COMPARATIVE ANALYSIS OF EDUCATIONAL OPPORTUNITIES IN THE U.S. AND KOREAN EDUCATIONAL SYSTEMS

by

MOONYOUNG EOM

(Under the Direction of Eric A. Houck)

ABSTRACT

The purpose of this study is to comprehensively assess the guarantee levels of equal opportunities in the U.S. and Korean educational systems. This study uses the school finance equity framework of Berne and Stiefel; however, it assumes equal opportunity as a superordinate concept of horizontal and vertical equity principles. Furthermore, this study expands the perspective on the guarantee of equal opportunity by including outcome aspects. Thus, outcome equity analysis is concomitantly conducted with resource equity analysis to examine equal opportunities in both countries. In addition to outcome equity analysis, adequacy analysis is chosen for estimating the cost of adequate education with educational outcomes taken into consideration.

Utilizing the data quantitative/qualitative resources and academic/non-academic outcomes from the ELS:2002 restricted-use and KELS:2005 datasets, this study arrived at the following findings through each analysis. Regarding the guarantee level of equal resource opportunities in both countries, the U.S. public high schools and Korean middle schools are not guaranteed equal opportunities in terms of qualitative resource aspects. Specifically, qualitative resources such as peer effects and school culture are not recognized as targets of distributional
equity in high special education student percentage schools. Additionally, school level SES influentially operates to determine the distribution conditions of educational resources in both countries’ educational systems.

Regarding the guarantee level of equal outcome opportunities in both countries, the academic outcome of special education students is less equitably distributed than that of counterpart students. Given the findings of resource equity, the result of outcome equity might be a possible indication that there is a significant relationship between the inequitable distribution of qualitative resources and academic outcome. In particular, this study shows that the U.S. high minority student percentage public highs schools and Korean metropolitan middle schools are not guaranteed equal opportunities in terms of both academic and non-academic outcomes.

Finally, this study indicates that schools that have secured the cost of adequacy do not always exhibit equal outcome opportunities. In other words, the spending levels of adequate education estimated without consideration of qualitative resources and the conditions of equal opportunity summarized with regard to only monetary resources are not enough to achieve the fulfillment of equal opportunities.

INDEX WORDS: Equal Educational Opportunity, Resource Equity, Adequacy, Outcome Equity, Comparative Education
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A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2011
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August 2011
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To my wife, EUNAE SON

Who always trusts, understands, and supports me

Who is the biggest gift I have been and will ever be given
ACKNOWLEDGEMENTS

I first want to express my deep appreciation to Dr. Eric Houck, my major professor. Without his help, I would not have been in the position to write the acknowledgements with such high pleasure. His insightful advice and guidance, which allowed for establishing my academic foundations, set an invaluable example to me as a professional researcher. In addition to Dr. Houck, I also want to express my thanks to Dr. Catherine Sielke and Dr. Elizabeth DeBray-Pelot for their academic and emotional support during my doctoral process. Words are barely sufficient to describe the depth of my appreciation for them. It is a priceless blessing and incredible fortune for me to have met these committee members in my study abroad.

Additionally, I would like to express my deep appreciation to Dr. Chung-il Yun, who is my academic father and role model. I am very much indebted to him because he inspired and motivated me to continue with my academic pursuits, and he is a living example of what a conscientious scholar and educator looks like. I take this opportunity to confess that he nurtured my current academic basis and vision. I hope as a future researcher that I will be able to further develop and advance his academic ideas for the betterment of school finance.

I thank my lovely family from the bottom of my heart. First of all, nothing would have been possible without my wife, Eunae Son, who is my forever companion and colleague. Her endless love and encouragement definitely got me through the long journey of this study. Her academic passion always has motivated me, and her generosity made what I am. At this time I would again like to confess to my wife, “I always love you.” Also, I express my sincere, heart-
felt thanks to my parents and parents-in-law. They are the origin of my life and generous
supporters. I cannot be grateful enough for the emotional contribution they made to this study.

This study was enabled by the gracious support of more people than I can possibly
acknowledge. Permit me to mention just a few of them. Pastor Daniel P. Park and the brothers
and sisters of the Athens Korean Baptist Church always supported and prayed for me. Without
their payers, I could not have completed my doctoral process. Greg Timmons, a considerate
friend and sharp proofreader, was also a great contributor to improving the quality of this study.

Most importantly, I would like to give all glory and praise to God, who permits me to
walk along the path of a researcher and educator. His endless love, grace, and plan have enabled
me to place the period at the end of this study.
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CHAPTER 1
INTRODUCTION

Statement of the Problem

The right to education is important enough to be regarded as a basic human right beyond those expressly provided in the constitutions of most countries (Cavicchioni & Motivans, 2001; Ladd, 2008; Rolle, 2004; Sherman & Poirier, 2007). In academia, the right to education has been mainly discussed in relation to the concept of equal educational opportunity. Specifically, the fields of educational finance, sociology, and law have dealt with equal educational opportunity conceptually and empirically (e.g., Berne & Stiefel, 1984, 1994; Coleman, 1968, 1990; Reed, 2001), even though the developed concepts and scope of each field are not exactly the same.

For example, educational sociology has emphasized equally provided educational opportunity because it can affect the fulfillment of social justice and upward movement within the social strata (e.g., Coleman, 1968, 1990; Coleman et al., 1966; Rawls, 2001, 2005). Educational finance has researched the issue of equal opportunity with the assumption that if there is a relationship between educational resources and some characteristics such as household income, local wealth, and sex, unequal opportunity is provided to students (e.g., Berne & Stiefel, 1984, 1994). Finally, educational law in the U.S. has tried to realize equal educational opportunity based on the Fourteenth Amendment and the right to equal protection under the law, while in Korea, the right to equal education corresponding to an individual’s abilities (as stated in Article 31 of the Korean Constitution) has been the grounds for guaranteeing equal educational opportunity to all students. Thus, it is at least evident that achieving equal
educational opportunity has been recognized as one of the very important goals of educational policies and social reforms across modern society (Coleman et al., 1966; Farrell, 2007; Rolle & Liu, 2007). Therefore, the fact that educational opportunity has been a focus of both educational research and policymaking appears to be taken for granted (Akiba, LeTendre, & Scribner, 2007; Konstantinovski, 2003; Peterson & Woessmann, 2007; Stromquist, 2006).

The concept of equal educational opportunity is not constant, but changeable like other concepts in the field of social science (Anyon, 2009; Coleman, 1968). For example, the concept of equal educational opportunity in pre-industrial Europe is different from that of the public education era in the United States. As a normative issue, the concept of equal educational opportunity has evolved according to how the meaning of equality is perceived in a specific society (Guiton & Oakes, 1995) and the public perceptions of the child’s position and the educational institutions’ roles in society (Coleman, 1968, 1990; Coleman et al., 1966; Peterson & Woessmann, 2007). Specifically, whereas previously families took responsibility for educating children before the advent of public education systems, governments and schools are currently expected to both play a substantial role in guaranteeing students a minimum level of performance and provide sufficient resources to ensure this outcome.

When Wise (1968) characterized nine alternative definitions of equal educational opportunity based on the Fourteenth Amendment, he foresightedly suggested non-discrimination, resource foundation, and minimum attainment as representative definitions of equal educational opportunity. Historically speaking, the courts of the United States and researchers of school law have interpreted the meaning of equal conditions as all children having equal access (e.g., desegregation), inputs (e.g., per pupil expenditure), and equal results (e.g., achievement) of schooling (Brown v. Board of education, 1954; Leyden, 2005; Minorini & Sugarman, 1999a,
Recently, equality of schooling results as well as equality of educational resources has been emphasized in the concept of equal educational opportunity more than before by accountability policies and systems (Berne & Stiefel, 1999; Carnoy, Elmore, & Siskin, 2003; Hirsch, 2006; Reich, 2006; Roemer, 1998; Sleeter, 2007). The transition from input-oriented to outcome-oriented educational policies can be traced at the federal level from reports such as *Nation at Risk* in 1983, and through policymaking such as *Goals 2000* in 1994 and the *No Child Left Behind Act* (NCLB) in 2001. These policies and laws served as momentum for focusing on equality of educational outcomes (Berne & Stiefel, 1999; Guiton & Oakes, 1995; Sleeter, 2007).

However, even though standards-based school reforms such as NCLB were recently implemented for the purpose of guaranteeing educational provisions not only from a resource perspective but also from an outcome perspective, the emphasis on educational outcomes in educational policies is not a new movement. Specifically, after the mid-1960s, the concept that educational opportunity should include equality of educational outcomes had already become the consensus. For example, the *Coleman Report* in 1966 asserted that educational equality is reached only when the results of schooling are the same for racial and religious minorities group and the dominant group (Coleman et al., 1966). Furthermore, Bowles (1968) even argued that equality of educational opportunity needs to extend to the results of education in terms of future attainment in jobs and income.

However, compared to its evolution and the extent of the concept in other social science fields, the concept of equal educational opportunity and its analysis in the field of school finance is decidedly limited (Berne & Stiefel, 1984, 1999). In other words, the discussion of educational opportunity in school finance is relatively focused on securing educational resources. For
example, Berne and Stiefel (1984) formulated the principle of equal opportunity as a subprinciple of the concept of equity and defined it as follows: “There should not be differences according to characteristics that are considered illegitimate, such as property wealth per pupil, household income, fiscal capacity, or sex” (p. 17). According to the definition, it is a negative principle. That is, the principle of equal opportunity exists perfectly when there is no relationship between equity objects and illegitimate characteristics (Berne & Stiefel, 1984). Additionally, this principle is often called fiscal (wealth) neutrality, which focuses on the relationship between local educational spending and local property wealth (B. D. Baker & Green III, 2008; Berne & Stiefel, 1984, 1999; Odden & Picus, 2008). Therefore, the principle of equal opportunity as discussed in the field of school finance is a narrower and more limited concept than that in the field of educational sociology.

Of course, it is not true that Berne and Stiefel (1984, 1994) failed to mention the guarantee of educational outputs and outcomes and educational opportunity. They included educational outputs and outcomes into equity objects (see Berne & Stiefel, 1984, p. 9, Figure 2.1) and provided the principle of equal opportunity as the third subprinciple in a school finance equity framework. Specifically, they developed the idea that even the results of schooling should not be associated with illegitimate characteristics such as race and fiscal capacity and should be equitably distributed to all students.

However, their equity framework, which is a very influential analytic tool in school finance, has been utilized in a limited fashion in actual research. Specifically, the concept of equity was primarily discussed in relation to the distribution of access or input resources such as enrollment ratios, per pupil expenditures, and pupil-teacher ratios (Berne & Stiefel, 1999; Levin, 1994a). Moreover, the third principle, equal opportunity, was little utilized in analyzing equity;
however, both horizontal and vertical equity principles were mainly discussed in school finance for three decades (Grubb, 2009a; Iatarola & Stiefel, 2003).

Berne and Picus (1994) raised questions about actual equity research, arguing that equity researchers focus exclusively on input and processing resources, ignoring the distribution of educational outcomes. They asserted that a horizontally and vertically equitable distribution of educational resources ultimately points to an equitable (not, equivalent) distribution of performance—that is, a reduction of the gap between advantaged and less advantaged students (Iatarola & Stiefel, 2003). Further, Berne and Picus (1994) more vigorously emphasized outcome equity as follows: “[I]n equity matters the true measure is not inputs but outcomes” (p. viii). Nevertheless, almost all equity analyses still remained focused on educational resources, not on educational outcomes.

Even though a great deal of equity research has been conducted focusing on educational resources, previous studies of the distribution of educational resources also have some limitations in terms of the range of resources as equity objects (Grubb, 2009b; Guthrie, 2006; Odden & Picus, 2008; Peterson & Woessmann, 2007). Specifically, when researchers conducted equity analysis with educational resources, they restricted them to variables with a physical or material characteristic (e.g., per pupil expenditure, teacher salary, years of teaching experience, etc.). Grubb (2009b) also indicated that previous equity studies examined inequity from the narrow perspective of educational resources: “[T]o understand the inequality of school resources, it is necessary to consider a much wider range of resources than has been customary” (p. 44). This tendency of previous equity studies to focus on the distribution of visible and countable variables came about partly because educational policies had sought visible and marked changes (e.g., increase of per pupil expenditure or decrease of pupil/teacher ratios) for the constituency
(e.g., B. D. Baker, 2001; Evans, Murray, & Schwab, 1997, 1999; Fiske & Ladd, 2004; Murray, Evans, & Schwab, 1998; Sherman & Poirier, 2007).

In addition, because of the research nature of school finance, which places more importance on quantitative methods than on qualitative methods, the elusiveness of measuring the quality of educational resources and item limitations of huge nationwide surveys placed emphasis on countable resources in school finance equity research (Fiske & Ladd, 2004; Grubb, 2007, 2009a, 2009b; Guthrie, 2006, 2007). However, it is obvious that equal educational opportunity cannot be fulfilled with the provisions of only physical or material resources (Brookover et al., 1978; Griffith, 1997; Grubb, 2009b; Guthrie, 2006; Walberg, 2006). Therefore, a systematic classification of educational resources—based on a broad concept of educational resources—is needed for a comprehensive understanding the degree of educational opportunity in the U.S. and Korean educational systems.

Educational opportunity studies, contrary to horizontal and vertical equity research, which has overly emphasized domestic analysis, have been conducted in international comparative contexts (Guthrie & Rothstein, 1999; Peterson & Woessmann, 2007; Sherman & Poirier, 2007). For instance, world educational institutions, such as the United Nations (UN), World Bank and the United Nations Educational, Scientific and Cultural Organization (UNESCO), have given their full material and emotional support to rectifying the problems of equal educational opportunity of less-developed and developing countries (Sherman & Poirier, 2007). However, previous literature has a tendency to use only quantitative and uniform indexes, such as per pupil expenditure and the ratio of educational revenue to the Gross Domestic Product (GDP), ignoring the peculiar characteristics of each country’s educational system (e.g., Akiba & LeTendre, 2009; Akiba et al., 2007; Cavicchioni & Motivans, 2001; Gorard & Smith, 2004;
Mingat & Tan, 1985; Sherman & Poirier, 2007). It is only natural that a comparative analysis of educational opportunities using only uniform quantitative indicators such as enrollment rates is not sufficient for improving current educational opportunities in each country (Cavicchioni & Motivans, 2001; Sherman & Poirier, 2007; Whitty & Power, 2003).

All nations have specific characteristics and divergent external influences that result from each country’s social structure and educational system (Coleman et al., 1966; Phillips & Chin, 2004; Sherman & Poirier, 2007). These external factors can seriously influence and cause the deterioration of educational opportunities and affect the ways to improve them. Additionally, these factors might be different for the U.S. and Korean educational systems. For example, race and regional differences (e.g., urban, suburban, and rural) have a big impact on deciding the degree of equal educational opportunity in the U.S. educational systems; however, it is rare that the race factor aggravates equality of educational opportunity in Korea, which is said to be a homogeneous nation, with few foreigners. Instead, it is reported that family background impedes equality of educational opportunity more than other factors in Korea as private educational costs are higher than before (D. P. Baker, Goesling, & LeTendre, 2002; Heyneman & Loxley, 1983; Y. Kang, 2008; M. R. Kim, 2009). Therefore, it is necessary to grasp the specific characteristics of each country’s educational system instead of conducting an ostensible assessment that considers the distribution of only basic educational materials (e.g., books, computers, etc.) and numerable teacher qualifications (Brooks, Maxcy, & Nguyen, 2010; Whitty & Power, 2003).

In addition to international comparisons of educational opportunities from a resource perspective, there are several worldwide panel surveys that compare student achievement among countries. For example, the Program for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) are two representative international
comparative surveys of student achievement. PISA, organized by the Organization for Economic Cooperation and Development (OECD), is a system of international assessments that focuses on 15-year-olds' capabilities in reading literacy, mathematics literacy, and science literacy (Source: http://nces.ed.gov/surveys/pisa/). TIMSS, sponsored by the International Association for the Evaluation of Educational Achievement (IEA), is a major source for international comparative information on the mathematics and science achievement of students in the fourth and eighth grades and on related contextual aspects such as mathematics and science curricula and classroom practices across countries (Source: http://nces.ed.gov/timss/). However, these well-designed and hugely invested projects have been criticized because they placed excessive emphasis on international rankings and test scores, which constitute the outcome aspect of educational opportunities, regardless of their initial purposes (Akiba et al., 2007; Gorard & Smith, 2004; Kilpatrick, 2009). Of course, TIMSS and PISA have some items for investigating educational environments and provisions from a resource perspective (see Baldi, Jin, Skemer, Green, & Herget, 2007; Lemke et al., 2001; Lemke et al., 2004); however, the reports of these two studies have devoted a good deal of space to the specific levels and rankings of student achievement among countries, and the attention of most countries has been drawn to those levels and rankings (Akiba et al., 2007; Kilpatrick, 2009). Therefore, it is a primary need to understand the results of international assessments considering the association with the provisions of educational conditions. Then, relative gaps and distributions of achievement between disadvantaged groups and a dominant group should be thoroughly examined with regard to the current guarantee of educational opportunities from a resource perspective.
Purpose of the Study

The purpose of this study is to comprehensively assess the guarantee levels of educational opportunities in the U.S. and Korean educational systems. Specifically, this study attempts to analyze how equal educational opportunities are achieved via each country’s educational system using both resource and outcome perspectives.

First, this study empirically stands on the basis of the equity framework of Berne and Stiefel (1984, 1994) and the adequacy frameworks, which are already popular analyses in school finance. However, regarding the equity framework used in this study, the principle of equal opportunity is conceptually composed of equity principles such as horizontal and vertical equity, which is unlike the original equity framework. This conceptual change results from the assumption that the concept of equal educational opportunity should be recognized as one of the final educational policy goals (Berne & Stiefel, 1999; Ladd, 2008; Roemer, 1998; Rolle, 2004; Sherman & Poirier, 2007). Therefore, this study supposes equal opportunity as a superordinate concept and attempts to assess the degree of equal educational opportunity in both countries using the analysis of equity and adequacy.

Second, this study examines the degree of educational opportunities in both countries’ educational systems using two different aspects: educational resources and outcomes. One of the purposes of this study is to expand the discussion of equal educational opportunity to a performance domain. Previous literature on international comparative analyses of educational opportunities has only nominally examined educational conditions and is too basic in its scope (e.g., Sherman & Poirier, 2007). Specifically, previous studies have been conducted for the purposes of illustrating what assistance is needed to build public educational systems in less-developed or developing countries by just comparing the enrollment ratios of primary and
secondary schools, per pupil expenditures and pupil/teacher ratios among countries. However, given that in the 21st century public educational systems in most countries are sufficiently developed, it is inappropriate to consider only enrollment and pupil/teacher ratios in fully guaranteeing educational opportunities.

Rather, whether or not each country’s educational system eventually provides all students with basic and essential knowledge and skills is (or should be) a more appropriate criterion for securing educational opportunities (Berne & Stiefel, 1999; Coleman, 1968, 1990; Coleman et al., 1966; Hirsch, 2006; Reich, 2006; Roemer, 1998). It is obvious that every student has the right to receive at least the minimum level of education necessary to take an active part in developing culture and society as a mature world citizen as a result of entering secondary schools. Moreover, the conditions to correct problems of educational opportunities are related not to absolute level of test scores but to relative gaps in distribution of achievement between disadvantaged groups and a dominant group. Therefore, it should be noted that the examination from an outcome perspective of guaranteeing educational opportunities does not mean ranking student achievement levels.

Third, this study attempts to expand the range of educational resources for securing equal educational opportunities. Actually, which educational resources decisively affect the degree of educational opportunities from an outcome perspective is an old and traditional topic in education finance and economics (Greenwald, Hedges, & Laine, 1996a, 1996b; Hanushek, 1979, 1986, 1997; Hedges, Laine, & Greenwald, 1994). Representatively, there is a research trend toward educational production function; however, the research results do not give us sufficient solutions to which resources are more directly related to guaranteeing educational outcomes than other resources (Monk, 1992; Rice, 2001; Rolle, 2004; Rumberger & Palardy, 2004). This
unsettled question intimates to us that abstract, immaterial or psychological resources (hereafter, qualitative resources) such as peer effect, parental support, and school culture—which previous literature did not focus on as equity objects—need to be considered as factors necessary to secure equal educational opportunities. Thus, this study analyzes the distribution of qualitative resources as equity objects in order to fully understand the degree of educational opportunities in addition to material resources (hereafter, quantitative resources) such as dollars.

Finally, the purpose of this study is to examine the relationship between the guarantee of educational opportunities based on a resource perspective and the guarantee of educational opportunities based on an outcome perspective. On the one hand, the relatively old international comparison studies of student achievement like PISS and TIMSS incited each country’s drive to improve its students’ test scores. On the other hand, even though it is not an intentional result, they unexpectedly drew attention away from the importance of resource aspects of educational opportunities and the close association of resource aspects with guaranteeing opportunities in terms of outcome aspects. Therefore, this study attempts to explain the relationship between the two different types of opportunity guarantees, considering external and peculiar characteristics, which might affect the guarantee levels of equal opportunities in both countries’ educational systems.

Research Questions

Specifically, this dissertation attempts to address the following research questions to achieve the purposes posed above:

1. In terms of educational resources, how are educational opportunities guaranteed in the U.S. and Korean educational systems?
2. In terms of educational outcomes, how are educational opportunities guaranteed in the U.S. and Korean educational systems?

3. What relationships exist between equal educational opportunity guarantees based on educational resources and guarantees based on educational outcomes in the U.S. and Korean educational systems?

Methodological Overview

To perform this study, I will use two similar longitudinal data sets from each country: the Education Longitudinal Study of 2002 (ELS:2002) and the Korean Education Longitudinal Study of 2005 (KELS:2005). The KELS:2005 as a data set for Korean analysis resembles the ELS:2002 in terms of survey methods, variables, and purposes (Ryu et al., 2005). Therefore, the two data sets fit this comparative study well.

In this study, the degree of educational opportunity will be assessed by equity and adequacy analyses, which consist of already popular measures in school finance. In particular, to analyze the equity of educational resources and outcomes, so called resource equity1 and outcome equity, respectively, Berne and Stiefel’s equity analysis framework (1984, 1994) for measuring the principles of horizontal and vertical equity will be used to comparatively evaluate the degree of educational opportunities. Specifically, various horizontal equity indexes such as the coefficient of variation, the Gini coefficient, and the 95th/5th percentile ratio will be used to assess the degree of horizontal equity. In addition, vertical equity will be measured by multiple regression via weighted least squares (WLS).

1 Contrasted with outcome equity, resource equity refers to a general equity analysis focusing on educational resources in this study.
With respect to the analysis of adequacy, the successful school approach using information on the performance and efficiency levels of each school will be employed in this study. By estimating the ratios\(^2\) of the current per pupil expenditure to the cost of adequacy in both countries’ compulsory education stages, the ratios can be utilized to examine the relationship between securing equal resource and outcome opportunities.

Significance of the Study

The assessment of the degree of educational opportunities in the educational systems of different countries is not a new research topic (Cavicchioni & Motivans, 2001; Gorard & Smith, 2004; Mingat & Tan, 1985; Stromquist, 2006). However, this study has significance in that it focuses on the guarantee of necessary and minimum educational outcomes as an important factor in establishing the concept of equal educational opportunity. Furthermore, this study can contribute to a shift by policymakers and researchers away from a focus on absolute levels and rankings of test scores in international comparison research to the distributional inequity in the achievements of disadvantaged groups and a dominant group. As a result, this study may indicate new directions for making better use of outcome equity analysis—including in the traditional equity framework of Berne and Stiefel (1984, 1994) but little utilized in previous equity research—to analyze educational opportunities in terms of outcome aspects.

This study may provide the possibility of broadening policymakers’ horizons on educational opportunities in terms of resource aspects as well as in terms of outcome aspects. Specifically, by considering qualitative resources that have been ignored in school finance research as equity objects (Grubb, 2009a, 2009b; Guthrie, 2006), this study will allow for fully assessing equal opportunities in terms of resource aspects. A comprehensive consideration of

\(^2\) In this study, the ratios is referred to as the guarantee rates of adequate education.
educational resources is eventually required for researchers and policymakers to improve the current guarantee levels of educational opportunities in their own educational system’s contexts. Collaterally, this study may make clear the disadvantages of considering a narrow range of educational resources such as expenditures and pupil/teacher ratio by uncovering the differences in equity levels of educational resources between a broad and a narrow assessment perspective.

Finally, this study will provide one exemplary case study that illustrates the consequences of failing to examine the relationship between the opportunity guarantees of educational resources and outcomes, which was previously pointed out as a weakness of international comparative assessments. The guarantee rates of adequate education can help in examining the relationship. Specifically, the relationships between the results of outcome equity and the guarantee rates of adequate education measured in dollars will provide evidence of whether or not per pupil expenditure (the cost of adequacy in both countries) can provide equal opportunities in terms of outcome aspects to all students. Moreover, the relationships allow for help in determining whether or not the provision of adequate education measured by dollars is sufficient to guarantee equal opportunity in both countries’ educational systems. Therefore, this study has the potential to strengthen the effectiveness of existing international comparative assessments such as PISA and TIMSS in improving the state of educational opportunities by considering the guaranteed degrees of educational conditions along with the results of international assessments.

Overview of the Study

An examination of educational opportunities including the equity of schooling results provides policymakers with an alternative perspective for setting the ultimate goals of educational policy. This study will scrutinize the current status of guaranteeing educational
opportunities in the U.S. and Korean educational systems by constructing resource equity, adequacy, and outcome equity analyses using the ELS:2002 and the KELS:2005 data sets. With respect to resource equity analysis, this study will assess the differences in the determination of inequity between analysis based on a broader (newer) range of educational resources and that based on a narrower (more traditional) range of educational resources. Finally, adequacy and outcome equity analyses will together allow for examining the relationship between securing educational opportunities based on a resource perspective and securing educational opportunities based on an outcome perspective.

This dissertation will proceed in the following manner: Chapter Two will define the operational concept of educational opportunity and will review equity and adequacy analysis from previous school finance studies and will then attempt to present a comprehensive and systematic classification of educational resources as equity objects. Chapter Two will end with comparisons of the U.S. and Korean educational systems to find external factors affecting the guarantee of educational opportunities in each country’s educational systems. Chapter Three will review the data sets to be used as well as methods and analytic strategy for answering the research questions raised above. Chapter Three will also propose statistical models to apply the methods to answer the research questions and describe the selection and operationalization of variables used in this study. Chapter Four will present findings from the analysis of resource and outcome equity and adequacy using the ELS:2002 for the U.S. educational system and the KELS:2005 for the Korean educational system and compare each country’s findings. Finally, Chapter Five will review the key findings, discuss research and policy implications for the field of school finance, mention several limitations of the overall research and suggest further steps for additional inquiry.
CHAPTER 2
LITERATURE REVIEW

Overview

This chapter first reviews prior literature from education finance, sociology, and law on the concept of educational opportunity and the analysis of equity and adequacy—very popular analytic frameworks in school finance—to be utilized in this study for examining guarantee levels of educational opportunities in the U.S. and Korean educational systems. Next, this chapter sets up educational resources using an educational production framework for assessing educational opportunities from a resource perspective. As a final step in this chapter, comparisons of both countries’ educational systems will address the following issue: which external factors that influence the guaranteed level of educational opportunities need to be constructed in the vertical equity model of each country. Overall, this chapter will allow for analyzing data sets and interpreting the results of each analysis appropriately.

Concept and Analysis of Educational Opportunity

In the field of school finance, the concept and analysis of educational opportunity have received only limited discussion because of their elusiveness (Berne & Stiefel, 1984; Ladd, 2008). However, the fields of education sociology and law have already included equality of outcomes into the concept of equal educational opportunity (e.g., Coleman, 1968; Reed, 2001; Roemer, 1998; Wise, 1968). This section offers the possibility that the concept and analysis of educational opportunity, even in the field of school finance, can be conceptually and empirically investigated using the historical connotations of equity and adequacy concepts and analyses,
which are two popular pillars in school finance.

*Concept of Educational Opportunity*

*Equal Opportunity in School Finance*

Compared to the principles of horizontal and vertical equity, the concept and analysis of equal opportunity has been little discussed as a single topic in the field of school finance. While many possible reasons exist, there are three principal possible reasons for the relative lack of flourishing research progress in equal opportunity. First, equal opportunity has taken on so many other meanings from various social science fields, and the definition of equal opportunity has evolved over the past 200 years from access to schooling to adequate education (Berne & Stiefel, 1984; Roemer, 1998; Rossmiller, 1994). Furthermore, the fact that the problem of unequal opportunity has been dealt with in ways that include very broad and unspecified aspects such as social movement, black students’ cost differences from white students, and future incomes and jobs (B. D. Baker & Green III, 2009; Bowles, 1968; R. Breen & Jonsson, 2005; R. Breen, Luijkx, Müller, & Pollak, 2009) might be contributing to the lack of continuous and accumulated products in equal opportunity research of school finance (Ladd, 2008; Peterson & Woessmann, 2007).

In the influential book *The Measurement of Equity in School Finance: Conceptual, Methodological, and Empirical Dimensions*, Berne and Stiefel (1984) formulated the principle of equal opportunity in a negative way as follows: “There should not be differences according to characteristics that are considered illegitimate, such as property wealth per pupil, household income, fiscal capacity, or sex” (p. 17). According to the definition, the principle of equal opportunity, as the third subprinciple of the concept of equity, can be perfectly satisfied when there is no relationship between equity objects and illegitimate characteristics (Berne & Stiefel,
Additionally, this principle is often called *fiscal neutrality*, originally developed by Coons, Clune, and Sugarman (1993) and discussed in the *Serrano* decision of the California Supreme Court in 1971 (Addonizio, 2003; B. D. Baker & Green III, 2008; Ladd, 2008; Odden & Picus, 2008). However, strictly speaking, the principle of fiscal neutrality focuses on the relationship between local educational spending and local property wealth (or household income), which is not the same principle of equal opportunity that Berne and Stiefel (1984) originally provided (Downes & Stiefel, 2008). Because Berne and Stiefel (1984) also considered outcomes as well as educational resources in the principle of equal opportunity, the principle of fiscal neutrality is a more narrow concept than the principle of equal opportunity (B. D. Baker & Green III, 2008).

Even though Berne and Stiefel (1984) expressly indicated that educational outcomes are also one type of equal opportunity objects, few researchers have conducted an assessment of equal opportunity with educational outcomes except Iatarola and Stiefel (2003). While they pointed out the lack of equity research using educational outcomes variables, they conceptualized equal opportunity in two ways: *neutral formulation* and *affirmative action formulation*. The former entails the lack of association between per pupil resources and disadvantaged groups (e.g., non-White students living in urban), and the latter entails a positive association in the relationship. Because of their formulation of the two ways of conceiving equal opportunity, Iatarola and Stiefel (2003) made a great contribution to school finance equity research in the sense that they clearly handled the distribution of educational outcome in equity analysis; however, they failed to make progress in the sense that equal opportunity based on educational outcomes did not emerge from the study.
Equal Opportunity in Education Sociology and Law

Even though the concept of equal opportunity has not developed into measuring its guarantee levels in the fields of education sociology, law, and other social science, these fields have contributed to conceptually establishing equal opportunity (Ladd, 2008; Leyden, 2005; Roemer, 1998). As with other concepts in social science, the meaning of equal opportunity has evolved over time, particularly since the 1960s (Berne & Stiefel, 1984, 1994; Coleman, 1990). For example, the survey on the lack of equality of educational opportunity by Coleman et al. (1966), required by Section 402 of the Civil Rights Act, represents the social interest in equal opportunity in the 1960s. In addition, influential books in sociology and school law—*A Theory of Justice* (1971) by John Rawls and *Rich Schools Poor Schools: The Promise of Equal Educational Opportunity* (1968) by Arthur Wise—also reflect great progress in the concept since the 1960s.

Most of all, Coleman et al. (1966) made a contribution to expanding the concept of equal opportunity to equality of schooling results (Coleman, 1990; Reed, 2001). While they assumed that no single concept of equal educational opportunity existed, they attempted to include a variety of concepts into their survey. Specifically, they presented five different types of inequality in terms of the community’s input, the racial composition of schools, various intangible characteristics of schools (e.g., teacher morale, teachers’ expectations, and level of interest of the student body in learning), and consequences of schools (Coleman, 1968, 1990; Coleman et al., 1966). Even though they reached the more or less dismal conclusion that school factors such as teacher quality are less likely to have an impact on student achievement than family characteristics, their survey resulted in expressly defining equal opportunity as guaranteeing equality of results given different individual inputs. When this change in the
concept of equal opportunity occurred, “[T]he school’s responsibility shifted from increasing and
distributing equally its ‘quality’ to increasing the quality of its students’ achievements”
(Coleman, 1990, p. 30).

In the field of education law, Wise (1968) also presented the minimum-attainment
definition as one of the nine alternative definitions of equal educational opportunity. He
characterized nine alternative definitions of equality of educational opportunity based on
“resources provided to students” and “student abilities and needs” (Leyden, 2005). Even though
he restricted equal opportunity issues to allocating educational resources, his classification of
equal opportunity concept has significance in the sense that the perfect fulfillment of opportunity
lies in achieving minimum and necessary attainments.

In addition to the academic field of education law, the U.S. courts historically have
expressed the changes in the meaning of equal conditions for all children (Reed, 2001).
Specifically, they have decided that *equality* means the provisions of equal access (e.g.,
desegregation) and inputs (e.g., per pupil expenditure) and eventual learning of basic skills (e.g.,
knowledge of economic, social, and political systems (*Brown v. Board of education*, 1954;
1971). According to Reed (2001), even though judicial decisions have intrinsic passivity because
of the lack of technical expertise and the need to maintain the separation of the three branches of
government, state supreme court decisions have functioned essentially as concrete proposals to
request legislative and administrative branches to achieve equality of educational outcome
aspects between minority and majority groups.

Finally, from the economics and political science perspectives, Roemer (1998) argued
that society must guarantee educational outcomes such as an individual’s economic prospects
regardless of the circumstances into which one is born. As Roemer argues in his book *Equality of Opportunity*, educational policymakers should provide all students having factors, or circumstances, outside the child’s control that affect outcomes with additional resources to achieve outcome equality (Ladd, 2008). Therefore, equal opportunity based on educational outcomes must be included in the concept of equality not only to produce an effective school but also to achieve a just society (Rawls, 2001, 2005).

**Accountability, Standards-Based Reforms and Equal Opportunity**

In addition to the emphasis in academia on equality of educational outcomes, practices in the field, as represented by educational policies, have also reflected the pursuit of securing equal opportunity to all students, particularly to disadvantaged students. Sleeter (2007) evaluated the accountability reform movement as a representative policy to transfer public interest from input resource-oriented opportunity to outcome-oriented opportunity. Hirsh (2006) also emphasized the guarantee of adequate outputs as a final goal of educational policies as follows: “Adequate outputs are what finally count in education” (p. 312). Thus, the trend of establishing accountability systems in educational policy is a confirmative pursuit of equal opportunity in terms of educational outcomes (Reed, 2001; Reich, 2006).

NCLB is known as a definitive educational policy of accountability, and it is assumed that participant states have to set the specific standards criteria to be achieved by individual schools (Carnoy et al., 2003; Elmore, 2003; Ladd, 2008; Leyden, 2005; Sleeter, 2007; Webb, 2006; Wong, 2008). NCLB aims at both equity and excellence goals in educational outcomes. Specifically, the equity goal is clearly suggested by the regulation stating that each school should report student achievement data grouped by poverty, race, ethnicity, disability, and limited English proficiency (Sleeter, 2007). In other words, NCLB also requires individual schools to
achieve not only on an overall basis but also within specific sub-groups.

Finally, NCLB deals with concerns about the excellence of educational outcomes in American public education in addition to the equity goal. These concerns are reflected in standard-setting and testing, implementation of proven methods of instruction, and the requirement that schools provide highly qualified teachers for every classroom (Carnoy et al., 2003; Mintrop & Trujillo, 2007; Sleeter, 2007). In sum, the accountability movement and standards-based reforms are geared to minimize the achievement gaps (or equalize achievement in terms of a minimum and necessary level) between disadvantaged groups and a dominant group through excellent levels and methods.

Conclusion: Conceptual Framework of Equal Opportunity

Based on prior literature and policies on equal educational opportunity, Figure 1 shows a conceptual framework for guaranteeing three levels of equal opportunity using the two aspects of educational opportunity.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Resource-Outcome Mixed</th>
<th>Outcome</th>
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Figure 1
Conceptual Framework for Guaranteeing Educational Opportunity
As presented in Figure 1, the guarantee of educational opportunity has three different levels. The first level is guarantee of equal opportunity in terms of resources aspects without consideration of the outcome. This level is exemplified by access to public education (Brown v. Board of education, 1954) and equalization of per pupil expenditure regardless of local wealth (Serrano v. Priest, 1971). The second level is guarantee of equal opportunity in terms of resource aspects with consideration of the outcome. This level is indicated by the provision of adequate education for all students to achieve a minimum level of basic knowledge (Rose v. The council for better education, 1989) and school finance formulas of states (e.g., Quality Basic Education (QBE) of the state of Georgia in 1986). The final level of guarantee of equal opportunity focuses on educational outcome aspects that promote abilities for social successes in the future after secondary education. This level of equal opportunity is being pursued by accountability and standards-based school reforms such as Nation at Risk in 1983, Goals 2000: The Educate America Act and the Improve America’s Schools Act in 1994, and NCLB Act in 2001.

In conclusion, the conceptual framework of educational opportunity illustrated in Figure 1, drawn from prior literature on equal opportunity and current educational polices, suggests that the concept of equal opportunity includes both resource and outcome aspects. Additionally, this framework suggests that the final goal of guaranteeing equal opportunity is to provide all students with the minimum skills and knowledge necessary to realize individual potential for social success (Berne & Stiefel, 1999; Ladd, 2008; Rawls, 2001, 2005; Reed, 2001; Roemer, 1998; Sherman & Poirier, 2007; Wise, 1968). Therefore, based on previous discussion of equal educational opportunity, the concept of equality of opportunity in education is operationally defined in this study as follows: “Equal opportunity in education means fairly guaranteeing educational resources and outcomes in compulsory education stages in order to give all children
the chance to succeed in their future adult lives using their potential.”

**Analyses of Educational Opportunity**

Based on the conceptual framework presented above, this study will utilize the analysis of equity and adequacy—popular analytic frameworks in school finance research—to compare educational opportunities provided by the U.S. and Korean educational systems. The two analytic tools will help provide a conceptual extension from resource to outcome aspects of educational opportunity concretized in an empirical world. Specifically, this section addresses which analytic methods are respectively needed to examine the three guarantee levels of educational opportunity proposed in Figure 1.

The conceptual and practical extension of equal educational opportunity from resource to outcome aspects can similarly be confirmed by the concepts of equity and adequacy, which are two pillars of school finance (Clune, 1994b). To be specific, the historical changes in emphasis on the concepts of equity and adequacy that have occurred in school finance are similar to changes in other social science fields when considering the concept of equal opportunity (Berne & Stiefel, 1999; Reich, 2006; West & Peterson, 2007). Therefore, the concepts of equity and adequacy have continuity based on the developmental history of the two concepts (Clune, 1994b; Glenn, 2009; Grossman, 1995; Grubb, 2009b).

In the traditional perspective of school finance, the concept of equity was primarily discussed in relation to the distribution of educational resources (Berne & Picus, 1994; Iatarola & Stiefel, 2003; Sherman & Poirier, 2007). The analysis of adequacy also assesses the cost of adequate education in both countries’ K-12 educational systems and the adequacy of per pupil

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3 In the case where the concept of equity is considered at given levels of educational outputs (e.g., B. D. Baker & Green III, 2008; Underwood, 1995), even the concept of equity can reflect the degree of equality of school results.
expenditures for the students of both countries (Clune, 1994b, 1995). Further, the concept of adequacy, even though it is finally summarized by a set of educational resources (i.e., per pupil expenditure), assumes the fulfillment of minimum educational outcomes (e.g., student achievement). In a sense, the concept of adequacy is intended to challenge all students to reach their highest potential—regardless of the students’ various starting points in learning. If this concept is accepted, the cost of adequacy can provide disadvantaged students with a level playing field to realize their potential (Guthrie & Rothstein, 1999; Ladd & Hansen, 1999; Peterson & Woessmann, 2007; Reich, 2006).

