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AN ANALYSIS OF THE CAUSES OF SHADOW EDUCATION IN THE ERA OF THE SCHOOLED SOCIETY

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Hyung-Kee Kim

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The dissertation of Hyung-Kee Kim was reviewed and approved* by the following:

David P. Baker
Professor of Education and Sociology
Dissertation Adviser
Chair of Committee

Soo-yong Byun
Assistant Professor of Educational Theory and Policy

Roger C. Shouse
Associate Professor of Educational Leadership

Edgar P. Yoder
Professor of Extension Education

Gerald LeTendre
Professor of Education and International Affairs
Department Head, Education Policy Studies

*Signatures are on file in the Graduate School.

ABSTRACT

The aim of this study is to examine whether the expansion of higher education across countries is associated with the growth of shadow education as a function of families' efforts to ensure attainment of educational opportunities. To address this research objective, this study samples approximately 163,000 students, nested in 21 Organization for Economic Cooperation and Development (OECD) countries, who took the 2009 Program for International Student Assessment (PISA). This study employs multilevel logistic regression in order to investigate the research question. An analysis of whether the relationship between the expansion of higher education and the use of shadow education is substantial after controlling for national- and individual-level variables follows.

The current study found a significant, positive relationship between the expansion of higher education and shadow education use in academic subjects for 21 countries in terms of the average growth rate of the population with higher education between 1955 and 2005 (AGR). The relationship was substantial even after controlling for national- and individual-level variables. This means that a student in a country with a high AGR was more likely to participate in shadow education than a student in a country with low AGR. When higher education was institutionalized in terms of AGR, shadow education use increased as a supplementary tool to achieve academic success in public education.

This study also supports previous findings that a female student from a family with high socioeconomic status (SES) was more likely to participate in shadow education

than a male student from a family with low SES. The findings show that while high-stakes testing did not have a substantial relationship with shadow education use in analyses with 21 and 20 countries, public education expenditure was negatively associated with shadow education use in the analysis with 20 countries. Further, the gross domestic product (GDP) per capita and the relative income between high school and college graduates did not have significant relationships with shadow education use in the analyses with 21 and 20 countries, respectively. Public social expenditure was negatively associated with shadow education use for 20 countries. Therefore, the results of this study suggest that economic and social benefits are not likely to be determinants of shadow education, while the institutionalization of higher education in terms of AGR is related with shadow education use. In other words, the findings support the assertion that neo-institutionalism can explain the growth of shadow education use in parallel with the expansion of higher education across 21 OECD countries, although the functionalism, human capitalism, and competitive theory perspectives seemed to explain the relationship.

This study contributes to the research literature by expanding the empirical understanding and body of evidence for the relationship between shadow education use and the expansion of higher education and the characteristics of shadow education. In the present era of mass shadow education, shadow education is rapidly becoming a salient focus of education policy around the globe. This research can help policymakers better prepare relevant policy measures for increasing shadow education use in order to supplement academic deficits, particularly for low-achieving students from families with low SES.

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CHAPTER 1

INTRODUCTION

The aim of this study is to examine the relationship between the expansion of higher education and shadow education as a means for families to increase a student's educational opportunities by enhancing that student's prospects for academic achievement. Shadow education refers to "a set of educational activities outside formal schooling [that] are designed to enhance the student's formal school career" (Stevenson & Baker, 1992, p. 1639). This study illuminates the characteristics of shadow education as an institution[1] to determine if shadow education use is growing in parallel with higher education across the sampled countries.

In the past two decades, scholars have focused on shadow education as a new locus for educational research. Pioneering comparative studies on shadow education have revealed that shadow education is prevailing around the globe (e.g. Baker, Akiba, LeTendre, & Wiseman, 2001; Bray, 1999). Prior to the last two decades, shadow education was found in only a few countries, namely Japan and Korea, and in conditions specific to East Asia. However, comparative studies began to show that shadow education, which includes supplemental attributes to formal schooling, was becoming a worldwide phenomenon. The studies also revealed that the students who were low-

[1] Institution means norms (rules) and practices ascribed to everyone within a society, such as marriage (Lee, 2003; Powell & DiMaggio, 1991). In addition, reality is socially constructed within the institution (Baker, 2009; Berger & Luckmann, 1967).

achievers on international assessment tests were the main customers of shadow education (Baker et al., 2001).

In spite of the global use of shadow education, there has been considerable debate and controversy over the causes and the effects of shadow education from a single-country to an international and comparative research. Many scholars have argued that the rate of return of the investment in shadow education and student competition for a limited number of positions at prestigious colleges are the main reasons why families buy shadow education services. The purpose behind buying these services is to enhance student achievement scores to increase the student's chances to enter highly selective colleges (e.g. Bray, 1999; Dang & Rogers, 2008). Over the last decade, scholars of neo-institutionalism have presented new insights, suggesting that the institutionalization of public education and the growth of shadow education should be considered together, and that shadow education can be viewed as an institution through single-country research in Japan and Korea (e.g. Lee, 2003; Mori & Baker, 2010). Researchers who approach shadow education from an institutional perspective have emphasized that, considering the expansion of public education, viewing shadow education as an institution can also help explain shadow education growth. Although these scholars opened up new avenues of research on shadow education, current studies have not examined the relationship between the expansion of public education and shadow education from a comparative and international perspective. Specifically, previous studies lack empirical evidence about shadow education on a number of fronts. First, a small number of researchers were concerned with evidence related to the institutional characteristics of shadow education across nations in terms of educational opportunity (e.g. Baker et al., 2001). Second,

although Lee (2003) found that the motive for shadow education did not come from pursuing a student's and a family's economic and social gains in Korea, the rate of return from higher education and social competition are still considered one of the main determinants for participating in shadow education for educational opportunity (Bray, 1999; Oh, 2011). These reasons still stand as key determinants for pursuing shadow education, although empirical studies across countries have not yet been conducted to show otherwise.

