wide projects such as improved infrastructure (e.g. irrigation systems). This difference is meaningful when one is trying to examine whether supports encouraged production levels as direct supports to farmers should lead to a short-term increase in production levels, whereas indirect supports to farmers may encourage an increase in production levels over the long-term.

Anderson and Nelgen (2013) offer a better option than the IFPRI measurement. In a dataset they compiled for the World Bank, these scholars examine how government intervention in agriculture distorts the gross return on certain commodities to producers for certain products, or the nominal rate of assistance (NRA). The nominal rate of assistance is defined as the percentage by which government policies directly shift the gross return to producers for a product. If the nominal rate of assistance is positive (i.e. NRA>0), then government policies are raising the gross return to producers of a product above what it would be without the government intervention. If the nominal rate of assistance is negative (i.e. NRA<0), then government policies are lowering the gross return to producers of a product below what it would be without the government intervention.[154] The value of the NRA indicates the extent of the gross return to the producer.

The products included are estimated to represent around 70 percent of total agricultural production in 75 countries (called focus countries), which Anderson and Nelgen argue accounts for 92 percent of global agricultural GDP.

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[154] Anderson, K. and M. Brückner. (2011). *Price Distortions Slow Economic Growth in Sub-Saharan Africa.* Washington D.C.: World Bank.

As mentioned above there are two types of government policies that seek to raise the gross return to producers for their products: tariffs and domestic producer subsidies. Anderson and Nelgen (2013) offer measurements for both. The NRA_{DS} (i.e. nominal rate of assistance for domestic support) measures the amount to which domestic producer subsidies raise the gross return to producers.[155] The NRA_{BMS} (i.e. nominal rate of assistance for border market support) measures the amount to which tariffs on imports raise the gross return to domestic producers for their products. To compare the level of domestic food production subsidies across states and time, this project will include the production-value weighted averages for the NRA_{DS}.[156]

For the empirical examinations in Parts III and IV, these data will be used to create a dichotomous variable. If the NRA_{DS} is positive or negative but increasing, then this project will code this strategy as a one. If the NRA_{DS} is zero, negative, or positive and decreasing, then this project will code this strategy as a zero.

5.2. Lower Trade Barriers on Food Imports

Increasing the amount of food imported into a state directly increases the overall food supply in that state.[157] Further, it may indirectly reduce the cost of individual food items. When food is imported, it can serve three distinct roles in relation to food that is grown domestically for domestic consumption: food imports can either directly compete with domestic food products, indirectly

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[155] Ibid.
[156] Anderson and Nelgen labeled these variables nra_cov_dms and nra_bms_covm respectively.
[157] Allouche, Jeremy. (2011). The Sustainability and Resilience of Global Water and Food Systems: Political Analysis of the Interplay between Security, Resource Scarcity, Political Systems, and Global Trade. *Food Policy*, 36(1): S3-S8; Calvacanti, Henrique B. (2005). Food Security. In F. F. Dodds and T. Pippar (Eds.), *Human and Environmental Security: An Agenda for Change*. London, UK: Earthscan Press; Naoi, M. and I. Kume. (2011). Explaining Mass Support for Agricultural Protectionism: Evidence from a Survey Experiment During the Global Recession. *International Organization*. 65(4): 771-795.

compete with food products via substitutive effects (e.g. substituting wheat for barley), or serve as a supplement for domestic food products.

In cases in which food imports directly compete with domestic food products, the introduction of these food imports into the market will serve to drive down the prices of both the imports and the domestic crops. In cases in which food imports indirectly compete with domestic food products, the introduction of these food imports into the market will serve to drive down the prices of both the imports and the domestic crops only in so much as the domestic food consumer is willing to substitute a domestic food product for the imported goods. When food imports are used as supplements to food items, these items do not compete with domestic food products but instead serve to address a gap in the food offered domestically. For example, if a state has no protein sources, importation of fish and meat would serve as a supplement. Because these imports are not competing with any domestic food products, an increase in these imports will not result in a decrease in to food prices.

If a leader is interested in targeting issues of food insecurity within his or her state, this leader may choose to increase food imports. In order to achieve this, this leader may choose policies that create an incentive for foreign food producers to increase the amount of food they import into the state. The easiest means by which to encourage food imports is to decrease any trade protections in place on food items as these protections discourage importation by decreasing the attractiveness of imports on the domestic market. Trade protectionist policies on food imports can be viewed broadly as either tariffs or quotas.

Tariffs are taxes on imports. By applying a tax to imported food goods, a state is increasing the cost of producing these goods for foreign producers. In order for these producers to recuperate these costs, they must increase the retail price of these goods. Import quotas limit the amount of

food products that can be imported into a state. By decreasing the supply of a food item, a state may increase the demand for this item. This is especially true in situations in which the food item is supplemental to the products grown domestically. Quotas can also increase the demand for foreign food items that are of a higher quality than domestic products with which they are competing.

Globally, agriculture is considered to have the highest trade protectionist policies on average of any other trade sector.[158] Proponents of liberalizing agricultural trade argue that if states agree to decrease their protectionist policies on food products, this will lead to a global increase in food production as food producers will have an incentive to produce food for export to other state.[159]

Opponents of liberalizing food trade counter these predictions by suggesting that that this plan will be advantageous to food producers in developed states, but will serve to discourage food producers in developing states. They suggest that the overall increase in food trade globally has been mostly from developed states to developing states because these states established large industrial-agricultural complexes in these states following World War II (by adopting industrial technologies onto agricultural production)and encouraged increases in domestic production by implementing farm subsidies. These combined shifts in agriculture led to developing states producing food surpluses by 1949.[160] So as not to flood the domestic markets of developed states with domestic

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[158] Anderson, K. and W. Martin. (2005). Agricultural Trade Reform and the Doha Development Agenda. *The World Economy*, 28(9): 1301-1327.

[159] E.g. Panagariya, A. (2005). Liberalizing Agriculture. *Foreign Affairs*, 4(7); Schoenbaum, T. J. (1992). Agricultural Trade Wars: A Threat to the GATT and Global Free Trade. *Mary's Law Journal*, 24(1): 1165.

[160] United States Government Printing Office. (1998). *The United States' Senate Committee on Agriculture, Nutrition, and Forestry: 1825 to 1998* (U.S. Senate Document 105-124). Washington, D.C.: United States Government. The Agricultural Act of 1949 established the authority for the U.S. to donate surplus commodities overseas through voluntary relief organizations. It was followed by the Agricultural Trade Developmental and Assistance Act of 1954, later titled Food for Peace, which sought to simultaneously provide food to the world's needy while reducing domestic farm surpluses.

food surpluses, these states began exporting these surpluses either as food aid or later as food exports to developing states.[161]

The result has been an overall increase in the amount of food being produced and traded globally, but a decrease in food production within developing states as producers in developing argue that the increase in food imports from developed states has flooded their market with cheaper priced goods and discouraged domestic food production in developing states.[162] Figure 5.1 illustrates that developing state have moved from being net food producers to net food importers throughout the last half of the twentieth century.[163]

Not all states have chosen to increase imports by decreasing trade protectionism. In the

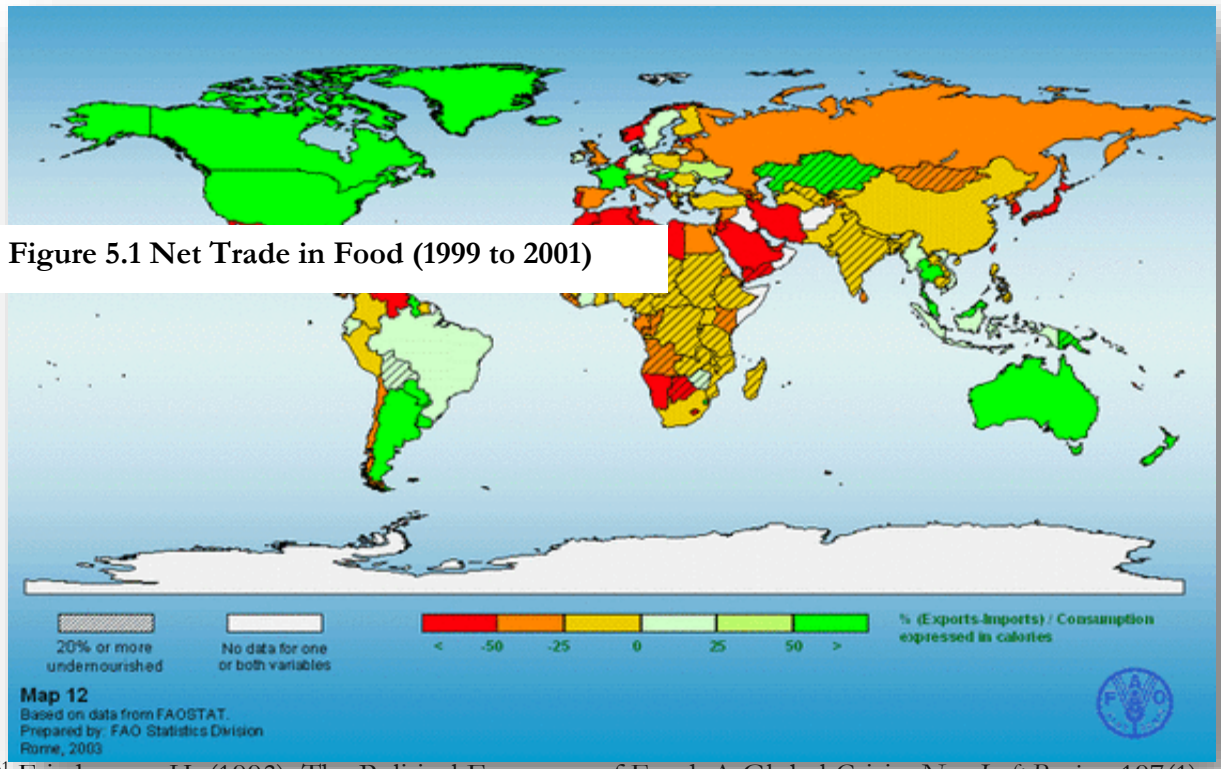

Figure 5.1 Net Trade in Food (1999 to 2001)

[161] Friedmann, H. (1993). The Political Economy of Food: A Global Crisis. *New Left Review*, 197(1): 29.
[162] De Schutter, O. (2011). *The World Trade Organization and the Post-Global Food Crisis Agenda: Putting Food Security First in the International Trade System*. Geneva, Switzerland: World Trade Organization, 32.
[163] Food and Agricultural Organization. (2003). *Net Trade in Food: 1999 to 2001*. Rome, Italy: United Nations.

theory section, this project will address a leader's decision to rely more on imports in response to food insecurity. Specifically, this project will argue that an increase in imports is likely tin states that do not have strong agricultural interests, whereas the presence of strong agricultural interests groups will result in high protectionist policies.

Leaders may choose to increase food imports into their state. To do so, leaders may choose policies that decrease any existing trade barriers in place on food imports, including tariffs and quotas. Globally, agriculture is considered to have the highest trade protectionist policies on average of any other trade sector.[164]

There are two options when measuring trade protectionism or openness for food imports. The first data are from the World Trade Organization. These data include both bound tariffs for WTO members (i.e. tariff levels within the agreed upon levels of the WTO) and unbound tariffs (i.e. those applied by non-WTO members to food imports).[165] This dataset includes an indicator for the equally-weighted average tariff level for all food commodities as well as indicators for the equally-weighted average tariff levels for a number of food groups. The data, however, are only available from 2006 to 2011.[166]

A second option is Anderson and Nelgen's dataset for the World Bank. As noted above, this dataset includes nominal rates of assistance (NRA) for dozens of food products.[167] Further, it is able to discern between policies that provide domestic producer subsidies directly and those that encourage domestic subsidies by taxing imports. Whereas the NRA_{DS} (i.e. nominal rate of assistance for domestic support) measures the extent to which domestic production subsidies raise the gross

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[164] Lloyd et al. (2010). Global Distortions to Agricultural Markets: Indicators of Trade and Welfare Impacts, 1960 to 2007. *Review of Development Economics*, 14(2): 141-160.
[165] World Trade Organization. (2012). *World Tariff Profiles*. Geneva, Switzerland.
[166] Ibid.
[167] Anderson, Kym, and Signe Nelgen. (2013). *Updated National and Global Estimates of Distortions to Agricultural Incentives: 1955 to 2011*. Washington D.C.: World Bank, 11.

return to domestic producers for their products, the NRA_{BMS} (i.e. nominal rate of assistance for border market support) measures the amount to which tariffs on imports raise the gross return to domestic producers for their products.

As Anderson and Nelgen's database improves on the one offered by the World Trade Organization as they provide data from 1990 to 2011 and offer specific indicators each of the types of producer supports, this project will their production-value weighted average of the NRA_{BMS} for each state-year. When data is missing, this project will include the measurement for the previous years for years when data is missing.

As mentioned above, if the NRA_{BMS} is positive, there are distortions in farmers favor (e.g. tariffs or non-tariff trade barriers). If, however, the NRA_{BMS} is zero or negative, then the producers are competing with little to no governmental assistance.

States can implemented trade openness in two ways. First, state leaders may choose not to protect domestic producers. This leaves producers open to international market competition. For this strategy, one would expect to see states with either zero or negative NRA_{BMS} measurements. If the NRA_{BMS} measurement for a state-year is zero, this means that producers are successfully competing at international market prices but receiving no additional returns on their product from government intervention. If the NRA_{BMS} measurement for a state-year is negative, this means that producers are unsuccessfully competing at international market prices, while also not receiving any assistance from the government.

Second, state leaders may also choose to implement trade openness by dismantling preexisting protectionist policies. If protectionist policies are represented by positive NRA_{BMS} measurements, then one would expect that as states dismantled their protectionist policies, there NRA_{BMS} measurement would decrease. Substantively, a decreasing NRA_{BMS} would suggest that

producers are receiving lower gross returns to domestic producers for their products than they did previously.

5.3. Sustainable Agricultural Policies

A distinct set of policies a state can implement when responding to increasing food insecurity are sustainable agricultural policies.[168] Sustainable agriculture is a term that suffers a multitude of definitions, including some that are heavily value-laden.[169] Smit and Smithers (1990) argue that most conceptual definitions of sustainable agriculture tend to incorporate four key components: natural resources, agricultural production, economic returns on agricultural production, and rural communities.[170] Different scholars focus on different combinations of these factors. For example, the literature known as environmental accounting focuses on how agricultural production affects the depletion of the natural resource base (e.g. soil erosion and water contamination from pesticides).[171] This project focuses on optimal agricultural production practices and yield levels that serve to balance short-term economic returns on production with long-term conservation of the natural resource base.[172]

In doing so, this project asserts that the purpose of these policies is to balance the short-term benefits of food production profits with the long-term benefits of conserving natural resources used in food production to ensure a state's future food supply. As a result, sustainable agricultural policies

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[168] Beeson, Mark. (2010). The Coming of Environmental Authoritarianism. *Environmental Politics*, 19(2): 276-294; Allouche, Jeremy. (2011). The Sustainability and Resilience of Global Water and Food Systems: Political Analysis of the Interplay between Security, Resource Scarcity, Political Systems, and Global Trade. *Food Policy*, 36(1): S3-S8.
[169] Edwards et al. (1990). *Sustainable Agricultural Systems*. Ankeny, Iowa: Soil and Water Conservation Society.
[170] Smit, B. and J. Smithers. (1993). Sustainable Agriculture: Interpretations, Analyses and Prospects. *Canadian Journal of Regional Science*, 16(3): 499-524.
[171] Ibid.
[172] Ibid, 505.

can be distinguished from agricultural production policies in so much as they encourage conservation of natural resources policies by agricultural producers. The U.S. farm bills of 1985, 1996, 2002, and 2008 have included conservation support programs directed at farmers and ranchers.[173] These farm bills have established and continued to fund the USDA's "Agricultural Management Assistance Program," that focuses on assisting:

> agricultural producers to manage risk and voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation practices into their farming operations. Producers may construct or improve water management or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming.[174]

The 2008 farm bill allocated $15 million dollars for this program annually. It is slated to offer financial assistance of up to 75 percent of the cost of installing conservation practices.[175] The total AMA payments, however, shall not exceed $50,000 per participant for any fiscal year.

Some leaders may seek to conserve natural resources used for food production. Currently, however, there is no global study that focuses on sustainable agricultural practices. The World Bank does measure the percentage of land that is (a) at least 1,000 hectares and (b) either totally or partially protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[176] This data is the World Resources Institute and is based on data from national authorities, national legislation and international agreements. As data are missing for 2011, this project uses available data from 2012 for 2011.

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[173] United States Department of Agriculture. (2008). *National Resource Conservation Service Farm Bill Conservation Programs*. Washington, D.C.: United States Government.
[174] Ibid, 1.
[175] Ibid.
[176] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.

5.4. Food Aid

There has been an increasing amount of literature on the effects of food aid on curbing food insecurity in recipient states. During the 1950s and 1960s, food aid was donor-based policy rather than based on recipient need. During these decades, the United States implemented food aid as a geopolitical strategy in the Cold War context (i.e. to curry allegiance by developing states on the periphery)[177] and as a means for ridding domestic food markets of food surpluses that could drive down domestic food prices at the expense of domestic producers.[178] As an example of the latter, Barrett & Maxwell show that the U.S. government food aid procurement programs offered by the USDA FSA offered purchasing prices for domestic food products that were on average eleven percent higher than domestic producers could price their goods on the domestic market. This demonstrates that the U.S. had a strong interest in protecting domestic producers from price depression by the absorbing the costs of purchasing and transporting domestic food products as food aid. Whereas the Cold War context shaped the United States' food aid donations most of all, the tying of food aid to domestic surpluses was seen in grain-producing states such as Canada and Australia as well.[179]

Neuremayer (2005) explains that donor-based food aid during the 1950s was called program food aid.[180] Program food aid is produced in the donor state, transported by the donor state, and then given to the recipient state's governments. The recipient state's government then is responsible

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[177] Wallerstein, I. (1974). *The Modern World-System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century* (Vol. I). Berkeley: University of California Press.
[178] Barrett, C. B. and D. Maxwell. (2005). *Food Aid After Fifty Years: Recasting Its Role*. New York, NY: Routledge, 91.
[179] Clapp, J. and D. Fuchs (Eds). (2009). *Corporate Interests in US Food Aid Policy: Global Implications of Resistance to Reform*. Boston: MIT Press, 125.
[180] Ibid, 395.

for either distribute this food free of charge, selling it at less than the local market value, or in some cases reselling this food aid to other neighboring states.

The 1970s and 1980s brought about a more recipient-focused perspective on food aid by donor states.[181] Scholars offer many reasons for this shift, including: public awareness and criticism of donor-based food aid both in donor and recipient states, a food crisis in the early 1970s (brought about by the economic recession during this time which led to increased transportation costs), and some argues the strategy of détente employed by Ford and Nixon contributed toward a Cold War easing during this time which allowed the U.S. to reconsider the role of food aid in its foreign policy strategy. As a result, donor states began to increasingly target food insecure states as recipients of food aid.[182]

This type of food aid is called emergency aid. In cases such as these, donor states would distribute to states experiencing natural disasters (e.g. floods, earthquakes, and droughts) or man-made disasters (e.g. military conflicts). In doing so, these donors may either give the aid to the state to distribute or choose to distribute this aid directly to the people. Thus this form of aid is considered to be less politically motivated on both the donor side and recipient states tend to be less political in their choices to distribute such aid.

In the 1990s, divisions amongst donor states emerged, most concretely between the United States, which continued to tie food aid to domestic surpluses, and other states that began to purchase food from producers in developing states to be given as food aid so as to simultaneously encourage economic production in these states and decrease food insecurity. This form of aid is

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[181] Ibid. Clapp notes that the European Union and Japan were delayed in giving food aid at all due to recreating agricultural markets following WWII. As a result, Europe began exporting donor-based food aid in the 1970s and 1980s and Japan followed suit in the 1990s.

[182] Hopkins, R. F. (1984). The Evolution of Food Aid: Towards a Development First Regime. *Food Policy*, 9(4): 345-362.

called project food aid. Though sourced from a different location than program aid, it too is usually given to the government within the recipient state and the government can either distribute it freely or sell it on the local market for less than its local market value.

The choice by the U.S. to source food aid from domestic producers through the 1990s was meant to continue to provide support to domestic producers and to benefit the U.S. shipping interests as well.[183] The U.S. choice to continue program aid has implications for the entire food aid regime as it is the largest donor of food aid by a state, donating $87 million in 2005.[184] Further, this divergent policy choice over food aid highlights broader trade disputes between the U.S. and European Union. Specifically, the European Union faults the United States for using food aid as a means for circumventing its commitments under the General Agreement on Tariffs and Trade (GATT) to reduce export subsidies for domestic agriculture producers.[185]

In cases that a leader is interested in targeting food insecurity (i.e. an emergency or recipient-based food need), receiving food aid may be the least costly option as the recipient state at most needs only to be responsible for the cost of distributing the aid to targeted groups and, as noted above, in some cases donors shoulder these costs as well. The only concern for leaders when determining the best strategy to address food aid would be the minimal cost of distributing this aid and the potentially negative impact on this aid on domestic producers' incentive to grow food products. As this project will argue in chapter four, leaders will be likely to do request and receive food aid when there are strong agricultural interest groups present within a state. Further, this project assumes that this strategy will be more likely to be chosen by low-income states. This

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[183] Barrett, C. B. and D. Maxwell. (2005). *Food Aid After Fifty Years: Recasting Its Role*. New York, NY: Routledge.
[184] Tarnoff, C. (2005). *Foreign Aid: An Introductory Overview of US Programs and Policy*. Washington, D.C.: Library of Congress.
[185] Clapp, J. and D. Fuchs (Eds). (2009). *Corporate Interests in US Food Aid Policy: Global Implications of Resistance to Reform*. Boston: MIT Press, *125*.

assumption is based on the reasoning that lower-income states have less other strategic alternatives available to them and that donor states would be more willing to give it to states that have a need (due to high levels of food insecurity) and are less able to finance a solution to respond to this need (i.e. low-income states).

Another strategic response to food insecurity is to accept (more) aid from donor states. The World Food Program (WFP) offers data on both the aggregate amount of food aid received and food aid by food commodity.[186] The data are presented in kilograms. This project will convert these measurements to kilograms per capita.

5.5. Outward Foreign Direct Investment (OFDI) in Food Production

In some instance, a state may be interested in increasing the food supply but have insufficient amounts of arable land to meet the food needs of their population by increasing domestic production levels. In such cases, one strategy a state may choose is to increase foreign direct investments in agricultural production in other states.[187]

FDI is defined as a category of international investment made by a resident entity in one economy with the objective of establishing a lasting interest in an enterprise resident in an economy other than that of the investor.[188] Lasting interest is defined as the IMF to mean "a long-term relationship between the direct investor and the enterprise and a significant degree of influence by the direct investor on the management of the direct investment enterprise."[189] Thus direct

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[186] World Food Program. (2012). *Food Aid Information System.* Rome, Italy: United Nations.
[187] World Bank. (2010). *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Results*. Washington, D.C.
[188] International Monetary Fund. (2003). *Direct Investment: Ten Percent Threshold of Voting Power/Equity Ownership, Employment*. Washington, D.C.
[189] Ibid., 152.

investment involves both the initial transaction between the two entities and all subsequent capital transactions between them and among affiliated enterprises.

The direct investors from a home state may be an individual, a private or public enterprise, a government, or an associated group of individuals or enterprises. [190] Direct investment enterprises in a host state can either be incorporated, meaning a foreign investor owns ten percent or more of the ordinary shares or voting power, or they can unincorporated, meaning a foreign investor can have equivalent ownership in the enterprise.

According to the most recent International Monetary Fund (IMF), FDI inflows totaled 23.7 trillion U.S. dollars in 2011.[191] This was a fifteen percent growth rate over FDI inflows in 2009. Though the IMF does not offer sectoral data, the World Bank provides data for the foreign direct investment in both the agriculture sector as well as the manufacturing of food products. In 1990, the total direct investment in agriculture was approximately eight billion U.S. dollars, and by 2007 it was 32 billion U.S. dollars. In 1990, the total direct investment in agriculture was approximately 80.3 billion U.S. dollars, and by 2007 it was 450 billion U.S. dollars.[192]

Dunning (1994) presents four main motivations for states and businesses to choose foreign direct investment endeavors. First, foreign direct investment allows businesses and states to increase access to natural resources (e.g. minerals, raw materials, and agricultural products). Second, it allows businesses and states to increase access to markets.[193] Third, it allows businesses and states to increase efficiency seeking by either transferring production (totally or in part) to locations with

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[190] Ibid, 153..
[191] International Monetary Fund. (2014). *Outward Direct Investment Data*. Washington, D.C.
[192] United Nations Development Program. (1994). *Human Development Report*. Washington, D.C.: United Nations, Ch. 2: 22.
[193] FDI helps businesses and states wishing to either deepen an existing presence in a market or expand to a new market. FDI helps to lower transportation costs, may allow states and businesses to avoid home state government regulations, to follow key clients in their foreign expansion, to adapt products to local conditions and tastes, or the reduction of transaction costs.

lower labor costs or by to exploit economies of scale and scope across borders. Finally, foreign direct investment allows businesses and states to increase strategic acquisitions of assets. Strategic acquisitions include ownership advantages, such as having proprietary ownership of specific assets, or transaction advantages (that more directly apply to trans-national companies able to set up headquarters and satellite hubs to move goods quickly through the production process to the market).

Those who engage in foreign direct investments in agriculture have different motivations than those who invest in other sectors (e.g. manufacturing and service).[194] The clearest motivation is to engage in foreign direct investment agriculture to acquire natural resources.[195] Arable land is considered to be the key natural resource sought by those who invest in agriculture in other states.[196] As a general trend, foreign direct investments in agriculture result in either the purchase or long-term lease of arable land from a host state.[197] Once the land is acquired, direct investors tend to organize vertically-integrated structures of production in which the home state or businesses invests in the needed agricultural inputs, engages in production and maybe some basic processing[198] in the host state, and then exports the crops produced to the home state.[199]

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[194] Mihalache-O'keef, Andreea and Quan Li. (2011). Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries. *International Studies Quarterly*, 55(1): 71–93.
[195] Ibid.
[196] Mirza, Hafiz and Anne Miroux. (2009). *Foreign Direct Investment and Other Forms of TNC Participation in Agricultural Production: Trends and Implications*. Rome, Italy. Food and Agricultural Organization.
[197] Ibid.
[198] E.g. cane sugar is processed either at the location in which it is harvested or nearby.
[199] E.g. Mihalache-O'keef, Andreea and Quan Li. (2011). Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries. *International Studies Quarterly*, 55(1): 71–93. These authors main purpose is to suggest that this type of FDI often has negative impacts on the host state. For example, they argue that FDI in agriculture force closures and expropriations of subsistence farms and present marginal spillover effects economically in the host state. As a result, they argue that these investments may lead to an increase in food insecurity within the host state.

A second motivation for increasing foreign direct investment in agriculture is to increase efficiency by hiring unskilled laborers in the host state instead of relying on domestic agricultural laborers.[200] In some cases foreign direct investment in agriculture may also be motivated in part by a concern over the potential scarcity of natural resources in the foreseeable future. For state leaders, foreign direct investments in agriculture because of concerns over resource scarcity may be driven by a desire to mitigate food insecurity.[201] This strategy is seen by many states as more efficient, more stable long-term strategy as land and labor abroad can often be purchased more cheaply than at home. Thus this strategy guarantees "a cheap and safe supply" of food for the home state.

As an example, the Chinese government policy brief published in 2006, for example, states that China intends to increase its "agricultural cooperation and exchanges with African nations" through "land development, agricultural plantation, breeding technologies" to ensure food security."[202] In addition, many suggest that this trend has been increased in part due to rising fuel and food prices in the mid-2000s.[203] In this context, foreign direct investments in agricultural are seen as a proactive step by states to control the food production and transportation process so as to ensure a more long-term food supply.

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[200] Zoomers, A. (2010) Globalisation and the Foreignisation of Space: Seven Processes Driving the Current Global Land Grab. *Journal of Peasant Studies*, 37: 429-447; Borras, S. Jr. and J. Franco. (2010). From Threat to Opportunity? Problems with the Idea of a "Code of Conduct" for Land-Grabbing. *Yale Human Rights and Development Law Journal*, 13: 507-523; McMichael, Philip. (2013). Land Grabbing as Security Mercantilism in International Relations. *Globalizations*, 10(1): 47-64;

[201] De Castro et al. (eds.). (2012). *The Politics of Land and Food Scarcity*. New York, NY: Routledge. In contrast to states, private businesses may be driven by expectations of increasing returns by acquiring access to these resources before their competitors.

[202] http: www.idcpc.org.cn.

[203] McMichael, Philip. (2013). Land Grabbing as Security Mercantilism in International Relations. *Globalizations*, 10(1): 47-64; Food and fuels prices during this time were considered to be been linked as increases in fuel prices have raised the cost of transporting food.

Leaders may also choose to increase foreign direct investments in food production in other states.[204] Data on post-colonial public foreign direct investment in food production for all states are not available. There are four possible sources for data on outward-bound foreign direct investment (ODFI) in agriculture.

UNCTAD offers data[205] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[206] This project will calculate the estimated amount of money being spent by a state on OFDI in agriculture by calculating five percent of the UNCTAD measurement for the overall OFDI projections per state per year.

5.6. Consumer Food Subsidies

Issues of food affordability may be addressed through policies that seek to lower the price of food for domestic consumers.[207] These policies seek to transfer monetary payments from the state (i.e. taxpayers) to consumers. They can either be implemented on a commodity specific basis or non-commodity specific basis.[208] Commodity-specific monetary transfers usually are implemented to

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[204] Zagema, B. (2011). *Land and Power: The Growing Scandal Surrounding the New Wave of Investments in Land*. (Briefing Paper). Oxford, UK: Oxfam International; Weis, T. (2007). *The Global Food Economy: The Battle for the Future of Farming*. London and New York: Zed Press; Parenti, C. (2011). *Tropic of Chaos. Climate Change and the New Geography of Violence*. New York: Nation Books.
[205] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[206] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.
[207] Anderson et al. (2012). *Political Economy of Public Policies: Insights from Distortions to Agricultural and Food Markets* (Discussion Paper No. DP9221). Washington, D.C.: Center for Economic and Policy Research.
[208] Organization of Economic Cooperation and Development. (2013). *Agricultural Policy Monitoring and Evaluation*. Paris, France: 21-22.

offset the price increase for certain commodities due to trade protectionist policies (e.g. tariffs).[209] Non-commodity specific monetary transfers include such programs as: the U.S.' food stamp program, the Child Nutrition Programs (e.g. school breakfast and lunch programs), and the Woman, Infant, & Children (WIC) Nutrition Program, and Commodity Assistance Programs.[210] The USDA's food stamp program is implemented by giving certain individuals who meet income eligibility requirements coupons that are redeemable at retail food stores that serve to reduce the cost of certain foods by 36 percent. The USDA school breakfast and lunch programs provide school districts and independent schools that choose to take part in these programs with cash subsidies for each meal they serve in return for offering free or reduced prices to eligible children.[211]The WIC Nutrition Program, also administered through the USDA, provides federal grants to states for:

> supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk.[212]

Finally, Commodity Assistance Programs such as the Emergency Food Assistance Program (TEFAP) include a federal and state partnership in which the USDA buys the food and pays for it to be transported to states. State agencies set criteria for eligibility and distribute food to eligible households.[213]

Consumer food subsidies are used to lower the price of food for domestic consumers. Anderson and Nelgen (2013) offer data on to what extent government policies seek to increase or lower the price of food products for citizens. The measurement is the consumer tax equivalent (CTE). If the consumer tax equivalent is positive, then the government is implementing policies that raise the

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[209] Ibid, 67.
[210] Ibid, 22-23.
[211] Food and Nutrition Service. (2014). *Food Distribution Programs*. Washington, D.C.: United States Department of Agriculture, 1.
[212] Ibid.
[213] Ibid.

costs of food for their state. These policies may include direct taxes on certain food items or, as noted above, they may include tariffs on food imports. Tariffs serve to raise the costs of imports for consumers and lower the amount of imports (which in turn allows domestic producers to raise their prices as well).

If the consumer tax equivalent is negative, however, this means that governments are intervening to lower the price for food items for consumers below what it would otherwise be. Anderson and Nelgen offer the value of consumption-weighted averages for states between 1990 and 2007.

5.7. Raise Trade Barriers on Food Imports

State leaders that are interested in encouraging domestic food production by discouraging imports of the same items or items that may be easily substituted for domestic food items may choose to implement or increase trade protectionist policies within a state. Trade protectionist policies that discourage imports generally fall into two categories: tariffs and quotas. Tariffs are custom duties, or taxes on imports. They serve two purposes. First, tariffs raise the price of imported goods, thus advantaging domestic products. Thus, whereas domestic production subsidies lower the price of domestic goods, tariffs serve the same function by increasing the price on imported food. Second, tariffs serve to raise revenues for governments. In this way they are more advantageous for states than domestic production subsidies as they require minimal administrative costs but generate revenue. Quotas are limits on the quantity of products that may be imported into a state over a given time period.

The "Agriculture Agreement" of the World Trade Organization's Uruguay Round was a liberalizing treaty that went into force in 1995. It concluded that (1) all non-tariff protectionist

policies (e.g. domestic production subsidies) should be replaced by tariffs that provide substantially the same level of protection, (2) Tariffs, including those implemented in the shift from non-tariff protectionist polies should be reduced on average by 36 per cent for developed countries and 24 per cent by developing countries, and (3) these reductions are to be undertaken over six years for developed countries and over ten years for developing countries. Least-developed countries are not required to reduce their tariffs.

A subsequent debate on trade protectionism in agriculture surrounding the "Agreement on Agriculture" was stalled in Doha, Qatar in 2001, largely because of strong agriculture and fishing interests in developing states (e.g. cotton and sugar in the U.S. and rice and fish in Japan) refusing to agree to either lower or transform their non-tariff protectionist policies into tariffs.[214] With Doha paralyzing a global trade agreement, regional trade agreements have increased. Of the 297 regional trade agreements in force, only about 20% were concluded prior to the establishment of the World Trade Organization in 1995 while more than 66% of the agreements have come into force since 2000, largely in part due to the failure of the Doha Round.[215] Regional trade agreements (a misnomer as many of these multilateral agreements no longer are made among neighboring states) serve to liberalize trade at the expense of other states not included in the agreement. Thus, whereas a state level analysis would show that tariffs on agriculture have generally been on the decline, globally the evidence is mixed.

Thus, as mentioned above, states may choose to maintain or increase trade protectionist policies to advantage domestic food producers either because they are concerned with food

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[214] Goodbye Doha, Hello Bali. (2012).*The Economist.* Retrieved from http://www.economist.com/node/21562196.
[215] Organization of Economic Cooperation and Development. (2003). *The Doha Development Agenda: Tariffs and Trade* (Policy Brief). Paris, France.

insecurity within their state or, as in the case of the U.S. cotton and sugar and Japanese rice and fish producers, to protect domestic food producers' interests.

This project will use the same original data from Anderson and Nelgen to measure trade protectionism as it did to measure trade openness. As for trade openness, this project will use the nominal rate of assistance for border market support (i.e. NRA_{BMS}) to measures the amount to which tariffs on imports raise the gross return to domestic producers for their products. This measurement includes the production-value weighted average of the NRA_{BMS} for each state-year. The distinction, however, is that this variable will include a scale for positive NRA_{BMS}, and all negative or neutral measurements will be coded as zero.

5.8. Food Rationing Systems

States interested in controlling the distribution of scarce resources such as food may choose to limit the size or frequency of distributions of that good to individuals or households within the state. Rationing was implemented in the United States and the United Kingdom during World War I and II. During both wars, a variety of goods were rationed including steel, tin, nylon, and wool. Food rationing during these wars was both result of shortages due to increase demand for food in the war effort as well as decreases in the supply of these goods because of labor shortages on farms.[216]

In a speech to Congress in 1942, Franklin Delano Roosevelt argued that food rationing was the "democratic, equitable solution" to ensuring that all citizens receive essential commodities should there be a shortage due to the war effort.[217] Months after the attack on Pearl Harbor, the Office of Price Administration (OPA) was established to distribute five red and six blue stamps

[216] Bentley, A. (1998). *Eating for Victory: Food Rationing and the Politics of Domesticity*. University of Illinois Press, 102
[217] Ibid., 14-20.

(each worth ten points) per person. This office asked school teachers to assist in distributing these stamps. Red stamps were to be used to purchase processed goods, and blue stamps were to be used to purchase meat, poultry and dairy. Each product in stores had a point awarded to it, and these points were reevaluated periodically. For example, a can of peaches was worth fewer points in 1942 than it was the previous year due to a large peach harvest.

States may choose to implement food rationing during peacetime. Some scholars suggest that state leaders may use food rationing systems to maintain control over their populations.[218] For example, Eberstadt (1999) argues that during the Soviet Union's 1933 famine Stalin chose to withhold to food restive populations in the Ukraine,[219] and Gause (1999) argues that during the imposition of economic sanctions on Iraq in the 1990s Saddam used Iraqi food stockpiles bolster the population's loyalty to the government.[220]

Other states have chosen to institute more permanent food rationing systems. Following the Korean War, North Korea needed an alternative to food imports it had historically relied on from the south.[221] As a result, it instituted state planning of the entire agriculture sector and sought to nationalize the production, market, trade, and distribution of key agricultural crops.[222] As an example, after 1957 grain producers were required to become members of cooperative farms, which in turn would sell their entire grain harvest directly the state. The state in turn would sell grain and other food items at heavily subsidized rate via its public distribution system (PDS).

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[218] Byman, D. and J. Lind. (2010). Pyongyang's Survival Strategy: Tools of Authoritarian Control in North Korea. *International Security*, 35(1): 44-74, 62.
[219] Eberstadt, N. (1999). The End of North Korea. Washington. D.C.: American Economic Institute Press, 62.
[220] Gause, F. G. (1999). Getting It Backward on Iraq. *Foreign Affairs*, 78(3): 57.
[221] Noland et al. (2001). Famine in North Korea: Causes and Cures. *Economic Development and Cultural Change*, 49(4): 741-767.
[222] Haggard, S. and M. Noland. (2007). *Famine in North Korea: Markets, Aid, and Reform*. New York, NY: Columbia University Press, 57.

This system has continued and expanded to include more crops since the 1950s. Noland et al. (2001) suggest that by the 1990s approximately 62 percent of North Koreans received permanent subsidized food rations through the public distribution system.[223] These authors suggest that most of the recipients of these food rations live in urban areas, while others are on state-owned or cooperative farms that either receive temporary rations or must depend on on-sit production. The amount of individual rations per person is based on a work-points system that accounts for the physical requirements of a specific job. Apte & Mokdad (1998) suggest, however, that average PDS distribution falls far below the daily requirements for nutrition intake accepted by the international health community.[224]

Some leaders may choose to limit the size or frequency of distributions of food to individuals or households within their state. There is currently no one source for data on food rationing systems. Instead, this project compiled information on state food rationing systems by examining a multitude of academic sources. This variable is coded dichotomously. A zero means that there was no state-implemented rationing system and a one means that there was one. Table 5.1 presents the states that had a food rationing system at any point between 1990 and 2011.

Table 5.1. Food Rationing Systems (1990 to 2011)

State	Year
Bangladesh	2008 to 2011
China	2006 to 2011
Cuba	1989 to 2011
Democratic People's Republic of Korea	1989 to 2011
Egypt, Arab Republic of	1989 to 2011
Iraq	2004 to 2011
Mozambique	1989 to 2011

[223] Noland et al. (2001). Famine in North Korea: Causes and Cures. *Economic Development and Cultural Change*, 49(4): 741-767, 747.
[224] Katona-Apte, J. and A. Mokdad. (1998). Malnutrition of Children in the Democratic People's Republic of North Korea. *The Journal of Nutrition*, 128(8): 1315-1319.

5.9. Immigration or Fertility Restriction Policies

Neo-Malthusian scholars, including Lester Brown, argue that the key to reducing food insecurity is controlling population pressures on the food supply.[225] Brown argues that the population growth is concentrated in states with scarce natural resources (e.g. little cropland and high soil erosion).[226]

In response to population pressures, states have begun to implement policies that attempt to reduce the numbers of births within their borders as well as limit the number of individuals immigrating to their states. For example, policies intended to target reproduction have been implemented in China and Iran.

When Ayatollah Khomeini replaced the Shaw in 1979, he dismantled family planning programs the Shah has introduced and instead encouraged large families in order to produce an eventually army that would be 20 million strong.[227] By the early 1980s, the population rate was 4.4 percent, one of the highest ever recorded. In the late 1980s, Iran reversed its policy, reintroducing family planning programs to encourage smaller families. These programs included the ministers of education and culture began a broadcast media campaign to encourage smaller families, religious leaders were mobilized to encourage smaller families, and 15,000 family planning "health houses" were instituted statewide. As a result, the population growth rate was cut in half from 1987 to 1994.

Population control policies that target family planning are largely voluntary. Perhaps the most well-known exception to this is China's one-child policy. Introduced in 1978, the one-child policy

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[225] Brown, L. R. (2011). *World on the Edge: How to Prevent Environmental and Economic Collapse*. New York, New York: W.W. Norton and Company, 153.
[226] Ibid, 60.
[227] Brown, L. R. (2004). *Outgrowing the Earth: The Food Security Challenge in an Age of Falling Water Tables and Rising Temperatures*. New York, New York: W.W. Norton and Company; Hesketh et al. (2005). The Effect of China's One-Child Family Policy After 25 Years. *New England Journal of Medicine*, 353(11): 1171-1176.

consists of a set of regulations restrictions family size, late marriage and childbearing, and the spacing of children (in cases in which second children are permitted).[228]

This policy is implemented via the State Family Planning Bureau and enforced by family-planning committees at provincial and county levels. Though in practice this policy applies to all families, it is strictly enforced in urban areas. In rural areas, where approximately 70 percent of the population resides, households may be allowed to have a second child if their first child is a girl in recognition of a perceived need for male labor in agricultural production.[229] Additional exceptions include: families in which the first child has a disability, both parents work in high-risk occupations (e.g. mining), and when both parents are from one-child families. Further, a third child is allowed among some ethnic minorities (which account for around 8.49 percent of the population as of 2010) and in remote, under-populated areas.[230]

Enforcement of this policy varies widely among local family planning officials. Some choose to reward compliance with economic incentives. Others punish non-compliance with substantial fines, confiscation of belongings, and dismissal from work.[231]

The policy includes virtually universal access to contraception and abortion. Chinese official statistics suggest that 87 percent of all married women use contraception, 90% of which is long-term forms such as intrauterine devices and sterilizations.[232] There are arguments that the policy encourages women to forgo prenatal medical appointments if they fear retribution for becoming

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[228] Ibid, 1171.
[229] Ibid.
[230] Hodgson, G. and K. Huang. (2013). Brakes on Chinese Development: Institutional Causes of a Growth Slowdown. *Journal of Economic Issues*, 47(3): 599-622.
[231] Hesketh et al. (2005). The Effect of China's One-Child Family Policy After 25 Years. *New England Journal of Medicine*, 353(11): 1171-1176.
[232] Ibid., 1176; United Nations Population Fund. (2014). *Family Planning: A Human Right*. New York: United Nations, 6; Yang, Q. (1994). Provincial Patterns of Contraceptive Use in China. *Asia-Pacific Population Journal*, 9(4): 23-42.

pregnant with additional children. A study carried out in rural Sichuan province in 1990 reported a doubling of maternal deaths for unapproved pregnancies as compared with those receiving government sanctions.[233]

Though several argue that the one-child policy has succeeded in dramatically reducing the birth rate,[234] others argue that the largely voluntary program, "late, long, few" that was implemented between 1970 and 1979 had already resulted in "a halving of the total fertility rate, from 5.9 to 2.9."[235] This policy encouraged couples to begin reproducing later, to space their children, and to have fewer children. As Appendix E illustrates, once the one-child policy was introduced in 1979, there was a more gradual fall in the rate until 1995, after which and it stabilized at approximately 1.7.[236]

There is currently a discussion within Chinese political circles, however, about relaxing the one-child policy.[237] Within this debate, some argue that it is anachronistic. Some of these arguments focus on the perspective that a small-family culture norm has been internalized by most Chinese couples and there is no longer need for involuntary enforcement of such a policy. Others argue that the economic disincentives are no longer deterring couples who have greater economic wealth than they did in 1979. Still others argue that the increasingly mobilized Chinese society makes it more difficult to track non-compliance.

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[233] Ni H. and A. M. Rossignol. (1995). Maternal Deaths Among Women with Pregnancies Outside of Family Planning in Sichuan, China. *Epidemiology*, 5(1): 490-494.
[234] Hodgson, G. and K. Huang. (2013). Brakes on Chinese Development: Institutional Causes of a Growth Slowdown. *Journal of Economic Issues*, 47(3): 599-622, 3.
[235] Hesketh, T. and WX Zhu. (1997). The One Child Family Policy: The Good, The Bad, and The Ugly. *British Medical Journal*, 314(1): 1685-1687.
[236] Wang, JY. (2003). Evaluation of the Fertility of Chinese Women During 1990-2000. *Theses Collection of National Family Planning and Reproductive Health Survey*. Beijing: Population Publishing House.
[237] Hesketh et al. (2005). The Effect of China's One-Child Family Policy After 25 Years. *New England Journal of Medicine*, 353(11): 1171-1176, 1176.