However, the concept of adequacy itself does not automatically satisfy the extreme endpoint of an equal opportunity spectrum—equality of results—which indicates that all students achieve a desirable level of performance (Clune, 1994a; Coleman, 1990). Even though an adequacy analysis, in part, includes educational outcome aspects, it does not answer the question of how educational outcomes are distributed, how wide the gaps in achievement are between the advantaged and the less advantaged students, and what relationships exist between the guarantees of educational resources and educational outcomes. As a result, the discussion of outcome equity in the field of school finance has been driven by the emphasis on the equality of schooling results drawn from education sociology and law since 1960s (Berne & Picus, 1994; Berne & Stiefel, 1999; Iatarola & Stiefel, 2003).

Finally, beyond leveling the field, achieving equity of results is the third level of securing equal opportunity, as seen in Figure 1. In order to examine this guarantee level of equal opportunity, the analysis of outcome equity—the same as resource equity except for an equity object—is additionally needed. The analysis of outcome equity allows for comprehensively analyzing how educational opportunities are guaranteed in terms of outcomes in addition to the
perspective provided by adequacy analysis. Consequently, when policymakers certify whether or not educational policies or reforms extend the guarantee levels of equal opportunity, the analysis of outcome equity can give them insights into diagnosis of and solutions for the problems of equal opportunity (Ladd, 2008; Reich, 2006). In sum, the analysis tools of equity and adequacy together can contribute to the evaluation of the degrees of equal opportunity and their improvement appropriately.

Figure 2 presents the analytic framework for guaranteeing educational opportunity used in this study. Resource equity analysis is matched with the guarantee level of equal opportunity in terms of resource aspects without consideration of outcome, adequacy analysis is matched with the guarantee level of equal opportunity in terms of resource aspects with consideration of outcome, and finally outcome equity analysis is matched with the guarantee level of equal opportunity in terms of outcome aspects.

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**Guarantee Levels of Equal Opportunity**

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<tr>
<th>Resource</th>
<th>Resource-Outcome Mixed</th>
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Figure 2

Analytic Framework for Guaranteeing Educational Opportunity
The following section describes the conceptual structure of equity and adequacy and the steps of estimating the cost of adequacy, respectively. Specific measures for equity used in this study will be addressed in the methods part of Chapter Three.

Equity and Adequacy in School Finance

*Equity in School Finance*

Equity studies have been recognized a huge part of school finance. In particular, Berne & Stiefel (1984, 1994) provided research on equity analysis of educational resources with a fundamental and productive framework. In that framework, they introduced various equity objects (e.g., educational inputs, outputs, and outcomes) and the three subprinciples of equity. However, literature has focused on input resources as an object and horizontal/vertical equity as a subprinciple. *Conceptual Structure of Equity*

Even though the focus of education policy objectives and school finance litigation has been changed from equity to adequacy, equity is still an essential provision to guarantee the right to education (Berne & Stiefel, 1984, 1994; Clune, 1994b; Odden & Picus, 2008). It is obvious that accurate estimations of the current degree of equity are prerequisites for improving the inequitable distribution of educational resources. In other words, quantitative measures for assessing equity enable researchers and policymakers to explore the distribution status of educational resources and to compare the level of equity in different school finance systems. According to the equity framework of Berne and Stiefel (1984), the following section discusses the principles of horizontal equity and vertical equity for this study.

Before discussing the concept of equity in earnest, it should be noted that all concepts of

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4 However, the third principle, equal opportunity, is conceptually assumed to be a superordinate principle of horizontal and vertical equity in this study. Therefore, the following section will address only both horizontal and vertical equity.
the social sciences have evolved over time due to discussion and debate in the academic and practical field (Coleman, 1990; Roemer, 1998; Rossmiller, 1994). For example, the concept of vertical equity originally does not consider educational outcomes (Reich, 2006); however, some scholars (e.g., B. D. Baker & Green III, 2008; Ladd, 2008; Rossmiller, 1994; Underwood, 1995) are discussing the concept of vertical equity linked to educational outcomes such as the concept of vertical equity as adequacy. Therefore, we can see that the concepts of school finance have also been changed over time, just as the other concepts of the social sciences. Even though there are some deviations in the concept of equity, the descriptions below will be based on the original ideas of equity concept.

Assuming that there are many ways to conceptualize equity, Berne and Stiefel (1984) developed the concept of equity with answers to four important practical questions: Equity (1) groups (who), (2) objects (what), (3) principles (how), and (4) summary statistics (how much). The first answer addresses the issue of equity target groups such as children and taxpayers. After a decision is made about the equity target, the concept of equity consists of objects, principles, and measures.

The second answer, the objects of equity, explains what educational resources or services should be equitably distributed among the groups such as children (Odden & Picus, 2008). The objects of equity analysis include educational input resources, such as dollars or revenues per pupil, educational processes, and outcomes (Berne & Stiefel, 1984; Iatarola & Stiefel, 2003; Odden & Picus, 2008). The third answer addresses equity principles. Generally, three equity principles have been discussed. Each principle needs different measures to be evaluated appropriately; therefore, the last answer addresses the measures of each equity principle.
Principle of Horizontal Equity

This principle means students who have equal situations should be treated equally. When educational resources are equally distributed across all students with similar attributes, horizontal equity is satisfied. Compared to the concept of adequacy, equity principles are relative concepts. Specifically, equity principles deal primarily with relative differences in educational resources, whereas the concept of adequacy emphasizes the absolute level of educational resources to guarantee a specific performance standard (B. D. Baker & Green III, 2008).

Principle of Vertical Equity

This principle means students who have different situations should be treated differently. Vertical equity implicitly assumes that students with special needs require greater amounts of educational resources to achieve set levels of performance. When educational resources are compensatorily distributed corresponding to various types of students with special needs such as disabilities, poverty, and Limited English Proficient (LEP), the degree of vertical equity can be promoted. Therefore, vertical equity involves perverse relationships in which resources are withheld from particularly needy classes of students (Berne & Stiefel, 1984; Houck, 2010). Like the principle of horizontal equity, vertical equity focuses on the relative differences among students with (without) special needs. However, vertical equity is more controversial than horizontal equity because “who” and “how much” questions of vertical equity should be addressed (B. D. Baker & Green III, 2008). In other words, compared to the principle of horizontal equity, vertical equity reflects social preferences and political debates, whereas horizontal equity means a minimal provision of fairness with objective criteria (Madden, Slavin, Karweit, Dolan, & Wasik, 1991).

When the principles of horizontal equity and vertical equity are analyzed together,
measures of horizontal equity provide information about inequalities in resources across a distribution. It may be the case (and often is) that spending is horizontally inequitable for appropriate reasons—additional funds are being expended to assist traditionally low-performing groups. Additional vertical equity analysis can assist in determining the relationships between more spending and student and school characteristics (Houck, 2010).

* Adequacy in School Finance *

U.S students’ low achievement, especially minorities’ low achievement, has been discussed as a primary problem of the U.S. K-12 education over the last 50 years (Addonizio, 2003). In order to solve the problem, many efforts have been made since the launch of *Sputnik* (1957). The education excellence reforms proposed by *A Nation at Risk* (1983) and standards-based reforms accelerated by *NCLB* Act (2001) are representative examples (Stronge, Ward, Tucker, & Hindman, 2007). As each state forced students and schools to satisfy the high standards of performance, parents filed school finance lawsuits because each state could not provide their children with “adequate” educational resources to achieve the high standards. In this policy context, it seems more important than ever to examine as many of the factors as possible that influence educational outcomes and to measure the concept of educational adequacy (Archibald, 2006).

*Conceptual Structure of Adequacy*

Unlike the concept of equity, the concept of adequacy is relatively hard to operationalize because defining standard performance and selecting alternative results of measuring it involves political processes (Rossmiller, 1994; Wise, 1983). Accordingly, the degree of guaranteeing adequate education might vary according to the concept and assumption of adequacy. For example, some scholars assert that the concept should include the equality of desirable level of
student performance (B. D. Baker & Green III, 2008; Garms & Smith, 1970; Koski & Reich, 2007; Underwood, 1995). However, the concept of adequacy does not reach the minimum level of equalization in student achievement (Clune, 1994b). Generally, adequacy can be defined as the provision of a set of educational resources that are sufficient to provide all students an equal opportunity to achieve high performance standards (B. D. Baker & Green III, 2008; Clune, 1994b; Odden & Picus, 2008).

In the field of school finance, the interest in the concept of adequacy focused attention on these issues: (1) how money really matters and (2) how much money is needed to achieve desirable standards (Archibald, 2006; Odden & Picus, 2008). In other words, examining the factors significantly affecting student performance and calculating the cost of adequacy are closely related. Consequently, the estimation of adequate spending is meaningful under the assumption that money matters. Additionally, considering the differences in students’ needs, the concept of adequacy suggests that the estimation processes should definitely include cost adjustments corresponding to factors causing cost differences (e.g., cost of living, student needs, etc.).

Measuring adequacy means the estimation of the cost of adequacy to achieve performance standards set by each state or country. Baker (2005) mentions, “In general, empirical evaluation of education adequacy involves identifying the total cost at which a desired set of student outcomes can be achieved” (p. 270). In the same sense, Duncombe and Lukemeyer (2002) regarded estimates of adequate education for each school district as the heart of an adequacy-based finance system.

Steps of Estimating the Cost of Adequacy

Duncombe & Lukemeyer (2002) summarized the three steps of estimating the cost of
adequacy, which can be applied to all measures commonly. The first step is to select measures (or, variables) of student outcomes set by a state’s law or government. Often, researchers choose standards-based test scores as a target performance. The next step is to estimate the cost of adequacy with which a benchmark school district can achieve the standard performance. This process involves linking the adequate spending level to the performance standard at a benchmark district. The final step addresses the issue of cost adjustments to reflect different characteristics of other districts. Usually, students with special needs, the cost of living, the diseconomies of scale (the size of districts), and the working conditions for the staff are the main considerations when adjusting the cost of adequacy. Because the selection of outcome measures might or might not be included depending on the approach used in research, the last two steps differentiate the characteristics of approaches for measuring adequacy (Downes, 2004; Duncombe, 2002).

In particular, the last step regarding cost adjustments is important in that the essential meaning of adequacy lies in guaranteeing all students, whether handicapped or non-handicapped, adequate levels of funding. That is, it is impossible to provide adequate education without considering cost adjustments (Duncombe & Lukemeyer, 2002; Duncombe & Yinger, 1999).

Educational Resources for Equal Opportunity

In the academic and practical field of school finance, no one denies the importance of educational resources in guaranteeing equal opportunity. However, previous studies on school finance equity have overly emphasized quantitative resources such as per pupil expenditure, pupil/teacher ratios, and teacher salary (Grubb, 2009a, 2009b; Guthrie, 2006; Shaw, 2009). Only dollars and physical resources have limitations on solving an equal opportunity problem because it is not only impossible but inefficient to fully guarantee equal educational opportunity with only quantitative resources (Peterson & Woessmann, 2007). Instead, it is necessary to choose a
broad range of educational resources including socio-psychological resources (e.g., principal leadership, peer effects, school culture, etc.), considering that various resources can affect the degrees of educational opportunities (Grubb, 2009b; Kozol, 1991).

Although such a significant importance of educational resources has been emphasized in the history of school finance research, there is as yet no clear consensus on concept, criteria, and classification of educational resources from a broad perspective (Phillips & Chin, 2004). Therefore, this study attempts to address what educational resources should comprehensively be examined in guaranteeing equal opportunity from a resource perspective.

The Operational Definition of Educational Resources

According to American Heritage Dictionary (2006), Collins (2007), and Merriam-Webster (2003), the meanings of resource can be summarized as follows: (1) something that can be used for support or help; (2) money available for use; (3) the total means for the development of countries, companies, individuals, etc.; (4) an available supply that can be drawn on when needed; (5) the ability to deal with problems. From these definitions, it seems obvious that resource is a broader and more abstract concept than simply money and is related to the concepts of support (or help), means, and abilities. Therefore, if the concept of resource is brought into education, some things (or means) including money play a role in supporting or helping educational outcomes such as achievement, attainment, and lifelong benefits of education in terms of individuals and societies.

Additionally, Grubb (2009b) in his book The Money Myth, asserting that money is usually “necessary but not sufficient” (NBNS), emphasizes other kinds of resources in addition to money—“leadership, vision, cooperation among teachers, effective instruction, unbiased information about effective versus ineffective practices, stability, consistent district and state
policies” (p. xii)—as sufficient for improving educational outcomes. Further, he develops a novel approach to finance and resources, which identifies what kinds of “right” resources can improve learning, attitudes, and other important outcomes and determines how those resources are related to funding.

Finally, the interest shift in the field of school finance can provide hints for an operational definition of educational resources. In the era of equity-based school finance litigation, the focus of academia and the political arena was more likely to be on the inequality of school funding. However, since the 1990s, as the concept of adequacy has been emphasized, leadership, specific programs, teachers, peer groups, facilities, and environments (or climates) that affect educational outcomes are considered more important than school funding (Clune, 1994a, 1994b; Guthrie, 2006; Rossmiller, 1994). Considering all of the above, educational resources can be operationally defined as “all concrete (physical) and abstract (psychological) factors not only to improve educational outcomes, but also to be controlled by educators’ (or policymakers’) directly and indirectly.”

Criteria for Educational Resources

Evidently, various educational resources were employed in the previous studies that examined the influential factors on educational outcomes. They are not confined to the field of school finance. For instance, family environments, cultural capital, and social classes have been main topics in the field of education sociology (e.g., V. E. Lee & Bryk, 1989; Roscigno & Ainsworth-Darnell, 1999; van de Werfhorst & Kraaykamp, 2001). Accordingly, in reference to the operational definition of educational resources, some criteria for identifying educational resources from the numerous relevant studies are needed. To identify educational resources corresponding to the purpose of this study, the following criteria are set:
1. Identified resources should be proved to positively affect educational outcomes including, but not limited to, achievement, attainment, and lifelong benefits of education based on scientific research. In other words, the condition of identified resources cannot be satisfied in cases where the identified resources were employed but insignificant in the literature.

2. Identified resources do not need to positively affect educational outcomes directly. In other words, the condition of identified resources can be satisfied when the identified resources can be proved to positively affect other educational resources improving educational outcomes.

3. The kinds of identified educational resources are not confined to the quantifiable materials (e.g., money). Educational resources can include abstract and psychological characteristics (e.g. quality, expectation, and climate), which are conceptually constructed. Likewise, educational outcomes determining whether or not something is an educational resource are not confined to student achievement. Educational outcomes can be recognized broadly from achievement to social benefits.

4. Identified educational resources are distinguished from means outside educators’ (or policymakers’) direct and indirect control. For example, even though the family backgrounds (e.g., SES) and racial composition of the student body are recognized as consistent and powerful predictors of educational outcomes, neither⁵ are included in the basket of educational resources according to the operational definition prescribed in this paper.

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⁵ The characteristics of student, school, and districts associated with educational outcomes but outside policymakers’ direct and indirect control are generally called *confounding (control) variables* in the educational production function.
Classification of Educational Resources

In this section, the educational production function model and Tagiuri’s (1968) taxonomy of school climate are provided as frameworks for classifying educational resources. The reasons for choosing the two frameworks are as follows: First, educational production function fits the previous operational definition of resource well, and the concept of adequacy recently dominating the field of school finance is inevitably related to the question of whether or not educational resources really affect schooling outcomes (Archibald, 2006; Odden & Picus, 2008). Second, Tagiuri’s (1968) taxonomy of school climate provides a comprehensive classification of educational resources including physical and psychological factors (Shaw, 2009). Therefore, the two basic theoretical frameworks will ultimately contribute to accomplishing this study’s purpose of comprehensively analyzing equal opportunity of resource aspects.

Educational Production Function Model: Input-Output

In reference to the operational definition of educational resources and the various provisions for adequate education, it is essential to examine the relationship between educational resources and outcomes (Odden & Picus, 2008). Accordingly, the educational production function model, which specifies educational resources associated with the improvement of student performance, can be a useful framework for classifying educational resources in that the model specification can suggest a systematic relationship among educational resources. The studies of educational production function, also referred to as input-output analysis, can be defined as examining how changes in different educational inputs, such as class size, create differences in educational outcomes (Hanushek, 1986; Levin, 1994b). However, in order to grasp the components of educational resources fully, a traditional input-output model needs to be modified into the input-throughput-output model (process model) including the process factors.
affecting educational outcomes (Archibald, 2006; Creemers & Scheerens, 1994; Grubb, 2009b; Levačić & Vignoles, 2002; Scheerens & Creemers, 1989).

The importance of accounting for an educational process in the conceptual model of production function has been proposed by many scholars in the field of school finance as well as school effectiveness research (Ferguson & Ladd, 1996; Grubb, 2009b; Levačić & Vignoles, 2002; Odden, Borman, & Fermanich, 2004). For example, Levačić and Vignoles (2002) strongly assert, “It [the education production function literature] must start to take account of school contexts and processes” (pp. 315-316). Further, they suggest the “context-input-process-outcome model” of school effectiveness, and they emphasize that the broad variables of educational resources should be specified in the production function model.

**Input-Throughput-Output Model for Classifying Educational Resources**

The limitation of the traditional production function model can be made up for by considering the process factors based on the lessons from school effectiveness research and the broad objects of equity and adequacy analyses. The “Input-Throughput-Output” model proposed in this study focuses on the extension of educational resources from traditional dollar-measured input resources to a broad concept of educational resources including the process factors. In this model, the word *throughput* is used because the process factors should be accounted for in the educational production function model as a framework for classifying the broad concept of educational resources. In this study, *throughput* refers to the factors of a schooling process that affect educational outcomes by triggering differences in the quality of inputs such as dollars.

**Tagiuri’s Taxonomy of School Climate**

According to Halpin and Croft (1963), organizations, including schools, have their own characteristics, referred to as *climate*, just as people have peculiar personalities different from
those of others. Even though the concept of school climate comes from abstract and psychological roots, Tagiuri (1968) developed this concept for the purpose of defining comprehensive educational environments (or resources). Additionally, he emphasized the systematic classification of organizational: “If the concept is treated more systematically, its value for prediction and construction of desired environments will inevitably increase” (p. 23). Therefore, Tagiuri’s taxonomy can provide insights into the classification of sub-categories within input and throughput resources divided by an educational production function framework.

Tagiuri (1968) defined organizational climate as “a relatively enduring quality of the internal environment of organization that (a) is experienced by its members, (b) influences their behavior, and (c) can be described in terms of the values of a particular set of characteristics (or attributes) of the organization” (p. 27). Furthermore, he presented the four sub-dimensions of organizational climate as follows: (1) Ecology: the physical and material variables in the school that are external to participants, (2) Milieu: variables that represent characteristics of individuals (e.g., teachers, principals, and students) in the school, (3) Social System: variables that concern the patterns or rules (formal and informal) of operating and interacting in the school, and (4) Culture: variables that reflect the norms, belief systems, values, cognitive structures, and meanings of persons within the school (Anderson, 1982; Shaw, 2009).

Classification of Educational Resources

First, from an educational production function perspective, educational resources can be mainly divided into input resources and throughput resources, and Tagiuri’s taxonomy of school climate allows for classifying sub-categories of input and throughput resources. Specifically, input resources can be divided into spending and physical resources in terms of the ecology dimension, and throughput resources can be categorized as follows: (1) Personal resources such
as principal, teacher, peer (student), and parent with regard to the milieu dimension representing school participants’ characteristics; (2) **Operational resources** such as programs and school rules with regard to the social system dimension, meaning the operational systems of the school; and (3) **Cultural resources** such as school culture (e.g., academic press), reflecting the culture dimension. Therefore, in the schooling process, it is assumed that the three major factors—personal, operational, and cultural factors—potentially make a difference in the quality of inputs invested. These factors are derived from the common components mentioned in previous studies examining schooling process in addition to Tagiuri’s taxonomy (e.g., Anderson, 1982; Archibald, 2005, 2006; Monk, 1990; Odden et al., 2004; Odden & Picus, 2008; Phillips & Chin, 2004). Table 1 summarizes the classification of educational resources using the two theoretical frameworks.

Table 1

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Input Resources</th>
<th>Throughput (Process) Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spending Resources</td>
<td>Personal Resources</td>
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<tr>
<td></td>
<td></td>
<td>Operational Resources</td>
</tr>
<tr>
<td></td>
<td>Physical Resources</td>
<td>Cultural Resources</td>
</tr>
</tbody>
</table>

**Input resources**

According to the previous operational definition of resources, *input resources* can be defined as factors affecting educational outcomes in spending or physical terms. The subsets of input resources consist of spending and physical resources purchased with dollars. With respect
to the rationales of these two main parts, some scholars support the concept of physical resources because educational outcomes might be determined not only by input dollars but also by the manner in which money is spent (B. D. Baker & Green III, 2008; Corcoran, Evans, Godwin, Murray, & Schwab, 2004; Monk, 1990; Odden & Clune, 1998). Additionally, the quality of physical resources is determined by throughput resources (Archibald, 2005; Levačić & Vignoles, 2002; Odden et al., 2004). For example, even though a small class size project itself might affect student achievement, the total effect of the project would be affected by the interaction between the class size policy and the quality of teachers, peer groups, and school culture. Therefore, we can hardly discuss the effects of physical resources without some consideration of throughput resources.

**Throughput resources**

In this study, *throughput* can be substituted by process resources, which refers to how input resources are actually utilized in the schooling processes (Rumberger & Palardy, 2004). In other words, input resources, which are composed of spending and physical resources, can induce different effects depending on the quantity and quality of each throughput (process) resource. According to the previous operational definition of resources, *throughput resources* are factors affecting educational outcomes in the process of transforming inputs into outcomes. Throughput resources consist of personal, operational, and cultural factors that essentially contribute to a school’s performance. Accordingly, throughput resources are related to the quality of (1) school participants such as principals, teachers, students, and parents, (2) a school’s operational systems such as programs and school rules, and (3) school culture (Anderson, 1982; Phillips & Chin, 2004). Table 2 presents several examples of throughput resources drawn from synthesis research on educational resources and school climate in the field of school finance (e.g.,

Table 2
Examples and Characteristics of Throughput Resources

<table>
<thead>
<tr>
<th>Throughput (Process) Resources</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abstract/ Psychological</td>
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<tr>
<td>(1) Personal Resources</td>
<td></td>
</tr>
<tr>
<td>(a) Principal Leadership</td>
<td>O</td>
</tr>
<tr>
<td>(b) Teacher Quality (Quantitative &amp; Qualitative)</td>
<td>O</td>
</tr>
<tr>
<td>(c) Peer Effects</td>
<td>O</td>
</tr>
<tr>
<td>(d) Family Support</td>
<td>O</td>
</tr>
<tr>
<td>(2) Operational Resources</td>
<td></td>
</tr>
<tr>
<td>(a) Educational Program</td>
<td>O</td>
</tr>
<tr>
<td>(b) School Rules’ Fairness &amp; Clarity</td>
<td>O</td>
</tr>
<tr>
<td>(3) Cultural Resources</td>
<td></td>
</tr>
<tr>
<td>(a) School Culture</td>
<td>O</td>
</tr>
</tbody>
</table>

In addition to examples of throughput resources, the author applied characteristics of resources to the examples as a criterion for classifying throughput resources. Grubb (2009) and Guthrie (2006) pointed out the problems of confining educational resources to numerable, countable, and visible variables because these characteristics cannot fully capture the quality of educational resources in a school. Moreover, it is obvious that per pupil revenues or expenditures alone are not enough to reveal the quality of educational resources (Berne & Stiefel, 1984; Corcoran et al., 2004; Grubb, 2009b; Monk, 1990; Odden & Picus, 2008; Okpala, 2002; Phillips & Chin, 2004). Therefore, the extension of throughput resources to abstract and (socio) psychological factors can give us more insights into analyzing equal educational opportunity provided by educational systems.

Taken together, even though there is no previous literature that comprehensively specifies
all throughput (process) resources, any throughput resource chosen by researchers can be located in the three types of throughput resources. Thus, this classification will help to allow researchers to promote communication between academia and policymakers to set up policy objectives and targets efficiently in the long run (Tagiuri, 1968; Shaw, 2009; Booth & Sheehan, 2008).

Comparison of the U.S and Korean Educational Systems

Finally, this section compares the K-12 educational systems in the U.S. and Korea. In the U.S., state governments have authority over education as stated in the Constitution. As a result, there are a variety of educational systems within this one country (Schrag, 2003). Thus, instead of specifically mentioning the U.S. K-12 educational system, the overview of the Korean educational system is described. The major differences between the two countries’ K-12 educational systems can give direction to framing this study around the analysis of equity and adequacy.

Korean K-12 Educational System

The educational system of a country can be overviewed in various ways because an educational system is composed of a variety of components such as governing and funding structures, educational policies, philosophy, curriculum, and so forth. Moreover, an educational system is affected by social context including the historical traditions in education. Thus, it is not easy to comprehensively review all of the components of a country’s educational system. This section explores the Korean K-12 educational system by focusing on three major components: educational governing, funding, and policy.

Educational Governing System: National vs. Regional Government

The Ministry of Education, Science, and Technology is the national government body responsible for the formulation and implementation of nationwide educational policies related to
academic activities, sciences, and public education. Specifically, the Ministry formulates the following major educational policies: (1) governance of the primary, secondary, and higher educational institutes, (2) the national curriculum, (3) administrative and financial supports for all varieties of educational offices and schools including private schools, (4) teacher training systems, and (5) lifelong education and human resource policies. Therefore, regional education government bodies have authority to regulate only the specific matters that are needed to implement the policies set by the national government.

Korea adopted a local autonomy system in K-12 education after the establishment of the Law for Local Education Autonomy (1991). According to the enforcement ordinance of the law, there are 16 educational administration districts⁶ corresponding to the 16 general administrative cities and provinces of Korea. Each regional education government body is composed of one superintendent as an executive organ and one board of education as a legislative organ. Under the 16 regional education government bodies, there are 182 county education offices; however, these offices of local school districts are different from the 16 regional education government bodies, which possess legally representative status in terms of legal independence. That is, the local education autonomy of Korea does not extend to the basic level unit of educational administration.

Even though local educational autonomy is imperfect in that the regional government bodies of education do not have complete authority over K-12 education, the educational governing system of Korea has been decentralized since the 1990s. As a result, the Ministry

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⁶ The administrative districts of Korea consist of the one metropolis (Seoul, capital of Korea), the six metropolitan cities (Busan, Taegu, Incheon, Gwangju, Daejeon, and Ulsan), the eight provinces (Gyeonggi-do, Gangwon-do, Chungcheongbuk-do, Chungcheongnam-do, Jeollabuk-do, Jeollanam-do, Gyeongsangbuk-do, Gyeongsangnam-do), and one special self-governing province (Jeju). The educational governing system also follows the classification of the general administrative district. Therefore, there are 16 independent local educational governments in Korea.
delegated much of its budget planning and major administrative decisions to each local area’s K-12 educational institutes. Specifically, according to the law and ordinance of local educational autonomy, the board of education, which consists of members of the board elected by citizens’ direct vote, deliberates and decides an ordinance of regional education government, a budget bill, and bonds; the superintendent, who is elected by citizens’ direct vote, represents a regional education government. The superintendent enacts regulations within the bounds of the local educational ordinance and has authority over curriculum management, the establishment/transfer/removal of public schools, and other administrative decisions regarding education, art, and science pertaining to each respective local area delegated by the national government.

*Educational Funding System: Government vs. Parent*

The funding sources for the Korean K-12 educational system are comprised of three main contributors: the national government, the regional governments, and parents. Even though the funding responsibility of Korean K-12 education is shared with parents, national/regional education governments surpass parents in terms of the proportion they contribute to the total amount of educational funding. In the case of elementary and middle schools, which come under the compulsory education stage, the governments’ share in educational funding is much higher than the parents’ burden.

With respect to the proportional weights of the national and regional education government bodies, the national government provides three times as much educational funding as do the regional government bodies. More specifically, the regional education government bodies bore only 23.5% of the total educational funding provided by the national education government body in 2009 (Ministry of Education, Science, and Technology, 2009). Because of
the low financial independence of regional education governments, Korea established the *Grant Law for Local Educational Finance* in 1972. According to the law, the national government is obliged to bear the cost of remuneration for teachers in compulsory education and to distribute the annual grant for local education, which accounts for 20.27% of the internal tax revenue. The accumulated educational funding is distributed to each school through the basic level school districts (182 local educational administrative offices).

In the funding mechanism of the Korean K-12 educational system, the role of parents should be examined regarding public/private educational activities. First, parents bear a financial burden for public educational activities in the Korean K-12 educational system. The types of formal fees for public educational activities are composed of three items: admission fee, tuition fee, and school supporting fee.

In the case of elementary school, there are no formal fee items due to the abolition of the school supporting fee in 1994 because of unconstitutionality. However, the parents whose child enters private elementary school are burdened with educational funding costs such as admission and tuition fees according to the benefit principle. With respect to middle school, as compulsory education policy has entirely been enforced since 2004, parents pay only a school supporting fee without admission or tuition fees. Per pupil payment (one year) ranged from $124 to $250, depending on the area, in 2009\(^7\), and there is no difference in the payment between public and private schools. Finally, in the case of high school, parents pay all of the three formal fees because high school is not considered compulsory education. Per pupil payment (one year) ranged from $771 to $1,800, depending on the area, in 2009, and there is also no difference in

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\(^7\) The exchange rate of 1,000 won to the U.S. dollar was applied for the calculation. The data were obtained from the Ministry of Education, Science, and Technology (2009).
the payment between public and private schools. For reference, the tuition fee is the most expensive among the three formal fee items for public educational activities (from $595 to $1,450).

Second, parents pay for their child’s costs for private educational activities. In the context of the Korean K-12 educational system, private educational activities refer to additional educational services voluntarily chosen by students or parents from private educational markets (e.g. a private academy for supplementary education) after school hours (Y. Kang, 2008; M. R. Kim, 2009). Representative examples include the enrollment in a private academy for core subjects (math/English), private tutoring for preparing for a nationwide exam, and private tutoring for developing artistic talent and aptitude. Of course, the amount and proportion of total costs for private educational activities vary greatly depending on family income levels and the degrees of preference for private educational services.

Major Educational Policies

Compulsory education

A compulsory education system is one of the main structural features representing a country’s educational system (Levin, 1994b). In Korea, the Basic Education Act and the Primary and Secondary Education Act regulate the fundamental structure of the K-12 school system. According to the law, the school ladder system of Korea has a single track 6-3-3-4 system. The 6-3-3-4 refers to the education years of elementary school, middle school, high school, and higher education, respectively.

Nine years of education in elementary and middle school are compulsory for children in Korea. The mandatory nine years is composed of six years of elementary school and three years of middle school. High school is not considered as part of compulsory education, so admission,
tuition, and textbook fees are only funded through middle school. Consequently, secondary education after middle school can be accessed only when parents pay for tuition fees (per year within $1,500 at a maximum level). Even though compulsory education does not include high school, almost all middle school graduates enter high school. In the case of lower income students, a financial assistance system supports their tuition fees and their meal plan expenses.

School ladder system

The Korean school ladder system has a single track 6-3-3-4 system which maintains a single line of school levels in order to ensure that every citizen can receive primary and secondary education without discrimination and according to the ability of each student. As mentioned above, the 6-3-3-4 refers to the education years of elementary, middle, high school, and four years of higher education, respectively. Of course, there are two or three years of college in Korea. The Basic Education Act and the Primary and Secondary Education Act regulate the fundamental structure of Korean K-12 education. As can be seen in Figure 3 below, the laws stipulate the establishment of various schools in order to provide all students with adequate primary and secondary education corresponding to the abilities of each student.

Teacher education and qualifications

While elementary school teachers are trained in four-year teacher colleges, secondary school teachers are educated in various ways such as graduation from colleges of education in four-year universities and completion of teacher’s certificate programs provided by colleges of education in universities. The educational system of secondary school teachers is called the mixed structure of exclusive and open training system in that those with majors other than

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education can also obtain the qualification of a secondary school teacher if they complete teacher’s certificate programs. By the same logic, the educational system of elementary school teachers is called *the exclusive training system*. The difference between elementary and secondary schools in the teacher educational system reflects a belief in the uniqueness of elementary education compared to secondary education.

Source: The website of Study in Korea (http://www.studyinkorea.go.kr)

Figure 3

The School Ladder System of Korea
Until 1990, graduates of national universities were hired at middle and high schools without having to pass any exams. However, such preferential treatment was abolished after the constitutional court ruled on the unconstitutionality of the discriminatory teacher hiring system which distinguished between private and national universities’ graduates. Since then, all candidates for public primary and secondary school teaching must pass the examination conducted by the regional education government. Private school teachers tend to have similar education and qualifications to public school teachers. Roughly speaking, there are few quality differences between public and private school teachers because obtaining a teaching position in a private schools is no less competitive than in a public school (Im, 2008; B. C. Kim, 2001; Park, 2000).

**College admission**

No educational policy has been changed or emphasized more than the college admission policy (S. J. Kang, 2001; Nam, 2005; Seo, 2008). There are three major criteria for selecting qualified students in Korean college admission system: (1) a nationwide entrance test, (2) high school record, and (3) talent and aptitude beyond academic ability. First, the nationwide entrance test, the College Scholastic Ability Test (CSAT), is the most important criterion for college admission in Korea. The exam is developed to estimate not simple memory ability but high order academic ability after the model of the SAT (Scholastic Aptitude Test), and it is administered once a year in November. Because of the significant weight placed on the CSAT by the college admission system, most students and parents invest huge amounts of time and money

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9 In the case of private high school teachers, principals can hire teachers who fail to pass the exam. Because of the strict renewal process for private teacher contracts, there are few differences between public and private teachers in terms of quality.

10 Generally, college refers to one kind of higher education institution in Korea; however, the word *college* indicates all kinds of higher education institutions in this study.
in private educational activities to achieve higher scores.

A student’s high school record has constantly been used for the criterion of college admission to make up for the insufficiency, when only the college entrance test is used for determining admission (e.g., test oriented K-12 education). Usually, school exam records, personality records, and the records of awards and honors are reported in the high school record. All grades’ records are reflected in the college admission process, albeit slightly different from university to university, but the last grade records are most emphasized (accounting for 40-50% of the overall record). Finally, the talent and aptitude criterion is stressed to enhance the university’s autonomy and to utilize a variety of criteria as well as a nationwide test score.

Major Differences between the Two Countries’ Educational Systems

Based on the common characteristics of the U.S. K-12 educational system among 50 states, peculiar properties of the Korean K-12 educational system are highlighted in this section.

Governing System: Imperfect Local Education Autonomy

Because of insufficient educational funding, facilities, and capacity, the local education autonomy of the Korean K-12 educational system maintains an imperfect structure in spite of the enforcement of the Law for Local Education Autonomy (1991). The imperfect governing structure is revealed in the national government of education having real authority to decide the extent of compulsory education, teacher qualifications, nationwide curricula, and the college admission system. The regional governments of education are only able to regulate the delegated details for the application of those policies to each respective local area. However, in the case of the U.S. K-12 educational system, districts’ superintendents have real authority over the selection of curriculum including the criteria and principles of basic program development and management. Further, they exert far-reaching influence upon staff recruitment including teacher
hiring and program management such as student evaluation plans.

The legal status of the board of education in each regional government of education also reflects the imperfect governing system in Korean K-12 education. The revision of the *Law for Local Education Autonomy* in 2007 lessened the independence of the boards of education in regional governments. Formerly independent local education legislatures, the boards of education, were made subordinate to general local legislatures. Finally, the local education autonomy of Korea does not reach the basic level of a school administrative unit (i.e. a school district in the U.S. educational context). The basic units (182 basic educational administrative offices) in the Korean K-12 educational system are not entitled to the legal autonomous rights such as hiring qualified teachers and selecting appropriate curriculum for each local area (B. J. Kim, 2003).

**Funding System: High Dependence on National Government and Parents**

Korean educational funding has been excessively dependent on the national education government and parent contributions (Rah, 2007). According to a statistical report (Ministry of Education, Science, and Technology, 2009), the regional education governments bore the burden of only about 25% of the total K-12 educational funding in 2009. This is because the national government has authority to levy internal duty tax and to distribute a specific proportion (20.27% as of 2009) of total revenues into regional education governments regulated by the *Grant Law for Local Educational Finance*. Of course, the local government of general administration also has authority over the levy of local taxes; however, most local tax revenues are appropriated to local general administration for local residents.

Parents whose child enters a high school must pay for admission and tuition fees and school supporting expenses because high school is still excluded from the compulsory education
Moreover, most parents pay for additional costs of private educational activities to support their child’s social success because they believe a successful result in the CSAT is directly connected with their child’s future wealth and success under the peculiar social context of Korea (M. R. Kim, 2009). From an international perspective, the family burden of total educational funding of Korea is the highest among the OECD countries, while the governments’ burden is the lowest among them (Rah, 2007).

Other Differences in Educational Policies

The school system of the U.S. is different from the Korean K-12 educational system in terms of grade configuration and the extent of compulsory education (see Figures 3 and 4). With respect to the grade configuration of the U.S, the decline of the junior high school coincided with the rise of the middle school, and the 5-3-4 school systems became the most common pattern of grade configuration after the mid-1970s (Beane & Lipka, 2006). In spite of slightly different contents of each state’s compulsory education system, throughout the U.S., education in the K-12 system is compulsory through high school. As previously mentioned, this contrasts with the policy in Korea, where laws guarantee all students only nine years of education until middle school. Finally, with respect to kindergarten education, the Korean K-12 educational system is different from that of the U.S. in that kindergarten education for 5-year-old children is not included in the stage of K-12 education in Korea. As a result, the kindergarten education of Korea is not a part of the compulsory education system, but in the United States it is.
Compared with the U.S. social context, Korea places excessive value on academic background. Dore (1976) regarded this peculiar phenomenon as a social disease, the so called Diploma Disease. It is generally recognized that the social context of academic cliques has caused a distorted educational fever which overemphasizes academic background (S. J. Lee, 2007; Nam, 2005; Seo, 2008). In this sense, high dependence on the nationwide entrance test and
excessive private educational activities might be natural in Korea. Of course, whether or not private educational services are inequitably distributed is more specifically discussed in the equity analysis of educational resources; however, inequitable distribution of private educational services might lead to significantly unfair educational opportunities for postsecondary education in Korea.

**Conclusion: Significance of Educational Systems’ Comparison**

Grubb (2009b) emphasized that the more essential problems of school finance result not from inadequate funding and resources themselves but from structural conditions that make schools use educational resources ineffectively. It is evident that even identical educational policies can be implemented in a variety of ways according to each society’s educational governing and funding system, educational priorities, and political mechanisms for making decisions (Levin, 1994b). Therefore, understanding which systematic characteristics prevent educational resources from being used effectively plays a very pivotal role in improving the likelihood that resources will be converted into desirable educational outcomes.

In addition, the characteristics of the specific country’s educational system can provide researchers with insight that enables them to interpret the inside meanings and the driving forces of research findings (Raivola, 1985; Rose, 1991; Whitty & Power, 2003). For example, when a researcher performs a comparative analysis of equity level in the distribution of educational resources, a more meaningful interpretation is not just saying how inequitably the distribution of educational resources is but explaining why the inequitable distribution occurs. It is obvious that different educational policies, systems, and social contexts result in different distribution of educational resources in each country (Cavicchioni & Motivans, 2001). Therefore, the comparison of the K-12 educational systems in both countries can provide a foundation for
appropriately interpreting the results of an equity and adequacy analysis.

Finally, the differences in the governing and funding mechanisms and educational policies between the U.S. and Korean K-12 educational systems provide implications for choosing external factors affecting the guarantee levels of educational opportunity in both countries. Based on the comparisons of both countries’ educational systems, Korean private education cost and activities affect the guarantee degrees of equal opportunity (Y. Kang, 2008; M. R. Kim, 2009; National Statistical Office, 2008). Unlike Korea, the U.S. private education activities do not matter for determining the guarantee levels of equal opportunities in a high school because the extent of compulsory education reaches high school education.