Based on the limitations and implications of previous studies, this study provides evidence and policy and theoretical implications for the relationship between higher education and shadow education. Specifically, this study investigates and questions the relationship between the expansion of higher education and shadow education use with respect to intention to increase educational opportunity. To examine this relationship, this study looks at national-level educational variables (high-stakes testing and public educational expenditures, GDP per capita, private internal rate of return from higher education and public social expenditure), and individual-level variables (economic, social, and cultural status (ESCS), achievement scores, and gender) as control variables.

To address the research question, the structure of the study is as follows. First, there is a review of the literature on shadow education. The review explores the expansion of higher education and its relationship with shadow education use in the schooled society in terms of educational opportunity. The schooled society is defined as a society where "not only all children and youth attend long periods of formal schooling and adult status is mostly determined by academic outcomes, but [is] also one where all institutions are increasingly influenced by the ideas, values, and norms originating out of

education as a social institution" (Baker, 2009, p. 2). Second, the relevant methods and data used to investigate the research question are articulated. Third, the results of multilevel logistic regressions are presented, followed by a discussion of these results, the study's policy and theoretical implications, and finally, its limitations.

Background on Shadow Education

Private tutoring has a long history as a primary type of educational learning activity (e.g., see the case of Japan in Mori & Baker, 2010). However, private tutoring lost its primary status in education when public education supplanted private education as a responsibility of the family or community (Katz, 1987). Shadow education has evolved into a new type of education alongside formal schooling, and scholars have shed light on shadow education globally since the 1990s.

Although research on shadow education was conducted before the 1990s, mainly in East Asian countries such as Japan and Korea (e.g., Kim et al., 1981; Rohlen, 1980), the term "shadow education" was not well-established. Since the 1980s supplementary private tutoring has received increased international attention by researchers (Mori & Baker, 2010), and Stevenson and Baker (1992) coined the term shadow education. It has since become a common term, and now shadow education and private supplementary tutoring are used interchangeably (e.g., Bray & Lykins, 2012; Lee & Lee, 2008; Mori, 2012). Stevenson and Baker (1992) used the term 'shadow' specifically to explain the strong linkage between public education and informal educational activities that resemble formal schooling activities. They emphasized that shadow education parallels public

education and argued that it can have a positive effect on students' academic achievements (Baker & LeTendre, 2005). Lee (2003) also argued that shadow education can be conceptualized as a family's intentional efforts to enhance their children's academic careers.

Shadow education includes various forms of educational activities, regardless of the place where the services are provided (Bray, 1999; Byun, Schofer, & Kim, 2012; Lee, 2003). For example, a remedial class provided by a school can still count as shadow education if the classes are held after the school's regular class time.[2] Bray (1999) used the term "shadow education system" to refer to private supplementary tutoring and described the characteristics of shadow education as it relates to mainstream public education. He explained that shadow education exists only when formal education exists, that the size and shape of shadow education resemble those of formal education, that the public puts more emphasis on formal education than shadow education, and that the features of shadow education are less typical than those of formal education. In short, he views shadow education as ancillary to formal education. His descriptions do not seem to differ from Stevenson and Baker's (1992) position in that both see the existence of formal schooling as a prerequisite for shadow education (Baker & LeTendre, 2005). Baker and colleagues further articulated the relationship between formal education and shadow

[2] There seems to be a controversy over whether an after school program is a kind of shadow education. According to Stevenson and Baker's definition of shadow education, after school programs that support low-achievers and are provided by a school funded by the government or paid for by students in Korea and the United States do count as shadow education. However, the Korean government has denied that these after school programs are a kind of shadow education, although the government had considered the programs as shadow education for at least the past 30 years (MEST, 2009; NSEC, July 30, 1980). This might be because President Lee's government (Feb. 2008 through Feb. 2013) in Korea was asked to reduce the private educational expenditure for shadow education as a primary task of the national government around 2009. If the tuition for the after school programs was excluded from the calculation of the private educational expenditure, the total private educational expenditure would have been reduced.

education, saying that, "[t]he term shadow education conveys the image of outside-school learning activities paralleling features of formal schooling" (2001, p. 2). In other words, shadow education imitates formal schooling in every aspect of form, content, and teaching methods (Baker & LeTendre, 2005; Bray, 2009; Lee, 2003).