A second area of population control policies seeks to restrict the entry of foreign individuals into a state and to limit their access to residence and employment. States seek to control immigration levels for a myriad of reasons: concerns about competitions for jobs,[238] concerns about cultural and ethnic homogeneity,[239] and concerns over scarcity of resources.[240]

Some policies seek to restrict the immigration of certain groups based on country of origin, economic characteristics, or sometimes both.[241] For example, the U.S. Chinese Exclusion Act of 1882 was supported by the Federation of Organized Trade and Labor Unions to reduce competition for jobs in unskilled labor explicitly from China. This same logic undergirded the Literacy Test provision in the Immigration Act of 1917, the purpose of which was to "screen and reduce the inflow of unskilled workers in the U.S labor force."[242]

Still other policies seek to limit overall immigration levels. As an example, Miller (2012) and Meyers (2006) examine factors that lead states to adopt generally restrictive immigration policies. Miller, for example, found that increases in national unemployment rate and decreases in national economic growth in industrialized states were significantly related to increases in support for general immigration restrictions.[243] Meyers (2006) explored comparative immigration policies among the

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[238] Epstein, G. S. and S. Nitzan. (2006). The Struggle over Migration Policy. *Journal of Population Economics*, 19(4): 703-723; Facchini, G. and A. M. Mayda. (2008). From Individual Attitudes Towards Migrants to Migration Policy Outcomes: Theory and Evidence. *Economic Policy*, 23(56): 651-713..
[239] Hillman, A. L. and A. Weiss. (1999). Beyond International Factor Movements: Cultural Preferences, Endogenous Policies and the Migration of People: An Overview. *Migration: The Controversies and the Evidence*, 1(1):76-91.
[240] Sainsbury, D. (2006). Immigrants' Social Rights in Comparative Perspective: Welfare Regimes, Forms in Immigration and Immigration Policy Regimes. *Journal of European Social Policy*, 16(3): 229-244.
[241] Blanco, L. and O. Anyanwu. (2011). *Immigration Regulation* (Working Paper). Malibu, CA: Pepperdine University, 3.
[242] Auerbach, J.A. and R.S. Belous (eds.). (1998). The Inequality Paradox: Growth of Income Disparity. *National Policy Association*, 112(13): 125.
[243] Miller, B. (2012). Exploring the Economic Determinants of Immigration Attitudes. *Poverty and Public Policy*, 4(2): 1-19, 10.

U.S., the U.K., Germany, and the Netherlands. In his study, he classified restrictive policies as those that substantially limited the total number of individuals allowed to immigrate to a state.[244] Though there is ample literature available on the link between food insecurity and emigration from a state,[245] there are less studies exploring the link between food insecurity within a state and increasing immigration restriction policies.

The United Nations' Department of Economic and Social Affairs has compiled the "World Population Policies" survey and policy data on population policies worldwide.[246] Among other things, the survey data addresses whether or not governments implemented policies that sought to raise, lower, or maintain both fertility levels and immigration levels for their state. Immigration control and fertility control variables will both be coded categorically. These data are gathered by the United Nations from "publications, documents, statements and other materials issued by Governments, including development plans, laws, regulations and proclamations." The United Nations suggests that "these materials are a particularly important source of data as they reflect the official positions taken by countries."[247] These data are available for 1996 and 2009. The 1996 data will be used as an estimate for the state for 1990 to 2000, and the data for 2009 will be used as an estimate for the state for 2001 to 2011.

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[244] Meyers, Eytan. (2004). *International Immigration Policy: A Theoretical and Comparative Analysis*. New York: Palgrave, 11.
[245] Miller, B. (2012). Exploring the Economic Determinants of Immigration Attitudes. *Poverty and Public Policy*, 4(2): 1-19.
[246] Population Division. (2009). *World Population Policies*. New York: United Nations.
[247] Ibid.

5.10. Resource Conflicts for Food Inputs

Though most scholars agree that degradation of the natural resources increases stress among human beings and thus on social systems,[248] two debates remain. First, scholars disagree as to which causes lead to natural resource degradation.[249] Second, and more relevant to this project, scholars also disagree as to whether a scarcity of resources lead groups and states to engage in conflict over access to additional resources.

The empirical record supports that decreases in water and arable land can lead to declining crop productivity, which in turn will increase the risk of hunger.[250] This does not mean, however, that all states experiencing hunger will engage in conflict to secure depleted resource supplies. Instead research has shown that resource depletion may be a catalyst for conflict, but other factors must also be present.

Some scholars focus on pre-existing stresses on states that may be exacerbated by resource scarcity. As an example, Kahl (2006) argues that low-income states may experience more conflicts in response to increases in food insecurity if high population growth, inadequate freshwater supplies, strained agricultural resources, existing social divisions,[251] economic decline, and/or weak political

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[248] E.g. Scheffran, J. (2009). The Gathering Storm: Is Climate Change a Security Threat? *Security Index: A Russian Journal on International Security*, 15(2): 21-31.

[249] E.g. Klomp, J. & E. Bulte, E. (2013). Climate Change, Weather Shocks, and Violent Conflict: A Critical Look at the Evidence. *Agricultural Economics*, 44(1), 63-78; Intergovernmental Panel on Climate Change, Working Group I. (2013). *Climate Change 2013: The Physical Science Basis*. Geneva, Switzerland: United Nations; Raleigh, C., & Urdal, H. (2013). Climate Change Demography Environmental Degradation and Armed Conflict. *Environmental Change and Security Program Report*, 13: 27-33.

[250] Scheffran, J. (2009). The Gathering Storm: Is Climate Change a Security Threat? *Security Index: A Russian Journal on International Security*, 15(2): 21-31, 24.

[251] Olson, J. (2013). *Food Fight: The Effect of Food Availability on the Probability of Violent Conflict Onset*. Available at SSRN: http://ssrn.com/abstract=2318647 or http://dx.doi.org/10.2139/ssrn.2318647.

institutions are also present.[252] In such cases, states may be ill-equipped to cope with the additional strain of food-related resource scarcity. This may lead to an increase in the risk of resource conflicts.[253] This literature tends to focus more on intrastate conflicts over scarce resources as interstate conflict is more difficult for a state to engage in when it is already failing to provide its citizenry with basic resources. An example of this literature is the focus on increasing desertification in Darfur led to food scarcity, water scarcity, and famine, in turn leading to civil war and ethnic cleansing.[254] There are other cases, however, in which large portions of the population were suffering from food insecurity and did not end in large-scale violence. For example, Salehyan (2008) argues that nearly a third of the populations in Malawi, Zambia, the Comoros, North Korea, and Tanzania have experienced food shortages and malnutrition, none of which led to civil war or state failure.[255] In short, the consensus among scholars that focus on intrastate conflict over resource scarcity is that when they occur, they most often remain localized and do not escalate to full-scale civil war or result in a failed state.[256]

Interstate conflicts that are exclusively over scarce food-related resources are even rarer. Some scholars extend to logic of the resource curse to include resources needed for food production

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[252] Messer, E. (2009). Rising Food Prices, Social Mobilizations, and Violence: Conceptual. Issues in Understanding and Responding to Connections Linking Hunger and Conflict. *Annals of Anthropological Practice*, 32(1): 12-22; Patel, R., & McMichael, P. (2009). A Political Economy of the Food Riot. *Review (Fernand Braudel Center)*, 935; Gleditsch, N. P., Nordås, R., & Salehyan, I. (2007). Climate change, migration, and conflict. *Coping with Crisis, Conflict and Change: The United Nations and Evolving Capacities for Managing Global Crises*. Gleditsch, Nordås & Salehyan (2007) argue that high levels of migration due to food scarcity do not lead to conflicts as many receiving states implement social integration and citizenship policies.

[253] Scheffran, J. (2009). The Gathering Storm: Is Climate Change a Security Threat? *Security Index: A Russian Journal on International Security*, 15(2): 21-31.

[254] Ki-Moon, B. (2007). A Climate Culprit in Darfur. *Washington Post*, 16: A15; de Waal, A. (2007). *Is Climate Change the Culprit for Darfur?* New York, NY: Social Sciences Research Council.

[255] Salehyan, I. (2008). From Climate Change to Conflict? No Consensus Yet. *Journal of Peace Research*, 45(3): 315-326.

[256] Ibid., 319.

(e.g. arable land and freshwater). These scholars focus on resource conflicts that occur when a state experiencing resource scarcity seeks an opportunistic advantage to secure future access to resources against a weak adversary, such as a failed or failing state, that has abundant natural resources.[257]

Though resource conflicts are rare, when such conflict occurs over issues of food insecurity, states seek to secure arable land, freshwater, or in some cases access to fishing zones in the territorial waters of another state. Many scholars argue that a push to acquire territory has historically included a desire to ensure access to cropland and hunting areas for those states.[258] As an example, the Chaco region between Bolivia and Paraguay provided opportunities to enhance food production and exports for both states. As a result, these states engaged in the Chaco War to each secure this region in 1932.[259]

Claims to freshwater, especially for riparian states that share the same freshwater source, has been an increasing focus in international relations. For example, Tir and Stinnett (year) examine when interstate conflicts erupt over sources of freshwater located between states.[260] These scholars suggest that the presence or lack of an international agreement over water rights between or among states may best explain when these conflicts will occur. Others, such as Klare (2001) suggest that population growth may threaten states' adherence to such treaties. As an example, he warns that population growth in India may threaten that state's future adherence to the Indus Water Treaty with Pakistan as this treaty grants Pakistan access to four-fifths of the Indus River's water supply.[261] Though food production is by no means to the only motivation for a state to secure access to

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[257] Westing, A. H. (Ed). (1986). *Global Resources and International Conflict: Environmental Factors in Strategic Policy and Action*. Oxford: Oxford University Press.
[258] Ibid., 2.
[259] Ibid, 16.
[260] Tir, J. and D. M. Stinnett. (2012). Weathering Climate Change: Can Institutions Mitigate International Water Conflict? *Journal of Peace Research*, 49(1): 211-225.
[261] Klare, M. T. (2001). *Resource Wars: The New Landscape of Global Conflict*. New York: Macmillan Press, 188.

freshwater sources, it is an important one. As Klare (2001) suggests, "by far the greatest need for water – beyond that needed for basic human survival – is for the irrigation of essential food crops."[262]

Yet another group of scholars suggest that, while territorial disputes have become less prevalent since World War II, issues over territorial water claims, including access to fishing areas, have remained and a disproportionate amount have resulted in militarized disputes.[263] As an example, Mitchell (1999) found that of the ninety-seven militarized disputes between democracies since 1946, 25% of these disputes were the result of alleged violations of territorial water boundaries for the purpose of fishing.[264] The United States alone has been a participant in seven militarized disputes over illegal fishing allegations since World War II: five with Canada, one with Peru, and one with Ecuador. Thus, when a state chooses to engage in resource conflict to secure resources for food, they tend to target resource abundant states and they tend to direct their efforts on securing arable land, freshwater supplies, and access to fishing areas.

Though data are readily available for the occurrence and prevalence of conflicts, it is more difficult determine the motivation of each state engaged in a conflict, specifically the motivation for a state to engage a conflict for the purpose of acquiring (or defending) natural resources. Two sources of data are beginning to present measurements for motivation of conflict.

The first is the Issue Correlates of War (ICOW) dataset.[265] Building on the original Correlates of War (COW) dataset, it intends to explain why states are motivated to engage in conflicts already captured in the Correlates of War data. Issues over natural resources are coded as those in which

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[262] Ibid., 142.
[263] Mitchell, S. M. and B. C. Prins. (1999). Beyond Territorial Contiguity: Issues at Stake in Democratic Militarized Interstate Disputes. *International Studies Quarterly*, 43(1): 169-183.
[264] Ibid, 175.
[265] Hensel, P. R. and S. M. Mitchell. (2006). The Issue Correlates of War Project. Retrieved from http://www.paulhensel.org/icow.html.

two or more states conflict over the use or abuse of a specific river or river system, states conflict over the use of specific maritime zones, and territorial claims in which states make claims of sovereignty over the same territory. Within territorial claims, this dataset offers sub-issues including resource contention. Though this dataset will include conflicts worldwide, it currently has only data for America and Western Europe.

A second dataset of resource conflicts is CONIS from the Heidelberg Institute for International Conflict Research (HIIK).[266] HIIK publishes an annual Conflict Barometer publication in which it summarizes conflicts worldwide for that year. In its 2012 publication it stated that resource issues was the third most common motivation for conflict, following ideological differences and desire for national power.[267] Though a dataset containing information on the participants of resource conflicts is not available to the public, the original data is presented in the annual Conflict Barometer publications. Compiling a list of states engaged in resource conflicts from the Conflict Barometers from 2004, 2005, 2006, 2008, and 2012, this project offers three variables. The first is the number of resource conflicts engaged in by a state in a given year.

The second measures the overall intensity of engagement by a state in a given year.

To calculate this, this project will adopt the coding for intensity of a conflict used by the HIIK (Appendix F). This project will combine intensity measurements for a state in a given year. For example, if State A engages in a conflict with State B at an intensity level of one and State C at an intensity level of two in that same year, the coding for State A's intensity level will be three.

The final measurement calculated by this project multiplies these first two measurements to offer an overall indicator for the level of engagement in resource conflicts for a state in a given year.

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[266] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[267] Ibid.

Thus, for example, if State A were to only be engaged in these two conflicts, the entry for that state in the given year would be six.

One additional strategy that remains is for a leader to simply ignore the food insecurity within their borders. Thus in the empirical examinations, this project will also hypothesize as to the conditions under which a leader may choose to do nothing.

CHAPTER 6

COMPETING EXPLANATIONS

FOR STRATEGIC RESPONSES TO FOOD INSECURITY

There is a growing body of literature that examines when a state responds to food insecurity within its own borders. Though much of the domestic politics scholarship on food insecurity focuses on factors that shape when powerful states choose to respond to food insecurity in other states,[268] more recent work has focused on state's capacity and willingness to address food insecurity at home, especially as the global economic downturn has decreased the capacity of states to fund international food aid efforts.[269]

This chapter examines possible explanations offered in the domestic politics literature for political outcomes that either have or could be extended to explain strategic responses to food insecurity. It highlights three variables – the size of a leader's winning coalition, the presence of agricultural interests, and a state's income level – as the best indicators for explaining when states choose to respond to food insecurity and which strategies they will choose.

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[268] Brysk, A. and A. Mehta. (2012). Does Global Good Citizenship Begin at Home? Domestic Gender Equity and Humanitarian Foreign Policy. Available at SSRN: http://ssrn.com/abstract=2064394; Barrett et al. (eds.). (2012). *Uniting on Food Assistance: The Case for Transatlantic Cooperation*. New York, NY: Routledge.

[269] Spector, B. (2011). *The United States and Africa in the Obama Era: New Wine in Old Bottles, Old Bottles for a New Beverage - Or a New Label on an Old Brew?* (Policy Brief 66). London: Centre for Policy Studies; Routledge; Lundsgaarde, Erik. (2012). *The Domestic Politics of Foreign Aid*. New York: Routledge; Clapp, J. (2012). *Hunger in the Balance: The New Politics of International Food* Aid. Ithica, NY: Cornell University Press.

6.1. Size of a Leader's Winning Coalition

A significant portion of the domestic politics literature focuses on how democracies behave differently from non-democracies. Though much of this scholarship has attempted to address the democratic peace paradigm, scholars have expanded this area of study to examine other policy choices than war or peace, including whether democracies are more likely to respond to good insecurity than non-democracies.

Broadly, domestic politics scholars in international relations suggest that democracies will choose international patterns of behavior that have the intended effect of maintaining or improving the well-being of their citizens more often than non-democracies.[270] Scholars within this field of study differ, however, as to the underlying reason as to why democracies tend to be more citizen-focused than non-democracies. This same disagreement can be seen in the scholarship that focuses on food insecurity.

For example, Maoz & Russett (1993) argue that democracies are more accustomed to compromising among various points of view than non-democracies.[271] One can see this same perspective in Brysk and Mehta's work, "Does Global Good Citizenship Begin at Home?" These authors argue that democracies are more likely to support international human rights initiatives than non-democracies including providing development assistance in the form of food aid.

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[270] Many of these current arguments mirror Immanuel Kant's presumption in *Perpetual Peace* that, in political systems where the power is dispersed,[270] the people's endorsement of a particular policy will matter more than political systems in which power is more concentrated.[270] Current scholars in this area have expanded on this claim by producing greater theoretical micro-foundations, testing this assumption empirically, and broadening the focus of the debate to multiple policy options. Some contemporary scholarship focuses on underlying value system they argue are inherent to democracies.

[271] They suggest that this value of compromise translates from the domestic realm into international patterns of interaction, especially with other similarly-compromising democracies. That said, this theoretical argument further fails to explain how the value of compromise shifts from the domestic to the international realm, and whether this more aggressive tendency by non-democracies is also a value.

Their reasoning reflects a constructivist-based assertion that democracies hold different values than non-democracies. Specifically, they argue that democracies values gender-equality more than non-democracies. As women, they argue, are more "other-identified and engage in more relational and compassionate moral reasoning in the public sphere,"[272] they theorize that a high presence of "women's empowerment" in democracies should translate to greater amounts of foreign aid by these states.

These scholars, however, fail to offer sufficient explanations for the origins of divergent values for democracies and non-democracies. Moreover, empirical studies have shown that interest-based factors are more supported empirically than normative-based explanations for democratic and non-democratic differences in policy choices.[273]

Other theoretical explanations for the differences in the pattern of international interaction between democracies and non-democracies are based on interests as opposed to values. These arguments tend to focus on either the interests of the larger population or the elites in states.

Gartzke, for example, adopts the median voter assumption that states that challengers and incumbents in democracies take policy positions that correspond to the preferences of the median voter so as to capture the majority of the selectorate. Thus the median voter is able to indirectly

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[272] Brysk, A. and A. Mehta. (2012). Does Global Good Citizenship Begin at Home? Domestic Gender Equity and Humanitarian Foreign Policy. Available at SSRN: http://ssrn.com/abstract=2064394, 7.

[273] E.g. Miller, S. V. and D. M. Gibler. (2011). Democracies, Territory, and Negotiated Compromises. *Conflict Management and Peace Science*, 28(3): 261-279; Miller & Gibler show empirically that the normative account of the democratic peace does not square as well with the facts as their salience-based argument when applied to territorial disputes. Specifically, they argue that democracies are more likely to pursue conflictual strategies based on policy disagreements than non-democracies, whereas non-democracies are more likely to pursue conflictual strategies based on territorial issues than democracies.

shape policy interests for the state.[274] Gartzke argues that there is considerably less variance in policy preferences in democracies than in non-democracies. He reasons that this is because policy outcomes in the former follow from the interests of the median voter's (which have proven to be relatively consistent) whereas the latter are based on the interests of an individual autocrat (which are able to vacillate more with less repercussions).

When applying the median voter assumption to food insecurity issues within a state, Acemoglu and Robinson (2006) argue that democracies with high-income inequality will be more likely to implement redistributive policies in the face of food insecurity than non-democracies with similar income inequality.[275]

The median voter approach, however, has limitations. First, the theory assumes that policy issues can be reduced along a one-dimensional continuum so as to isolate a median voter position on each issue. In reality policy issues are often times highly complex; as a result, a voter may have different responses to multiple aspects of a given policy. In these cases a median voter's policy preferences might be hard to pinpoint.

Second, the median voter theory best applies to democracies, which have large selectorates and thus have elections with a challenger and incumbent interests in reflecting the position of the median voter. In non-democracies, however, selectorates tend to be smaller and leaders are not always competing against challengers over specific policy issue areas. Thus the interests of the median voter would be less important in explaining policy outcome in non-democracies.

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[274] Gartzke, E. and A. Weisiger. (2011). A Socio-Rationalist Theory of Alliance Formation (Meeting Paper). *American Political Science Association's Annual Meeting Program*. Seattle: Washington.
[275] Robinson, J. A. (2006). Economic Development and Democracy. *Annual Review of Political Science*, 9(1): 503-527.

To determine the difference in policy outcomes between democracies and non-democracies, some domestic politics scholars based their theories on the divergent interest of the elites in each regime type.

Bueno de Mesquita's selectorate theory presents the strongest theory for how the varying size of the elite group may best explain policy differences between democracies and non-democracies.[276] Bueno de Mesquita et al.'s selectorate theory begins with the assumption that all political systems have two institutional characteristics: a selectorate and a winning coalition. The selectorate (*S*) is the set of people in the polity who can take part in choosing a leader. The winning coalition is the quantity of selectors whose support the leader must retain to remain in office (*W*). The size of the winning coalition and the selectorate as well as the ratio of the size of the winning coalition to the selectorate can vary widely across political systems, but individual leaders are responsible for choosing who in the selectorate is a part of his or her winning coalition.[277]

Different types of governments vary in the relative size of their winning coalitions and selectorates as well as the selectorate relative to the population (Figure 6.1). Democracies tend to have a large winning coalition relative to their selectorates and a large selectorate relative to their total populations. The exact sizes of winning coalitions and selectorates vary among democracies based on the extent of suffrage and election laws and procedures.[278] For example, election rules in a

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[276] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.
[277] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400. Previously the term winning coalitions was used to describe both the number of people who support a leader at a given time and the minimum number of people whose support a leader needs to remain in power (i.e. these concepts were assumed to be one in the same). These authors added another category, support coalition, which is the set of people whose support a leader at any given time. Distinguishing between the two allows scholars to examine situations in which the size of a support coalition is less than a winning coalition but the leader still remains, or a situation in which a leader's at risk to be removed and replaced.
[278] Ibid., 393.

two-party presidential democracies tend to require a candidate to gain about 50% of the selectorate to control the government, whereas parliamentary democracies tend to require a candidate to gain about 25% of their selectorate to control the government.

Non-democracies tend to have small winning coalitions. Within the broad category of non-democracies, there can be states with small winning coalitions relative to their selectorate and small selectorates relative to the total population. Monarchies and military juntas tend to have both small winning coalitions and small selectorates. In addition, there can be states with small winning coalitions relative to their selectorate, but their selectorates can still be quite large relative to their total populations. One-party autocracies tend to be in this category.

The selectorate theory presupposes that the primary interests of a leader are to seek and then remain in power. To do so, a leader must obtain and maintain the loyalty of his or her winning coalition. Bueno de Mesquita et al. suggest that leaders do so by allocating a state's resources (R)[279] between public goods (g) and private goods (z). Public goods are goods (and services) that are indivisible and non-excludable, or to the benefit of all.

Examples of domestic policies that focuses on allocating resources to public goods include national infrastructure (e.g. highways and rails), and a public education system. An example of a foreign policy approach that focuses on allocating resources to public goods is national security defense.[280]

In contrast to public goods, private goods (and services) are to be enjoyed exclusively by a targeted group of a leader's supporters. Examples of domestic policies that focus on allocating resources to private goods include direct payments to producers or granting monopolies to key

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[279] A state's resources are assumed in this theory to come from taxes collected from the labor effort of the population.

[280] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.

industries or corporations. An example of a foreign policy approach that focuses on allocating resources to private goods is imperialism, which tend to benefit a few while placing the burden on the entire state (e.g. British imperialism).[281]

Figure 6.1 Selectorate Theory

Monarchy/Military Junta (E.g. C.A.R.) | **Democracy (E.g. United States)** | **One-Party Autocracy (E.g. China)**

Bueno de Mesquita et al. theorize that the size of a state's winning coalition will determine which type of goods that leader chooses to distribute more. They argue that, as the size of a winning coalition (*W*) increases, leaders will allocate more public goods than private ones.

As noted above, Bueno de Mesquita et al. base this theory on the assumption that leaders are interested in maintaining their winning coalition so as to remain in power, and that they are engaging in rational, benefit-maximizing political calculations to determine the most efficient means by which to do so. To understand why leaders would choose private versus public goods depending on the size of their winning coalitions, one needs to understand the motivations of supporters, or members of the winning coalition, and the cost to a leader in maintaining these supporters' loyalty.

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[281] Ibid.

Individuals are motivated by their own cost-benefit calculations. Each individual's benefit-portion of these calculations is based on four components: public goods received from a leader, private goods (if any) received from a leader, the untaxed portion of their economic activity, and each individual's leisure time. As each of these components increases, so does an individual's welfare, albeit with diminishing returns. When an individual is choosing which leader they wish to support, they use the proposed tax rate under each leader, their own expected labor versus leisure estimates, and the proposed allocation of private and/or public goods to determine under which leader they will have the highest expected welfare.

When considering the potential benefits of future goods in their calculations, a current supporter of the incumbent understands private and public goods quite differently. Supporters who receive private goods from an incumbent understand that the reason they receive these goods is because of their loyalty to the incumbent. Were someone to challenge this leader for their position, supporters wishing to continue to benefit from private goods would need to be assured that the challenger would include them within his or her winning coalition and continue to give (or increase) the supporter's private goods. Even if made these promises by the challenger, however, there is no guarantee. Thus supporters in a current winning coalition must weigh the high probability that an incumbent would continue to give him or her private goods to maintain their loyalty against the risk that a challenger may exclude him or her from the challenger's winning coalition and thus from getting private goods completely.[282]

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[282] Ibid. Bueno de Mesquita et al. argue that the risk in such a calculation is exacerbated by the uncertainty of whether a challenger is interested in an individual's support because of a mutual affinity (and therefore will provide private goods were he or she to win) or simply as a means of coming to power (and therefore will not). Further, they suggest that this calculation varies among those citizens that are more willing to wait for a leader to may more in policy provisions than he or she has in the past (as promised in her reelection campaigns) than others.

In contrast, supporters and non-supporters both benefit from public goods due to their non-excludable nature. Were a supporter of an incumbent to switch his or her support to a challenger, he or she would still enjoy the same public goods. As a result, there is less motivation for supporters to remain loyal in these cases. As an example, a United States' citizen would still have access to public education were they to vote for a challenger to the current president.

When a leader has a small winning coalition, it would be most efficient for him or her to consider distributing private goods as he or she need only please a small number of people and private goods ensure that this small number of people remain more loyal. In contrast, leaders with a large winning coalition have more people they are required to please to maintain their coalition. Thus it is political efficient for them to allocate resources for public goods to please a larger number of people.

The larger of the winning coalition relative to the size of the selectorate exacerbates, the less likely members in the winning coalition are to remain in a successor's coalition. Thus, as the size of a winning coalition increases relative to the selectorate, members of that winning coalition decrease in their loyalty to a leader.[283]

Scholars have applied the selectorate theory to a leader's decision to respond to issues of food insecurity. As an example, Plumper and Neumayer (2009) assert that leaders with large winning coalitions will be more likely to request and international food donations than leaders with small

[283] Further, as the size of the winning coalition increases in relation to the size of the selectorate (or the ratio of winning coalition to selectorate gets larger), the same phenomenon occurs. For example, presidential systems have relatively large ratios of winning coalitions to selectorate as compared to parliamentary systems. In the United States, the number of citizens the winning coalition is 51% of the selectorate and the selectorate is 91% of the residents of the total population. Thus the ratio of winning coalition to selectorate is about 5/9ths.

winning coalitions when faced with a famine within their borders.[284] These scholars assume that international food donations are a popular strategy for all leaders as the costs for such goods are shouldered by the IO, NGO, or other state(s). They reason, however, that leaders with large winning coalitions will be more likely to accept international food aid as they have fewer individuals within their population to whom they can shift the burden of a policy without political repercussions. In contrast, leaders with small winning coalitions are more likely to choose targeted strategies that alleviate the concern of this affected by the famine within their winning coalition but shift the burden of these private goods to those outside of their winning coalition who may or may not be affected.

Other scholars have used the same underlying logic as the selectorate theory to argue that democracies are more likely to implement sustainable agricultural practices than non-democracies. Because sustainable agricultural practices are meant to assess agricultural practices in terms of long-term benefits of conservation in addition to short-term benefits of production profits, these policies can be considered to be a public good.[285] In support of this claim, democratic states have traditionally led the research and development surrounding sustainable agricultural techniques.[286]

Other scholars, however, argue that non-democratic leaders are more likely to implement sustainable agricultural policies than democratic ones.[287] These authors argue that non-democratic leaders will be less concerned about the political opposition to the short-term costs of sustainability policies (e.g. increased costs for producers when meeting new regulatory standards). Further, they

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[284] Plumper T. and E. Neumayer. (2009). Famine Mortality, Rational Political Inactivity, and International Food Aid. *World Development*, 37(1): 50-61.
[285] Pretty, J. N. and R. Hine. (2001). *Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence*. Colchester: University of Essex.
[286] Aerni, P. (2009). What is Sustainable Agriculture? Empirical Evidence of Diverging Views in Switzerland and New Zealand. *Ecological Economics*, *68*(6), 1872-1882.
[287] Beeson, Mark. (2010). The Coming of Environmental Authoritarianism. *Environmental Politics*, 19(2): 276-294.

argue that some benefits of these practices are only felt in the long-term (e.g. conservation of resources) and even then on an aggregate level. Individual producers, however, might be unable to make changes to their industries to meet the new regulatory standards and may lose market share or go out of business as a result. Beeson (2010), for example, argues that non-democracies in Asia will be more likely to respond to food insecurity crises by implementing sustainable agricultural and fishing regulations because they are able to remain isolated from political pressure imposed by the agriculture and fishing sectors seeking to maintain and even increase domestic production. [288]

The discrepancy between these two predictions – one that asserts that democracies will be more likely to implement sustainable agriculture polices and another that asserts non-democracies will be more likely to do so – reflects an area of explanatory weakness in the otherwise-comprehensive selectorate theory. Selectorate theory is focused on explaining a leader's motivations to act, but it does not seek to explain situations in which a leader is motivated to act but institutionally constrained. Instead, Bueno de Mesquita et al. assumes that a leader can decide and implement state policy without problems.[289]

Returning to Beeson's argument that non-democracies in Asia will be more likely to respond to food insecurity crises by implementing sustainable agricultural and fishing regulations, it is clear that this argument rests on the assumption that an authoritarian leader will be less constrained to act because he or she is more institutionally removed from political pressure than a democratic leader. He says nothing, however, about whether the non-democratic leader will be motivated to implement sustainable agricultural policies. Selectorate theory would assert that he would not. To explain conditions in which a leader would be both motivated and unconstrained to act in the best interest of his or her citizenry, additional theoretical explanations that addresses leader constrain is needed.

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[288] Ibid.
[289] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press, 74.

To measure the size of a winning coalition, Bueno de Mesquita et al. originally[290] created a five-point scale that combined three components of the Polity IV score with a measurement by Arthur Banks that distinguishes military or military-civilian regimes from non-military regimes.[291]

The three components of the Polity IV score are competitiveness of executive recruitment (XRCOMP), openness of executive recruitment (XROPEN), and competitiveness of participation (PARCOMP). Bueno de Mesquita et al. award a state one point for have at least one executive chosen by competitive elections (i.e. an XRCOMP score equal or greater than two), one point for if candidates for the position of executive are chosen through open recruitment (i.e. the XROPEN score is equal to or greater than two), and one point if the state has stable and enduring political groups that regularly compete for political influence with little coercion used (i.e. its PARCOMP score equals five). Finally, if a regime is not a military or military-civilian regime as coded by Banks (1996), Bueno de Mesquita et al. award it a point. Thus the original winning coalition variable was measured on a five point scale, from zero to four, and then normalized so that its smallest value is zero and its largest value is one.

As Bueno de Mesquita et al.'s original dataset only extends to 1999, this project calculates newer measurements for the first three components of *W* using updated Polity IV data. For the fourth component, coding of military regimes, this project will include newer data from Cheibub et al. (2009).[292] In cases where these data and Bank's data are both available, previous studies have shown that the correlation between them is 0.94 (n = 5875).[293] This project will also normalize the

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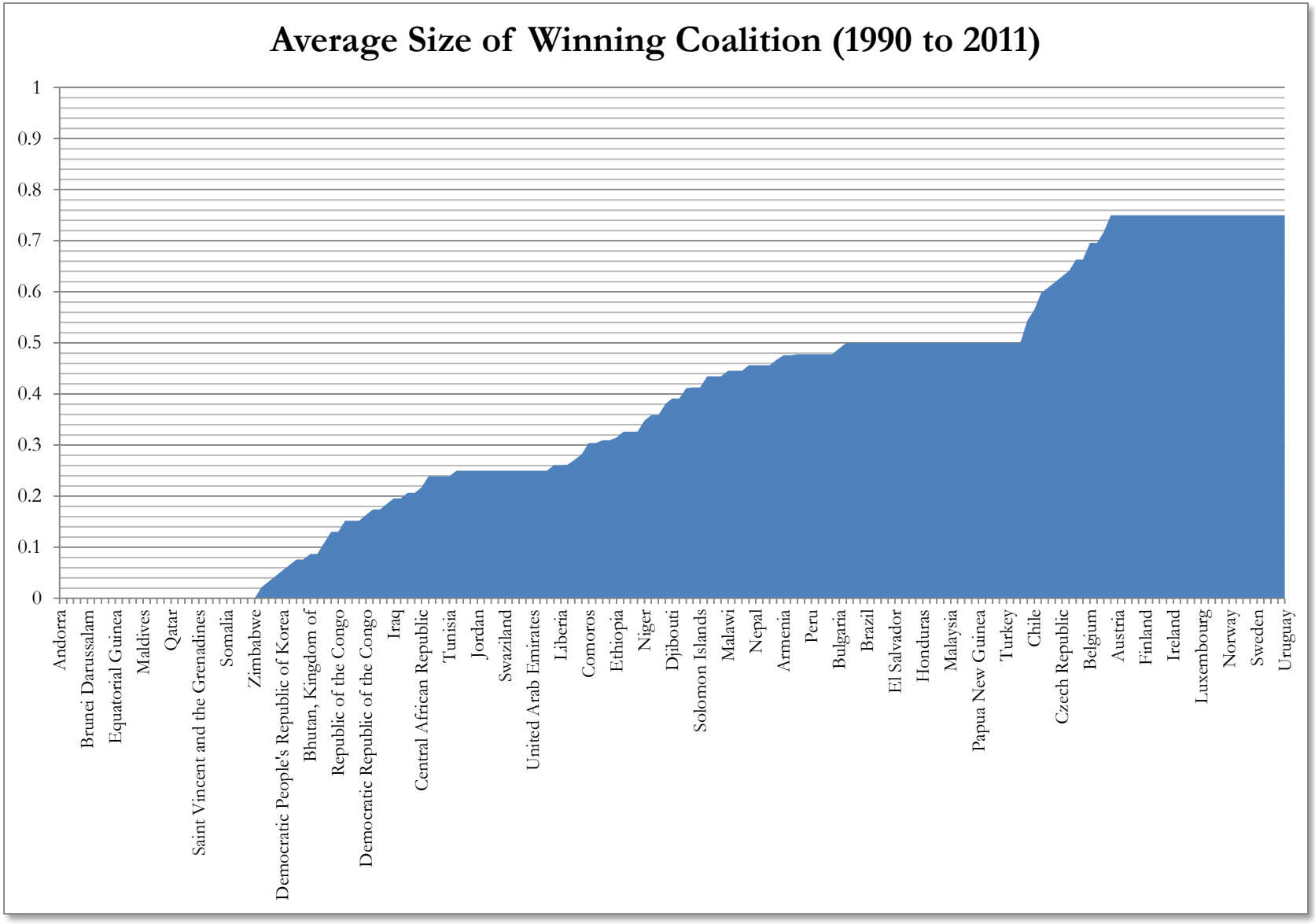
[290] Ibid.
[291] Banks, A. S. (2011). Cross-National Time-Series Data Archive, 1815-[2011]. Retrieved from http://www2.scc.rutgers.edu/cnts/about.php.
[292] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.
[293] Cao, X. and H. Ward. (in press). Winning Coalition Size, State Capacity, and Time Horizons: an Application of Modified Selectorate Theory to Environmental Public Goods Provision. *International Studies Quarterly*.

data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition (Figure 6.2).


Average Size of Winning Coalition (1990 to 2011)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Andorra
Brunei Darussalam
Equatorial Guinea
Maldives
Qatar
Saint Vincent and the Grenadines
Somalia
Zimbabwe
Democratic People's Republic of Korea
Bhutan, Kingdom of
Republic of the Congo
Democratic Republic of the Congo
Iraq
Central African Republic
Tunisia
Jordan
Swaziland
United Arab Emirates
Liberia
Comoros
Ethiopia
Niger
Djibouti
Solomon Islands
Malawi
Nepal
Armenia
Peru
Bulgaria
Brazil
El Salvador
Honduras
Malaysia
Papua New Guinea
Turkey
Chile
Czech Republic
Belgium
Austria
Finland
Ireland
Luxembourg
Norway
Sweden
Uruguay

6.2. Strength of Agricultural Interests

Domestic politics scholarship in international relations dovetails with the scholarship in comparative politics in that both offer theories to explain when a leader is unable to implement policy because of checks on his or her power referred to as executive constraints or veto points.[294] In the international relations literature, Mansfield and Milner (2010) define veto point as "constitutionally mandated institutions" that have the power to prevent or allow executive decisions from moving forward.[295] From the comparative politics literature, Crepaz and Moser (2004) offer a slightly different definition of veto points, describing them as situations in which "power is diffused by means of institutional separation."[296] In essence, veto points can serve as potential policymaking roadblocks. By examine the role veto points play in a given state, one may discern between leaders who are motivated, yet constrained, and leaders who are simply unmotivated to respond to issues of food insecurity within their border.

Early literature in this area focused on the role of formal veto players, or actors within the institutions of the national government that could constrain the executive (e.g. the judicial and

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[294] For a discussion of how executive constraints may shape international economic policy choices, please see Rogowski, R. (1998). Institutions as Constraints on Strategic Choice. In D. A. Lake and R. Powell (Eds.). *Strategic Choice and International Relations*. Princeton, NJ: Princeton University Press. For a discussion of how executive constraints may shape international security policy choices, please see Siverson, R. (1995). Democracies and War Participation: In Defense of the Institutional Constraints Argument. *European Journal of International Relations*, 1(4): 481-489. For a discussion of executive constraints in the comparative politics literature, please see Tsebelis, G. (2002). *Veto Players: How Political Institutions Work*. Princeton University Press; Hallerberg, M. and P. Marier. (2004). Executive Authority, The Personal Vote, and Budget Discipline in Latin American and Caribbean Countries. *American Journal of Political Science*, 48(3): 571-587; Crepaz, M. M., and A.W. Moser. (2004). The Impact of Collective and Competitive Veto Points on Public Expenditures in the Global Age. *Comparative Political Studies*, 37(3): 259-285.

[295] Mansfield, E. D. and H. V. Milner. (2010). Regime Type, Veto Points, and Preferential Trading Arrangements. Stanford Journal of International Law, 46(1): 219.

[296] Crepaz, M. M., and A.W. Moser. (2004). The Impact of Collective and Competitive Veto Points on Public Expenditures in the Global Age. *Comparative Political Studies*, 37(3): 259-285.

legislative branches in the United States).[297] Subsequent literature on veto points has expanded this scholarship to focus on informal players as well, including special interest groups such as trade unions or entrepreneurial associations.

Food insecurity literature tends to focus on the role of informal veto players, especially agricultural interest groups, in shaping food policy responses.[298] For example, many scholars argue that high levels of domestic agricultural production subsidies reflect the presence of powerful informal veto players in the agricultural sector with strong ties to influential formal veto players.[299]

For example, in his work, "The Rise of the Agricultural Welfare State," Sheingate argues that the large number of veto points in the U.S.' government structure (due to principles of federalism and the separation of powers) actually allowed agricultural interest groups to serve as informal veto players. Browne suggests that the large number of veto players, due to the decentralized nature of the U.S. government, leads to a "weakness of public officers in contests with private organizations and the elites these represent." That is, he argues that these agricultural interests groups were able to grow more powerful throughout the twentieth century because of the large number of formal veto points in the U.S. government.

Browne's argument mirrors the logic of Bueno de Mesquita et al.'s selectorate theory in that the larger number of formal veto points means that each member of Congress has relatively small

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[297] Giuliani, M. (2003). Europeanization in Comparative Perspective: Institutional Fit and National Adaptation. In K. Featherstone and C. M. Radaelli (Eds.). *The Politics of Europeanization*. Oxford; Oxford University Press.

[298] Resnick et al. (2012). The Political Economy of Green Growth: Cases from Southern Africa. *Public Administration and Development*, 32(3): 215–228; Diagne et al. (2012). Agricultural Trade for Food Security in Africa: A Ricardian Model Approach. (No. 123842). From the *International Association of Agricultural Economists' Conference* (August 2012). Foz do Iguacu, Brazil.

[299] Taylor, A. J. (1995). *Cultivating Congress: Constituents, Issues, and Interests in Agricultural Policymaking*. Lawrence, KS: University Press of Kansas; Sheingate, A. D. (2003). *The Rise of the Agricultural Welfare State: Institutions and Interest Group Power in the United States, France, and Japan*. Princeton, NJ: Princeton University Press; Pasour, E. C. and R. R. Rucker. (2005). *Plowshares and Pork Barrels: The Political Economy of Agriculture*. Denver, CO: The Independent Institute.

winning coalitions they need to please. Thus, although the U.S. President may be interest in delivering public goods, members of Congress are interested in delivering private goods to their winning coalitions.

Browne argues that, throughout the twentieth century, powerful agricultural interests in the Midwestern and Southern regions of the United States have funded Congressional election campaigns in return for favorable agricultural subsidy policies. Further, he argues that this "agricultural welfare system" has been in retrenchment because the large number of formal veto points in government makes agricultural reform difficult.[300]

Comparative politics literature on agricultural interest groups supports these presumptions. In his research on African economic development for newly-independent states, Robert Bates asserts that Kenya's "exceptionalism" (i.e. fewer food shortages and comparatively rapid economic growth) was the result of political elites with strong agricultural interests choosing to encourage domestic food production through producer subsidies and import controls. Bates' argument mirrors those mentioned above as he suggests that political elites chose to create and perpetuate formal political institutions that would ensure future rent-seeking endeavors for their key supporters.[301] Bates compared Kenya's policy choices to other states (e.g. Nigeria) in which the leaders were not as concerned about agricultural interests.[302]

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[300] Smith, V. H. and B.K. Goodwin. (2014). *The Devil is in the Details: Base Updating and the Cost of New Farm Bill Programs* (No. 39869). Washington, D.C.: American Enterprise Institute; Reimer, A. P. and L. S. Prokopy. (2014). Farmer Participation in US Farm Bill Conservation Programs. *Environmental Management*, 53(2): 318-332.
[301] Bates, R. H. (2005). *Beyond the Miracle of the Market: The Political Economy of Agrarian Development in Kenya*. New York: Cambridge University Press; Bates, R. H. (1981). *Markets and States in Tropical Africa: The Political Basis of Agricultural Policies*. Berkeley: University of California Press.
[302] Bates, R. H. (1981). *Markets and States in Tropical Africa: The Political Basis of Agricultural Policies*. Berkeley: University of California Press, 128.

As an example of comparative politics scholarship that focuses on the role of agricultural interests and food insecurity, Resnick et al. (2012) examines the success of traditionally strong agricultural interests groups in Malawi, Mozambique, and South Africa from blocking reforms to agricultural policies that would have decreased food insecurity levels within these states. He argues that these interest groups opposed these reforms, even though many of these groups' members continue to face high food insecurity levels, because these the reforms would have required costly adjustments to their systems of production and disrupted their current comparative advantage in the global agricultural market. Thus the role of strong agricultural interests groups should be considered when examining state responses to food insecurity.

There have been only a few studies that examine the role that formal and informal veto points play in shaping state responses to food insecurity. As an example, Michelsen (2009) examined the role formal and informal veto players played in European member-state's willingness to adopt EU sustainable agricultural policies.[303] In his empirical study, he found that states with a larger number of formal veto points took longer to adopt sustainable agriculture policies of the European Union. In contrast, he found that informal veto points played less of a role in either delaying or encouraging the adoption of EU sustainable agricultural policies. In this study, however, the strength of informal veto players is measured as an overall level of conflict (i.e. low, medium, and high) between organic and conventional agricultural interests. Thus the research does not capture the potential strength of each of these groups on the formal veto players. In chapter four, this project will attempt to incorporate the logic of agricultural interests as informal veto players into a selectorate theory of state responses to food insecurity.

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[303] Michelsen, J. (2009). The Europeanization of Organic Agriculture and Conflicts Over Agricultural Policy. *Food Policy*, 34(3): 252-257. The two initial EU organic agriculture regulations are EEC Regulation 2092/91 on certification of organic products and EEC Regulation 2078/92 on agro-environmental support including financial support for organic farmers.

A fourth component of the democracy variable in Polity IV that measures executive constraint (i.e. XCONSTR) has not been included in the winning coalition variable because Bueno de Mesquita et al. assume that "constraints on executive power…play no role in [their] theory."[304] These scholars, however, have included this as a control variable for the purpose of isolating the effect of winning coalitions from the other characteristic that distinguish democracies from non-democracies.[305]

This project will include a normalized version of executive constraint from Polity IV as a control variable. This measurement will seek to capture highly-institutionalized constraints (i.e. formal veto points or players) on executive power that may affect policy implementation. This measurement is thus distinguished from the key explanatory variable, which seeks to capture the motivations of democratic versus non-democratic leaders based on the size of the winning coalitions.[306] This project will also normalize this measurement so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, the leader of that state will be considered to face low levels of executive constraint. If a given state-year has a score of 0.5 or higher, the leader of that state will be considered to face high levels of executive constraint.

6.3. State Income-Level

In addition to regime type and veto points, domestic politics literature that focuses on food insecurity often examines per capita income as a factor to predict a state's given response to food insecurity within its borders. Food insecurity literature consistently asserts that income-levels are

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[304] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.
[305] Ibid, 393.
[306] Henisz, W. J. (2002). The Institutional Environment for Infrastructure Investment. *Industrial and Corporate Change*, 11(2): 355-389.

correlated with high levels of food insecurity (and vice versa). On an individual level of analysis, Pinstrup-Andersen et al. argue that income level "conditions" an individual's access to food.[307] More national levels, such as Bullock and Firebaugh (1990) and Firebaugh and Beck (1994), asserts that overall economic growth leads to an increase in the food supply in a given state.[308] Thus, when examining a state's responses to food insecurity, it is important to also understand that per capita income may contribute to the level of food insecurity within a state as well as the capacity of a state to respond to food insecurity.

The research that examines the effect of increasing income levels on increasing state responses to food insecurity is mixed. Some argue that an increase in income levels have led to a decrease in food insecurity. Examples within this literature include Mehta et al. (2007), who argue that increasing income levels in Africa have led states to invest in greater irrigation capacity and crop biotechnology to increase overall food availability, and Godfray et al. (2010), who argue that as states increase their per capita income levels they will engage in open trade, which will increase food availability domestically.