Rather, race and urbanity are more crucial factors than any other determinants (B. D. Baker & Green III, 2009; Hoxby, 2000; Orfield, Frankenberg, & Lee, 2003; Roscigno & Ainsworth-Darnell, 1999; Scafidi, Sjoquist, & Stinebrickner, 2005) because racial composition can determine peer effects, which have an impact on black students’ achievement in the U.S. educational system (B. D. Baker & Green III, 2009; Booth & Sheehan, 2008; Duncombe, 2007; Hoxby, 2000; Orfield et al., 2003). In this sense, Brown v. Board of Education (1954) is regarded as a landmark decision because desegregation led to improving the schooling results of black students beyond access to public education (Coleman et al., 1966; Rumberger & Palardy, 2005; Wise, 1968). In sum, specific characteristics, drawn from comparing both countries’ educational systems, suggest that different variables such as private education cost and race composition should be considered in the specific model of vertical equity for appropriate assessing equal educational opportunity in each educational system (B. D. Baker & Green III, 2009; Bowles, 1968; Coleman, 1968; Guiton & Oakes, 1995; Peterson & Woessmann, 2007; Roemer, 1998; Wise, 1968).
CHAPTER 3
DATA AND METHODS

Overview

This chapter reviews the data and analytic strategies used to answer the following research questions:

1. In terms of educational resources, how are educational opportunities guaranteed in the U.S. and Korean educational systems?

2. In terms of educational outcomes, how are educational opportunities guaranteed in the U.S. and Korean educational systems?

3. What relationships exist between equal educational opportunity guarantees based on educational resources and guarantees based on educational outcomes in the U.S. and Korean educational systems?

Answers to these questions will be examined in the contexts of the U.S. and Korean educational systems. The counterpart to the U.S. K-12 educational system is Korea in this study because Korea is recognized for its high performance in international achievement studies such as PISA and TIMSS. However, there is little research examining how the distribution of Korean students’ test scores compares to the guarantee levels of disadvantaged groups and a dominant group, and how such high test scores are associated with guaranteeing sufficient educational resources. Another reason for choosing Korea as a comparison country is my familiarity with both countries’ K-12 educational systems will allow me to accurately interpret the inner
meanings and the driving forces of the research findings. Finally, examining the guarantee levels of educational opportunity from a comparative perspective will facilitate understanding the different ways to address the different causes and effects of equal opportunity problems in both countries.

As mentioned in the previous chapter, the equity framework of Berne and Stiefel (1984, 1994) and the adequacy analysis framework for measuring the cost of adequate education will be used to answer the three research questions posed above. However, it should be noted that unlike the original framework of Berne and Stiefel (1984, 1994), the equity analysis used in this study focuses on horizontal and vertical equity principles rather than equal opportunity principle because equal opportunity is conceptually assumed to occupy a higher level than the other two principles. Additionally, the equity analysis will be used to analyze the distribution of educational outcomes in the name of outcome equity analysis. Overall, this chapter describes data sets, methods, analytic strategies, variables, and statistical models before discussing the major results and implications of the study.

Data Sets

This study attempts to assess the guarantee levels of educational opportunities in the U.S. and Korean educational systems using the analysis of equity and adequacy. The evaluation of equal educational opportunity can be examined with three kinds of analyses: (1) resource and (2) outcome equity with horizontal and vertical analysis, and (3) adequacy analysis. In each analysis, two longitudinal data sets will be used: the Education Longitudinal Study of 2002 (ELS:2002) and the Korean Education Longitudinal Study of 2005 (KELS:2005). The following section describes the two data sets and mentions the rationale for using the data sets for comparisons. Finally, the specific year survey from which the variables of the study are obtained will be
chosen from the ELS:2002 and the KELS:2005, respectively because this study basically uses specific cross-sectional data from the both longitudinal data sets.

**ELS:2002**

To perform the analysis of equity and adequacy in terms of educational resources and outcomes in the U.S. context, the ELS:2002 data set will be used, a data set derived from the ELS:2002, which was administered by the National Center for Education Statistics (NCES), which collected data from students, teachers, parents, school administrators, and schools at multiple time points (2002 and 2004 for secondary education). A nationally representative probability sample of 15,362 tenth graders in 752 schools (580 public, 172 private), representing 3.6 million seventh graders with 23,000 schools across the country was selected (Ingels et al., 2007).

The ELS:2002 is the fourth in the NCES national longitudinal high school cohort series after the NLS-72, the HS&B, and the NELS:88. The ELS:2002, compared with the previous longitudinal studies, is intended to provide information on (1) the identification of school attributes associated with achievement, (2) the influence of parent and community involvement on student achievement, (3) the dynamics and determinants of dropping out of the educational system, (4) changes in educational practices over time, and (5) the transition of different racial/ethnic, gender, and socioeconomic groups from high school to postsecondary institutions and the labor market (Bozick & Lauff, 2007). Specifically, this study will use school administrator questionnaires, school libraries, and parent and teacher evaluations of students. For example, variables measuring the level of importance of grades among peer groups will be used for estimating peer educational aspiration (peer effects) as a psychological throughput resource in the U.S. context.
The base-year design has seven survey components: (1) the assessments of students in mathematics and reading, (2) a survey of students, (3) a survey of parents, (4) a survey of teachers, (5) a survey of school administrators, (6) a survey of librarians, and (7) a facilities checklist (Ingels et al., 2007). Student achievement is measured by mathematics and reading achievement at the base year in 2002. Mathematics achievement was reassessed in the first follow-up in 2004 so that achievement gain over the last two years of high school could be measured and related to school processes and enrollment in mathematics courses (Bozick & Lauff, 2007). Equity objects will be obtained mainly from the school administrators’ survey. The other variables for assessing the guarantee levels of educational opportunity will be additionally gathered from teacher and parent questionnaires.

*KELS:2005*

To perform equity and adequacy analyses of educational resources and outcomes in the Korean context, the KELS:2005 data set will be used, derived from the KELS:2005, which was administered by the Korea Educational Development Institute (KEDI). The KELS:2005 is initially designed for longitudinal study in Korea, which enables us to enhance our understanding of the effects of education and school policies on students’ intellectual, moral, and social development.

The KELS:2005 collected data from students, teachers, parents, school principals, and schools at each time point. A nationally representative probability sample of 6,908 seventh graders within 150 schools (122 public, 28 private), representing 703,914 seventh graders with 2,929 schools (excluding sports academies and branch schools) across the country was selected. A stratified random cluster sample was used in which the first stage estimated the proportion of schools in cities (16 cities and provinces) based on city size and was selected through a random
sample of schools in each city or province (proportional stratified random sampling). A random sample of schools in each stratum was the second-stage unit, and a random sample of students within each school was the third-stage unit. In most participating schools, 50 students were randomly selected from all 7th graders. In schools with fewer than 50 students, all eligible students were selected. In schools with fewer than 50 students who initially agreed to participate, students with similar characteristics, academic achievement, and background were substituted (Ryu et al., 2005).

For the purposes of the study, a school questionnaire was chosen to obtain equity objects at a school level. Because school information and financial data are the main analysis objects of the study, the results of school questionnaires, except for some throughput resources data, will be used. Other throughput resources such as peer effects, family support, and total education costs, including private education costs, will be obtained from student and parent questionnaires. Unfortunately, there is no fourth wave school questionnaire. Moreover, even if there was, fourth wave data could not represent the Korean high school population due to selection bias. Therefore, guarantee levels of educational opportunities in Korean middle schools will be analyzed using the analysis of equity and adequacy.

In the equity analysis of educational resources and outcomes, the unit of analysis is a school. The KELS:2005 provides similar variables for 150 schools compared to the 752 sample schools of the ELS:2002. In the follow-up surveys, data for critical variables might be missing for some schools, and such schools will be excluded from my samples to maintain the high-quality of the data sets. The analysis of adequacy will be conducted with a school level unit in both countries’ data sets.
Rationales of Using the Two Different Data Sets

First, the KELS:2005 as a data set for Korean analysis resembles the ELS:2002 in terms of survey methods, variables, and purposes (Ryu et al., 2005). Accordingly, the two data sets fit this comparative study well. Nevertheless, comparison with one data set such as PISA or TIMSS might be more reasonable than with two different data sets in terms of survey periods and the same achievement test. However, the PISA and TIMSS data sets lack various variables that can apply to the framework of systematic classified educational resources for comprehensively assessing educational opportunity in both countries’ educational systems, which is the crucial reason for excluding the PISA and TIMSS data sets in this study.

The differences in the base year from the ELS:2002 and the KELS:2005 might be considered a problem by some. However, the differences will not be problematic because the objects of comparison are not the raw data (e.g., the level of per pupil expenditure) but the statistics of equity and relative ratios of actual per pupil expenditure to the cost of adequacy. Except for the differences in the base year, no data set is more suitable for this study in terms of the purpose, variables, and survey sampling method.

Specific Year Survey for Major Variables

As previously mentioned, the two data sets basically target different education stages in that the ELS:2002 focuses on U.S. high schools, and Korean middle schools are the focus of the KELS:2005. On the one hand, this study aims at comparatively analyzing educational opportunities in terms of resources and outcomes in public educational systems using two representative nationwide secondary education data sets of the U.S. and Korea. In this study, the range of public educational systems is identical to the years of compulsory education. Because the governing and funding systems of the private secondary schools in both countries have
peculiarities, only public schools were chosen from a secondary school system as a unit of analysis in the study.

On the other hand, the most remarkable difference in the educational systems of the both countries is the extent in years of compulsory education, which absolutely affects the characteristics of educational governing and funding systems. In addition to the populations of both data sets and the purpose of this study, the peculiar characteristics of both countries’ educational systems makes analyzing different education stages to compare educational opportunities in the U.S. and Korean public educational systems an even more reasonable choice. Indeed, comparing the same stage of education (e.g. the high schools of both countries) might lead to a misinterpretation of the distributional inequity of educational resources in both countries’ public educational systems. Thus, this study deals with Korean middle schools, where compulsory education is enforced only until the middle school stage, and the high schools of the U.S., where compulsory education is enforced until the high school stage.

Next, this study takes limited advantage of both longitudinal data sets. In other words, this study analyzes educational opportunities of both countries using a cross-sectional data from the ELS:2002 and the KELS:2005. Of course, the guarantee levels of educational opportunities might be more significantly analyzed using several years’ worth of survey data compared to using data from only one survey year (Rolle & Liu, 2007); however, the purpose of this study is not to analyze the degree of change in educational opportunities through a specific educational policy. Unlike policy evaluation research, this study, as a type of case study, attempts to broaden the means of guaranteeing educational opportunities by comparing the degree of equal educational opportunity in the U.S. and the Korean educational systems. Therefore, the specific
year’s survey data from the ELS:2002 and the KELS:2005 are enough to achieve the purpose of this study.

Finally, it is true that the quality of a quantitative study can be influenced by the quality of a data set used in the study. For example, when the influential variables related to a main hypothesis are missing in a substantial number of cases, the missing values should be substituted with potential values using a statistical missing value analysis such as multiple imputation (McKnight, McKnight, Sidani, & Figueredo, 2007). However, such an approach is not perfect with regard to facilitating unbiased conclusions. This situation occurs more often in the case of longitudinal study than in cross-sectional study (Holt, 2008; McKnight et al., 2007).

As a result of a preliminary study using both data sets, essential variables for examining the guarantee levels of educational opportunities in the U.S. and Korea (e.g., the percentage of special education in the KELS:2005 in 2007, parental support variables in the ELS:2002 in 2004) were found to be missing because of inconsistent survey items and the non-response of subjects. Therefore, considering the nature of quantitative study and the specific conditions of the ELS:2002 and the KELS:2005, main variables used in this study were obtained from the base-year survey of the ELS:2002 and the first follow-up survey of the KELS:2005. However, it should be noted that the advantages of longitudinal data sets such as the ELS:2002 and the KELS:2005 were not totally nullified by using educational outcome variables of multiple survey points (e.g., math achievement scores in 2005, 2006, and 2007 of the KELS:2005 and in 2002 and 2004 of the ELS:2002).

Methods

Even though the focus of educational policy objectives and school finance litigation has shifted from equity to adequacy (e.g., Rose v. Council for Better Education, 1989), equity is still
an essential provision to guarantee equality of educational opportunity (Berne & Stiefel, 1984, 1994; Clune, 1994b; Odden & Picus, 2008). It is obvious that fair access to educational resources is a prerequisite for all students’ achievement of a desirable performance level (Murnane, 1991; Reed, 2001). The analysis of adequacy itself does not automatically ensure the provision of equality of schooling results as the conceptual framework of educational opportunity posed previously in this study (see Figure 1). Accordingly, the analysis of output equity is needed to check whether or not a certain educational system is satisfying equal opportunity in terms of outcomes. Because a classification of educational resources as equity objects is already described in Chapter Two, this section will address the measures of horizontal and vertical equity and appropriate approach for measuring adequacy used in this study.

**Horizontal Equity Analysis**

The horizontal equity principle means students who have equal situations should be treated equally. When educational resources are equally distributed across all students with similar attributes, horizontal equity is satisfied. The measures of horizontal equity assess how far the distribution is from perfect equality, which would exist if every pupil in the distribution received the same objects. Consequently, measures of horizontal equity are statistics or indexes that capture the spread or dispersion in a distribution.

Berne & Stiefel (1984) classified 11 measures into five groups which have similar patterns through the practical equity analysis of Michigan and New York (Berne & Stiefel, 1984; Downes & Stiefel, 2008). Table 3 provides the specific groupings of 12 equity measures based on the empirical studies by Berne and Stiefel (1984). Appropriate equity measures for national comparisons will be discussed in subsequent sections.
Table 3

Five Groups of Horizontal Equity Measures

<table>
<thead>
<tr>
<th>First Group</th>
<th>Second Group</th>
<th>Third Group</th>
<th>Fourth Group</th>
<th>Fifth Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Range</td>
<td>- Coefficient of variation</td>
<td>- McLoone index</td>
<td>- Federal range ratio</td>
<td>- Atkinson index at high value of the poor</td>
</tr>
<tr>
<td>- Restricted range</td>
<td>- Gini coefficient</td>
<td></td>
<td></td>
<td>- 95th/5th percentile ratio*</td>
</tr>
<tr>
<td>- Variance</td>
<td>- Theil measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Standard deviation of logarithm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Relative mean deviation</td>
<td></td>
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</tbody>
</table>

* 95th/5th percentile ratio was not used in the empirical studies of Berne and Stiefel (1984).

In a comparative study, sensitivity to the equal proportional changes can lead to biased results of the horizontal equity analysis. Moreover, when researchers attempt to analyze longitudinal data with dollar measured variables, the bias possibility is higher than in cross-sectional data (Berne & Stiefel, 1984; Downes & Stiefel, 2008). In this sense, first group measures—the range, the restricted range, and the variance—should be excluded in this comparative study (see Table 3). Additionally, the range and the restricted range are not good measures because they cannot assess the degree of inequity of the system because they cannot encompass all observations (Odden & Picus, 2008).

Exemplary Benchmark Levels for Comparison

The interpretation of horizontal equity measures’ values is ultimately up to the researcher’s judgment (Odden & Picus, 2008). However, it does not imply that all arbitrary interpretations are allowed. Even though researchers do not need to be confined to the absolute guidelines of equity statistics, exemplary benchmark levels can get the results of equity research communicated and disseminated. In particular, the existence of benchmark levels in equity analysis can make up for the inherent limitation of equity analysis, which only focuses on
relative comparisons among equity objects. Accordingly, horizontal equity measures with benchmark levels are more useful in an international comparative study. According to the benchmark criterion for selecting equity measures, the Gini coefficient and the coefficient of variations are appropriate measures for this comparative study (Odden & Picus, 2008).

**Gini coefficient**

The Gini coefficient is a standard economic measure of dispersion (Odden & Picus, 2008). It expresses the ratio between the percentage of any given population and the cumulative percentage of resources expended. The Gini coefficient represents the ratio between a hypothetical situation in which each percent of a distribution receives that same percentage of revenue (i.e., 1 percent of the population receives 1% of total funding, 2% of the population receives 2% of total funding, etc.), and the actual distribution of revenue by percent of population (so called “Lorenz curve”). In other words, the Gini coefficient is the ratio of the area between the 45° line and the Lorenz curve to the total area below the 45° line. The coefficient varies from 0 (perfect equality) to 1 (perfect inequality). As reported by Odden & Picus (2008), a Gini coefficient of .05 or lower is a desirable representation of equity. Even though the Gini coefficient includes all observations and is insensitive to proportional changes of horizontal equity objects, understanding the Gini coefficient might be challenging conceptually (Odden & Picus, 2008).

**Coefficient of variation**

The coefficient of variation is a simple measure of dispersion, calculated by dividing the standard deviation of a distribution by its mean. The value of the coefficient of variation indicates how closely the values of an equity object across all percentiles are clustered around the average value; thus, it can be interpreted as the percent variation about the average value.
(Augenblick, Myers, & Anderson, 1997; Odden & Picus, 2008). The greater the inequity in the system, the larger the coefficient of variation. The minimum of the coefficient of variation is zero, which means perfect equity. However, if there are many outliers, the value of the coefficient of variation can be over 1. As outlined by Odden & Picus (2008), coefficients of variation greater than .1 reflect some degree of horizontal inequity across a distribution. Unlike the measures using ranges, the coefficient of variation includes all observations for a horizontal equity analysis, has no inflation problem, and can be easily understood (Odden & Picus, 2008).

*Measures from the Fourth and Fifth Groups: 95th/5th percentile ratio*

The 95th/5th percentile ratio measures the ratio of the value at the 95th percentile compared to the 5th percentile. Generally speaking, the ratio of percentile values allows for an examination of the manner in which the distribution clusters around the median value. Among the ratio measures of percentile values, the 95th/5th percentile ratio also provides a measure of the magnitudes of the dispersion across a complete distribution.

The classified groups of horizontal equity measures reflect similar trends of the measure’s values proven by empirical equity studies (Berne & Stiefel, 1984). It is ideal to select at least one measure per group; however, only the 95th/5th percentile ratio is finally selected for comparing the distributional status of educational resources in this study. This is because the federal range ratio has not often been chosen in school finance equity research and a parsimonious analysis is considered better than a complex analysis by choosing another equity index from the fourth group. The final reason for choosing the 95th/5th percentile ratio is that it is easier to understand the meaning of the value than the Atkinson index.
**Vertical Equity Analysis**

The vertical equity principle means students who have different situations should be treated differently. Vertical equity implicitly assumes that students with special needs require greater amounts of educational resources to achieve set levels of performance. When educational resources are distributed corresponding to various types of students with special needs such as disabilities, poverty, and limited English proficiency, the degree of vertical equity can be promoted. Therefore, vertical inequity involves perverse relationships in which resources are withheld from particularly needy classes of students (Berne & Stiefel, 1984; Houck, 2010).

**Multiple Regression**

As a vertical equity measure for national comparisons, the multiple regression measure has more advantages than the weighted dispersion measure. First, the multiple regression measure is based on certain established statistical methods and is more informative than the weighted dispersion measure (Berne & Stiefel, 1984). In this sense, Berne and Stiefel (1984) assessed vertical equity only with the regression-based measure due to its desirability and diversity. Second, the weighted dispersion measure might be less appropriate in a comparative study than the multiple regression measures because pupil-need weights calculated by different data sets cannot produce objective results (Odden & Picus, 2008). Third, for the purpose of comparisons across nations, standardized regression coefficients\(^{11}\) of multiple regression can be used to interpret the magnitude and direction of relationships between equity objects and independent variables (e.g. pupil characteristics). Finally, the multiple regression measure has the advantage of allowing researchers to use weights to adjust sampling biases such as

\(^{11}\) Standardized regression coefficients are utilized to discern levels of vertical equity in this study. In the analysis of vertical resource and outcome equity, t-values are reported as well as the coefficients because the purpose of this study is not to develop causal relationships.
oversampling and clustering.

**Adequacy Analysis**

Nowadays, each approach for measuring adequacy is being slightly modified to improve the original disadvantages because researchers are likely to combine one approach with other approaches (Downes, 2004). Therefore, the sections that follow describe the basic ideas, processes, and example research applying each approach in terms of original characteristics and are confined to the costs of providing an adequate public education at the elementary and secondary level (Taylor, Baker, & Vedlitz, 2005).

Specifically, three approaches are described in this section: the professional judgment approach, the successful school approach, and the cost function approach. The evidence-based approach, which has been discussed as the fourth approach for measuring adequacy (Odden & Picus, 2008), is excluded in this subsection because this approach has similar ideas and processes with the successful school approach. Moreover, the fourth approach usually plays a role in setting the initial “research-based” resource levels just before professional judgment panelists’ specific considerations for adequate educational resources in the process of estimating the cost of adequacy (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). Finally, the rationales of choosing the successful school approach for this study purpose will be also addressed.

**Professional Judgment Approach**

This approach arose from the attempt to overcome the key deficiency of the historical spending approach, in which the state sets a basic cost with reference to the actual expenditures of school districts in a prior year (Augenblick et al., 1997; Rebell, 2006). Even though the historical spending approach was easy and made calculating the cost of adequacy predictable, it
could be influenced not by actual needs, but by local wealth or preferences. Accordingly, more grounded costs estimated by professional groups are needed. This approach was first applied in the school finance system reform of the state of Washington three decades ago (Odden & Picus, 2008).

The idea behind the professional judgment approach is that experts (or, professional educators) can postulate the needs of benchmark school districts precisely and can transform those needs into a standard set of prices (Augenblick et al., 1997). Accordingly, this approach depends on the experience and best judgment of professional educators to estimate the cost of adequacy. The professional judgment approach is also called the Resource Cost Model (RCM) or the input approach (Downes, 2004; Duncombe & Lukemeyer, 2002; Odden & Picus, 2008) in that a professional group seeks to find what adequate resources or inputs are required for prototypical classrooms, schools, and districts to achieve an adequacy standard. Compared with other approaches, in the professional judgment approach, professional educators are believed to provide detailed information on the resources to meet a specific standard. In sum, the professional judgment approach has more resource-oriented and bottom-up characteristics than any other approach (Downes, 2004; Taylor et al., 2005).

The professional judgment approach focuses on the estimation of adequate cost levels from benchmark districts. After estimating the cost of adequacy from prototype districts, the cost is then adjusted for input cost differences across districts, typically through an input price index (Downes, 2004). Studies using the professional judgment approach have been conducted in Alaska, California, and Illinois (Augenblick et al., 1997), New York (AIR and MAP, 2004), Wyoming (Augenblick, 1997; Guthrie et al., 1997; MAP, 2002). Odden and Picus (2008) mentioned that Kansas, Kentucky, Maryland, Massachusetts, and South Carolina also have
recently conducted similar types of adequacy studies.

Successful School Approach

This approach arose from the attempt to overcome the key deficiency of the professional judgment approach, namely, that the levels of educational resources are indirectly connected with the results of student achievement results through experts’ subjective judgments (Odden & Picus, 2008). The successful school approach is also called the best practice approach or the empirical identification approach (Downes, 2004; Downes & Stiefel, 2008; Odden & Picus, 2008). This approach estimates the adequate levels of spending based on school reform models or schools that have been proven effective (Taylor et al., 2005).

According to Downes (2004), the successful school approach is based on the idea that “the expenditures of districts already meeting a state’s performance standard or experiencing successful school reform efforts provide a clear indication of the amount that must be spent to provide an adequate education” (p. 5). In other words, the proponents of this approach attempt to utilize the successful experiences of school reform efforts such as the Modern Schoolhouse program, Success for All, and Accelerated Schools in determining the expenditures needed to provide an adequate education (Downes & Stiefel, 2008). Considering that this approach first decides successful districts based on schools’ or districts’ performance, it is more performance-oriented than the resource-oriented approach (Taylor et al., 2005).

With respect to the steps of the approach, it focuses on the second step, which calculates the cost of adequacy from benchmark districts. The key to this approach hinges on selecting successful districts (or, benchmark districts) presently meeting the performance standards to estimate the cost of adequacy. For instance, extraordinary districts with very high or low expenditures are eliminated to minimize their influence on the adequate cost (Downes, 2004).
After identifying the successful schools or districts, researchers can calculate average per pupil spending as an adequate cost. That is, this approach attempts to estimate the cost of adequacy by examining how much benchmark districts are spending.

Unlike the professional judgment approach, the successful school approach can identify a spending level which is directly linked to a specific level of student performance (Odden & Picus, 2008). Finally, the calculated average cost is adjusted in order to estimate the adequate cost of the other districts. Studies using the successful school approach have been conducted in Illinois (Augenblick & Myers, 2001b; Hinrichs & Laine, 1996), Maryland (Augenblick & Myers, 2001a), New York (State Aid Work Group, 2004), Ohio (K. Alexander, Augenblick, Driscoll, Guthrie, & Levin, 1995; Augenblick, 1997), Washington (Fermanich, Picus, & Odden, 2006), and Mississippi (Augenblick et al., 1997).

Cost Function Approach

This approach arose from the attempt to overcome the key deficiency of the successful school approach, namely, that the adequate levels of spending might not be applicable for big-city and small rural districts, even with cost adjustments for pupil needs and geographic living expenses (Odden & Picus, 2008). That is, the cost function approach has been chosen to deal with disadvantages such as biased and insufficient cost adjustments and atypical benchmarks. As advanced statistical methods have become available, the cost function approach is becoming an increasingly common method for measuring educational adequacy (Taylor et al., 2005).

The cost function approach is based on the idea that researchers or policymakers can obtain unbiased and accurate estimations of the cost of adequacy through econometric methods and actual data. Specifically, the cost function approach identifies an average per pupil expenditure to produce a given level of performance, adjusting for student and district
characteristics, input price index (e.g. teacher salary), and other factors affecting an adequate cost. Accordingly the specific benchmark districts do not need to be considered in advance and a variety of performance standards and outside school districts control factors can easily be considered in this approach. In sum, this approach provides accurate adjustments for student needs and resource price differences with advanced statistical techniques (Duncombe & Lukemeyer, 2002).

The cost function approach first needs to specify an accurate cost function from high quality datasets which include the information on student performance, input prices, student needs, and other district’s characteristics affecting student outcomes. The result of cost function provides adequate per pupil spending for the average district. Then, cost indices can be created from the cost function (Duncombe & Lukemeyer, 2002). Finally, cost differences resulting from student needs, cost of living, and working conditions for staff are adjusted with cost indices. Specifically, adequate costs for districts other than benchmark districts are calculated by multiplying spending in the benchmark districts by a cost index which is calculated for each district from the cost function (Downes, 2004). Studies using the professional judgment approach have been conducted in New York, Wisconsin, Texas, and Illinois (Duncombe, 2002; Duncombe, Ruggiero, & Yinger, 1996; Imazeki & Reschovsky, 2005, 2006; Reschovsky & Imazeki, 1998, 2001), Kansas (Duncombe & Yinger, 2005a), and Missouri (Duncombe, 2007).

Rationales of Choosing the Successful School Approach

The professional judgment approach can provide practitioners with detailed information about how they should organize and spend educational resources (Augenblick et al., 1997; Duncombe & Lukemeyer, 2002) and can be relatively simple and transparent to researchers and policymakers (Taylor et al., 2005). However, the professional judgment approach has some
inherent and practical weaknesses. First, this approach does not clearly connect educational resources with expected or desired outcomes (Duncombe & Lukemeyer, 2002; Odden & Picus, 2008). Additionally, the professional judgment approach does not focus much attention on the third step for cost adjustments (Duncombe & Lukemeyer, 2002).

Unlike the professional judgment approach, the successful school approach has the significant advantage of allowing one to connect adequate spending level with the performance standard (Duncombe & Lukemeyer, 2002). Considering that the purpose of the analysis of adequacy is to examine a guarantee of equal opportunity in terms of resource aspects with consideration of outcome, as described in conceptual framework in this study (see Figure 1), the successful school approach fits the purpose of the study well.

Next, this approach can also provide educational strategies that produce desired results because it refers to the successful examples from specific reforms (Odden & Picus, 2008). Finally, once successful districts are chosen using performance standards as criteria, this approach is simple to implement and easy to explain (Downes & Stiefel, 2008; Duncombe & Lukemeyer, 2002). Compared to the cost function approach, which has limitations such as being difficult for policymakers to understanding and having a significant dependence on quality of the dataset (Downes & Stiefel, 2008), the simplicity and ease of the successful school approach make it ideal for this study.

In spite of its specific strengths, it should be noted that there are weaknesses in the successful school approach in terms of selecting benchmark schools or districts. Specifically, the most successful districts might not be typical districts (i.e., a highly selected sample), especially if the performance standard set for the districts is much higher than the norm (Downes, 2004; Downes & Stiefel, 2008; Duncombe & Lukemeyer, 2002; Odden & Picus, 2008). However,
according to Augenblick et al. (2006; 2007), this weakness can be ameliorated by choosing various criteria for defining successful schools (e.g., non-academic performance considerations, the performance levels of the disadvantaged students, etc.).

Specific Criteria for Choosing Successful Schools

Basically, the successful school approach examines the actual per pupil spending of schools that have already met specific performance standards that they are expected to achieve by federal or national authorities (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). In the previous studies, the base per pupil expenditure of identified successful schools usually has been used to determine the overall adequate education funding level (Fermanich, Mangan, et al., 2006; Odden, Picus, & Fermanich, 2003; Odden, Picus, Goetz, Mangan, & Fermanich, 2006). Accordingly, which criteria are applied in selecting successful schools and which schools are eventually selected are primary concerns in the analysis of adequacy.

Specifically, this study used two main criteria for selecting successful schools in both countries’ educational systems. One is an academic outcome criterion, standardized math test score, which often has been utilized in education research since mathematics is an important predictor of succeeding in postsecondary education and in finding high-paying jobs (Adelman, 1999; Cabrera, Burkum, & La Nasa, 2005; Carnevalc & Desrochers, 2003; Sadler & Tai, 2007). This study also focused on how well schools were serving their special-needs students (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). Therefore, math test scores of special-needs students were separately computed from the ELS:2002 and the KELS:2005 in selecting successful schools from both countries’ educational systems.

The other criterion is non-academic outcome, the degree of school disorder perceived by students, which results from personal, operational, and cultural factors of school processing and
ultimately affects the academic performance of schools (Furlong & Morrison, 2000; Gottfredson, Gottfredson, Payne, & Gottfredson, 2005; Greene, 2008; Halawah, 2005). Another reason that the non-academic criterion is used for identifying successful schools is educational outcome as established by academic criteria is often considered to be mainly determined not by schooling effects but by family background (Coleman, 1968; Hanushek, 1986, 1989, 1997; Hanushek, Rivkin, & Taylor, 1996). Thus, using the non-academic criterion for successful schools has the advantage of considering schools’ internal attributes that make their schools successful in determining the cost of adequacy.

Finally, this study applies efficiency screens to identifying successful schools in order to compute the per pupil expenditure of adequate education. The efficiency criteria are applied to exclude schools whose actual spending in any one of two areas is anomalous compared to the other successful schools (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). Specifically, this study used two efficiency measures used in previous studies. Schools having ratio values below zero standard Z-score were excluded from the set of efficient successful schools.

*Outcome Equity Analysis*

For analyzing the equity analysis of educational outcomes, Berne and Stiefel’s (1984, 1994) framework of the school finance will be also used. Initially, they included outputs and outcomes as well as inputs in equity objects. However, most equity analysis studies have focused exclusively on inputs, ignoring issues of outcome equity (Berne & Picus, 1994; Iatarola & Stiefel, 2003). Even adequacy studies, which are closely tied to a desirable level of student performance, have rarely emphasized the distribution of outcomes (Iatarola & Stiefel, 2003). In spite of the scarcity of outcome equity research, it is obvious that the fulfillment of equal opportunity is not
enough to provide all children with equal educational resources (Berne & Picus, 1994; New York State Department of Education, 1992). Therefore, educational performance, including non-academic outcomes, is also an important object of equity analysis in addition to educational resources in this study. Compared to the analysis of resource equity, there is no difference in analytic techniques except equity objects between resource and output equity analyses.

Analytic Strategy

There is no prior literature exactly corresponding to this study that attempts to analyze guarantee levels of educational opportunity using the analysis of equity and adequacy together. This situation exists because this study provides a new assessment of equal opportunity that joins the conceptualizations of equal opportunity that have been discussed in education sociology and law with popular analytic tools of school finance. The following section outlines an analytic strategy to answer the research questions posed previously. The analyses have three orderly steps to reflect the conceptual change in equal opportunity. Figure 4 summarizes each analytic strategy to assess guarantee levels of educational opportunities in terms of educational resources and outcomes.

As shown in Figure 4, in the first step, the analysis of resource equity will be conducted to assess the degree of educational opportunity in terms of educational resources. The analysis of resource equity will play a role in answering the first research question: In terms of educational resources, how are educational opportunities guaranteed in the U.S. and Korean educational systems? Specifically, horizontal equity analysis of educational resources classified in this study (Chaper Two) presents information on the distributional inequity across schools in both countries’ educational systems. Additionally, vertical equity analysis can provide the
distributional relationship between guarantee levels of resources and independent variables such as disability, SES, and regional disadvantage.

![Figure 5](image-url)

Analytic Strategy for Assessing Educational Opportunity

Second, the analysis of adequacy will evaluate the levels of educational opportunity in terms of resource-outcome mixed aspects. The reason that the second step is called resource-outcome mixed aspects is the analysis of adequacy assumes performance standards to be achieved, and the cost of adequacy indicates the per pupil expenditure necessary to achieve the performance standard (B. D. Baker & Green III, 2008; Clune, 1994b; Odden & Picus, 2008).

The analysis of adequacy will provide additional information for answering the first research question because the ratios of the current spending to adequate costs can indicate the guarantee levels of equal opportunity in terms of resource aspects with consideration of outcome. Thus, the second step of the analyses used in this study is different from the analysis of resource
equity in that theoretically, outcome is not considered in the first-step analysis. Specifically, using the successful school approach, the cost of adequacy will be estimated.

As mentioned above, the analytical result of resources will be finally summarized in dollars. In other words, adequacy analysis just assumes that the provision of adequate education can lead to the fulfillment of equal opportunity in terms of educational outcomes. However, in practice, in the analysis of adequacy, it does not matter whether the cost of adequacy really leads to improvement in the distribution of schooling results (Clune, 1994a, 1994b, 1995). Therefore, it is necessary to analyze the distribution of outcomes to ascertain whether or not the extreme endpoint of educational opportunity is finally achieved using outcome equity analysis.

Next, the analysis of outcome equity will examine the guarantee levels of educational opportunity in terms of outcomes. Just like the analysis of resource equity in the first step, the analysis of horizontal and vertical equity will be conducted together. The analysis of outcome equity will play a role in answering the second research question: In terms of educational outcomes, how are educational opportunities guaranteed in the U.S. and Korean educational systems? Specifically, horizontal equity analysis of educational outcomes will reveal the distributional inequity of educational outcomes across schools in both countries’ educational systems. Additionally, vertical equity analysis can provide the distributional relationship between guarantee levels of outcomes and independent variables such as disability, SES, and regional disadvantage.

Finally, regarding the third research question—What relationships exist between equal educational opportunity guarantees based on educational resources and guarantees based on educational outcomes in the U.S. and Korean educational systems?—the results of adequacy analysis will be utilized as an independent variable in analyzing vertical equity of outcomes.
Specifically, whether or not the ratios of the current spending to adequate costs have a significant relationship with an outcome distribution will determine how the opportunity guarantee of resources is associated with the opportunity guarantee of outcomes, controlling for disability, SES, and regional disadvantage.

Variables and Statistical Models

In the analysis of equity and adequacy, decisions about operationalizing variables to represent educational resources and outcomes are important for assessing levels of distributional equity and adequacy (Odden & Picus, 2008). Roughly speaking, previous studies had a tendency to choose input variables as educational resources more than throughput (process) variables and concrete/physical resource variables more than abstract/psychological resource variables, which may have had important influences on performance. In other words, dollars have often been chosen for school finance research without any consideration of which variables can best express how those dollars are being spent in schooling processes. In this study, based on the previously classified categories of educational resources, available variables from the ELS:2002 and the KELS:2005 will be used to achieve the purposes of this study, which is to comprehensively compare guarantee levels of educational opportunities in terms of resources and outcomes in the U.S. and Korean educational systems. Table 4 shows the resource variables matched to the types of educational resources in this study.
Table 4

Resource Variables Matched to Types of Educational Resources in the Study

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Resource Variables</th>
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<tbody>
<tr>
<td><strong>Input Resources</strong></td>
<td><strong>Spending</strong></td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td>Ratio of Pupil to Teacher</td>
</tr>
<tr>
<td><strong>Throughput (Process) Resources</strong></td>
<td><strong>Personal Resources</strong></td>
</tr>
<tr>
<td></td>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peer Effects</td>
</tr>
<tr>
<td></td>
<td>Parental Support</td>
</tr>
<tr>
<td><strong>Operational Resources</strong></td>
<td>Programs</td>
</tr>
<tr>
<td></td>
<td>School Rules</td>
</tr>
<tr>
<td><strong>Cultural Resources</strong></td>
<td>School Culture</td>
</tr>
</tbody>
</table>

**Input Resource Variables**

Input educational resources consist of spending and physical resources. In this study, three variables representing the spending subset of educational resources are used: (1) per pupil current expenditure\(^\text{12}\), (2) per pupil instructional expenditure, and (3) ratio of instructional to current expenditure. The fact that there is no per pupil expenditure variable in the 2005 data of the KELS:2005 is one of many reasons to select 7\(^{th}\) grade middle schools as a main analysis subject instead of base-year grade (6\(^{th}\) grade). The subset of physical resources consists of two variables: (1) ratio of pupil to teacher and (2) the degree of sufficiency of physical resources as

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\(^{12}\) Per pupil current expenditure includes instruction, instruction-related, support services, and other elementary/secondary current expenditures, but excludes expenditures on capital outlay, other programs and payments to state and local governments, interest on long-term debt, and payments to private and charter schools (Honegger, 2010).

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perceived by principals. The ratio of pupil to teacher is the most popular variable used in school finance studies regardless of the context of K-12 educational systems (Iatarola & Stiefel, 2003).

With respect to physical resources, this variable comes from school administrator questionnaires in the ELS:2002 and the KELS:2005. In addition to quality of provided physical resources, the existence of resources such as texts/supplies and multi-media resources are included in those questionnaires.

Throughput (Process) Resource Variables

Throughput resources are composed of three high level subsets: (1) personal, (2) operational, and (3) cultural resources, which are classified based on Tagiuri’s taxonomy of school climate. The subsets of throughput resources are assumed to determine the effect magnitudes of input resources in the processes of producing educational outcomes. This subsection describes the low level subsets and the variables.

First, the personal resource subset includes the four lower subsets that are composed of major agents—principals, teachers, students, and parents—participating together in producing educational outcomes. These agents are derived from the common components mentioned in discussions of a schooling process by previous studies (Archibald, 2005, 2006; Monk, 1990; Odden et al., 2004; Odden & Picus, 2008; Phillips & Chin, 2004). Specifically, two variables representing the principal leadership subset of throughput resources are used: (1) principal’s influence on deciding school activities (e.g., hiring teachers and staff) and (2) principal’s relationship with cooperative institutions or associations (e.g., school board).

Regarding the teacher quality subset, there are two main criteria for selecting variables used in this study: quantitative and qualitative property of teacher quality. Specifically, three variables representing quantitative property of teacher quality are used: (1) percentage of non-
tenured teachers, (2) teachers’ degree level, and (3) years of teaching experience. Three variables representing qualitative property of teacher quality are used as well: (1) teachers’ perception of job pride, (2) students’ perception of teacher quality, and (3) parents’ perception of teacher quality. The classification of teacher quality variables allows for comparing the distributional inequities between quantitative (traditional or narrow) and qualitative (new or broader) aspects of teacher quality in the U.S. and Korean educational systems.

The peer effect subset variable is obtained from students’ questionnaires that ask the importance of grades to their first, second, and third closest friends. The answers are estimated by a three-point liker scale (e.g., not at all important/somewhat important/very important). Regarding the parental support subset, two variables are used specifically: (1) the degree of parents’ involvement and (2) parents’ concerns about child’s study and other activities.

Second, two representative operational factors are chosen for representing the operational resource subset. Specifically, educational program and school rules are used in this study. Because there are no exact same variables for representing the variety of educational programs provided to students in both countries’ data sets, hours of extracurricular activities per week for the U.S. case and number of deep-supplement subjects for the Korea case are used, respectively. The degree of fairness and clarity in school rules is selected because this variable has been recognized as an important factor that affects delinquent behavior and student victimization (Gottfredson et al., 2005).