Shadow education as a normative partner to formal schooling has been prevailing and growing for the past few decades in every corner of the world from developed countries such as Japan to less developed countries such as Cambodia and Kenya (Assaad & Elbadawy, n. d.; Baker & LeTendre, 2005; Bray, 1999, 2009; Bray & Lykins, 2012; Dang & Rogers, 2008; Dawson, 2010; Silova, 2010; Stevenson & Baker, 1992). Globally shadow education has become a popular type of learning activity. For example, 38% of eighth grade test-takers in 43 participating countries in the 1995 Trends in International Mathematics and Science Study (TIMSS) used shadow education, and the participation rate increased to include 47% of all students in 48 countries participating in the 2003 TIMSS (Baker et al., 2001; Lee & Lee, 2008). More than 50% of students in Eastern European countries used private tutoring services between November 2004 and January 2005 (Silova, Budiene, & Bray, 2006). Ninety three percent of freshmen in colleges in Azerbaijan used shadow education during their final grade of secondary school between November 2004 and January 2005 (ibid).

Based on the prevalence and growth of shadow education globally, scholars have started to pay attention to who the main users of shadow education are, differentiating between high- and low-achievers to articulate whether the main purpose of engaging in shadow education is to supplement a student's academic deficit or to compete with other students. When Baker and colleagues (2001) analyzed the 1995 TIMSS database, they

distinguished the high-achiever's enrichment motive from the low-achiever's remedial motive. They reported that, cross-nationally, the low-achiever's remedial motive for the current academic subject was the main reason for participating in shadow education. Analyzing whether the remedial or the enrichment motive for participating in an after school program was dominant based on evidence from the 2003 PISA, Southgate (2009) reported that the remedial motive was dominant in 25 out of 36 participant countries. However, in an extension of Baker and colleagues' study, Lee and Lee (2008) reported that the enrichment motive was dominant for grade 12 students in the 1995 TIMSS in the Russian Federation, South Africa, Denmark, and Australia, although they supported Baker and colleagues' finding that the remedial motive was dominant among grade eight students in these countries .

Shadow education now represents all kinds of out-of-school learning activities that supplement regular academic courses. As Baker and colleagues predicted, shadow education has become a social and global institution alongside formal schooling. While the institutional characteristics of shadow education were illuminated in a single-country study (e.g. Japan in Mori & Baker, 2010), a small number of studies have examined whether evidence of the institutional characteristics of shadow education exist across countries from the viewpoint of increasing educational opportunity. The next chapter details the rationale behind this study.

CHAPTER 2

RATIONALE FOR THE STUDY

Higher education is a part of overall public education, and the expansion of higher education also represents part of the overall institutionalization of formal education (Baker, forthcoming; Benavot & Riddle, 1988; Fuller & Rubinson, 1992; Meyer, 1977; Meyer, Ramirez, & Soysal, 1992). However, it does not seem fully orthogonal to explore whether the expansion of higher education is only associated with the growth of shadow education or whether the greater institutionalization of formal education is associated with shadow education. The current study focuses on the possibility of the first kind of association, which is also the narrower of the two questions about the relationship between shadow and formal education, not only because the expansion of higher education seems close to shadow education use in terms of educational opportunity, but also because a majority of the previous studies have focused on the first potential relationship.

The Expansion of Higher Education and Shadow Education as a Means of Increasing Educational Opportunity

The purpose of this study is to investigate whether shadow education is a means for a student to increase his/her educational opportunity while higher education continues to expand. Student enrollment in higher education has increased dramatically across

countries since the 1960s, and it has almost become a prerequisite for populations in advanced economies (Baker, forthcoming; Schofer & Meyer, 2005). Students participate in shadow education more and more to supplement their academic deficits in public education across countries. By investigating shadow education alongside the expansion of higher education, the meaning of shadow education as a tool for enriching educational opportunity can be revealed. However, little is currently known about the meaning of shadow education use across countries. In this vein, this study investigates the following research question:

> Is the expansion of higher education related to shadow education use across countries?

The following sections examine the evidence for the expansion of higher education over the past century as well as theoretical explanations for this expansion, and then finally the relationship between the expansion of higher education and shadow education.

Enrollment in higher education[3] has been used as an indicator for the expansion of higher education (e.g. Schofer & Meyer, 2005). Enrollment in higher education was around 3% or less in 1950, around 10% or less in 1975, and around 20% or less in 1995 across nations (ibid). The gross tertiary education enrollment ratio on average in 2007 was over 25% across countries, and 70% or more in 2007 in North America and Western

[3] The number of universities, the higher education enrollment, the higher education expansion regardless of social differentiation and economic development, the expanded curriculum, and the increasing influences of the university organization on society are suggested as indicators of the expansion of higher education worldwide (Frank & Meyer, 2007).

Europe[4] (UNESCO, 2009). Although higher education enrollment in East Asian countries was less than 50%, 70% or more high school graduates entered higher education (ISCED 5A) in some countries, such as Poland and Korea, in 2008 (OECD, 2010a).

The Expansion of Higher Education

The dominant theories on educational expansion, such as the technical functionalism and human capitalism, and conflict theories, can help explain the different degrees of educational expansion across countries by focusing on local characteristics, such as economic development and colonialism (Schofer & Meyer, 2005). However, neo-institutionalist theory views the expansion of higher education as an inevitable result of the stepwise expansion of public education (Baker, 2009; Meyer et al., 1992).