Jenkins and Scanlan (2001) argue that, though higher income levels are correlated with an increase in food availability, this is not the same thing as a decrease in food insecurity. To support their claim, their research found that higher income levels did not correlated with a decrease in child hunger within a state.[309] These scholars suggest that this is because hunger is not only an economic issue but also a political one. Instead, these authors argue that food insecurity must be addressed

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[307] Pinstrup-Andersen et al. (1997). *The World Food Situation: Recent Developments, Emerging Issues, and Long-Term Prospects*. Montpellier, France: CGIAR, 4.
[308] Bullock, B. and G. Firebaugh. (1990). Guns and Butter? The Effect of Militarization on Economic and Social Development in the Third World. *Journal of Political and Military Sociology*, 18(1): 231-66; Firebaugh, G. and F. Beck. (1994). Does Growth Benefit the Masses? Growth, Dependence, and Welfare in the Third World. *American Sociological Review*, 59(1): 631-53.
[309] Jenkins, Craig J. and S.J. Scanlan. (2001). Food Security in Less Developed Countries, 1970 to 1990. *American Sociological Review*. 66(Oct.): 718–744.

through "political democratization" so "that disadvantaged children, minorities, women, and rural households have secure access to this supply."[310] This argument mirrors Amartya Sen work on food entitlements.[311]

This research on food insecurity mirrors the domestic politics argument that regime type and income-level are either mutually-reinforcing or spurious characteristics. One group of scholars, for example, asserts that the phenomenon of the democratic peace is actually a product of characteristics associated with capitalism rather than democracy.[312] Commercially-focused liberals have argued for centuries that the potential benefits from trade will decrease the likelihood of conflict between states.[313] As a revised version of this, Gartzke suggests that it is not trade but domestic development levels that determine the international behaviors of states.

A second group argues that democracies tend to wealthier than non-democracies. Bueno de Mesquita et al. makes this assertion. They posit that leaders of small winning coalitions tend to choose higher tax rates so as to exact resources from the larger pool of residents and distribute these resources to the smaller group that constitutes his or her winning coalition. In contrast, leaders of large winning coalitions tend to choose lower tax rates as exacting resources from the larger pool of residents in its state would necessarily include a large number of members of his or her winning coalition and the portions of these resources to each member of this large winning coalition would be quite small.

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[310] Ibid.
[311] Sen, A. (1982). *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Oxford University Press.
[312] Gartzke, E. (2007). The Capitalist Peace. *American Journal of Political Science*, 51(1): 166-191.
[313] Bliss, H. and B. Russett. (1998). Democratic Trading Partners: The Liberal Connection, 1962–1989. *The Journal of Politics*, 60(4): 1126-1147; Keohane et al. (Eds.). (1993). *After the Cold War: International Institutions and State Strategies in Europe, 1989-1991*. Boston: Harvard University Press; Oneal, J. R. and J. L. Ray. (1997). New Tests of the Democratic Peace: Controlling for Economic Interdependence, 1950-85. *Political Research Quarterly*, 50(4): 751-775.

These presumptions about tax rates are important to the discussion of overall state wealth in so much as Bueno de Mesquita et al. predict that states with lower tax rates will tend to have higher economic growth than those with low tax rates. This prediction is based on several assumptions about how taxation motivates individuals to labor or not. First, Bueno de Mesquita assumes that individuals are more interested in laboring when they can keep a larger share of their profits. Second, the assumption is then that higher tax rates shape an individual's choice between labor and leisure; specifically, states with increasingly higher tax rates discourage individuals from laboring more and may even provide a disincentive. Further, these scholars assume that leaders with small winning coalitions will tend to implement lower tax rates and provide public goods, such as education, national security, the rule of law, which also serve to promote economic growth. Thus the literature on food insecurity supports this claim that regime type and income level are mutually reinforcing characteristics.

The most reliable data available are the Gross National Income (GNI) per capita of each state in a given year offered by the World Bank.[314] Measurements for income-level tend to include the log of per capita income.[315] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

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[314] World Bank. (2011). *World Development Indicators Databases*. Washington, D.C. The World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.

[315] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400.

This project will examine these possible independent variables separately as well as together. When combining size of a winning coalition (large or small), strength of domestic agricultural interests (strong or weak), and income-level (high or low), this project creates eight possible categories for states (e.g. LARGE-STRONG AG-HIGH, LARGE-STRONG AG-LOW, etc.).

The next part of the dissertation will present theoretical explanations for and empirical tests of state responses to food insecurity. Incorporating the domestic factors presented in this chapter, Part III will answer four central research questions: (1) What factors best explain when a state responds to food insecurity and when it does not? (2) What factors best explain whether state's strategic responses to food insecurity will be cooperative, quasi-cooperative, or conflictual in nature? (3) What role (if any) do certain agricultural interest groups play in shaping state responses? (4) Does the level of income of a state help to explain a state's response?

PART III

EXPLAINING STATE RESPONSES TO FOOD INSECURITY

CHAPTER 7

TO RESPOND OR NOT TO RESPOND?

7.1. A Selectorate Theory of Food Insecurity

Bueno de Mesquita et al.'s selectorate theory assumes that leaders are interested in maintaining power by ensuring they are meeting the interests of their winning coalition. Based on this assumption, a leader will be more motivated to respond to food insecurity if members of his or her winning coalition are food insecure than if there were no members of his or her winning coalition are not.

This project agrees with the predictions in the domestic politics literature in international relations that leaders are more *likely* to respond to food insecurity than leaders with small coalitions. It is not, however, due to any inherent lack of motivation on the part of leaders with large winning coalitions or inherent lack of citizen-responsiveness in leaders with small winning coalitions. Instead, if two leaders – one with a small winning coalition and one with a large winning coalition – are experiencing similar levels of food insecurity within their winning coalition, this project suggests that each will be *equally motivated* to respond to food insecurity. The leader with a large winning coalition, however, will appear more motivated to respond to food insecurity in their border simply because he or she has a greater probability of having food insecure individuals within their winning coalition than those with smaller winning coalitions. Thus they will be more likely respond.

What if the food insecurity is outside of a leader's winning coalition? This project asserts that a leader should also be motivated to respond to food insecurity outside of his or her winning coalition

in so much as members of his or her winning coalition are affected by it. Though selectorate theory suggests there is a minimal role in politics for the selectorate and a smaller role for the non-selectorate,[316] food insecure individuals in a state have the potential to affect the preferences of the winning coalition indirectly.

In some situations, members of a winning coalition may be altruistically concerned about the well-being of those who are outside of the winning coalition and food insecure. It is plausible that, though individuals are unaffected by food insecurity, they would consider it important that food insecurity be diminished within their state. A right to food for all individuals is an international norm that has been codified in the United Nations Declaration on Human Rights as well as several other sources of international law.[317] Though these laws are not legally binding on states, there are believed to be political costs associated with a state's failure to address food insecurity, and there may be political costs associated with a leader not responding to food insecurity if members of his or her winning coalition see this as a failure of overall leadership.

In other situations, food secure members of a winning coalition may be interested in addressing food insecurity in population beyond the winning coalition because of their own material interests. If a significant number of food insecure individuals are unable to produce goods as efficiently as they would were their sustentative needs met, this may lower the productive capacity in certain sectors. In such cases, food insecurity may increase production cost for employers and thus retail costs for consumers. Were members of the winning coalition to be either producers and consumers

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[316] If individuals are part of the non-selectorate, it means they are unqualified to vote, or choose a leader, for reasons of age, gender, mental health, income level, etc. If one were to assume that a leader is motivated by the interests of their winning coalition alone, then one could surmise that a leader would be unmotivated to address problems of food insecurity were they to be isolated to the non-selectorate in a state as this group does not have even the potential to participate in the leader's winning coalition.

[317] E.g. Mechlem, Kerstin. (2004). Food Security and the Right to Food in the Discourse of the United Nations. *European Law Journal*, 10(5): 631-648.

(or both) of products made domestically that relied on these individuals, these material concerns could place pressure indirectly on the leader, not because the winning coalition is food insecure, but because they are affected indirectly by those who are. Thus, when determining a leader's motivation to respond to food insecurity, it is important to understand who may be affected directly as well as indirectly by food insecurity within a leader's winning coalition and the level of support a leader enjoys.

In a revised version of the selectorate theory,[318] Bueno de Mesquita et al. describe a leader's support coalition, or the set of people who would potentially support a leader at any given time. Whereas previously the term "winning coalition" was used to describe both the number of people who support a leader at a given time and the minimum number of people whose support a leader needs to remain in power (i.e. these concepts were assumed to be one in the same), distinguishing between the two allows scholars to examine situations in which a leader's power may be threatened as his or her support coalition diminishes or may be very secure (as his or her support coalition increases). For larger purposes, this information would be useful for a leader determining how much energy and resources to allocate in seeking to maintain power. For the purposes of this project, the size of the support coalition helps to illustrate when a leader may be motivated to respond to food insecurity outside of his or her winning coalition.

Whether a leader has a large or small winning coalition, the size of a leader's support coalition relative to his or her winning coalition determines how comfortably a leader may be able to maintain power. If the support coalition is larger than the winning coalition, a leader may remain in power comfortably. This is because there are more people that support the leader than he or she needs to maintain a winning coalition and thus they have greater freedom in how they choose to

[318] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400.

allocate resources and which policies they choose to implement.[319] Within this scenario, if a leader enjoys a larger support coalition than he or she needs to maintain a winning coalition, then the leader may be less motivated to respond to food insecurity when it is outside his or her within coalition. The assumption is that the food insecurity does not directly threaten leader's ability to maintain his or her winning coalition. Moreover, whereas ignoring the problem may affect some winning coalition members indirectly (either for altruistic or material reasons), the leader can substitute some members of the support coalition for these displeased members of the winning coalition if needed (e.g. prior to an election).

If, however, a leader has a support coalition that is smaller than his or her winning coalition, this leader is expected to be highly motivated to respond to food insecurity within his or her state even if leaders do not have members of his or her winning coalition that are food insecure. This is based on the assumption that leaders with relatively small support coalitions are in danger of losing their seats. Thus they are motivated to retain members of their small support coalition as well as gain members into their winning coalition they have lost. As a result, they are likely to be highly active in responding to issues within the state, including food insecurity.

In summation, all leaders will be highly motivated to respond to food insecurity within their winning coalition. Due to probability, however, leaders with large winning coalitions will be more likely to have food insecurity within their coalition. Thus leaders with large winning coalitions will appear more motivated to respond to issues of food insecurity within their borders than leaders with small winning coalitions.

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[319] With large winning coalitions, this may result in greater freedom in policy formulation when determining how to allocate public goods. For leaders with small winning coalitions, a large support coalition may mean the leader has greater freedom in choosing new members of his or her winning coalition who may require less private goods.

Further, in cases in which food insecurity does not occur within a leader's winning coalition, a leader is likely to respond to these issues in so much as they affect members of the winning coalition. Thus if individuals within a winning coalition are interested in addressing food insecurity, either for altruistic or material reasons, the leader with be motivated to do so if they feel that no response by serve to threaten their ability to maintain a winning coalition. In other words, leaders will address food insecurity outside of their winning coalition when there support coalition is relatively smaller than there winning coalition.

As noted above, leaders are more likely to respond to food insecurity when they have members of their winning coalition who are directly affected by food insecurity. Further, leaders with large winning coalitions are more likely to respond to food insecurity (all else being equal) simply because they have a higher probability of having someone within their winning coalition who is affected (either directly or indirectly) by food insecurity. Finally, if food insecurity occurs outside of their winning coalition, they are more likely to respond if they have a small support coalition relative to the size of their winning coalition.

Though selectorate theory explains a leader's motivations, Bueno de Mesquita et al. make no assumption about constraints places on a leader. Instead, they assume that a leader can decide and implement state policy without any problems.[320]

One can imagine, however, that there are situations in which a leader is highly motivated to respond to food insecurity (i.e. those within his or her winning coalition is directly affected and/or the leader's support coalition is relatively small), but he or she is unable to do so because of political roadblocks. As mentioned in chapter two, the literature on executive constraints focuses on the

[320] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press, 74.

number of veto players.[321] Thus, when examining whether a leader will be motivated yet constrained by other members of his or her government, it is important to examine the number of veto players within a state. Including veto points can highlight the difference between a leader who is highly motivated to respond to food insecurity and is successful in implementing strategies in respond and another leader who is equally motivated to respond to food insecurity, but is unsuccessfully in implementing a response.

7.2. A Leader's Motivations vs. His or Her Constraints

Selectorate theory is focused on explaining a leader's motivations to act, but it does not seek to explain situations in which a leader is motivated to act but institutionally constrained. Instead, Bueno de Mesquita et al. assumes that a leader can decide and implement state policy without problems.[322] Though identifying constraints on the executive is beyond the scope of the selectorate theory, it is clear that some of the literature on food insecurity assumes the leader is motivated and unconstrained or vice versa. As an example, Beeson's argument that non-democratic leaders in Asia will be more likely to respond to food insecurity crises by implementing sustainable agricultural and fishing regulations clearly rests on the assumption that these leaders will be less constrained to act as they would be more institutionally removed from political pressure than their democratic counterparts. It says nothing, however, about whether they are motivated to do so.

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[321] As noted in the previous chapter, formal veto players include members of the legislative branch, judicial branch, or sub-national governments who can prevent an executive agenda from being implemented. Informal veto players include members of a political process that can indirectly do the same (e.g. interest groups such as business associations, trade unions, etc.). Though the veto player literature in chapter two focuses on both formal and informal veto players, this project assumes that informal veto players serve in shaping specific policy preferences in responding but play a minimal role in determining whether or not an executive will respond to food insecurity.

[322] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press, 74.

By including the motivation and constraints on a leader, this project seeks to capture the full explanations of leader's choices to respond (or not to respond) to issues of food insecurity within their borders. As noted in the literature on veto players, the larger the number of players, the more likely the executive is to be constrained. Thus this project assumes that the higher the number of veto players in a state, the more likely a leader will be constrained in his or her response to food insecurity.

Table 7.1 demonstrates the predictions of whether a leader will respond to food insecurity based on their level of motivation and constraint. The columns represent the argument mentioned above about motivations levels. The rows represent the literature on veto points.

The upper left quadrant includes situations in which a leader is both highly-motivated (due to food insecurity within the winning coalition and a relatively small support coalition) to respond to food insecurity but unable to successfully implement a policy response due to a large number of veto players. In these scenarios one would expect to have a leader express interest in responding to food insecurity within his or her state. Further, one would expect to see debate in the other branches of government over the issue. A strategic response would not be implemented, however, either due to a government divided over this issue or attempts to link this policy response to other, contentious issues.

The upper right quadrant includes scenarios in which a leader is both unmotivated to respond (e.g. there is no food insecurity within his or her winning coalition and/or their support is quite large) and constrained to do so. Leaders in these scenarios are highly unlikely to act.

The lower right quadrant includes scenarios in which a leader may be unconstrained to respond to food insecurity but is also unmotivated to do so. In these scenarios one would expect to

have a leader to express no interest in responding to food insecurity within his or her state. Further, there will likely be no debate within the rest of government on the matter.

The lower left quadrant includes scenarios in which a leader is both highly-motivated (due to food insecurity within the winning coalition and a relatively small support coalition) and unconstrained (a small number of veto points) to respond to issues of food insecurity.

Table 7.1: Leaders' Motivation & Constraints

		Motivation	
		High	**Low**
Constraint	**Large # of Veto Players**	Unlikely to Respond	Highly Unlikely to Respond
	Small # of Veto Players	Highly Likely Respond	Unlikely to Respond

This project asserts that large winning-coalition leaders will be more likely to respond to food insecurity within their borders than small-coalitions leaders based on the higher likelihood that they will have winning coalition members who are affected by food insecurity.

7.3. Hypothesis

This empirical model will test a single hypothesis. This hypothesis builds on four underlying assumptions articulated above. First, leaders are interested in maintaining power by choosing policies that are in the interest of their winning coalition. Second, if a leader has a large winning coalition, he or she is probabilistically more likely to have individuals in it that are either directly or indirectly affected by food insecurity than leaders with a small winning coalition. Third, a leader will be more likely to respond to issues of food insecurity outside of his or her winning coalition if the support

coalition is smaller than his or her winning coalition. Fourth, the higher the number of veto players in a state, the more likely a leader will be constrained in his or her response to food insecurity. From these assumptions, the first hypothesis follows:

Hypothesis 1:

Leaders with large winning coalitions will be more likely to respond to food insecurity than leaders with small winning coalitions experiencing similar levels of food insecurity unless there is a large number of veto players present.

7.4. Dependent Variable

Strategic Response. As this model seeks to distinguish in broadest terms between a leader's choice to respond to food insecurity or to do nothing, the dependent variable for this model will be dichotomous. If a leader is facing food insecurity and chooses any of the strategic responses first mentioned in chapter five, the dependent variable will be coded as a one. Another option for a state, however, is to do nothing in response to food insecurity within its borders. A decision to not respond to food insecurity would either be the result of political calculus by a state leader or leaders that responding to food insecurity is not in their self-interest or the result of an inability for the state to respond. The latter may be the case in states with minimal control over their territory, such as failing or failed states. If the leader chooses no strategies in response to high levels of food insecurity, the dependent variable will be coded as a zero.

As noted in chapter five, there are ten strategic responses a state may choose when responding to food insecurity. To code this variable, this project must first determine whether each strategy is chosen (1) or not chosen (0) by a state in a given year.

Anderson and Nelgen (2013) offer the nominal rate of assistance of domestic production subsidies (i.e. NRA_{DS}). This measures the amount to which domestic producer subsidies raise the gross return to domestic producers.[323] If this measurement is positive, then government policies are raising the gross return to producers of a product above what it would be without the government intervention. If this measurement is negative, then government policies are lowering the gross return to producers of a product below what it would be without the government intervention.[324] For this empirical examination, if the NRA_{DS} is positive or negative but increasing, then this project will code this strategy as a one. If the NRA_{DS} is zero, negative, or positive and decreasing, then this project will code this strategy as a zero.

Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[325] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

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[323] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives*. Washington D.C.: World Bank.
[324] Anderson, K. and M. Brückner. (2011). *Price Distortions Slow Economic Growth in Sub-Saharan Africa*. Washington D.C.: World Bank.
[325] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives*. Washington D.C.: World Bank.

As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[326]

The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[327] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

UNCTAD offers data[328] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[329] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view

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[326] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
[327] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.
[328] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[329] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.

consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for some products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

There is currently no one source for data on food rationing systems. Instead, this project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[330] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

The Heidelberg Institute for International Conflict Research (HIIK)[331] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[332] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

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[330] Population Division. (2009). *World Population Policies*. New York: United Nations.
[331] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[332] Ibid.

7.5. Independent Variable

Size of a Winning Coalition. This project asserts that the size of a leader's winning coalition will best explain whether or not he or she will choose to respond to issues of food insecurity within their state. Specifically, leaders with large winning coalitions are believed to be more likely to respond to food insecurity than leaders with small winning coalitions because they are likely to have more food insecure members in their larger winning coalition.

To measure the size of a winning coalition, Bueno de Mesquita et al. originally[333] created a five-point scale that combined three components of the Polity IV score with a measurement by Arthur Banks that distinguishes military or military-civilian regimes from non-military regimes.[334]

The three components of the Polity IV score are competitiveness of executive recruitment (XRCOMP), openness of executive recruitment (XROPEN), and competitiveness of participation (PARCOMP). Bueno de Mesquita et al. award a state one point for have at least one executive chosen by competitive elections (i.e. an XRCOMP score equal or greater than two), one point for if candidates for the position of executive are chosen through open recruitment (i.e. the XROPEN score is equal to or greater than two), and one point if the state has stable and enduring political groups that regularly compete for political influence with little coercion used (i.e. its PARCOMP score equals five). Finally, if a regime is not a military or military-civilian regime as coded by Banks (1996), Bueno de Mesquita et al. award it a point. Thus the original winning coalition variable was measured on a five point scale, from zero to four, and then normalized so that its smallest value is zero and its largest value is one.

As Bueno de Mesquita et al.'s original dataset only extends to 1999, this project calculates newer measurements for the first three components of *W* using updated Polity IV data. For the

[333] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.
[334] Banks, A. S. (1996). *Political Handbook of the World*. New York: CSA Publications.

fourth component, coding of military regimes, this project will include newer data from Cheibub, Gandhi, and Vreeland's (2009).[335] In cases where these data and Bank's data are both available, previous studies have shown that the correlation between them is 0.94 (n = 5875).[336] This project will also normalize the data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

7.6. Control Variables

Overall Food Insecurity Level. When examining what factors best explains state responses to food insecurity, it is important to take into account the level of food insecurity faced by each state in a given year. For this model, this project will examine whether the size of a winning coalition affects whether a state responds to food insecurity, while controlling for the level of food insecurity within each state. The underlying assumption is that a state leader will necessarily act as food insecurity levels are high, but may not act when food insecurity levels are low. That said, if food insecurity levels are high and a leader acts, it can be assumed that states leaders are motivated to do so because of high levels of food insecurity rather than for other reasons. The measurement for this variable is the original one presented in chapter three. Measurements vary from zero (i.e. no food insecurity issues within a state) to one (i.e. high levels of food insecurity within a state).

Leadership Constraint. A fourth component of the democracy variable in Polity IV that measures executive constraint (i.e. XCONSTR) has not been included in the winning coalition

[335] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.
[336] Cao, X. and H. Ward. (in press). Winning Coalition Size, State Capacity, and Time Horizons: an Application of Modified Selectorate Theory to Environmental Public Goods Provision. *International Studies Quarterly*.

variable because Bueno de Mesquita et al. assume that "constraints on executive power…play no role in [their] theory."[337] These scholars, however, have included this as a control variable for the purpose of isolating the effect of winning coalitions from the other characteristic that distinguish democracies from non-democracies.[338]

This project will include a normalized version of executive constraint from Polity IV as a control variable. This measurement will seek to capture highly-institutionalized constraints (i.e. formal veto points or players) on executive power that may affect policy implementation. This measurement is thus distinguished from the key explanatory variable, which seeks to capture the motivations of democratic versus non-democratic leaders based on the size of the winning coalitions.[339] This project will also normalize this measurement so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, the leader of that state will be considered to face low levels of executive constraint. If a given state-year has a score of 0.5 or higher, the leader of that state will be considered to face high levels of executive constraint.

7.7. Empirical Results

To test the first hypothesis for this project (i.e. does the size of a leader's winning coalition affect the likelihood that the leader will respond to food insecurity), this project ran a logistic regression. Whereas Ordinary Least Squares (OLS) models estimate the unknown parameters in a linear regression model and assume the error variance will be normally-distributed, logistic regressions are used to predict dichotomous outcomes and assume a logistic distribution, or S-curve. This intuitively

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[337] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 395.
[338] Ibid., 393.
[339] Henisz, W. J. (2002). The Institutional Environment for Infrastructure Investment. *Industrial and Corporate Change*, 11(2): 355-389.

makes sense as linear regression models' error variances are likely to group around the mean, whereas logistic regression models' error variances are likely to group around zero and one. This project will run a logistic regression to predict the probability of a leader choosing to respond or not to respond based on the size of his or her winning coalition.

OLS and logistic models must be interpreted differently as well. Whereas in OLS models, R-squared is the coefficient of determination that indicates a goodness of fit (i.e. how well one independent variable explains the variance in the dependent variable or how well it explains the variance in the dependent variable as compared to other independent variables), in logistic regressions a chi-square test is used to determine whether your data follows a particular distribution assumed by the model (e.g. whether large-winning coalition leaders choose to respond).
The null hypothesis for the chi-square test is that the size of a winning coalition has no effect on the likelihood that a leader will respond to food insecurity within his or her state's border. Based on the results of chi-squared test, there is a significant difference in a leader's decision to respond based on the size of his or her winning coalition.

As this project has shown that the size of a winning coalition has some effect on the likelihood of a leader to respond or not, the next step is to examine the nature of this relationship. Specifically, the goal of running this logistic regression is to determine whether a leader with a large winning coalition is more likely to respond to food insecurity within his or her border than a leader of a small winning coalition and if so then by how much.

For this model, one would expect to find empirical evidence that suggests the leader is highly motivated to address food insecurity, that he or she has taken the steps needed from an executive to address these issues, but that other members of the government have blocked policy implementations that would address these issues

The results support this project's assertion that the size of a winning coalition does have an effect on the likelihood of a leader to respond to food insecurity within his or her border. In fact, these results suggest there is a highly-significant, positive relationship between the size of a leader's winning coalition and his or her likelihood of response (Table 7.2). Moreover, the results also illustrate that the level of executive constraint also influences the likelihood of response. Substantively, this suggests that as the size of a leader's winning coalition increases ten percent, there is a twenty-seven percent increase in the likelihood of a leader responding to food insecurity within their borders. Further, as the size of a leader's executive constrain increases ten percent, there is a twenty-three percent increase in likelihood of a leader responding to food insecurity within their borders. This seems intuitive. When this project ran this model again without controlling for executive constraint, the relationship between coalition size and response likelihood was still significant.

Table 7.2 Size of Winning Coalition & Likelihood of Response

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Size of a Leader's Winning Coalition	0.027008	0.006931	3.897	9.98e-05 ***
Overall Food Insecurity Level	0.032159	0.019789	1.625	0.104
Executive Constraint	0.023668	0.004779	4.952	7.77e-07 ***

7.8. Political Implications

The results confirm this projects primary hypothesis: the larger a leader's winning coalition, the more likely he or she is to respond to food insecurity. Interestingly, the greater the executive constraint on the leader, the more likely he or she is to also respond to food insecurity. This is also intuitive as more players who have a voice in the decision-making process, the more likely for the concerns and needs of the food insecure to be addressed.

CHAPTER 8

THE NATURE OF STRATEGIC RESPONSES

This project asserts that there are three different kinds of responses to food insecurity: cooperative, quasi-cooperative, and conflictual. Cooperative strategies focus on mitigating the effects of food insecurity for all those affected within a state. Conflictual strategies focus on alleviating the suffering only for a targeted few, and quasi-conflictual strategies can be used either to assist all or only a few affected individuals within a state. This final category is considered to be quasi-cooperative as this project assumes that leaders will use inclusive language either way.

This chapter further asserts that leaders with large winning coalitions will be more likely to choose strategies when responding to food insecurity that alleviate suffering for all in a state, while small winning-coalition leaders will choose strategies that alleviate suffering only for those within their winning coalition. The first part of this chapter presents the above arguments in greater detail, and the second part of this chapter demonstrates the statistical significance of these assertions.

Bueno de Mesquita et al. predict that leaders with large winning coalitions will be more likely to choose to allocate more public goods, while leaders with small winning coalitions will be more likely to choose to allocate more private goods. Private and public goods differ in their excludability: private goods can be allocated to certain individuals at the exclusion of other individuals, whereas public goods cannot.[340]

[340] A closely relative measurement to excludability is rivalry. Whereas the excludability measurement focuses on who is benefitting from these goods, rivalry focuses on the allocation of scarce resources. Non-rival goods (like public goods) are those whose costs to disperse after producing them is close

Bueno de Mesquita et al. base this theory on the assumption that leaders are engaging in rational, benefit-maximizing political calculations to determine the most efficient means by which to do so. When a leader has a small winning coalition, it would be most efficient for him or her to consider distributing private goods as he or she need only please a small number of people and private goods ensure that this small number of people remain more loyal. In contrast, leaders with a large winning coalition have more people they are required to please to maintain their coalition. Thus it is political efficient for them to allocate resources for public goods to please a larger number of people.

In chapter five, this project examined ten strategies for responding to food insecurity. This project seeks to organize these strategies even further based on their excludability. Broadly this project discerns among strategies that are cooperative in nature, quasi cooperative in nature, and conflictual in nature.

8.1. Cooperative Strategies

Strategies considered to be cooperative are similar to public goods in that all members of a state are expected to benefit from these strategic choices. This is not to suggest that the benefits of each of these cooperative strategies will be uniformly dispersed throughout a state. Some will indeed benefit more than others as it the case with most public goods. For example, though everyone in the United States is granted access to free public education, some public schools are considered to be of higher quality than others. Further, it should also be noted that this project does not assert that these strategies are equally beneficial. Again, as is the case with public goods, some policies considered to be public goods may serve to benefit all more than others. For example, public education from

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to zero. In contrast, consumption of rival goods (i.e. private goods) prevents simultaneous consumption by others.

kindergarten to twelfth grade may serve to benefit all more than a vaccine campaign administered once every decade or so. Thus cooperative strategies are categorized as such as their benefit cannot targeted only to a certain portion of the population (i.e. a leader's winning coalition), but there benefits can be felt by all to an extent.

As Table 8.1 illustrates, there are three cooperative strategies state leaders can choose when responding to food insecurity. Two domestic strategies are to increase domestic food production in your state or to implement sustainable agricultural policies to encourage conservation of resources used in food production, and one international strategy is to increase food imports to your state.

The top row of Table 8.1 includes three cooperative strategies: increase domestic food production, lower trade barriers on food imports, and implement sustainable agricultural practices. Leaders may encourage domestic food production by offering producer supports.[341] These can take many forms. Leaders can pay producers for food inputs (e.g. seeds, equipment, etc.), they can pay producers directly,[342] or they can provide compensation in the case of crop losses.[343] Though these domestic production strategies benefit producers directly, they are considered to be cooperative (i.e. non-excludable) strategies, as consumers also benefit from an increase in the increase in food grown domestically so long as these items remain in the domestic market.

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[341] Though we are assuming states are implementing these policies in response to an increase in food insecurity (i.e. an increase in demand), there may also be times in which states may also offer producer supports when there is no increase in demand. In these cases, state leaders choose to implement these policies in return for the political support from producers.

[342] Organization of Economic Cooperation and Development. (2014). *Introduction to the OECD Producer Support Estimate and Related Indicators of Agricultural Support*. Paris, France. The OECD discerns that there are four categories of direct monetary transfers: single commodity transfers are based on whether a producer harvests a certain crop (e.g. corn), group commodity transfers are based on whether a producer harvests a group of crop (e.g. starches), all commodity transfers are based on the quantity a producer harvests of any crops, and other transfers that do not require any harvested crops at all.

[343] Peterson, E. W. F. (2009). *A Billion Dollars a Day: The Economics and Politics of Agricultural Subsidies*. Hoboken, NJ: John Wiley and Sons, 98.

Lowering trade barriers on certain items serves to increase its importation. Like Bueno de Mesquita et al., this project asserts that opening trade is a non-excludable, cooperative strategy.[344] The underlying logic is that all residents in a state are consumers. As an increase in the amount of food sold in the domestic market results in a decrease in the price for individual food items sold in that market, whether or not they are buying imported food or domestically-grown food, residents within a state benefit from lower prices on food items when imports increase.

Sustainable agricultural policies serve to balance short-term economic returns on food production with long-term conservation of the natural resource inputs that go into food production.[345] The purpose of a leader implementing these policies would be to ensure that resources were conserved in the long-term either as an ends in itself or to ensure that domestic food production could consider indefinitely. Such policies are considered cooperative as conservation of resources for either purpose seeks to improve well-being of all individuals within a state.

Table 8.1: The Nature of Strategic Responses to Food Insecurity

Cooperative	Increase Food Production Sustainable Agriculture Food Imports
Quasi-Cooperative	Consumer Food Subsidies Food Aid OFDI in Food Production
Conflictual	Population Control Food Rationing Trade Protectionism Resource Conflicts No Response

[344] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.
[345] Smit, B. and J. Smithers. (1993). Sustainable Agriculture: Interpretations, Analyses and Prospects. *Canadian Journal of Regional Science*, 16(3): 499-524; Allouche, Jeremy. (2011). The Sustainability and Resilience of Global Water and Food Systems: Political Analysis of the Interplay between Security, Resource Scarcity, Political Systems, and Global Trade. *Food Policy*, 36(1): S3-S8.

8.2. Conflictual Strategies

The bottom row of Table 8.1 contain strategies considered to be conflictual, or excludable, in nature: maintaining or increasing trade protectionist policieson food, instituting a food rationing system, implementing population control policies, engaging in resource conflicts, or choosing not to respond to issues of food insecurity at all.

Food trade protectionism is a strategy intended to protect domestic food producers from the international market. Trade protectionist policies serve this purpose by increasing by decreasing the amount of food being imported from other states. This increases the price of food grown domestically for consumers. If the intention of these policies is to alleviate food insecurity, one might assume that this strategy is intended to move a state toward greater food sovereignty. To be non-excludable, however, this policy would necessarily be implemented in conjunction with other policies. Specifically, one might expect to see this strategy in conjunction with production subsidies to encourage domestic food production. Further, one might expect to see this strategy implemented with consumer subsidies that offset the increasing cost of domestic food, either for the near-term while producers gain their competitive footing in the global market or for the long-term as a state determines that it willing to incur the costs of ensuring its own food sovereignty. If, however, these policies are used without other strategies then they are meant to provide domestic food producers excludable goods while requiring domestic consumers to bear the cost.

The state strategy to ration food could have the intended effect of ensuring all individuals are able to have some food. Thus one could imagine this strategy to be used as a non-excludable good to prevent some citizens from having more than others. The logic of Bueno de Mesquita et al. would

suggest, however, that such a strategy would lead to minimal benefits for each person.[346] Instead, this project suggest that this strategy would most often be used in situations in which scarce resources are conserved so as to redistributed to a leader's smaller winning coalition.

Population control policies are those which address scarcity of resources by implementing a domestic strategy to limit the number of residents with a state. One example of this type of policy would be the implementation or enforcement of policies to limit immigration. Another, more extreme example, of a population control policy is China's one child policy. These policies serve to decrease pressure on a state's scarce resources by reducing the number of individuals within that state.

The empirical record supports that decreases in water and arable land can lead to declining crop productivity, which in turn will increase the risk of hunger.[347] This does not mean, however, that all states experiencing hunger will engage in conflict to secure depleted resource supplies. Instead research has shown that resource depletion may serve as a catalyst for conflict. When such conflict occurs over issues of food insecurity, states seek to secure arable land, freshwater, or in some cases access to fishing zones in the territorial waters of another state.

Bueno de Mesquita et al. argue that conflicts in general are excludable in nature as the costs are quite and the benefits are secured only if victory is achieved. Their selectorate theory of war predicts that leaders with small winning coalitions are more likely to engage in conflicts as they are able to

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[346] This reasoning mirrors their argument that tax rates are usually lower in states with large winning coalitions as there is little benefit for the leader for giving a minimal level of rewards to a lot of people.

[347] E.g. Klomp, J. & E. Bulte, E. (2013). Climate Change, Weather Shocks, and Violent Conflict: A Critical Look at the Evidence. *Agricultural Economics*, 44(1), 63-78; Intergovernmental Panel on Climate Change, Working Group I. (2013). *Climate Change 2013: The Physical Science Basis*. Geneva, Switzerland: United Nations; Raleigh, C. and H. Urdal. (2013). Climate Change Demography Environmental Degradation and Armed Conflict. *Environmental Change and Security Program Report*, 13(1): 27-33.

shift the costs onto individuals outside of their winning coalition. Further, if the leader is victorious, the benefits of the conflict can be distributed to members of his or her winning coalition as private goods. Leaders with larger winning coalitions, in contrast, are less able to shift the costs of conflicts outside of their winning coalitions as there are fewer individuals within this group. Further, the benefits of a conflict must be distributed throughout a much larger group, so that each individual gets only a marginal level of benefits. As a result, conflicts are considered to be strategies used by leaders when they are interested in distributing private goods.

The final option for responding to food insecurity is to choose not to respond at all. In such cases, this project predicts that a leader's political calculations suggests that there is no threat (either directly or indirectly) to his or her maintenance of his or her coalition were he or she to choose inaction in the face of food insecurity. Whereas above was mention of the situations in which a leader chose not to respond, this project also assumes that inaction could be based on the lack of capacity of a given leader to respond. This would be expected in failed states.

8.3. Quasi-Cooperative Strategies

Whereas cooperative strategies are non-excludable and conflictual strategies are excludable, there is a category that falls somewhere in between: strategies that can either be implemented in an excludable or non-excludable manner. These strategies are considered to be quasi-cooperative in that they suggest non-excludability, but in practice leaders can exclude large portions of the population from their benefits.

Quasi-cooperative strategies (middle row of Table 8.1) include receiving food aid, outward foreign direct investment in food production, and implementing consumer food subsidies.

Bueno de Mesquita & Smith's research on aid suggests that aid may be reallocated by a leader either as public or private goods.[348] Their argument suggests that food aid may not ever reach its intended recipients in a state if these individuals are not in the winning coalition.

Leaders choose outward foreign direct investment in food production for two reasons. First, they are interested in either increasing the domestic food supply but have insufficient amounts of resource inputs (more likely arable land or water) to increase domestic production levels.[349] Second, they may also be interested in ensuring the prices for food items remain low by controlling the productions costs by buying land and hiring labor in states in which both are cheaper.[350]

Most of the state-to-state foreign direct investments in food production grow staples to be exported to the home country. Though the trend is for these food items to be then sold on the domestic market, by importing these goods the state has the ability to regulate them. Thus it could be plausible that these items were not being made readily available to the larger population but instead were being distributed only to certain individuals within the population as is done with food aid.

The purpose of consumer food subsidies is to decrease the costs of food items for the domestic consumer. These policies can either be implemented on a commodity specific basis (e.g. sugar subsidies) or non-commodity specific basis (e.g. U.S. Food Stamp program).[351] Commodity-specific monetary transfers usually are implemented to offset the price increase for certain commodities due

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[348] Plumper T. and E. Neumayer. (2009). Famine Mortality, Rational Political Inactivity, and International Food Aid. *World Development*, 37(1): 50-61.
[349] Outsourcing's Third Wave. (2009). The Economist. Retrieved from http://www.economist.com/node/13692889, 4.
[350] Ibid.
[351] Vojtech, Vaclav. (2014). *South Africa: Estimates of Support to Agriculture*. Paris, France: Organization of Economic Cooperation and Development, 21-22.

to trade protectionist policies (e.g. tariffs).[352] Non-commodity specific monetary transfers are usually meant to offset the price for certain sectors of a population.

When a leader is interested in decreasing the cost of food for all domestic consumers, he or she will choose to implement consumer subsidies on a given commodity or group of commodities. If, however, a leader is interested in decreasing the cost of food for certain consumers, he or she will choose to implement consumer subsidies that target payments to this group. Thus consumer subsidies can be used in either an excludable or non-excludable nature.

8.4. Predicting the Nature of Strategic Responses to Food Insecurity

Heretofore, the literature on selectorate theory has not explored the choice of strategy a state leader may choose when responding to food insecurity. This project extends the basic assumptions of the selectorate theory to predict how the size of a leader's coalition affects the general nature of his or her strategic response to food insecurity within his or her state borders.

If one assumes that a leader interested in maintaining his or her winning coalition, then one may also assume that this leader would be likely to address issues of food insecurity were they to affect members of that coalition. Further, if one assumes that a leader with a large winning coalition is more likely to choose non-excludable policies, then one may posit that leaders with large winning coalitions are more likely to choose cooperative (i.e. non-excludable) strategies when addressing food insecurity.

In contrast, if one assumes that a leader with a small winning coalition is more likely to choose excludable policies, then one may posit that leaders with small winning coalitions will be more likely

[352] Organization of Economic Cooperation and Development. (2013). *Agricultural Policy Monitoring and Evaluation*. Paris, France: 67.

to choose conflictual strategies (excludable) strategies that deliver relief only to those affected within their winning coalition.

When it comes to quasi-cooperative strategies, this project asserts that leaders with large winning coalitions will implement these strategies in a non-excludable manner, while leaders with small winning coalitions will implement these same strategies in an excludable manner that benefits only those affected within their winning coalition.

This project asserts that food aid can be distributed in a non-excludable or excludable manner. As Bueno de Mesquita & Smith's suggest, aid may be reallocated by a leader to all those in need of it or to those in which the leader wishes to target.[353] Upon receiving food aid, this project predicts that leaders with large winning coalitions will choose to distribute food aid in a non-excludable manner. Thus, these leaders will likely receive large amounts of food aid. In contrast, this project predicts that leaders with small winning coalitions will receive less food aid overall and they will distribute this aid directly to members of their winning coalition who may or may not be food insecure.

When choosing foreign direct investments in food production, leaders with large winning coalitions will be more likely to choose to grow large amounts of staples, and most of these crops will be transported back to the domestic market rather than sold on the international market. In contrast, leaders with small winning coalitions will be more likely to choose to grow smaller amounts of staples than large-coalition leaders, and some of these crops may be sold on the international market.

Consumer subsidies are also considered to be quasi-cooperative strategies in that they can be used either to benefit the entire population or only certain sectors of the population within a state. Leaders with large winning coalitions will be more likely to use this strategy to decrease the price of

[353] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.

certain food items for all consumers. These leaders will do so by implementing commodity-specific monetary transfers.[354] In contrast, leaders with small winning coalitions will lower the overall price of food for certain sectors of the population by implementing non-commodity specific monetary transfers.

Trade protection serves a unique role in that it is a conflictual strategy, but it may also be employed by a leader of a large winning coalition only in combination with consumer subsidies. Logically, large coalition leaders are not likely to choose trade protectionism as it is conflictual in nature. Specifically, though it may benefit strong agricultural interests to implement, it hurts domestic consumers as it increases the costs of imported goods. If a large coalition leader does choose trade protectionism to increase domestic production, he or she will also likely implement an additional strategy to absorb the cost burden for the consumers rather than have them pay higher prices for imports.

There are two reasons a large-coalition leader may be motivated to implement trade protectionist policies. First, there is the motivation by states to reach food self-sufficiency, or to provide the domestic population with its food supply predominately through domestic agricultural production. Second, if there are strong agricultural interests in a leader's winning coalition, then ignoring them would be political suicide. In either case, a large-coalition leader of a high-income state will likely absorb the increase in costs associated with higher imports on the domestic market. If a large-coalition leader of a small-income state implements trade protectionism policies and cannot absorb the increase in costs associated with higher imports on the domestic market, one should expect to see his or her support coalition shrink in size.

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[354] Organization of Economic Cooperation and Development. (2013). *Agricultural Policy Monitoring and Evaluation*. Paris, France: 67.

This section has made predictions about the general nature of leader's strategic responses to food insecurity. Specifically, leaders with large winning coalitions will be interested in implementing either cooperative strategies (e.g. increase domestic production, increase sustainable agricultural policies to protect resource inputs, or increase imports) to address food insecurity or quasi-cooperative strategies (e.g. implement consumer subsidies, receive food aid, or foreign direct investment in food production) in a manner that is non-excludable. In contrast, leaders with small winning coalitions will be interested in implementing either conflictual strategies (e.g. implement population control policies, implement food rationing systems, increase trade protectionism, engage in resource conflicts, or do nothing) to address food insecurity or the same quasi-cooperative strategies in a manner that is excludable.

This chapter asserts that leaders with large winning coalitions are more likely to choose either cooperative strategies when responding to food insecurity or quasi-cooperative strategies that they will implement in a non-excludable manner.

8.5. Hypotheses

As noted above, if one assumes that a leader with a large winning coalition is more likely to distribute public goods, then then one may surmise that leaders with large winning coalitions are also more likely to choose cooperative (i.e. non-excludable) strategies when addressing food insecurity. In contrast, if one assumes that a leader with a small winning coalition is more likely to distribute private goods, then one may also surmise that leaders with small winning coalitions will be more likely to choose conflictual strategies (excludable) strategies that mitigate food insecurity only for those members of their winning coalition who are affected. Thus the second hypothesis follows:

Hypothesis 2: If a leader with a large winning coalition and one with a small winning coalition are both experiencing similar levels of food insecurity, the leader with the large winning coalition will choose cooperative strategies when responding to food insecurity while the leader with the small winning coalition will be more likely to respond to food insecurity using conflictual strategies.

It is not enough to include a dependent variable for quasi-cooperative strategies similar those above as this would not capture whether a leader chooses to implement these strategies for the purpose of distributing private or public goods. To examine leaders' purposes for implementing these strategies, this project designed several, closely-related empirical tests.

When it comes to quasi-cooperative strategies, this project asserts that leaders with large winning coalitions will implement these strategies in a non-excludable manner, while leaders with small winning coalitions will implement these same strategies in an excludable manner (i.e. that benefits only those affected within their winning coalition). The three quasi-cooperative strategies are food aid, outward foreign direct investment in food production, and consumer food subsidies.

If a leader is interested in distributing food aid in a non-excludable manner, then he or she will be likely to receive large amounts of food. In contrast, this project predicts that leaders with small winning coalitions will receive lower levels of food aid. Thus hypothesis three follows:

Hypothesis 3: When experiencing similar levels of food insecurity, leaders with large winning coalitions will receive greater amounts of food aid than leaders with small winning coalitions.

When choosing foreign direct investments in food production, leaders interested in implementing this policy in a non-excludable manner will be more likely to implement more food production projects abroad. In contrast, leaders with small winning coalitions will be less likely to do so.

Hypothesis 4: When experiencing similar levels of food insecurity, leaders with large winning coalitions will engage in more foreign direct investments projects in food production than leaders with small winning coalitions.

Consumer subsidies are also considered to be quasi-cooperative strategies in that they can be used either to benefit the entire population or only certain sectors of the population within a state. Leaders with large winning coalitions will be more likely to use this strategy to decrease the price of certain food items for all domestic consumers than leaders of small winning coalitions. Thus hypothesis five follows:

Hypothesis 5: When experiencing similar levels of food insecurity, leaders with large winning coalitions will implement more consumer subsidies than leaders with small winning coalitions.

8.6. Dependent Variables

The dependent variable for this model is the nature of a strategic response. As noted in chapter six, the winning coalition literature suggests that leaders with large winning coalitions will be more likely to choose to distribute public versus private goods. Whereas public goods are considered to be non-excludable, or enjoyed by all, private goods can be enjoyed only by certain members of a population. This project applies this logic to strategic responses to food insecurity. It argues that cooperative strategies are those by which leaders choose to distribute public goods, while conflictual strategies are those by which leaders choose to distribute private goods. Thus this model examines whether the response is more conflictual or cooperative (quasi-cooperative strategies will be examined below).

Cooperative Response. Cooperative strategies are those by which a leader chooses to distribute public goods. These include domestic production subsidies, policies that lower trade barriers on food imports, and sustainable agricultural policies that seek to conserve natural resources. Each of these strategies is first coded dichotomously (see chapter seven). Then, for each cooperative strategy chosen by a given state leader in a given year, one point will be awarded. If no cooperative strategies are chosen, the state will earn a zero for its cooperative response efforts. Next, this project creates a scale of cooperative strategic response, ranging from zero to three.