Finally, the cultural resource subset is used for examining educational opportunities in terms of resources. According to Murphy et al. (1982), academic press indicates a normative

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13 Deep-supplement subject means the subject divided into levels of difficulty in order to allow a choice of specific levels according to a student’s progress in understanding the subject.
emphasis on academic excellence and conformity to high performance levels. Research concludes that academic press as a school cultural resource can create an atmosphere of persistence for teachers and students, influencing academic efforts and successes (Goddard, Sweetland, & Hoy, 2000; Hoy, Tarter, & Hoy, 2006; V. E. Lee & Smith, 1999; Phillips, 1997). Based on these previous studies, this study added academic press to the broadened range of educational resources to analyze guarantee levels of educational opportunities comprehensively. This variable allows for scrutinizing the distributional equity of educational resources in terms of not only physical and concrete aspects but also psychological and abstract aspects.

Another Classification by Variable Characteristics

The purpose of this study is to extend the focus of a conceptual framework for guaranteeing equal opportunity from educational resources to educational outcomes and at the same time to broaden the range of resources necessary to achieve equal opportunity in terms of educational outcomes. Based on these purposes, the variables used in this study can be classified as shown in Table 5 with regard to quantitative/qualitative characteristics\textsuperscript{14} of variables in addition to classification by the types of educational resources proposed in Table 4. As indicated in Table 5, the variables are mainly divided by concrete/physical and abstract/psychological characteristics. Both spending (input resources) and educational programs (operational resources) are composed of only quantitative variables. In contrast, principal’s leadership and peer effect (personal resources), school rule (operational resources), and school culture (cultural resources) consist of only qualitative variables. Finally, both physical resources (input resources) and teacher quality/parental support (personal resources) are composed of

\textsuperscript{14} In this study, \textit{quantitative} indicates the variables having concrete/physical characteristics and \textit{qualitative} indicates the variables having abstract/psychological characteristics.
quantitative and qualitative variables together. This other classification of the variables used will allow for the analysis of a guarantee of educational opportunities in terms of resource aspects from a broadened and comprehensive perspective.

Table 5
Variable Characteristics of Educational Resources Used in the Study

<table>
<thead>
<tr>
<th>Variable Characteristics</th>
<th>Resource Variables Used in the Study</th>
<th>Types of Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concrete/Physical</strong></td>
<td>Per Pupil Current Expenditure</td>
<td>Spending Resources</td>
</tr>
<tr>
<td></td>
<td>Per Pupil Instructional Expenditure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio of Instructional to Current Expenditure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio of Pupil to Teacher</td>
<td>Physical Resources</td>
</tr>
<tr>
<td></td>
<td>Percentage of Non-tenured Teachers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teachers’ Degree Level</td>
<td>Teacher Quality</td>
</tr>
<tr>
<td></td>
<td>Years of Teaching Experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents’ Involvement</td>
<td>Parental Support</td>
</tr>
<tr>
<td></td>
<td>Hours of Extracurricular Activities per Week (U.S. Case)</td>
<td>Programs Operational Resources</td>
</tr>
<tr>
<td></td>
<td>Number of Deep-Supplement Subjects (Korea Case)</td>
<td></td>
</tr>
<tr>
<td><strong>Abstract/Psychological</strong></td>
<td>Sufficiency of Physical Resources</td>
<td>Physical Resources</td>
</tr>
<tr>
<td></td>
<td>Principal’s Influence on Deciding School Activities</td>
<td>Principal Leadership</td>
</tr>
<tr>
<td></td>
<td>Principal’s Relationship with Cooperative Institutions or Associations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teachers’ Perception of Job Pride</td>
<td>Teacher Quality</td>
</tr>
<tr>
<td></td>
<td>Students’ Perception of Teacher Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents’ Perception of Teacher Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peers’ Educational Aspiration</td>
<td>Peer Effect</td>
</tr>
<tr>
<td></td>
<td>Parent’s Concerns about Child’s Study and Other Activities</td>
<td>Parental Support</td>
</tr>
<tr>
<td></td>
<td>Fairness &amp; Clarity of Rules</td>
<td>School Rules</td>
</tr>
<tr>
<td></td>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press</td>
<td>School Culture Cultural Resources</td>
</tr>
</tbody>
</table>

*Note: Italicized Resources (Physical Resources, Teacher Quality, & Parental Support) indicate the variables that have both concrete/physical and abstract/psychological characteristics in this study.*

**Outcome Variable**

The KELS:2005 provides the mean of standardized scores for three subjects—Korean, English, and Math—for each student; however, the ELS:2002 does not provide both the reading
and math standardized scores of the first follow-up survey. Only the math score can be obtained from the first follow-up survey of the ELS:2002. Thus, the standardized math scores of both data sets are used in this study. Beyond the specific limitation on accessibility in this study, the math scores are preferable to other objects’ scores in an international comparative study (e.g. PISA and TIMSS) because those scores reduce the bias due to native language (D. P. Baker et al., 2002; Stromquist, 2006). Table 6 shows the specific outcome variables used in this study.

Table 6
Outcome Variables and Control Variables for the Study

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Control Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Academic:</td>
<td>(1) Common Factors Affecting Educational Opportunity in Both Countries: SES, Region (Urbanity), and Special Education</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2002 (10th grade) and 2004 (12th grade)</td>
<td></td>
</tr>
<tr>
<td>(2) Non-Academic:</td>
<td>(2) Different Factors: Racial Composition and Limited English Proficient (LEP)</td>
</tr>
<tr>
<td>Perceived Degree of School Disorder by Student in 2002</td>
<td></td>
</tr>
<tr>
<td>(1) Academic:</td>
<td></td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2005 (6th grade), 2006 (7th grade), and 2007 (8th grade)</td>
<td></td>
</tr>
<tr>
<td>(2) Non-Academic:</td>
<td></td>
</tr>
<tr>
<td>Perceived Degree of School Disorder by Student in 2006</td>
<td></td>
</tr>
</tbody>
</table>

Control Variables

In this study, control variables are used for the vertical equity analysis of educational resources and outcomes. The overlapped variances among control variables might be in vertical equity models; however, it should be noted that the purpose of this study is to determine the magnitude and direction of relationships between control variables and educational resources and outcomes, not to predict particular causal relationships.

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15 In the multiple regression models for examining vertical equity, all the pertinent control variables that often have been used in each country’s field of school finance are included in the statistical models for this study. The overlapped variances among control variables might be in vertical equity models; however, it should be noted that the purpose of this study is to determine the magnitude and direction of relationships between control variables and educational resources and outcomes, not to predict particular causal relationships.
resources and outcomes. Two representative variables often have been used in equity analysis: Socioeconomic status (SES) and region. Since the Coleman Report in 1966, many researchers have used the SES variable as an independent variable for vertical analysis because the variations in educational resources can be mainly explained by SES (Baicker & Gordon, 2006; B. D. Baker & Green III, 2009; Card & Payne, 2002; Iatarola & Stiefel, 2003; Nyhan & Alkadry, 1999; Rolle & Liu, 2007; Springer, Liu, & Guthrie, 2008). For example, Rubenstein, Schwartz, Stiefel, & Amor (2007) asserted that a positive association between student poverty and additional school resources coexisted with a negative association between student poverty and teacher qualifications. Roza and Hill (2004) also emphasized that minority students had fewer experienced teachers in terms of the years of experience and credentials. In the KELS:2005, the SES composite score variable is generated by the same method as in the ELS:2002. In the ELS:2002, the SES score is composed of five composite variables, including father and mother education, father and mother occupation, and family income. Specifically, the mean of each factor score is used.

Besides the SES variable, region and the percentage of special education students for vertical equity analysis of educational resources and outcomes are selected. In the context of Korean K-12 education, the regional variations in educational resources have been a long-standing problem that should be addressed by policymakers, as is also true for the U.S. educational systems (Duncombe & Yinger, 2005b; Ki & Jeong, 2005; Lankford, Loeb, & Wyckoff, 2002; Neild, Farley-Ripple, & Byrnes, 2009). Additionally, no one disagrees with the notion that special education students need more resources than general education students. In this sense, the provision of adequate resources for special education has received significant treatment (Iatarola & Stiefel, 2003; Odden & Picus, 2008; Reed, 2001). Finally, based on the
comparisons of both countries’ educational systems and previous literature, the percentages of minority students and LEP students for the U.S. educational system and total family educational expenditures including private tutoring fees for the Korean educational system are considered to reflect the specific characteristics affecting the guarantee levels of educational opportunities, respectively. Table 6 presented above also classifies different and common factors that affect the status of educational opportunities in both countries in detail.

*Statistical Models*

*Horizontal Equity Analysis and Adequacy Analysis*

In the analysis of horizontal equity with educational resources and outcomes, statistical models are not needed because several horizontal equity indexes can summarize the distributional status of resources and outcomes. Additionally, adequacy analysis using the successful school approach also does not need a statistical model because this study does not attempt to estimate the future cost of adequate education in both countries’ educational systems. However, the specific statistical models need to be formulated in the analysis of vertical equity in terms of educational resources and outcomes. The following statistical models are representative equations used in the analysis of vertical equity for the study.

*Vertical Equity Analysis of Educational Resources*

\[
R = h (A, B, C, D_{US}, E_{US}, F_{K}, \epsilon, \mu)
\]

where the variable of educational resources at school level \((R)\) is specified as a function of Socioeconomics status (A: SES, factor scores by father and mother education, occupation, and family income), region (B), special education (C), race in the U.S. (\(D_{US}\)), LEP in the U.S. (\(E_{US}\)),
total family educational cost \((F_K)\) in Korea, a vector of unobserved characteristics of a school \((\varepsilon)\), and a random error term \((\mu)\).

*Vertical Equity Analysis of Educational Outcomes*

The statistical model of the vertical equity analysis of educational outputs is identical to the method of vertical equity analysis except that standardized math scores (academic outcome) and the degree of school disorder (non-academic outcome) are used as dependent variables instead of resource dependent variables.
CHAPTER 4

ANALYSIS

Overview

The purpose of this study is to comprehensively assess the guarantee level of educational opportunities in the U.S. and Korean educational systems. This study analyzes how equal educational opportunities are guaranteed via each country’s educational system using both resources and outcome perspectives of opportunity. The research employed a broad conceptual framework for examining guaranteeing educational opportunity, which has three different levels of educational opportunities. The adoption of a conceptual framework of educational opportunity, including the perspective of educational outcomes, enables this study to generate a more complete picture of guaranteeing educational opportunities provided in the U.S. and the Korean educational systems.

To answer the research questions posed in the previous chapter, this chapter carries out the following necessary analysis steps: the first section compares the descriptive statistics of the U.S. high schools in 2002 and the Korean middle schools in 2006. The second section focuses on resource equity analysis, explaining the guarantee level of educational opportunity in terms of resources in both countries’ educational systems. The third section relies on adequacy analysis to address guarantee levels of educational opportunities in terms of resource-outcome mixed aspects. The fourth section emphasizes educational opportunities in terms of outcome aspects. The final section addresses the relationship between opportunity guarantee in terms of resource
aspects and opportunity guarantee in terms of outcome aspects. The comparison of analysis is always presented in the final subsection of each analysis section.

Descriptive Analysis

*Analysis of Descriptive Statistics: ELS:2002*

This subsection discusses descriptive statistics of the U.S. high schools in 2002. The unit of analysis is a high school and total sample size is 471 public schools from the total 751 schools (including private high schools) surveyed by the ELS:2002. Across input resources, per pupil current expenditure is about $8,700, and per pupil instructional expenditure accounts for about 60% of per pupil current expenditure. As of 2002, U.S. high schools have about 17 students per teacher, and principals of high schools perceive the provided physical resources as presenting very little hindrance to their students’ learning, which means the quality of physical resources is sufficient so as not to hinder students’ learning.

Regarding throughput resources, first, the description of personal resources is focused on the four major agents—principal, teacher, peer, and parent—composing a school setting. The principal leadership variables of the U.S. public high schools are calculated by several questionnaires estimating (1) principal’s influence on deciding school activities such as hiring/firing teachers and course offerings and (2) principal’s relationship with the school board, central office, and teachers’ association. Overall, principals of the U.S. public high schools exercise high levels of major influence (2.54 out of 3, hereafter 2.54/3) and have very cooperative relationships (3.47/4).

Regarding teacher quality resource summarized by quantitative variables, the U.S. public schools have 8.25% non-tenured teachers, an average of 17.1 years of education among teachers, and about 15 years of experience among teachers. In terms of teacher quality represented by
qualitative characteristics, public high school’s teachers possess a relatively high level of job pride (3.81/5), reflected by answering that if they could go back to college and start over again, they probably would become teachers again. Additionally, parents (2.90/4) think more favorably about the teacher quality of their schools than do students (2.82/4); however, considering the standard deviation, it can be judged that there is little difference between the two.

The peer effect, estimated by how important grades are to close friends, shows the middle level of “somewhat important” and “very important” in educational aspiration (2.41/3). Considering the crucial influences of peer effect on student achievement (Baron & Kenny, 1986; Hoxby, 2000; Kain, 1998), the distribution of educational aspiration will be analyzed in terms of the SES levels, percentage of minority students and region of public high schools in another subsection in more detail.

Regarding parental support, surveyed by questionnaires of quantitative characteristics, about 30% of the U.S. high school’s parents participate in school activities, volunteer work, and parent-teacher associations. In terms of the qualitative characteristic of parental support, they almost always had concern about their child’s study and other activities.

As the second throughput resource, this study chose two variables to describe the degree of operational resources: (1) educational programs provided for developing students’ various capabilities and aptitude and (2) fairness and clarity of school rules. Specifically, the U.S. high schools provide about 4.5 hours of extracurricular activities per week to their students, and the U.S. high school students perceive fairness and clarity (2.77/4) of their school rules at the below average level of “agree” (3 out of 4 scaling).

As the third throughput resource, teachers’ and students’ academic press perceived by principals was chosen to reflect school culture. Academic press is measured by several
questionnaires asking about the school’s emphasis on and expectation of high academic performance in the ELS:2002. Specifically, the U.S. high schools’ principals judge the statement that there is very high academic press in their schools as “somewhat accurate” (3.82/5).

Regarding academic outcome of the U.S. public high schools, the standardized math test scores in 2002 and 2004, based on Item Response Theory (IRT), are a little different between the two survey points (Bozick & Lauff, 2007). In terms of non-academic outcome, public high school students perceive the degree of school’s disorder as 2.7 out of 4 on a Likert scaling\(^\text{16}\). This 2.7 indicates the degree of school disorder at the below average level of “agree” (3 out of 4 scaling). In other words, their school life sometimes has been interrupted by school disorder. Finally, the descriptive statistics of control variables used in this study show that there is an average of 2.22 % students with disability and about an average of 35% minority students in the U.S. high schools. Table 7 below summarizes the descriptive statistics of the U.S. high schools in 2002.

Table 7

Descriptive Statistics of Key Variables in the ELS

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spending</td>
<td>Per Pupil Current Expenditure</td>
<td>469</td>
<td>8,736.02 (2630.10)</td>
</tr>
<tr>
<td></td>
<td>Per Pupil Instructional Expenditure</td>
<td>469</td>
<td>5,404.46 (1658.61)</td>
</tr>
<tr>
<td></td>
<td>Ratio of Instructional to Current Expenditure</td>
<td>469</td>
<td>.62 (.05)</td>
</tr>
<tr>
<td>Physical Resources</td>
<td>Ratio of Pupil to Teacher</td>
<td>450</td>
<td>16.63 (3.61)</td>
</tr>
<tr>
<td></td>
<td>Sufficiency of Physical Resources [1,4]</td>
<td>391</td>
<td>3.22</td>
</tr>
</tbody>
</table>

\(^{16}\) For the sake of maintaining a consistent meaning of the Likert scaling values through this study, the high value of school disorder has a positive meaning, indicating a highly ordered school atmosphere in terms of school climate, even though \textit{school disorder} itself has a negative meaning.
<table>
<thead>
<tr>
<th>Throughput (Process) Resources</th>
<th>Personal Resources</th>
<th>Operational Resources</th>
<th>Cultural Resources</th>
<th>Academic Outcome Variables</th>
<th>Non-Academic Outcome Variable</th>
<th>Control Variables (Affecting Educational Opportunity in the U.S.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Principal Leadership</td>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
<td>Programs</td>
<td>School Culture</td>
<td>Mean of Standardized Math Test Score in 2002 (10th grade)</td>
<td>Mean of Standardized Math Test Score in 2004 (12th grade)</td>
</tr>
<tr>
<td></td>
<td>Principal’s Influence on Deciding School Activities [1,3]</td>
<td>Percentage of Non-tenured Teachers 414</td>
<td>Hours of Extracurricular Activities per Week 470</td>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press [1,5]</td>
<td>Perceived Degree of School Disorder by Student in 2002 [1,4]</td>
<td>470</td>
</tr>
<tr>
<td></td>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,4]</td>
<td>Teachers’ Degree Level 462</td>
<td>Fairness &amp; Clarity of Rules [1,4] 469</td>
<td>49.82 (4.67)</td>
<td>49.35 (4.75)</td>
<td>-0.0484 (.3388)</td>
</tr>
<tr>
<td></td>
<td>Resources</td>
<td>Teachers’ Degree Level 462</td>
<td>469</td>
<td>3.82 (68)</td>
<td>469</td>
<td>2.77 (.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Years of Teaching Experience 462</td>
<td>469</td>
<td>14.93 (5.36)</td>
<td>4.46 (1.94)</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teachers’ Perception of Job Pride [1,5] 462</td>
<td>469</td>
<td>3.81 (8.57)</td>
<td>3.57 (.13)</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students’ Perception of Teacher Quality [1,4] 469</td>
<td>469</td>
<td>2.82 (.18)</td>
<td>2.73 (.16)</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents’ Perception of Teacher Quality [1,4] 469</td>
<td>469</td>
<td>2.90 (21)</td>
<td>2.41 (.13)</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peer Effects</td>
<td>469</td>
<td>2.41 (.13)</td>
<td>469</td>
<td>2.73 (.16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peers’ Educational Aspiration [1,3]</td>
<td>469</td>
<td>2.41 (.13)</td>
<td>469</td>
<td>2.73 (.16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parental Support</td>
<td>469</td>
<td>2.41 (.13)</td>
<td>469</td>
<td>2.73 (.16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents’ Involvement [0,1]</td>
<td>469</td>
<td>.28 (.11)</td>
<td>469</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents’ Concerns about Child’s Study and Other Activities [1,4]</td>
<td>469</td>
<td>.28 (.11)</td>
<td>469</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Resources</td>
<td>470</td>
<td>4.46 (1.94)</td>
<td>469</td>
<td>2.77 (.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cultural Resources</td>
<td>391</td>
<td>3.82 (68)</td>
<td>469</td>
<td>2.77 (.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School Culture</td>
<td>391</td>
<td>3.82 (68)</td>
<td>469</td>
<td>2.77 (.17)</td>
</tr>
</tbody>
</table>

<Notes>
1. Descriptive statistics presented above are mainly based on the ELS data of 2002.
2. All monetary value is computed to the value of dollars as of 2006. The applied inflation rate is the Consumer Price Index (CPI) inflation calculator provided by the Bureau of Labor Statistics.
Analysis of Descriptive Statistics: KELS:2005

This subsection discusses descriptive statistics of the Korean middle schools in 2006. The statistics in Table 8 summarize educational resources/outcomes and control variables of 150 Korean middle schools, which are within the compulsory education system, surveyed by the KELS:2005. Across input resources, per pupil current expenditure is about $1,300. Per pupil instructional expenditure is about $360 and accounts for about an average 27% of per pupil current expenditure. This low ratio of instructional to current expenditure, .27, is remarkable. Considering that it has been demonstrated that expenditures for instructional activities can directly affect educational outcomes, including student achievement, the low proportion of per pupil instructional expenditure is a troubling sign for student performance (Archibald, 2006; Berne & Stiefel, 1984; Childs & Shakeshaft, 1986; Odden & Picus, 2008; Okpala, 2002; Unnever, Kerckhoff, & Robinson, 2000). As of 2006, Korean middle schools have about 20 students per teacher, and principals of middle schools perceive the level of physical resource sufficiency provided to their schools as mid-level (3.37/5). That is, the quality of physical resources is a little insufficient so as to hinder students’ learning.

Regarding throughput resources, first, the principal leadership variables of the Korean middle schools are calculated in the same manner (same variables obtained from same questionnaires in both data sets) as in the U.S. case. Overall, principals of the Korean middle schools exercise the levels of “somewhat”, “not as the U.S. high schools’ ‘major,’ influence” (3.27/5) and “very cooperative relationship” (4.4/5).

In the category of teacher quality resource summarized by quantitative variables, Korean middle schools have .06 % non-tenured teachers, which means there are few non-tenured teachers in Korean middle schools, and tenured teachers are the clear majority in Korean middle
schools. Additionally, teachers in Korean middle schools have an average of 16.7 years of education and about 16 years of experience. In terms of teacher quality represented by qualitative characteristics, middle school teachers do not feel a high sense of job pride (3.53/5) as reflected by the fact that responses to the question about becoming a teacher if they could go back to college and start over again indicated even chances for and against. Additionally, students (3.36/5) view the teacher quality of their schools more favorably than do their parents (3.17/5).

The peer effect, estimated by how important grades are to close friends, resides at the level of “somewhat important”, not the level of “very important” in educational aspiration (2.1/3). In the category of parental support surveyed by questionnaires of quantitative characteristics, about 17% of the Korean middle school’s parents participate in school activities, volunteer work, and parent-teacher associations. In terms of qualitative characteristics of parental support, they almost never\(^\text{17}\) have concerns about their child’s study and other activities (3.59/5).

As the second throughput resource, the Korean middle schools provide an average of about 1.5 subjects of deep-supplement subjects to their students, and the Korean middle school students perceive the level of fairness and clarity of their school rules at the middle level of “strongly disagree” and “strongly agree” (3.06/5).

As the third throughput resource, teachers’ and students’ academic press perceived by principals was chosen to reflect school culture. Academic press is measured by several questionnaires asking about school’s emphasis on and expectation of high academic performance in the KELS:2005 and the ELS:2002. Specifically, the Korean middle schools’ principals judge the statement that there is very high academic press in their schools as “somewhat accurate” (3.82/5), which is exactly same value as in the U.S. case.

\(^{17}\) 4 indicates the “almost always” level and 5 the “always” level of parent concerns about study and other activities of the student.
Regarding academic outcome of the Korean middle schools, the standardized math test scores in 2005, 2006, and 2007 are reported. In particular, the math test scores’ average for each school stands out in 2007. Considering that the mean is 500 and the standard deviation is 50, the mean vertical scaling score of the third wave (2007) is improved by about 9 points when compared to the previous year. In terms of non-academic outcome, middle school students perceive the degree of school’s disorder at 3.22 out of 5 using Likert scaling. This 3.22 indicates the degree of school disorder is at the slight above average level of “somewhat” or “sometimes” (3 out of 5 scaling). In other words, their school life sometimes has been interrupted by school disorder. Finally, the descriptive statistics of control variables used in this study show that there are an average of 2.28 % disability students and about an average of $371 total family educational spending, including private tutoring fees, per month. Table 8 below summarizes the descriptive statistics of the Korean middle schools in 2006.

Table 8
Descriptive Statistics of Key Variables in the KELS

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spending</td>
<td>Per Pupil Current Expenditure</td>
<td>140</td>
<td>1,326.82 (1,259.19)</td>
</tr>
<tr>
<td></td>
<td>Per Pupil Instructional Expenditure</td>
<td>135</td>
<td>365.40 (597.34)</td>
</tr>
<tr>
<td></td>
<td>Ratio of Instructional to Current Expenditure</td>
<td>134</td>
<td>.27 (.16)</td>
</tr>
<tr>
<td>Physical Resources</td>
<td>Ratio of Pupil to Teacher</td>
<td>150</td>
<td>19.34 (5.52)</td>
</tr>
<tr>
<td></td>
<td>Sufficiency of Physical Resources [1,5]</td>
<td>150</td>
<td>3.37 (.88)</td>
</tr>
<tr>
<td>Throughput (Process) Resources</td>
<td>Principal Leadership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Resources</td>
<td>Principal’s Influence on Deciding School Activities [1,5]</td>
<td>150</td>
<td>3.27 (.66)</td>
</tr>
<tr>
<td></td>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,5]</td>
<td>150</td>
<td>4.40 (.61)</td>
</tr>
<tr>
<td>Teacher Quality</td>
<td>Percentage of Non-tenured Teachers</td>
<td>150</td>
<td>.06 (.06)</td>
</tr>
<tr>
<td></td>
<td>Teachers’ Degree Level</td>
<td>150</td>
<td>16.76</td>
</tr>
</tbody>
</table>
### (Quantitative & Qualitative)

<table>
<thead>
<tr>
<th>Qualitative</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of Teaching Experience</td>
<td>150</td>
<td>15.84 (4.06)</td>
</tr>
<tr>
<td>Teachers’ Perception of Job Pride [1,5]</td>
<td>148</td>
<td>3.53 (0.30)</td>
</tr>
<tr>
<td>Students’ Perception of Teacher Quality [1,5]</td>
<td>150</td>
<td>3.36 (0.27)</td>
</tr>
<tr>
<td>Parents’ Perception of Teacher Quality [1,5]</td>
<td>149</td>
<td>3.17 (0.16)</td>
</tr>
</tbody>
</table>

#### Peer Effects

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peers’ Educational Aspiration [1,3]</td>
<td>150</td>
<td>2.10 (0.13)</td>
</tr>
</tbody>
</table>

#### Parental Support

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents’ Involvement [0,1]</td>
<td>150</td>
<td>1.7 (0.07)</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study and Other Activities [1,5]</td>
<td>150</td>
<td>3.59 (0.17)</td>
</tr>
</tbody>
</table>

#### Operational Resources

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Deep-Supplement Subjects</td>
<td>150</td>
<td>1.45 (0.83)</td>
</tr>
<tr>
<td>Fairness &amp; Clarity of Rules [1,5]</td>
<td>150</td>
<td>3.06 (0.20)</td>
</tr>
</tbody>
</table>

#### Cultural Resources

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press [1,5]</td>
<td>150</td>
<td>3.82 (0.65)</td>
</tr>
</tbody>
</table>

#### Academic Outcome Variables

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of Standardized Math Test Score in 2005 (6th grade)</td>
<td>150</td>
<td>299.52 (25.02)</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2006 (7th grade)</td>
<td>150</td>
<td>398.82 (28.24)</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2007 (8th grade)</td>
<td>150</td>
<td>508.90 (24.30)</td>
</tr>
</tbody>
</table>

#### Non-Academic Outcome Variable

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Degree of School Disorder by Student in 2006 [1,5]</td>
<td>150</td>
<td>3.22 (0.46)</td>
</tr>
</tbody>
</table>

#### Control Variables

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic Status</td>
<td>149</td>
<td>-0.0350 (0.2442)</td>
</tr>
<tr>
<td>Region (1: Metropolitan/2: Megalopolis/3: Middle and Small Cities/4: Rural)</td>
<td>150</td>
<td>2.53 (0.93)</td>
</tr>
<tr>
<td>Percentage of Special Education Students</td>
<td>150</td>
<td>2.28 (4.14)</td>
</tr>
<tr>
<td>Total Family Educational Cost including Private Tutoring Fees</td>
<td>149</td>
<td>371.53 (123.22)</td>
</tr>
</tbody>
</table>

### Notes

1. Descriptive statistics presented above are mainly based on the KELS data of 2006.
2. All monetary values are computed to the value of dollars as of 2006. The applied exchange rate is the year average, 955.10 won to 1$.

### Comparison

Even though accurate comparisons of guaranteeing educational opportunities in both countries’ educational systems can be analyzed through the analysis of equity and adequacy, descriptive statistics presented above largely address the different characteristics of the distribution of educational resources and outcomes in both countries. Before analyzing
descriptive statistics of both countries in detail, it should be noted that the U.S. statistics are for public high schools and the Korean statistics are for middle schools.

Across input resources, the most noticeable difference in distributing the spending subset of educational resources is the average ratio of instructional to current expenditure. Compared to the average ratio of the U.S. (.62), the average ratio of the Korean middle schools (.27) is strikingly low and has a very high standard deviation (Korea: .16 vs. the U.S.: .05). Finally, per pupil expenditure of the U.S. public high schools is 6.5 times more than that of the Korean middle schools; however, this figure should not be regarded as reflecting a difference in the level of investment in public education in the two countries’ educational systems. Rather, the higher amount of expenditures in the U.S. public high schools might result from a difference in education stage and economic scale.

With respect to physical resources, the number of students per teacher in the Korean middle schools is three students more than in the U.S. high schools. In terms of the sufficiency of physical resources not hindering students’ learning, the U.S. high schools (3.22/4) provide a higher quality of physical resources than the Korean middle schools (3.37/5) because the degree of insufficiency of physical resources leading to a learning hindrance is lower in the U.S. than in Korea.

Next, regarding personal resources as the first throughput resources, the U.S. high school principals’ leadership is better than that of the Korean middle school principals in terms of influence on deciding school activities (2.54/3 vs. 3.27/5); however, it is less than that of the Korean middle school principals in terms of relationship with other cooperative institutions (3.47/4 vs. 4.4/5).

Recently, both countries’ educational systems have concentrated on improving the
quality of teachers so as to guarantee a desirable level of performance for all students (E. G. Kim et al., 2008; Stronge & Hindman, 2006; Stronge et al., 2007). Considering teacher’s pivotal roles in improving the quality of each country’s educational system, high percentage of non-tenured teachers (8.25%) in the U.S. public high schools is notable compared to the Korean case (.06%). This difference might imply inequality of educational opportunities from a resource perspective in the U.S. educational system depending on distributional inequity of the variable. This implication will be discussed in more detail in the section examining the relationship between opportunity guarantee in terms of resources and opportunity guarantee in terms of outcomes. It is very interesting that contrary to the apparent implications of the above quantitative variables of teacher quality resource, the perception the surveyed U.S. teachers, students, and parents have of teacher quality in U.S. public high schools is higher than the perception the surveyed Korean teachers, students, and parents have of teacher quality in Korean middle schools (e.g., job pride: 3.81/5 vs. 3.53/5).

In addition to the higher teacher quality perceived by teachers, students, and parents in the U.S. educational system, the peer effect variable of the U.S. high schools as a personal resource also has a higher positive value than that of the Korean middle schools (2.41/3 vs. 2.10/3). In parental support measured by questionnaires of quantitative characteristic, the involvement of parents of the U.S. public high schools in school activities, volunteer work, and parent associations is about 10 percent greater than that of Korean parents as well.

Further, regarding operational resources as the second throughput resources, the U.S. educational system provides students with fairer and clearer school rules than the Korean educational system. As a final type of educational resources, both countries’ principals perceive cultural resource identified by academic press in this study at the exact same level (3.82/5).
In terms of educational outcomes, the Korean middle school students show greater improvement in the mean of standardized math test scores than the U.S. public high school students; however, non-academic outcomes indicate few differences between both countries’ educational systems.

Finally, there are no significant differences in SES levels, region, and the percentage of special education, which are commonly considered in both countries’ vertical equity models of educational resources and outcomes. In the further analysis, the relationship between each control variable and the distribution of educational resources and outcomes will allow a more detailed comparison of the guarantee level of educational opportunities in both countries’ educational systems.

In sum, the U.S. educational system provides public high schools with more educational resources, including qualitative resources, than the Korean educational system provides to its middle schools. Specifically, quantitative resources, except for the percentage of non-tenured teachers, and almost all qualitative resources are more firmly secured in the U.S. educational system. However, in terms of the improvement in standardized math test scores, Korean middle schools exhibit greater progress than the U.S. public high schools. Finally, the percentage of special education students and the degree of academic press are almost the same in both countries. In the following sections, these differences and similarities will be examined in more detail in the analysis of equity and adequacy.
Table 9

Comparison of the U.S. and Korea in Descriptive Statistics

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>U.S.</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (SD)</td>
<td>N</td>
</tr>
<tr>
<td><strong>Input Resources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spending</strong></td>
<td>Per Pupil Current Expenditure</td>
<td>469</td>
<td>8,736.02 (2630.10)</td>
</tr>
<tr>
<td></td>
<td>Per Pupil Instructional Expenditure</td>
<td>469</td>
<td>5,404.46 (1658.61)</td>
</tr>
<tr>
<td></td>
<td>Ratio of Instructional to Current Expenditure</td>
<td>469</td>
<td>.62 (.05)</td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td>Ratio of Pupil to Teacher</td>
<td>450</td>
<td>16.63 (3.61)</td>
</tr>
<tr>
<td></td>
<td>Sufficiency of Physical Resources [1,4]/[1,5]</td>
<td>391</td>
<td>3.22 (.65)</td>
</tr>
<tr>
<td><strong>Throughput (Process) Resources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal Resources</strong></td>
<td>Principal’s Influence on Deciding School Activities [1,3]/[1,5]</td>
<td>390</td>
<td>2.54 (.32)</td>
</tr>
<tr>
<td></td>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,4]/[1,5]</td>
<td>389</td>
<td>3.47 (.52)</td>
</tr>
<tr>
<td><strong>Teacher Quality (Quantitative &amp; Qualitative)</strong></td>
<td>Percentage of Non-tenured Teachers</td>
<td>414</td>
<td>8.25 (25.48)</td>
</tr>
<tr>
<td></td>
<td>Teachers’ Degree Level</td>
<td>462</td>
<td>17.10 (.64)</td>
</tr>
<tr>
<td></td>
<td>Years of Teaching Experience</td>
<td>462</td>
<td>14.93 (5.36)</td>
</tr>
<tr>
<td><strong>Quantitative</strong></td>
<td>Teachers’ Perception of Job Pride [1,5]/[1,5]</td>
<td>462</td>
<td>3.81 (.57)</td>
</tr>
<tr>
<td><strong>Qualitative</strong></td>
<td>Students’ Perception of Teacher Quality [1,4]/[1,5]</td>
<td>469</td>
<td>2.82 (.18)</td>
</tr>
<tr>
<td></td>
<td>Parents’ Perception of Teacher Quality [1,4]/[1,5]</td>
<td>469</td>
<td>2.90 (.21)</td>
</tr>
<tr>
<td><strong>Peer Effects</strong></td>
<td>Peers’ Educational Aspiration [1,3]/[1,3]</td>
<td>469</td>
<td>2.41 (.13)</td>
</tr>
<tr>
<td><strong>Parental Support</strong></td>
<td>Parents’ Involvement [0,1]/[0,1]</td>
<td>469</td>
<td>.28 (.11)</td>
</tr>
<tr>
<td></td>
<td>Parents’ Concerns about Child’s Study and Other Activities [1,4]/[1,5]</td>
<td>469</td>
<td>3.57 (.13)</td>
</tr>
<tr>
<td><strong>Operational Resources</strong></td>
<td>Hours of Extracurricular Activities per Week</td>
<td>470</td>
<td>4.46 (1.94)</td>
</tr>
<tr>
<td></td>
<td>Number of Deep-Supplement Subjects</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>School Rules</strong></td>
<td>Fairness &amp; Clarity of Rules [1,4]/[1,5]</td>
<td>469</td>
<td>2.73 (.16)</td>
</tr>
<tr>
<td><strong>Cultural Resources</strong></td>
<td>School Culture</td>
<td>Principal’s Perception on Teachers’ and Students’ Academic Press [1,5]/[1,5]</td>
<td>391</td>
</tr>
<tr>
<td><strong>Academic Outcome Variables</strong></td>
<td>Mean of Standardized Math Test Score in 2002 (10th grade)</td>
<td>470</td>
<td>49.82 (4.67)</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2004 (12th grade)</td>
<td>469</td>
<td>49.35 (4.75)</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2005 (6th grade)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2006 (7th grade)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2007 (8th grade)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Non-Academic Outcome Variable</strong></td>
<td>Perceived Degree of School Disorder by Student in 2002 [1,4]/[1,5]</td>
<td>469</td>
<td>2.77 (.17)</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td>Socio-economic Status</td>
<td>470</td>
<td>-.0484 (.3388)</td>
</tr>
<tr>
<td>(Affecting Educational Opportunity in the U.S.)</td>
<td>Urbanity (1: Urban/2: Suburban/3: Rural)</td>
<td>471</td>
<td>1.99 (.71)</td>
</tr>
<tr>
<td>Region (1: Metropolitan/2: Megalopolis/3: Middle and Small Cities/4: Rural)</td>
<td>N/A</td>
<td>N/A</td>
<td>150</td>
</tr>
<tr>
<td>Percentage of Special Education Students</td>
<td>470</td>
<td>2.22 (4.54)</td>
<td>150</td>
</tr>
<tr>
<td>Percentage of Minority Students</td>
<td>460</td>
<td>34.29 (31.82)</td>
<td>N/A</td>
</tr>
<tr>
<td>Percentage of Limited English Proficient (LEP) Students</td>
<td>446</td>
<td>3.42 (6.90)</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Family Educational Cost including Private Tutoring Fees</td>
<td>N/A</td>
<td>N/A</td>
<td>149</td>
</tr>
</tbody>
</table>

*Note:* Descriptive statistics presented above are mainly based on the ELS data of 2002 and the KELS data of 2006. All monetary values are computed to the value of dollars as of 2006.
Resource Equity Analysis

In this section, guarantee conditions of equal educational opportunities are analyzed using horizontal equity analysis of input and throughput resources in the U.S. and Korean educational systems. Regardless of additional needs such as region and special education, the analysis of horizontal equity of educational resources provides information about how equitably resources are distributed among each country’s schools. In other words, horizontal equity indexes how far the distribution is from perfect equality. Therefore, horizontal equity analysis itself does not allow for specific conclusions about whether or not equal opportunity is achieved in the absence of vertical equity analysis (Houck, 2010; Iatarola & Stiefel, 2003; Rolle & Liu, 2007; Rubenstein, Doering, & Gess, 2000). However, the results of horizontal equity analysis in this study might offer distributional differences beyond arithmetic equality among types of educational resources (e.g., Iatarola & Stiefel, 2003) and between both countries’ educational systems (e.g., Sherman & Poirier, 2007).

*Horizontal Equity Analysis of Educational Resources*

*U.S. Educational System*

In the relative evaluation of horizontal resource equity between input and throughput resources, input resources of the U.S. public high schools are less equitably distributed than throughput resources. However, this does not mean that all equity indexes of throughput variables are lower than those of other input variables. Nevertheless, it is noticeable that the variables of spending resources except ratio of instructional to current expenditure and the variables of physical resource are inequitably distributed in terms of relative comparisons\(^{18}\)

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\(^{18}\) Iatarola & Stiefel (2003) emphasize the relative comparison in horizontal equity analysis as follows: “In order to assess what these numbers say about how equitable spending and resources are, a comparative perspective is essential, since there is no absolute answer to the question, what is fair and equitable?” (p. 72).
among variables used in this study. These figures may indicate the presence of vertical equity, since the distribution of educational resources in deference to specific needs such as the percentage of special needs students and region would create horizontal inequities (Houck, 2010; Iatarola & Stiefel, 2003; Rolle & Liu, 2007). Therefore, more cautious decisions regarding guarantee or not of equal opportunities in terms of resource aspects using equity indexes are needed. In the following subsection, the relative distributional conditions of input and throughput resources are analyzed with horizontal equity statistics in more detail. Table 10 shows equity index values of educational resources with which the U.S. educational system provided public high schools in 2002.

Before describing the results of horizontal equity of each variable, it should be noted that an extreme value of equity statistics (e.g., the coefficients of variation are greater than 1) is not a result of miscalculation but a result of outliers. However, considering the relatively small sample size (471 public high schools for the U.S. and 150 middle schools for Korean analysis), the author decided to include some schools’ exceptional values in order to avoid distorting the actual distribution conditions of educational resources in analyzing the guarantee level of educational opportunity in terms of resource aspects.