First, the technological functional theorists and human capitalists argue for a tight relationship between education and economy (Becker, 1962; Clark, 1962; Collins, 1971; Schultz, 1961). From these perspectives, students attend public schools in order to acquire skills relevant to the workplace, not only because occupations are allocated based on the match between a job seeker's skills and specific job offerings, but also because education is an efficient way to achieve the skills required in business (Bills, 2003). When technical developments occur, people will extend their education in order to meet

[4] In terms of the average graduation ratio of higher education, around 40% of an age cohort on average graduated from a university-level education in 2007 in the 24 OECD countries, ranging from below 20% in Greece to above 60% in Iceland (OECD, 2009). The average rate of graduation from a university-level education institution has increased by 18% between 1995 and 2007. In addition, 9% of an age cohort is expected to have a certificate from a vocationally oriented institution in the 24 countries.

an industry's requirements before seeking a job (Collins, 1971). For functional theorists, the expansion of higher education is a natural result of people's economically rational choices and behaviors.

Human capital theorists, also germane to functionalists, argue that people enhance their capacities for jobs by increasing their educational credentials in order to gain more economic returns than they could before (Bills, 2003). Human capitalists take the view that educational credentials indicate job-seekers' abilities and productivity, which determine payoffs (Becker, 1962; Bills, 2003; Schultz, 1961). As a result, college graduates receive more payoffs than high school graduates or those with less education. When people pursue the maximization of economic returns, they attend public schooling longer than their former generations. In sum, the expansion of higher education is the result of people's economically rational choices for the purpose of gaining economic remuneration through formal education.

Second, conflict theorists argue that competition for limited economic goods and social status produce the higher education expansion (Collins, 1971; Schofer and Meyer, 2005). They view education as a means for dominant groups to maintain their preferred social orders, and thus they reproduce the previous orders reflecting the privileged groups' interests through formal schooling (Bowles & Gintis, 1976; Collins, 1971). For example, public education is used as a tool for distinguishing adolescents with the same gifts by their families' origins because students from the dominant group are likely to have had a longer period of education than those from other groups (Bowles & Gintis, 1976). Status competition theorists assert that students compete with other students in order to win a limited number of social positions that are allocated to the winners (Collins, 1971, 1979;

Boudon, 1974). For instance, as educational credentials are used to screen job-seekers, students and parents increase the length of a child's education, and then, consequently, expansion from elementary to higher education occurs. Status competitions may result in oversupplying the labor market with college graduates. In this sense, the researchers who talk about over-education or *diploma disease* argue that the overeducated will cause economic inefficiency (Dore, 1976; Sicherman, 1991 cited in Baker, 2011).[5]

Third**,** higher education is not exclusive to the elite or dominant social groups, and it is not simply a venue to accrue economic benefits. In other words, higher education has become a normative learning activity for all populations in the late twentieth century (Baker, forthcoming; Bohonnek et al., 2010; Brennan, 2004; Guri-Rosenblit, 2011; Trow, 2005). The institutional perspective on the expansion of higher education views the expansion as the extension of stepwise expansions from elementary to secondary education as part of the process of nation-building and the formation of human capital (Baker, forthcoming; Meyer et al., 1992; Ramirez and Boli, 1987). In addition, neo-institutionalists deny the previous perspective that the expansion of higher education came from changes in the demand and supply of laborers in the past century, because neo-institutionalism holds the view that public education has its own institutional trends that are not easily changed unless tremendous changes occur (Meyer, Ramirez, Frank, & Schofer, 2006; Powell & DiMaggio, 1991; Tyack & Cuban, 1995).

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[5] Contrary to this argument, Yano (2012) suggested that the overeducated workers will find jobs relevant to their degrees and knowledge (skills), taking an example from England between 1980 and 1986. For those six years, the overeducated workers decreased from 38% in 1980 to 30% in 1986 (Dolton & Vignoles, 2000). In addition, the so-called overeducated workers have contributed to organizational and national developments through their embedded knowledge and skills (Baker, forthcoming)

From the institutional perspective, the expansion of higher education is the result of a longing for the extended education that is considered as a normative or taken-for-granted learning activity. Once people acknowledge that educational credentials are advantageous to graduates in every aspect of their future lives, school enrollment rises. This rise is based on the socially constructed culture that education is considered an institution that is taken for granted (Baker, 2009; Berger & Luckmann, 1967; Coleman, 1988). As the importance of public education increases, more educated parents are likely to invest in their children's education, because they fully understand the importance of public education in the era of the schooled society (Baker, 2009, 2011, forthcoming; Lee, 2003; MEST, 2008; Tyack & Cuban, 1995). In sum, the expansion of higher education is a normative result from parents' investments in children's education in the process of the stepwise expansion of education. Indeed, global institutional changes—from increasing democratization and human rights, scientization, the advent of development planning and the structuration of global policy—are linked with the rise of a new model of society. This rapid expansion of higher education gained traction after the 1960s (Schofer & Meyer, 2005).