Conflictual Response. The second variable for this empirical model is conflictual response. Conflictual strategies are those in which leaders choose to distribute private goods. Conflictual strategies include trade protectionism, choices to engage in resource conflicts with other states, food rationing systems, population control policies, and choosing to do nothing.[355] Each of these strategies is coded dichotomously (see chapter seven). Then, for each conflictual strategy chosen by a given state leader in a given year, one point will be awarded. If no conflictual strategies are chosen, the state will earn a zero for its conflictual response efforts. Next, this project creates a scale of conflictual strategic response, ranging from zero to five.

Based on the theoretical arguments posited in chapter four, this project expects that leaders with large winning coalitions will be more likely to choose cooperative strategies in response to food insecurity than leaders with small winning coalitions.

Quasi-cooperative strategies, or those strategies which can be used to distribute either public or private goods, include request and receipt of food aid, foreign direct investments in food production, and consumer food subsidies. To measure the nature of strategic responses to food insecurity by leaders, this project will have two scaled dependent variables: cooperative response and conflictual response. Quasi-cooperative strategies will be examined separately below.

Nature of Food Aid Strategy. This model examines whether the size of a winning coalition best explains the amount of food per capita that a leader chooses receives as food aid. The original data for this variable is gathered form the World Food Program (WFP), and then this project has converted these data to kilograms per capita.

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[355] If no cooperative, quasi-cooperative, or actively conflictual strategies are chosen by a state leader, then it is assumed the leader has chosen not to respond to food insecurity. This project argues that ignoring the needs of the food insecure in your state is inherently conflictual. Thus no action will be awarded one point as well.

Food Aid Type. If a leader is interested in distributing food aid in a non-excludable manner, then he or she will be likely to receive large amounts of food aid and willingly accept the types of aid that are considered to be less fungible (e.g. food aid in the form of food items rather than monetary transfers). In contrast, this project predicts that leaders with small winning coalitions will receive lower levels of food aid and/or will accept more fungible types of food aid.

Nature of Outward Foreign Direct Investment Strategy. When choosing foreign direct investments in food production, leaders interested in implementing this policy in a non-excludable manner will be more likely to implement larger food production projects abroad and large amounts of food should be returned to the host state. In contrast, leaders with small winning coalitions will be more likely to choose to grow smaller amounts of staples than large-coalition leaders, and most of these crops may be sold on the international market. Similarly, if a state leader chooses to implement foreign direct investment, this model examines the extent to which he or she increased that investment as compared to all other leaders who chose this strategy.

UNCTAD offers data[356] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[357] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. This project will calculate the estimated amount of money being spent by a state on OFDI in agriculture by calculating five percent of the UNCTAD measurement for the overall OFDI projections per state per year.

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[356] United Nations Conference on Trade and Development. (2009). World Investment Report. *United Nations*.
[357] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.

Consumer Food Subsidies. Leaders with large winning coalitions will be more likely to use this strategy to decrease the price of certain food items for all domestic consumers. These leaders will do so by implementing commodity-specific monetary transfers.[358] In contrast, leaders with small winning coalitions will lower the overall price of food for certain sectors of the population by implementing non-commodity specific monetary transfers. If a state leader chose to increase consumer food subsidies, this model examines the extent these subsidies increased as compared to other leaders who chose this strategy.

8.7. Independent Variables

Size of a Leader's Winning Coalition. For this empirical test, the key explanatory variable for explaining variation in the nature of strategic response is the size of a leader's winning coalition. As in the model presented in chapter seven, this model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[359] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

8.8. Control Variable

Overall Food Insecurity Level. This model will examine whether the size of a winning coalition affects whether the nature of a state leader's response to food insecurity, while controlling for the

[358] Organization of Economic Cooperation and Development. (2013). Agricultural Policy Monitoring and Evaluation, 67.
[359] Cheibub, José Antonio, Jennifer Gandhi, and James Raymond Vreeland. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.

level of food insecurity within each state. To measure food insecurity, this project will include the original measurement for food insecurity developed in chapter three.

8.9. Empirical Results

To test the next four hypotheses concerning the nature of strategic responses by leaders, this project will run logistic regressions to predict the probability of a leader choosing to respond in a cooperative or conflictual manner based on the size of his or her winning coalition.

Hypothesis two assert that a leader with a large winning coalition is more likely to respond to food insecurity within his or her state with cooperative strategies, while a leader with a small winning coalition is likely more likely to respond to food insecurity within his or her state with conflictual strategies. Thus this project expects to find a positive correlation between the size of a winning coalition and a leader's choice to increase domestic production subsidies, to lower trade barriers, to implement sustainable agricultural policies while controlling for the level of food insecurity in a state. In contrast, it expects to find a negative correlation between the size of a winning coalition and a leader's choice to increase trade barriers, implement rationing systems, engage in resource conflicts, and implement fertility and immigration restriction policies while controlling for the level of food insecurity in a state.

Though this project could include each of these strategies into the same model, this choice would include an additional assumption that the leader is able to choose among these policies. In reality, however, leaders may have narrower, more restricted strategic options. As a result, this project chooses to examine the relationship between the size of a winning coalition and the likelihood of choosing each of these strategies. The additional three strategies that are considered to quasi-cooperative in nature will be addressed subsequently.

As Table 8.2 illustrates, there is a highly significant, positively empirical relationship between the size of a winning coalition and the likelihood a leader will choose the cooperative strategies of increasing domestic production subsidies or implementing sustainable agricultural policies when controlling for food insecurity. This is in keeping with expectations of this project.

Though the results suggest that there may be a positive relationship between the size of a leader's winning coalition and trade openness, this relationship failed to reach significance. This project attempted to examine these results in greater detail through several subsequent tests. First, it removed the food insecurity control variable from the equation. The results highlighted a significant relationship with size of a winning coalition and likelihood to lower trade barriers. These results are in keeping with those of Bueno de Mesquita et al.[360] Thus it appears that either the level of food insecurity may affect the likelihood that a state may lower its trade barriers or that the level of trade barriers may have an effect on the level of food insecurity within a state.

The second, related examination seeks to understand whether strong agricultural interests are preventing the lowering of trade barriers (and possibly causing an increase in food insecurity)? This project ran a third model to examine the relationship between coalition size and trade openness that included the presence of agricultural interests as a control variable. The results indicate that strong agricultural interests may be indeed preventing large coalition leaders from lowering their trade barriers (p-value 0.0946).

As Table 8.2 illustrates, the larger the size of a leader's winning coalition the less likely a leader is to choose a conflictual strategy, though only certain strategies reached statistical significance (i.e. establishing and maintaining rationing systems, implementing fertility restriction policies, and choosing not to respond to food insecurity).

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[360] Bueno De Mesquita et al. (2003). *The Logic of Political Survival*. Cambridge: MIT Press.

8.10. Political Implications

This project asserts that leaders with large winning coalitions will implement the three quasi-cooperative strategies – receive food aid, engage in outward foreign direct investment in food production, and offer consumer subsidies – in a manner that is non-excludable, while leaders with small winning coalitions will implement these strategies in an excludable manner.

The results suggests that large winning coalition leaders are likely to choose to engage in outward foreign direct investment and to implement consumer subsidies than small winning coalition leaders. These relationships are highly significant. In direct contrast, however, to this project's expectations leaders with large winning coalitions are less likely to accept food aid than leaders with small winning coalitions.

Table 8.2 Size of Winning Coalition & The Nature of Responses

	Variables	Estimate	Std. Error	z value	Pr(>|z|)
Cooperative Strategies	Domestic Production Subsidies	0.081030	0.014783	5.481	4.95e-08 ***
	Trade Openness	0.002202	0.014201	0.155	0.877
	Sustainable Agriculture	0.086100	0.010061	8.558	<2e-16 ***
	Rationing Systems	-0.198821	0.028465	-6.985	3.46e-12 ***
Conflictual Strategies	Resource Conflicts	-0.00385	0.01795	-0.214	0.83
	Trade Protectionism	-0.005655	0.012994	-0.435	0.663
	Immigration Restriction	-0.04375	0.34939	-0.125	0.9
	Fertility Control Policies	-4.3314	0.2250	-19.25	<2e-16 ***
	Do Nothing	-10.3796	2.8631	-3.625	0.000294 ***
Quasi-Cooperative	Food Aid	-8.565e-05	1.756e-04	-0.488	0.626
	OFDI Food	0.07711	0.01257	6.132	9.86e-10 ***
	Consumer Subsidies	0.164151	0.016727	9.813	<2e-16 ***

CHAPTER 9

GROWING CONCERNS:

THE ROLE OF AGRICULTURAL INTERESTS

IN STRATEGIC RESPONSES

The main argument presented in chapter nine is that leaders facing pressure from agricultural interests will choose different strategies when responding to food insecurity than those without agricultural interest-group pressures. Further, this chapter asserts that the type of agricultural interest will shape specific strategic responses to food insecurity. The first part of this chapter presents these arguments, and the second part of this chapter demonstrates the empirical significance of these assertions.

When determining which specific strategies a leader will choose in response to any of the issues of food insecurity, it is important to consider whether or not a strong agricultural interest group is present within that state. As noted in chapter six, leaders in a state may be highly motivated to respond to food insecurity within their winning coalition but constrained to do so because of the presence of either formal or informal veto players. Formal veto players include other members of the government, and informal veto players include interest groups who may attempt to constrain a leader. Domestic agricultural producers can serve as a well-organized interest group that acts as an informal veto players to constrain executive action.

Browne (1995) argues that the United States has a large number of formal veto players and informal veto players.[361] Though his argument is to suggest that the presence of a large number of formal veto players actually leads to a rise in the number of informal veto players (due to a logical reasoning that resembles an extended selectorate theory),[362] this project will examine formal and informal veto players separately. This project asserts that the larger the number of formal veto players, the more likely to executive is to be constrained.

The presence of strong agricultural interests groups as informal veto players will place pressure on the executive to consider certain strategies over others. Strong agricultural interests can either consist of a large number of relatively small-sized producers or a group of relatively large, commercial producers. In either case, if a leader's winning coalition includes strong agricultural interests, he or she will be more likely to implement policies that encourage domestic production.

9.1. Agricultural Interests' Preferred Strategic Responses

There are three strategies a leader is likely to employ when he or she is interested in maintaining the support of strong agricultural interests groups: domestic subsidies for producers, foreign direct investment, trade protectionist policies, and resource conflicts. When determining which of these strategies a leader will choose to maintain the support of agricultural interests.

If the strong agricultural interests in a leader's winning coalition consist of large commercial producers, the leader will be likely to choose foreign direct investment strategies for several reasons.

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[361] Browne, W. P. (1995). Demosclerosis: Implications for Agricultural Policy. *American Journal of Agricultural Economics*, 77(5): 1128-1134.

[362] Browne argues that formal veto players are interested in remaining in power and thus are open to the influences of strong informal players. In his research, Browne demonstrates that the agricultural policies of the United States throughout the twentieth century were shaped by strong agricultural interests who acted as informal veto players who influenced formal veto players through lobbying efforts. Once policies were implemented that benefited these informal veto players, they then used their influence to ensure these policies became entrenched.

First, though the state makes significant financial contributions to public-private foreign direct investment projects, these projects also require substantial capital commitments on private partners as well. In the case of small-sized farms, the capital needed would be greater than the profit margins they are able to meet to see a return on their initial investments. Second, the economy of scale that is needed to make foreign direct investment projects viable would be more conducive to producers who have historically managed large commercial farms. Third, large commercial producers able to finance such projects would find foreign direct investment opportunities highly attractive as they would be able to secure access to resource inputs and lower labor costs.

If the strong agricultural interests in a leader's winning coalition consist instead of a number of small-sized producers, he or she will be likely to support domestic production subsidies and/or trade protectionist policies over foreign direct investment.

9.2. Hypotheses

When determining which of these strategies a leader will choose to maintain the support of agricultural interests, this project hypothesizes that:

> *Hypothesis 6:* Leaders with strong agricultural interests within their winning coalitions will choose the following strategies when responding to food insecurity: to maintain or increase domestic production subsidies, to engage in foreign direct investments in food production, to maintain or increase trade protectionism, and to participate in resources conflicts.

If the strong agricultural interests in a leader's winning coalition consist of large commercial producers, this project assumes that leaders will likely choose foreign direct investment or domestic production subsidies. Both of these strategies require significant financial contributions from the state. Further, OFDI requires an economy of scale that can be best provided by large commercial producers and domestic production subsidies are often the result of strong lobbying from wealthy interests groups. In contrast, if the strong agricultural interests in a leader's winning coalition consist of small-sized producers, the project assumes that a leader will choose trade protectionism to address food insecurity. Thus hypotheses seven follows:

> *Hypothesis 7:* When experiencing similar levels of food insecurity, leaders with strong agricultural interests that consists of large-commercial farms will choose to engage in foreign direct investment, while leaders with strong agricultural interests that consists of small farms will choose to maintain or increase domestic production subsidies and to maintain or increase trade protectionist policies.

9.3. Dependent Variables

This project will include each of the ten strategies. Each of these strategies will be coded dichotomously.

Domestic Production Subsidies. Anderson and Nelgen (2013) offer the nominal rate of assistance for domestic support (i.e. NRA_{DS}), which measures the amount to which domestic producer

subsidies raise the gross return to domestic producers.[363] If this measurement is positive, then government policies are raising the gross return to producers of a product above what it would be without the government intervention. If this measurement is negative, then government policies are lowering the gross return to producers of a product below what it would be without the government intervention.[364] For this empirical examination, if the NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[365] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly

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[363] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives*. Washington D.C.: World Bank.
[364] Anderson, K. and M. Brückner. (2011). *Price Distortions Slow Economic Growth in Sub-Saharan Africa*. Washington D.C.: World Bank.
[365] Ibid.

for sustainable use).[366] This project chose to code a given state-year as having implemented sustainable agricultural policies if it conserved more than the median percentage of its land (11.25%), and a zero if it conserved less than 11.25 percent of its land.

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[367] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[368] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[369] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices

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[366] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
[367] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.

[368] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[369] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.

higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[370] For

[370] Population Division. (2009). *World Population Policies*. New York: United Nations.

both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[371] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[372] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

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[371] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[372] Ibid.

9.4. Independent Variables

As this project seeks to examine the role that agricultural interests play in determining a state's response to food insecurity, this project includes two explanatory variables; the first measures the strength of the agricultural interests in a state and the second measures the type of agricultural interests (e.g. large- or small-sized producers).

Strength of Agricultural Interests. The World Bank Development Indicators offer a measurement for the size of an agricultural sector within a state based on the share of agriculture in the state's overall GDP.

Type of Agricultural Interests. To attempt to discern between agricultural interests that are based on small-sized producers and those that are based on large commercial producers, this project will include World Bank Development Indicators that measures the number of tractors per 100 square km of arable land.[373] The assumption underlying this choice of measurements is that large commercial farms would tend to use heavy-machinery, while small producers would rely less on heavy equipment.

9.5. Control Variable

Overall Food Insecurity Level. This model will examine whether agricultural interests' strength or type affects the response of a leader to food insecurity, while controlling for the level of food insecurity within each state. This variable will use the overall measurement for food insecurity for each state-year calculated in chapter three.

[373] World Bank. (2014). *Agricultural Machinery Data*. Washington, D.C.

9.6. Empirical Results

Overall, results confirm the expectations posited in this chapter (Table 9.1). As predicted, leaders with strong agricultural interests to consider tend to raise trade barriers, to engage in outward foreign direct investment in food production, and to discourage food aid.

Two results did not confirm the expectations presented in this chapter. First, the results for the relationship between agricultural interests and domestic production subsidies appeared to be counterintuitive as the stronger the agricultural interests the less likely a leader was to implement or increase domestic production subsidies.

Table 9.1 Agricultural Interests & Strategic Responses

Hyp.	Variables	Estimate	Std. Error	z value	Pr(>|z|)
Ag	Domestic Production Subsidies	-18.7829	4.6307	-4.056	5.25e-05 ***
No Ag	Trade Openness	-1.0702	0.6311	-1.696	0.0902 .
Ag	Resource Conflicts	-0.2321	0.1543	-1.504	0.133
Ag	Trade Protectionism	1.0702	0.6311	1.696	0.0902 .
No Ag	Food Aid	-78.324	9.008	-8.695	<2e-16 ***
Ag	OFDI Food	1.189e-03	6.194e-04	1.92	0.055 .

Further examination suggests, however, that including income level may better explain these results. Assuming that high-income states may choose to increase domestic production subsidies to please strong agricultural interests, while low-income states are more likely to increase trade protectionism, this project reran the empirical analysis, controlling for income level and including trade protectionism as an alternative strategy to increasing domestic production subsidies. The results are highly significant and in the directions predicted. Domestic production

subsidies were positively correlated with high-income states with strong agricultural interests (i.e. p-value 1.61e-11), and trade protectionism was negatively correlated with high-income states with strong agricultural interests (i.e. p-value 0.00334).

A second relationship that did not conform to the expectations presented in this chapter is that between strong agricultural interests and engagement in resource conflicts. This project predicts that these inconclusive results are based on the lack of good data to measure specific types of resource conflicts (e.g. oil vs. water). As both the HIIK's dataset and ICOW become more fully developed, this project presumes these results would be positively correlated and statistically significant.

This project also hypothesized about the strategies a leader would choose based on the type of agricultural interests within a state: leaders with large-commercial agricultural interests would be more likely to choose to engage on OFDI, while leaders with small famers as the basis for his or her agricultural interests would be more likely to engage in trade protectionism or trade protectionism. As Table 9.2 illustrates, the statistical results supports these expectations. Domestic production subsidies and OFDI are positively correlated with large commercial agricultural interests, and these relationships are highly significant. Though trade protectionism failed to reach statistical significance, the relationship between it and large commercial agricultural interests is negatively correlated as predicted.

Table 9.2 Type of Agricultural Interests & Strategic Responses

Hyp.	Variables	Estimate	Std. Error	z value	Pr(>|z|)
Small	Domestic Production Subsidies	309.09	68.59	4.506	7.43e-06***
Small	Trade Protectionism	-23.79	68.29	-0.348	0.728
Large	OFDI Food	213.27	47.90	4.452	9.07e-06 ***

9.7. Political Implications

As noted in chapter six, leaders may be constrained in the strategies they choose if they have strong agricultural interests within their winning coalition. Moreover, the type of agricultural interests (i.e. large commercial versus small family farms) will also determine which of the pro-agricultural strategies these interests will encourage.

CHAPTER 10

GOLDEN GRAIN: DO RICHER STATES DO MORE?

This chapter examines whether a leader chooses certain strategic responses to food insecurity based on the income-level of his or her state. This project asserts that leaders of high-income states will likely choose multiple strategies to address food insecurity than leaders of low-income state. This chapter demonstrates the empirical significance of this assertion and explores whether the income level of a state and certain strategic responses are correlated.

10.1. Income Level & Strategic Responses to Food Insecurity

A state's income level offers some insight into the capacity of a state to implement certain policies over others as some policies will be more costly to implement. This project makes several assertions about the strategic choices of states based on their income level.

First, states with high-income levels will be more likely to choose multiple strategies than states with low-income levels. This assumption is based on two premises: a high-income state is capable of implementing multiple strategies and because food insecurity is affecting the leader's winning coalition, he or she would be motivated to find an effective response by implementing multiple strategies.

Further, this project assumes that states with high-income levels have a greater ability to absorb the costs for certain policies than low-income states, whereas states with low-income levels must either choose to not respond to food insecurity or find a means by which they can shift the burden of these costs either to populations external to the state or to populations within their state.

Thus, this project asserts that states with high-income levels will be more likely to choose costlier strategies than states with low-income levels. As it is nearly impossible to accurately estimate the costs of implementing policies for a state as policies vary in their initial required capital commitments as well as those required over their duration, this project will use this research model for the purpose of exploring whether the income level of a state is correlated with a state's choice of certain strategic choices over others.

10.2. Hypotheses

If one assumes that a high-income state is capable of implementing multiple strategies, and because food insecurity is affecting the leader's winning coalition, it would follow then a state with high-income levels will be more likely to choose multiple strategies than states with low-income levels. Thus the eighth hypothesis is:

> *Hypothesis 8:* Leaders of high-income states will be more likely to choose multiple strategies when responding to food insecurity than leaders of low-income states.

This project does not make any specific predictions about which strategies a state will choose based on its income level. Instead, this project assumes that high-income level states will have a greater capacity to absorb the costs of certain policies than low-income states. Thus, when it is in their interest to do so, their leaders will likely choose costlier strategies than states with low-income levels. As this is only a preliminary assertion and this project makes no predictions about the relative cost of certain strategies over others, hypothesis nine will read:

Hypothesis 9: Leaders of high-income level states will choose similar strategies when responding to food insecurity, and leaders of low-income level states will choose similar strategies when responding to food insecurity, controlling for size of winning coalition, extent of leadership constraint, and overall food insecurity level.

10.3. Dependent Variables

This project will include the eleven strategies (including doing nothing), and they will be coded dichotomously. Further, this empirical test will also include a scaled variable, *number of responses*, that ranges from zero through ten. This variable measures the number of responses chosen by a given state in a given year.

Domestic Production Subsidies. For this empirical examination, if Anderson and Nelgen's[374] NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[375] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased

[374] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives*. Washington D.C.: World Bank.
[375] Ibid.

from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[376]

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[377] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[378] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[379] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural

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[376] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
[377] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.
[378] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[379] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.

sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[380] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[381] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[382] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

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[380] Population Division. (2009). *World Population Policies*. New York: United Nations.
[381] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[382] Ibid.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

Number of Responses. This variable measures the number of responses chosen by a given state in a given year. It ranges from zero to ten.

10.4. Independent Variables

State Income-Level. The key explanatory variable for this empirical test is state income level. The data for this variable are the Gross National Income (GNI) per capita of each state in a given year offered by the World Bank.[383] Measurements for income-level tend to include the log of per capita income.[384] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

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[383] World Bank. (2011). *World Development Indicators Databases*. Washington, D.C. The World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.

[384] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.

10.5. Control Variable

Overall Food Insecurity Level. As this model tests whether there is a correlation between a state's income level and its choice of responses to food insecurity (i.e. the number of responses and specific strategies chosen), it is essential to control for the level of food insecurity a state faces. There may be cases in which a high-income state chooses only a few strategies or to engage in strategies only as low levels because this state does not face intense levels of food insecurity. In contrast, a low-income state may choose multiple strategies or to engage in strategies at substantial levels because this state faces high levels of food insecurity.

Size of a Leader's Winning Coalition. This empirical examination seeks to test whether there is a correlation between a state's income level and its choice of responses to food insecurity (i.e. the number of responses and specific strategies chosen), controlling for the size of a winning coalition.

The size of a winning coalition is included as control variable as this project asserts that some states would be interested in pursuing certain strategies over others based on whether the strategy is meant to target certain members of the winning coalition or be used to address food insecurity for all residents of a state.

This model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[385] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

[385] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.

Leadership Constraint. A third control variable includes in this empirical tests is leadership constraint. This variable is included because to distinguish between leadership that chooses to respond because they understand that the food insecurity within a state does not threaten their winning coalition and those leaders that do not respond because they are unable to address the situation for various reasons (e.g. including they cannot afford to do so).This empirical test will use the same measurement for leadership constraint chosen for previous models.

10.6. Empirical Results

The empirical results confirm the expectations that states with high-income levels will be more likely to choose multiple strategies than states with low-income levels (i.e. p-value of 0.00584). Further, the income level of a state is an important variable to include when predicting which strategy a state will choose. As Table 10.1 demonstrates that leaders of high-income states are more likely to choose to increase or maintain domestic production subsidies, to lower trade barriers, to increase immigration restrictions, to increase or maintain consumer subsidies. They are less likely, however, to receive food aid.

These results are intuitive. Domestic production subsidies and consumer subsidies require considerable financial contribution from the state. Thus wealthier states are more likely to have the capacity to provide these subsidies. Further, fertility restrictions or sustainable agricultural policies require significant bureaucratic and/or law enforcement capacities to implement and impose. Also, one would expect that a state with high-levels of income would be less likely to request and receive food aid. Finally, though states need not contribute significant when lowering trade barriers, it seems logical that high-income states may be more ready to compete in the international market as they

would enjoy more competitive or comparative advantages. As a result, they would benefit more from lower trade barriers.

The negatively correlated relationships are also relatively straightforward. As expected, the higher income states are less likely to receive food aid or impose food rationing systems. Somewhat counterintuitively, the higher income states are also less likely to engage in resource conflicts or outward foreign direct investment. This is probably do to the fact that high-income states are more likely to have adequate agricultural resources at home and thus need not go abroad for them.

Table 10.1 High-Income Level & Strategic Responses

Variables	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**
Domestic Production Subsidies	48938.9	5009.7	9.769	<2e-16 ***
Trade Openness	1924	815	2.36	0.0184 *
Sustainable Agriculture	338.93	23.96	14.15	<2e-16 ***
Rationing Systems	-6969.8	1726.2	-4.038	5.51e-05 ***
Trade Protectionism	-1923.6	815.0	-2.36	0.0184 *
Resource Conflicts	-21.880	8.963	-2.441	0.0148 *
Immigration Restriction	484.9	383.5	1.265	0.206
Fertility Control Policies	3921	199	19.700	<2e-16 ***
Do Nothing	-726.2	1740.7	-0.417	0.677
Food Aid	-14029.8	438.6	-31.99	<2e-16 ***
OFDI Food	2127.0	613.8	3.465	0.000536 ***
Consumer Subsidies	16289.5	865.3	18.83	<2e-16 ***

10.7. Political Implications

Unsurprisingly, high- income states have more options when responding to food insecurity. From these results one may reason that domestic production subsidies, sustainable agricultural

policies, fertility control policies, OFDI, and consumer subsidies all require significant financial contributions from the state. The only strategy that requires significant contribution from the state, yet is not likely to be chosen by high-income states is resource conflicts. One may imagine that states that choose resource conflicts are willing to make a risky strategic choice based on the need for resources and the lack of financial resources to obtain them.

PART IV:

PREDICTING STATE RESPONSES TO THE FOUR DIMENSIONS OF FOOD INSECURITY

CHAPTER 11

STRATEGIC RESPONSES TO ISSUES OF FOOD AVAILABILITY

Whereas the size of a leader's coalition helps to explain the general nature of a leader's strategic response to food insecurity, more information is needed to predict which of the ten specific strategies a leader can choose. This part of the project combines factors examined previously to begin to predict which specific strategies state leaders choose when facing food insecurity.

This chapter addresses the strategic responses to issues of availability. The first section of this chapter explains which strategies a leader is likely choose when facing issues of food availability. The second section then includes the size of a leader's winning coalition, the level strong agricultural interests, and the level of income as key explanatory variables to predict which of these strategies a leader will choose when faced with issues of availability.

11.1. Possible Strategic Responses to Issues of Availability

This project asserts that there are eleven possible strategic responses to food insecurity (including the strategic choice not to respond). Not all of these strategies, however, are best for responding to issues of food availability. The food availability dimension of food insecurity focuses on the supply-side of the state's food system. Food availability issues arise when the supply of food available is a state is less than the demand for food. This project suggests that there are seven possible strategic responses to food availability. Three of these strategies directly target issues of

food availability, while four additional strategies may indirectly increase the amount of food available within a state.

If issues of food availability arise from not having necessary amounts of food available, than strategies that target these issues directly would serve to increase a state's domestic food supply. Three direct strategies in response to issues of food availability would be to increase domestic production levels, to increase imports, or to increase amounts of food aid being received.

Strategies may also be employed that do not directly target production levels, but may serve to increase domestic food supply levels nonetheless. The first of these strategies, trade protectionism, serves to encourage domestic food production by protecting these producers from the ebb and flows of the international market. By reducing the competition for these producers, these policies have the effect of encouraging increases in domestic production levels.

Two additional strategies, foreign direct investments in food production and resource conflicts, each serve to increase domestic production levels by securing long-term access to additional food production inputs such as arable land and water. Engagement in resource conflicts is a strategy that is not chosen very often, as it is includes high political and financial costs and the benefits are gleaned only in the case that a state is victorious. If a leader chooses to engage in a resource conflict and is victorious, then his state will obtain control over scarce resources (e.g. exclusive access to freshwater). In such cases, if the leader allocates these resources as inputs into food production, then the state should see a marked increase in food availability for that state.

A final strategy that may serve to indirectly increase the amount of food available within a state is to implement population control policies. Population control policies are intended to decrease the number of individuals within a state either through restrictive immigration or

reproductive policies. These policies will not directly increase a state's food supply overall, but eventually they do serve to increase the amount of food available per person by decreasing the total number of individuals within a state. Thus these policies may serve to increase a state's food supply in proportion to its population.

11.2. Predicting Strategic Responses to Issues of Availability

If a state is facing an issue of food availability, a leader may choose to implement one or more strategies in response. For an illustration of the specific strategies leaders will choose when faced with issues of food availability as predicted by this project, please see Figure 11.1.

This project asserts that leaders with a large winning coalition will more likely cooperative strategies or quasi-cooperative strategies in a non-excludable manner. The cooperative strategies that target issues of food availability are to choose to increase domestic production or to increase food imports.

Leaders with small winning coalitions who are facing issues of food availability within their states will more likely implement conflictual strategies in response. Conflictual strategies that target issues of food availability include implementing population control policies, increasing trade protectionism, and engaging in resource conflicts with other states.

The quasi-cooperative strategies that target issues of food availability are to increase receipts of food aid and to increase foreign direct investment in food production. Leaders with large and small winning coalitions will both employ quasi-cooperative strategies, but they will do so for different purposes.

This project asserts that a leader with a large winning coalition will be motivated by the need to increase food availability for all members of the state's population. Thus leaders with large winning coalitions will implement these strategies in a non-excludable manner. In the case of food aid, large-coalition leaders will food aid will be received in larger amounts than those sent to leaders with small winning coalitions and will more than likely be in the form of food items rather than monetary payments. In terms of foreign direct investment, items grown will likely be large amount of staple crops and these items will almost exclusively be shipped back to the home state to be sold on the domestic market.

A leader with a larger small winning coalition will likely choose quasi-cooperative strategies only to ensure food availability for members of his winning coalition. Thus one would expect to these leaders to receive smaller amounts of food aid that large-coalition leaders and this aid will more than likely be in a fungible form (e.g. monetary payments). In terms of foreign direct investment, items grown will likely be smaller amounts of crops and some of these items will be intended for the international, rather than domestic, market.

When strong agricultural interests are present, leaders will likely choose to increase domestic production levels, engage in foreign direct investment, and increase trade protectionism. Leaders with large winning coalitions that include strong agricultural interests will be motivated to address food insecurity by choose only two of these strategies.

First, domestic subsidies to producers would serve to increase food availability for the affected individuals within the state and encourage domestic production. Second, foreign direct investment in food production could serve both purposes if food production if staples were grown and exported to the home state. A large-coalition leader's choice between these two strategies depends on the

specific character of the agricultural interests. If the strong agricultural interests in a leader's winning coalition include a large number of relatively small-sized, then he or she is likely to support domestic production subsidies more than foreign direct investment.

If a leader with a large coalition need not please a strong agricultural interest group, then he or she will be more likely to choose cooperative strategies that increase food availability without necessarily increasing food production. Thus large-coalition leaders without strong agricultural interests will be likely to increase imports or receive food aid in the face of food availability issues.

As noted above, a leader with a small winning coalition will be more likely to engage in more conflictual (i.e. excludable) strategies when addressing issues of food availability. Further, if small-coalition leaders choose quasi-cooperative strategies, they will do so in an excludable manner, targeting these strategies to those within the winning coalition affected by food insecurity.

If a leader has strong agricultural interests within her or her small winning coalition, he or she is likely to address the issue of food availability within his or her state by implementing one of three strategies: increase trade protectionism, engage in foreign direct investment, or initiate a resource conflict.

Leaders with small coalition that include strong agricultural interests will be more likely to choose trade protectionist policies to encourage domestic production levels. Trade protectionist policies are more advantageous than domestic production subsidies for small winning coalition leaders as they require very little financial contributions for the state to implement as well as serve as a source for state revenue.

Though trade protectionist policies could be used by leaders with large winning coalitions, these do not serve their purposes as well. This is because trade protectionism hurts domestic

consumers by driving up the prices of food (thus shifting the cost burden of these policies onto the domestic consumer). In small winning coalitions, this is less of a problem as long as a leader can ensure that consumers outside of the winning coalition pay the burden for these policies. In large winning coalitions, however, this policy is difficult as there are fewer individuals outside of the winning coalition. Thus leaders of small winning coalitions will be more likely to implement these policies in response to food availability as they serve to increase food availability domestically, they benefit the strong agricultural interests within the state, and the costs of these policies can be shifted outside of the winning coalition.[386]

A leader with a small winning coalition that includes strong agricultural interest may also choose to engage in foreign direct investment in response to issues of food availability. Foreign direct investment can serve to increase the amount of food available for members of a leader's small winning coalition. Small winning coalition leaders with the strong agricultural interests will choose to support trade protectionism more than foreign direct investment if these interests include relatively small-sized producers. If, however, a leader's small winning coalition includes relatively large, commercial producers, he or she would likely encourage foreign direct investment as these investments require capital-intense commitments by producers.

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[386] Another means by which leaders choose to encourage domestic food production without absorbing the costs is to tax domestic consumers for food items and then use this revenue to subsidize domestic producers. Leaders may choose this strategy when they have a small winning coalition and can thus effectively shift the cost of agricultural production outside of their winning coalition. Domestic food taxes are not discussed in detail in this project as they are not intended to decrease food insecurity. Instead, they are used as a direct, stable source of collecting revenue. Mentioning them in this study, however, may highlight situations in which leaders choose the seemingly paradoxical strategy of responding to food availability issues within their state by taxing food. In these situations, this project would argue that the leader is taxing individuals outside his or her winning coalition to address food availability issues within it.

In some rare cases leaders of small winning coalitions will choose to engage in resource conflicts to please their strong agricultural interest groups. Though the costs of this strategy is quite high and victory is not guaranteed, leaders of small winning coalitions will be more likely to choose these policies as they can always shift these costs to those outside their winning coalition if they are unsuccessful.

If a leader with a small winning coalition does not have a strong agricultural interest group to consider, he or she will be more likely to implement population control policies or receive food aid. Though all states can benefit from having higher levels of income per capita, leaders with large winning coalition especially benefit from having high-income levels as these leaders have a smaller portion of the population on which they can shift the cost burdens for policies. Thus higher per capita income levels allow these leaders to enact policies to please their large coalition and to have the state absorb the costs for policies.

As noted in chapter ten, the income level of a state may shape a leader's strategic response. Of the strategic responses to food availability, this project asserts that high-income states will be more likely to maintain or increase domestic production subsidies, implement foreign direct investment, and receive food aid, engage in resource conflicts, and implement population control policies as these strategies require significant contributions by the state. In contrast, this project asserts that low-income states will be more likely to maintain or increase trade openness, receive food aid, and maintain or increase trade protectionism.

Leaders with large winning of high-income states are more capable, and thus more likely, to implement costlier strategies. Thus they will be most likely to maintain or increase domestic production subsidies and to engage in foreign direct investments. In contrast, leaders with large

winning of small-income states leaders will be unable to fund these policies and unwilling to shift the cost burden onto those within their states. Thus they will be more likely to respond to issues of food availability by maintaining or increasing food openness or receiving food aid.

Leader with small winning coalitions have five strategic options they are likely to choose among when addressing issues of food availability. They will choose among three conflictual strategies – increase trade protectionism, engage in resource conflicts, and implement population control policies – and two quasi-cooperative strategies – receiving food aid or direct foreign investment. If they choose any of the quasi-cooperative strategies, they will implement these strategies in an excludable manner (i.e. distribute food aid or food grown via FDI projects only to those in their winning coalition affected by food insecurity).

Small winning coalition leaders of high-income states will be capable of choosing the costlier of these five strategies, including engaging in resource conflicts, implementing population control policies, and increasing direct foreign investments. In contrast, small coalition leaders of low-income states will be more likely to choose the less costly strategies of maintaining or increasing trade protectionist policies or receiving food aid.

The rest of this section examines the possible interactions of these explanations mentioned above in an attempt to predict which strategies a leader will choose when facing issues of food availability based on all of the factors combined (i.e. the size of a winning coalition, the level of agricultural interests in a state, and the level of income of the state).

When a leader of a high-income state has a large winning coalition that includes strong agricultural interest groups, a state would be able to absorb the costs of certain costly strategies and a leader would be motivated to increase domestic production subsidies or foreign direct investments

in agriculture in order to please these agricultural interest groups. In these cases, leaders have both has the motivation to choose these policies to please strong agricultural interests and the ability to have the state absorb the costs. Thus, this project asserts that leaders of a high-income state with large winning coalitions that include strong agricultural interest groups will be more likely to increase domestic production subsidies or engage in foreign direct investment in food production.

More interestingly, leaders of low-income states that have large coalitions with strong agricultural interests will find themselves in a bind. These leaders will be concerned with pleasing the agricultural interests within their winning coalition, but they will be unable to either absorb the burden of either foreign direct investments in agriculture or domestic production costs. Further, they cannot completely shift any burdens to the relatively small group of individuals outside of their winning coalition.

In such cases, one may predict that the leader will be forced to choose a sub-optimal strategy. If a leader chooses either to increase imports or receipts of food aid in response to issues of availability, he or she will increase the competition for domestically-grown food products, thus angering the agricultural interests within his or her winning coalition. When this occurs, one would expect to see the size of the support coalition for this leader shrink below the size of his or her winning coalition.

If a leader chooses either to increase domestic production or foreign direct investments, he or she will need to finance these policies. For leaders of low-income states, however, this would mean implementing some taxation to exact revenue from a portion of the population (e.g. implementing a food tax). As raising taxes will inevitable anger consumers within his or her large winning coalition, this project asserts that leaders of low-income state with large winning coalitions that include strong

agricultural interest groups will be more likely to choose to do nothing in response to food insecurity, and should these leaders decided to choose from the sub-optimal strategies, the size of leaders' support coalitions should decrease.

If large-coalition leaders of high-income level states have no agricultural interests to consider, they will be more likely to choose multiple strategies. There are multiple reasons for this. First, these leaders are motivated to address food availability in a non-excludable manner. Presupposing that a large-coalition leader may have heterogeneous interests within a large winning coalition, it may be strategically advantageous to try several different strategies for responding to issues of availability. Further, as the state is a high-income state, it is capable of absorbing the costs of more expensive strategies, such as domestic production subsidies and foreign direct investments. Finally, these leaders' strategic choices are unencumbered by agricultural interests. Thus they may choose to increase imports by lowering barriers to trade or receive food aid.[387]

This project assumes that large-coalitions leaders of low-income states that are not concerned with strong agricultural interests would choose to maintain or increase food imports, to receive food aid, or some combination of both. These strategies work well for these leaders are relatively cheap to employ and benefit domestic food consumers. These leaders would not be encumbered by strong agricultural interests opposed to increases in competition, but they would be motivated to find a solution to issues of food availability. Thus these leaders would be likely to choose these options.

Leaders that have small winning coalitions that include strong agricultural interests will be more likely to choose conflictual strategies in response to food availability, including increasing trade protectionism, initiating resource conflicts, or engaging in foreign direct investment in an excludable

[387] Food aid is less likely in this case, however, as donor states would be reluctant to give food aid to a state that is fully capable of financing its own food distribution.

manner (e.g. exporting goods back to the state to be distributed only to those in the winning coalition). Leaders with small winning coalitions have more options when choosing among policies than a leader of a large winning coalition because they can shift the cost burden of the population onto those outside of their winning coalition.

Leaders of high-income states with small winning coalitions that include strong agricultural interests will likely choose strategies that benefit domestic producers. Resource conflicts are costly, but if successful, they can increase a state's access to resources for food production such as arable land and freshwater. If unsuccessful, however, these leaders can shift the cost burden of these endeavors onto individuals outside of their winning coalitions. Foreign direct investment in food production is a second strategy that may be implemented by small coalition leaders of high-income states with agricultural interest to consider. When predicting which of these two options a leader will choose, it is more likely that he or she would choose foreign direct investments if the agricultural interests consisted of relatively large commercial producers.

Leaders of both high-income and low-income states with strong agricultural interests may choose to implement trade protectionist policies as these policies protect domestic growers and can lead to an increase in food production. Trade protectionism requires some enforcement infrastructure at a state's border, but it also has the potential to extract much revenue as protectionism can apply to food imports from multiple states. As a result, leaders of low-income states with small winning coalitions that include agricultural interests would more likely choose trade protectionism.

Leaders with small winning coalitions that include weak agricultural interests will be more likely to receive food aid and implement population control policies. If a leader of a high-income state is

in this situation, then he or she will be able to finance the more expensive strategies of population control policies, which require implementation and continued enforcement. If, however, a leader of a low-income state is in this situation, he or she will likely focus on receiving food aid. In these cases, the leader will not distribute the food aid in an equitable manner but will concentrate on ensuring those affected within his or her winning coalition are the primary if not exclusive recipients.

11.3. Hypotheses

If a state is facing an issue of food availability, a leader may choose to implement one or more specific strategies that either directly or indirectly increases the amount of food that is available domestically. Thus hypothesis ten reads:

> *Hypothesis 10:* Leaders experiencing issues of food availability will choose to maintain or increase domestic production subsidies, to maintain or increase trade protectionist policies or to maintain or increase trade openness policies (depending on the strength of agricultural interests), to receive food aid, to engage in direct foreign investment, or to participate in resource conflicts for the purposes of either obtaining or maintaining natural resources used in food production resources.

To determine whether there are patterns of strategic responses to certain types of food insecurity that can be explained by examining the size of a leader's winning coalition, the agricultural interests within a state, and the income-level of that state, this project will generate eight hypotheses about state responses to issues of availability.

Hypothesis eleven will predict responses of leaders with strong agricultural interests in high-income states (i.e. LARGE-STRAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis eleven states:

> *Hypothesis 11:* In response to issues of food availability, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies and to engage in foreign direct investment in food production.

Hypothesis twelve will predict responses of leaders with large-winning coalition leaders with strong agricultural interests in low-income states (i.e. LARGE-STRAG-LOWs). Assuming that large-coalition leaders will choose cooperative or non-excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that low-income states will be financially constrained, hypothesis twelve states:

Hypothesis 12: In response to issues of food availability, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.

Hypothesis thirteen will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in high-income states (i.e. LARGE-WAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to certain choose strategies, and that high income states will be able to implement most policy options, hypothesis thirteen reads:

Hypothesis 13: In response to issues of food availability, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-HIGHs) will choose multiple strategies.

Hypothesis fourteen will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in low-income states (i.e. LARGE-WAG-LOWs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to protect against food imports or to refuse significant amounts of food aid, and that low-income states will be financially constrained,

hypothesis fourteen reads:

> *Hypothesis 14:* In response to issues of food availability, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-LOWs) will choose to maintain or increase trade openness policies and to receive food aid.

This project will also generate four hypotheses about small-winning coalition leaders. Hypothesis fifteen will predict responses of small-winning coalition leaders with strong agricultural interests in high-income states (i.e. SMALL-STRAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or quasi-cooperative, yet excludable, strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis fifteen states:

> *Hypothesis 15:* In response to issues of food availability, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investments in food production and to participate in resource conflicts.

Hypothesis sixteen will predict responses of leaders with small-winning coalition leaders with strong agricultural interests in low-income states (i.e. SMALL-STRAG-LOWs). Assuming that large-

coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that a low-income states will be financially constrained, hypothesis sixteen states:

> *Hypothesis 16:* In response to issues of food availability, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will maintain or increase trade protectionist policies.

Hypothesis seventeen will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in high-income states (i.e. SMALL-WAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that there will be little to no pressure on the leader from agricultural interests, and that high-income states will be able to implement most policy options, hypothesis seventeen states:

> *Hypothesis 17:* In response to issues of food availability, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-HIGHs) will choose to maintain or increase population restriction polices.

Hypothesis eighteen will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in low-income states (i.e. SMALL-WAG-LOWs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies, that there

will be little to no pressure on the leader from agricultural interests, and that low-income states will be financially constrained, these leaders will more likely focus on receiving food aid. In these cases, the leader will not distribute the food aid in an equitable manner but will concentrate on ensuring those affected within his or her winning coalition are the primary if not exclusive recipients. Thus hypothesis eighteen is:

> *Hypothesis 18:* In response to issues of food availability, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-LOWs) will receive food aid.

11.4. Dependent Variables

This empirical test will include the eleven strategies (including doing nothing), and they will each be coded dichotomously. The details are included again in section.

In addition to these dichotomous variables, two other dependent variables will be included. Hypotheses fourteen predicts that large-winning coalition leaders will be likely to choose significant amounts of food aid, and hypothesis eighteen predicts that small-winning coalition leaders will be likely to receive less food aid as they need only to address only those within their winning coalition. Thus a twelve dependent variable will attempt to measure the nature of food aid strategy.

The final dependent variable in this empirical model measures the number of strategies as hypothesis thirteen predicts that large-winning coalition leaders with no agricultural interests and high-income levels in their states are likely to implement multiple strategies.

Domestic Production Subsidies. For this empirical examination, if Anderson and Nelgen's[388] NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[389] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[390] Out of these many states for which data was available, this many protected this much…This project will code this percentage as a one for conservationist and this percentage as a zero.

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[388] Anderson, Kym, and Signe Nelgen. (2013). *Updated National and Global Estimates of Distortions to Agricultural Incentives: 1955 to 2011*. Washington D.C.: World Bank, 11.
[389] Ibid.
[390] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[391] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

Nature of Food Aid Strategy. This model examines whether the size of a winning coalition best explains the amount of food per capita that a leader chooses receives as food aid. The original data for this variable is gathered form the World Food Program (WFP), and then this project has converted these data to kilograms per capita.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[392] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[393] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same

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[391] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.
[392] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[393] United Nations Conference on Trade and Development. (2014). World Trade Data. *United Nations*.

spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[394] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[395] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[396] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or

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[394] Population Division. (2009). *World Population Policies*. New York: United Nations.
[395] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[396] Ibid.

constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

Number of Responses. This variable measures the number of responses chosen by a given state in a given year. It ranges from zero to ten.