First, in terms of the resource variables having quantitative characteristics, it is very strikingly that the variables of ratio of instructional to current expenditure and teachers’ degree level are equitably distributed among the U.S. public high schools. However, per pupil current and instructional expenditures are inequitably distributed, which might suggest a fair guarantee of educational opportunities in that a variety of additional needs such as special education are reflected in the actual provision of resources in terms of vertical equity.
## Table 10

**Horizontal Equity Analysis of Educational Resources in the US**

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spending</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Pupil Current Expenditure</td>
<td>.301 .142 2.088</td>
<td></td>
</tr>
<tr>
<td>Per Pupil Instructional Expenditure</td>
<td>.307 .154 2.555</td>
<td></td>
</tr>
<tr>
<td>Ratio of Instructional to Current Expenditure</td>
<td>.077 .039 1.238</td>
<td></td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td>.411 .187 3.130</td>
<td></td>
</tr>
<tr>
<td>Sufficiency of Physical Resources [1,4]</td>
<td>.201 .112 2.000</td>
<td></td>
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<tr>
<td><strong>Personal Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal Leadership</td>
<td>Principal’s Influence on Deciding School Activities [1,3]</td>
<td>.125 .070 1.500</td>
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<tr>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,4]</td>
<td>.151 .082 1.498</td>
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</tr>
<tr>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
<td>Percentage of Non-tenured Teachers</td>
<td>3.090 .685 .1</td>
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<tr>
<td>Teachers’ Degree Level</td>
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</tr>
<tr>
<td>Years of Teaching Experience</td>
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<tr>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
<td>Teachers’ Perception of Job Pride [1,5]</td>
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<tr>
<td>Students’ Perception of Teacher Quality [1,4]</td>
<td>.063 .035 1.224</td>
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<tr>
<td>Parents’ Perception of Teacher Quality [1,4]</td>
<td>.072 .040 1.243</td>
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<tr>
<td>Peer Effects</td>
<td>Peers’ Educational Aspiration [1,3]                         .055 .031 1.196</td>
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</tr>
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<td>Parental Support</td>
<td>Parents’ Involvement [0,1]</td>
<td>.405 .225 3.952</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study and Other Activities [1,4]</td>
<td>.037 .020 1.128</td>
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<td><strong>Operational Resources</strong></td>
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<tr>
<td>Programs</td>
<td>Hours of Extracurricular Activities per Week</td>
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<td>Fairness &amp; Clarity of Rules [1,4]</td>
<td>.059 .032 1.207</td>
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<td><strong>Cultural Resources</strong></td>
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<td></td>
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<tr>
<td>School Culture</td>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press [1,5]</td>
<td>.177 .099 1.873</td>
</tr>
</tbody>
</table>

**Note:** The value of the denominator is zero.

Additionally, physical resources are also inequitably distributed among schools compared to other variables with quantitative characteristics. Specifically, the ratio of pupil to teacher has values that are about four times larger than an absolute threshold according to Odden and Picus (2008), which suggested the absolute threshold of that coefficient of variation is below .1, and the Gini coefficient is below .05.

Next, regarding personal resources as the first throughput resource, the percentage of non-tenured teachers in teacher quality variables with quantitative characteristics is the most
inequitably distributed among all variables, and the distribution of teachers’ teaching experience is relatively inequitable. However, the equitable distribution of teachers’ degree level is outstanding compared to the other two quantitative teacher quality variables. The parents’ involvement variable as a personal resource having quantitative characteristics is inequitably distributed among the U.S. public high schools. Specifically, parents’ involvement of schools located in the 95th percentile is about four times higher than in the low percentile counterparts, which indicates that the magnitude of inequity is large, particularly at the extreme ends of the distribution. Finally, programs as an operational resource having quantitative characteristics are inequitably provided among public high schools at index value levels similar to those of the parental involvement variable. With the exception of the percentage of non-tenured teachers, the program variable has the second most inequitable value of equity indexes (Cov: .435 and Gini: .242) among quantitative variables in the U.S. educational system.

Regarding the resource variables having qualitative characteristics, it should be noted that the values of abstract/psychological variables have limited ranges such as from 1 to 3, 4, or 5 in Likert scaling. Accordingly, the distribution of abstract/psychological variables is not expected to be significantly dispersed compared to the distribution state of quantitative and continuous variables theoretically having unlimited values. In conclusion, stricter threshold criteria need to be applied to judge the distribution conditions of abstract/psychological variables than are necessary for concrete/physical variables. Because this study marks the first time qualitative resources have been analyzed with an equity framework, there are no existing guidelines for judging inequity of the resources. Therefore, the author focuses on relatively inequitable distribution of qualitative resources among variables used in this study.

In spite of the limited range of variable values, the sufficiency of physical resources and
academic press all perceived by principals are less equitably distributed among the U.S public high schools than any other abstract/psychological variables. Considering that these two variables need to be distributed regardless of additional needs, the qualitative resources might worsen guarantee degree of educational opportunities in terms of both resources and outcomes. Whether or not the two inequitable variables are actually provided to all students toward guarantee of equal opportunities will be revealed by vertical equity analysis considering needier students. The other variables with qualitative characteristics show the equitable distribution among public high schools, even though there are slight differences in equity index values.

In sum, as a concrete/physical variable, teachers’ years of education and ratio of instructional to current expenditure are very equitably distributed among the U.S. public high schools regardless of additional special needs. However, the percentage of non-tenured teachers, parental involvement rates, and educational programs are inequitably distributed among public high schools. In particular, considering that the percentage of non-tenured teachers is relatively high compared to the Korean educational system, the most highly inequitable distribution among quantitative resources might be problematic in terms of equal educational opportunity. On the other hand, as an abstract/psychological variable, the sufficiency of physical resources and academic press are less equitably distributed among the U.S. public high schools than any other variables having qualitative characteristics. Moreover, in spite of the limited value ranges of Likert scaling, it is notable that the U.S. public high school teacher’s perception of job pride exhibits the coefficient of variation (.150) and the Gini coefficient (.082) above an absolute threshold for horizontal inequity diagnosis.
Korean Educational System

In the relative evaluation of horizontal resource equity between input and throughput resources, input resources of the Korean middle schools are less equitably distributed than throughput resources in the U.S. public high schools. However, this does not mean that all equity indexes of throughput variables are lower than those of other input variables. Even when the criteria\textsuperscript{19} of horizontal equity discussed in the context of the Korean educational system are applied, the variables of spending are very inequitably distributed among the Korean middle schools. For example, the 95\textsuperscript{th}/5\textsuperscript{th} percentile ratio (24.853) indicates that the gaps between high and low level schools with regard to per pupil instructional expenditure widen a great deal.

In the following subsection, the relative distributional conditions of input and throughput resources are described with horizontal equity statistics in more detail. Table 11 shows the detail equity index values of educational resources provided by the Korean educational system to middle schools in 2006.

First, in terms of the resource variables having quantitative characteristics, it is very strikingly that the variable of teachers’ degree level is equitably distributed among the Korean middle schools. However, per pupil current and instructional expenditures are the least equitably distributed, which might suggest a fair guarantee of educational opportunities from a resource perspective. Additionally, physical resources are relatively equitably distributed among schools compared to other variables with quantitative characteristics in the Korean context.

Next, regarding personal resources as the first throughput resource, the percentage of non-tenured teachers as a teacher quality variable having quantitative characteristics is very

\textsuperscript{19} According to Yun (2004), Gini coefficients greater than .4 reflect some degree of horizontal inequity in Korean context. Additionally, he introduced the criterion that Gini coefficients greater than .6 reflected an extremely inequitable situation.
inequitably distributed among all variables. Specifically, according to the absolute thresholds Odden and Picus (2008), the coefficient of variation (.996) and the Gini coefficient (.511) are about 10 times larger than the criterion for a desirably equitable distribution. However, the distribution of teachers’ degree level is the most equitable among the Korean middle schools as in the U.S. public high schools. Specifically, the coefficient of variation, .024, and the Gini coefficient, .012, are the lowest statistics as shown in Table 11.

Table 11

## Horizontal Equity Analysis of Educational Resources in Korea

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Measures</th>
<th>Variables</th>
<th>Coef. Var.</th>
<th>Gini Coef.</th>
<th>95th/5th Ratio</th>
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<tbody>
<tr>
<td><strong>Input Resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spending</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td></td>
<td></td>
<td>.285</td>
<td>.150</td>
<td>3.531</td>
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<tr>
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<td></td>
<td></td>
<td>.260</td>
<td>.149</td>
<td>2.450</td>
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<tr>
<td><strong>Personal Resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal Leadership</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School Activities [1,5]</td>
<td></td>
<td></td>
<td>.203</td>
<td>.114</td>
<td>1.959</td>
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<tr>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,5]</td>
<td></td>
<td></td>
<td>.139</td>
<td>.073</td>
<td>1.502</td>
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<tr>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
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<td></td>
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<tr>
<td>Quantitative</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Percentage of Non-tenured Teachers</td>
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<td></td>
<td>.996</td>
<td>.511</td>
<td>-1</td>
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<td></td>
<td>.024</td>
<td>.012</td>
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<tr>
<td>Years of Teaching Experience</td>
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<td>.257</td>
<td>.146</td>
<td>1.770</td>
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<tr>
<td>Qualitative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers’ Perception on Job Pride [1,5]</td>
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<td></td>
<td>.085</td>
<td>.048</td>
<td>1.333</td>
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<td>.082</td>
<td>.044</td>
<td>1.296</td>
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<td>Parents’ Perception on Teacher Quality [1,5]</td>
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<td>.050</td>
<td>.027</td>
<td>1.158</td>
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<tr>
<td>Peer Effects</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Peers’ Educational Aspiration [1,3]</td>
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<td></td>
<td>.062</td>
<td>.035</td>
<td>1.227</td>
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<td>Parental Support</td>
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<tr>
<td>Parents’ Involvement [0,1]</td>
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<td>.433</td>
<td>.224</td>
<td>4.221</td>
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<td>Parents’ Concerns about Child’s Study and Other Activities [1,5]</td>
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<td></td>
<td>.048</td>
<td>.026</td>
<td>1.159</td>
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<td><strong>Operational Resources</strong></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Programs</td>
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<td></td>
</tr>
<tr>
<td>Number of Deep-Supplement Subjects</td>
<td></td>
<td></td>
<td>.575</td>
<td>.280</td>
<td>6.667</td>
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<td>School Rules</td>
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</tr>
<tr>
<td>Rule’s Fairness &amp; Clarity [1,5]</td>
<td></td>
<td></td>
<td>.067</td>
<td>.037</td>
<td>1.223</td>
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<td><strong>Cultural Resources</strong></td>
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</tr>
<tr>
<td>School Culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal’s Perception on Teachers’ and Students’ Academic Press [1,5]</td>
<td></td>
<td></td>
<td>.170</td>
<td>.095</td>
<td>1.873</td>
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</tbody>
</table>

*Note:* The value of the denominator is zero.
Regarding the resource variables having qualitative characteristics, the sufficiency of physical resources, principal’s influence and academic press all perceived by principals of the Korean middle schools are less equitably distributed among schools than any other abstract/psychological variable used in this study. Considering that these three variables need to be distributed regardless of additional needs, the inequitable distribution of the variables might be a troubling sign for guaranteeing equal opportunities in terms of resource aspects. However, the inequitable distribution in the sufficiency of physical resources not hindering students’ learning might exhibit vertical equity because the Korean educational system has made persistent efforts to improve the educational environments of rural schools (Ki & Jeong, 2005; Ministry of Education, Science, and Technology, 2009). Hence, deeper examination using vertical analysis is needed to judge whether or not equal resource opportunities are secured for needier students. Finally, the other qualitative resources used in this study have equitable distributions among middle schools, even though there are slight differences in equity index values among the qualitative resources.

In sum, as a concrete/physical variable, teachers’ years of education is very equitably distributed among the Korean middle schools. However, spending resources are very inequitably distributed among middle schools. The other quantitative resources such as the ratios of pupil to teacher, non-tenured teachers’ percentage, parental involvement rates, and educational program variables are inequitably distributed in terms of absolute threshold criteria for horizontal inequity. On the other hand, as an abstract/psychological variable, the sufficiency of physical resources, principal leadership, and school culture are less inequitably distributed than any other qualitative resource.
Comparison

The results of horizontal equity analysis have the following common characteristics in the U.S. and Korean educational systems. In terms of educational resources having quantitative characteristics, the teachers’ degree levels are very equitably distributed compared to other resources; however, the percentage of non-tenured teachers has a markedly inequitable distribution (Cov: U.S.: 3.090 vs. Korea: .996). In the overall evaluation of teacher quality variables having quantitative characteristics, it is concluded that the Korean educational system provides more equitable teacher quality regardless of additional needs of each school compared to the U.S. educational system. Finally, the equity statistics of spending variables are relatively inequitably distributed in both countries compared to equity statistics of other quantitative resources. In terms of educational resources having qualitative characteristics, both countries’ educational systems inequitably provide physical resource sufficiency and academic press.

On the other hand, the results of horizontal equity analysis indicate different characteristics between the U.S. and Korean educational systems. Regarding quantitative resources, the U.S. has more equitable distribution of spending resources, even though both countries’ spending resources are relatively inequitably distributed in terms of absolute threshold criteria. In particular, the ratio of instructional to current expenditure among Korean middle schools—considering this variable transformed by ratio values, not raw expenditure values—is very inequitably distributed compared to the U.S. public high schools. In terms of a comparative perspective, teacher quality variables as a quantitative resource are more equitably distributed in Korean middle schools than in the U.S. public high schools. Specifically, the percentage of non-tenured teachers is seriously inequitably distributed in the U.S. educational system, which might impede the guarantee of equal resource opportunities.
With respect to different distributional characteristics of qualitative resources, even though physical resource sufficiency and principal’s influence are more equitably distributed in the U.S. than in Korea, their differences are not significant considering the different scaling ranges of the same questionnaires (e.g., principal’s influence: ELS [1,3] vs. KELS: [1,5]). Finally, it is remarkable that teachers’ perception of job pride is less equitable in the U.S. than in Korea even though the variable has the same Likert scaling range ([1,5]). Table 12 presents the specific equity statistics for comparisons.
Table 12

Comparison of the U.S. and Korea in Horizontal Equity of Educational Resources

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Resources</td>
<td>Spending</td>
<td>Per Pupil Current Expenditure</td>
<td>.301</td>
<td>.949</td>
<td>.142</td>
<td>.457</td>
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<td></td>
<td></td>
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<td>.552</td>
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<td></td>
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<td>.596</td>
<td>.039</td>
<td>.323</td>
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<td>Physical Resources</td>
<td>Ratio of Pupil to Teacher</td>
<td>.411</td>
<td>.285</td>
<td>.187</td>
<td>.150</td>
<td>3.130</td>
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<tr>
<td></td>
<td></td>
<td>Sufficiency of Physical Resources [1,4]/[1,5]</td>
<td>.201</td>
<td>.260</td>
<td>.112</td>
<td>.149</td>
<td>2.000</td>
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<tr>
<td>Throughput (Process) Resources</td>
<td>Personal Leadership</td>
<td>Principal’s Influence on Deciding School Activities [1,3]/[1,5]</td>
<td>.125</td>
<td>.203</td>
<td>.070</td>
<td>.114</td>
<td>1.500</td>
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<td></td>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,4]/[1,5]</td>
<td>.151</td>
<td>.139</td>
<td>.082</td>
<td>.073</td>
<td>1.498</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quantitative</td>
<td>Percentage of Non-tenured Teachers</td>
<td>3.090</td>
<td>.996</td>
<td>.685</td>
<td>.511</td>
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<tr>
<td></td>
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<td>Teachers’ Degree Level</td>
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<td>.024</td>
<td>.020</td>
<td>.012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Years of Teaching Experience</td>
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<td>.257</td>
<td>.202</td>
<td>.146</td>
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<td></td>
<td></td>
<td>Qualitative</td>
<td>Teachers’ Perception of Job Pride [1,5]/[1,5]</td>
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<td>.085</td>
<td>.084</td>
<td>.048</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Students’ Perception of Teacher Quality [1,4]/[1,5]</td>
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<td>.082</td>
<td>.035</td>
<td>.044</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Parents’ Perception of Teacher Quality [1,4]/[1,5]</td>
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<td>.050</td>
<td>.040</td>
<td>.027</td>
</tr>
<tr>
<td></td>
<td>Peer Effects</td>
<td>Peers’ Educational Aspiration [1,3]/[1,3]</td>
<td>.055</td>
<td>.062</td>
<td>.031</td>
<td>.035</td>
<td>1.196</td>
</tr>
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<td></td>
<td>Parental Support</td>
<td>Parents’ Involvement [0,1]/[0,1]</td>
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<td>.433</td>
<td>.225</td>
<td>.224</td>
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<tr>
<td></td>
<td></td>
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<td>Parents’ Concerns about Child’s Study and Other Activities [1,4]/[1,5]</td>
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<td>.048</td>
<td>.020</td>
<td>.026</td>
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<tr>
<td></td>
<td>Operational Resources</td>
<td>Programs</td>
<td>Hours of Extracurricular Activities per Week</td>
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<td>.242</td>
<td>N/A</td>
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<td></td>
<td></td>
<td></td>
<td>Number of Deep-Supplement Subjects</td>
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<td>.575</td>
<td>N/A</td>
<td>.280</td>
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<td></td>
<td>School Rules</td>
<td>Fairness &amp; Clarity of Rules [1,4]/[1,5]</td>
<td>.059</td>
<td>.067</td>
<td>.032</td>
<td>.037</td>
<td>1.207</td>
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<td></td>
<td>Cultural Resources</td>
<td>School Culture</td>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press [1,5]/[1,5]</td>
<td>.177</td>
<td>.170</td>
<td>.099</td>
<td>.095</td>
</tr>
</tbody>
</table>

*Note: The value of the denominator is zero.*
Vertical Equity Analysis of Educational Resources

The analysis of vertical equity is a useful analytic tool that allows for examining the relationship and strength between educational resources and external factors causing the differences in educational opportunities (Houck, 2010; Rolle & Liu, 2007). Specifically, the magnitudes and signs of coefficients in vertical equity models can provide information about how well additional needs, such as those of students attending a rural school or of students with disabilities, are compensated for in order to eventually induce the fulfillment of outcome equity (Berne & Picus, 1994; Iatarola & Stiefel, 2003). It is obvious that the provision of educational resources should be discriminatively but fairly guaranteed corresponding to these external factors in order to fulfill the opportunity guarantee of educational outcomes. The school level SES, region, special education, race, and LEP are chosen as the predictors of the U.S. public high schools’ vertical equity models, and the school level SES, region, special education, and total family educational cost are chosen for the Korean middle schools’ models. In this section, a detailed analysis of the achievement, or lack thereof, of distributional equity of educational resources as each predictor changes will be presented.

U.S. Educational System

SES effects

In order to achieve equal opportunity in terms of resource aspects, educational resources need to be provided differently corresponding to the levels of the school’s aggregated SES (i.e., school SES or school level SES). As described earlier, our measure of SES is a composite factor score constructed by parents’ job, education level, and incomes. According to the results of vertical equity analysis by the SES levels (see the first column in Table 13 below), school level SES is significantly but negatively associated with the distribution conditions of almost all
Table 13
Vertical Equity Analysis in the U.S.: Influence of SES, Urbanity, Special Education, Race, and LEP on Educational Resources

<table>
<thead>
<tr>
<th>Resource Variables</th>
<th>Standardized Regression Coefficients (t-values)</th>
<th>SES</th>
<th>Urban</th>
<th>Rural</th>
<th>Special Education</th>
<th>Race</th>
<th>LEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Pupil Current Expenditure</td>
<td>.193*** (4.163)</td>
<td>-.192***</td>
<td>-.041</td>
<td>.339***</td>
<td>.499***</td>
<td>-.009</td>
<td>(-.197)</td>
</tr>
<tr>
<td>Per Pupil Instructional Expenditure</td>
<td>.223*** (4.608)</td>
<td>-.179***</td>
<td>-.039</td>
<td>.300***</td>
<td>.347***</td>
<td>.055</td>
<td>(1.189)</td>
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<tr>
<td>Ratio of Instructional to Current Expenditure</td>
<td>.086# (1.817)</td>
<td>-.104#</td>
<td>-.055</td>
<td>-.055</td>
<td>-377***</td>
<td>.180**</td>
<td>(3.980)</td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td>.021# (.458)</td>
<td>.227***</td>
<td>-.166***</td>
<td>-.191***</td>
<td>.172**</td>
<td>-.043</td>
<td>(-1.011)</td>
</tr>
<tr>
<td>Sufficiency of Physical Resources</td>
<td>.141# (2.623)</td>
<td>-.158*</td>
<td>-.011</td>
<td>-.061</td>
<td>-186**</td>
<td>.033</td>
<td>(.649)</td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School</td>
<td>-.070# (-1.231)</td>
<td>-.108</td>
<td>-.029</td>
<td>.037</td>
<td>.024</td>
<td>-.076</td>
<td>(-1.415)</td>
</tr>
<tr>
<td>Principal’s Relationship with Cooperative</td>
<td>.068 (1.201)</td>
<td>-.150*</td>
<td>-.030</td>
<td>-.017</td>
<td>-.010</td>
<td>.000</td>
<td>(-.003)</td>
</tr>
<tr>
<td>Percentage of Non-tenured Teachers</td>
<td>-.094# (-1.822)</td>
<td>-.271***</td>
<td>.069</td>
<td>.126*</td>
<td>.336***</td>
<td>-.084#</td>
<td>(-1.715)</td>
</tr>
<tr>
<td>Teachers’ Degree Level</td>
<td>.142# (2.825)</td>
<td>-.105#</td>
<td>-.245***</td>
<td>.114*</td>
<td>.204***</td>
<td>-.035</td>
<td>(-.729)</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td>-.022# (-.421)</td>
<td>-.035</td>
<td>-.118*</td>
<td>-.050</td>
<td>-.159*</td>
<td>-.005</td>
<td>(-.099)</td>
</tr>
<tr>
<td>Teachers’ Perception of Job Pride</td>
<td>.112* (2.144)</td>
<td>.013</td>
<td>.078</td>
<td>.086#</td>
<td>-.092</td>
<td>.090#</td>
<td>(1.808)</td>
</tr>
<tr>
<td>Students’ Perception of Teacher Quality</td>
<td>.033 (1.656)</td>
<td>.144*</td>
<td>.010</td>
<td>-.227***</td>
<td>.057</td>
<td>-.092#</td>
<td>(-1.921)</td>
</tr>
<tr>
<td>Parents’ Perception of Teacher Quality</td>
<td>.241*** (4.779)</td>
<td>-.071</td>
<td>-.067</td>
<td>-.051</td>
<td>-.140*</td>
<td>.058</td>
<td>(1.211)</td>
</tr>
<tr>
<td>Peers’ Educational Aspiration</td>
<td>.133** (2.775)</td>
<td>-.010</td>
<td>.054</td>
<td>-.170***</td>
<td>.406***</td>
<td>-.059</td>
<td>(-1.293)</td>
</tr>
<tr>
<td>Parents’ Involvement</td>
<td>.324*** (6.530)</td>
<td>-.090</td>
<td>.181***</td>
<td>-.018</td>
<td>.071</td>
<td>-.058</td>
<td>(-1.217)</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study and</td>
<td>-.081 (-1.608)</td>
<td>-.135*</td>
<td>-.075</td>
<td>-.245***</td>
<td>-.108#</td>
<td>-.028</td>
<td>(-.574)</td>
</tr>
<tr>
<td>Other Activities</td>
<td>.212*** (4.914)</td>
<td>-.123*</td>
<td>.133**</td>
<td>-.144***</td>
<td>-.371**</td>
<td>.033</td>
<td>(-.803)</td>
</tr>
<tr>
<td>Hours of Extracurricular Activities per Week</td>
<td>-.023 (-.466)</td>
<td>.153**</td>
<td>.117*</td>
<td>-.243***</td>
<td>.109#</td>
<td>-.087#</td>
<td>(-1.833)</td>
</tr>
<tr>
<td>Fairness &amp; Clarity of Rules</td>
<td>.401*** (7.686)</td>
<td>-.068</td>
<td>.105#</td>
<td>-.076</td>
<td>-.010</td>
<td>.042</td>
<td>(.853)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.

Specifically, regarding types of educational resources, the school level SES of the U.S.
public high schools is significantly associated with the following types of educational resources: spending, physical resources, personal resources (teacher quality, peer effects, and parental support), operational resources (programs), and cultural resources. In terms of variables with qualitative characteristics, the school level SES significantly affects the distribution of physical resources (sufficiency), personal resources (teacher quality and peer effects), and cultural resources.

In terms of the resource variables having quantitative characteristics, the U.S. educational system provides more of every quantitative resource significantly associated with school level SES to high SES schools more than to low SES schools (see Table 13). In particular, the quantitative resources associated with school SES at the highest significance level (p<.001) are as follows: (1) per pupil current expenditure, (2) per pupil instructional expenditure, (3) parents’ involvement, and (4) hours of extracurricular activities per week.

Next, regarding the resource variables having qualitative characteristics, every qualitative resources significantly associated with SES has a positive relationship. (1) Teacher quality perceived by parents and (2) academic press perceived by principals are associated with school level SES at the highest significance level. In particular, academic press as a cultural resource is the most closely associated with school level SES among the resources whose vertical distributions are influenced by school SES (standardized coefficient: .401). In sum, in all categories of concrete/physical and abstract/psychological variables except principal’s leadership resource, high SES public high schools exhibit more educational resources than low SES schools, which indicates that school level SES negatively affects the guaranteeing of equal opportunities in terms of resource aspects among the U.S. public high schools.
Region effects

In the U.S. K-12 educational system, the unequal provision of educational resources among urban, suburban and rural schools has been considered an urgent issue in school finance (Andrews, Duncombe, & Yinger, 2002; Duncombe & Yinger, 2005b; A. Gamoran, 1996; Hirth, Meyers, & Valesky, 1992; Lankford et al., 2002; Neild et al., 2009; Sielke, 2004). In this study, following previous literature, region effects on the distribution of educational resources are considered to examine the guarantee of equal resource opportunities among the U.S. public high schools. Suburban is selected as a criterion nominal variable due to its having the greatest number of subjects in the ELS:2002. The second and third columns in Table 13 presented above reports the specific magnitudes and influences of region variables on educational resources in the U.S. context.

Urban. Compared to suburban, urban is significantly associated with the following types of educational resources: spending, physical resources, personal resources (principal leadership, teacher quality, and parental support), and operational resources (programs and school rules). In terms of variables with qualitative characteristics, urban significantly affects the distribution of physical resources (sufficiency), personal resources (principal leadership, teacher quality, and parental support), and operational resources (fairness and clarity of school rules).

Among the resource variables having quantitative characteristics, the U.S. educational system fails to provide urban public high schools with sufficient quantitative resources so as to achieve equal resource opportunities except for the percentage of non-tenured teachers. Specifically, the U.S. provides lower amounts of per pupil current and instructional expenditures to urban public high schools. Moreover, the proportion of instructional to current expenditures in the U.S. urban public high schools is relatively lower than in suburban schools, even though the
statistical strength is low (p<.10). With respect to physical resources, the U.S. educational system provides a smaller number of teachers to urban schools than to suburban schools, which indicates a vertically inequitable distribution of teacher supply. In terms of teacher quality, urban schools have more tenured teachers; however, they exhibit lower degree levels of teachers. Finally, urban schools provide fewer hours of extracurricular activities than suburban schools in terms of an operational resource.

Regarding the resource variables having qualitative characteristics, principals of urban public high schools perceive their physical resources as insufficient leading to hindrance of students’ learning, and they evaluate their own relationship with cooperative institutions or associations at the lower level as compared to the evaluations from suburban school principals. Additionally, teacher quality perceived by students is lower than suburban schools, and the school rules of urban schools perceived by students are fairer and clearer than those of suburban schools. However, parents’ concerns about study and other school activities are not as prominent in urban public high schools as compared to suburban public high schools.

In sum, in terms of concrete/physical variables, urban schools have more tenured teachers in the U.S. educational system. However, the distribution conditions of the resource in the U.S. educational system need to be improved so as to provide higher current and instructional expenditures, higher degree level teachers and more extracurricular activities to urban public high school students. In other words, the U.S. urban public high schools are not guaranteed equal resource opportunities in terms of all input resources compared to suburban public high schools. Regarding abstract/psychological variables, high teacher quality and fair and clear school rules perceived by students contribute to guaranteeing equal opportunity for urban public high schools. However, interest in the distribution conditions of resources needs to be broadened to consider
the following abstract/psychological resources in urban public high schools: physical resource sufficiency, principal relationship, and parents’ concerns about school activities.

*Rural.* Comparing to suburban, rural region is significantly associated with the following types of educational resources: physical resources, personal resources (teacher quality and parental support), operational resources, and cultural resources. In terms of variables having qualitative characteristics, the rural region factor is significantly associated with fairness and clarity of rules as an operational resource and academic press as a cultural resource.

Specifically, among the resource variables having quantitative characteristics, the U.S. educational system provides more teachers to rural public high schools than to suburban schools. With respect to teacher quality, rural public high schools have teachers with lower degree levels and less experience than suburban schools. However, it is a positive sign for equal opportunities that the parents of rural public high schools participate more in school activities and associations than suburban schools’ parents. Additionally, rural schools provide more hours of extracurricular activities than suburban schools. Additionally, rural schools provide more hours of extracurricular activities than suburban schools. Regarding the resource variables having qualitative characteristics, rural region is significantly associated with fairness and clarity of school rules perceived by students and academic press perceived by principals; however, its relationship is not very strong (p<.05 and p<.10 respectively).

In sum, in terms of concrete/physical variables, rural public high schools have more teachers, exhibit higher parental participation, and provide more hours of extracurricular activities, indicating a guarantee of equal resource opportunities for the U.S. rural public high schools. However, the resource provision conditions of the U.S. educational system need to be improved so as to provide higher quality teachers to rural public high school students in terms of
teachers’ degree level and years of experience. Regarding abstract/psychological variables, the two resources variables, school rules and culture resources, significantly associated with rural region are distributed so as to fulfill vertical equity in the U.S. educational system.

Special education effects

In order to achieve equal opportunity in terms of resource aspects, it is obvious that more educational resources should be provided to guarantee equal opportunity to students having additional needs due to disability. In this study, the special education factor is considered by using the percentage of special education students in each school. As indicated in the fourth column of Table 13, the special education factor of the U.S. public high schools is significantly associated with the following types of educational resources: spending, physical resources, personal resources (teacher quality, peer effects, and parental support), and operational resources. In terms of qualitative characteristics of variables, the special education factor significantly correlates with the distribution of personal resources (teacher quality, peer effects, and parental support) and operational resources (fairness and clarity of school rules).

In terms of the resource variables having quantitative characteristics, the U.S. educational system provides a greater amount of per pupil current and instructional expenditures to public high schools having a high percentage of special education students. With respect to physical resources, the U.S. provides more teachers to schools to a high special education student percentage schools. These results corroborate previous literature indicating that the U.S. educational system has provided more input resources to special education students (Iatarola & Stiefel, 2003; Ladd, 2008; Lankford & Wyckoff, 1995; Levin, 1989; OECD, 2004). High special education student percentage schools have fewer tenured teachers; however, they have more high degree level teachers compared to counterpart schools. Finally, high special education student
percentage schools provide fewer hours of extracurricular activities than schools with a low percentage of special education students.

Next, regarding the resource variables having qualitative characteristics, the current distribution of teacher quality perceived by students fails to guarantee equal opportunity for special education students in terms of a resources aspect as a personal resource. The number of teachers having high job pride increases a little in high special education student percentage schools; however, the coefficient and significance is not that large (standardized coefficient:.086 and p<.10). Close friends’ educational aspiration, parents’ concerns about their child’s study, and fairness and clarity of school rules in high special education student percentage schools are lower than low percentage schools, indicating unsatisfactory equal resources opportunities in terms of qualitative resources.

In sum, in terms of concrete/physical variables, high special education student percentage schools exhibit higher current and instructional expenditures, more teachers and more high degree level teachers in the U.S. educational system. However, the high percentage of non-tenured teachers should be improved so as to guarantee equal opportunity for special education students from a resource perspective. Regarding abstract/psychological variables, it is striking that there are no additional qualitative resources provided based on the percentage of special education students except for the teacher’s job pride variable. Rather, there is an inequitable distribution of those qualitative resources in the U.S. educational system. Therefore, the distributional conditions of abstract/psychological resources need to be considered to fully secure equal opportunities for special education students in providing more resources for them.

Race and LEP effects

It is undeniable that one of the major problems in the U.S. public education system is
unequal educational opportunities, including the achievement disparities between majority and minority student groups (Addonizio, 2003; B. D. Baker & Green III, 2009; Mintrop & Trujillo, 2007; O'Brien, 1999; Roscigno & Ainsworth-Darnell, 1999; Scafidi et al., 2005; Sleeter, 2007). Following previous literature, minority and LEP student group effects on the distribution of educational resources are presented in the following subsection to examine the guarantee of equal opportunity from a resource perspective among the U.S. public high schools.

Race effects. As indicated in the fifth column of Table 13, race, specifically percentage of minority students in this study, is significantly associated with the following types of educational resources: spending, physical resources, personal resources (teacher quality, peer effects, and parental support), and operational resources (programs and school rules). In terms of qualitative characteristics of variables, the race factor is significantly associated with the distribution of physical resources (sufficiency), personal resources (teacher quality and parental support), and operational resources (fairness and clarity of school rules).

Among the resource variables having quantitative characteristics, the U.S. educational system grants a greater amount of per pupil current and instructional expenditures to high minority student percentage schools; however, such additional current per pupil expenditures are not proportionally spent on instructional activities. With respect to physical resources, the U.S. educational system provides a smaller number of teachers to high minority student percentage schools, which indicates a vertically inequitable distribution of teacher supply. These schools have more non-tenured teachers and fewer experienced teachers; however, they have more high degree level teachers. Finally, high minority student percentage schools provide fewer hours of extracurricular activities than low percentage counterpart schools.

Regarding the resource variables having qualitative characteristics, the principals of high
minority student percentage schools regard their physical resources as insufficient leading to hindrance of students’ learning. High minority student percentage schools have high teacher quality perceived by parents and high peers’ educational aspiration compared to low percentage schools; however, in these high percentage schools, parents’ concerns about study and other school activities are not as prominent as in low percentage schools. Finally, students attending high minority student percentage schools perceive their school’s rules as fair and clear compared to low percentage schools, even though the significance is not very strong (p<.10).

In sum, in terms of concrete/physical variables, high minority student percentage schools exhibit higher current and instructional expenditures and a greater number of high degree level teachers in the U.S. educational system. However, as shown in the inequitable distribution of the ratios of instructional to current expenditure, more spending does not lead to securing physical resources that directly affect students’ learning environments in high minority student percentage schools. Regarding abstract/psychological variables, contradicting the results of previous literature claiming negative effects of minority student groups on educational aspiration, the results of racial effects on educational resources indicate that there is high educational aspiration in high minority student percentage high schools. Additionally, high teacher quality perceived by parents and fair and clear school rules perceived by students contribute to guaranteeing equal opportunity for high minority student percentage schools.

However, the resource provision conditions of the U.S. educational system need to be improved so as to provide a larger number of teachers, more tenured and experienced teachers, and more extracurricular activities to high minority student percentage schools. Finally, interest in the distributional conditions of educational resources needs to be broadened to include the following abstract/psychological resources in high minority student percentage schools: physical
resource sufficiency and parental concerns about school activities.

**LEP effects.** According to the sixth column of Table 13, the LEP factor of the U.S. public high schools is significantly associated with the following types of educational resources: spending, personal resources (teacher quality only), and operational resources (school rules). In terms of variables with qualitative characteristics, this factor is significantly associated with teacher quality as a personal resource and fairness and clarity of school rules as an operational resource.

Specifically, among the resource variables having quantitative characteristics, schools with high LEP student percentage schools are provided a relatively appropriate proportion of instructional expenditure compared to low LEP student percentage schools. With respect to teacher quality variables, high LEP student percentage schools have more tenured teachers than low percentage counterpart schools, even though the statistical significance is not highly influential (p<.10).

Regarding the resource variables having qualitative characteristics, the overall characteristics of qualitative resources significantly associated with the LEP factor are not outstanding in terms of magnitude and influence of the factor (i.e., small coefficient values and low significance levels). The number of teachers having high job pride increases a little in high LEP student percentage schools (standardized coefficient: .090 and p<.10). Additionally, the current distribution of teacher quality perceived by students fails to guarantee equal opportunity for LEP students (standardized coefficient: -.092, p<.10). Finally, fairness and clarity of school rules in high LEP student percentage schools are lower than low percentage counterpart schools (standardized coefficient: -.087, p<.10).

In sum, in terms of concrete/physical variables, the two quantitative resources associated
with the LEP factor are distributed in a way to achieve vertical equity in the U.S. educational system. Specifically, high LEP student percentage schools exhibit a relatively high proportion of instructional expenditures out of current expenditures and more tenured teachers. Regarding abstract/psychological variables, the provision of teachers with high job pride in high LEP student percentage schools contributes to guaranteeing equal opportunity for the public high schools. However, interest in the distributional conditions of educational resources needs to be broadened to include the following abstract/psychological resources in high LEP student percentage schools: teacher quality perceived by students and fairness and clarity of school rules.

*Korean Educational System*

*SES effects*

In order to achieve equal opportunity in terms of resource aspects, educational resources need to be provided differently corresponding to school’s aggregated SES levels. According to the first column of Table 14, school SES levels of the Korean middle schools are significantly associated with the following types of educational resources: spending, physical resources, and personal resources (teacher quality and parental support). In terms of qualitative characteristics of variables, the school SES is actively related to distributional conditions of personal resources (teacher quality and parental support).

In terms of the resource variables having quantitative characteristics, the Korean educational system grants a greater amount of per pupil current expenditure to lower SES level middle schools; however, such additional expenditures are not proportionally spent on instructional activities. With respect to physical resources, Korea provides more teachers to low SES middle schools, which indicates a vertically equitable distribution of teacher supply.
Table 14

Vertical Equity Analysis in Korea: Influence of SES, Region, Special Education and Education Cost on Educational Resources

<table>
<thead>
<tr>
<th>Resource Variables</th>
<th>Standardized Regression Coefficients (t-values)1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SES Metropolitan</td>
</tr>
<tr>
<td>Per Pupil Current Expenditure</td>
<td>-.336***</td>
</tr>
<tr>
<td></td>
<td>(-2.195)</td>
</tr>
<tr>
<td>Per Pupil Instructional Expenditure</td>
<td>-.062</td>
</tr>
<tr>
<td></td>
<td>(-.427)</td>
</tr>
<tr>
<td>Ratio of Instructional to Current</td>
<td>.467***</td>
</tr>
<tr>
<td>Expenditure</td>
<td>(2.943)</td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td>.291*</td>
</tr>
<tr>
<td></td>
<td>(2.528)</td>
</tr>
<tr>
<td>Sufficiency of Physical Resources</td>
<td>-.112</td>
</tr>
<tr>
<td></td>
<td>(-.729)</td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School</td>
<td>-.213</td>
</tr>
<tr>
<td>Activities</td>
<td>(-1.355)</td>
</tr>
<tr>
<td>Principal’s Relationship with Cooperative</td>
<td>-.042</td>
</tr>
<tr>
<td>Institutions or Associations</td>
<td>(-.277)</td>
</tr>
<tr>
<td>Percentage of Non-tenured Teachers</td>
<td>-.144</td>
</tr>
<tr>
<td></td>
<td>(-.971)</td>
</tr>
<tr>
<td>Teachers’ Degree Level</td>
<td>-.112</td>
</tr>
<tr>
<td></td>
<td>(-.742)</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td>.057</td>
</tr>
<tr>
<td></td>
<td>(.404)</td>
</tr>
<tr>
<td>Teachers’ Perception of Job Pride</td>
<td>-.457***</td>
</tr>
<tr>
<td></td>
<td>(-2.999)</td>
</tr>
<tr>
<td>Students’ Perception of Teacher Quality</td>
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</tr>
<tr>
<td></td>
<td>(-1.739)</td>
</tr>
<tr>
<td>Parents’ Perception of Teacher Quality</td>
<td>-.159</td>
</tr>
<tr>
<td></td>
<td>(-1.105)</td>
</tr>
<tr>
<td>Peers’ Educational Aspiration</td>
<td>.189</td>
</tr>
<tr>
<td></td>
<td>(.199)</td>
</tr>
<tr>
<td>Parents’ Involvement</td>
<td>.072</td>
</tr>
<tr>
<td></td>
<td>(.535)</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study</td>
<td>.296***</td>
</tr>
<tr>
<td>and Other Activities</td>
<td>(2.517)</td>
</tr>
<tr>
<td>Number of Deep-Supplement Subjects</td>
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</tr>
<tr>
<td></td>
<td>(-.748)</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>(-.206)</td>
</tr>
<tr>
<td>Principal’s Perception of Teachers’ and</td>
<td>.241</td>
</tr>
<tr>
<td>Students’ Academic Press</td>
<td>(1.640)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.