The Relationship between the Expansion of Higher Education and Shadow Education Use

As described earlier, many studies on higher education expansion and shadow education have been conducted, but scholars have not paid much attention to the relationship between the two. However, there are implications from the previous studies

that can be inferred. First, the technical functionalists and human capitalists assumed a direct link between educational credentials and job assignment[6], suggesting that students put emphasis on educational credentials and consider higher education as a means of economic success in the labor market. As a result, students may consider shadow education as a means of enhancing their academic achievements or increasing the length of their education, because educational credentials help graduates succeed in the workplace. When students want to increase their level of educational credentials from the upper secondary education to higher education based on their enhanced academic achievements, they may expect a higher private Internal Rate of Return from higher education (hereafter IRR) compared to the private internal rate of return from upper secondary education[7]. If the increase in IRR occurs, students' desires to acquire a high IRR would rise. In order to achieve their goal of gaining a high IRR, students will use shadow education as a means to enhance their educational opportunities. From functionalism and human capitalism, the following statement could be inferred. If IRR increases, the desire for higher education will increase. Thus, these perspectives might suggest a positive relationship between higher education expansion and shadow education use.

In addition, from a functionalist perspective, it can be inferred that the growth of shadow education is a result of parents and their children's dissatisfaction with public

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[6] Scholars of technical functionalism and human capitalism argued that the relationship between higher education expansion and national economic development differs by economic development (El-Khawas, 1998).

[7] Woo et al. (2004) argued that a demand for shadow education is decided by a lifetime expected return.

education (Lee & Jang, 2008; Oh, 2011). This reasoning suggests that if public education functions normally and it meets students' demands for quality formal schooling, shadow education will decrease. Some scholars and governments stand on this view (e.g., Bray, 2011; MEST, 2009a). In addition, some scholars argue that a malfunctioning of public school comes from a lack of qualified educational investments when public education expands rapidly (Kim & Lee, 2001). In sum, shadow education is considered an alternative to public education when the latter does not function as well as a society expects it to function.

Second, for the conflict theorists, shadow education is considered a tool to maintain or reproduce a previous social order if it helps students from high SES families—who can buy shadow education services—increase their chances of academic success. In addition, from the status competition theoretical perspective, shadow education is also a crucial tool to compete with other students for limited valuable social and economic positions. If students get in on the race of competing with others, they want to receive higher education by using shadow education in a country where upper secondary education becomes more common. When higher education expands, shadow education will also grow. For example, shadow education has functioned as a means to compete with other students since the Meiji Restoration (Mori & Baker, 2010). Even after upper secondary education became popular, higher education was not expanding enough to accept all students who wanted to go to prestigious universities in Japan, as exemplified by the hierarchy of higher education in terms of college entrance exam scores (Stevenson & Baker, 1992). Graduates from those prestigious universities were guaranteed to have socioeconomic benefits in terms of salary and promotion in Japan.

Accordingly, a student may use shadow education as a means to compete with other students.

Lastly, once education functions as a legitimate allocator of adult roles including job assignment based on people's educational credentials, students will increase their educational credentials from upper secondary education to tertiary education. A certain minimum level of academic achievement is required to go to higher education institutions. Students then participate in shadow education as a means to supplement their academic deficits in academic subjects. Contrary to the argument from status competition theory, Lee (2003) found that although the cost for shadow education increased and the number of slots in colleges increased (thus, the rate of return decreased) between the 1970s and 2000s in Korea, shadow education use also increased. In other words, economic or social benefits did not cause the expansion of shadow education in Korea. As shadow education acquired an auxiliary status for public education, it became a normative element of schooling (Baker & LeTendre, 2005; Lee, 2003). Meanwhile, the level of the expansion of higher education means that higher education is institutionalized in a country. The more higher education permeates the public, the more it is institutionalized. Shadow education responds to the level of institutionalization of higher education. The more higher education expands, or becomes institutionalized, the more shadow education is used.

The Limitations of Previous Studies

Although examining shadow education as an isomorphic global phenomenon alongside the expansion of higher education can help people understand the causes of shadow education, what is less clear is the relationship between shadow education and higher education expansion. As described above, the three different theoretical perspectives reached different conclusions on the reasons for the expansion of higher education and its relationship to shadow education use in terms of pursuing educational opportunity. From the technical functionalism and human capitalist camps and the status competition theorists' perspectives, economic and social returns from education seem to be the main reason for the use of shadow education. On the contrary, neo-institutionalists assert that shadow education in the schooled society becomes a normative learning activity that helps students to supplement their academic success in the public education system (Mori & Baker, 2010).

Lee's (2003) longitudinal study on the relationship between higher education and shadow education between 1972 and 2001 in Korea reported that the empirical evidence did not support the arguments from the functional and the conflict theories, but aligned with the neo-institutionalists' perspectives. According to Lee, those arguments were based on the rate of return from higher education or status competition for limited positions in the labor market, but were more consistent with the normative aspect of shadow education. In other words, although the rate of return from higher education decreased and the number of slots in colleges increased (i.e., higher education expanded), the rate of participation in shadow education, the private educational expenditures on shadow education, the time invested in shadow education, and the number of Korean cram schools, or *Hakwon*, had risen (ibid). He also reported that shadow education was

not an exclusive service for an elite group to maintain their dominance; rather, the middle class, such as groups of medium-income or semi-professional workers, used shadow education more than those from the privileged or higher class. Even if at first shadow education had been used for the purpose of accruing economic and occupational benefits, it has since acquired the status of a normative institution alongside formal schooling, following the latter's institutional rules of public education (see the isomorphic process in Japan in Mori & Baker, 2010). As a result, most researchers and the people acknowledge that shadow education is a necessary and normative type of education in a country, with a high use of shadow education, such as Korea (Kang, 2011; Kim, 2012b; Woo et al., 2009).