11.5. Independent Variables

Size of a Leader's Winning Coalition. For this empirical test, the key explanatory variable for explaining variation in the nature of strategic response is the size of a leader's winning coalition. As in the model presented in chapter seven, this model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[397] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

Strength of Agricultural Interests. The World Bank Development Indicators offer a measurement for the size of an agricultural sector within a state based on the share of agriculture in the state's overall GDP.

State Income-Level. The key explanatory variable for this empirical test is state income level. The data for this variable are the Gross National Income (GNI) per capita of each state in a given

[397] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.

year offered by the World Bank.[398] Measurements for income-level tend to include the log of per capita income.[399] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

11.6. Control Variables

Food Availability Level. The measurement for this variable is the original one presented in chapter three. Measurements vary from zero (i.e. no food availability issues within a state) to one (i.e. high levels of food availability issues within a state).

11.7. Empirical Results

This project predicted that leaders experiencing issues of food availability will choose to implement domestic production subsidies, to either lower or raise barriers to food imports, to receive food aid, to engage in direct foreign investment, or to participate in resource conflicts for the purposes of either obtaining or maintaining natural resources used in food production resources. As Table 11.1 illustrates, the results confirm that leaders facing increases in food availability issues are less likely to engage in domestic food production rather than more. As highlighted in the previous

[398] World Bank. (2011). *World Development Indicators Databases*. Washington, D.C. World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.
[399] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.

chapter, however, domestic production subsidies require significant resources. When the model is run again controlling for a state's income level, leaders are highly likely to choose domestic production subsidies (p-value of <2e-16). A similar highly-significant relationship occurs with high levels of availability issues and trade openness when one controls for income level (p-value of 0.00299).

When this project controlled for income-level when examining the relationship between level of availability issues and a leader's choice to engage in OFDI, the relationship still failed to reach statistical significance. When, however, the relationship between level of availability issues and a leader's choice to engage in OFDI was examined while controlling for presence of agricultural interests, a leader was highly likely to choose OFDI when faced with high levels of availability issues depending on the level of agricultural interests present within the state. This is in keeping with the assumption made and empirically supported in chapter nine that there is a relationship between the strength of agricultural interests in a state and a leader's choice to engage in OFDI.

Table 11.1 Issues of Food Availability & Strategic Responses

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies	-0.83101	0.03576	-23.24	<2e-16 ***
Trade Openness	-0.008281	0.006638	-1.248	0.212
Resource Conflicts	3.719e-04	8.251e-05	4.507	7.19e-06 ***
Trade Protectionism	0.008281	0.006638	1.248	0.212
Food Aid	0.074333	0.003191	23.29	<2e-16 ***
OFDI Food	-0.012709	0.004357	-2.917	0.00356

This project hypothesizes that leaders of states with high-income levels who have large-winning coalitions with strong agricultural interests will be likely to engage in domestic production subsidies and OFDI. As Table 11.2 illustrates, when this project examines the relationship between a state's winning coalition, agricultural interests, and income-level characteristics and these two strategies, the results do not confirm hypothesis twelve. The relationship between LARGE-STRAG-HIGHs and domestic production subsidies is negatively, rather than positively, correlated and this relationship is statistically significant. This appears counterintuitive as this project hypothesizes that large winning coalition leaders would be likely to choose domestic production subsidies as they encourage food production, increase the profits for their agricultural interests, and do not lead to higher food prices for the consumers like trade barriers do. To explain these results, this project reran this empirical test, disaggregating the three characteristics of the state: large winning coalition, strong agricultural interests, and high-income level.

When examining the relationship between size of a leader's coalition and the likelihood a leader would choose domestic production subsidies, it was revealed that a highly significant, positive relationship exists between these two factors (with a p-value of 0.00468) when controlling for high levels of food availability issues. In contrast, a statistically significant negative relationship exists between the strength of agricultural interests and domestic production subsidies (with a p-value of 4.65e-13) when controlling for high levels of food availability issues. Finally, when examining the relationship between income level and the likelihood a leader would choose domestic production subsidies, it was revealed that a highly significant, positive relationship exists between these two factors (p-value of <2e-16) when controlling for high levels of food availability issues.

Thus it appears that the strength of agricultural interests may be causing large winning coalition leaders to avoid domestic production subsidies.

This seems counterintuitive, however, in that domestic production subsidies are meant to assist domestic producers and therefore should be supported by agricultural interests. As another alternative to supporting domestic producers would be to increase trade protectionism, this project examined the same relationship between domestic production subsidies and coalition size, strengths of agricultural interests, and income level but controlling for trade barriers as an alternative to domestic production subsidies.

In doing so, the statistically significant positive relationship between coalition size and domestic production subsidies remained; moreover, coalition size and trade barriers were negatively correlated, though the relationship failed to reach statistical significance.

When examining the relationship between strength of agricultural interests and domestic production, a negative, statistically significant relationship remained, but strength of agricultural interests was positively correlated with the likelihood of a leader to choose to increase trade barriers (p-value of 0.0874). Finally, the higher the income level for a state the more likely it is to choose domestic production subsidies and the less likely it is to choose trade barriers. These relationships are both highly significant (with p-values of <2e-16 and 0.0076 respectively).

These results indicate that trade barriers serve as more than simply a cheaper alternative for a cash-strapped state with strong agricultural interests. Instead, agricultural interests may be interested in protecting their industry from import competition because they do not have a comparative advantage and thus are concerned that they cannot compete with imports even with domestic production subsidies in place.

Thus it is import-competing, fearful agricultural interests that may be drive LARGE-STRAG-HIGHs to address issues of food availability through other means that increasing domestic production of food via domestic subsidies. These findings have significant political implications on food insecurity as large winning coalition leaders may be discouraging imports as their citizens face high food availability issues. As table 11.2 also illustrates, though the relationship between LARGE-STRAG-HIGHs and OFDI is positively correlated, it fails to reach statistical significance.

Table 11.2 Large Winning Coalition, Strong Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies	-0.871396	0.038497	-22.64	<2e-16 ***
Outward Foreign Direct Investment	2.862e-06	4.248e-06	0.674	0.501

This project also hypothesizes that leaders of low-income state with a large winning coalition that include strong agricultural interest groups will be in a bind when it comes to addressing high levels of food availability issues within their states. The underlying reason for this is that agricultural interests will want these leaders to encourage domestic production, while food insecure citizens will want them to address availability issues. Though this situation is similar to those in LARGE-STRAG-HIGH states, leaders of LARGE-STRAG-LOW states will have fewer resources to please the heterogeneous interests within their large winning coalition. This project hypothesizes that leaders in these situations will be less likely to respond to food insecurity than other leaders. As Table 11.3 illustrates, LARGE-STRAG-LOW leaders will be less likely to choose domestic production subsidies, sustainable agricultural policies, immigration or fertility policies, OFDI, or consumer subsidies.

These leaders, however, are also more likely to choose to respond than to do nothing. Interestingly, the results suggest that these leaders are more likely to choose resource conflicts, a strategy that may seek to secure food inputs for agricultural interests, or increase food aid, a strategy which helps those whom are food insecure. Moreover, when both of these strategies are included within the same model, each has a statistically significant positive relationship with LARGE-STRAG-LOWs. Thus it appears that leaders in these situations choose from among the divergent interests within their large winning coalition. Though this project has not included data on support coalition size, one would expect to see a leader's support coalition shrink in response to either of these strategic responses to food availability issues.

Table 11.3 Large Winning Coalition, Strong Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Do Nothing	-0.286768	0.107927	-2.657	0.00793 **
Resource Conflicts	0.0010349	0.0003187	3.247	0.0012 **
Food Aid	0.36619	0.01597	22.94	<2e-16 ***

If a leader of a high-income state has a large winning coalition that does not include strong agricultural interests, this project argues that he or she will be more likely to choose multiple strategies in response to issues of food availability. As Table 11.4 illustrates, the results empirically support this hypothesis. These leaders are highly likely to choose multiple strategies (p-value 1.02e-14).

Leaders of a low-income state with a large winning coalition that does not include strong agricultural interests who are experiencing issues of food availability will be more likely to increase food imports or receive significant amounts of food aid. Though the results show that these leaders

are highly likely to receive food aid (p-value = 2.23e-14), there is a negative correlation between LARGE-WEAK-LOWs and trade openness (though the relationship is not statistically significant).

Table 11.4 Large Winning Coalition, Weak Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Number of Strategies	0.042582	0.005474	7.78	1.02e-14 ***

When examining this relationship between LARGE-WEAK-LOWs and trade openness, it appears that, though large winning coalition leaders with weak agricultural interests are more likely to have trade openness, low-income states tend to have less open trade policies (p-value=0.00299) when controlling for high levels of food availability issues.

Table 11.5 Large Winning Coalition, Weak Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Openness	-0.02923	0.01900	-1.538	0.124
Food Aid	0.095324	0.012415	7.678	2.23e-14 ***

As illustrated in Table 11.6, leaders of a high-income state with a small winning coalition that includes strong agricultural interests who are facing issues of availability will be more likely to engage in resource conflicts (p-value = 2.25e-05) and increase foreign direct investments in food production (though the relationship failed to reach statistical significance).

Table 11.6 Small Winning Coalition, Strong Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Resource Conflicts	3.544e-04	8.325e-05	4.257	2.25e-05 ***
OFDI Food	2.113e-07	4.119e-06	0.051	0.959

Leaders of a low-income state with a small winning coalition that includes strong agricultural interests who are facing issues of availability will be more likely increase trade protectionism.

Though this relationship is not statistically significant, it is in the direction predicted (Table 11.7). Further, when one disaggregates the three components of SMALL-STRAG-LOWs, it is clear that small winning coalitions, strong agricultural interests, and low-income states are all ore likely to increase or maintain trade protectionism (p-values of 0.724, 0.0913, and 0.00299 respectively). This project asserts that the failure of the correlation between the size of a winning coalition and the likelihood of a leader raising or maintaining trade barriers to reach statistical significance is due to the agricultural interests in large-winning coalitions that make leaders act in a more conflictual manner than they otherwise would.

Table 11.7 Small Winning Coalition, Strong Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Protectionism	0.03037	0.02497	1.216	0.224

Leaders of a high-income state with small winning coalitions that include weak agricultural interests who are experiencing issues of food availability will be more likely to engage in multiple strategies (p-value =5.27e-07) as hypothesized (Table 11.8).

Table 11.8 Small Winning Coalition, Weak Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Availability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Number Strategies	859.6	171.0	5.027	5.27e-07 ***

Finally, leaders of a low-income state with small winning coalitions that include weak agricultural interests will be more likely to accept insignificant amounts of food aid in response to issues of availability. This was as hypothesized.

Table 11.9 Small Winning Coalition, Weak Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Availability

Variables	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**
Food Aid	0.123266	0.009793	12.59	<2e-16 ***

Most of the empirical results confirmed the hypothesis put forth in this chapter with some notable exceptions. The first notable exception is that, when faced with food availability, large coalition leaders often choose cooperative strategies unless there are strong agricultural interests. In these cases, the agricultural interests may be fearful of import-competition. Thus leaders may choose to impost trade protectionism to protect these domestic producers.

The second notable exception is that, though this project assumed that trade openness would be a more attractive option for states with low income levels facing food availability issues as it is a "cheaper" policy to implement, the empirical results suggest that high-income states are more likely to engage in trade openness in agriculture when controlling for high availability issues. This relationship remains even when controlling for agricultural interests in each states. Thus, it may be that high-income states are more likely to implement trade openness in general and this policy has a spillover effect to the agricultural sector, even though agricultural as traditionally been more protected than other sectors.

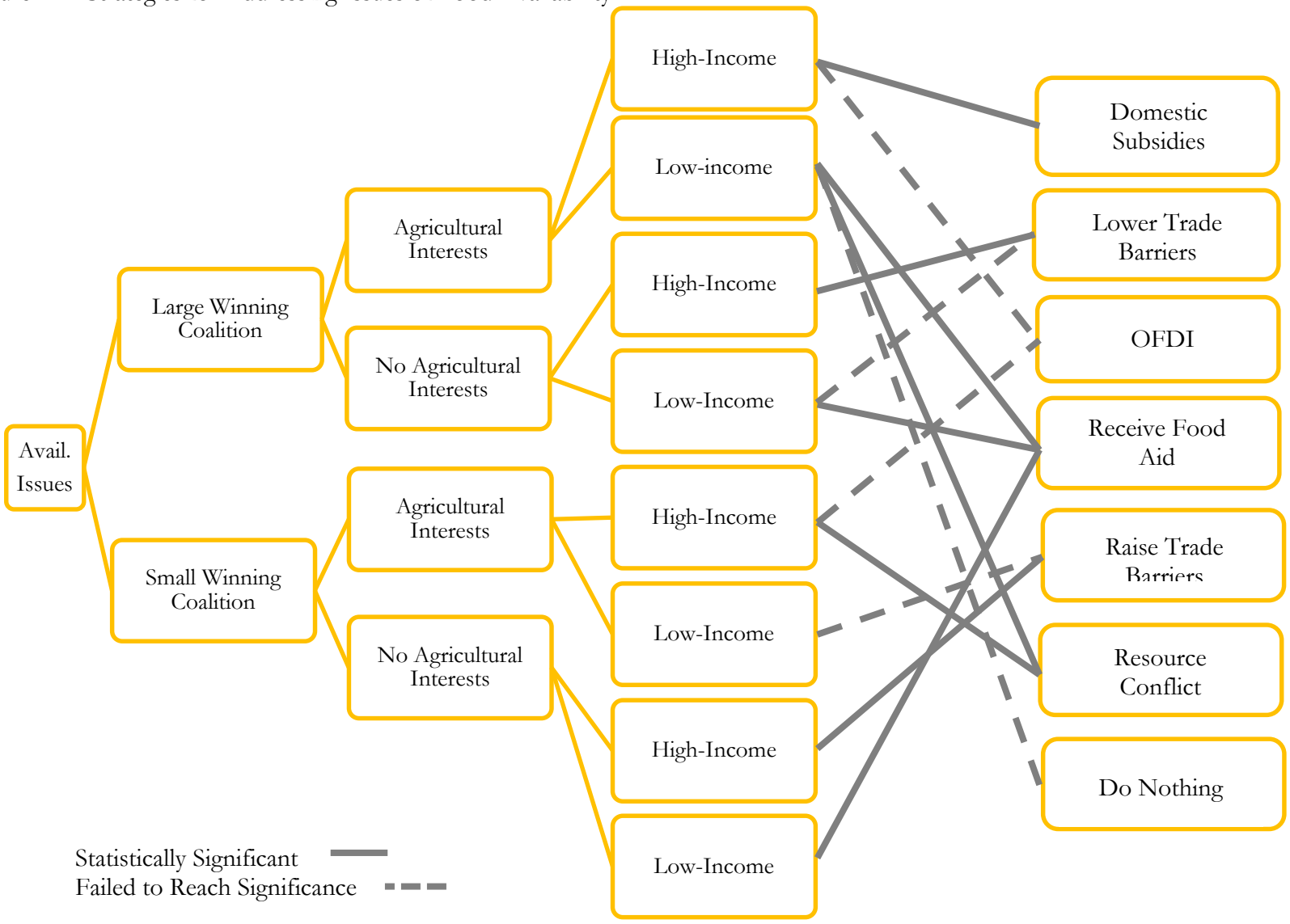
11.8. Political Implications

The results confirm most of the hypotheses presented in this chapter, though some relationships failed to reach significance, most were positively correlated as predicted. The notable exception was the prediction that leaders of low-income states with large-winning coalitions that include agricultural interests would be in a bind when choosing how to respond to food availability issues.

This project predicted they would not wish to choose between the agricultural interests and those who are food insecure within their winning coalition, and a result would choose do to nothing. The results indicate that leaders in these situations would prefer to act than not act, even when their choice threatens to displease part of their coalition. In this case, leaders chose to either engage in resource conflicts or receive food aid. The former strategy offers an opportunity to secure food inputs (e.g. arable land and water) for the state. Thus this strategy would directly interest strong agricultural interests.

The latter strategy addresses the food availability issues within the state directly, but increases the amount of foreign food on the domestic market, which is not in the interest of the domestic producers. When examining the choice between the two, leaders in these cases are more likely to choose to receive food aid. This is logical as it requires little financial contribution from the state, whereas resource conflicts costs the state a great deal and there is risk of losing a resource conflict.

Figure 11.1 Strategies for Addressing Issues of Food Availability



CHAPTER 12

STRATEGIC RESPONSES TO ISSUES OF FOOD ACCESS

This chapter addresses the strategic responses to issues of access. The first section of this chapter explains which strategies a leader is likely choose when facing issues of food access. The second section then includes the size of a leader's winning coalition, the level strong agricultural interests, and the level of income as key explanatory variables to predict which of these strategies a leader will choose when faced with issues of access.

12.1. Possible Strategic Responses to Issues of Food Access

Broadly defined, food access is the situation in which food is distributed to individuals within a population. Thus issues of food access differ from issues of food availability in that the latter are cases in which there are not sufficient amounts of food within the state, whereas the former are cases in which food is available but individuals may not have access to it. Within the process of food production to consumption, food access issues can occur during the period in which food is (or is not) transported within a state, when food is sold, the steps by which food is prepared, and the steps by which it is distributed within a household.

Because of the different types of access issues, it is difficult to draw generalizations about issues of food access. For the purposes of beginning to generate hypotheses surrounding issues of food access, this project will concentrate on issues of food affordability and leave the issues of transportation infrastructure, preparation infrastructure (e.g. clean water and sanitation access), and

intra-household disparities to future research. For an overview of the strategies leaders will choose in response to issues of food access, please see Figure 12.1.

There are six strategies that have the potential to increase food affordability: increasing domestic food production, increasing food imports, receiving food aid, increasing foreign direct investment, consumer subsidies, and successful resource conflicts. The first three strategies – increasing domestic production, increasing food imports, and receiving food aid – all lower the cost of food by increasing its overall availability.

12.2. Predicting Strategic Responses to Issues of Food Access

This project asserts that leaders with a large winning coalition will more likely choose cooperative strategies or quasi-cooperative strategies in a non-excludable manner. The cooperative strategies that target issues of food access include increasing overall domestic food production and increasing food imports. As long as domestic food production is not intended to be exported, it should increase the supply of food domestically. Food imports also increase the amount of food available in the state and thus should make each unit of food cheaper. This project does not assume that food will be equally priced or even equally affordable to all within a state if these strategies are implemented. Instead, it is only to suggest that these strategies should improve the amount of food that is available domestically and thus decrease the prices of food at the aggregate level.

If leaders with large-winning coalitions were to choose among the strategies to address issues of food affordability, this project asserts that leaders with large winning coalitions will be more likely to choose cooperative strategies or quasi-cooperative strategies that they would implement in a non-excludable manner. Thus, these leaders are more likely to choose to increase domestic food production and increase food imports in response to food availability issues.

In contrast, leaders with small winning coalitions who are facing issues of food access will be more likely to implement conflictual strategies in response. A conflictual strategy for addressing food access in a state is to engage in a resource conflict with another state. If victorious, a leader will gain resources (e.g. arable land, water sources, etc.) that will decrease the overall costs of food production domestically and in turn drive down food prices.

The quasi-cooperative strategies that target issues of food access are to increase receipts of food aid, to increase foreign direct investment in food production, or to implement consumer subsidies. Leaders with large and small winning coalitions will both employ quasi-cooperative strategies, but they will do so for different purposes.

Receiving food aid is a quasi-cooperative strategy as food aid must be distributed either by the state or with the state's cooperation (in the case of non-government food aid). This allows the state to have some control over how evenly food aid is distributed. This project predicts that leaders with large winning coalitions will be more likely to distribute food aid to all those affected by food insecurity, while leaders with small winning coalitions will be more interested in allocating food aid to individuals within their winning coalition affected by food insecurity.

Another quasi-cooperative strategy states can implement to increase food affordability is to engage in foreign direct investment in food production. Food products generally have three main areas that determine their prices: production costs, transportation costs, and governmental costs (or assistance). Foreign direct investments in agriculture can differ from domestic production in that it may cost less to produce (e.g. foreign direct investments in agriculture tend to be made in states where land and labor is cheaper) but they cost more to transport to the domestic market. As a result, foreign direct investment in agriculture should be relatively equal or cheaper than domestic agricultural production. In so much as food grown in a host state is transported back to the

domestic market, foreign direct investment in food production should decrease the price of goods on the domestic market.

Leaders with strong agricultural interest are interested in making domestic food prices more affordable while pleasing agricultural producers in their states. These leaders may employ strategies that serve to increase domestic production, such as domestic production subsidies, implementing foreign direct investment, or engaging in resource conflicts to secure food inputs. By increasing domestic production, these strategies are meant to decrease the cost of individual food items.

As noted in the previous chapter, a leader will likely choose between domestic producer subsidies or foreign direct investment depends on the specific character of the agricultural interests within a state. If the strong agricultural interests in a leader's winning coalition include a large number of relatively small-sized farms, then he or she is likely to support domestic production subsidies more than foreign direct investment. If, however, the strong agricultural interests in a leader's winning coalition include relatively large commercial farms, then he or she is likely to support foreign direct investment over domestic production subsidies.

Consumer subsidies are a third quasi-cooperative strategy for increasing food affordability. Consumer subsidies are intended to decrease the cost of food for consumers. This strategy is employed by leaders who are not willing to introduce imports or food aid to compete with the domestic products but are nonetheless interested in driving down food prices. As a result, these leaders seek to decrease specific food prices directly by implementing commodity-specific food subsidies. These subsidies will likely by applied to domestically-produced food items and the state is likely to absorb the costs of these subsidies rather than shift them to a portion of the population.

Leader without strong agricultural interests could choose these strategies but these leaders will be more likely to address issues of affordability by increasing food imports and food aid.

Further, similar to leaders of high-income states with issues of availability, leaders of high-income states with issues of access will have more strategic options when addressing these issues. This project asserts that leaders of these states will likely choose any of the strategies mentioned to address food access and will likely choose multiple strategies to do so.

Leaders of high-income states could potentially choose from any of the strategies to address issues of affordability. They will be unlikely, however, to receive food aid as this strategy is usually reserved for states who demonstrate they have lower-income levels and thus a need for food assistance. Receiving food aid may be the best option for low-income states as it costs nothing for a state to produce and consumers can receive food at minimal to no cost.

There are some hypotheses that can be generated about strategic responses to issues of food access, specifically affordability issues, when examining the size of a leader's winning coalition, the presence of agricultural interest groups, and the income level of a state.

Large-coalition leaders of high-income states with strong agricultural interests will need to balance the interests of the consumers, who are suffering from high food prices, with the interests of domestic producers. These leaders will be more likely to choose cooperative strategies or quasi-cooperative strategies, which they will employ in a non-excludable manner. Further, these leaders will be able to absorb the costs of policies chosen, an advantage as they have few outside of their winning coalition to whom they can shift the burden of these policies. As a result, leaders such as these will more likely choose one or more[400] of the following: increase domestic production, increase foreign direct investment, and implement consumer subsidies that serve to decrease the price of certain commodities for all consumers in a state. Whereas the first two strategies serve to drive

[400] An earlier assumption made is that leaders of large winning coalitions in high-income states have the capacity and motivation to employ a multitude of strategies in response to issues of food insecurity.

down prices of food items by increasing domestic production, the third strategy is meant to offset high prices for consumers of certain goods. This does not encourage domestic production, but it does allow producers to continue to charge higher prices.

Leaders of low-income states with large coalitions that include strong agricultural interests will face a dilemma in their response to food affordability that is similar to those facing issues of availability. These leaders will feel pressure from consumers to lower the price of food. These leaders will also, however, face pressure from domestic producers to prevent other goods from flooding the market and driving down the price of domestic goods and thus their profits. Leaders in these situations will then have to make a choice between consumers and producers within their winning coalition. Likely, this choice will benefit some and hurt others. Thus these leaders' support coalition will likely shrink in size so that it is lower than their winning coalition.

Leaders of high-income states with large coalitions that include weak agricultural interests will be more likely to choose to increase imports so as to drive down the price of food on the domestic market. Leaders of low-income states with large coalitions that include weak agricultural interests will have an easier time than those that do. They should be able to ask for and receive food aid. Whereas an influx of food would not be attractive to those wishing to protect domestic producers, if a leader is unconcerned with agricultural interests this would be the cheapest strategy to implement.

This project assumes that leaders of high-income states with small coalitions that include agricultural interests will choose to increase foreign direct investment or engage in resource conflicts in response to issues of food affordability. Both strategies are more likely to be implemented by a leader of a high-income state as both are costly. Moreover, as leaders of small winning coalitions need to be concerned only about those individuals within their coalition, they can choose more

conflictual strategies, such as resource conflicts. If they are victorious, they can distribute the benefits of the conflict (i.e. food inputs) via private goods. If, however, they are defeated, they can shift the cost of the conflict onto individuals outside their winning coalition. Finally, were these leaders to choose foreign direct investment, they would implement this strategy so as to benefit those agricultural interests within the winning coalition and the harvests yielded from these investments would be distributed only to those affected within the winning coalition, either at a reduced cost or for free.

Leaders of low-income states with small coalitions that include strong agricultural interests will have limited viable options when addressing food access. In specific, this project predicts that those concerned about agricultural interests will not have any viable options. These leaders will be interested in protecting the profits of domestic producers. This interest excludes strategies that introduce competitive products onto the domestic market such as increasing imports or food aid. Though policies meant to increase domestic production would serve the agricultural interest and decrease the price of food domestically, these leaders are unable to absorb the cost these policies. Further, these leaders would be unable to finance strategies such as implementation such as consumer subsidies or resource conflicts. In such cases one would likely see support for this leader decline.

Leaders of high-income states have more options when responding to food insecurity. Further, leaders that do not have strong agricultural interests to consider will be less constrained when choosing which strategy to implement in response to food affordability issues. Finally, leaders in this situation that have small winning coalitions will only be interested in lowering the price of food only for affected by high prices that are within their small winning coalition. As a result, these leaders will be more likely to choose as quasi-cooperative strategy of consumer subsidies; however,

they will implement this strategy by offering non-commodity specific subsidies that targets a certain group rather than a specific food item.

Leaders of low-income states with small coalitions that are unconcerned about agricultural interests will have more options than small coalition, low-income leaders who are interested in pleasing agricultural interest groups. These leaders will be able to increase the food supply and drive down the cost for each food item by either choosing to increase imports or receive food aid in response.

12.3. Hypotheses

If a state is facing an issue of food access, specifically the issue of affordability, a leader may choose to implement one or more specific strategies:

> *Hypothesis 19*: Leaders experiencing issues of food access will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, to receive food aid, to engage in foreign direct investments in food production, to maintain or increase consumer subsidies, and to participate in resource conflicts.

To determine whether there are patterns of strategic responses to certain types of food insecurity that can be explained by examining the size of a leader's winning coalition, the agricultural interests within a state, and the income-level of that state, this project will generate eight hypotheses about state responses to issues of food access.

Hypothesis twenty will predict responses of leaders with strong agricultural interests in high-income states (i.e. LARGE-STRAG-HIGHs). Assuming that large-coalition leaders will choose

cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis twenty states:

> *Hypothesis* 20: In response to issues of food access, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies, to engage in foreign direct investment, or to maintain or increase consumer subsidies.

Hypothesis twenty-one will predict the response of leaders with large-winning coalition leaders with strong agricultural interests in low-income states (i.e. LARGE-STRAG-LOWs). Assuming that large-coalition leaders will choose cooperative or non-excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that low-income states will be financially constrained, hypothesis twenty-one states:

> *Hypothesis 21*: In response to issues of food access, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, or to do nothing.

Hypothesis twenty-two will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in high-income states (i.e. LARGE-WAG-HIGHs). Assuming that

large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to certain choose strategies, and that high-income states will be able to implement most policy options, hypothesis twenty-two reads:

> *Hypothesis* 22: In response to issues of food access, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-HIGHs) will choose to maintain or increase trade openness policies.

Hypothesis twenty-three will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in low-income states (i.e. LARGE-WAG-LOWs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to protect against food imports or to refuse significant amounts of food aid, and that low-income states will be financially constrained, hypothesis twenty-three reads:

> *Hypothesis 23*: In response to issues of food access, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-LOWs) will receive food aid.

This project will also generate four hypotheses about small-winning coalition leaders. Hypothesis twenty-four will predict responses of small-winning coalition leaders with strong agricultural interests in high-income states (i.e. SMALL-STRAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or quasi-cooperative, yet excludable, strategies in response to

food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis twenty-four states:

> *Hypothesis 24*: In response to issues of food access, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment.

Hypothesis twenty-five will predict responses of leaders with small-winning coalition leaders with strong agricultural interests in low-income states (i.e. SMALL-STRAG-LOWs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that a low-income state will be financially constrained, hypothesis twenty-five states:

> *Hypothesis 25*: In response to issues of food access, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, and to receive food aid.

Hypothesis twenty-six will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in high-income states (i.e. SMALL-WAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response

to food insecurity, that there will be little to no pressure on the leader from agricultural interests, and that high-income states will be able to implement most policy options, hypothesis twenty-six states:

> *Hypothesis 26*: In response to issues of food access, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-HIGHs) will choose to maintain or increase consumer subsidies.

Hypothesis twenty-seven will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in low-income states (i.e. SMALL-WAG-LOWs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies, that there will be little to no pressure on the leader from agricultural interests, and that low-income states will be financially constrained, these leaders will more likely focus on receiving food aid. In these cases, the leader will not distribute the food aid in an equitable manner but will concentrate on ensuring those affected within his or her winning coalition are the primary if not exclusive recipients. Thus hypothesis twenty-seven is:

> *Hypothesis 27*: In response to issues of food access, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-LOWs) will choose to maintain or increase trade openness policies and to receive food

12.4. Dependent Variables

This empirical test will include the eleven strategies (including doing nothing), and they will each be coded dichotomously. The details are included again in section. In addition, hypothesis twenty-six predicts that a small-winning coalition leader will choose non-commodity specific consumer subsidies as a strategy to lower the prices of food for those within his or her winning coalition. As a result, this empirical model also includes a dependent variable that measures the nature of consumer subsidies.

Domestic Production Subsidies. For this empirical examination, if Anderson and Nelgen's[401] NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[402] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated

[401] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives.* Washington D.C.: World Bank.
[402] Ibid.

by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[403] Out of these many states for which data was available, this many protected this much…This project will code this percentage as a one for conservationist and this percentage as a zero.

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[404] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[405] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[406] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade

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[403] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
[404] World Food Program. (2012). *Food Aid Information System.* Rome, Italy: United Nations.
[405] United Nations Conference on Trade and Development. (2009). *World Investment Report.* Geneva, Switzerland: United Nations.
[406] United Nations Conference on Trade and Development. (2014). *World Trade Data.* Geneva, Switzerland: United Nations.

barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[407] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[408] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[409] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

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[407] Population Division. (2009). *World Population Policies*. New York: United Nations.
[408] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[409] Ibid.

12.5. Independent Variables

Size of a Leader's Winning Coalition. For this empirical test, the key explanatory variable for explaining variation in the nature of strategic response is the size of a leader's winning coalition. As in the model presented in chapter seven, this model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[410] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

Strength of Agricultural Interests. The World Bank Development Indicators offer a measurement for the size of an agricultural sector within a state based on the share of agriculture in the state's overall GDP.

State Income-Level. The key explanatory variable for this empirical test is state income level. The data for this variable are the Gross National Income (GNI) per capita of each state in a given year offered by the World Bank.[411] Measurements for income-level tend to include the log of per capita income.[412] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

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[410] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.
[411] World Bank. (2011). *World Development Indicators Databases*. Washington, D.C. The World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.
[412] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.

12.6. Control Variables

Level of Food Access Issues. The measurement for this variable is the original one presented in chapter three. Measurements vary from zero (i.e. no food access issues within a state) to one (i.e. high presence of issues of food access within a state).

12.7. Empirical Results

This project hypothesized that leaders facing issues of food access are more likely to increase domestic food production, lower trade barriers on food imports, receive food aid, increase foreign direct investments in food production, increase consumer subsidies, and engage in resource conflicts. The results listed in Table 12.1 confirm these expectations.

Leaders facing food access issues are likely to choose domestic production subsidies, and these results are highly significant (p-value=5.47e-11). Though initially no relationship existed between food access issues and a leader's choice to lower trade barriers, this relationship is highly significant and positively correlated when one controls for income level (p-values= 0.00231). This further supports the findings in chapter eleven that high income states are more likely to address issues of food insecurity with open trade. Leaders facing food access issues are also likely to receive food aid, and these results are highly significant (p-value = <2e-16).

Though initially no relationship existed between food access issues and a leader's choice to engage in OFDI, this relationship is significant and positively correlated when one controls for strength of agricultural interests (p-values= 0.0375). Further, though no relationship existed between food access issues and a leader's choice to maintain or increase consumer subsidies, this relationship is significant and positively correlated when one controls for income level for a state (p-values= <2e-16).

As a result, domestic production subsidies and food aid are strategies chosen across different states in response to food access issues, trade openness and consumer subsidies are strategies chosen by high-income states in response to food access issues, and OFDI is chosen by states with strong agricultural interests in response to food access issues.

Table 12.1 Issues of Food Access & Strategic Responses

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies	0.310483	0.047005	6.605	5.47e-11 ***
Trade Openness	-0.005147	0.007302	-0.705	0.481
Food Aid	0.051782	0.004319	11.99	<2e-16 ***
OFDI Food	-5.518e-06	4.295e-06	-1.285	0.199
Consumer Subsidies	-0.006183	0.008813	-0.702	0.483

As Table 12.2 illustrates, leaders of high-income states with large winning coalitions that include strong agricultural interests will be highly likely choose to encourage domestic production (p-value=1.86e-12) and increase or maintain consumer subsidies in response to issues of food access (p-value=0.0683). Though the relationship with LARGE-STRAG-HIGHs and OFDI is positively correlated, it fails to reach statistical significance (p-value = 0.133). When examining the relationship between choosing OFDI and each of the components of LARGE-STRAG-HIGHs (i.e. size of a winning coalition, agricultural interests, and income level), it becomes clear that large winning coalitions and high-income states are highly likely to pursue OFDI when faced with access issues (with p-values of 1.36e-09 and 0.00671 respectively).

The relationship between the strength of agricultural interests and OFDI is less clear (p-value of 0.716). As noted in chapter nine, however, this project asserts that strong agricultural interests that consist of large commercial farms are the ones most interested in OFDI because they can afford the significant contributions required of them to invest abroad. When this project

reexamines the relationship between the strength of agricultural interests and OFDI, controlling for type of agricultural interests, states with strong agricultural interests that consists of large commercial farms are highly likely to respond to access issues with OFDI (p-value=2.57e-05).

Table 12.2 Large Winning Coalition, Strong Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies	0.347337	0.048857	7.109	1.86e-12 ***
OFDI Food	0.009681	0.006446	1.502	0.133
Consumer Subsidies	0.014881	0.008155	1.825	0.0683 .

This project also predicts that leaders of low-income states with large winning coalition that include strong agricultural interests will have limited options for pleasing their consistency. Strategies that please agricultural interests are either expensive to implement (e.g. domestic subsidies and OFDI) or would increase the price of food for consumers whom are already facing access issues (e.g. trade protectionism). Strategies that please those who are food insecure are either expensive to implement (e.g. consumer subsidies) or would be in direct contrast to the agricultural interests they are interested in pleasing (e.g. food aid or opening trade). As a result, this project predicts that a leader of a LARGE-STRAG-LOW may choose not to respond.

As Table 12.3 illustrates, these leaders are likely to respond, even though there options are limited. Of the strategic responses to issues of food access, these leaders are likely to ignore the agricultural interests and receive food aid. One may assume that perhaps these leaders encourage aid that does not compete with domestically-grown food products to minimize the impact of this choice on agricultural interests. Though examining the effectiveness of this strategic choice is beyond the scope of this project, one would assume that these leader's support coalitions would shrink as agricultural interests protested this strategy.

Table 12.3 Large Winning Coalition, Strong Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Do Nothing	-0.192596	0.105759	-1.821	0.0687 .
Food Aid	0.32175	0.01620	19.86	<2e-16 ***

As predicted and noted in Table 12.4, if leaders of high-income states have large winning coalitions that do not include strong agricultural interests, they will choose to increase imports in response to issues of food affordability (p-value = 0.0468).

Table 12.4 Large Winning Coalition, Weak Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Openness	0.05416	0.02721	1.99	0.0468 *

If leaders of low-income states have large winning coalitions that do include a strong agricultural interest group, they will be highly likely to choose food aid in response to issues of food affordability (p-value = 1.71e-07).

Table 12.5 Large Winning Coalition, Weak Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Food Aid	0.063669	0.012148	5.241	1.71e-07 ***

This project predicts that leaders of high-income states that have small winning coalitions that include a strong agricultural interest group will likely choose to increase foreign direct investment or engage in resource conflicts in response to issues of food affordability. The relationship between SMALL-STAG-HIGHs and OFDI is positively correlated as predicted and statistically significant (p-value = 0.0775).

As noted in Table 12.6, the relationship between SMALL-STAG-HIGHs and ODFI is positively correlated. Further, this relationship is statistically significant.

Table 12.6 Small Winning Coalition, Strong Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
OFDI Food	0.012317	0.006973	1.766	0.0775 .

As with leaders of low-income states that have large winning coalitions that include strong agricultural interests, SMALL-STRAG-LOWs will also have to choose between strategies that please their strong agricultural interests or those that address the food insecurity within their state borders. Unlike, LARGE-STRAG-LOWs, however, these leaders will be more likely to choose not to respond to food insecurity within their borders. This seems plausible as small winning coalition leaders will be less likely to have food insecure individuals within their winning coalition based on a probability of numbers.

Table 12.7 Small Winning Coalition, Strong Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Do Nothing	0.36261	0.01624	22.33	<2e-16 ***

As Table 12.8 indicates, leaders of high-income states with small winning coalitions that include weak agricultural interests will be more likely to choose consumer subsidies in response to issues of food affordability. This relationship is highly significant with a p-value of 2.34e-07.

Table 12.8 Small Winning Coalition, Weak Agricultural Interests, High-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Consumer Subsidies	0.076372	0.014698	5.196	2.34e-07 ***

Finally, as Table 12.9 illustrates, leaders of low-income states with small winning coalitions that do not include strong agricultural interest group will likely choose to receive food aid in response to issues of food affordability.

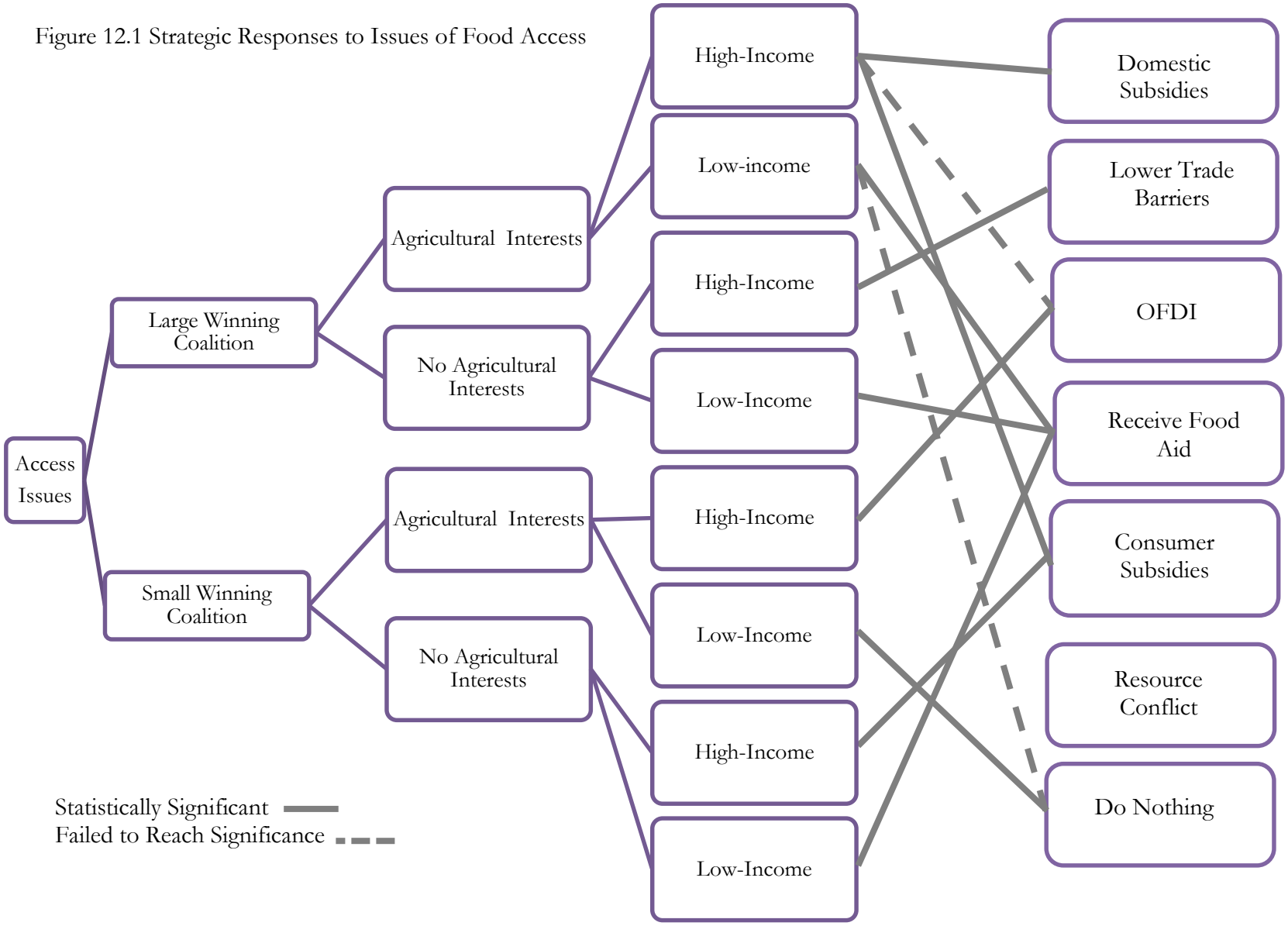
Table 12.9 Small Winning Coalition, Weak Agricultural Interests, Low-Income State, & Strategic Responses to Issues of Food Access

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Food Aid	0.095838	0.010321	9.286	<2e-16 ***

12.8. Political Implications

Overall, the results of the empirical study confirm the hypotheses presented in this chapter with few exceptions. As had occurred in the previous chapter, this project hypothesizes incorrectly that a leader will choose to do nothing when faced with sub-optimal choices. This is not the case, however, as leaders find it political advantageous to do something, even if their choice risks isolating part of their winning coalition. In the case of food access issues, it appears that large-coalition leaders of low-income states with strong agricultural interests will choose to receive food aid even though this is not in the best interests of domestic producers. Interestingly, small coalition leaders in the same position will choose instead to do nothing.

Figure 12.1 Strategic Responses to Issues of Food Access



CHAPTER 13

STRATEGIC RESPONSES TO ISSUES OF FOOD UTILIZATION

This chapter addresses the strategic responses to issues of utilization. The first section of this chapter explains which strategies a leader is likely choose when facing issues of food utilization. The second section then includes the size of a leader's winning coalition, the level strong agricultural interests, and the level of income as key explanatory variables to predict which of these strategies a leader will choose when faced with issues of utilization.

12.1. Possible Strategic Responses to Issues of Food Utilization

Once food has been made available and individuals gain access to it, the last step in the process is food consumption. Food utilization issues center around two different food consumption problems: undernourishment and malnourishment. Undernourishment occurs when an individual lacks sufficient amounts of calories from food. Most cases of undernourishment may be because of availability, access, or stability issues that disrupt the food production to consumption process. There are other situations, however, in which an individual may be unable to consume sufficient quantities of food calories because of existing or underlying health concerns.

A second, more distinct issue associated with food utilization is malnourishment. In these situations, individuals lack certain macro- or micronutrients essential for maintaining a level of health. Macronutrients are the components in food that provide energy: proteins, carbohydrates, and fats. Healthy ranges for macronutrients in proportion to overall energy intake are 55-75 percent for

carbohydrates, 15-35 percent for fats, and 10-15 percent for proteins.[413] In addition to macronutrients, the body also needs micronutrients, or minerals and vitamins needed for proper growth, development, and function.[414] The World Health Organization considers iron, iodine, and vitamin A to be the three most important micronutrients to one's health obtained from food consumption.[415]

As noted in previous chapters, food utilization issues include undernourishment and malnourishment. Whereas undernourishment describes the state in which an individual does not obtain sufficient calories from food, malnourishment describes the state in which an individual may or may not obtain sufficient or insufficient calories. In either case, the individual does not obtain necessary macro- and micronutrients required by the body to live an active and healthy life.

Issues of undernourishment are closely related to issues of availability and access. In situations in which an individual suffers from undernourishment, many of these situations may the result of food availability issues within a state (i.e. there are not large amounts of food available in the state) or access issues (e.g. food is available but has not been properly transported to certain regions, or it has been sold at prohibitively high prices on the markets, or it has not been prepared or distributed well within the household). In such cases, undernourishment may be the direct result of these processes.

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[413] The FAO offers data on the average percentage of intake for each of these types of macronutrients by state. This indicator, however, is far from ideal for two reasons. First, the range of acceptable intake is varies so much for each type of macronutrient that it is difficult to truly understand if a population may be suffering from malnutrition based on this data. Second, these data are estimates based on production trends and not actual measurements of consumption. As this project has already included the FAO's production data, these two measurements would be almost perfectly correlated. It is for these reasons this measurement is not included in this study.
[414] Food and Agricultural Organization. (2000). *State of Food Insecurity in the World*. Rome, Italy: United Nations.
[415] Ibid.

Leaders interested in targeting such situations of undernourishment would likely implement strategies that are similar to those targeting food availability or access.

What makes undernourishment issues distinct from availability and access issues is that there is an additional component that includes the biological utilization abilities of individuals. These factors take into account how an individual's overall health may affect his or her ability to transfer calories into energy in those situations whether or not availability and access may not be issues. Though there may be strategies leaders can employ to reduce diseases within a state (e.g. improve the health infrastructure within a state, implement nation-wide vaccine campaigns, etc.), it is more difficult to isolate which of these strategies target food utilization issues specifically.