Next, regarding the resource variables having qualitative characteristics, the distributions of teacher quality as a personal resource fulfill vertical equity in that teachers with higher job
pride and quality teachers are distributed to lower SES middle schools. However, parents’ concerns about study and other school activities are not as prominent in low SES schools as in high SES schools. In order words, parental concerns about school level as a personal resource are not guaranteed sufficiently to low SES schools. Considering that parental support is closely related to the levels of SES, vertical inequity might be a natural phenomenon in the Korean educational system; however, the parental support resource needs to be provided in a fairer manner in the future rather than at the current state if it is proven to affect equal opportunities in terms of outcome aspects in the Korean middle school context.

In sum, in terms of concrete/physical variables, lower SES middle schools exhibit higher current expenditures and more teachers in the Korean educational system. However, the ratios of instructional expenditures out of current expenditures need to be distributed equitably to low SES schools. Specifically, the Korean educational system needs to spend additionally increased current expenditures to provide more instructional activities for guaranteeing equal opportunities for low SES schools. Regarding abstract/psychological variables, teachers with high job pride and high teacher quality perceived by students contribute to guaranteeing equal opportunity for low SES middle schools. However, interest in the distributional conditions of resources needs to be broadened to include abstract/psychological resources such as parents’ concerns about school activities.

Region effects

In the overall Korean K-12 educational system, the constitutional right to equal education regardless of the area in which schools are located has been treated as an important means of guaranteeing equal opportunity to all students (Ki & Jeong, 2005; Ministry of Education, Science, and Technology, 2009). Accordingly, the national education government body has made efforts
to improve the educational environments of rural areas. For example, the compulsory education policy for middle school and kindergarten was initially implemented in rural areas (Ministry of Education, Science, and Technology, 2009). Such efforts are made to narrow the educational resources gap between cities, including metropolitan, megalopolis, and middle/small cities, and rural areas. In this sense, educational resources need to be provided differently by school region in order to achieve equal resource opportunities in the Korean context as in the U.S. educational system. Middle/small cities are selected as a criterion nominal variable due to the greatest number of subjects in this study. The second, third and fourth columns of Table 14 present the specific statistics of region variables.

Metropolitan. Comparing to middle/small cities, metropolitan region is significantly associated with the following types of educational resources: spending, physical resources, personal resources (teacher quality and parental support), and cultural resource. In terms of qualitative characteristics of variables, the metropolitan region factor significantly affects the distribution of physical resources (sufficiency), personal resources (teacher quality), and cultural resources (academic press).

Specifically, among the resource variables having quantitative characteristics, the Korean educational system grants a greater amount of per pupil current expenditures to metropolitan middle schools; however, such additional expenditures are not proportionally spent on instructional activities. With respect to physical resources, the Korean educational system provides more teachers to metropolitan middle schools than to middle/small city schools, which indicates a vertically equitable distribution of teacher supply. Additionally, metropolitan schools have more tenured and experienced teachers; however, the parents of metropolitan middle schools participate less in school activities and associations than parents of middle/small city
Regarding the resource variables having qualitative characteristics, metropolitan middle schools are not provided for in terms of all qualitative resource aspects that are significantly associated with the metropolitan region variable compared to middle/small city schools. Specifically, principals of metropolitan middle schools perceive their physical resources as insufficient leading to hindrance of students’ learning. Additionally, metropolitan middle schools’ teacher quality perceived by parents and academic press are lower than that of middle/small city schools, indicating the existence of unequal resource opportunities.

In sum, in terms of concrete/physical variables, metropolitan middle schools exhibit higher current expenditures, more teachers, more tenured and experienced teachers in the Korean educational system. However, the resource provision conditions of the Korean educational system need to be improved so as to spend additionally increased current expenditures on instructional activities for metropolitan middle schools. Regarding abstract/psychological variables, it is remarkable that the distribution of all qualitative resource variables significantly associated with metropolitan region fails to fulfill vertical equity of metropolitan middle schools compared to middle/small city schools.

*Megalopolis.* Megalopolis region is significantly associated with the following types of educational resources: spending resources and personal resources (teacher quality and parental support). In terms of qualitative characteristics of variables, the megalopolis region factor significantly affects the distribution of personal resources (teacher quality and parental support) only.

Specifically, among the resource variables having quantitative characteristics, the Korean educational system does not guarantee an appropriate proportion of instructional expenditure to
megalopolis schools compared to middle/small city middle schools; however, megalopolis schools have a smaller number of non-tenured teachers.

Regarding the resource variables having qualitative characteristics, megalopolis middle schools are provided for in terms of all qualitative resource aspects that are significantly associated with the megalopolis region factor compared to middle/small city schools. Specifically, parents of megalopolis middle schools believe their school teachers are high quality, and those parents are more concerned about their child’s study and other school activities than middle/small city schools’ parents.

In sum, in terms of concrete/physical variables, megalopolis middle schools have more tenured teachers; however, the resource provision conditions of the Korean educational system need to be improved so as to spend additionally increased current expenditures on instructional activities of megalopolis middle schools. Regarding abstract/psychological variables, it is impressive that all qualitative resource variables significantly associated with megalopolis region are distributed so as to fulfill vertical equity in the Korean educational system compared to middle/small city schools.

**Rural.** Comparing to middle/small cities, rural region is significantly associated with the following types of educational resources: spending, physical resources, and personal resources (teacher quality only). In terms of qualitative characteristics of variables, rural region significantly affects the distribution of teacher quality as a personal resource. Specifically, among the resource variables having quantitative characteristics, the Korean educational system grants a greater amount of per pupil instructional expenditures to rural middle schools than to middle/small city schools. Additionally, rural middle schools have more teachers per pupil and more experienced teachers. Regarding the resource variables having qualitative characteristics,
rural region is only related to the teacher quality perceived by students. Rural school students perceive their teachers as being high quality; however, the relationship is not very strong (p<.10).

In sum, in terms of concrete/physical variables, rural middle schools exhibit higher instructional expenditure, more teachers, and experienced teachers in the Korean educational system. Regarding abstract/psychological variables, high teacher quality perceived by students contribute to guaranteeing equal opportunity for rural middle schools. Finally, it is very remarkable that all resources variables significantly associated with rural region are distributed so as to fulfill vertical equity in the Korean educational system. This might result from the Korean education government bodies’ persistent efforts to improve the educational environments of rural areas (Ki & Jeong, 2005).

**Special education effects**

As indicated in the fifth column of Table 14, the special education factor of the Korean middle schools is significantly associated with the following types of educational resources: spending, physical resources, and personal resources (teacher quality only). In terms of qualitative characteristics of variables, there is no qualitative resource that significantly correlates with the special education factor in the distribution of educational resources in the Korean middle schools.

The Korean educational system grants a greater amount of per pupil instructional expenditures to high special education student percentage middle schools. With respect to physical resources, Korea provides more teachers to high special education student percentage schools. Finally, it is very remarkable that all teacher quality variables as a quantitative resource used in this study are equitably distributed to high special education student percentage middle schools.
In sum, all resources variables significantly associated with special education are quantitative resources, and they are distributed so as to fulfill vertical equity in the Korean educational system. However, there is no relationship between the special education factor and the distributions of qualitative resources among the Korean middle schools. In other words, high special education student percentage schools are not provided more qualitative resources such as teacher quality, peers’ educational aspiration, and parents’ concerns than low percentage counterpart schools.

Total family education cost effects

Basically, private demand for supplementary educational services corresponds to the individual’s aptitude and ability is desirable individually and socially and is outside of the government’s range of control. However, this study includes total family education cost, including private tutoring fees, into vertical equity analysis because unequal educational opportunities caused by private education activities such as private tutoring for academic subjects can significantly affect unfair educational outcomes in the Korean education context (Y. Kang, 2008; M. R. Kim, 2009; National Statistical Office, 2008).

As shown in the last column of Table 14, the total family education cost factor of the Korean middle schools is significantly associated with the following types of educational resources: spending and personal resources (principal leadership and parental support). In terms of qualitative characteristics of variables, the factor is significantly associated with principle’s relationship, parental involvement rates and parents’ concerns about their child as a personal resource.

Specifically, among the resource variables having quantitative characteristics, schools having low total family education cost are provided a relatively appropriate proportion of
instructional expenditures compared to schools having a high total family education cost. With respect to teacher quality variables, low total family education cost schools have more tenured teachers; however, the statistical significance is not that remarkable (p<.10). Finally, parents in low total family education cost schools participate less in school activities and associations than parents in high total family education cost schools, indicating the existence of unequal resource opportunities.

Regarding the resource variables having qualitative characteristics, low total family education cost schools do not have principals who have a good relationship with cooperative institutions and parents who are concerned about their child’s study and activities, relatively speaking. In particular, the relationship between parental support variables and total family education cost seems to be natural because high family education cost is accompanied by high parental involvement and concerns about school activities.

In sum, in terms of concrete/physical variables, low total family education cost schools exhibit a relatively high proportion of instructional expenditures out of current expenditures and more tenured teachers in the Korean educational system, even though the significance levels are not that high. Additionally, abstract/psychological variables significantly associated with total family education cost imply that high parents’ concerns are reflected by high total family education cost (Y. Kang, 2008; E. G. Kim et al., 2008; M. R. Kim, 2009; S. J. Lee, 2007). This implication is supported by the outstanding but understandable result that schools having high total family education cost exhibit a very high percentage of parental involvement (standardized coefficient: .483, p<.001).
**Comparison**

**SES effects**

The results of vertical equity analysis on the basis of school SES show few common characteristics between the two countries. The only variable on which SES has the same effect is the ratio of instructional to current expenditure. Specifically, high SES level schools are provided a high proportion of instructional expenditures out of current expenditures, which indicates vertical inequity of the ratios.

However, Table 15 presents several different and remarkable characteristics in the distribution conditions of educational resources based on school SES levels. First, school SES levels in the U.S. educational system is a very influential factor in terms of resource types and relationship strengths between the resources and school SES compared to the Korean case. Additionally, the U.S. educational system consistently provides all quantitative and qualitative resources that are significantly associated with SES in the direction of infringing on equal educational opportunity for low SES.

### Table 15

**SES Comparison of the U.S. and Korea in Vertical Equity of Educational Resources**

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>SES Coefficient (t-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>U.S.</td>
</tr>
<tr>
<td><strong>Input Resources</strong></td>
<td>Per Pupil Current Expenditure</td>
<td>.193*** (4.163)</td>
</tr>
<tr>
<td></td>
<td>Per Pupil Instructional Expenditure</td>
<td>.223*** (4.608)</td>
</tr>
<tr>
<td></td>
<td>Ratio of Instructional to Current Expenditure</td>
<td>.086# (1.817)</td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td>Ratio of Pupil to Teacher</td>
<td>.021 (.458)</td>
</tr>
<tr>
<td></td>
<td>Sufficiency of Physical Resources</td>
<td>.141** (2.623)</td>
</tr>
<tr>
<td><strong>Throughput (Process)</strong></td>
<td><strong>Personal Resources</strong></td>
<td>Principal’s Influence on Deciding School Activities</td>
</tr>
<tr>
<td></td>
<td>Principal Leadership</td>
<td>Principal’s Relationship with Cooperative</td>
</tr>
<tr>
<td>Resources</td>
<td>Institutions or Associations</td>
<td>Percentage of Non-tenured Teachers</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Teacher Quality (Quantitative &amp; Qualitative)</td>
<td>Quantitative</td>
<td>-0.094# (-1.822)</td>
</tr>
<tr>
<td></td>
<td>Qualitative</td>
<td></td>
</tr>
<tr>
<td>Peer Effects</td>
<td></td>
<td>Peers’ Educational Aspiration</td>
</tr>
<tr>
<td>Parental Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.

**Region effects: Urban (metropolitan/megalopolis) vs. rural**

As indicated in Table 16, the results of vertical equity analysis on the basis of school region show several common characteristics for both countries. First, regardless of the coefficients’ signs, an urban factor is more influential in terms of resource types and relationship strengths between the resources and region than a rural factor. Second, a few common resources are significantly associated with a rural factor in both countries’ educational systems. For example, regardless of the signs of regression coefficients, only the ratio of pupil to teacher and years of teaching experience are significantly associated with rural. Third, a rural factor is related to a decrease in the number of students per teacher in both countries’ educational systems, indicating the existence of vertical equity. Finally, an urban factor is commonly associated with a low proportion of instructional expenditures out of current expenditures and a low percentage of...
non-tenured teachers in both countries.

Table 16
Region Comparison of the U.S. and Korea in Vertical Equity of Educational Resources

<table>
<thead>
<tr>
<th>Variables</th>
<th>Region Coefficient (t-values)</th>
<th>U.S.</th>
<th></th>
<th>Korea</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Metropolitan</td>
<td>Meagalopolis</td>
</tr>
<tr>
<td>Per Pupil Current Expenditure</td>
<td>-0.192***</td>
<td>-0.041</td>
<td></td>
<td>0.293***</td>
<td>0.098</td>
</tr>
<tr>
<td></td>
<td>(-3.632)</td>
<td>(-7.80)</td>
<td></td>
<td>(3.274)</td>
<td>(1.53)</td>
</tr>
<tr>
<td>Per Pupil Instructional Expenditure</td>
<td>-0.179***</td>
<td>-0.039</td>
<td></td>
<td>0.053</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>(-3.233)</td>
<td>(-7.05)</td>
<td></td>
<td>(6.29)</td>
<td>(3.47)</td>
</tr>
<tr>
<td>Ratio of Instructional to Current Expenditure</td>
<td>-0.104#</td>
<td>-0.055</td>
<td></td>
<td>-0.290**</td>
<td>-0.206*</td>
</tr>
<tr>
<td></td>
<td>(-1.918)</td>
<td>(-1.019)</td>
<td></td>
<td>(-3.151)</td>
<td>(-2.342)</td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td>0.227***</td>
<td>-0.166**</td>
<td></td>
<td>-0.264**</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>(4.434)</td>
<td>(-3.259)</td>
<td></td>
<td>(-3.815)</td>
<td>(1.114)</td>
</tr>
<tr>
<td>Sufficiency of Physical Resources</td>
<td>-0.158*</td>
<td>-0.011</td>
<td></td>
<td>-0.225*</td>
<td>-0.038</td>
</tr>
<tr>
<td></td>
<td>(-2.494)</td>
<td>(-1.77)</td>
<td></td>
<td>(-2.429)</td>
<td>(-4.37)</td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School Activities</td>
<td>-0.150#</td>
<td>-0.030</td>
<td></td>
<td>-0.056</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td>(-2.233)</td>
<td>(-4.81)</td>
<td></td>
<td>(-6.07)</td>
<td>(8.88)</td>
</tr>
<tr>
<td>Principal’s Relationship with Cooperative Institutions or Associations</td>
<td>-0.271***</td>
<td>-0.118*</td>
<td></td>
<td>-0.347**</td>
<td>0.093</td>
</tr>
<tr>
<td></td>
<td>(-4.552)</td>
<td>(-1.987)</td>
<td></td>
<td>(-4.068)</td>
<td>(1.143)</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td>-0.035</td>
<td>-0.118*</td>
<td></td>
<td>-0.149</td>
<td>-0.125</td>
</tr>
<tr>
<td></td>
<td>(-0.576)</td>
<td>(-1.987)</td>
<td></td>
<td>(-1.636)</td>
<td>(-1.442)</td>
</tr>
<tr>
<td>Teachers’ Perception of Job Pride</td>
<td>-0.105#</td>
<td>-0.120**</td>
<td></td>
<td>-0.245**</td>
<td>-0.171*</td>
</tr>
<tr>
<td></td>
<td>(-1.834)</td>
<td>(-4.303)</td>
<td></td>
<td>(-2.827)</td>
<td>(2.705)</td>
</tr>
<tr>
<td>Teachers’ Degree Level</td>
<td>0.113</td>
<td>0.078</td>
<td></td>
<td>0.150</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>(.218)</td>
<td>(1.325)</td>
<td></td>
<td>(1.642)</td>
<td>(3.45)</td>
</tr>
<tr>
<td>Peers’ Educational Aspiration</td>
<td>-0.071</td>
<td>-0.067</td>
<td></td>
<td>-0.245**</td>
<td>0.171*</td>
</tr>
<tr>
<td></td>
<td>(-1.240)</td>
<td>(-1.179)</td>
<td></td>
<td>(-2.827)</td>
<td>(2.705)</td>
</tr>
<tr>
<td>Students’ Perception of Teacher Quality</td>
<td>.144*</td>
<td>.010</td>
<td></td>
<td>0.047</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>(2.508)</td>
<td>(.179)</td>
<td></td>
<td>(-.531)</td>
<td>(7.41)</td>
</tr>
<tr>
<td>Percentage of Non-tenured Teachers</td>
<td>-0.10</td>
<td>-0.054</td>
<td></td>
<td>0.033</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>(-.191)</td>
<td>(.993)</td>
<td></td>
<td>(.352)</td>
<td>(.607)</td>
</tr>
<tr>
<td>Parents’ Involvement</td>
<td>-0.090</td>
<td>-0.179***</td>
<td></td>
<td>0.192**</td>
<td>-0.127</td>
</tr>
<tr>
<td></td>
<td>(-1.581)</td>
<td>(3.211)</td>
<td></td>
<td>(2.197)</td>
<td>(-1.642)</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study and Other Activities</td>
<td>-0.135*</td>
<td>-0.075</td>
<td></td>
<td>0.098</td>
<td>0.191**</td>
</tr>
<tr>
<td></td>
<td>(-2.329)</td>
<td>(-1.308)</td>
<td></td>
<td>(1.276)</td>
<td>(2.621)</td>
</tr>
<tr>
<td>Hours of Extracurricular Activities per Week</td>
<td>-0.122</td>
<td>-0.042</td>
<td></td>
<td>0.068</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>(-2.488)</td>
<td>(-1.805)</td>
<td></td>
<td>(-1.811)</td>
<td>(9.85)</td>
</tr>
<tr>
<td>Number of Deep-Supplement Subjects</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td>0.017</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1.77)</td>
<td></td>
<td>(-1.77)</td>
<td>(.095)</td>
</tr>
<tr>
<td>Fairness &amp; Clarity of Rules</td>
<td>0.153**</td>
<td>0.117*</td>
<td></td>
<td>0.042</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(2.687)</td>
<td>(2.078)</td>
<td></td>
<td>(4.46)</td>
<td>(-9.91)</td>
</tr>
<tr>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press</td>
<td>-0.068</td>
<td>-0.281**</td>
<td></td>
<td>0.083</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>(-1.096)</td>
<td>(-3.181)</td>
<td></td>
<td>(-3.181)</td>
<td>(.985)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.
However, there are two different characteristics in the distribution conditions of educational resources based on region in the U.S. and Korean educational systems. Overall, in terms of input resources, the U.S. public high schools located in urban areas are not guaranteed equal resource opportunity compared to the Korean middle schools located in urban areas. Regarding the distribution conditions of educational resources in the Korean domestic context, metropolitan middle schools are not guaranteed equal resource opportunities—particularly parents’ high trust of teacher quality and high concerns about child’s study and other activities—compared to megalopolis middle schools. Finally, it is remarkable that the U.S. urban public high schools are inequitably provided all input resources such as spending and physical resources associated with an urban factor.

*Special education effects*

The results of vertical equity analysis on the basis of special education indicate that both countries’ educational systems pay particular attention to guaranteeing the equal resource opportunities of special-needs students. For example, high special education student percentage schools exhibit more per pupil instructional expenditures, a larger number of teachers and a greater number of high degree level teachers than low percentage schools in both countries’ educational systems.

However, Table 17 presents several different characteristics in the distribution conditions of educational resources based on special education in both countries. Most importantly, in Korea, all variables that are significantly associated with a special education factor are quantitative, not qualitative resources. Additionally, the quantitative resources such as teacher quality variables are equitably distributed so as to achieve equal resource opportunities among Korean middle schools. In contrast, in the U.S. educational system, a special education factor is
associated with several qualitative resources; however, with the exception of teacher’s job pride, those qualitative resources are not equitably distributed.

Table 17

Special Education Comparison of the U.S. and Korea in Vertical Equity of Educational Resources

<table>
<thead>
<tr>
<th>Types of Educational Resources</th>
<th>Variables</th>
<th>Special Education Coefficient (t-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>U.S.</td>
</tr>
<tr>
<td><strong>Input Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Pupil Current Expenditure</td>
<td></td>
<td>.339***&lt;br&gt;(7.305)</td>
</tr>
<tr>
<td>% Pupil Instructional Expenditure</td>
<td></td>
<td>.300***&lt;br&gt;(6.186)</td>
</tr>
<tr>
<td>Ratio of Instructional to Current Expenditure</td>
<td></td>
<td>-.055&lt;br&gt;(-1.151)</td>
</tr>
<tr>
<td><strong>Physical Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td></td>
<td>-.191***&lt;br&gt;(-4.228)</td>
</tr>
<tr>
<td>Sufficiency of Physical Resources</td>
<td></td>
<td>-.061&lt;br&gt;(-1.098)</td>
</tr>
<tr>
<td><strong>Personal Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School Activities</td>
<td></td>
<td>.037&lt;br&gt;(.631)</td>
</tr>
<tr>
<td>Principal’s Relationship with Cooperative Institutions or Associations</td>
<td></td>
<td>-.017&lt;br&gt;(-.288)</td>
</tr>
<tr>
<td>% Teachers’ Degree Level</td>
<td></td>
<td>.126*&lt;br&gt;(2.433)</td>
</tr>
<tr>
<td>% Teachers’ Perceived Job Pride</td>
<td></td>
<td>.114*&lt;br&gt;(2.281)</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td>% Teachers’ Perceived Job</td>
<td>.050&lt;br&gt;(.947)</td>
</tr>
<tr>
<td>% Teachers’ Perceived Job Quality</td>
<td></td>
<td>.086#&lt;br&gt;(1.651)</td>
</tr>
<tr>
<td>% Parents’ Perceived Teacher Quality</td>
<td></td>
<td>-.227***&lt;br&gt;(-4.517)</td>
</tr>
<tr>
<td>% Peers’ Perceived Teacher Quality</td>
<td></td>
<td>-.051&lt;br&gt;(-1.010)</td>
</tr>
<tr>
<td><strong>Throughput (Process) Resources</strong></td>
<td>% Peers’ Educational Aspiration</td>
<td>-.170***&lt;br&gt;(-3.545)</td>
</tr>
<tr>
<td><strong>Operational Resources</strong></td>
<td>% Parents’ Involvement</td>
<td>-.018&lt;br&gt;(-.352)</td>
</tr>
<tr>
<td>% Parents’ Concerns about Child’s Study and Other Activities</td>
<td></td>
<td>-.245***&lt;br&gt;(-4.824)</td>
</tr>
<tr>
<td><strong>Cultural Resources</strong></td>
<td>Hours of Extracurricular Activities per Week</td>
<td>-.144***&lt;br&gt;(-3.328)</td>
</tr>
<tr>
<td>Number of Deep-Supplement Subjects</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>% Fairness &amp; Clarity of Rules</td>
<td>N/A</td>
<td>-.243***&lt;br&gt;(-4.853)</td>
</tr>
<tr>
<td>% Principal’s Perception of Teachers’ and Students’ Academic Press</td>
<td></td>
<td>-.076&lt;br&gt;(-1.410)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.
Adequacy Analysis

Even though the analysis of resource equity allows for closely examining the guarantee state of equal opportunities in terms of resource aspects, it does not fully answer the amount at which each educational resource specifically should be provided to secure for all students minimum or necessary levels of educational outcomes (N. A. Alexander, 2007; B. D. Baker, 2005; B. D. Baker & Green III, 2008; Clune, 1994b, 1995; Rubenstein et al., 2000). Regarding this limitation of resource equity, adequacy analysis can serve as a supplement to examine equal educational opportunity by considering educational outcomes in the estimation of the cost of adequate education. In addition to assuming the achievement of the specific performances, adequacy analysis has an advantage in that the cost of adequacy—calculated by the successful school approach in this study—can provide a representative and parsimonious value instead of various distributional inequity conditions of a set of educational resources.

In this study, adequacy analysis plays a role in judging guarantee levels of equal opportunity from a more broadened resource perspective, considering only the cost of adequacy, which means that the perspective is supplemented by a consideration of educational outcomes. Accordingly, this analysis will be able to provide additional evidence as to whether or not equal opportunity in terms of resource aspects is achieved in addition to the analysis of resource equity. Finally, the relationship in the distribution conditions between the provided educational resources and the realized educational outcomes can be analyzed using the analyses of resource equity and adequacy in this study. The following subsections present common criteria for identifying successful schools in the U.S. and Korean educational system, the cost of adequacy in both countries’ educational systems, and a comparison of the characteristics of the successful U.S. and Korean schools.
Criteria for Identifying Successful Schools

In this study, the successful school approach allows for calculating the actual per pupil spending of the U.S. public high schools and the Korean middle schools, not estimating the future cost of adequate education. Accordingly, there is no process of examining cost differentials such as inflation, size, and regional cost of living differences; rather, the process, specifically criteria, of identifying successful schools will determine the possibility of a reasonable calculation of the adequacy cost (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007; Fermanich, Mangan, et al., 2006). In particular, academic and non-academic performance standards and special-needs students’ academic performance standards are selected in this study following representative previous studies using the successful school approach (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007; Fermanich, Mangan, et al., 2006).

1. Z-score of standardized math in 2002 > 0.5;

2. Z-score of special-needs students’ standardized math in 2002 > 0.5:

3. Z-score of the degree of school disorder in 2002 > 0.5; and

4. Efficiency Screens: Z-score of pupil/teacher and pupil/staff ratios > 0

Finally, this study utilizes efficiency screens as a final criterion to select successful schools in both countries’ educational systems. The efficiency criteria, Z-score of pupil/teacher and pupil/staff ratios > 0, are applied to exclude schools whose academic and non-academic performance standards are caused by less efficient usage of per pupil current expenditure than
other successful schools (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). This efficiency screen process usually produces lower per pupil expenditure of adequate education than other approaches to adequacy analysis (Addonizio, 2003; Duncombe & Lukemeyer, 2002; Reich, 2006; Taylor et al., 2005). Specifically, schools having ratio values below zero standard Z-score were excluded from the set of efficient successful schools. The following section applies the criteria presented above to both countries’ educational systems.

**U.S. Educational System**

Table 18 presents the results of adequacy analysis for the U.S. educational system. The eight identified public high schools are out of 471 total public high schools used in this study. The eight schools constitute about two percent of the total sample size. The average per pupil expenditure of these schools is $8,205.61, which indicates the cost of adequacy of public high schools in the U.S. educational system. The schools that are provided with amounts above the adequacy cost account for 46.3 percent of total public high schools analyzed in this study. The proportion of schools securing the adequacy cost does not reach half the total number of high schools.

Additionally, the average guarantee rate of adequate education—calculated by the ratio of actual per pupil expenditure to the cost of adequacy—is 1.06, which means the U.S. public high school students normally are provided a little above $8,205.61 per year as of 2006. Finally, it is very remarkable that with the exception of one school, all identified successful schools are in suburban areas, and there is no successful school in an urban area. This finding suggests that educational environments and outcomes in urban and rural schools in the U.S. educational system should be improved in terms of equal opportunity, as previous literature has indicated.

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20 The expenditure in 2002 is transformed into the monetary value in 2006 using the CPI inflation rate.
(Caldas, 1993; Choi, 2010; Darling-Hammond, 2007; Hirth et al., 1992; Lankford et al., 2002; Neild et al., 2009; Sielke, 2004).

Table 18

Adequacy Analysis in the U.S.: Spending and Region of Successful Schools

<table>
<thead>
<tr>
<th>School ID</th>
<th>Per Pupil Current Expenditure</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td>$8,564.54</td>
<td>Suburban</td>
</tr>
<tr>
<td>81</td>
<td>$7,713.25</td>
<td>Suburban</td>
</tr>
<tr>
<td>93</td>
<td>$7,892.09</td>
<td>Suburban</td>
</tr>
<tr>
<td>98</td>
<td>$10,380.08</td>
<td>Suburban</td>
</tr>
<tr>
<td>116</td>
<td>$7,974.28</td>
<td>Rural</td>
</tr>
<tr>
<td>306</td>
<td>$7,646.91</td>
<td>Suburban</td>
</tr>
<tr>
<td>308</td>
<td>$7,814.01</td>
<td>Suburban</td>
</tr>
<tr>
<td>312</td>
<td>$7,659.69</td>
<td>Suburban</td>
</tr>
</tbody>
</table>

Average (Cost of Adequacy) $8,205.61
Number of Schools above Adequacy Cost 218 schools (46.3%) out of 471 schools
Average Guarantee Rate of Adequacy (SD) 1.06 (.32)

Note: Average Guarantee Rate of Adequacy indicates the mean of ratios of the current per pupil expenditure to the adequacy cost ($8,205.61) among the U.S. public high schools.

Korean Educational System

Table 19 presents the result of adequacy analysis in the Korean educational system. The three identified Korean middle schools are out of 150 total middle schools. The three schools constitute about two percent of the total sample size. The average per pupil expenditure of these schools is $833.35, which indicates the cost of adequacy of middle schools as a compulsory education in the Korean educational system. The schools that are provided with amounts above the adequacy cost account for 55.3 percent of total middle schools selected for this study. The proportion of schools securing the adequacy cost is more than half of total high schools.
Table 19

Adequacy Analysis in Korea: Spending and Region of Successful Schools

<table>
<thead>
<tr>
<th>School ID</th>
<th>Per Pupil Current Expenditure</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>$773.03</td>
<td>Metropolitan</td>
</tr>
<tr>
<td>44</td>
<td>$1,180.42</td>
<td>Megalopolis</td>
</tr>
<tr>
<td>85</td>
<td>$546.59</td>
<td>Middle &amp; Small City</td>
</tr>
</tbody>
</table>

Average (Cost of Adequacy) $833.35

Number of Schools above Adequacy Cost 83 schools (55.3%) out of 150 schools

Average Guarantee Rate of Adequacy (SD) 1.59 (1.51)

Note: Average Guarantee Rate of Adequacy indicates the mean of ratios of the current per pupil expenditure to the adequacy cost ($833.35) among the Korean middle schools.

Additionally, the average guarantee rate of adequate education is 1.59, which means the Korean middle school students normally are provided an amount over one and half of $833.35 per year as of 2006. Finally, it is very remarkable that all identified successful schools are located in each region except rural; however, there is a great deal of range in the guarantee rate of adequate education (SD: 1.51). This finding suggests that educational environments and outcomes in rural schools in the Korean educational system still should be treated as an important educational policy target in terms of equal opportunity, as previous literature has emphasized (Y. Kang, 2008; Ki & Jeong, 2005; H. J. Kim, 2008; M. R. Kim, 2009; National Statistical Office, 2008; Yun, 2004).

Comparison

According to Tables 18 and 19, per pupil expenditure of the successful U.S public high schools (i.e., the cost of adequacy) is about 10 times more than that of the successful Korean middle schools. This difference of average per pupil current expenditure is 3.5 times larger than that of all schools used in this study (see Table 12). This might result from not only from the different education stages (U.S.: high school education vs. Korea: middle school education) but also from the different economic scales (U.S.: 47,284 vs. Korea: 20,591 as of 2010).
Homepage of International Monetary Fund (IMF) [http://www.imf.org/external/index.htm](http://www.imf.org/external/index.htm). The schools that are provided with amounts above the adequacy cost account for about half of total schools analyzed in this study.

However, the average guarantee rate of adequate education in the Korean educational system is higher than in the U.S. educational system (1.59 vs. 1.06). Additionally, the successful Korean schools are relatively evenly distributed in terms of region compared to the successful U.S. schools, which are excessively concentrated in suburban regions. Finally, it is remarkable that the descriptive statistics of external factors used as control variables are absolutely different from the values of the less advantaged groups (e.g., low SES level and total family education cost and high percentage of special education, minority, and LEP students) in both countries’ educational systems. These differences confirm that external factors affecting educational opportunities commonly account for characteristics of successful schools in both countries’ educational systems. Table 20 presents the specific descriptive statistics of the successful U.S. and Korean schools.

Table 20

Comparison of Successful Schools in the U.S. and Korea

<table>
<thead>
<tr>
<th>Variables</th>
<th>U.S.</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Pupil Current Expenditure</td>
<td>8</td>
<td>N</td>
</tr>
<tr>
<td>Per Pupil Instructional Expenditure</td>
<td>8</td>
<td>8,205.61 (926.97)</td>
</tr>
<tr>
<td>Ratio of Instructional to Current Expenditure</td>
<td>8</td>
<td>.60 (.04)</td>
</tr>
<tr>
<td>Ratio of Pupil to Teacher</td>
<td>8</td>
<td>20.33 (2.93)</td>
</tr>
<tr>
<td>Sufficiency of Physical Resources [1,4]/[1,5]</td>
<td>8</td>
<td>3.26 (.82)</td>
</tr>
<tr>
<td>Principal’s Influence on Deciding School Activities [1,3]/[1,5]</td>
<td>8</td>
<td>2.73 (.19)</td>
</tr>
<tr>
<td>Principal’s Relationship with Cooperative Institutions or Associations [1,4]/[1,5]</td>
<td>8</td>
<td>3.67 (.36)</td>
</tr>
<tr>
<td>Percentage of Non-tenured Teachers</td>
<td>7</td>
<td>12.73 (10.73)</td>
</tr>
<tr>
<td>Teachers’ Degree Level</td>
<td>8</td>
<td>17.40 (.46)</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td>8</td>
<td>12.79 (4.57)</td>
</tr>
<tr>
<td>Teachers’ Perception of Job Pride [1,5]/[1,5]</td>
<td>8</td>
<td>4.08 (.35)</td>
</tr>
<tr>
<td>Students’ Perception of Teacher Quality [1,4]/[1,5]</td>
<td>8</td>
<td>2.84 (.15)</td>
</tr>
<tr>
<td>Parents’ Perception of Teacher Quality [1,4]/[1,5]</td>
<td>8</td>
<td>3.05 (.17)</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Peers’ Educational Aspiration</td>
<td>2.38 (.12)</td>
<td>2.17 (.12)</td>
</tr>
<tr>
<td>Parents’ Involvement</td>
<td>.30 (.17)</td>
<td>.19 (.07)</td>
</tr>
<tr>
<td>Parents’ Concerns about Child’s Study and Other Activities</td>
<td>3.49 (.14)</td>
<td>3.65 (.07)</td>
</tr>
<tr>
<td>Hours of Extracurricular Activities per Week</td>
<td>7.27 (2.58)</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of Deep-Supplement Subjects</td>
<td>N/A</td>
<td>1.33 (.58)</td>
</tr>
<tr>
<td>Fairness &amp; Clarity of Rules</td>
<td>2.76 (.11)</td>
<td>3.00 (.25)</td>
</tr>
<tr>
<td>Principal’s Perception of Teachers’ and Students’ Academic Press</td>
<td>4.29 (.70)</td>
<td>4.33 (.34)</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2002 (10th grade)</td>
<td>56.57 (2.75)</td>
<td>N/A</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2006 (7th grade)</td>
<td>N/A</td>
<td>434.88 (34.28)</td>
</tr>
<tr>
<td>Perceived Degree of School Disorder by Student in 2002</td>
<td>2.97 (.07)</td>
<td>3.55 (.14)</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>.4007 (.4675)</td>
<td>.2200 (.2402)</td>
</tr>
<tr>
<td>Percentage of Special Education Students</td>
<td>.72 (.50)</td>
<td>1.17 (1.32)</td>
</tr>
<tr>
<td>Percentage of Minority Students</td>
<td>10.41 (8.44)</td>
<td>N/A</td>
</tr>
<tr>
<td>Percentage of Limited English Proficient (LEP) Students</td>
<td>2.38 (2.07)</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Family Educational Cost including Private Tutoring Fees</td>
<td>N/A</td>
<td>478.50 (129.91)</td>
</tr>
</tbody>
</table>

*Note: Descriptive statistics presented above are mainly based on the ELS data of 2002 and the KELS data of 2006. All monetary value is computed to the value of dollars as of 2006.*

### Outcome Equity Analysis

In this section, guarantee conditions of equal educational opportunities are analyzed using the analysis of horizontal outcome equity with regard to academic and non-academic outcomes in the U.S. and Korean educational systems. This analysis does not consider external factors such as SES levels, region, and special education that can commonly or particularly affect educational outcomes in both countries’ contexts. Hence, the analysis of horizontal equity of educational outcomes provides information on how equitably outcomes are distributed among each country’s schools. That is, conclusions about the relationship and strengths between the external factors and distributional equity of educational outcomes cannot be reached using only analysis of horizontal outcome equity. Therefore, regarding the guarantee degree of equal opportunity in terms of outcome aspects, an analysis of vertical outcome equity is needed to supplement the horizontal equity analysis of educational outcomes to answer whether or not equal opportunity is achieved from an outcome perspective as well.
Horizontal Equity Analysis of Educational Outcomes

In this study, educational outcomes are composed of both academic and non-academic variables. Previous literature reports that the degree of school disorder eventually affects school climate and student achievement and determines the overall quality of students’ school life in the long run (Furlong & Morrison, 2000; Gottfredson et al., 2005; McEvoy & Welker, 2000; Welsh, 2000). Accordingly, it is reasonable to consider school disorder a criterion for guaranteeing educational opportunities in terms of educational outcomes as well as academic performance. Further, this study attempts to compare the distribution of outcomes between the special-needs student group and no special-needs student group, even though the classification of the criterion group and the comparison group does not need to be considered in the analysis of horizontal equity. This specific classification of student groups allows for grasping the distributional inequity of both groups’ educational outcomes and invoking a broad perspective regarding guaranteeing opportunity for disadvantaged students.

U.S. Educational System

Table 21 presents equity indexes of educational outcomes across time in both special-needs students and no special-needs students in the U.S. public high schools. First, in terms of academic and non-academic outcomes, non-academic outcome (the degree of school disorder) of the U.S. public high schools is equitably distributed more than academic outcome. Specifically, as shown in Table 20, non-academic outcome has a .035 Gini coefficient and a .063 coefficient of variation. Both values indicate a level below the absolute threshold of a desirable distribution (.05 and .1 respectively) by Odden and Picus (2008).

Next, in terms of the academic outcomes between special-needs students and no special-needs students, the academic outcomes of no special-needs students are more equitably
distributed in 2002 and 2004 than of special-needs students. The differences of distributional inequity imply that more efforts and effective strategies should be implemented in targeting the guarantee of educational opportunities for special-needs students compared to no special-needs students. Finally, Table 21 suggests that the distributions of both groups’ academic outcomes have inequitably changed over the years.

Table 21
Horizontal Equity Analysis of Educational Outcomes in the US

<table>
<thead>
<tr>
<th>Types</th>
<th>Variables</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coef. Var.</td>
</tr>
<tr>
<td>Academic Outcomes</td>
<td>Mean of Standardized Math Test Score in 2002 (10th grade)</td>
<td>.153</td>
</tr>
<tr>
<td>Special-Needs Students</td>
<td>Mean of Standardized Math Test Score in 2004 (12th grade)</td>
<td>.159</td>
</tr>
<tr>
<td>No Special-Needs Students</td>
<td>Mean of Standardized Math Test Score in 2002 (10th grade)</td>
<td>.094</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2004 (12th grade)</td>
<td>.096</td>
</tr>
<tr>
<td>Non-Academic Outcome</td>
<td>Perceived Degree of School Disorder by Student in 2002</td>
<td>.063</td>
</tr>
</tbody>
</table>

**Korean Educational System**

Table 22 presents equity statistics of educational outcomes over time in both special-needs students and no special-needs students of the Korean middle schools. First, in terms of academic and non-academic outcomes, academic outcome of the Korean middle schools, except for math test score in 2005, is more equitably distributed than non-academic outcome, unlike the U.S. case. Specifically, as indicated in Table 22, academic outcome in 2006, which is the most inequitable, except for academic outcome in 2005, has a .068 Gini coefficient and a .124 coefficient of variation. Both values are lower than non-academic outcome, which indicates that the distribution of academic outcomes is more equitable than non-academic outcomes. Moreover, the equity index values (Cov: .142, Gini: .078) of non-academic outcome are above the absolute threshold of a desirable distribution (.10 and .05 respectively) by Odden and Picus (2008).
Next, in terms of the academic outcomes between special-needs students and no special-needs students, the academic outcomes of no special-needs students are more equitably distributed for all three survey years (2005-2007) than of special-needs students. The differences of distributional inequity imply that more effort and effective strategies should be implemented in targeting the guarantee of educational opportunities for special-needs students compared to no special-needs students. Finally, Table 22 shows that the distributions of both group students’ academic outcomes have improved over the three years.