What is less clear is whether Lee's findings are applicable to other countries (though it appears possible theoretically speaking), and whether social and economic gains are the main determinants for using shadow education across countries. The growth of shadow education may be the result of a normative and isomorphic process of shadow education mimicking formal schooling. In this sense, economic and social benefits may not affect the growth of shadow education across countries. Indeed, although there may be an association between the expansion of higher education and shadow education use, little is known about this association from a comparative and international perspective. To articulate the gaps in the previous studies, the current study examines whether there is an association between the expansion of higher education and shadow education use in academic subjects across countries in terms of educational opportunity.

CHAPTER 3

DATA and METHODS

The purpose of this study is to investigate whether the expansion of higher education is related to the use of shadow education in academic subjects in order to increase educational opportunity. In addition to this question, this study examines whether the relationship is substantial when national- and individual-level variables are controlled. The following sections provide descriptions of the 2009 PISA, the data used to investigate this potential relationship, the way the variables were measured, and the statistical models.

Data

The main database for this study is the 2009 PISA , which is provided by OECD. The 2009 PISA is an international assessment test of 15-year-old students that has been conducted every three years since 2000. On average, around 7,315 students in 34 OECD countries and 31 non-membership countries or economies participated in the 2009 PISA, ranging from 4,298 students in France to 25,887 students in Spain (OECD, 2012).

Pioneering comparative studies on shadow education used TIMSS (e.g., Baker et al., 2001). However, the 2009 PISA is better suited for this study for the following reasons. First, the 2009 PISA used directed questionnaires to inquire about students' shadow education use. For example, students were asked whether they attended

enrichment or remedial out-of-school-time lessons in reading, mathematics, science, and other school subjects (see Appendix A). Second, the 2009 PISA provides more internationally comparable[8] information on individual and family backgrounds than does TIMSS. Third, most of the participant countries in the 2009 PISA are considered developed countries, while several developing countries as well as developed countries participated in TIMSS. The advanced countries seem to better fit the goal of this study in terms of the institutionalization of education, because advanced economies have experienced the stepwise expansion of public education moreso than some of the participant countries in TIMSS. Fourth, the accessibility of the national-level variables explored in this study is high in OECD countries, because OECD provides a variety of socioeconomic variables.

In addition to the 2009 PISA database, this study employs national-level data from different sources such as other OECD databases, the World Bank's economic database, and Barro-Lee's educational attainment data set, because this study investigates the research question when controlling for national-level variables that the 2009 PISA

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[8] For the past few centuries, there have been controversies over the validity and reliability of large-scale international student assessment tests and their uses, especially in terms of the sampling bias, test bias, and educational quality of the test. First, Bracey (1997) argued that the sampled students are not representative, that there are variations in enrollment rate in a subject, for example, math class in 12th grade, and that the high-achievers are intentionally selected in some countries. However, others contradict these issues (Baker, 1997; Stedman, 1994); this camp argued that students from the U.S. do not come from the high-achieving group and their attendance in math class is not different from students from other countries. Second, there is another controversy over the curriculum students learn. Bracey argued that students from the U.S. are disadvantaged in algebra because they learn it in 9th grade and that the questionnaires are culturally biased (1997). However, American students show poor achievement in all areas in math, and back-translation cures the problems of biased questions (Baker, 1997; Stedman, 1994). Third, the boom in international assessment tests is instigated by media and marketing needs (Bracey, 1997). Although the media has this kind of tendency, the data from the international assessment tests are useful to renew the public education system (Baker, 1997; Stedman, 1994). OECD has pursued an increase in global cooperation and shadow information based on their belief in comparability.

does not provide. Barro and Lee's (2013) dataset provides educational attainment data for 146 countries every five years from 1950 to 2010, as well as information on the distribution of educational attainments among the over-15-year-old category and the 25-year-old or older population by sex at seven levels of schooling. These seven levels of schooling include no formal education, incomplete primary, complete primary, lower secondary, upper secondary, incomplete tertiary, and complete tertiary, and include the average years of schooling every five years by country based on the datasets of UNESCO, Eurostat, and other sources (Barro and Lee, 2010; See www.barrolee.com).

Study Sample

Using two-stage stratified cluster sampling and random sampling, the 2009 PISA selected students from public and private schools in 65 participant countries. The PISA selected 15-year-old students attending an educational institution. The PISA chose them in order to compare the results of their education in terms of preparation for the challenges of a knowledge-based society, not only because compulsory education ends around the age of 15-years in most countries, but also because school enrollment at this level is almost universal in most OECD members (OECD, 2012).