Issues of malnourishment are easier to examine. As mentioned earlier, malnourishment exists when an individual is unable to obtain the necessary macro-and micronutrients he or she needs. Originally, strategic responses to malnourishment in the past by state leaders, non-governmental organizations, and international organizations have been focused on the assumption that donations of large quantities of food should alleviate food insecurity issues, including malnourishment, within a recipient state. Subsequent research and a greater understanding of issues of malnourishment have shown that increases of certain kinds of foods are needed to decrease issues of malnourishment.

This project asserts that leaders that are faced with food utilization issues of malnourishment within their winning coalition will be the more likely to respond with strategies that target specific food commodities than if these leaders were facing another type of food insecurity. For an overview of the strategies leaders will choose in response to issues of food utilization, please see Figure 13.1.

Some of the strategies lend themselves to more targeted responses than others. Of the ten strategies, resource conflict, population control policies, and sustainable agricultural policies are

inappropriate for addressing issues of food utilization. Resource conflicts are meant to secure certain agricultural inputs, and thus would not be used to directly address issues of malnourishment. Population control policies also may have the indirect effect of decreasing pressure on the supply of certain food items, but a leader would not likely choose this strategy as a direct response to malnourishment. Sustainable agricultural policies attempt to ensure long-term agricultural inputs and thus would not be the optimal policy for a leader interested in alleviating malnourishment in the near term.

Strategies in which food commodities are consistently regulated by the state are the easiest for state leaders to choose to increase certain types of food items. These strategies include: domestic producer subsidies that target specific food commodities, imports, food aid, foreign direct investment projects, and food rationing systems.

Production subsidies can be implemented to target increases in certain food commodities. Further, imports and food items as aid (i.e. not money transfers) are both easily regulated as they must enter a state through its border areas and can be used to increase the availability of certain macro- and micronutrient-rich foods. In addition, foreign direct investment may be an advantageous strategy to decrease food utilization issues because the state has control over which crops can be grown. Consumer subsidies that seek to make certain commodities or commodity groups cheaper may lower malnourishment in populations so long as the commodities chosen were nutrient rich. Finally, some leaders may choose to implement a food rationing systems to address issues of food utilization. Though food rationing systems may limit the amount of food available for individuals within the population, it may also be used to ensure that the limited supply of available food be reserved for certain individuals within a state's population.

Trade protectionism is a strategy that could be used to increase food utilization. First, these policies can target certain commodities or a commodity group. For example, a state can increase tariffs on a certain type of wheat, wheat in general, or all cereal grains. Second, by implementing these strategies, the state is creating an incentive for domestic producers to increase production on commodities that once had to compete with certain imports. As a result, domestic production in these commodities, or substitutable alternatives, should increase. Third, if substantial production increases, then these policies may serve to direct down the price of these items on the domestic market eventually. Thus at best trade protection at best may serve as a long-term strategy for creating greater self-sufficiency, increasing domestic production, and driving down prices.

12.2. Predicting Strategic Responses to Issues of Food Utilization

Large coalition leaders will be likely to implement cooperative strategies or quasi-cooperative strategies in a non-excludable manner. There are two cooperative strategies for decreasing malnourishment: implement domestic producer subsidies to encourage the increase in production of certain nutrient rich food items or increasing imports on such items.

Leaders with large winning coalitions addressing malnourishment may also choose the quasi-cooperative strategies of receiving food aid, increasing foreign direct investment, and implementing consumer subsidies. Large-coalition leaders may focus on receiving food aid. Food aid, like imports, can be easily regulated as they must enter a state through border areas. The literature on food aid suggests that past food aid was based on the export of donor states' surpluses and focused less on

the recipient states' food needs.[416] Shifts in these trends since the 1980s, however, suggest that donor states are considering the recipient states needs more. As a result, if a leader is interested in receiving food aid as a means for addressing food utilization issues, one would expect that he or she would be vocal in the need for certain kinds of food and that food aid imports would be based on these requests. Thus one would expect to see an increase in the receipt of certain kinds of food items in response to food utilization.

These leaders may also choose to increase foreign direct investment. These investments would be targeted to encourage that certain crops be produced that would improve the quality of individuals' diets in the home state. Thus one would expect to see detailed production plans that focused on producing a certain group of food items and then transporting those items back to the home state to be distributed or sold.

If a large-coalition leader were to choose consumer subsidies, he or she would be more likely to implement subsidies that target specific commodities or commodity groups. By making nutrient-rich goods cheaper, they may be able to lower malnourishment in their population. Consumer subsidies are a preferable option for large-coalitions leaders as these subsidies are non-excludable (i.e. any individual in a state can benefit from these subsidies if they choose to purchase a given food item).

As noted previously, trade protectionism as a response to food utilization issues is highly unlikely to be chosen by large winning coalition leaders as it is excludable, or conflictual in nature. Whereas these policies serve the interests of producers by decreasing the price imports relative to domestic goods, they result in higher prices for domestic consumers.

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[416] E.g. Friedmann, H. (1982). The Political Economy of Food: The Rise and Fall of the Postwar International Food Order. *American Journal of Sociology*, S248-S286; Friedmann, H. (2009). Discussion: Moving Food Regimes Forward: Reflections on Symposium Essays. *Agriculture and Human Values*, 26(4): 335-344.

If large coalition leaders ever do choose to implement trade protectionist strategies (e.g. to move toward greater long-term food self-sufficiency), they will absorb the cost increase for the consumers or face political consequences. Thus trade protectionism will only be chosen by a large-coalition leader only if consume subsidies are implemented well. In such cases, the implementation of consumer subsidies is the strategy that is addressing immediate issues of malnourishment.

Leaders with small winning coalitions will be more likely to choose conflictual strategies than large-coalition leaders. As a result, they will be likely to choose trade protectionism or to implement food rationing systems when addressing issues of food utilization than large coalition leaders.

Were small winning coalition leaders likely to implement trade protectionism to target malnourishment, they would implement other strategies in combination to these to offset the rising prices for those consumers within their winning coalition. Motivated by a push for increase self-sufficiency in the long-term, these leaders would be motivated to shift the immediate costs of these policies onto a portion of the population outside of their winning coalition. As a result, these leaders would likely distribute food aid only to those consumers within their winning coalition to decrease their expenditures on food, increase non-commodity specific consumer subsidies that allow only members within the winning coalition to gain access to subsidized food items., or implement a food rationing system that reallocates food rations to from individuals outside of the winning coalition to members within their winning coalition. Were these leaders to choose one of these strategies in conjunction with trade protectionism, the other strategy would be seen as the immediate, and thus primary, solution to issues of malnourishment within the leader's small winning coalition.

Some small coalition leaders will choose only to implement food rationing systems. These systems serve to control the distribution of the limited food supply. When food supplies are low,

small coalition leaders can use such systems to limit the amount of food obtained by individuals outside of their winning coalition so as to ensure an adequate food supply for members within their winning coalitions. If malnourishment is an issue for members of the winning coalition, the leader would likely attempt to control the supply of nutrient-rich foods.

If these leaders choose to implement any of the quasi-cooperative strategies, they will do so in a manner that only marginally increases the amount of certain types of food to address issues of malnourishment as they only need small increases to decrease malnourishment within their winning coalitions.

For example, if a leader were to implement foreign direct investment or food aid in an excludable manner, one would expect to see marginal increase in nutrient-rich food items as leaders would only need enough to please those affected in their smaller winning coalition. If leaders were interested in implementing consumer subsidies to alleviate malnourishment within their small winning coalition, they would likely implement non-commodity specific subsidies that can provide extended relief to a certain, targeted group of people.

Leaders who are interested in both considering agricultural interests within their larger winning coalition and reducing malnourishment in their state will likely choose to either increase domestic production subsidies on high-protein foods or targeted foreign direct investment in food production to increase macro- or micronutrient rich foods in the market and decrease malnourishment within the state. As foreign direct investment will be used in a non-excludable manner by these leaders, it should lead to a significant increase in availability of these food commodities on the domestic market.

Leaders who are interested in both considering agricultural interests and reducing malnourishment in their small winning coalition will more likely choose to increase targeted foreign direct investment that has marginal food returns to the home state or increase targeted trade protectionist policies. If the leader employs the latter, he or she will also choose strategies that decrease the cost of food for consumers within his or her winning coalition (e.g. receive food aid, increase non-commodity specific consumer subsidies, or implement the food rationing system). If the leader fails to implement such strategies in conjunction with trade protectionism, he or she will likely face negative political consequences.

Leaders with large winning coalitions will necessarily choose to finance policies that target food utilization issues by using state resources rather than shifting the cost burden onto members of the population. As these leaders are concerned with a larger portion of the population's well-being, leaders with high-income level states will be more fortunate as they will have the resources to finance one or more of the strategies mentioned above. If these leaders must also consider agricultural interests, they will more than likely focus on increasing domestic producer subsidies for nutrient-rich foods or increase foreign direct investments projects that seek to increase these foods. If these leaders choose the latter, they will make significant investments in these projects and large quantities of food will be shipped back to the home state.

Leaders with large coalitions that include strong agricultural interests will be at a disadvantage when choosing how to respond to malnourishment issues in their state. Specifically, the strategies chosen to accommodate agricultural interests, commodity-specific producer subsidies and foreign direct investment, are costly to implement. Large-coalition leaders of low-income states

can neither absorb the costs of these strategies nor shift the burden onto portions of the population without facing negative political consequences.

Leaders of high-income states with large coalitions that are unconcerned with agricultural interests will be more likely of all the leaders to choose to increase imports of certain, nutrient-rich foods in response to malnourishment issues. In addition, they may choose consumer subsidies. Though these do not benefit producers, they serve to benefit consumers, which may include farmers as well. If a large-coalition leader chooses this strategy, he or she will implement commodity-specific consumer subsidies because they are non-excludable.

Leaders of low-income states with large coalitions that do not include agricultural interests will choose to increase food aid as their policy option. This strategy serves to decrease malnourishment while not placing the burden of the policy costs onto a portion of the state's population. As these leaders are concerned about the well-being of the entire population, they will request and ideally receive significant amounts of food aid.

If small-coalition leaders of high-income level states have strong agricultural interests, they are more likely to increase targeted foreign direct investment or increase trade protectionism. Each of these strategies serves to benefit domestic producers. Though trade protectionism is relatively inexpensive to implement, these leaders may prefer this strategy over foreign direct investment if the agricultural interests within their state are smaller-sized farmers. In contrast leaders with larger commercial producers will be more likely to engage in foreign direct investment. In either case, these leaders will increase production in food that is rich in nutrients and direct these crops back to the winning coalition members affected by malnourishment. As this group is expected to be relatively small, one would expect to see only marginal increases in these products when these strategies are

implemented. As trade protectionism will increase the costs of goods for domestic consumers, these states must also consider strategies that offset these increases for members of their winning coalition (e.g. non-specific consumer subsidies, food aid, and food rationing systems).

Small-coalition leaders of low-income states will choose to implement trade protectionism in response to issues of malnourishment within their winning coalition. In doing so, they will also be likely to receive food aid. This strategy serves to decrease the increase in food costs for consumers within their winning coalition. Though other strategies may serve the same purpose (e.g. food rationing systems and non-commodity specific consumer subsidies), receiving food aid is the least expensive of these strategies. Thus it will be preferred by a low-income state.

In contrast, small-coalition leaders of high-income states will likely choose to implement food rationing systems or increase non-commodity specific consumer subsidies in response to malnourishment issues. If, however, they are small-coalition leaders of low-income states and do not have a strong agricultural interest within their winning coalition, they will likely receive nutrient-rich food aid, which they will distribute only to those affected within their winning coalitions.

12.3. Hypotheses

If a state is facing an issue of food access, specifically the issue of affordability, a leader may choose to implement one or more specific strategies: To determine whether there are patterns of strategic responses to certain types of food insecurity that can be explained by examining the size of a leader's winning coalition, the agricultural interests within a state, and the income-level of that state, this project will generate eight hypotheses about state responses to issues of food utilization.

Hypothesis 28: Leaders experiencing issues of food utilization will choose to maintain or increase domestic producer subsidies on high-protein foods, to maintain or increase trade openness policies on high-protein foods, to receive high-protein food aid, to engage in foreign direct investment, to increase or maintain consumer subsidies on high-protein foods, to implement food rationing systems, and to maintain or increase trade protectionist policies on high-protein foods.

Hypothesis twenty-nine will predict responses of leaders with strong agricultural interests in high-income states (i.e. LARGE-STRAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis twenty-nine states:

Hypothesis 29: In response to issues of food utilization, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies on high-protein food items and to engage in foreign direct investment.

Hypothesis thirty will predict the response of leaders with large-winning coalition leaders with strong agricultural interests in low-income states (i.e. LARGE-STRAG-LOWs). Assuming that large-coalition leaders will choose cooperative or non-excludable quasi-cooperative strategies in

response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that low-income states will be financially constrained, hypothesis thirty states:

> *Hypothesis* 30: In response to issues of food utilization, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.

Hypothesis thirty-one will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in high-income states (i.e. LARGE-WAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to certain choose strategies, and that high-income states will be able to implement most policy options, hypothesis thirty-one reads:

> *Hypothesis* 31: In response to issues of food utilization, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-HIGHs) should choose to maintain or increase trade openness policies on high-protein foods and to maintain or increase consumer subsidies on high-protein foods.

Hypothesis thirty-two will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in low-income states (i.e. LARGE-WAG-LOWs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there

will be little to no agricultural interests pressuring the leader to protect against food imports or to refuse significant amounts of food aid, and that low-income states will be financially constrained, hypothesis thirty-two reads:

> *Hypothesis 32*: In response to issues of food utilization, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-LOWs) will receive high-protein food aid.

This project will also generate four hypotheses about small-winning coalition leaders. Hypothesis thirty-three will predict responses of small-winning coalition leaders with strong agricultural interests in high-income states (i.e. SMALL-STRAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or quasi-cooperative, yet excludable, strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis thirty-three states:

Hypothesis 33: In response to issues of food utilization, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment or to maintain or increase trade protectionist policies on high-protein foods; if a leader chooses trade protectionist policies, he or she will also implement strategies that decrease the costs of food items to targeted consumers (e.g. implement food rationing systems, receive high-protein food aid, and maintain or increase consumer subsidies on high-protein foods).

Hypothesis thirty-four will predict responses of leaders with small-winning coalition leaders with strong agricultural interests in low-income states (i.e. SMALL-STRAG-LOWs). Assuming that large-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that a low-income state will be financially constrained, hypothesis thirty-four states:

Hypothesis 34: In response to issues of food utilization, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose maintain or increase trade protectionist policies on high-protein foods; if a leader chooses trade protectionist policies, he or she will receive marginal increases in high-protein food aid to offset the increased costs for food for members of his or her winning coalition.

Hypothesis thirty-five will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in high-income states (i.e. SMALL-WAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that there will be little to no pressure on the leader from agricultural interests, and that high-income states will be able to implement most policy options, hypothesis thirty-five states:

Hypothesis 35: In response to issues of food utilization, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-HIGHs) will choose to implement food rationing systems and to maintain or increase consumer subsidies for high-protein foods.

Hypothesis thirty-six will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in low-income states (i.e. SMALL-WAG-LOWs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies, that there

will be little to no pressure on the leader from agricultural interests, and that low-income states will be financially constrained, these leaders will more likely focus on receiving food aid. In these cases, the leader will not distribute the food aid in an equitable manner but will concentrate on ensuring those affected within his or her winning coalition are the primary if not exclusive recipients. Thus hypothesis thirty-six is:

> *Hypothesis 36*: In response to issues of food utilization, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-LOWs) will receive marginal increases in high-protein food aid.

12.4. Dependent Variables

This empirical test will include the eleven strategies (including doing nothing), and they will each be coded dichotomously.

Domestic Production Subsidies. For this empirical examination, if Anderson and Nelgen's[417] NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[418] As states can

[417] Anderson, K. (2009). *Distortions to Agricultural Versus Nonagricultural Producer Incentives*. Washington D.C.: World Bank.
[418] Ibid.

implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[419] Out of these many states for which data was available, this many protected this much…This project will code this percentage as a one for conservationist and this percentage as a zero.

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[420] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

[419] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.
[420] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[421] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[422] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across

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[421] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[422] United Nations Conference on Trade and Development. (2014). *World Trade Data*. Geneva, Switzerland: United Nations.

most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[423] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them. If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

[423] Population Division. (2009). *World Population Policies*. New York: United Nations.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[424] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[425] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

12.5. Independent Variables

Size of a Leader's Winning Coalition. For this empirical test, the key explanatory variable for explaining variation in the nature of strategic response is the size of a leader's winning coalition. As in the model presented in chapter seven, this model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[426] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-

[424] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[425] Ibid.
[426] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.

year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

Strength of Agricultural Interests. The World Bank Development Indicators offer a measurement for the size of an agricultural sector within a state based on the share of agriculture in the state's overall GDP.

State Income-Level. The key explanatory variable for this empirical test is state income level. The data for this variable are the Gross National Income (GNI) per capita of each state in a given year offered by the World Bank.[427] Measurements for income-level tend to include the log of per capita income.[428] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

12.6. Control Variables

Level of Food Utilization Issues. The measurement for this variable is the original one presented in chapter three. Measurements vary from zero (i.e. no food utilization issues within a state) to one (i.e. high presence of issues of food utilization within a state).

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[427] World Bank. (2014). *World Bank Atlas Method*. Washington, D.C. The World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.
[427] Ibid.
[428] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.

12.7. Empirical Results

This project asserts that leaders facing food utilization issues of malnourishment within their winning coalition will be likely to respond with strategies that target specific food commodities: domestic producer subsidies, increasing imports, receipt of food aid, foreign direct investment, consumer subsidies, food rationing systems, and trade protectionism. To examine the empirical relationship between food utilization and strategies, this project measured strategies that targeted all food commodities and then those that targeted only high protein foods. The assumption is that leaders interested in addressing macronutrient deficiencies associated with malnourishment would implement policies that the protein supply for food insecure individuals.

The results are listed in Table 13.1. When a state is facing high utilization issues, a leader is less likely (rather than more likely) to respond to these utilization issues by increasing domestic production subsidies on high protein food items. As noted in previous chapters, the choice to implement domestic production subsidies may be driven by income-level as domestic production subsidies require significant financial contributions from the state. When this project reran this empirical examination controlling for income level, utilization issues and a leader's choice to increase or maintain domestic production subsidies on high protein foods were positively correlated and highly significant (p-value = <2e-16).

The initial results for the relationship between food utilization issues and a leader's choice to lower trade barriers or maintain an open trade policy on high protein food items is positively correlated as this project predicted (p-value = 0.00135), and trade protectionism on these same food items in negative correlated (0.00135). OFDI is positively correlated with food utilization issues, while consumer subsidies for high protein foods is negatively correlated with food utilization issues.

This project hypothesizes that leaders of a high-income state with a large winning coalition that includes strong agricultural interests will choose likely increase high protein domestic production subsidies or to engage in foreign direct investments in response to food utilization. The relationship between food utilization issues and a leader's choice to increase OFDI is positively correlated and highly significant as is the relationship between food utilization issues and a leader's choice to increase domestic production subsidies on high protein foods when controlling for type of agricultural interests.

Table 13.1 Issues of Food Utilization & Strategic Responses

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies on High Protein Foods	-0.073717	0.008779	-8.397	<2e-16 ***
Trade Openness on High Protein Foods	0.032814	0.032814	-3.21	0.00135 **
Trade Protectionism on High Protein Foods	-0.105349	0.032814	-3.21	0.00135 **
High Protein Food Aid	0.010975	0.008713	1.26	0.208
OFDI Food	1.497e-05	5.785e-06	2.587	0.00972 **
Consumer Subsidies for High Protein Foods	-0.081542	0.009756	-8.358	<2e-16 ***

Table 13.2 Large Winning Coalitions, Strong Agricultural Interests, High-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Domestic Production Subsidies on High Protein Foods	657.30	61.83	10.630	<2e-16 ***
OFDI Food	1.902e-05	6.906e-06	2.754	0.00593 **

Leaders of low-income states with large winning coalitions that include strong agricultural interests will have a difficult time choosing strategies that both address the concerns of agriculture interests and mitigate food utilization issues. This project predicts that these leaders would either

choose to do nothing, or would a strategy that assisted one group and not the other. As Table 13.3 illustrates, LARGE-STRAG-LOW leaders are likely to respond to issues of food utilization. Further, they may choose to receive food aid (a strategy that targets utilization issues) or increase trade protectionism across all goods (a strategy that helps agricultural interests). When choosing between these two strategies, LARGE-STRAG-LOW are slightly more likely to choose trade protectionism (p-value = 0.0109) than to receive food aid (p-value = 0.0988).

Table 13.3 Large Winning Coalitions, Strong Agricultural Interests, Low-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**
Do Nothing	-0.193610	0.111068	-1.743	0.0814 .
Food Aid High Protein Food	0.123222	0.024598	5.009	5.79e-07 ***
Trade Protectionism	0.06783	0.02683	2.528	0.0116 *

This project predicts that leaders of high-income states with large winning coalitions that do not include strong agricultural interest group will likely choose to increase high protein imports and consumer subsidies in response to malnourishment issues. As Table 13.4 illustrates, these predictions are supported statistically.

Table 13.4 Large Winning Coalitions, Weak Agricultural Interests, High-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**
Trade Openness on High Protein Foods	0.41079	0.08862	4.635	3.92e-06 ***
Consumer Subsidies for High Protein Foods	0.21083	0.02979	7.077	2.39e-12 ***

Leaders of low-income with large winning coalition that do not include agricultural interests will likely receive significant amounts of high protein food as aid to address issues of malnourishment. Table 13.5 illustrates that leaders of such states are not likely to receive high protein food aid. When

this project tested the correlated between food utilization issues in LARGE-NAG-LOWs and low-protein food aid, the relationship was positively correlated and statistically significant (p-value = 0.0143). These results could be capturing he pattern of donor-based aid mentioned in chapter five, in which donor states choose the food to import without focusing primarily on the recipient's needs. As a result, food insecurity issues could be more effectively addressed through a more nuanced view of what type of food is needed in a given state to address the specific type of food aid that state is facing.

Table 13.5 Large Winning Coalitions, Weak Agricultural Interests, Low-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
High Protein Food Aid	0.003696	0.017285	0.214	0.831

As Table 13.6 illustrates, leaders of high-income states with small winning coalitions that include strong agricultural interests will likely choose to increase foreign direct investment (p-value = 0.019). Counter to the expectation, SMALL-STRAG-HIGH leaders are not likely to increase trade protectionism in high protein foods. They are, however, likely to increase trade protectionism across all foods (p-value = 4.98e-05).

This project also predicted that if a SMALL-STRAG-HIGH leader chooses trade protectionism, he or she will also implement a strategy that decrease the costs of goods to targeted consumers. This project found that these leaders were highly unlikely to increase consumer subsidies (p-value = < 2e-16), but highly likely to implement rationing systems (p-value = 0.000297).

Table 13.6 Small Winning Coalitions, Strong Agricultural Interests, High-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Protectionism on High Protein Foods	-0.036986	0.034921 -	1.059	0.29
OFDI Food	1.638e-05	6.981e-06	2.347	0.019 *

As Table 13.7 explains, SMALL-STRAG-LOW leaders will choose trade protectionism in the interest of their agricultural interests and they will also request and receive high protein food aid for those facing food utilization within their sinning coalition.

Table 13.7 Small Winning Coalitions, Strong Agricultural Interests, Low-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Protectionism	0.06841	0.02682	2.551	0.0109 *
High Protein Food Aid	0.21700	0.13135	1.652	0.0988 .

As Table 13.8 demonstrates, SMALL-NAG-HIGH leaders will choose to increase consumer subsidies for high protein foods to address issues of malnourishment.

Table 13.8 Small Winning Coalitions, Weak Agricultural Interests, High-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Consumer Subsidies for High Protein Foods	0.029039	0.013916	2.087	0.0371 *

Finally, this project predicts that leaders of low-income states with small winning coalitions that do not have strong agricultural interests will likely receive high protein food aid. As Tale 13.9 illustrates, the relationship between SMALL-NAG-LOW leaders and choosing high protein food aid fails to reach statistical significance and is negatively (rather than positively correlated). When testing the relationship between SMALL-NAG-LOW leaders and low protein food aid, however, it appears

that these leaders are highly likely to receive food aid that is low in protein (p-value = 5.65e-06). This may be another example of food aid distribution that is donor rather than recipient based.

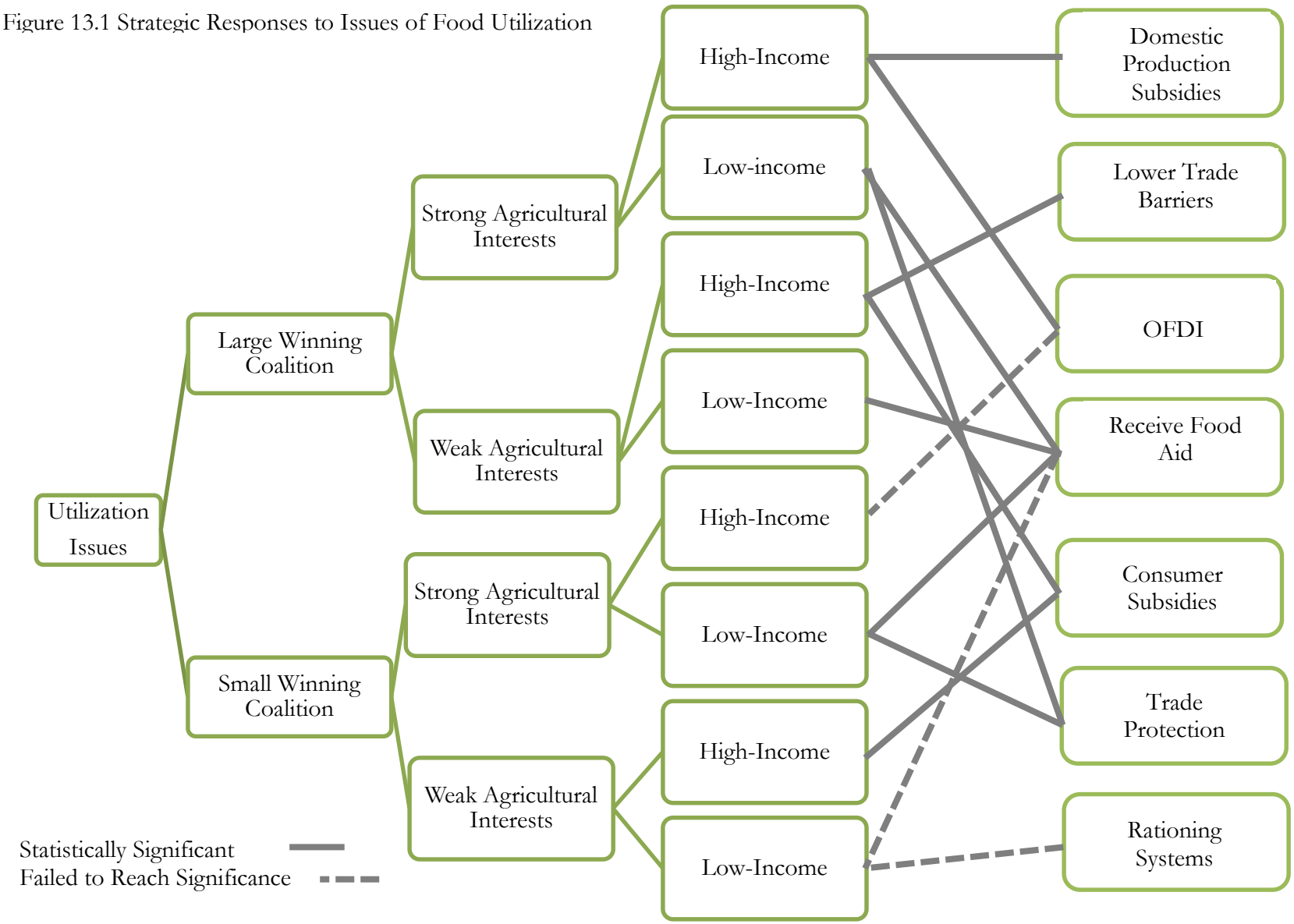
Table 13.9 Small Winning Coalitions, Weak Agricultural Interests, Low-Income State, & Strategic Responses to & Strategic Responses to Issues of Food Utilization

Variables	Estimate	Std. Error	z value	Pr(>|z|)
High Protein Food Aid	-0.005083	0.015119	-0.336	0.737

12.8. Political Implications

Overall the results reflect the expectations put forth in this chapter. The only expectation is this project predicted that a leader with a large-winning coalition, strong agricultural interests, and low-income state will not have an optimal strategic response to food utilization issues within his or her borders. Though there is indeed no ideal strategic response for these leaders, the results indicate that leaders find it politically necessary to respond, even if the strategy they choose isolates either the agricultural interests or those affected by food insecurity within their winning coalition. As Table 13.3 illustrates, these leaders may choose either to protect domestic farmers by increasing or maintaining trade barriers or these leaders will likely choose to increase high-protein food aid to address food utilization issues.

Figure 13.1 Strategic Responses to Issues of Food Utilization



CHAPTER 14

STRATEGIC RESPONSES TO ISSUES OF FOOD STABILITY

This chapter addresses the strategic responses to issues of stability. The first section of this chapter explains which strategies a leader is likely choose when facing issues of food stability. The second section then includes the size of a leader's winning coalition, the level strong agricultural interests, and the level of income as key explanatory variables to predict which of these strategies a leader will choose when faced with issues of stability.

14.1. Possible Strategic Responses to Issues of Food Stability

The final dimension of food insecurity is stability. This dimension does not capture a part in the food production-to-consumption process, but instead factors that have the potential to either maintain or interrupt this process. These factors are as external, secondary effects that are not of the food production-to-consumption process but may affect it nonetheless. Further, these factors can be felt suddenly, like shocks to this system, or they can influence the system more gradually.

Though it is difficult to isolate exactly which strategies may best be used to target food stability issues, as opposed to those that may target other types of food insecurity issues, this project asserts that certain strategic responses to food insecurity insulate the production-to-consumption process from outside shocks or gradual deleterious effects more than others. Put differently, these strategies then offer some more long-term ways to shore up the food production to consumption process. As an example, whereas increasing imports may address food availability in the short-term,

it may also make a state more vulnerable to global price shocks as the domestic consumers become more reliant on the international market. In contrast, were a state leader to choose to invest in foreign direct investment, he or she may be ensuring both an increase in food availability and greater long-term control over the domestic food supply and thus domestic food prices.

Five strategies best target stability issues in the food consumption-to-production process by focusing on the long-term best interest of individuals in a state. First, sustainable agricultural policies seek to balance the short-term benefits of food production (e.g. profits for producers and greater availability) with the long-term benefits of conserving natural resources used in food production.

Second, engaging in foreign direct investment is a means by which leaders increase the availability of natural resources by leasing land, using water, and hiring labor in other states. These agreements are usually not temporary but requiring long-term commitments on the part of both states.

Third, trade protectionism is a strategy by which leaders encourage domestic production by making domestic goods look relatively cheaper as compared with imports. Some states may choose this strategy if they are interested in ensuring "food sovereignty" or long-term self-sufficiency in food production. Fourth, resource conflicts can be seen as a strategy for ensuring long-term access to these resources for food production by attempting to acquire them through force.

Finally, population control policies seek to control the number of residents within a state. In the medium-term, immigration policies seek to limit the pressure non-citizens place on the state's ability to provide for its citizenry, or at least key parts of it. In the long-term, reproduction policies may limit the size of individuals' families within a state. The assumption is that these policies would be used so as to ensure a state can provide for its citizenry (or key parts of it) going forward.

14.2. Predicting Strategic Responses to Issues of Food Stability

If a leader has a large winning coalition, he or she will be more likely to choose sustainable agricultural policies or foreign direct investment in food production. Sustainable agricultural policies are considered to be cooperative domestic strategies because the conservation of natural resources for future food production serves the long-term benefit for all.

In contrast, leaders with small winning coalitions will be more likely to implement trade protectionism, engage in resource conflicts, or institute population control policies in response to ensure food stability. Each of these policies is considered to be conflictual as they exclude certain portions of the population from the benefits each brings. Trade protectionism encourages domestic production by increasing the price of imports for consumers. Resource conflicts can be a means by which leaders share the benefits of the conflict (when victorious) with members of his or her winning coalition, while shifting the cost of that conflict onto those outside of this coalition, and population control policies can be used to ensure food availability and access for coalition members by limiting the overall number of individuals outside of the winning coalition.

Foreign direct investment is a strategy that may be chosen by leaders with either large or small winning coalitions. If a large-coalition leader chooses this strategy, this leader will ensure that this investment produces significant amounts of food that would be exported from the host to the home state. If a small-coalition leader chooses this strategy, this leader will ensure only that sufficient amounts of food would be exported from the host to the home state to feed those within his or her small winning coalition.

If a leader has a strong agricultural interest, he or she could likely choose to implement sustainable agricultural policies, foreign direct investment in food production, trade protectionism,

or resource conflicts in response to issues of stability. Each of these strategies may serve to benefit domestic producers.

Sustainable agricultural policies may benefit producers if the state is willing to compensate producers for their loss of short-term profits by implementing sustainable agricultural practices. The United States' sustainable agricultural policies are a good example of policies which create an incentive on the parts of producers to conserve natural resources by compensating these producers for such efforts.

Foreign direct investment and trade protectionism are strategies that benefit domestic producers as well. Foreign direct investments in food production benefit large commercial producers that are part of these projects, and trade protectionism benefits domestic producers who would otherwise be competing with competitive food imports. Finally, resource conflicts benefit domestic producers in so much as these conflicts lead to successful acquisitions of natural resources that can be used in food production. For an overview of the strategies leaders will choose in response to issues of food stability, please see Figure 14.1.

If a leader is not concerned about strong agricultural interests, he or she may choose to implement population control policies to address stability issues. These strategies seek to mitigate pressure on the domestic food supply by decreasing demand rather than increasing supply. Thus this strategy does not benefit domestic producers.

If large-coalition leaders are concerned with issues of stability in the food production-to-consumption process as well as agricultural interests, they may either choose to implement sustainable agricultural policies or engage in foreign direct investment. Leaders of high-income states in these cases would be likely to absorb the cost of either of these policies. Were he or she to engage

in the latter, one would expect that the intended purpose would be to increase food imports to the home state significantly.

Leaders of low-income states would not have this same luxury. In such cases, these leaders would be unable to choose a strategy that would please both consumers and producers within their large winning coalitions. As a result, in the case of instability, one should expect to see these leaders' support coalitions shrink.

Leaders of large winning coalitions in high-income states that are less concerned with agricultural interests may engage in broader sustainability efforts within their state. These policies may include those that encourage sustainable agricultural production practices. Leaders like these of low-income states will have no optimal strategy for addressing issues of food stability. In such cases, one would expect to see their support coalition shrink.

Leaders of high-income states with small winning coalitions that include agricultural interests will choose foreign direct investments, trade protectionism, or to engage in a resource conflict. Foreign direct investment will be more likely in these situations if the agricultural interests include large commercial producers. Though these projects are likely to be quite large, the food that will be imported to the home state will not be significant as it would be the case for a large winning coalition leader in the same situation as it will only need to target those within the winning coalition. If these small-coalition leaders choose trade protectionism instead of foreign direct investments, it is likely because the domestic producers are small. These leaders may also consider engaging in resource conflicts to acquire access to additional natural resources used in food production.

If leaders with small winning coalitions that include agricultural interests are from a low-income state, they will choose to engage in trade protectionism in response to issues of stability.

This strategy serves to advantage domestic producers, while increasing food self-sufficiency for the state in the long-term.

Leaders of states with high-income levels with small winning coalitions that include weak agricultural interests will be more likely to implement population control policies in response to stability issues. These policies are costly to enforce. Further, they do not serve the interest of domestic producers as they decrease demand for rather than increasing the supply of food.

It is less clear how leaders of states with low-income levels with small winning coalitions that include weak agricultural interests will respond to stability issues. All of the policies in response to stability issues are costly to enforce except trade protectionism. Trade protectionism, however, would only benefit a leader when they are interested in protecting domestic producers from competitive imports. In this case, it is likely that these leaders will try to address stability issues using other, cheaper strategies (e.g. increasing imports and food aid). These strategies may stave off severe stability issues, though long-term vulnerability of the food production to consumption process will remain. The success of these policies will be determined by how effectively the effects of stability issues can be shifted onto the population outside of the winning coalition.

14.3. Hypotheses

If a state is facing an issue with food stability, a leader may choose to implement one or more specific strategies:

> *Hypothesis 37*: Leaders experiencing issues of food stability will choose to implement sustainable agricultural policies, to engage in foreign direct investment, to maintain or increase trade protectionist policies, to participate in resource conflicts, and to maintain or increase population restriction polices.

To determine whether there are patterns of strategic responses to certain types of food insecurity that can be explained by examining the size of a leader's winning coalition, the agricultural interests within a state, and the income-level of that state, this project will generate eight hypotheses about state responses to issues of food access.

Hypothesis thirty-eight will predict responses of leaders with strong agricultural interests in high-income states (i.e. LARGE-STRAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that encourage domestic production, and that high income

states will be able to implement most policy options, hypothesis thirty-eight states:

> *Hypothesis 38*: In response to issues of food stability, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to implement sustainable agricultural policies or to engage in foreign direct investment.

Hypothesis thirty-nine will predict the response of leaders with large-winning coalition leaders with strong agricultural interests in low-income states (i.e. LARGE-STRAG-LOWs). Assuming that large-coalition leaders will choose cooperative or non-excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that low-income states will be financially constrained, hypothesis thirty-nine states:

> *Hypothesis 39*: In response to issues of food stability, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.

Hypothesis forty will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in high-income states (i.e. LARGE-WAG-HIGHs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to certain choose strategies, and that high-income states will be able to implement most policy options, hypothesis forty reads:

Hypothesis 40: In response to issues of food stability, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-HIGHs) will choose to implement sustainable agricultural policies.

Hypothesis forty-one will predict responses of leaders with large-winning coalition leaders with weak agricultural interests in low-income states (i.e. LARGE-WAG-LOWs). Assuming that large-coalition leaders will choose cooperative strategies in response to food insecurity, that there will be little to no agricultural interests pressuring the leader to protect against food imports or to refuse significant amounts of food aid, and that low-income states will be financially constrained, hypothesis forty-one reads:

Hypothesis 41: In response to issues of food stability, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-WAG-LOWs) will not have an optimal strategic response and will choose to do nothing.

This project will also generate four hypotheses about small-winning coalition leaders. Hypothesis forty-two will predict responses of small-winning coalition leaders with strong agricultural interests in high-income states (i.e. SMALL-STRAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or quasi-cooperative, yet excludable, strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that high income states will be able to implement most policy options, hypothesis forty-two states:

Hypothesis 42: In response to issues of food stability, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment, to maintain or increase trade protectionist policies, and to participate in resource conflicts.

Hypothesis forty-three will predict responses of leaders with small-winning coalition leaders with strong agricultural interests in low-income states (i.e. SMALL-STRAG-LOWs). Assuming that large-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that strong agricultural interest groups will pressure the leader to choose strategies that protect and/or encourage domestic production, and that a low-income state will be financially constrained, hypothesis forty-three states:

Hypothesis 43: In response to issues of food stability, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose to maintain or increase trade protectionist policies.

Hypothesis forty-four will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in high-income states (i.e. SMALL-WAG-HIGHs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies in response to food insecurity, that there will be little to no pressure on the leader from agricultural interests, and that high-income states will be able to implement most policy options, hypothesis forty-four states:

Hypothesis 44: In response to issues of food stability, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-HIGHs) will choose to maintain or increase trade protectionist policies.

Hypothesis forty-five will predict responses of leaders with small-winning coalition leaders with weak agricultural interests in low-income states (i.e. SMALL-WAG-LOWs). Assuming that small-coalition leaders will choose conflictual or excludable quasi-cooperative strategies, that there will be little to no pressure on the leader from agricultural interests, and that low-income states will be financially constrained, these leaders will more likely focus on receiving food aid. In these cases, the leader will not distribute the food aid in an equitable manner but will concentrate on ensuring those affected within his or her winning coalition are the primary if not exclusive recipients. Thus hypothesis forty-five is:

Hypothesis 45: In response to issues of food stability, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-WAG-LOWs) will not have an optimal strategic response and will choose to do nothing.

14.4. Dependent Variables

This empirical test will include the eleven strategies (including doing nothing, and they will each be coded dichotomously. The details are included again in section.

Domestic Production Subsidies. For this empirical examination, if Anderson and Nelgen's[429] NRA_{DS} is positive, then this project will code this strategy as a one. If the NRA_{DS} is zero or negative, then this project will code this strategy as a zero.

Low Trade Barriers on Food Imports. Anderson and Nelgen (2013) also offer the nominal rate of assistance for border market support (i.e. NRA_{BMS}), which measures the amount to which tariffs or other non-tariff trade barriers raise the gross return to domestic producers.[430] As states can implemented trade openness by either choosing not to protect domestic producers or actively dismantling existing trade protectionist policies, this project will code trade openness for each state-year as a one if the NRA_{BMS} is negative, if the NRA_{BMS} is zero, or if a positive NRA_{BMS} decreased from the previous year. This project will code trade openness for each state-year as a zero if a positive NRA_{BMS} measurement increases or remains constant from the previous year.

Sustainable Agriculture Policies. As there is no data available to accurately measure states' commitment to sustainable agriculture policies, this project will include the World Bank's measurement the percentage of land (over 1,000 hectares) that is at least protected (e.g. designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use).[431] Out of these many states for which data was available, this many protected

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[429] United Nations Conference on Trade and Development. (2012). *World Investment Report*. Geneva, Switzerland: United Nations.
[430] Ibid.
[431] Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded.

this much…This project will code this percentage as a one for conservationist and this percentage as a zero.

Food Aid. The World Food Program (WFP) offers data on both the aggregate amount in kilograms of food aid received by food commodity.[432] To measure across states and time, this project will convert these measurements to kilograms per capita. If a state in a given year receives food aid, this project will be code the state-year as a one. If a state does not receive food aid, this project will code the state-year as a zero.

Outward Foreign Direct Investment in Food Production. UNCTAD offers data[433] on the value of outward foreign direct investment projects begun by a state per capita from 2004 to 2009. Though this data does not include information on agricultural OFDI investments per country, the World Bank data suggests that five percent of state OFDI is in agriculture.[434] If a state is engaged in overall OFDI in a given year, this project will assume that some of these investments are in the agricultural sector. If there is any OFDI for a given state-year, it will code state-year as a one. If there are no OFDI projects for a given state-year, this project will code it as a zero.

Consumer Food Subsidies. Anderson and Nelgen (2013) offer the value of consumption-weighted averages for consumer tax equivalents (CTEs) for states between 1990 and 2007. Similar to trade barriers, they view consumer food taxes and consumer subsidies as opposite ends of the same spectrum. Thus, if the CTE is positive, it means that government intervention is making food prices higher for the consumer, whereas a negative CTE means that government intervention is lowering food prices for the consumer.

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[432] World Food Program. (2012). *Food Aid Information System*. Rome, Italy: United Nations.
[433] United Nations Conference on Trade and Development. (2009). *World Investment Report*. Geneva, Switzerland: United Nations.
[434] United Nations Conference on Trade and Development. (2012). *World Investment Report*. Geneva, Switzerland: United Nations.

Were a state to want to lower the price of food for consumers, they can do so by either lowering existing food taxes or increasing consumer food subsidies. Thus, if the consumer tax equivalent (CTE) is negative or positive but decreasing, then it will code the consumer food subsidies strategy as a one. If, however, the consumer tax equivalent (CTE) is either positive or negative but increasing, then it will code the consumer food subsidies strategy as a zero.

Raise Trade Barriers on Food Imports. For higher food trade barriers, this project will again use the NRA_{BMS} offered by Anderson and Nelgen (2013). If states implements trade protectionism across most or all products, then its NRA_{BMS} should be positive. If, however, a state either begins to implement trade protectionism for certain products or increases trade protectionism on all products gradually, then the NRA_{BMS} may be negative but the value of the measurement is increasing. This project will code trade protectionism for each state-year as a one if the NRA_{BMS} is positive, or if the NRA_{BMS} is negative but has increased from the previous year. This project will code trade protectionism for each state-year as a zero if a negative NRA_{BMS} measurement decreases or remains constant from the previous year.

Food Rationing Systems. This project has compiled information on state food rationing systems by examining a multitude of academic sources. If a state did implement or maintain a food rationing system in a given year, this project codes this strategy as a one. If a state did not implement or dismantled a food rationing system in a given year, this project codes this strategy as a zero.

Immigration & Fertility Restriction Policies. The United Nations data on government policies that restrict immigration and fertility offer three answers to a state leader survey they conducted.[435] For both types of population restrictions, the government leaders were asked if they intended to implement policies that would raise restrictions, maintain current levels of restriction, or lower them.

[435] Population Division. (2009). *World Population Policies*. New York: United Nations.

If the United Nations data indicate that state leader(s) intended to maintain or raise restrictions on fertility or immigration, this project will code this strategy as a one. If the United Nations data indicate that state leader(s) intended to lower restrictions on fertility or immigration, this project will code this strategy as a zero.

Resource Conflict. The Heidelberg Institute for International Conflict Research (HIIK)[436] stated in its 2012 Conflict Barometer publication issues over resources were the third most common motivation for conflicts.[437] Though no dataset that measure the number or magnitude of resource conflicts for food inputs (e.g. arable land and water) exists, this project compiled data on the number and magnitude of resource conflicts for each state in a given year. For this model, were a state to have engaged in any resource conflicts in a given year, this project will code the state-year as a one. If the state did not engage in any resource conflicts in a given year, this project will code the state-year as a zero.

Do Nothing. The final strategy considered for this model is to do nothing. For the purpose of this model, this project will include a control variable of executive constrain so as to discern between those leaders that choose to do nothing because of political calculus (i.e. no motivation or constraint) and those leaders that are motivated to act, but cannot implement strategies because of executive constraint.

[436] Heidelberg Institute for International Conflict Research. (2012). *Conflict Barometer*. Heidelberg, Germany: Department of Political Science at the University of Heidelberg, 5.
[437] Ibid, 5.