Table 22
Horizontal Equity Analysis of Educational Outcomes in Korea

<table>
<thead>
<tr>
<th>Types</th>
<th>Variables</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Outcomes</td>
<td>Special-Needs Students</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2005 (6th grade)</td>
<td>.161 .088 1.687</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2006 (7th grade)</td>
<td>.124 .068 1.536</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2007 (8th grade)</td>
<td>.081 .045 1.303</td>
</tr>
<tr>
<td>No Special-Needs Students</td>
<td>Mean of Standardized Math Test Score in 2005 (6th grade)</td>
<td>.084 .047 1.320</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2006 (7th grade)</td>
<td>.071 .040 1.265</td>
</tr>
<tr>
<td></td>
<td>Mean of Standardized Math Test Score in 2007 (8th grade)</td>
<td>.048 .026 1.151</td>
</tr>
<tr>
<td>Non-Academic Outcome</td>
<td>Perceived Degree of School Disorder by Student in 2006</td>
<td>.142 .078 1.570</td>
</tr>
</tbody>
</table>

Comparison

According to Table 23, the results of horizontal outcome equity analysis show only one common characteristic in both countries’ educational systems. In terms of the academic outcomes between special-needs students and no special-needs students, the academic outcomes of no special-needs students are more equitably distributed than those of special-needs students (see Table 23).

However, there are three different characteristics in the distribution of educational outcomes. First, in terms of academic and non-academic outcomes, non-academic outcome (the
degree of school disorder) of the U.S. public high schools is more equitably distributed than academic outcome; in contrast, academic outcome of Korean middle schools is more equitably distributed than non-academic outcome. Second, the distributional equity of academic outcome in Korea is superior to the U.S. and that of non-academic outcome in the U.S. is superior to Korea. Finally, the distributional inequity of academic outcome among the U.S. public high schools has worsened across the survey years; however, that of Korean middle schools has improved.

Table 23
Comparison of the U.S. and Korea in Horizontal Equity of Educational Outcomes

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Coef. Var.</th>
<th>Gini Coef.</th>
<th>95th/5th Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>Korea</td>
<td>U.S.</td>
</tr>
<tr>
<td>Academic Outcome (Math)¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special-Needs Students</td>
<td>.153</td>
<td>.124</td>
<td>.083</td>
</tr>
<tr>
<td>No Special-Needs Students</td>
<td>.094</td>
<td>.071</td>
<td>.052</td>
</tr>
<tr>
<td>Non-Academic Outcome (Disorder)²</td>
<td>.063</td>
<td>.142</td>
<td>.035</td>
</tr>
</tbody>
</table>

<Note>
1. For the U.S. and Korea, academic outcomes are the mean of standardized math test score in 2002 of the ELS:2002 and the mean of standardized math test score in 2006 of the KELS:2005, respectively.
2. For the U.S. and Korea, non-academic outcomes are the degree of school disorder perceived by student and measured in 2002 and 2006, respectively.

Vertical Equity Analysis of Educational Outcomes

The analysis of vertical outcome equity is an effective analytic tool for examining the relationship and strength between educational outcomes and external factors causing the differences of educational opportunities from an outcome perspective. Specifically, coefficients of multiple regression models with educational outcomes as a dependent variable can answer the question regarding to what degree factors beyond the control of students, such as region or having disabilities, influence the distributional inequity of educational outcomes (Berne & Picus, 1994; Iatarola & Stiefel, 2003). It is obvious that the discriminative and unfair relationship
between students’ external factors and necessary educational outcomes to fully guarantee equal educational opportunities should be solved by the cooperative efforts of researchers and policymakers. For the U.S. public high schools’ vertical outcome equity models, the school level SES, region, special education, race, and LEP are chosen as predictors. For the Korean middle schools’ outcome equity models, the school level SES, region, special education, and total family educational cost are chosen. In this section, the directions and levels of strength between the predictors and educational outcomes are analyzed in detail using the standardized regression coefficient of each predictor.

U.S. Educational System

Before analyzing with the specific regression coefficients in earnest, it should be noted that predictors as external factors that might affect distributional inequity of educational outcomes should not negatively relate to academic and non-academic outcomes in order to achieve equal opportunity in terms of outcome aspects (Ladd, 2008; Roemer, 1998).

In terms of academic outcome, the U.S. public high schools’ SES level, region (rural), and LEP are positively associated with the mean of standardized math test score in 2002 (see Table 24). The relationship between school SES and math score is the most strong among the three predictors. Adversely, high special education student percentage and high minority student percentage schools have a statistically negative relationship with math scores at the highest significance level (p<.001), which suggests that students attending those schools are not guaranteed fair educational opportunity from an outcome perspective in the U.S educational system.

Next, in terms of non-academic outcome, the U.S. public high schools in rural areas are positively associated with degree of school disorder. Specifically, students attending schools in
rural areas perceive school disorder at an average level about 0.17 out of 5 in Likert scaling less than students attending schools in suburban areas. However, high minority student percentage and high LEP student percentage schools have a statistically negative relation to the degree of school disorder. These negative relationships imply that students attending these schools are not provided with fair educational opportunity in terms of a non-academic outcome aspect, which might eventually affect the quality of students’ school life.

In sum, the U.S. educational system does not secure equal opportunities in terms of both academic and non-academic outcomes to students attending high minority student percentage schools. Additionally, special education students are not guaranteed equal opportunity in terms of an academic outcome, and LEP students are not secured it in terms of a non-academic outcome in the U.S. educational system.

Table 24
Vertical Equity Analysis in the U.S.: Influence of SES, Urbanity, Special Education, Race, and LEP on Educational Outcomes

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Standardized Regression Coefficients (t-values)</th>
<th>SES</th>
<th>Region</th>
<th>Special Education</th>
<th>Race</th>
<th>LEP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2002</td>
<td>.514*** (15.989)</td>
<td>.000 (-.021)</td>
<td>.148*** (4.063)</td>
<td>-.141*** (-4.369)</td>
<td>-.486*** (-12.339)</td>
<td>.067* (2.181)</td>
</tr>
<tr>
<td>Perceived Degree of School Disorder by Student in 2002</td>
<td>.025 (.528)</td>
<td>-.037 (-.680)</td>
<td>.168** (3.081)</td>
<td>-.078 (-1.608)</td>
<td>-.181** (-3.071)</td>
<td>-.211*** (-4.599)</td>
</tr>
</tbody>
</table>

*Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.

**Korean Educational System**

In terms of academic outcome, the Korean middle schools’ SES level, region (megalopolis), and total family education cost are positively associated with the mean of the standardized math test score in 2006 (see Table 25). The relationship between school SES and
math score is the most strong among the three predictors. In contrast, middle schools located in metropolitan, Seoul (capital of Korea) have a statistically negative relationship with the math score, which suggests that students attending schools in metropolitan areas are not guaranteed fair educational opportunity from an outcome perspective in the Korean educational system.

Next, in terms of non-academic outcome, the Korean middle schools in rural areas are positively associated with degree of school disorder. Specifically, students attending schools in rural areas perceive school disorder at an average level about .25 out of 5 in Likert scaling less than students attending schools in middle/small cities. However, it is interesting that even high SES middle schools have a low degree of school order at the .10 significance level.

Finally, middle schools located in metropolitan Seoul in this study have a statistically negative relation to the degree of school disorder compared to the degree of school disorder of middle schools located in middle/small cities. In order words, this negative relationship implies that students in metropolitan areas are not provided with fair educational opportunity in terms of a non-academic outcome aspect.

Table 25
Vertical Equity Analysis in Korea: Influence of SES, Region, Special Education, and Education Cost on Educational Outcomes

<table>
<thead>
<tr>
<th>Resource Variables</th>
<th>Mean of Standardized Math Test Score in 2006</th>
<th>Perceived Degree of School Disorder by Student in 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SES Mean of Standardized Math Test Score in 2006</td>
<td>Region Perceived Degree of School Disorder by Student in 2006</td>
</tr>
<tr>
<td>SES Region Special Education Cost</td>
<td>Metropolitan</td>
<td>Megalopolis</td>
</tr>
<tr>
<td>Mean of Standardized Math Test Score in 2006</td>
<td>.533*** (4.754)</td>
<td>-.200** (-2.969)</td>
</tr>
<tr>
<td>Perceived Degree of School Disorder by Student in 2006</td>
<td>-.274# (-1.932)</td>
<td>-.274** (-3.214)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.
Comparison

According to Table 26, the results of vertical outcome equity analysis in both countries’ educational systems have several common characteristics. The school SES among predictors is the most influential factor to affect an academic outcome (standardized math test score) in the direction of impeding the guarantee of equal outcome opportunity. However, the rural factor operates in a positive direction because in the case of both countries students attending rural schools feel their schools are more ordered than do students attending suburban schools. Finally, in terms of adjusted R² values, external factors used in both countries’ models have relatively meaningful explanation variances in the academic models; however, non-academic models need to be supplemented with additional factors. Specifically, the predictors account for about 60 percent of math test score and about 15 percent of the degree of school order in both models.

Table 26
Comparison of the U.S. and Korea in Vertical Equity of Educational Outcomes

<table>
<thead>
<tr>
<th>Variables /Statistics</th>
<th>SES Standardized Regression Coefficient (t-values)</th>
<th>Region</th>
<th>Special Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>Korea</td>
<td>City</td>
</tr>
<tr>
<td></td>
<td>(Adj R²)</td>
<td>(Adj R²)</td>
<td>City (Adj R²)</td>
</tr>
<tr>
<td>Academic Outcome (Math)¹</td>
<td>.514*** (15.989)</td>
<td>.533*** (4.754)</td>
<td>.000 (-.021)</td>
</tr>
<tr>
<td>Non-Academic Outcome (Disorder)²</td>
<td>.025 (.528)</td>
<td>-.274# (-1.932)</td>
<td>-.037 (-.680)</td>
</tr>
</tbody>
</table>

>Note>

1. For the academic outcome, adjusted R² values are 0.623 (U.S.) and 0.481 (Korea) in each model, and for the non-academic outcome, adjusted R² values are 0.155 (U.S.) and 0.172 (Korea) in each model.
2. For the U.S. and Korea, academic outcomes are the mean of standardized math test score in 2002 of the ELS:2002 and the mean of standardized math test score in 2006 of the KELS:2005, respectively.
3. For the U.S. and Korea, non-academic outcomes are the degree of school disorder perceived by student and measured in 2002 and 2006, respectively.
However, there are several different characteristics in the distributional conditions of educational outcomes. First, the U.S. public high school SES is a more statistically influential factor in determining academic performance than the Korean middle school SES in terms of significance (t-values: U.S.: 15.989 vs. Korea: 4.754). Additionally, the total explanation variances of the U.S. academic model are larger than the Korean model. This result might be attributable to the additionally considered predictors such as race and LEP, which are very pertinent in explaining the U.S. public high schools’ math test scores. In terms of the guarantee state of equal opportunities, the Korean urban middle schools are not guaranteed equal outcome opportunities compared to the U.S. urban public high schools. Regarding the U.S. region effects on educational outcomes, rural public high schools are guaranteed equal outcome opportunity compared to the Korean rural middle schools. Finally, the math test scores of the U.S. special-needs students are inequitably distributed so as not to achieve equal opportunity in terms of an academic outcome; however, the Korean special education factor is not associated with math test score.

Relationship Analysis between Resource and Outcome Opportunities

Based on the previous analyses of resource equity, adequacy and outcome equity, this section attempts to address the third research question: What relationships exist between equal educational opportunity guarantees based on educational resources and guarantees based on educational outcomes in the U.S. and Korean educational system? In order to answer the question, the following two approaches will be used: (1) relationship analysis between the guarantee rate of adequacy and educational outcomes and (2) synthetic analysis of resource and outcome equity.
Analysis of Adequacy Guarantee Rate

As discussed in Chapter Two, this study assumes there are three levels in guaranteeing equal educational opportunity (see Figure 1). These three steps can be comprehensively examined using analysis of resource equity, adequacy, and outcome equity, respectively (see Figure 2 and 5). Specifically, resource and outcome equity analysis was utilized for answering the first and second research questions about distribution conditions of educational resources and outcomes. Of course, adequacy analysis can present the distribution conditions of educational resources by the level of adequate education summarized by per pupil expenditure. In addition to a parsimonious judgment of equal opportunity in terms of a resource aspect, adequacy analysis can also be used to examine the relationship between guarantees of resources and outcomes.

Guarantee Rate of Adequacy as a Predictor of Educational Outcomes

Through adequacy analysis, this study estimated the cost of adequacy in both countries’ educational systems (see Tables 18 and 19). Specifically, the U.S. educational system needs to provide per pupil current expenditure of $8,205.61 for public high school students to achieve performance standards, including non-academic outcome, and the Korean educational system needs to provide $833.35 for middle school students to achieve performance standards. From the specific cost of adequacy, the guarantee rate of adequate education is calculated by the ratio of actual per pupil expenditure to the cost of adequacy.

If the cost of adequacy—summarized by only monetary resources—guarantees equal opportunities in terms of educational outcomes, there will be a statistically significant relationship between the guarantee rate and educational outcomes. Otherwise, the cost of

---

21 Generally, the cost of adequacy is calculated with quantitative factors such as total number of students and teachers, not qualitative factors such as peer effects (e.g., Duncombe, 2007; Imazeki, 2008). Therefore, the cost of adequacy is far from the guarantee of equal opportunity from a broad perspective of resources.
adequacy itself is not enough to secure equal educational opportunity in terms of an outcome aspect, even though it is summarized as the necessary condition of equal opportunity based on outcome aspects. In this judgment, it should be noted that the cost of adequacy usually ignores how much money is needed to provide equal opportunities in terms of abstract/psychological resources as well as concrete/physical resources. The following subsection presents the multiple regression models, including guarantee rate of adequacy as a predictor, and results in both countries’ educational systems.

Statistical Model and Variable Selection Method

The statistical models used in this section are identical to those of the methods of vertical outcome equity except that guarantee rate of adequacy is used as an independent variable.

\[ O = h(A, B, C, G, D_{US}, E_{US}, F_K, H_K, \varepsilon, \mu) \]

where the variable of educational outcomes at school level (O) is specified as a function of Socioeconomics status (A: SES, factor scores by father and mother education, occupation, and family income), region (B), special education (C), guarantee rate of adequacy (G), race in the U.S. (D_{US}), LEP in the U.S. (E_{US}), total family educational cost (F_K) in Korea, math test score from the previous year (H_K) in Korea\(^{22}\), a vector of unobserved characteristics of a school (\varepsilon), and a random error term (\mu).

\(^{22}\) School finance research has used previous test scores as one of the strong predictors for academic performance (e.g., Schwartz & Zabel, 2005; Wenglinsky, 1998). However, a previous test score is used only in the Korean model only because the ELS:2002 does not provide 9th grade standardized math test score.
Results

*Academic outcome.* According to Table 27, guarantee rate of adequacy is proven not to secure equal opportunity in terms of an academic outcome aspect in the U.S. and Korean educational systems. This result implies that the cost of adequacy summarized by per pupil expenditure cannot predict the distribution of math test scores as an academic outcome controlling for external factors such as SES, race, and special education. All external factors except for urban region are statistically significant in explaining an academic outcome in the U.S. educational system; however, SES and metropolitan region variables are only statistically associated with an academic outcome in the Korean context. The different predictors explaining an academic outcome might result from inserting math test scores from a previous year into the Korean model. Finally, both countries’ academic outcome models account for about 60 percent of an academic outcome.

Table 27

Final Models of Academic Outcomes in the U.S. and Korea

<table>
<thead>
<tr>
<th>Variables</th>
<th>U.S. Standardized Coefficients (t-values)</th>
<th>Korea Standardized Coefficients (t-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guarantee Rate</td>
<td>.055 (.103)</td>
<td>Guarantee Rate .077 (1.345)</td>
</tr>
<tr>
<td>SES</td>
<td>.503*** (15.327)</td>
<td>Math Score in 2005 .537*** (7.540)</td>
</tr>
<tr>
<td>Race</td>
<td>-.515*** (-12.033)</td>
<td>SES .363*** (3.431)</td>
</tr>
<tr>
<td>Special Education</td>
<td>-.161*** (-4.696)</td>
<td>Family Education Cost .033 (.335)</td>
</tr>
<tr>
<td>Rural</td>
<td>.150*** (4.115)</td>
<td>Metropolitan -.189** (-3.116)</td>
</tr>
<tr>
<td>LEP</td>
<td>.068* (2.206)</td>
<td>Special Education .015 (.264)</td>
</tr>
<tr>
<td>Urban</td>
<td>.009 (.246)</td>
<td>Megalopolis .015 (.256)</td>
</tr>
<tr>
<td>$\text{AdjR}^2$</td>
<td>.626</td>
<td>Rural .007 (.122)</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.
Non-academic outcome. According to Table 28, guarantee rate of adequacy is proven to secure equal opportunity in terms of a non-academic outcome aspect in the U.S. educational system. That is, even though the cost of adequacy does not guarantee equal opportunity based on an academic aspect, it has the potential to improve the U.S. public high schools’ performance in terms of a non-academic aspect. However, the guarantee rate of adequacy in the Korean context does not significantly affect the guarantee levels in terms of a non-academic outcome nor in terms of an academic outcome. The Korean result implies that the cost of adequacy summarized by per pupil expenditure cannot predict the distribution of non-academic performance controlling for external factors such as region and SES. High LEP student percentage, high minority student percentage, and high special education student percentage schools are significantly associated with a high degree of school disorder. In Korea, metropolitan/rural regions and SES are statistically significant factors in explaining a non-academic outcome. Finally, contrary to the high variances of external factors in an academic outcome, both countries’ non-academic outcome models account for only about 17 percent of school disorder.

Table 28

Final Models of Non-Academic Outcomes in the U.S. and Korea

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized Coefficients (t-values)</td>
<td>Standardized Coefficients (t-values)</td>
</tr>
<tr>
<td>Guarantee Rate</td>
<td>.166** (3.323)</td>
<td>Guarantee Rate -0.009 (-.106)</td>
</tr>
<tr>
<td>LEP</td>
<td>-.210*** (-4.618)</td>
<td>Metropolitan -0.278** (-3.047)</td>
</tr>
<tr>
<td>Race</td>
<td>-.265*** (-4.165)</td>
<td>Rural .262** (3.032)</td>
</tr>
<tr>
<td>Rural</td>
<td>.173** (3.194)</td>
<td>SES -.291# (-1.906)</td>
</tr>
<tr>
<td>Special Education</td>
<td>-.134** (-2.631)</td>
<td>Family Education Cost .215 (1.444)</td>
</tr>
<tr>
<td>SES</td>
<td>-.007 (-.149)</td>
<td>Megalopolis -.040 (-.477)</td>
</tr>
<tr>
<td>Urban</td>
<td>-.006 (-.111)</td>
<td>Special Education .011 (.122)</td>
</tr>
<tr>
<td>$\text{Adj R}^2$</td>
<td>.174</td>
<td>$\text{Adj R}^2$ .169</td>
</tr>
</tbody>
</table>

Note: Standardized regression coefficients: ***p < .001; **p < .01; *p < .05; #p < .10. The values are Standardized regression coefficients, and t-values are in parentheses.
Conclusions

In conclusion, the cost of adequacy summarized by the spending levels that are assumed sufficient to achieve desirable educational outcomes certainly does not bring equal educational opportunity in terms of an academic outcome in both countries’ educational systems. This finding suggests that monetary resources alone are not enough to guarantee equal opportunities from an outcome perspective. However, the cost of adequacy estimated by the four popular adequacy approaches is not meaningless in that its guarantee leads to high non-academic school performance. Rather, future steps need to be taken to determine which approach reflects real-world education environments to provide equal opportunities in terms of both resources and outcomes.

Synthetic Analysis of Resource and Outcome Equity

In this study, equity analysis is conducted with two different objects: educational resources (resource equity) and outcomes (outcome equity), which divide equity analysis into two useful analytic tools for fully examining equal educational opportunities. Accordingly, analysis of resource and outcome equity is well suited for the purposes of this study, even though each analysis is mainly useful for distribution conditions of equity objects to scrutinize the guarantee of equal opportunity and is also synthesized to examine the relationship between guarantees of resources and outcomes.

Results of Resource Equity Analysis in Both Countries

Basically, resource equity analysis provides information on how educational opportunities are guaranteed based on resource aspects, which is the first research question in this study. In this section, the results of horizontal and vertical equity analysis address whether or not additional resources are secured corresponding to external factors affecting equal educational
opportunities. Eventually, they are synthesized to examine whether the fair guarantee of educational resources brings desirable fulfillment of outcomes to all students on the basis of SES, region, special education, race, LEP, and total family education cost (for Korean context).

*Horizontal equity of educational resources.* Horizontal equity analysis functions as a diagnostic step for vertical equity analysis because horizontally inequitable distribution may indicate the presence of vertical equity (Houck, 2010; Iatarola & Stiefel, 2003). Therefore, it may be an initial step to check if horizontally inequitable distribution is caused by a fair guarantee of equal opportunity from a vertical equity perspective.

According to the previous results of horizontal equity analysis, there are specific resources commonly inequitably distributed in both countries. In terms of quantitative variables, the percentage of non-tenured teachers and spending resources commonly have high values of equity indexes used in this study (see Table 12). Regarding qualitative variables, in spite of the limited value ranges of Likert scaling, the sufficiency of physical resources not incurring learning hindrance and academic press are relatively inequitably distributed in the U.S. and Korean schools. Therefore, the two different quantitative and qualitative resource variables need to be additionally checked to determine the relationship between external factors and each variable using the results of vertical equity analysis.

*Vertical equity of educational resources.* Tables 29 and 30 summarize the results of vertical equity analysis focused on the four variables having inequitable distribution. A value above the significance level of .05 (p<.05) is considered to indicate a meaningful relationship with the resources, and NO, PR, and NR indicate NO relationship, Positive Relationship and Negative Relationship, respectively.
Table 29

Summary of Vertical Equity in Common Horizontal Inequity Variables in the U.S.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Variables</th>
<th>SES</th>
<th>Urban</th>
<th>Rural</th>
<th>Special Education</th>
<th>Race</th>
<th>LEP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative</strong></td>
<td>Spending</td>
<td>NR</td>
<td>NR</td>
<td>NO</td>
<td>PR</td>
<td>PR</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Non-tenured</td>
<td>NO</td>
<td>PR</td>
<td>NO</td>
<td>NR</td>
<td>NR</td>
<td>NO</td>
</tr>
<tr>
<td><strong>Qualitative</strong></td>
<td>Sufficiency of Physical Resources</td>
<td>NR</td>
<td>NR</td>
<td>NO</td>
<td>NO</td>
<td>NR</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Academic Press</td>
<td>NR</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

Note: NO, PR, and NR indicate NO relationship, Positive Relationship and Negative Relationship, respectively.

In the U.S. educational system, more spending resources are equitably distributed to high special education student percentage and high minority student percent schools than to low percentage schools, which indicates a Positive Relationship between spending and the disadvantaged student groups. Iatarola and Stiefel (2003) conceptualize equal opportunity in terms of resource aspects in two ways: (1) neutral formulation, which indicates a lack association between resources and external factors (NO in this study) and (2) affirmative action formulation, which indicates a positive association in the relationship (PR in this study). Therefore, based on the conceptualization of guaranteeing equal opportunity, special education and minority students are provided with equal educational opportunities in terms of representative resources having quantitative characteristics. However, in terms of qualitative resources, special education and LEP students are not guaranteed equal educational opportunities in the sense that there is NO relationship or Negative Relationship between qualitative resources and the disadvantaged students.

Next, the U.S. educational system does not provide students attending schools in rural regions and LEP students with the additional resources presented above. In other words, the guarantee of equal opportunity does not reach the level of affirmative action. Considering that additional resources should be distributed based on region and LEP factors to achieve equal opportunity in terms of resources aspects, NO relationship between the four resources and the
disadvantaged student groups means that equal educational opportunities are not secured for them.

Finally, the qualitative resources that have a horizontally inequitable distribution are not significantly associated with external factors whose characteristics should be criteria for providing additional resources. This result suggests that qualitative resources are discriminatively, not reasonably, distributed to the U.S. public high schools without fair criteria.

Table 30
Summary of Vertical Equity in Common Horizontal Inequity Variables in the Korea

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Variables</th>
<th>SES</th>
<th>Metropolitan</th>
<th>Megalopolis</th>
<th>Rural</th>
<th>Special Education</th>
<th>Family Education Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative</td>
<td>Spending</td>
<td>PR</td>
<td>PR</td>
<td>NR</td>
<td>PR</td>
<td>PR</td>
<td>PR</td>
</tr>
<tr>
<td></td>
<td>Non-tenured</td>
<td>NO</td>
<td>PR</td>
<td>PR</td>
<td>NO</td>
<td>PR</td>
<td>PR</td>
</tr>
<tr>
<td>Qualitative</td>
<td>Sufficiency of Physical Resources</td>
<td>NO</td>
<td>NR</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Academic Press</td>
<td>NO</td>
<td>NR</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

Note: NO, PR, and NR indicate NO relationship, Positive Relationship and Negative Relationship, respectively.

In the Korean educational system, more spending and fewer non-tenured teachers are equitably distributed to high special education student percentage schools than to low percentage schools, indicating a Positive Relationship between the resources of spending and teacher quality and special education students. Therefore, special education students are provided with equal educational opportunities in terms of both representative resources having quantitative characteristics. However, in terms of qualitative resources, special education students in Korea are not guaranteed equal educational opportunities in the sense that there is NO relationship between qualitative resources and the disadvantaged students.

Next, the Korean educational system also provides students attending schools in metropolitan regions with the additional quantitative resources presented above. In other words,
the guarantee levels of equal opportunity reach the levels of *affirmative action formulation* in terms of quantitative spending and teacher quality. However, in terms of qualitative resources, there is a Negative *R*elationship between qualitative resources and the students. That is, schools in metropolitan regions exhibit a low degree of physical resource sufficiency and academic press, which is similar to the situation with special education and minority students in the U.S. public high schools.

Finally, as with the inequitable distribution conditions of qualitative resources presented above in the U.S. educational system, the qualitative resources are not associated with external factors whose characteristics should be criteria for providing additional resources. This situation implies that qualitative resources are simply discriminatively distributed without reasonable criteria.

### Results of Outcome Equity Analysis in Both Countries

Basically, outcome equity analysis addresses how educational opportunities are guaranteed based on outcome aspects, which is the second research question in this study. In this section, the results of horizontal and vertical equity analysis address whether or not educational outcomes are unfairly related to factors beyond the students’ control such as region, race, and LEP. The results of outcome equity analysis should be ultimately utilized for confirming that fair distribution conditions of educational resources affirmatively affect guaranteeing equal opportunities in terms of outcome aspects. In this subsection, the results of horizontal and vertical equity analysis of educational outcomes are presented together.

Outcome equity analysis focuses on the distributional inequity of educational outcomes on the basis of disadvantaged students such as the disabled and minority students (Berne & Picus, 1994; Iatarola & Stiefel, 2003). Following previous literature, this study analyzed the horizontal
distribution of an academic outcome by dividing student groups into no special-needs students and special-needs students.

According to the previous results of horizontal outcome equity analysis, it is remarkable that there is more inequitable distribution among special-needs students than no special-needs students. Regarding the results of vertical outcome equity analysis, Table 31 presents a summary of vertical equity in both countries. In particular, only the external factors that are closely related to the educational resources analyzed in the previous subsection are considered in Table 31. In terms of an academic outcome, the U.S. educational system does not guarantee equal opportunity to special education and minority students. In Korea, students attending schools in metropolitan regions also are not secured equal opportunity in terms of an academic aspect. Finally, in terms of a non-academic aspect, the U.S. minority and LEP public high school students and Korean metropolitan middle school students perceive a lesser degree of school order than counterpart students.

Table 31

Summary of Vertical Equity in Both Countries

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>U.S. Special Education</th>
<th>Race</th>
<th>LEP</th>
<th>Korea Metropolitan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>NR</td>
<td>NR</td>
<td>PR</td>
<td>NR</td>
</tr>
<tr>
<td>Non-Academic</td>
<td>NO</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

*Note: The LEP significance is at the .05 level, and all other NR’s significance is at the below .001 level.*

*Synthesis of Both Results*

The results of resource and outcome equity analysis in both countries allow for reaching several meaningful conclusions on the relationship between opportunity guarantees of resources and outcomes. First, according to horizontal outcome equity of special-needs students and
vertical resource equity in both countries’ educational systems, while the U.S. special-needs students are guaranteed equal educational opportunity in terms of spending resource as a quantitative resource and the Korean special-needs students are secured equal educational opportunity in terms of spending and tenured teachers, academic outcome distributions of special education students are horizontally inequitably distributed in both countries. Considering that special-needs students should receive more attention in order to guarantee a minimum level of academic performance necessary for them to live in society as responsible members, quantitative resources such as spending and certified teachers might not be enough to adequately level the playing field for them to realize their potentials.

Second, while the metropolitan middle schools exhibit more spending and tenured teachers, but less physical resource sufficiency and less academic press than middle/small city schools, they are not guaranteed equal opportunity in terms of academic and non-academic outcome aspects. This relationship between opportunity guarantees of resources and outcomes also confirms that vertical equity of quantitative resources does not simply induce a desirable distribution of educational outcomes. Rather, vertical inequity of qualitative resources might incur unequal educational opportunities in terms of outcome aspects considering the no relationship between the cost of adequacy and academic and non-academic outcomes in the Korean educational system.

Third, while high special education student percentage and high minority student percentage schools are provided with spending resources equitably, the U.S. educational system fails to guarantee a vertically equitable academic outcome to them at the highest significance level (p<.001). At the same time, minority students do have sufficient physical resources so as not to hinder their learning; furthermore, minority and special education students experience less
academic press in terms of a positive, studious atmosphere than counterpart students. This perverse relationship between resources and outcomes in terms of equal opportunity might be evidence indicating that it is unwise of policymakers to pursue the fulfillment of equal educational opportunity without considering qualitative resources in the provision of adequate education.

Finally, LEP students in the U.S. educational system are guaranteed equal resource opportunities not in terms of affirmative action formulation but neutral formulation, introduced by Iatarola and Stiefel (2003), because there is NO relationship between any resources posed in this section and LEP students’ needs. For example, except for the fact that high LEP student percentage schools have fewer non-tenured teachers than low percentage counterpart schools (see Table 13), they do not have any affirmative action formulation across the four resources presented in this section. However, it should be noted that from the traditional perspective introduced by Berne and Stiefel (1984, 1994), high LEP student percentage schools are secured equal opportunities. Nevertheless, this study finds that students attending high LEP student percentage schools enjoy a less ordered school life than low percentage counterpart students. Therefore, this neutral formulation relationship shown in the LEP students’ case also suggests that affirmative action formulation of both qualitative and quantitative resources should be applied to distributing educational resources in order to achieve equal educational opportunity ultimately.

Summary of Empirical Results

Descriptive Analysis

Overall, the U.S. educational system provides public high schools with more educational resources, including qualitative resources, than the Korean educational system does to middle
schools. Specifically, regarding quantitative resources, the strength of the U.S. educational system is its relatively high ratio of instructional to current expenditures compared to the Korean educational system; however, the excessively high percentage of non-tenured teachers in U.S. public high schools should be addressed to guarantee equal opportunities to the students. Except for non-certified teachers, the U.S. has an edge in ratios of pupil to teacher, average years of education among teachers and the rates of parents’ participation variables.

Moreover, it is remarkable that even qualitative resources are more secured in the U.S. educational system. For example, teacher’s perception of job pride and peer effect of the U.S. public high schools gain predominance over the Korean qualitative resources. Operational and cultural resources of the U.S. schools having abstract and psychological characteristics also have a relative superiority over Korean schools. However, it is significant that math achievement little improved; rather, it marginally decreased between 10th grade and 12th grade. Finally, comparing control variables, the U.S. public high schools and the Korean middle schools have almost the same percentage of special education students per school.

*Resource Equity Analysis*

*Horizontal Resource Equity*

In the category of quantitative resources, the teachers’ degree level variable is very equitably distributed in the both countries’ educational systems; however, the percentage of non-tenured teachers, spending, parental involvement rates, and educational programs are the resources that are inequitably distributed. In the U.S. public high schools, a high average percentage of non-tenured teachers (8.25%) is a troubling sign for equal resource opportunities; furthermore, its highly inequitable distribution (Cov: 3.090) indicates that the U.S. educational system fails to guarantee equal opportunities in terms of a resource aspect. With respect to
Korean horizontal inequity, the average of the ratios of instructional to current expenditure among middle schools is very low (Korea: .27 vs. U.S.: .62), relatively speaking; making matters worse, the ratios are extremely inequitably distributed (percentile ratio: 8.2).

In the category of qualitative resources, (1) the insufficiency of physical resources leading to hindrance of students’ learning and (2) academic press perceived by principals exhibit relatively inequitable distributions in both countries compared to the horizontal distributions of other qualitative resources. Except for the two qualitative resources, the distributional equity of other qualitative resources in both countries’ educational systems has few differences in terms of horizontal inequity considering the limited value ranges of Likert scaling. If one should be mentioned, it is notable that among Korean middle schools, teachers’ perception of job pride is more equitably distributed than in the U.S. public high schools. Specifically, the U.S. public high school teachers are superior to Korean middle school teachers in terms of descriptive statistics; however, the U.S. equity statistics of job pride are above the absolute criteria for a desirable distribution in terms of horizontal equity (U.S.: .150 (Cov) vs. Korea: .085 (Cov)).

Finally, in terms of the overall evaluation of resource distributions, the outstanding difference in both countries’ provision of educational resources lies in teacher quality. It should be noted that such a judgment resulted not from an absolute threshold aspect but from a relative comparison aspect of equity statistics. Specifically, Korean middle schools exhibit more equitable distributions of teacher quality, including qualitative characteristic resources such as teacher’s job pride, than the U.S. public high schools, which indicates that the Korean educational system guarantees equal resource opportunities to middle schools compared to the inequitable provision of the U.S. educational system in terms of teacher quality.
Vertical Resource Equity

SES effects in both countries

First of all, the results of this study indicate that school level SES influentially operates to determine the distribution conditions of educational resources corresponding to additional needs in both countries’ educational systems. The U.S. educational system fails to fairly provide every quantitative and qualitative resource significantly associated with SES, which implies that the school level SES in the U.S. plays a role in distributing educational resources in the direction of impeding equal resource opportunities. Specifically, the U.S. public high school SES is significantly associated with the distributional inequity of spending, physical resources, teacher quality, peer effects, parental support, operational resources, and cultural resources. It is remarkable that the resource most affected by the levels of school SES is academic press, which is recognized as very influential on school culture in school climate literature (Anderson, 1982; V. E. Lee & Smith, 1999; Phillips, 1997; Shaw, 2009; Shouse, 1996). Finally, in the category of resources, only principal’s leadership is not statistically influenced by the levels of school SES in the U.S. educational system.

In the overall evaluation of vertical resource equity among Korean middle schools, the Korean educational system guarantees equal opportunities in that there is no relationship between school level SES and educational resources, referred to as neutral formulation (Berne & Stiefel, 1984; Iatarola & Stiefel, 2003). Contrary to the no or positive relationships between SES and almost all resources, the result that parents’ concern about their child’s study and other activities is inequitably associated with school SES implies that school SES might more strongly affect the distributional inequity of qualitative resources than that of quantitative resources. In other words, school SES can make a difference in the abstract/invisible area (which, however, is
important in equal educational opportunities) as well as in the concrete/visible area. Therefore, this empirical result suggests that the distribution conditions of qualitative resources also should be considered just as important as those of quantitative resources in guaranteeing equal opportunities. In the category of quantitative resources, that high SES schools spend a greater proportion of current expenditures on instructional activities than low counterpart schools is a condition that hinders the fulfillment of equal opportunities.

The difference between both countries in vertical resource equity regarding a school SES factor is that the U.S. public high school SES is inequitably associated with educational resources, indicating the existence of unequal opportunity; however, Korean middle school SES is neutrally associated with those resources, indicating the existence of equal opportunity from the traditional perspective introduced by Berne and Stiefel (1984). Even though the traditional judgment would be accepted, low ratios of instructional to total expenditure and parent’s concern about school activities in low SES middle schools indicate unequal opportunities in the Korean educational system. Finally, there is no consistent and affirmative relationship between school SES and educational resources, unlike in the U.S. case.

**Region effects in both countries**

*Urban.* The U.S. urban public high schools are not guaranteed equal resource opportunities in terms of input resources (spending and physical resources). However, contrary to findings in previous literature, an urban region factor is significantly related to low percentage of non-tenured teachers in the U.S. educational system. For reference, the percentage of non-tenured teachers is most influenced by an urban region factor in terms of standardized regression coefficients among the resources associated with the factor. Except for the percentage of non-tenured teachers, there is no consistent relationship between an urban region factor and
throughput resources in terms of vertical equity. Therefore, it is desirable that equal opportunities of input resources should be improved first for the U.S. urban public high schools.

In the Korean urban (metropolitan, megalopolis, and middle/small city) middle schools, additional current expenditures are not proportionally spent on instructional activities; however, high quality teachers are provided, indicating the existence of vertical equity. It is a troubling sign that metropolitan middle schools exhibit vertical inequity in the distributions of all the qualitative resources significantly associated with a metropolitan region factor. Specifically, the insufficiency of physical resources, parents’ mistrust of teacher quality and low academic press are related to metropolitan middle schools. Contrarily, megalopolis middle schools included in an urban area have parents’ trust of teacher quality and high parents’ concern about school activities.

The difference between both countries in vertical resource equity regarding an urban factor is that the U.S. urban public high schools are not secured input resources; however, Korean urban middle schools are secured those resources, indicating the guarantee of equal resource opportunities. In particular, metropolitan middle schools are fairly guaranteed spending resources, the ratios of pupil to teacher and teacher quality. Thus, parents’ mistrust of teacher quality and low academic press in metropolitan middle schools need to be considered priorities in educational policies in Korea.

*Rural.* The U.S. rural public high schools are not guaranteed equal resource opportunities in terms of teachers’ degree level and years of teaching experience. However, fairness and clarity of school rules and academic press are more equitably distributed in rural public high schools than suburban public high schools. In the category of quantitative resources, the U.S. rural public
high schools are fairly guaranteed high parental involvement rates and more hours of extracurricular activities, indicating the existence of vertical equity.

It is striking that Korean rural middle schools exhibit equal opportunities in terms of the resources significantly associated with a rural factor. Unlike the U.S. case, more experienced teachers are assigned to Korean rural middle schools. Additionally, a larger number of teachers is provided to Korean rural middle schools than Korean middle/small city middle schools. However, it cannot be decisively concluded that equal resource opportunity of rural middle schools is guaranteed in terms of the number of teachers because the situation might be due to the fact that the low ratios of pupil to teacher are caused by decreases in the number of students in rural middle schools. Further examination is needed before concluding that it is a positive sign for the guarantee of equal resource opportunity in the Korean educational system. Finally, from an affirmative action formulation perspective, Korean rural middle schools are not sufficiently provided quantitative and qualitative resources compared to the U.S. rural public high schools.

*Special education effects in both countries*

The U.S. high special education student percentage public high schools are guaranteed equal resource opportunities in terms of input resources. However, peer effects, parent’s concerns and the two operational resources used in this study need to be distributed equitably in order to achieve equal resource opportunities completely in the U.S. educational system. This study corroborates claims that the U.S. has improved the educational environments for special education by focusing on quantitative resources such as spending and teachers. For reference, the magnitude of special education effects on the distributions of spending is the largest among all the resources associated with a special education factor (coefficients: .339 for current expenditure and .300 for instructional expenditure). In the category of qualitative resources, high
special education student percentage schools are not guaranteed qualitative resources such as peer effects and parent’s concerns.

In sum, the U.S. high special education student percentage schools are provided more spending and physical resources; however, they are not guaranteed equal opportunities in terms of qualitative resources. This finding might be a possible indication of the need to examine the relationship between the inequitable distribution of qualitative resources and educational outcomes. Therefore, this study indicates that interest in the distributional inequity of resources needs to be broadened to include abstract/psychological resources to achieve equal opportunities completely.