The present study focuses on OECD countries first, because of trouble acquiring comparable data for national-level variables from non-OECD members. In addition, this study selects 21 OECD countries—Australia, Austria, Belgium, Canada, Czech Republic, Denmark, France, Germany, Hungary, Ireland, Japan, Korea Republic, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, and

the United States—as the sampled countries because 13 countries—Chile, Estonia, Finland, Greece, Ireland, Israel, Italy, Luxembourg, Mexico, the Netherlands, Poland, Slovenia, and Turkey—of the 34 total OECD member countries do not provide data for at least one or more of the relevant national-level variables.

This study does not include school-level variables, because the aim is to reveal the relationships between the expansion of higher education and shadow education from a national-level comparative perspective. There may be some variation by schools; however, the current study focuses on national-level similarities and differences. This is not to say that school-level variables are not important in the relationships, but this study disregards the influence of school-level variables in order to examine the relationships at the national-level.

This study selected 163,428 15-year-old students as the sample from 21 OECD countries out of the 65 total countries that participated in the 2009 PISA. The sample is limited to students who provided information on shadow education use, family and individual background, and achievement scores in reading, mathematics, and science literacy. As described in Table 3.1, 9,839 students (5.7%) are excluded, because they did not provide all the information that this study requires. The proportion of missing cases is relatively small, so this study used a listwise deletion. The final analytical sample consisted of 163,428 15-year-old students from 21 OECD countries as shown in Table 3.1.

Table 3.1 Sampled students and missing cases

	Test-takers	Missing cases		Sampled students	Shadow education users in academic subjects	
		numbers	rate		numbers	rate
Australia	14,251	858	6.0	13,393	3,069	22.9
Austria	6,590	430	6.5	6,160	1,926	31.3
Belgium	8,501	628	7.4	7,873	1,841	23.4
Canada	23,207	1,046	4.5	22,161	4,782	21.6
Czech Republic	6,064	328	5.4	5,736	2,623	45.7
Denmark	5,924	458	7.7	5,466	1,005	18.4
France	4,298	222	5.2	4,076	1,727	42.4
Germany	4,979	783	15.7	4,196	1,488	35.5
Hungary	4,605	77	1.7	4,528	1,801	39.8
Ireland	3,937	269	6.8	3,668	1,014	27.6
Japan	6,088	181	3.0	5,907	3,340	56.5
Korea	4,989	268	5.4	4,721	3,787	80.2
New Zealand	4,643	203	4.4	4,440	1,083	24.4
Norway	4,660	155	3.3	4,505	1,114	24.7
Portugal	6,298	397	6.3	5,901	2,979	50.5
Slovak Republic	4,555	139	3.1	4,416	1,936	43.8
Spain	25,887	1,785	6.9	24,102	13,327	55.3
Sweden	4,567	197	4.3	4,370	984	22.5
Switzerland	11,812	426	3.6	11,386	2,998	26.3
United Kingdom	12,179	738	6.1	11,441	5,958	52.1
United States	5,233	251	4.8	4,982	1,345	27.0
OECD	173,267	9,839	5.7	163,428	60,127	36.8

Measures

Dependent Variable.

The goal of this study is to investigate whether the expansion of higher education is associated with shadow education use across nations in terms of educational opportunity. To address this question, whether a student participated in shadow education in any academic subject (reading, mathematics, science, and other school subjects) is the dependent variable of this study. The information on students' participation in shadow education is provided by the 2009 PISA database. Test-takers were asked to answer eight questions on shadow education use in academic subjects (see Appendix A). Specifically, the 2009 PISA asked students to answer whether they used shadow education in reading, mathematics, science, and other school subjects for enrichment or remedial lessons, regardless of the location of the services, including school, home, or somewhere else.

A student was counted as a user of shadow education if he or she attended any type of out-of-school-time lesson. In other words, test-takers were divided into users and non-users of shadow education, regardless of their motives for shadow education. Among 163,428 students in 21 countries, 36.8% had used shadow education in at least one academic subject when they took the 2009 PISA assessment test, as Table 3.1 shows (see Appendix A).

Independent Variables.

In order to measure the independent variable, the expansion of higher education, was measured using the average growth rate of the population who experienced higher

education (AGR). Although Schofer and Meyer (2005) presented an overall growing trend in the expansion of higher education around the globe during the twentieth century using college students per 10,000 capita over a century, there does not seem to be an agreed-upon research measure for the expansion of higher education. Indeed, it seems that cross-sectional data (e.g., higher education enrollment in 2008) may be limited in showing a growing trend in higher education, while longitudinal data is more relevant because it shows the trajectory of growth of higher education and reflects how much higher education has been institutionalized or accumulated by the whole population of a country. The rate of the population with higher education for a specific time may be used, but it may cause bias in measuring the expansion of higher education because it measures mixed-aged cohorts.

In this regard, this study uses Barro-Lee's longitudinal educational attainment dataset, which provides the rate of the population aged over 25 with higher education per country every five years. This dataset mirrors the development of higher education in a country over the past 50 years and reflects the degree of institutionalization of higher education in the adult population. Thus, this study uses AGR as a proxy for the expansion of higher education (see Appendix B). In the Barro-Lee dataset, the increased unit (e.g., the population with higher education in 1960 minus the population with higher education in 1955) is divided by the population with higher education in 1955 in order to measure the increased value for the given five years. By measuring AGR through this formula, this study tried to assess how much the population with higher education had increased for the past 50 years.