14.5. Independent Variables

Size of a Leader's Winning Coalition. For this empirical test, the key explanatory variable for explaining variation in the nature of strategic response is the size of a leader's winning coalition. As in the model presented in chapter seven, this model will include data for this measurement from the Polity IV dataset and Cheibub, Gandhi, and Vreeland's (2009).[438] As noted previously, this project normalizes these data so that its smallest value is zero and its largest value is one. If a given state-year has a score of 0.5 or lower, that state will be considered to have a leader with a small winning coalition. If, however, a given state-year has a score of 0.5 or higher, that state will be considered to have a leader with a large winning coalition.

Strength of Agricultural Interests. The World Bank Development Indicators offer a measurement for the size of an agricultural sector within a state based on the share of agriculture in the state's overall GDP.

State Income-Level. The key explanatory variable for this empirical test is state income level. The data for this variable are the Gross National Income (GNI) per capita of each state in a given year offered by the World Bank.[439] Measurements for income-level tend to include the log of per capita income.[440] This project adopts the World Bank's categories of lower-income, lower-middle income, upper-middle income, and high-income states. For lower-income states, the GNI per capita is at or below $1,025. For the lower-middle income states, the GNI per capita ranges from $1,026 to $4,035. For upper-middle income states, the GNI per capita ranges from $4,036 to $12,475, and for high-income states the GNI per capita is at or higher than $12,476.

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[438] Cheibub et al. (2010). Democracy and Dictatorship Revisited. *Public Choice*, 143(2-1): 67-101.
[439] World Bank. (2014). *World Bank Atlas Method*. Washington, D.C. The World Bank includes both the average exchange rate for a state's currency and the rate of inflation occurring within a state in its calculations of GNI.
[440] Morrow et al. (2008). Retesting Selectorate Theory: Separating the Effects of W from Other Elements of Democracy. *American Political Science Review*, 102(3): 393-400, 396.

14.6. Control Variables

Level of Food Stability Issues. The measurement for this variable is the original one presented in chapter three. Measurements vary from zero (i.e. no food stability issues within a state) to one (i.e. high presence of food instability within a state).

14.7. Empirical Results

This project hypothesizes that leaders addressing stability issues will be likely to implement sustainable agricultural policies, to engage in foreign direct investment, to raise barriers on food imports, to engage in resource conflicts, and to implement population control policies.

Though the initial results reported in Table 14.1 suggest a negative correlations between stability issues and sustainable agricultural policies, this relationship is highly significant and positively correlated when controlling for income level (p-value = <2e-16). This makes sense as these policies require significant financial contributions by the state both to set aside land for conservation and enforce that sustainable practices are being followed.

Table 14.1 Issues of Food Stability & Strategic Responses

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Sustainable Agriculture	-0.0004381	0.0003373	-1.299	0.194
Resource Conflicts	0.0002288	0.0001478	1.548	0.122
Trade Protectionism	0.015007	0.011020	1.362	0.173
Immigration Restriction	-0.022645	0.004624	-4.897	1.03e-06 ***
Fertility Control Policies	-0.021122	0.002926	-7.22	6.95e-13 ***
OFDI Food	1.703e-05	6.282e-06	2.711	0.00676 **

A positive correlation exists between both stability issues and resource conflicts and stability issues and trade protectionism, though neither relationship is statistically significance. When one

controls for strength of agricultural interests, the relationship between stability issues and trade protectionism reaches statistical significance (p-value = 0.0905).

Both forms of population control policies (i.e. immigration and fertility regulations) are negatively correlated with an increase in stability issues and each of these is statistically significant (p-values = 1.03e-06 and 6.95e-13 respectively). When controlling for income level, however, fertility regulations are positively correlated and highly statistically significant (p-value = <2e-16) while immigration regulations are positively correlated yet fail to reach statistical significance.

Table 14.2 Large Winning Coalition, Strong Agricultural Interests, High-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
OFDI Food	2.213e-05	7.640e-06	2.896	0.00381 **

Table 14.2 demonstrates that leaders of high-income states with large winning coalitions that include strong agricultural interests will be likely to choose to engage in foreign direct investment in response to issues of food stability (p-value=0.00381).

When examining the strategic response of leaders of low-income states that have large winning coalitions that includes strong agricultural interests, this project predicts that thee leaders will not have an optimal strategic response that pleases both agricultural interests and those who are food insecurity. Thus it assumes these leaders are likely to not act. In this case, the results suggest that these leaders are, in contrast, likely to respond to food insecurity. Moreover, when examining which strategies they are likely to choose, it appears that these leaders are highly likely either to engage in resource conflicts or receive food aid. Engaging in resource conflicts is considered to be a high-risk, but potentially highly rewarding strategy. Further, it addresses the concerns of both those facing food insecurity within a state and those in the agricultural sector who may be interested in securing

food inputs. It is in contrast, however, to the cooperative nature of leaders with lager winning coalitions.

Table 14.3 Large Winning Coalition, Strong Agricultural Interests, Low-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Do Nothing	-0.217392	0.120630	-1.802	0.0716 .
Resource Conflicts	0.0009206	0.0003450	2.668	0.00774 **
Food Aid	0.40823	0.01784	22.88	<2e-16 ***

A second option these leaders may choose is to receive food aid. This strategy prioritizes the interests of those whom are food insecure over the agricultural interests within a winning coalition. This, however, is the safer bet of the two. When examining the option between these two strategies, the relationship between stability issues and receiving food aid remained highly significant (p-value = 4.63e-05), while the relationship between stability issues and resource conflict did not (p-value = 0.128).

As Table 14.4 illustrates, leaders of high-income state that have large winning coalitions that include strong agricultural interests will be likely to implement sustainable agricultural policies as part of a broader set of sustainability efforts.

Table 14.4 Large Winning Coalition, Weak Agricultural Interests, High-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Sustainable Agriculture	0.0050007	0.0007645	6.541	7.27e-11 ***

This project predicts that leaders of low-income states that have large winning coalitions that does not include strong agricultural interests will choose strategies that may alleviate the short-term effects of food instability, but may not seek to address vulnerabilities in the food production-to-consumptions process. Thus these leaders will more than likely agree to continue to receive food aid.

Table 14.5 Large Winning Coalition, Weak Agricultural Interests, Low-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Food Aid	0.0008731	0.0002893	3.018	0.00257 **

In contrast, this project predicts that leaders of high-income states with small winning coalitions that include strong agricultural interests will either choose resource conflicts, trade protectionism, and foreign direct investment in response to food stability issues.

Table 14.6 Small Winning Coalition, Strong Agricultural Interests, High-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Resource Conflicts	0.0002401	0.0001524	1.576	0.115
Trade Protectionism	0.010710	0.011879	0.902	0.367
OFDI Food	1.948e-05	7.653e-06	2.545	0.011*

As the results in Table 14.7 confirm, leaders of low-income states with small winning coalitions that includes strong agricultural interests will likely choose trade protectionism in response to food stability issues. Though the relationship is positive, however, it the relationship fails to reach statistical significance.

Table 14.7 Small Winning Coalition, Strong Agricultural Interests, Low-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Trade Protectionism	0.03625	0.02735	1.326	0.185

SMALL-NAG-HIGH leaders may be in the enviable position to get to do nothing in response to food stability issues. These leaders need not be concerned with agricultural interests. Further, if they have members within their small winning coalition who are food insecure they can address them individually with significant financial resources.

Table 14.8 Small Winning Coalition, Weak Agricultural Interests, High-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Do Nothing	0.40577	0.07445	5.45	5.47e-08 ***

Finally, leaders of low-income states with small winning coalitions that include weak agricultural interests will be likely to not address the long-term effects of food stability issues, but instead continue to receive food aid to mitigate the short-term effects.

Table 14.9 Small Winning Coalition, Weak Agricultural Interests, Low-Income Level, & Strategic Responses to Issues of Food Stability

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Food Aid	0.165300	0.011326	14.60	<2e-16 ***

14.8. Political Implications

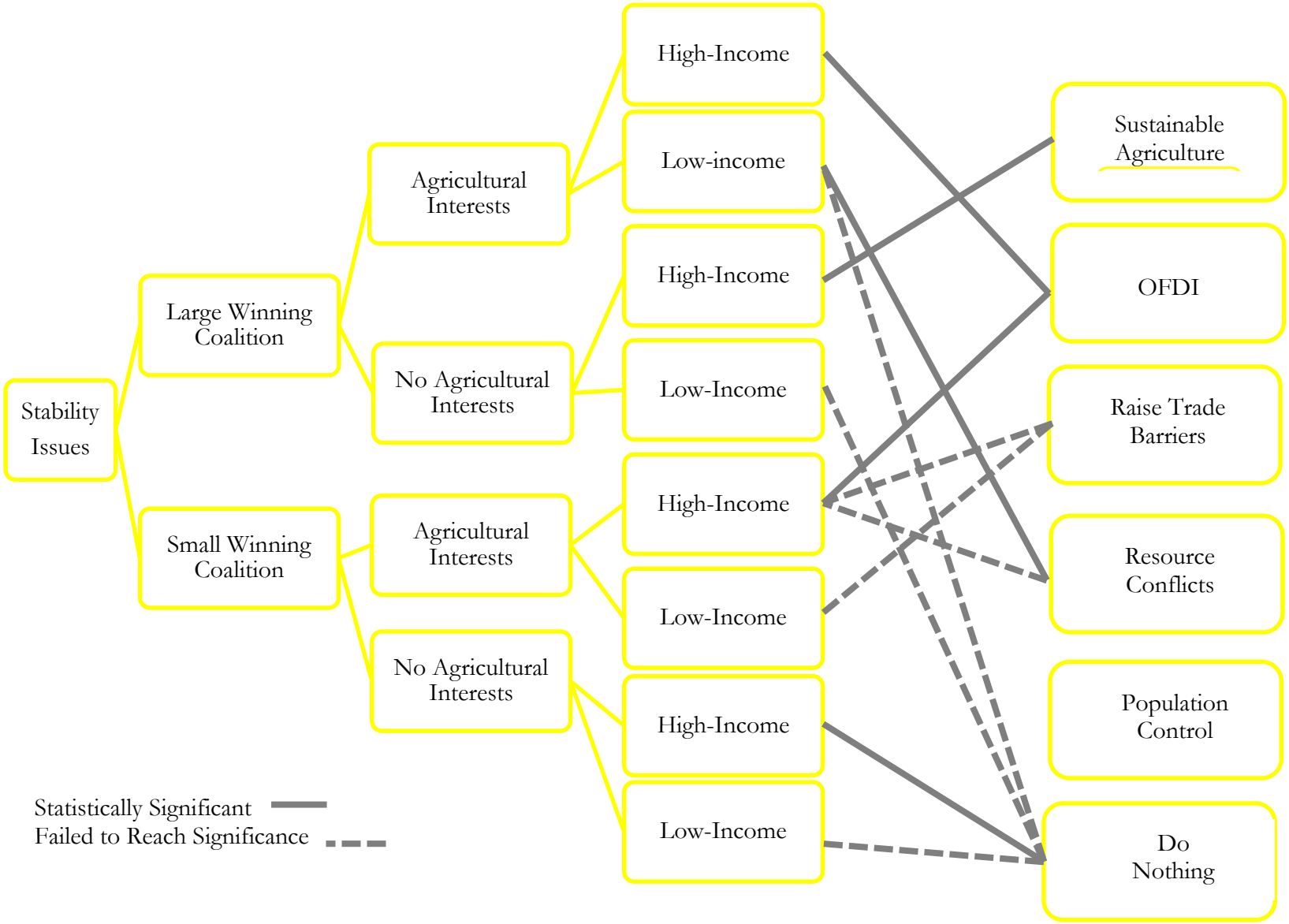
Once again, it is apparent than in cases in which a leader has only sub-optimal strategic choices, they will still choose to do something rather than appear unresponsive. The only exception to this pattern is small winning coalition leaders of high-income states with no agricultural interests (Table 14.8). In this case, they are highly likely to not respond to issues of food stability at all. Thus one can assume that either the food insecurity is not directly affected those within these leaders' small winning coalitions or they are able to distribute other private goods to these coalition members to offset the negative effects of food instability.

For the other leaders who choose to do something in the face of sub-optimal alternatives, the most interesting results are the leaders of large winning coalitions in low-income states with strong agricultural interests (Table 14.3). It appears that these leaders will choose either a strategy that serves the strong agricultural interests (i.e. resource conflicts) or one that serves those who are food insecure within their winning coalition (i.e. food aid). When choosing among these options, these leaders are more likely to choose to receive food aid. This appears more practical as resource

conflicts require significant financial contributions to conduct and the rewards are far from guaranteed. In contrast, food aid benefits the food insecure and costs little for the low-income state to implement.

Overall, the strategies chosen reflect those hypothesized in this chapter. Leaders with large winning coalitions considered more cooperative strategies (e.g. sustainable agriculture) or quasi-cooperative strategies (e.g. food aid and OFDI), which they likely choose to enact on a non-excludable manner. In contrast, small winning coalitions are more likely to choose conflictual strategies (e.g. trade protectionism) and quasi-cooperative strategies (e.g. food aid and OFDI), which they likely choose to enact on an excludable manner.

Figure 14.1 Strategic Responses to Issues of Food Stability



CHAPTER 15

CONCLUSION

This project has addressed five key challenges to food insecurity. First, it has improved on the definition most commonly accepted by the FAO, to offer a clearer conceptual view of food insecurity. Specifically, this project recasts the availability, access, and utilization dimensions as steps along the food production-to-consumption process. Moreover, the stability dimension serves not as a step in this process but rather includes factors that undergird and can potentially undermine this process.

The second challenge this project addressed is to better operationalize food insecurity. Though multiple measurements are offered, some suffer from being overly simple (and thus incomplete), while others are too complex to be readily used. This project found the balance between these two by creating five measurements for food insecurity – one for each dimension and one overall food insecurity measurement – using factor analysis. In doing so, this project offered scales by which future scholarship can provide more nuanced views of the type of food insecurity each state faces.

A third challenge addressed in this project was the need to situate food insecurity within the international relations literature. As noted, the international relations field focuses primarily on traditional military threats between states. Further, human security studies – the burgeoning literature that does extend the security focus to non-traditional threats and examines how these threats affect the lives of individuals – faces criticisms for being overly normative and for ignoring the role of the state. This project hopes to have addressed these concerns by examining the role states play in addressing food insecurity in a positivistic manner. In doing so, this project

demonstrates how food insecurity (and human security studies) plays an important role in the field of international relations.

Two final challenges this project sought to address are the lack of both theoretical explanations for when states choose to respond to food insecurity, and if so, which strategies they choose and empirical examinations to support or discount these explanations. This project offers both.

In chapter seven, this project asserts that large-winning coalition leaders are more likely to respond to food insecurity than small-winning coalition leaders. Further, the empirical examination found this relationship to be highly significant.

Chapter eight asserts that there are different kinds of responses to food insecurity: cooperative, quasi-cooperative, and conflictual. Further, it posits that large-winning coalition leaders are more likely to choose cooperative strategies when responding to food insecurity, and small-winning coalition leaders are more likely to choose conflictual strategies. Though quasi-conflictual strategies can be used either to assist all or only a few affected individuals within a state, large-coalition leaders will use them in a non-excludable manner while small-winning coalition leaders will use them to address only those who are affected by food insecurity within their coalition. Each of these assertions is supported empirically.

Chapter nine describes how the presence of strong agricultural interests may affect which strategies are chosen. The empirical results support the hypotheses that agricultural interests will likely shape the response a leader will choose. Moreover, if the agricultural interests consist of large, commercial farmers, these leaders are more likely to choose outward foreign direct investment in food production as it can address each type of food insecurity and has the potential to increase profits for these commercial producers. In contrast, if the agricultural interests in a state consist of smaller farm, leaders of these states are more likely to choose domestic food production subsidies

and trade protectionism. Each of these strategies serves to benefit smaller producers who may not have the capital to invest in large production projects in other states.

Chapter ten explored the relationship between income level and strategic responses and found that leaders of high-income level states are likely to choose domestic production subsidies, to lower trade barriers, to implement sustainable agricultural policies, to implement fertility control policies, and to offer consumer food subsidies. They are highly unlikely, however, to receive food aid.

The remainder of this project tested specific predictions for strategic responses to each of the types of food insecurity – issues of availability, access, utilization, and stability. The results in chapters eleven through fourteen confirm most the hypotheses presented on responses to issues of food availability. Though some relationships failed to reach significance, almost all were positively correlated as predicted. One of the most interesting findings is that leaders with sub-optimal strategic alternatives more than likely choose to do something in response to food insecurity even if there choice threatens to isolate key parts of their winning coalition. Most often the choice for leaders was between pleasing strong agricultural interests or those who are suffering from food insecurity within their winning coalition. Though in most cases the leader chose to address the food insecurity within their states, those that did choose to please their agricultural interests did so using conflictual strategies (e.g. resource conflict). This was the case even for large-winning coalition leaders who otherwise tended to choose cooperative strategies. The implication here is that, when a leader is faced with conflicting interests within his or her winning coalition, the leader may choose to double down on the group he or she aligns with by implementing excludable strategies that ensure that group gains private goods.

The only other result that failed to confirm to the hypotheses posited in this project was the choice to lower trade barriers on food imports. In situations in which a leader is not concerned with

agricultural interests and is the head of a low-income state, lowering trade barriers on imports would seem a logical response. It was not chosen, however. Instead, lowering trade barriers is highly correlated with high-income states. The assumption here is that producers in states with high-income may be better able to compete in the international market without protectionist policies. If a leader of a low-income state is concerned with addressing food insecurity within his or her borders, however, agreeing to lower trade barriers would be a beneficial to consider.

Some general conclusions can be made from the results presented in chapters seven through fourteen. First, it appears that, though the currently measurements for food insecurity do not reflect its multidimensionality, political leaders are generally choosing strategies that are appropriate to addressing specific issues of food insecurity. Thus it appears that leaders may be recognizing the distinctions between the types of food insecurity even though current scholars of food insecurity are not measuring these distinctions. This seems intuitive if one assumes that a leader's political survival is based on his or her ability to respond to the needs or interests of those within his or her winning coalition. Thus, when food insecurity is present within their coalitions, leaders have a keen interest in understanding the kind of strategies that will alleviate the issue for those within their winning coalition.

A second general conclusion that can be drawn from the empirical results contained in this project is that a political leader may be motivated to respond to food insecurity within their borders, but the strategies he or she chooses are based on the size of his or her winning coalition and the strength of agricultural interests within his or her state. Most interestingly, though large winning coalitions leaders tend to choose cooperative strategic responses to food insecurity (e.g. domestic production subsidies, trade openness, and sustainable agricultural policies), they may switch to more

conflictual strategies when there is a strong agricultural interest present within their state (and presumably within their large coalition).

Two additional conclusions can be drawn from this project that run counter to those predicted. First, when leaders have only sub-optimal strategic alternatives from which to choose (e.g. agricultural interests who prefer one strategy and food insecure individuals who prefer another), leaders will more likely to choose do something rather than appear unresponsive to food insecurity issues within their borders. It would be interesting to investigate in future research whether this is unique to issues of food, or if leaders faced with other human security threats (e.g. environmental degradation) will also choose to act. A second conclusion that runs counter to those predicted is that low-income are more likely to engage in resource conflicts to secure food inputs than high-income states. Though this project predicted that the cost of resource conflicts was enough to deter low-income states from attempting it (with leaders of small winning coalitions being more likely to choose this strategy than large winning coalition leaders), it appears that resource conflicts may be the a high-risk/high-reward strategy most often chosen by those leaders who cannot afford other strategic options. This has important implications on predicted when resource conflicts may occur in the future.

Though this project was successful in addressing each of the challenges recognized in the food insecurity research area, it could go further. First, future research interests should include qualitative studies of specific cases for each of the hypotheses posited. Second, future research should include data that distinguishes between quasi-cooperative strategies that are implemented in an excludable manner versus those that are implemented in a non-excludable manner. Finally, future research should also include measures of effectiveness of each of the strategic responses (e.g. size of a support coalition) to determine if a leader's choice was indeed a good political move.

The larger purpose of this project was to offer a positivist approach to examining the role states play in responding to food insecurity. In a world in which there is both an abundance of food available and eight-and-a-half millions of people suffering from food insecurity, the politics behind food must be better understood. As this project asserts, all leaders wish to maintain power. If a leader can be motivated to address food insecurity, it need not matter if the reason they address it is for political survival or the daily survival of those who suffer.

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APPENDIX A: INTERNATIONAL FOOD SECURITY CLASSIFICATION PHASE (IPC		
Indicator	Suggested Measurements	
Mortality Rate	Crude Mortality Rate (CMR)	Number of deaths during a specific time period ÷ Number of persons at risk of dying during that period × Time period
	Under-Five Mortality Rate (U5MR)	Number of deaths of children under five during a specific time period ÷ Number of children under five at risk of dying during that period × Time period
Acute Malnutrition	Global acute malnutrition rates include the percent of the population that has weight-for-height index (w/h) less than -2 Z-scores or has oedema (swelling of cell, tissue, or serous cavities of the body)	
Stunting	Percent of the population that has weight-for-height index (w/h) less than -2 Z-scores for its age.	
Disease	Indication that a disease has reached epidemic and pandemic levels in a given population. These are only general terms whose meaning needs to be interpreted according to the particular disease in question and its implications for food security analysis as individual diseases have specific thresholds of severity and magnitude to guide analysis for that disease (24).	
Food Access/ Availability	Though the IPC suggests 2100 kcal/day as a good estimate for a typical kcal intake, it suggests that emphasis should be on comparing the normal/typical kcal intake of a population group to that during times of stress (25).	
Dietary Diversity	Swindale and Bilinsky (2005) identify twelve main food groups used to calculate a dietary diversity score: cereals, roots and tubers, vegetables, fruits, meat/poultry/offal, eggs, fish and seafood, pulses/legumes/nuts, milk and milk products, oils/fats, sugar/honey, and miscellaneous. Research conducted at FSAU found that three or less food groups indicates a critical situation (FSAU 2005). IPC warns no dataset yet available that calculates this.	
Water Access/ Availability	The Sphere Handbook identifies water requirements for different basic survival needs: survival needs for water intake (2.5-3 liters per day), basic hygiene practices (2-6 liters per day), basic cooking needs (3-6 liters per day), and total combined basic water needs (7.5-15 liters per day). These values depend on a number of local factors including climate, individual physiology and social/cultural norms.	
Destitution/ Displacement	Qualitative distinctions between: “emerging and diffuse” (which includes the beginning stages and a spatial pattern that still includes integration with other members of society); “concentrated and increasing” (which is the stage at which populations are converging on particular localities - e.g., camps and towns - creating new health, protection, and other social problems in addition to limiting options for food access/availability); and “large scale and concentrated” (which is a qualitative description whose interpretation will depend on the local context) (28).	
Civil Security	The level of violence is divided into two types: (1) High Intensity Conflict (violence characterized by fatality rates averaging >1000/year or extensive (>5%) population dislocation or both), and (2) Low Intensity Conflict (violence characterized by fatality rates <1,000/year (but >100), and <5% population dislocation.	

Coping Strategies	The IPC suggests quantifying levels of coping using the Coping Strategies Index (CSI) developed by CARE and WFP.
Hazards	Presence of natural hazards (hurricanes, floods, drought, earthquakes, cyclones, tsunamis, etc.) and socio-economic hazards (market and trade fluctuations, policy shifts, conflict, etc.).
Structural Conditions	The IPC notes that structural issues are not easily measured but suggests can be identified using problem tree analysis and reviewing key indicators in the Human Development Index and other socio-economic surveys.
Livelihood Assets	Livelihood assets as defined in the Sustainable Livelihoods Approach (SLA) are divided into five inter-related capitals. The IPC also notes that quantifying the status of particular assets will depend on the information requirements of that particular asset.

APPENDIX B: THE OVERLAPPING ORGANIZATIONAL FRAMEWORKS OF THE FAO'S "FOOD SECURITY" DATASET[441]

Determinants											Outcomes															Misc.	
Availability					Physical Access			Econ. Access	Utilization		Utilization				Inadequate Access to Food				Vulnerabilities/ Stability								
Average Dietary Energy Supply Adequacy	Average Value of Food Production	Share of Dietary Energy Supply Derived from Cereals, Roots and Tubers	Average Protein Supply	Average Supply of Protein of Animal Origin	Percent of Paved Roads over Total Roads	Rail-lines Density	Road Density	Domestic Food Price Level Index	Access to Improved Water Sources	Access to Improved Sanitation Facilities	Percentage of Children Under Five Who Are Stunted	Percentage of Children Under Five Who Are Affected by Wasting	Percentage of Children Under Five Who Underweight	Percentage of Adults Who Are Underweight	Prevalence of Undernourishment	Share of Food Expenditure of the Poor	Depth of the Food Deficit	Prevalence of Food Inadequacy	Cereal Import Dependency Ratio.	Percent of Arable Land Equipped for Irrigation	Value of Food Imports Over Total Merchandise Exports	Political Stability and Absence of Violence/Terrorism	Per Capita Food Supply Variability	Per Capita Food Production Variability	Domestic Food Price Level Index Volatility	Total Population	Number of People Undernourished

441 Food and Agricultural Organization. (2013a). *Food Security Dataset*. Rome, Italy: United Nations.

APPENDIX C: CHOOSING APPROACHES TO CREATING FACTOR SCORES

There are two approaches to creating factor scores: non-refined and refined.[442] Non-refined approaches include sum of scores, simple averages, sum of scores with high factor loading, sum of standardized scores, and weight scores based on factor loadings. Sum of scores is the method by which one would simply add the observed variables together that had high factor loadings (and subtracting in the case of negative values of the observed variables). A closely related approach is the determine the simple-weighted average of these observed variables. There are two main weakness to these approaches. First, this approach gives equal weight to all variables with high loadings, regardless of the value of their loadings. It seems odd to have access to this information and then ignore it when creating a scale. Second, if observed variables have drastically different metrics, ignoring differences in relative variability could result in less reliable factor scores.

To remedy the first problem, another method takes only the sum of the variables with high factor loadings. This approach is necessarily arbitrary, however, as one research may choose any loadings above 0.4 and another may choose any loadings above 0.5. In addition, the variability of the raw data is not preserved. As this project suggests that each of the variables play a key role in the food-production-to-consumption process, it would disadvantageous to exclude some observed variables at this point in time. Alternatively, one could include each of the variables in the factor score by weighting each based on the relative value of their loadings.

To remedy the second problem, one could choose to standardize all observed variables prior to running an exploratory factor analysis and then add the scores for all the observed variables that load on a factor. This would be attractive for projects like mine, where the metrics vary widely.

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[442] DiStefano et al. (2009). Understanding and Using Factor Scores: Considerations for the Applied Researcher. *Practical Assessment, Research and Evaluation*, 14(20): 1-11.

The best non-refined approach would probably be to standardize the data for the observed variables prior to running exploratory factor analysis, and then weight each of the factor scores based on the relative value of loadings for each of the observed variable on a factor. There are several weakness, however, to the non-refined approaches. Though they are considered to produce more transparent and thus stable results across samples,[443] these approaches do not produce means and standard deviations for each of the factor scores and may produce factor scores that are correlated even when the EFA solution is orthogonal.[444]

Refined approaches to creating factor scores include regression scores, Bartlett scores, and Anderson-Rubin scores. All of these approaches require that both principal components and common factor extraction methods are used with exploratory factor analysis. These approaches produce scores that are linear combinations of the shared variance between the observed variable and the factor and what is not shared (the uniqueness or error term variance).[445]

There are several positives to these approaches. First, each of these approaches produce standardized scores similar to a Z-score. Further, these approaches produce factor scores that are highly correlated with a given factor and obtain unbiased estimates. Finally, these methods attempt to retain the relationships between factors.

Whereas the weighted sum-of-scores approach reflects the extent to which each individual observed case can be represented by a calculated factor score, regression factor scores treat factor scores as the dependent variable and make predictions of factor scores based on the correlation

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[443] Grice, J. W. and R. J. Harris. (1998). A Comparison of Regression and Loading Weights for the Computation of Factor Scores. *Multivariate Behavioral Research*, 33(2): 221-247.
[444] Glass, G. V. and T. O. Maguire. (1966). Abuses of Factor Scores. *American Educational Research Journal*, 3(4): 297-304.
[445] Gorsuch, R. L. (1983). *Factor Analysis* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

among observed variables, among observed variables and factors, and among factors. Under this process, the computed factor scores are standardized to a mean of zero.

Bartlett scores differ from regression scores in that they use maximum likelihood estimates instead of linear regressions to calculate factor scores and are thus considered to produce unbiased estimates.[446] Finally, the Anderson-Rubin approach used an adjusted least squares formula to produce factor scores that are not only uncorrelated with other factors, but also uncorrelated with each other.

Choosing among these three options require tradeoffs. Linear regression maximizes validity as it provides the highest correlations between a factor score and the corresponding factor. That said, regression factor scores are not unbiased estimates of true factor scores and could correlate with other factors and factor scores, even when an EFA solution is orthogonal. Bartlett factor scores are also highly correlated with the factor being estimated (though not maximal), and they also offer factor scores only correlate with their own factor in an orthogonal solution. Finally, Anderson-Rubin produces factor scores that are orthogonal when the solution is orthogonal, but its factor scores are the least correlated with the corresponding factors.

[446] Hershberger, S. L. (2005). Factor Score Estimation. *Encyclopedia of Statistics in Behavioral Science*. Hoboken, NJ: John Wiley & Sons.

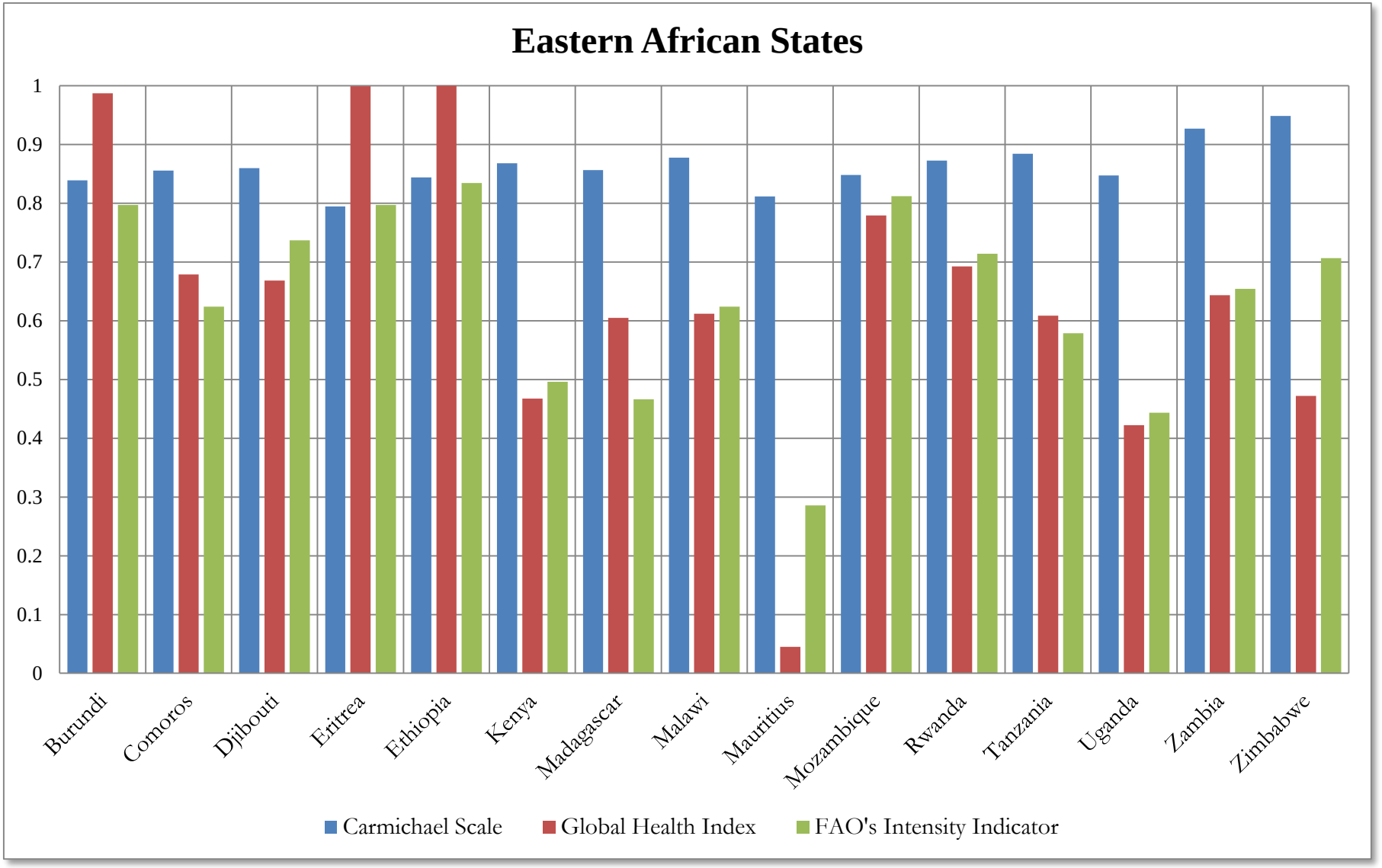
APPENDIX D: COMPARING FOOD INSECURITY MEASUREMENTS

To illustrate the relative explanatory power of the measurements for food insecurity offered by this project, the following figure compares three Eastern African states' food insecurity measurements: the one created in the project, the IFPRI's Global Health Index, and the FAO's Intensity of Food Deprivation indicator. This project asserts that the current measurements used to indicate food insecurity levels in each state highlight only a few aspects of the utilization dimension of food insecurity. By including measurements for all of the dimensions, this project presents a more complete view of food insecurity. As illustrated, the food insecurity measurement offered by this project tends to be higher than the other measurements with a few exceptions.

As an example, based on the Global Health Index, Mauritius is not suffering from significant food insecurity issues. Based on the FAO's indicator, however, Mauritius has more significant food insecurity issues, but its food insecurity issues are not as severe as other states in Eastern Africa. Based on this project's measurement, however, Mauritius has highly significant food insecurity issues. The second figure below offers Mauritius' food insecurity scores along each of the four dimensions. This figure highlights that Mauritius has significant food availability issues and substantial food stability issues that increase its overall food insecurity score. Because these other indicators measure only certain aspects of food utilization, they are failing to capture other issues of food insecurity. This has important implications for policymakers. Measuring food utilization may highlight certain downstream effects that result from issues of food availability and access. Focusing only on measuring this dimension, however, may encourage policies that target this dimension. As the food utilization issues arise at the consumption step in the food production-to-consumption process, the result could be policies that address problems once they have occurred rather than those that seek to prevent problems from occurring at all.

As a second example, based on the Global Health Index and FAO measurements for Zambia, it has significant food insecurity issues. Moreover, these measurements have relatively similar values. These values are substantially lower, however, than this project's measurement. The third figure offered below highlights Zambia's food insecurity scores along each of the four dimensions. This figure demonstrates that, whereas Zambia does have significant food utilization issues, issues in the other three dimensions are present as well.

Because these other indicators measure only certain aspects of food utilization, they are failing to capture other issues of food insecurity. This has important implications for policymakers. Measuring food utilization may highlight certain downstream effects that result from issues of food availability and access. Focusing only on measuring this dimension, however, may encourage policies that target this dimension. As the food utilization issues arise at the consumption step in the food production-to-consumption process, the result could be policies that address problems once they have occurred rather than those that seek to prevent problems from occurring at all. The subsequent figures compare these three indicators across the world's sub-regions. States are excluded if there were not data for all three food insecurity measurements.


Eastern African States
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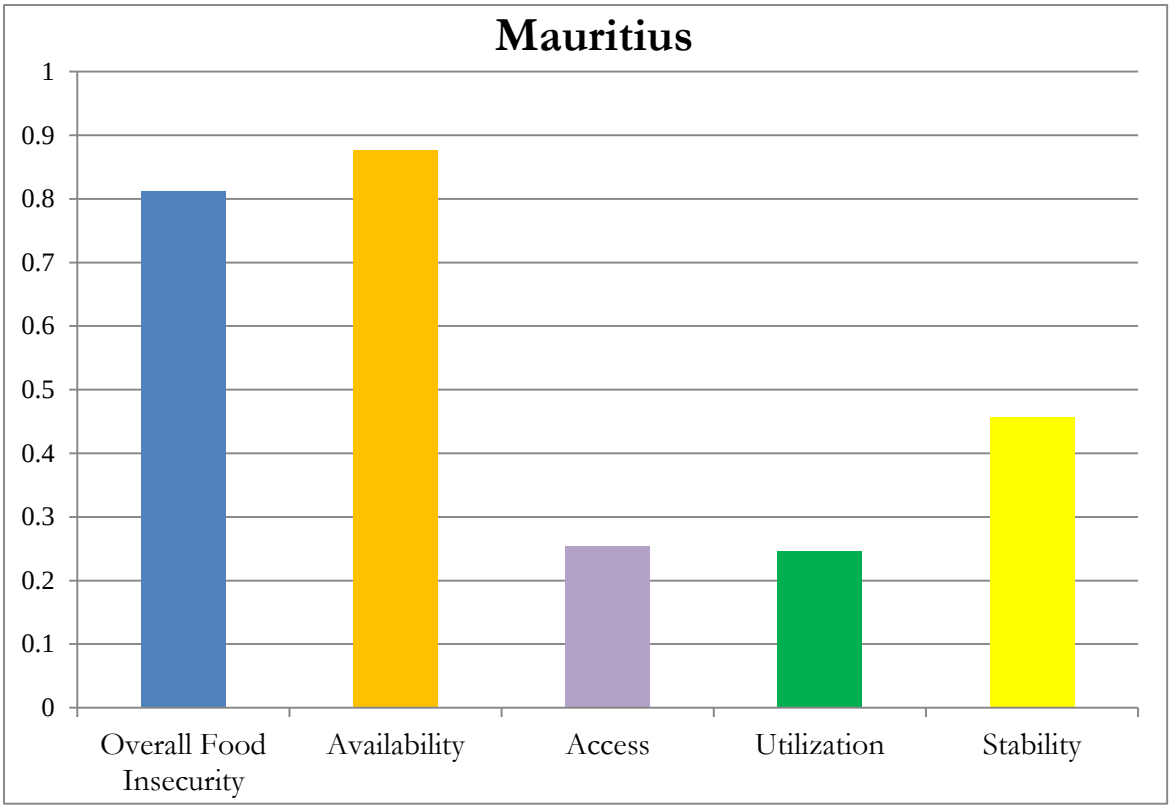
Burundi
Comoros
Djibouti
Eritrea
Ethiopia
Kenya
Madagascar
Malawi
Mauritius
Mozambique
Rwanda
Tanzania
Uganda
Zambia
Zimbabwe
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Mauritius
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Overall Food Insecurity
Availability
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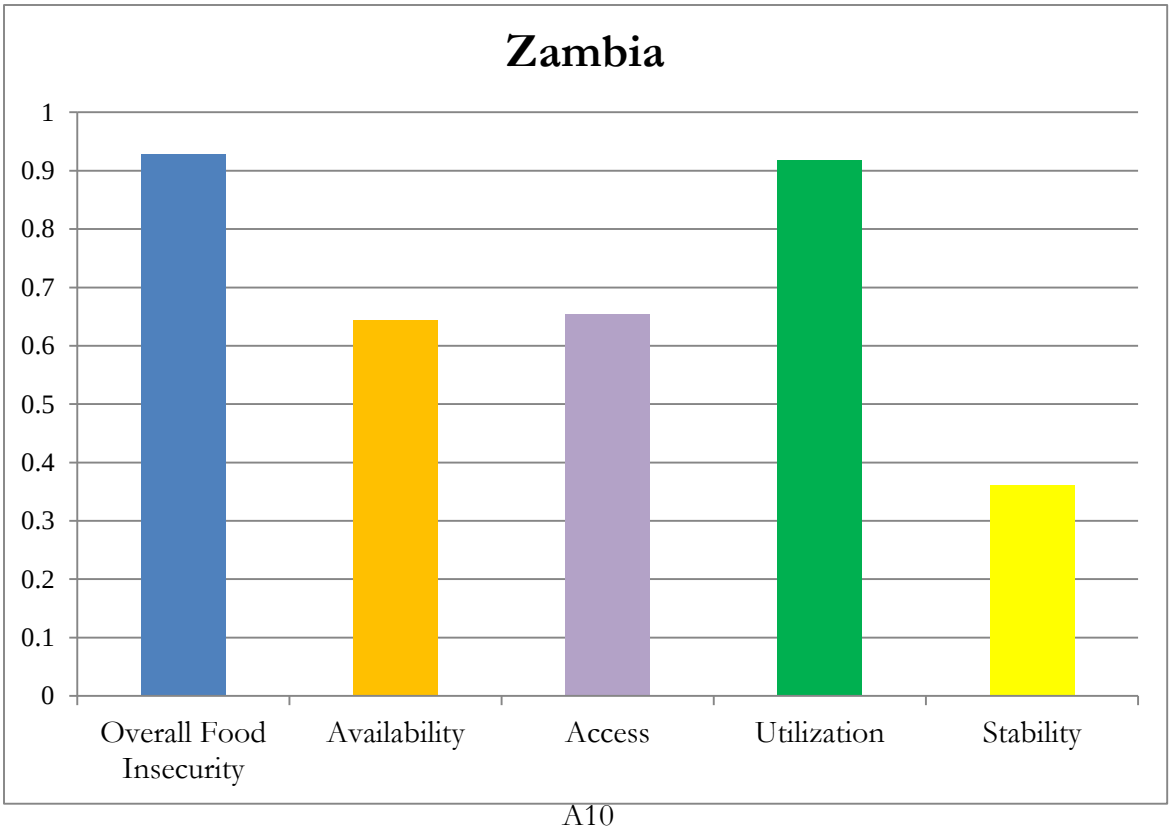
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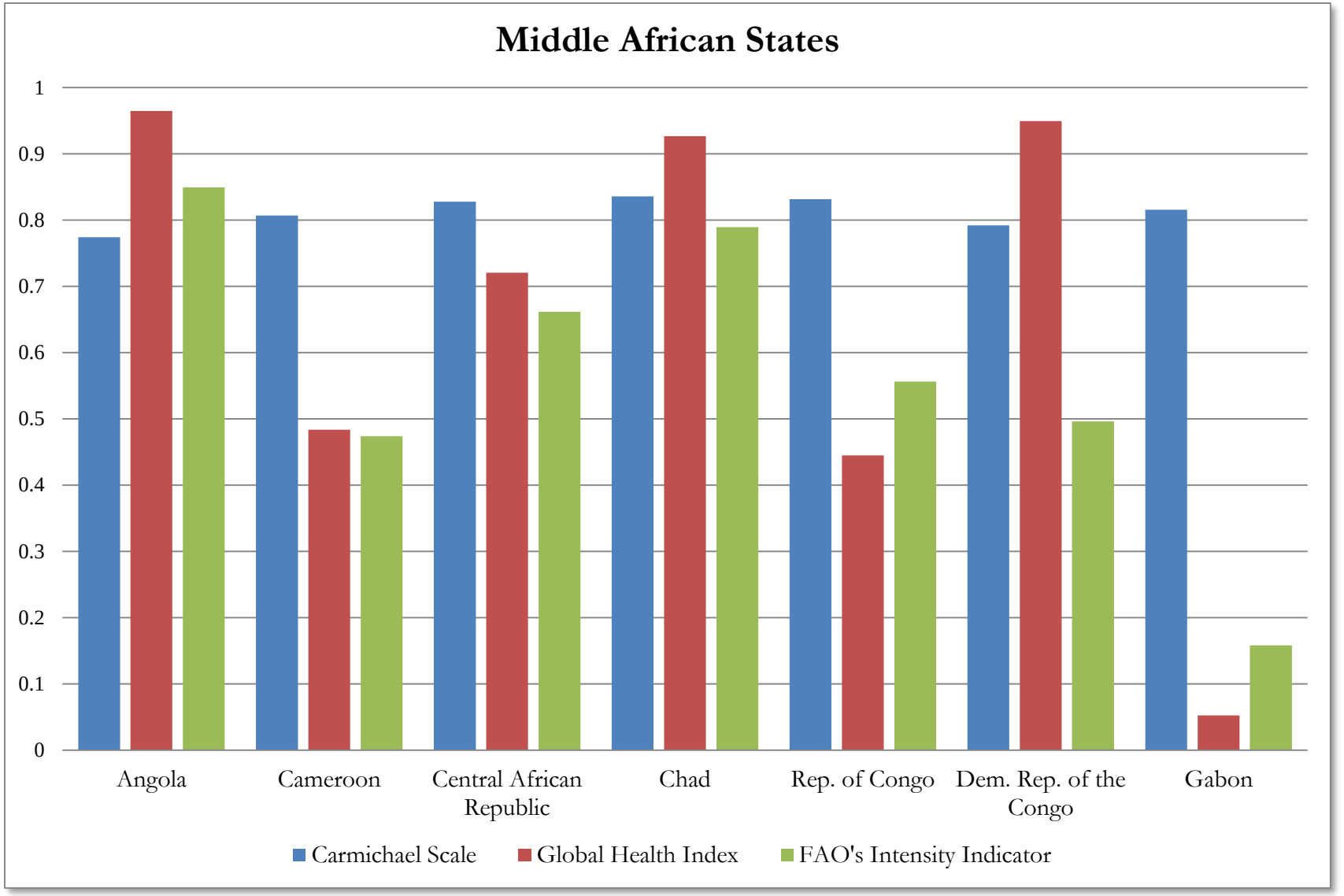
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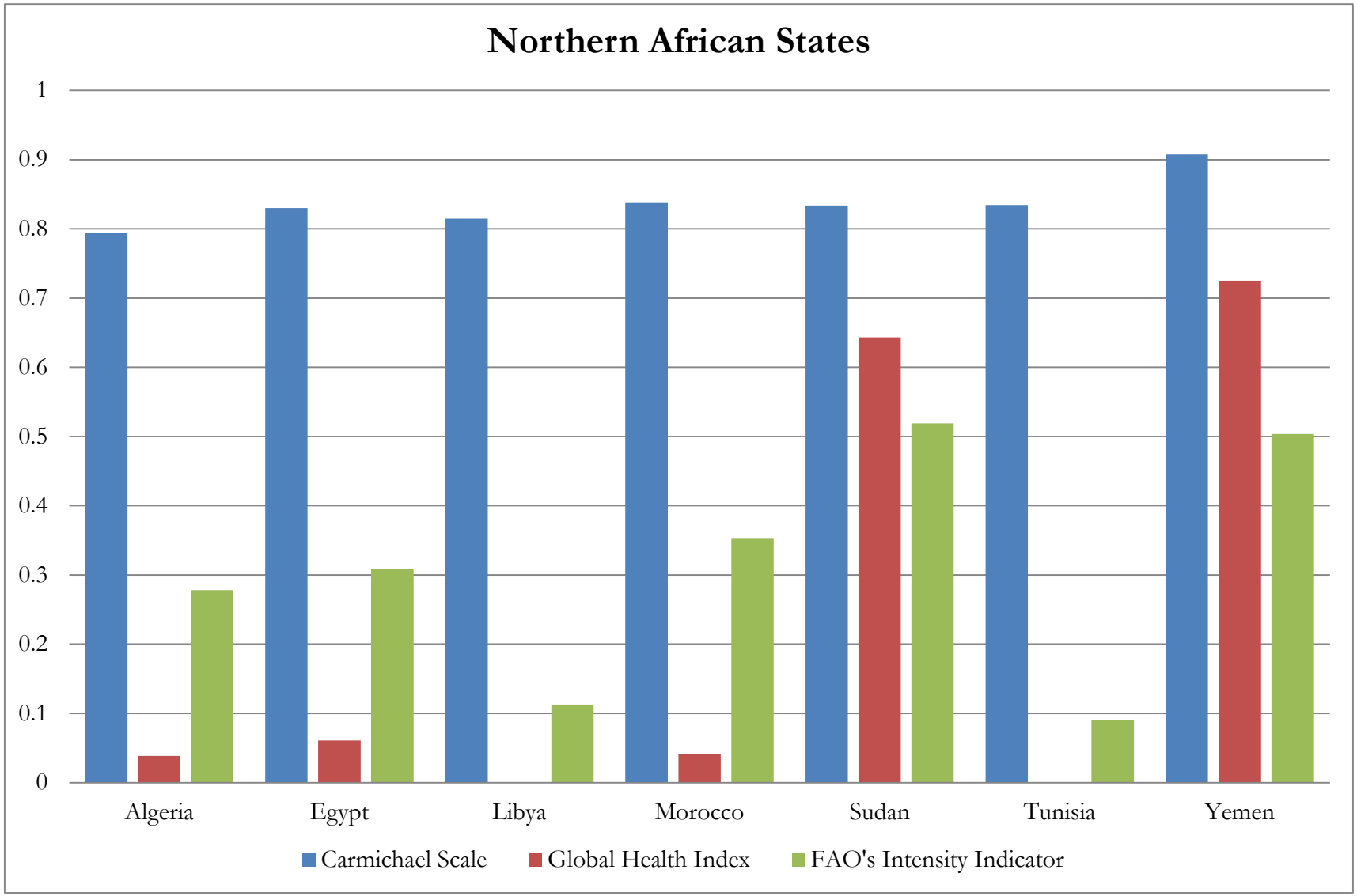
Central African Republic
Chad
Rep. of Congo
Dem. Rep. of the Congo
Gabon
Carmichael Scale
Global Health Index
FAO's Intensity Indicator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Yemen
Carmichael Scale
Global Health Index
FAO's Intensity Indicator