It is significant that the Korean special education factor is significantly associated with only quantitative resources in terms of vertical equity. Specifically, Korean high special education student percentage middle schools are guaranteed equal resource opportunities in that instructional expenditures, the ratios of pupil to teacher and teacher quality are vertically equitably distributed to the schools. However, it is absolutely necessary to provide equitable distributions of qualitative resources from an affirmative action formulation perspective because this study shows that the percentage of special education students in the Korean educational system are never considered an influential factor in the provision of educational resources.

Race and LEP effects in the US

The U.S. high minority student percentage schools exhibit different vertical equity levels among input resources. Specifically, spending resources are fairly provided to them; however, physical resources are not equitably distributed. This finding suggests that the spending provided to such schools does not reach sufficient physical resources that directly are utilized in students’ learning activities. Among throughput resources, even though there are not consistent directions
between the percentage of minority students and educational resources, the finding that high minority student percentage schools are assigned more non-tenured teachers is remarkable but congruent with previous literature (e.g., Houck, 2010). However, this study also shows the incongruent finding that there exist more positive peer effects in high minority student percentage schools in the U.S. educational system, which should provoke further research on the state and role of peer effects in high minority student percentage schools. Finally, more extracurricular activities are needed to guarantee equal resource opportunities to minority students.

This study reveals that the percentage of LEP students in the U.S. educational system is not an influential factor affecting equitable distribution of educational resources from an affirmative action formulation perspective. It is a good sign for equal resource opportunity that the ratios of instructional expenditures out of current expenditures are relatively high in high LEP student percentage schools. High ratios of instructional expenditures might be the result of additional activities such as ESL courses. Finally, the provision of a low percentage of non-tenured teachers for LEP students is different from the conditions of equal opportunities for minority and special education students in the U.S. educational system.

*Total family education cost effects in Korea*

This study shows that total family education cost including private tutoring fees directly reflects parents’ concern about student’s study and school activities in the Korean education context. Specifically, high total family education cost percentage middle schools exhibit higher parents’ involvement rates and parent’s concerns than low percentage counterpart schools. Additionally, high total family education cost significantly explains the variance of principal’s
relationship with teacher-parent associations in Korean middle schools. These findings suggest that high total family education cost is accompanied by parental support.

_Adequacy Analysis_

This study estimated the cost of adequacy represented by per pupil current expenditure using the successful school approach. This approach regards the actual spending of the schools that have already met specific performance and efficiency criteria as the cost of adequacy (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007). Thus, the guarantee ratios of adequacy allow for judging the degree of equal resource opportunities in addition to the analysis of resource equity in this study. The results of the adequacy analysis indicate that about two percent successful schools out of each total sample size (471 schools for the U.S. analysis and 150 schools for Korean analysis) were identified in both countries.

Specifically, the U.S. successful schools are eight public high schools from the ELS:2002, and seven of those schools are located in suburban regions. The Korean successful schools are three middle schools from the KELS:2005, and all schools are located in city regions (one school each from metropolitan, megalopolis, and middle/small city school). The schools that are provided with amounts above the adequacy cost account for 46.3 percent of the 471 U.S. public high schools and 55.3 percent of the 150 Korean middle schools, indicating that Korean middle school education as a final compulsory education stage is guaranteed equal opportunity nine percent more than U.S. public high school education as a final compulsory education stage. Finally, the results of adequacy analysis reveal that the average guarantee rate of adequate education is 1.06 for the U.S. public high schools and 1.59 for the Korean middle schools. Therefore, adequacy analysis shows that overall, Korean middle school education is guaranteed equal resource opportunity more than U.S. public high school education.
Outcome Equity Analysis

Horizontal Outcome Equity

On the one hand, the results of horizontal outcome equity analysis indicate the common characteristic that the academic outcomes of no special-needs students are more equitably distributed than those of special-needs students in both countries’ educational systems. On the other hand, there are three different characteristics in the distribution of educational outcomes. First, non-academic outcome is more equitably distributed than academic outcome in the U.S. educational system; adversely, academic outcome is more equitably distributed than non-academic outcome in the Korean educational system. Second, the distributional equity of academic outcome in Korea is superior to the U.S. and that of non-academic outcome in the U.S. is superior to Korea. Finally, the distributional inequity of academic outcome among the U.S. public high schools has worsened across the survey years; however, that of Korean middle schools has improved.

Vertical Outcome Equity

The U.S. academic outcome levels are significantly associated with all external factors considered in this study regardless of coefficients’ signs. Specifically, the U.S. public high school’s SES level, region (rural), and LEP are positively associated with the mean of standardized math test score in 2002. However, high special education student percentage and high minority student percentage schools are not guaranteed equal opportunity in terms of an academic outcome considering that they have a statistically negative relationship with math scores at the highest significance level (p<.001).

The U.S. non-academic outcome levels are significantly associated with region, race, and LEP factors regardless of coefficients’ signs. Specifically, the U.S. rural public high schools are
positively associated with the degree of school order, indicating the existence of equal opportunity. However, high minority student percentage and high LEP student percentage schools are not provided with fair educational opportunity in terms of a non-academic outcome aspect, which might eventually affect the quality of student’s school life.

The Korean academic outcome levels are significantly associated with school SES, region, and total family education cost regardless of coefficients’ signs. Specifically, the Korean middle school’s SES level, region (megalopolis), and total family education cost are positively associated with the mean of standardized math test score in 2006. However, metropolitan middle schools are not guaranteed equal opportunity in terms of an academic outcome considering that they have a statistically negative relationship with math scores.

The Korean non-academic outcome levels are significantly associated with both school SES and region factors regardless of coefficients’ signs. Specifically, Korean rural middle schools are positively associated with the degree of school order, indicating the existence of equal opportunity. However, high SES level middle schools and metropolitan middles schools are not provided with equal opportunity in terms of a non-academic outcome aspect.

On the one hand, the results of vertical outcome equity analysis show three common characteristics in both countries’ educational systems. First, school SES is the most influential factor to affect the distributional inequity of an academic outcome among the predictors used in this study. This finding corroborates the previous literature (e.g., D. P. Baker et al., 2002; Coleman, 1990; Coleman et al., 1966; Hanushek, 1986; Heyneman & Loxley, 1983). Second, a rural factor in both countries is positively associated with the degree of school order. That is, students attending both countries’ rural schools feel their schools are more ordered than counterpart school students. Finally, the external factors used in both countries’ academic models
have high explanation variances in the academic models; however, the external factors need to be supplemented by additional factors in both countries’ non-academic models. Specifically, the predictors account for about 60 percent of math test score and about 15 percent of the degree of school order in both models.

On the other hand, there are four different characteristics in the results of vertical outcome equity analysis of both countries. First, the Korean educational system fails to guarantee equal opportunities in terms of both academic and non-academic outcomes to metropolitan middle schools. However, the U.S. urban public high schools are guaranteed equal outcome opportunities in that there is no relationship between an urban region factor and educational outcome, referred to as neutral formulation. Second, the math test score of the U.S. special-needs students is inequitably distributed so as not to achieve equal opportunity in terms of an academic outcome; however, the Korean special education factor is not associated with math test score. Third, the U.S. public high school SES is a more statistically influential factor to determine academic performance levels than Korean middle school SES. Finally, the total explanation variances of the U.S. academic model are larger than the Korean model.

**Relationship Analysis between Resource and Outcome Opportunities**

**Analysis of Adequacy Guarantee Rate**

This study shows that the cost of adequacy summarized by the spending levels does not predict the guarantee of equal outcome opportunity. In other words, adequacy guarantee rates of each school are not significantly associated with the levels of an academic outcome. However, this study indicates that the cost of adequacy is not always a meaningless criterion for explaining the guarantee level of educational outcomes because adequacy guarantee rates are significantly associated with non-academic school performance in the U.S. model.
Synthetic Analysis of Resource and Outcome Equity

Based on the results of resource equity analysis, this study identified specific quantitative and qualitative resources that are inequitably distributed in both countries. Specifically, the commonly inequitably distributed variables in both countries’ educational systems are as follows: (1) spending resources, (2) the percentage of non-tenured teachers (quantitative resources), (3) the sufficiency of physical resources not incurring learning hindrance, and (4) academic press (qualitative resources).

By synthesizing the results of resource equity analysis with those of outcome equity analysis, this study reveals four meaningful relationships between opportunity guarantees in terms of resources and those in terms of outcomes. First, while the U.S. special-needs students are guaranteed equal educational opportunity in terms of spending resource as a quantitative resource and the Korean special-needs students are secured equal educational opportunity in terms of spending and tenured teachers, academic outcome distributions of special education students are horizontally inequitably distributed in both countries. Second, while the metropolitan middle schools exhibit more spending and tenured teachers but less physical resources’ sufficiency and less academic press than middle/small city schools, they are not guaranteed equal opportunity in terms of academic and non-academic outcome aspects. Third, while high special education student percentage and high minority student percentage schools are provided with spending resources equitably, the U.S. educational system fails to guarantee a vertically equitable academic outcome to them. Finally, while LEP students of the U.S. educational system are guaranteed equal resource opportunities in terms of neutral formulation, students attending high LEP student percentage schools enjoy less ordered school life than low percentage counterpart students. This neutral formulation relationship shown in the LEP
students’ case also suggests that *affirmative action formulation* of both qualitative and quantitative resources should be applied to distributing educational resources in order to achieve equal educational opportunity ultimately.
CHAPTER 5

CONCLUSION

Review of Key Findings

This study posed three research questions:

1. In terms of educational resources, how are educational opportunities guaranteed in the U.S. and Korean educational systems?

2. In terms of educational outcomes, how are educational opportunities guaranteed in the U.S. and Korean educational systems?

3. What relationships exist between equal educational opportunity guarantees based on educational resources and guarantees based on educational outcomes in the U.S. and Korean educational systems?

Through analyses of resource equity, adequacy, and outcome equity, the results address the guarantee conditions of equal opportunities and the relationships between opportunity guarantees in terms of resource aspects and guarantees in terms of outcome aspects. This section reviews key findings corresponding to the research questions.

Guarantee Conditions of Equal Resource Opportunities

In this study, the guarantee conditions of equal resource opportunities were examined by horizontal and vertical resource equity and the cost of adequacy in the U.S. and Korean educational systems. Qualitative resources were included in the variables as target objects in order to examine guarantee level of equal resource opportunities comprehensively. Finally, the
cost of adequacy benefited from summarizing guarantee conditions of equal opportunity with one numerical value and bridging a gap between resources and outcomes aspects of educational opportunities. The following subsections overview the three aspects of equal resource opportunities in each country’s educational system.

*U.S. Educational System*

Before overviewing equal resource opportunities of the U.S. educational system in detail, it needs to be emphasized that the results indicate that school SES negatively affects the distribution conditions of both the quantitative and qualitative resources. In other words, the school SES levels in the U.S. operate against the fulfillment of equal resource opportunity.

**Quantitative resource aspects**

Overall, quantitative resources of the U.S. public high schools are less equitably distributed than qualitative resources. Because of the limited value ranges of qualitative resources, equity indexes of almost all quantitative resources are higher than those of qualitative resources. Nevertheless, it is noticeable that spending and physical resource variables of quantitative resources (i.e., the ratios of pupil to teacher) are inequitably distributed, which might indicate the presence of vertical equity. Specifically, high special education student percentage and high minority student percentage schools are guaranteed equal resource opportunities in terms of spending; however, low SES schools and urban schools are not guaranteed equal resource opportunities in terms of spending.

In the U.S. educational system, teachers’ degree level is very equitably distributed regardless of the additional needs of each school; however, the percentage of non-tenured teachers as a teacher quality variable is the most inequitably distributed among all quantitative resources. Specifically, high minority student percentage schools are not guaranteed equal
resource opportunities because they have more non-tenured teachers than low percentage schools. Regarding teachers’ degree level, rural schools have lower degree level and less experienced teachers than suburban schools, indicating that their equal resource opportunities are not secured in terms of teacher quality resources being composed of quantitative variables. Finally, educational programs are also inequitably distributed so as not to achieve equal resource opportunities between high special education student percentage and high minority student percentage schools and low percentage counterpart schools.

**Qualitative resource aspects**

In the qualitative resource aspects, the sufficiency of physical resources and academic press all perceived by principals are less equitably distributed in the U.S. From an affirmative action formulation perspective, all qualitative resources should also be vertically equitably distributed in order to meet equal resource opportunities. However, principals of low SES school perceive that they are not provided physical resources not leading to hindrance of students’ learning and appropriate levels of the cultural resources that place high emphasis on academic performance. Additionally, principals in high minority student percentage schools also perceive insufficient quality of physical resources, which might incur unequal outcome opportunities.

**Adequacy cost aspect**

In the U.S. educational system, 46.3 percent of public high schools are guaranteed equal resource opportunities in the sense that the schools are provided with amounts above the adequacy cost. The proportion of schools securing the adequacy cost does not reach half of total high schools. Additionally, the average guarantee rate of adequate education is 1.06, which means that students attending a typical U.S. public high school are provided a little above the amount of $8,205.61 per year as of 2006. Finally, it is very remarkable that except for one school,
all successful schools are located in suburban regions, and there is no successful school in an urban region. This finding confirms that the U.S. suburban schools’ educational environments in terms of current expenditures are better than urban and rural schools.  

*Korean Educational System*  

*Quantitative resource aspects*  

Spending resources of Korean middle schools are the least equitably distributed, which might suggest a fair guarantee of equal resource opportunities. Specifically, except for megalopolis schools, all schools are provided spending so as to achieve equal resource opportunity from a vertical equity perspective. As in the U.S. educational system, teachers’ degree level is very equitably distributed among the Korean middle schools; however, percentage of non-tenured teachers is inequitably distributed. In particular, the horizontal inequity of non-tenured teachers’ distribution results from the existence of vertical equity in urban (metropolitan and megalopolis) middle schools and high special education student percentage schools.  

*Qualitative resource aspects*  

In the qualitative resource aspects, the sufficiency of physical resources, principal’s influence and academic press all perceived by principals are less equitably distributed in the Korean educational system. Specifically, the three qualitative resources are provided to Korean middle schools at a neutral formulation level. In this study, a neutral formulation level is assumed to be insufficient or unfair in terms of guarantee of equal opportunity because it means no relationship between resources and additional needs that should be accompanied by additional provisions of educational resources. In addition to the unequal resource opportunity in low SES and high special education student percentage schools, metropolitan middle schools are not
guaranteed equal resource opportunities in that the principals seriously perceive the quality of physical resources as a hindrance to student’s learning, and the level of academic press is lower than in other schools. In sum, three qualitative resources (the sufficiency of physical resources, principal’s influence, and academic press) need to be provided to achieve equal resource opportunities in the Korean educational system.

Adequacy cost aspect

In the Korean educational system, the average per pupil expenditure of these schools is $833.35, which indicates the cost of adequacy of middle schools as a compulsory education. 55.5 percent of middle schools are secured equal resource opportunities in terms of current expenditures. The proportion of schools securing the adequacy cost is more than half of total high schools, which indicates that the guarantee level of equal resource opportunities in the Korean middle school education stage is higher than in the U.S. high school education stage. Additionally, the average guarantee rate of adequate education is 1.59, which means that students attending a typical Korean middle school are provided over one and a half of $833.35 per year as of 2006. Finally, it is very remarkable that all successful schools are identified from each region except for rural region; however, there is a great deal of range in the guarantee rate of adequate education (SD: 1.51). This finding confirms that Korean rural schools’ educational environments in terms of current expenditure are poorer than other region schools.

Guarantee Conditions of Equal Outcome Opportunities

The ideal realization of equal educational opportunity lies in all students’ fulfillment of desirable educational outcomes sufficient for success in society. Therefore, there is a need to examine guarantee conditions of equal outcome opportunities in terms of both horizontal and vertical outcome equity. Non-academic outcomes are also considered in the guarantee of equal
outcome opportunities to provide all students with a sound school life as well as academic outcomes (Furlong & Morrison, 2000; Gottfredson et al., 2005; McEvoy & Welker, 2000; Welsh, 2000).

U.S. Educational System

On the one hand, results from horizontal outcome equity indicate that non-academic outcome (school disorder) in the U.S. educational system is more equitably distributed than academic outcome. Specifically, equity index values of non-academic outcome satisfy an absolute threshold of a desirable distribution by Odden and Picus (2008). Next, in terms of the academic outcomes between special-needs students and no special-needs students, no special-needs students are more guaranteed equal outcome opportunities than special-needs students. The differences of distributional inequity in both groups imply that more efforts and effective strategies should be implemented in targeting the guarantee of educational opportunities of special-needs students compared to no special-needs students. Finally, the distributions of both group students’ academic outcomes have inequitably changed across years, even though the differences in equity statistics are slight.

On the other hand, results from vertical outcome equity indicate that in terms of academic outcome, school SES level, rural, and LEP are positively associated with the mean of standardized math test score in 2002. The relationship between school SES and math score is the most strong among the three predictors. Adversely, high special education student percentage and high minority student percentage schools are not guaranteed equal outcome opportunities because they have a statistically negative relationship with math scores. Next, in terms of non-academic outcome, rural schools are positively associated with a high degree of school order; however, high minority student percentage and high LEP student percentage schools are not
secured equal outcome opportunities affecting the quality of students’ school life. In sum, the U.S. educational system does not secure equal opportunities in terms of both academic and non-academic outcomes to students attending high minority student percentage schools. Additionally, special education students are not guaranteed equal outcome opportunities in terms of an academic outcome, and LEP students are not secured equal outcome opportunities as well in terms of a non-academic outcome in the U.S. educational system.

Korean Educational System

On the one hand, results from horizontal outcome equity analysis indicate that academic outcome of the Korean middle schools is more equitably distributed than non-academic outcome. Specifically, the equity statistics of non-academic outcome are above an absolute threshold of a desirable distribution by Odden and Picus (2008). Next, in terms of the academic outcomes between special-needs students and no special-needs students, no special-needs students are more firmly secured equal outcome opportunities than special-needs students. Finally, the distributions of both groups’ academic outcomes have improved over the three years (2005-2007).

On the other hand, results from vertical outcome equity indicate that in terms of academic outcome, megalopolis is positively associated with the mean of standardized math test score. The relationship between school SES and math score is the strongest among the predictors having a significant association with math score regardless of coefficients’ signs. However, school SES impedes the fulfillment of equal outcome opportunities in the Korean educational system as in the U.S. case. Additionally, metropolitan middle schools have a statistically negative relationship with math scores, which indicates that the students are not guaranteed fair educational opportunity from an outcome perspective. Next, in terms of a non-academic outcome, rural
schools have a positive relationship with high degree of school disorder. Finally, metropolitan schools and high SES schools are not provided with fair educational opportunity of a non-academic outcome aspect in the Korean context.

The Relationship of Opportunity Guarantee between Resources and Outcomes

Adequacy Cost Guarantee and Outcomes

The guarantee rate of adequacy is proven not to secure equal outcome opportunities in terms of an academic outcome in the U.S. and Korean educational system. Accordingly, this study confirms that monetary resources only are not enough to guarantee equal outcome opportunities. Nevertheless, this study finds that the cost of adequacy is not meaningless in that its guarantee significantly affects high non-academic school performance from the U.S. non-academic outcome model. Finally, the guarantee of only adequacy cost in the Korean context is proven to be an ineffective way to secure equal opportunity in terms of non-academic outcome.

Relationship between Resource and Outcome Equity

The results through the analysis of resource and outcome equity indicate there is meaningful evidence of the relationships between opportunity guarantees in terms of resources and guarantees in terms of outcomes. First, the U.S. and Korean special-needs students are guaranteed equal resource opportunity in terms of spending; however, the academic outcome distributions in both countries are not equitably distributed compared to the U.S. and Korean no-special needs students.

Second, while the metropolitan middle schools exhibit more spending and tenured teachers but less physical resources’ sufficiency and less academic press than middle/small city schools, they are not guaranteed equal opportunity in terms of academic and non-academic outcome aspects. This relationship between opportunity guarantees of resources and those of
outcomes also confirms that the existence of vertical equity in only quantitative resources does
not simply induce a desirable distribution of educational outcomes.

Third, while high special education student percentage and high minority student
percentage schools are provided with spending resources equitably, the U.S. educational system
fails to guarantee a vertically equitable academic outcome to them.

Finally while LEP students of the U.S. educational system are guaranteed equal resource
opportunities in terms of neutral formulation, students attending high LEP student percentage
schools enjoy less ordered school life than low percentage counterpart students. This neutral
formulation relationship shown in the LEP students’ case also suggests that affirmative action
formulation of both qualitative and quantitative resources should be applied to distributing
educational resources in order to achieve equal educational opportunity ultimately.

Implications

The purpose of this study is to comprehensively examine the guarantees of educational
opportunities in terms of resource and outcome aspects in the U.S. and Korean educational
systems. In order to achieve the purpose, this study chose three types of analysis: resource equity,
adequacy, and outcome equity analyses. Within the major findings obtained by the three analysis
methods, the following sections draw research and policy implications this study holds for the
field of school finance.

Research Implications

Extension of the Concept of Equal Opportunity to Outcomes

The ultimate goal of the guarantee of equal opportunities in terms of resource aspects
surely lies in inducing the fulfillment of essential outcomes necessary for all students to live as
sound citizens regardless of background or inborn disability (Berne & Picus, 1994; Iatarola &
Stiefel, 2003). In this sense, this study included the equality of outcome aspects into a complete guarantee of equal opportunities and conducted outcome equity analysis to examine guarantee levels of equal opportunities in the U.S. and Korean educational systems. As a result, the following research implications were drawn from the empirical results of outcome equity analysis.

First, the findings of outcome equity analysis indicate that the distribution of academic outcome among special education students is less equitably distributed than academic outcome distribution of no special-needs students. Because average achievement levels of advantaged or minority (e.g., African American) students have been the focus of international student achievement surveys such as PISA and TIMSS, the inequitable outcome distribution of special education students has attracted little attention, relatively speaking. Therefore, this study implies that special-needs students should be better taken care of as well as minority students as policymakers act on the intent to secure a minimum level of academic performance for all students so as to permit them to live in society as responsible members.

Second, the horizontal distribution of non-academic outcome in the U.S. educational system presents an implication contradicting studies that claim the schooling performance of the U.S. educational system is inferior to other OECD countries. Although PISA and TIMSS regularly have reported the low academic achievement of minority students, if educational outcomes are expanded into non-academic aspects, claims questioning the effectiveness of the U.S. public high schools need to be reevaluated. Therefore, this study suggests that the U.S. educational system is not working as badly as previous literature has indicated.

Nevertheless, it should be mentioned that the U.S. educational system fails to improve unequal opportunities in terms of academic outcomes across the survey years (2002-2004). This
study reveals that the distributional inequity of academic outcome among the U.S. public high schools has worsened, while in contrast that of Korean middle schools has improved across three years (2005-2007). In addition to the changes of inequity levels, academic outcome of the U.S. public high schools is inequitably distributed in terms of absolute thresholds of a desirable distribution. The results of outcome inequity might be aggravated by huge influential effects of school SES on the distribution of educational outcomes provided by vertical outcome equity in the U.S. educational system.

Third, as shown in previous studies, the results of vertical outcome equity confirm that school SES levels significantly operate in the direction of impeding the guarantee of equal outcome opportunities. The negative influences of SES on guarantee of equal opportunities should spur new ways to compensate for this effect. This study has the potential to suggest compensational perspectives and ways such as giving attention to the distributional inequity of qualitative resources (e.g., parental support and school culture).

Finally, the results of outcome equity in the Korean educational system uncover unequal outcome opportunities of metropolitan middle schools. Korean educational policies historically have focused on the improvement of rural schools’ educational environments or the foundation of rural educational infrastructure (Ki & Jeong, 2005; H. J. Kim, 2008; Kong, Park, Song, & Yun, 2008; Korean Ministry of Education, 2008; Ministry of Education, Science, and Technology, 2009). Consequently, the inequitable academic and non-academic outcomes of metropolitan middle schools have been ignored, relatively speaking, compared to the issues of rural schools’ poor educational environments. In sum, through outcome equity analysis, the findings of this study allow for broadening the perspective of equal opportunities and revealing specific groups and regions that have been relatively neglected in terms of equal outcome opportunities.
Extension of Equity Objects to Qualitative Resources

This study presents limitations of the traditional perspective that focused on quantitative resources in achieving equal opportunities. In the field of school finance, spending variables and teacher quality variables such as teacher qualifications popularly have been used as equity objects. However, if the argument that resource equity analysis eventually will lead to achievement of equal opportunity in terms of educational outcomes (Berne & Picus, 1994; Hirsch, 2006; Iatarola & Stiefel, 2003; Reich, 2006) is accepted, it is reasonable that all variables, including qualitative resources, need to be considered in resource equity in the sense that qualitative resources are also essential to guarantee equal outcome opportunities. The following findings of this study confirm that the equitable distributions of qualitative resources are necessary to fulfill equal educational opportunities in terms of both resource and outcome aspects.

First, in the relationship analysis between resource and outcome guarantees, the result of this study shows that the U.S special education students are sufficiently provided spending resources equitably without securing qualitative resources; however, this study indicates that their academic outcome exhibits inequitable distribution horizontally and vertically. This perverse relationship between quantitative resources and an academic outcome suggests that quantitative resources only are not enough for special-needs students to level the playing field to realize their potential. Considering that both countries’ educational systems secure equal resource opportunities in terms of instructional expenditures, ratio of pupil to teacher, and teaching experience years to special education students, a meaningful resource equity analysis can result if qualitative resources such as peer’s educational aspiration and academic press are also considered equity objects in future school finance research.
Second, while the Korean metropolitan middle schools exhibit more spending and tenured teachers but less physical resources’ sufficiency and less academic press than middle/small city schools, they are not guaranteed equal opportunity in terms of academic and non-academic outcome aspects in the Korean educational system. This relationship between opportunity guarantees in terms of resources and outcomes also confirms that vertical equity of quantitative resources does not simply induce a desirable distribution of educational outcomes. Rather, this study shows that vertical inequity of qualitative resources in terms of affirmative action formulation might incur unequal outcome opportunities in the Korean educational system.

Third, while high special education student percentage and high minority student percentage schools are provided with spending resources equitably, the U.S. educational system fails to guarantee a vertically equitable academic outcome to them. At the same time, minority students do have sufficient physical resources not to hinder their learning; furthermore, minority students experience less academic press as a positive studious atmosphere than counterpart students. This perverse relationship between resources and outcomes in terms equal opportunity shows the importance of equitable distributions of qualitative resources as well as quantitative resources.

Finally, this study reveals that the U.S. school SES is more influential in determining resource inequity than the Korean school SES, and the resource most affected by school SES is academic press in the U.S educational system. Considering the fact that academic press is recognized as very influential on school culture in school climate literature, it is concluded that the influences of U.S. school SES on equal opportunities maximize in creating academically positive pressure. If there is recognition of the fact that the distribution of school culture resource has been neglected due to invisible characteristic, it is natural that qualitative resources such as
school culture should receive attention in order to reduce the negative effects of school SES on equal opportunities.

*Professional Judgment Approach Considering Qualitative Resources for Measuring Adequacy*

Beyond serving as a catchphrase for qualitative resources, a reasonable adequacy analysis has the potential to realize the importance of qualitative resources with the actual estimation of adequacy cost. This study indicates that guarantee rates of adequacy cost are significantly associated with the degree of school order, indicating the meaningfulness of adequacy analysis. Therefore, this study implies that the estimation of adequacy cost including distributional improvement cost of qualitative resources might strengthen the relationship between guarantee of adequacy cost and educational outcomes.

This study chose the successful school approach to estimate the cost of adequacy. However, this approach has a tendency to calculate the least per pupil expenditure among the four popular approaches (Downes, 2004; Taylor et al., 2005). Accordingly, the successful school approach is often used to estimate the base cost for predicting the future cost of adequacy in practice (Augenblick et al., 2006; Augenblick Palaich and Associates, 2007; Fermanich, Mangan, et al., 2006). More accurate and real spending can be examined by cost differential consideration using the cost function approach. However, the cost function approach also has the disadvantage of considering only qualitative resources necessary to achieve the desirable levels of school performance set by state or federal governments. Therefore, the professional judgment approach using statistical methods for estimating cost function is an effective alternative in that combining both approaches benefits from considering qualitative resources and cost differentials together.

*Equal Opportunity as an Affirmative Action Formulation Perspective*

Iatarola and Stiefel (2003) conceptualize the two criteria for guaranteeing equal
opportunity in resource aspects: (1) neutral formulation, which indicates a lack of association between resources and external factors and (2) affirmative action formulation, which indicates a actively positive association in the relationship. The results of empirical analyses support the claim that affirmative action formulation is a more effective criterion for reliably guaranteeing equal outcome opportunities. For example, the U.S. public high schools having a high percentage of minority students and those having a high percentage of special education students fail to guarantee outcome opportunity, while they guarantee equal resource opportunities at the neutral formulation level, but do not reach the affirmative action formulation level in terms of the sufficiency of physical resources and academic press, which are horizontally inequitably distributed in the U.S. educational system. The relationship implies insufficiency of neutral formulation as a condition of equal resource opportunities reliably leading to a guarantee of equal outcome opportunities.

Another finding that supports affirmative action formulation for completing equal opportunities is drawn from the guarantee case of LEP students’ educational opportunities. Specifically, LEP students of the U.S. educational system are guaranteed equal resource opportunities not in terms of affirmative action formulation but neutral formulation. For example, except for the fact that high LEP student percentage schools have less non-tenured teachers than low percentage counterpart schools, they do not have any affirmative action formulation across the four resources chosen for relationship analysis. Even though high LEP student percentage schools are secured equal opportunities according to a traditional perspective, this study indicates that high LEP student percentage schools are not guaranteed equal opportunity in terms of non-academic outcome. In sum, this neutral formulation relationship shown in the LEP students’ case also suggests that affirmative action formulation of both qualitative and quantitative resources
needs be applied to distributing educational resources in order to achieve equal educational opportunity completely.

_School Level SES’s Influence on Resources and Outcome Opportunities_

This study confirms that SES levels are the most influential factor affecting the distribution conditions of educational resources and outcomes in both countries’ educational systems. Accordingly, this study corroborates the fact that this unavoidable conclusion has not changed that much since the _Coleman Report_ in 1966 (Jencks & Mayer, 1990; Rumberger & Palardy, 2005). In particular, the U.S. school level SES significantly affects the distribution of almost all resources including qualitative resources such as parents’ concerns and fairness and clarity of school rules; furthermore, it consistently determines math test score in both countries’ educational systems. More elusiveness lies in the fact that school level SES is usually recognized as a factor out of policymakers’ control.

_Teacher Quality Differential Producing Differences in Both Countries’ Equal Resource Opportunities_

This study indicates that the resource making differences in both countries’ equal resource opportunities is teacher quality in terms of both quantitative and qualitative categories of resources. In the case of the U.S. educational system, the teacher quality variables except for teachers’ degree level are very inequitably distributed among public high schools in terms of horizontal and vertical equity. In particular, high special education student percentage and high minority student percentage schools are exposed to more non-tenured teachers, which indicates that they are not guaranteed equal resource opportunities. In addition to high inequity level, the descriptive statistics show that there is a notably high percentage of non-tenured teachers in the U.S. public high schools (8.25%) compared to that of Korean middle schools (.06%).
On the other hand, Korean middle schools are equitably provided teacher quality corresponding to region, special education and total family education cost, which indicates the existence of equal opportunities. The school level SES factor in the Korean educational system has no relationship with the distribution of teacher quality. In sum, the remarkable differences of the distribution conditions of teacher quality present a possible indication that teacher quality resources might underlie differences between math score deterioration of the U.S. public high schools and math score improvement of Korean middle schools across survey years.

Policy Implications

From the key findings and research implications of this study, the following policy implications can be suggested to realize the purposes of the study in practice. First of all, both countries’ educational systems should expand the concept of equal educational opportunity using the two kinds of perspectives. Specifically, for guaranteeing equal opportunities in terms of resource and outcome aspects, both countries’ policymakers should

1. Improve the distributional inequity of academic outcomes between special-needs and no special-needs students.

2. Improve the distributional inequity of qualitative resources.

For guaranteeing equal resource opportunities in the U.S. educational system,

1. The U.S. public high schools should be provided with a lower average percentage of non-tenured teachers.

2. The negative effects of School level SES on equal opportunities need to be minimized by compensating for the differences in SES level with attention to the distribution of qualitative resources.
3. The U.S. urban public high schools first need to be provided with input resources sufficiently.

4. The U.S. rural public high schools need to be provided with higher degree level and more experienced teachers.

5. The U.S. high special education student percentage public high schools need to be provided with more extracurricular activities.

6. The U.S. high minority student percentage public high schools need to be provided with more tenured and experienced teachers and extracurricular activities.

For guaranteeing equal resource opportunities in the Korean educational system,

1. Korean middle schools (particularly metropolitan/megalopolis and low SES level middle schools) should be provided with higher ratios of instructional to current expenditure.

2. Korean low SES level middle schools need to be provided with an increased level of parents’ concerns about student’s study and school activities.

3. Korean metropolitan middle schools need to be provided with an increased level of parents’ trust in teacher quality and high academic press.

4. Korean rural middle schools and high special education student percentage middle schools need to be provided with more qualitative resources from an affirmative action formulation perspective.

For guaranteeing equal outcome opportunities in the U.S. educational system,

1. The horizontal inequity of math test scores needs to be improved.

2. The vertical inequity of math test scores needs to be improved for the U.S. high special
education student percentage and high minority student percentage public high schools.

3. The vertical inequity of the degree of school order needs to be improved for the U.S. high minority student percentage and high LEP student percentage public high schools.

For guaranteeing equal outcome opportunities in the Korean educational system,

1. The horizontal inequity of the degree of school order needs to be improved.
2. The vertical inequity of math test scores needs to be improved for Korean metropolitan middle schools.
3. The vertical inequity of the degree of school order needs to be improved for Korean low SES level middle schools and metropolitan middle schools.

For guaranteeing the relationship between equal resource opportunities and equal outcome opportunities, both countries’ policymakers should

1. Improve adequacy analysis methods so as to include the cost for achieving distributional equity of qualitative resources.
2. Guarantee equal outcome opportunities and provide qualitative resources together.

Limitations

Different Comparative Subjects

The purpose of this study is to compare distributional equity of resources and outcomes and the cost of adequacy in the public education boundary in the U.S. and Korean educational systems. The private schools are excluded in the study because they have been recognized as an organization having autonomy in terms of governing and financing mechanism. Consequently, if
research subjects are extended to private schools, it is hard to draw general conclusions on how equal opportunities are guaranteed or how they can be achieved. For this reason, this study chose the U.S. public high schools and the Korean middle schools as analysis subjects.

However, the U.S. middle schools should be used as a counterpart of Korean middle schools, if the data for them were available. Basically, the different education stages of middle school and high school create significant differences in amounts and conditions of educational resources. Therefore, the different results from resource and outcome equity analyses in both countries’ educational systems might sometimes be confused because of different research subjects. For example, in the case of the cost of adequacy in both countries, there are about 10 times differences, and it is not very clear what proportion is caused by both countries’ public educational systems. The amount differences in adequacy cost might result from economic growth differences or differences in educational stage. This limitation could be solved by using the data sets having common comparative subjects (e.g., PISA or TIMSS); however, the PISA and TIMSS datasets do not provide information about qualitative resources that are definitely necessary for achieving the purpose of this study.

*Limited Value Ranges of Likert Scaling in Qualitative Resources*

Regarding the horizontal equity index’s values of qualitative resources, it basically has limited value ranges such as from 1 to 3, 4, or 5 because of the characteristics of Likert scaling. Accordingly, the distribution of abstract/psychological variables is not expected to be dispersed that much compared to the distribution state of quantitative and continuous variables. This limitation causes overall equitable distribution of qualitative resources in both countries’ educational systems. However, the usage of qualitative resources as equity objects is definitely a meaningful way to support the argument that quantitative resources only are not enough to
achieve equal resource and outcome opportunities. Therefore, in further research, stricter threshold criteria for desirable distributions of qualitative resources estimated by Likert scaling need to be developed to judge the distributional inequity. Using larger ranges of scaling might be one alternative; however, reasonable deviation should be provided as well in determining the value ranges of qualitative resources.


The ELS:2002 data set does not provide school level spending information. Because school district is the minimum level having the authority to decide the levels of local educational expenditures and revenues corresponding to local property tax amounts in the U.S. educational system, the Common Core Data (CCD) for financial information are also reported by each district unit. This inconsistency of subject level between an analysis unit and a survey unit is a factor that is out of the control of researchers. Thus, I merged the district level financial information into each public high school used in this study using common district codes. The merged information might not be representative values of a research subject level; however, it is not that problematic considering that ultimately all states fund districts rather than schools in the U.S. educational system (Berne & Stiefel, 1983; Evans et al., 1997, 1999; Rolle & Liu, 2007; Rubenstein et al., 2000).

Next Steps

Exploring Additional Factors for Non-Academic Models

The results of school disorder regression model in both countries suggest that instead of the external factors used in this study, other influential factors should be explored to achieve equal outcome opportunities in terms of non-academic outcomes. This study implies there might be factors explaining the variances of non-academic outcomes such as school violence different
from factors affecting academic outcomes (e.g., Furlong & Morrison, 2000; Greene, 2008; Welsh, 2000). Specifically, the U.S. and Korean non-academic outcome models account for 17.4 percent and 16.9 percent out of total variances of school disorder, respectively. These figures are much lower than those of academic outcome models (62.6% for U.S. and 63.6% for Korea). Therefore, there is a need to explore new determinants of school disorder in further research.

*Education Production Function Study Using Qualitative Resources*

This study might prompt a new direction in education production function study using qualitative resource variables such as operational resources (school rule) and cultural resources (academic press, belief, etc.). In order to examine the relationship between qualitative resources and educational outcomes completely, more frequent and accumulated research of qualitative resources’ effectiveness is needed than has been performed before (He, 2009; Leyden, 2005).

The education production function study using qualitative resources will allow for deeply examining the importance of the resources in determining absolute levels and distributional inequity. For example, this study shows that Korean low SES schools are provided a relatively low parental support. Further research on whether or not low parental support affects educational outcomes in the low SES schools will allow for strengthening the persuasiveness of the claim that parental support as a qualitative resource should be considered an effective policy target for improving equal opportunities in the Korean educational context.

Additionally, synthesizing vertical equity analysis with education production function study, the effects of the resources that especially exhibit an extreme inequity on the levels of educational academic and non-academic outcomes need to be scrutinized with deliberation. The relationships revealed by the synthesis analyses will help policymakers to achieve equal educational opportunity as an ultimate goal. For example, peer effects in the U.S. high special
education student percentage public high schools are not exerted positively, indicating the existence of vertical inequity. This study also presents the finding that the distributinal inequity of special education students’ math test scores is worse than Korean high special education student percentage middle schools. Thus, examining how the low peer effects in the U.S. public high schools having a higher percentage of special education students affect absolute levels and relative inequity of academic outcomes might be a meaningful step for improving the achievement gaps between advantaged and disadvantaged students. Finally, it will be also significant to attempt to examine the relationship between school disorder and qualitative resources used in this study.

Educational Aspiration of Minority Students in the US

Contrary to previous literature, this study finds that the U.S. high minority student percentage public high schools exhibit high educational aspiration, indicating the existence of positive peer effects. Considering that racial composition is often utilized as the proxy variable of peer effects (e.g., A. Gamoran, 1996; Jencks & Mayer, 1990; Kahlenberg, 2001; Rumberger & Palardy, 2005), the finding of this study might provoke researchers to reexamine the further relationship between educational aspiration and more specifically divided racial compositions or educational outcomes and the different peer effects of each racial group.

Exploring Reasons for Different Guarantee Levels in Qualitative Resources

This study presents an interesting finding that the distribution conditions of qualitative resources are oppositely shown between metropolitan and megalopolis middle schools even though the two regions are not much different in terms of the provision of quantitative resources. For example, middle schools located in the two regions are provided with more tenured teachers and low ratios of instructional to current expenditures in terms of quantitative resources;
however, metropolitan middle schools exhibit parents’ mistrust of teacher quality and low academic press, in contrast to the completely opposite conditions of qualitative resources in megalopolis middle schools. The finding of this study provides motivation to scrutinize reasons for and influences of the distributional differences in the qualitative resources between metropolitan and megalopolis middle schools in the Korean educational system.
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