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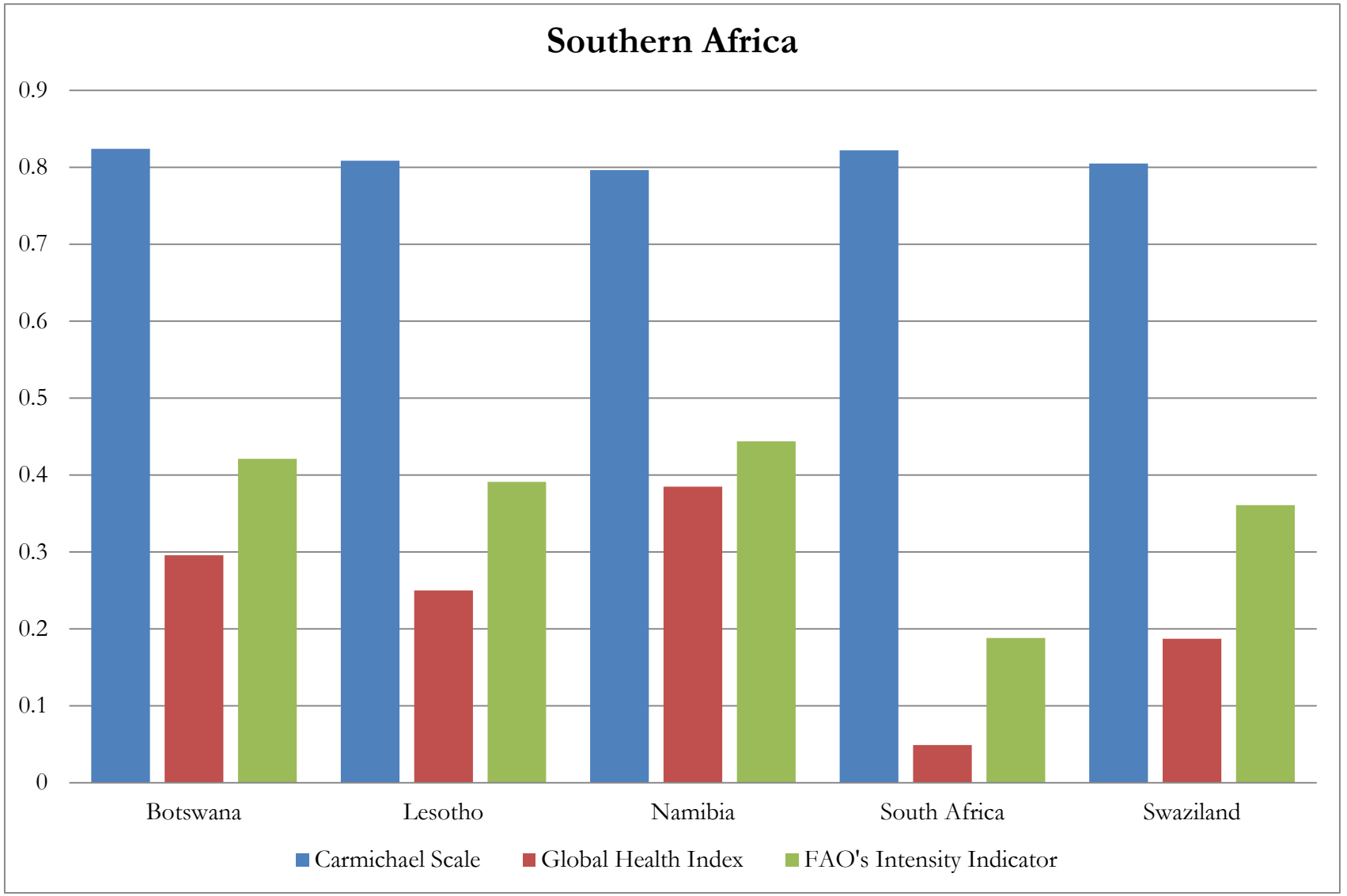
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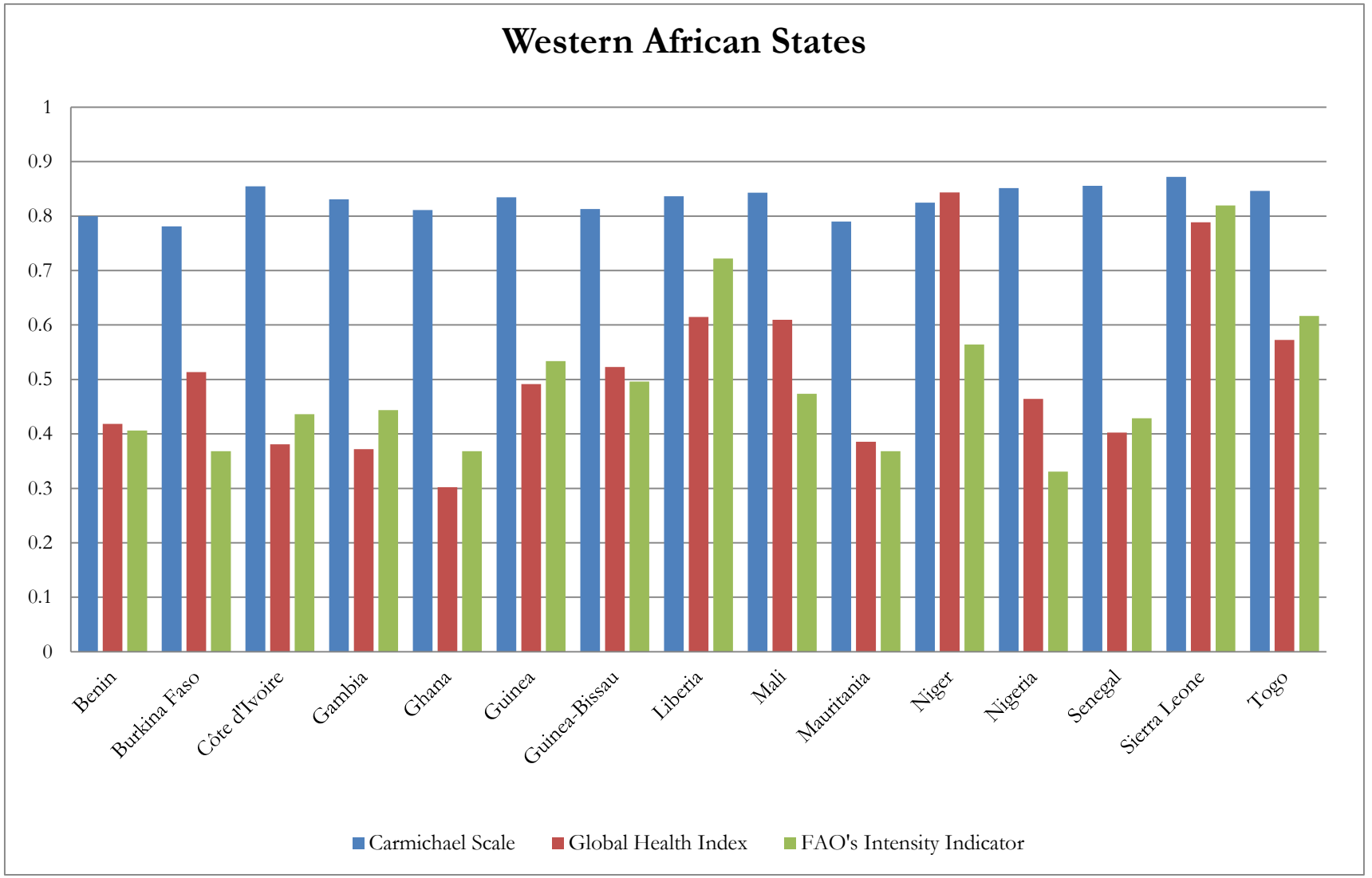
South Africa
Swaziland
Carmichael Scale
Global Health Index
FAO's Intensity Indicator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Côte d'Ivoire
Gambia
Ghana
Guinea
Guinea-Bissau
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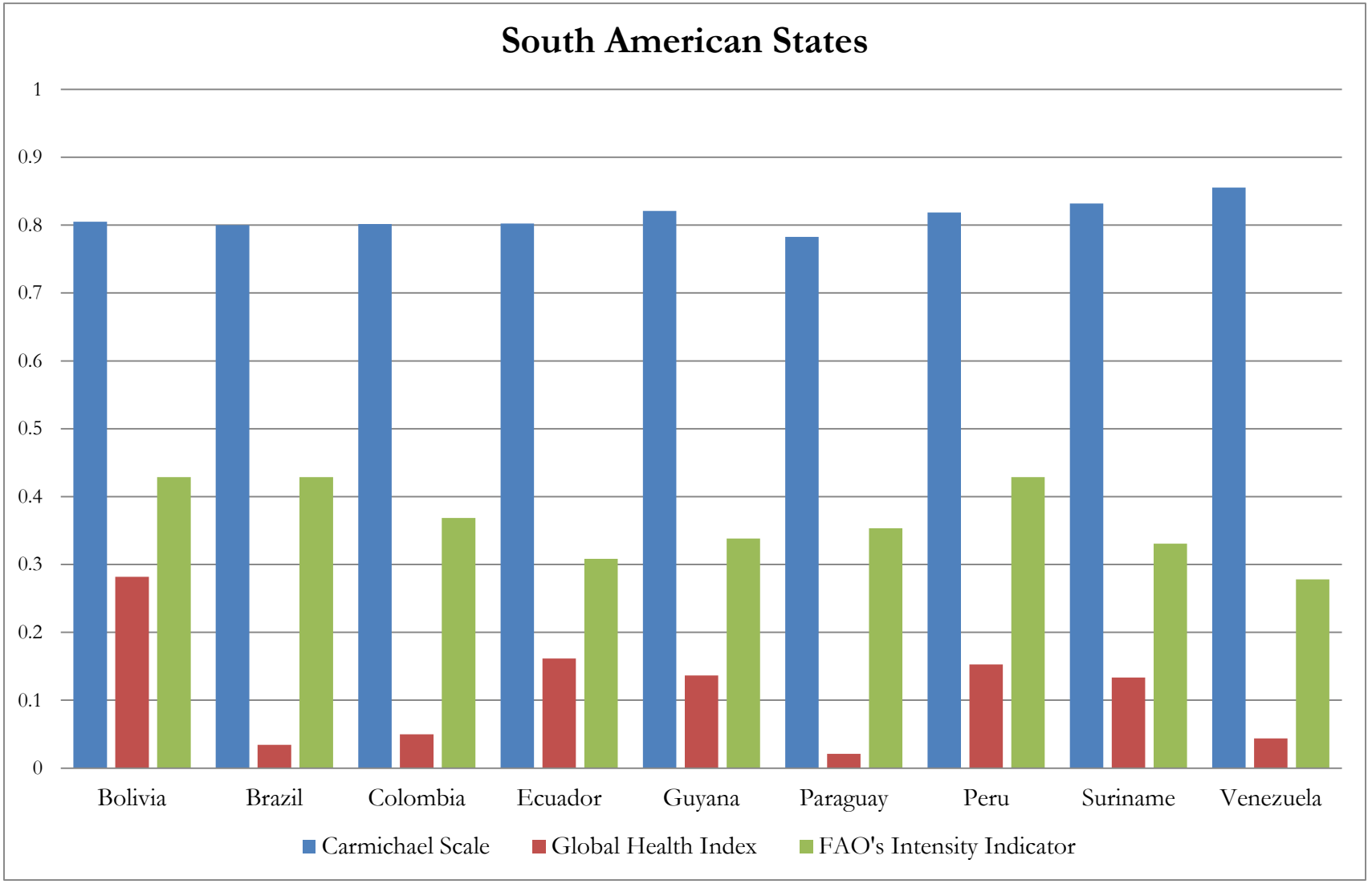
Nigeria
Senegal
Sierra Leone
Togo
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


South American States
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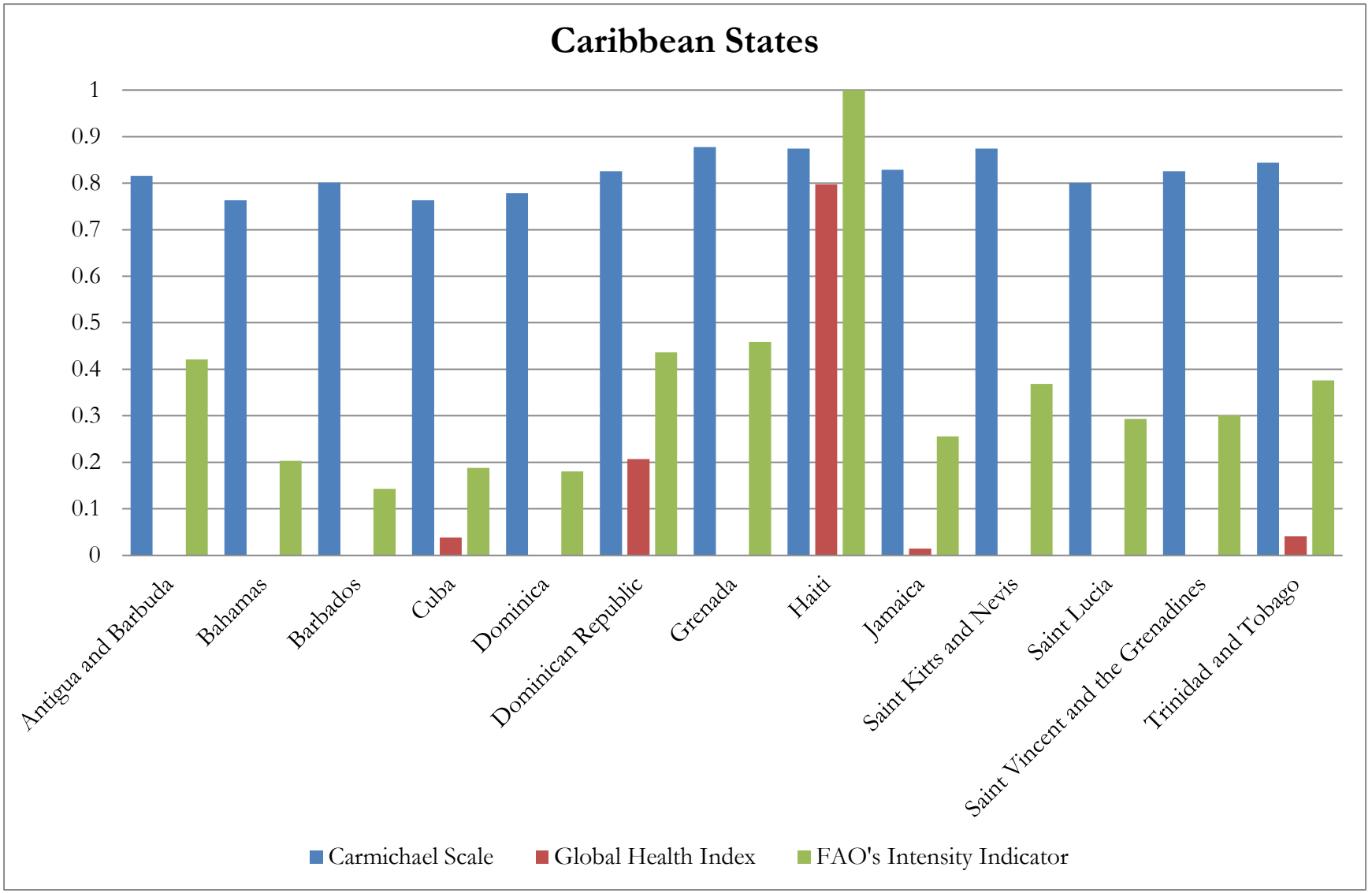
Ecuador
Guyana
Paraguay
Peru
Suriname
Venezuela
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Caribbean States
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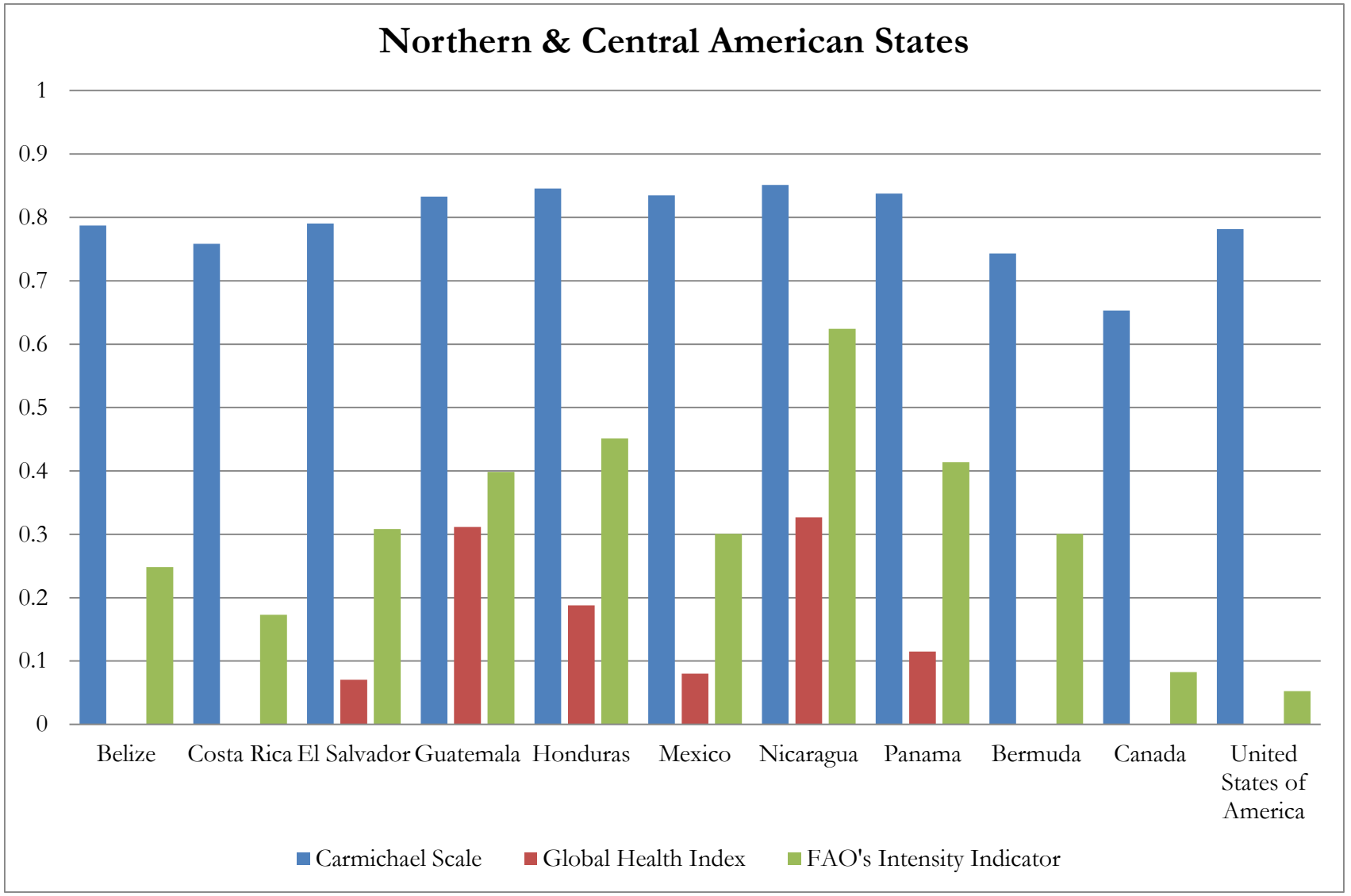
Bahamas
Barbados
Cuba
Dominica
Dominican Republic
Grenada
Haiti
Jamaica
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Trinidad and Tobago
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Northern & Central American States
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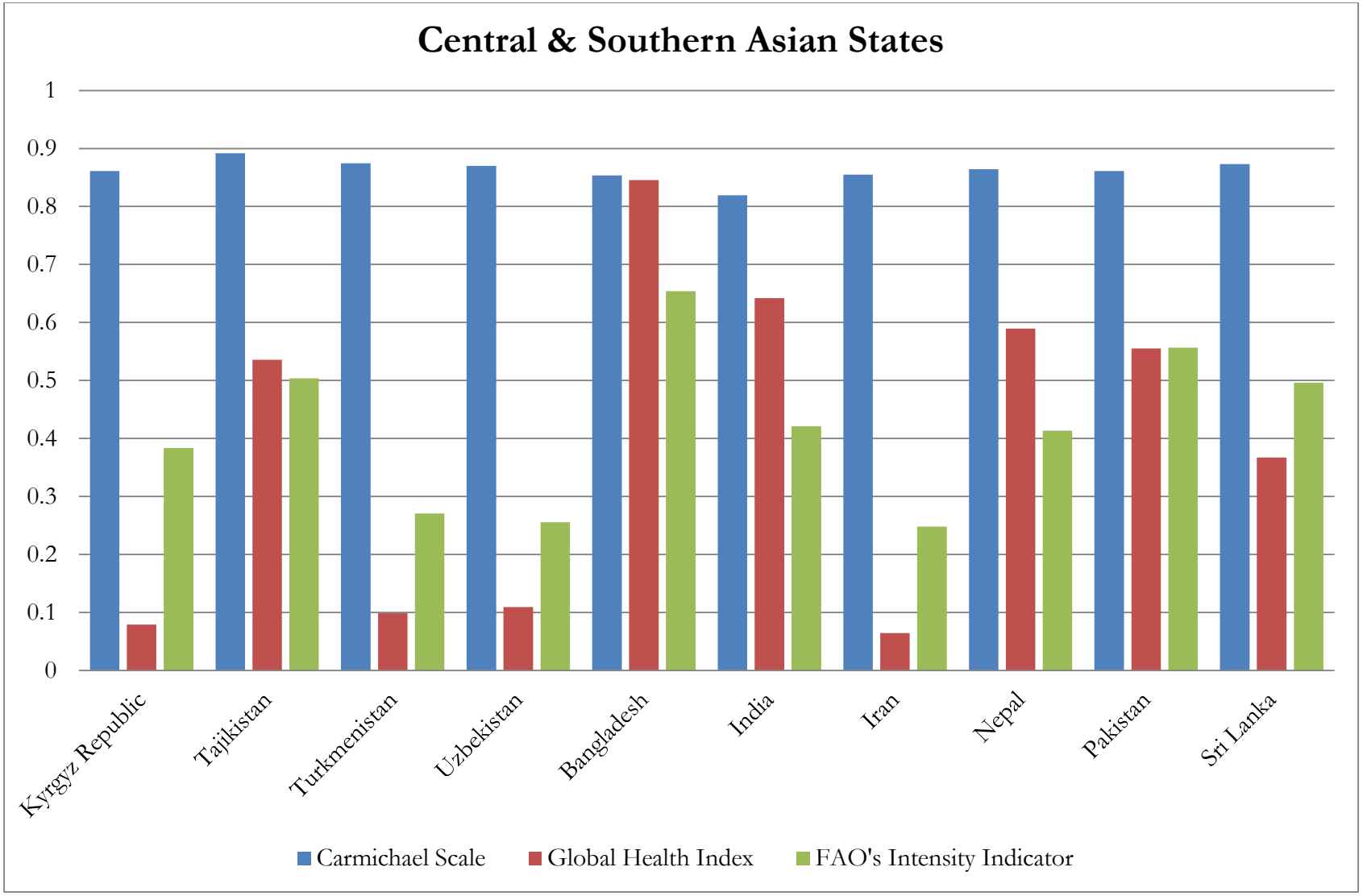
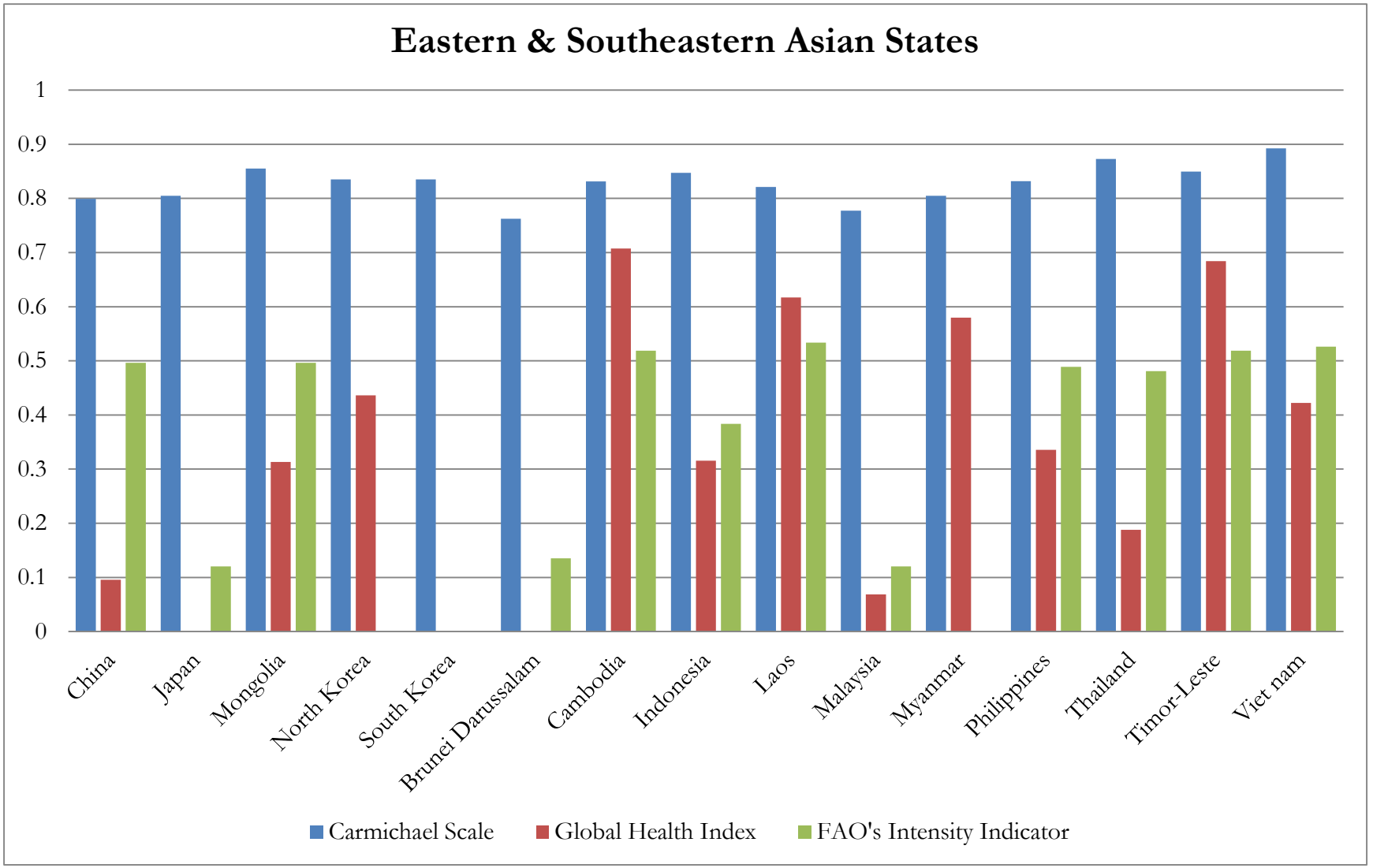
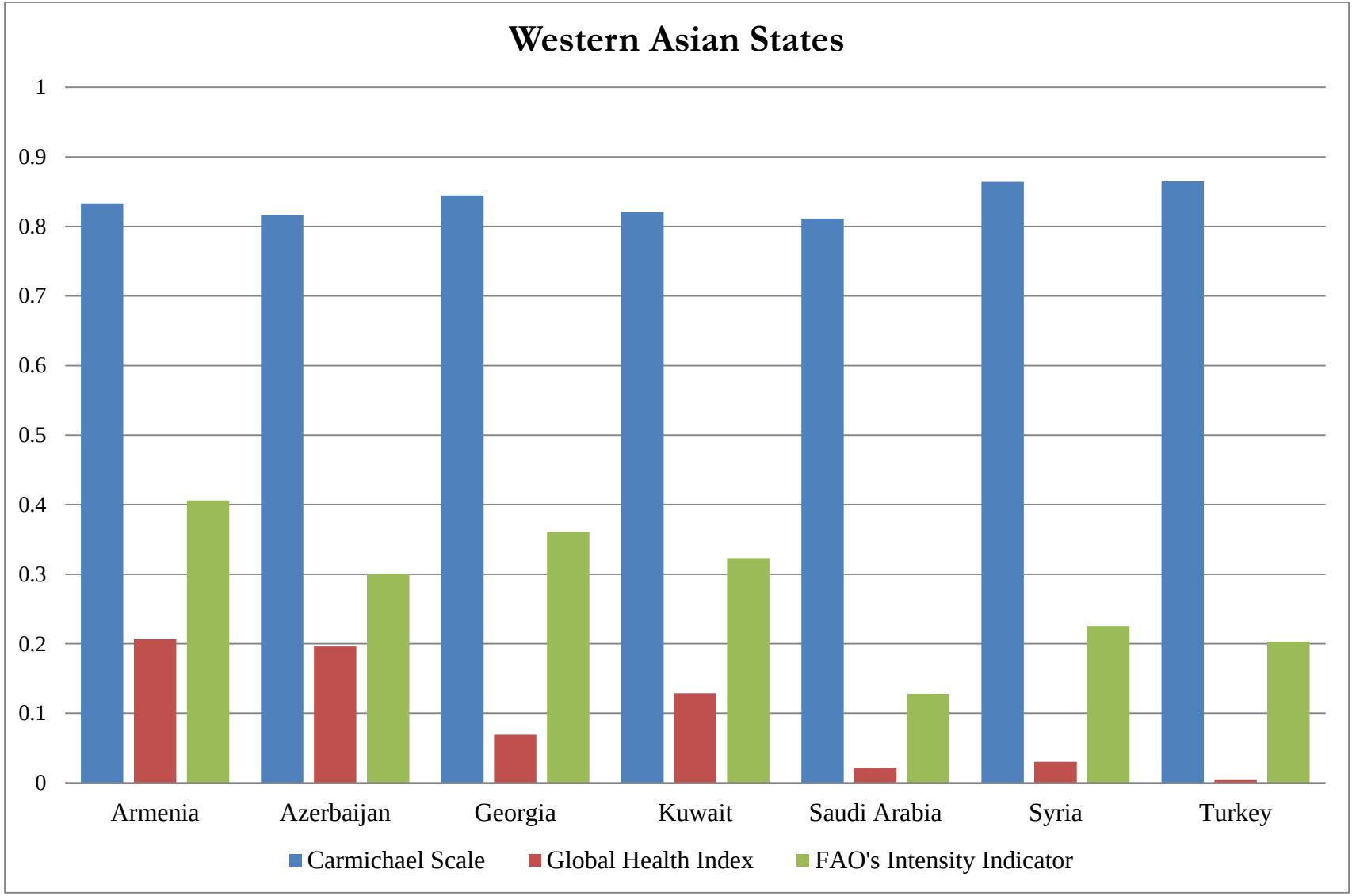
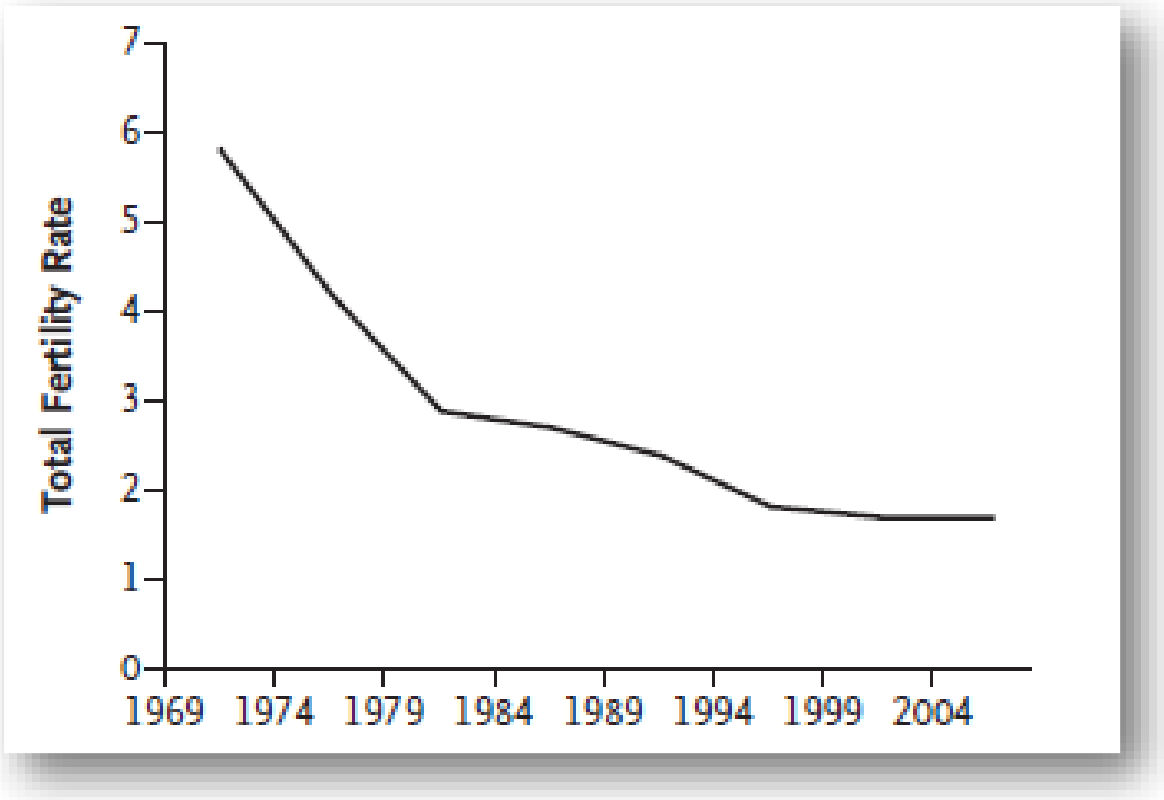
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Belize
Costa Rica
El Salvador
Guatemala
Honduras
Mexico
Nicaragua
Panama
Bermuda
Canada
United States of America
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Central & Southern Asian States
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Kyrgyz Republic
Tajikistan
Turkmenistan
Uzbekistan
Bangladesh
India
Iran
Nepal
Pakistan
Sri Lanka
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Eastern & Southeastern Asian States
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
China
Japan
Mongolia
North Korea
South Korea
Brunei Darussalam
Cambodia
Indonesia
Laos
Malaysia
Myanmar
Philippines
Thailand
Timor-Leste
Viet nam
Carmichael Scale
Global Health Index
FAO's Intensity Indicator


Western Asian States
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Armenia
Azerbaijan
Georgia
Kuwait
Saudi Arabia
Syria
Turkey
Carmichael Scale
Global Health Index
FAO's Intensity Indicator

APPENDIX E: TOTAL FERTILITY RATE IN CHINA (1969 TO 2004)[447]



[447] Hesketh et al. (2005). The Effect of China's One-Child Family Policy After 25 Years. *New England Journal of Medicine*, 353(11): 1171-1176.

APPENDIX F: HIIK'S CONFLICT INTENSITY CODING				
State of Violence	Intensity Group	Level of Intensity	Name of Intensity	Definition
Non-Violent	Low	1	Latent Conflict	A positional difference over definable values of national meaning is considered to be a latent conflict if respective demands are articulated by one of the parties and perceived by the other as such.
		2	Manifest Conflict	A manifest conflict includes the use of measures that are located in the preliminary stage to violent force. This includes, for example, verbal pressure, threatening explicitly with violence, or the imposition of economic sanctions.
Violent	Medium	3	Crisis	A crisis is a tense situation in which at least one of the parties uses violent force in sporadic incidents.
	High	4	Severe Crisis	A conflict is considered to be a severe crisis if violent force is repeatedly used in an organized way.
		5	War	A war is a type of violent conflict in which force is used with a certain continuity in an organized and systematic way. The conflicting parties exercise extensive measures, depending on the situation. The extent of the destruction is massive and of long duration.

APPENDIX G: HYPOTHESES QUICK REFERENCE		
Ch. Seven	1	Leaders with large winning coalitions will be more likely to respond to food insecurity than leaders with small winning coalitions experiencing similar levels of food insecurity unless there is a large number of veto players present.
Chapter Eight	2	If a leader with a large winning coalition and one with a small winning coalition are both experiencing similar levels of food insecurity, the leader with the large winning coalition will choose cooperative strategies when responding to food insecurity while the leader with the small winning coalition will be more likely to respond to food insecurity using conflictual strategies.
	3	When experiencing similar levels of food insecurity, leaders with large winning coalitions will receive greater amounts of food aid than leaders with small winning coalitions
	4	When experiencing similar levels of food insecurity, leaders with large winning coalitions will engage in more foreign direct investments projects in food production than leaders with small winning coalitions.
	5	When experiencing similar levels of food insecurity, leaders with large winning coalitions will implement more consumer subsidies than leaders with small winning coalitions.
Chapter Nine	6	Leaders with strong agricultural interests within their winning coalitions will choose the following strategies when responding to food insecurity: to maintain or increase domestic production subsidies, to engage in foreign direct investments in food production, to maintain or increase trade protectionism, and to participate in resources conflicts.
	7	When experiencing similar levels of food insecurity, leaders with strong agricultural interests that consists of large-commercial farms will choose to engage in foreign direct investment, while leaders with strong agricultural interests that consists of small farms will choose to maintain or increase domestic production subsidies and to maintain or increase trade protectionist policies.
Chapter Ten	8	Leaders of high-income states will be more likely to choose multiple strategies when responding to food insecurity than leaders of low-income states.
	9	Leaders of high-income level states will choose similar strategies when responding to food insecurity, and leaders of low-income level states will choose similar strategies when responding to food insecurity, controlling for size of winning coalition, extent of leadership constraint, and overall food insecurity level.

APPENDIX G: HYPOTHESES QUICK REFERENCE		
Chapter Eleven	10	Leaders experiencing issues of food availability will choose to maintain or increase domestic production subsidies, to maintain or increase trade protectionist policies or to maintain or increase trade openness policies (depending on the strength of agricultural interests), to receive food aid, to engage in direct foreign investment, or to participate in resource conflicts for the purposes of either obtaining or maintaining natural resources used in food production resources.
	11	In response to issues of food availability, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies and to engage in foreign direct investment in food production.
	12	In response to issues of food availability, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.
	13	In response to issues of food availability, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-HIGHs) will choose multiple strategies.
	14	In response to issues of food availability, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-LOWs) will choose to maintain or increase trade openness policies and to receive food aid.
	15	In response to issues of food availability, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investments in food production and to participate in resource conflicts.
	16	In response to issues of food availability, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will maintain or increase trade protectionist policies.
	17	In response to issues of food availability, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-HIGHs) will choose to maintain or increase population restriction polices.
	18	In response to issues of food availability, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-LOWs) will receive food aid.

APPENDIX G: HYPOTHESES QUICK REFERENCE (CONTINUED)		
Chapter Twelve	19	Leaders experiencing issues of food access will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, to receive food aid, to engage in foreign direct investments in food production, to maintain or increase consumer subsidies, and to participate in resource conflicts.
	20	In response to issues of food access, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies, to engage in foreign direct investment, or to maintain or increase consumer subsidies.
	21	In response to issues of food access, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, or to do nothing.
	22	In response to issues of food access, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-HIGHs) will choose to maintain or increase trade openness policies.
	23	In response to issues of food access, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-LOWs) will receive food aid.
	24	In response to issues of food access, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment.
	25	In response to issues of food access, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose to maintain or increase domestic production subsidies, to maintain or increase trade openness policies, and to receive food aid.
	26	In response to issues of food access, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-HIGHs) will choose to maintain or increase consumer subsidies.
	27	In response to issues of food access, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-LOWs) will choose to maintain or increase trade openness policies and to receive food aid.

APPENDIX G: HYPOTHESES QUICK REFERENCE		
Chapter Thirteen	28	Leaders experiencing issues of food utilization will choose to maintain or increase domestic producer subsidies on high-protein foods, to maintain or increase trade openness policies on high-protein foods, to receive high-protein food aid, to engage in foreign direct investment, to increase or maintain consumer subsidies on high-protein foods, to implement food rationing systems, and to maintain or increase trade protectionist policies on high-protein foods.
	29	In response to issues of food utilization, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to maintain or increase domestic production subsidies on high-protein food items and to engage in foreign direct investment.
	30	In response to issues of food utilization, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.
	31	In response to issues of food utilization, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-HIGHs) should choose to maintain or increase trade openness policies on high-protein foods and to maintain or increase consumer subsidies on high-protein foods.
	32	In response to issues of food utilization, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-LOWs) will receive high-protein food aid.
	33	In response to issues of food utilization, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment or to maintain or increase trade protectionist policies on high-protein foods; if a leader chooses trade protectionist policies, he or she will also implement strategies that decrease the costs of food items to targeted consumers (e.g. implement food rationing systems, receive high-protein food aid, and maintain or increase consumer subsidies on high-protein foods).
	34	In response to issues of food utilization, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose maintain or increase trade protectionist policies on high-protein foods; if a leader chooses trade protectionist policies, he or she will receive marginal increases in high-protein food aid to offset the increased costs for food for members of his or her winning coalition.
	35	In response to issues of food utilization, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-HIGHs) will choose to implement food rationing systems and to maintain or increase consumer subsidies for high-protein foods.
	36	In response to issues of food utilization, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-LOWs) will receive marginal increases in high-protein food aid.

APPENDIX G: HYPOTHESES QUICK REFERENCE		
Chapter Fourteen	37	Leaders experiencing issues of food stability will choose to implement sustainable agricultural policies, to engage in foreign direct investment, to maintain or increase trade protectionist policies, to participate in resource conflicts, and to maintain or increase population restriction polices.
	38	In response to issues of food stability, leaders of high-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-HIGHs) will choose to implement sustainable agricultural policies or to engage in foreign direct investment.
	39	In response to issues of food stability, leaders of low-income states with large winning coalitions that include strong agricultural interests (i.e. LARGE-STRAG-LOWs) will not have an optimal strategic response and will choose to do nothing.
	40	In response to issues of food stability, leaders of high-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-HIGHs) will choose to implement sustainable agricultural policies.
	41	In response to issues of food stability, leaders of low-income states with large winning coalitions that include weak agricultural interests (i.e. LARGE-NAG-LOWs) will not have an optimal strategic response and will choose to do nothing.
	42	In response to issues of food stability, leaders of high-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-HIGHs) will choose to engage in foreign direct investment, to maintain or increase trade protectionist policies, and to participate in resource conflicts.
	43	In response to issues of food stability, leaders of low-income states with small winning coalitions that include strong agricultural interests (i.e. SMALL-STRAG-LOWs) will choose to maintain or increase trade protectionist policies.
	44	In response to issues of food stability, leaders of high-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-HIGHs) will choose to maintain or increase trade protectionist policies.
	45	In response to issues of food stability, leaders of low-income states with small winning coalitions that include weak agricultural interests (i.e. SMALL-NAG-LOWs) will not have an optimal strategic response and will choose to do nothing.