AGR (the average growth rate of the population with higher education between 1955 and 2005) = [[{(1960-1955)/1955} + {(1965-1960)/1960} + {(1970-1965)/1965} + {(1975-1970)/1970} + {(1980-1975)/1975} + {(1985-1980)/1980} + {(1990-1985)/1985} + {(1995-1990)/1990} + {(2000-1995)/1995} + {(2005-2000)/2000}] / 10] x 100

The Operationalization of the Other Variables.

This study also includes the following national- and individual-level variables, because there has been controversy over the relationships between these variables and shadow education use. The following section reviews the national-level variables, such as high-stakes tests and public expenditure on public education, as well as an examination of why this study includes other national- and individual-level variables. After the discussion of these reasons, the ways the variables were measured are presented.

National-level variables.

In addition to the fact that the institutionalization of shadow education may have a theoretically positive relationship with overall education expansion in that shadow education is supposed to function as a means for students to meet minimum academic requirements (Baker et al., 2001), high-stakes testing and the quality of public education in terms of public educational expenditure as a percentage of the GDP appear to be related to the growth of shadow education. Based on this, this study reviews the previous work on high-stakes testing and public education expenditure in relation to shadow

education. In addition, the previous research on other national-level variables such as GDP per capita, IRR, and public social expenditure is reviewed.

High-stakes testing.

High-stakes testing may intensify the participation in shadow education in a country, such as Japan, where an achievement score may decide a student's long-term livelihood prospects (Stevenson & Baker, 1992). Academic success in terms of an achievement score is considered to reflect the student's ability to fulfill a job assignment in a knowledge-based society. From the conflict theorists' perspective, therefore, shadow education can be considered as an important means to prepare for the competition for a limited number of valuable social positions. This view suggests that when an educational system uses high-stakes testing, students may increase their shadow education use because they think of shadow education as a means to increase their achievement scores. However, neo-institutionalists view this issue differently. High-stakes testing in itself does not cause a surge in shadow education use because students also participate in shadow education as a remedial strategy to meet a minimum level of academic performance (Baker et al., 2001).

Bray (1999, 2011) first argued that national high-states testing may affect the level of shadow education use, taking Finland as an example. He asserted that the educational system in Finland does not have high-states testing, so only a small number of Finnish students use shadow education. In other words, if high-stakes tests are introduced, the exam stresses students because it shapes their future pathways. As a result, they increase their participation in shadow education to compete with other students

(Bray, 2011; Gauci & Wetz, 2009). Many scholars support Bray's suggestion, arguing that high-stakes testing may encourage students' shadow education use (Fergany, 1994; Foondun, 1992, cited in Southgate, 2009: 19; Lee, 2011; Lee and Lee, 2008; Tansel & Bircan, 2004; Psacharopoulos & Papakonstantinou, 2005). If an education system has a bottleneck where students want to pass between educational stages, shadow education may be a useful tool to compete against rival students. In this sense, it is argued that a college entrance exam as a high-stakes test encourages students' shadow education use to grow (Lee, 2011; Tansel & Brican, 2006 cited in Lee & Lee, 2008).

Contrary to Bray's argument, other scholars armed with neo-institutionalism views suggest that shadow education useparallels the path of the universalization of formal schooling. A comparative study on shadow education use that examined the 1995 TIMSS reported that high-stakes testing did not affect shadow education use (Baker et al., 2001). Baker and colleagues hypothesized that high-stakes testing might be a barrier to entering a prominent university and acquiring continuously high-paid work positions, which are limited mostly to high achievers with formal schooling. However, the test-taker's main strategy behind participating in shadow education in the 1995 TIMSS did not come from a competitive motive, but from a supplementary motive. The institutionalized remedial motive was more popular than the enrichment motive, not because students used shadow education to record high achievement scores, but because students were asked to succeed at a minimum level of education (ibid). In this sense, shadow education may be used more often in a country where the level of institutionalization of formal schooling is higher than other countries, not in a country with high-stakes testing (ibid). For example, the rate of participation in shadow education

increased during the process of the expansion of higher education in Korea between 1972 and 2001 regardless of college competition rates (Lee, 2003).

Although Baker and colleagues found a non-significant result of the effect of high-stakes testing on shadow education, some scholars argued that the proxy for high-stakes tests used by that study has low reliability. For example, Lee and Lee (2008) questioned the validity of the students sampled in Baker et al.'s (2001) study, suggesting that 8th graders are not representative of the population of students taking high-stakes tests because they are remote from having to take a college entrance examination (Lee & Lee, 2008). Lee and Lee's critique was based on the assumption that it is the competition rate of college entrance examinations that influences the level of shadow education use. However, as Lee (2003) pointed out, the competition rate of a college entrance examination was not associated with the expansion of shadow education. The PISA sample of 15-year-old students used in the current study is comprised of mostly 10th graders who are close to taking a college entrance examination. To measure whether a country has a high-stakes testing system, this study adopts Baker and colleagues' (2001) application of Bishop's (1998) Curriculum-Based External Exit Examination in Secondary school (CBEEES). The variable is coded as follows: 0 is given to a country with regular use of high-stakes tests in mathematics and science (N=9: Austria, Czech Republic, Denmark, Hungary, Japan, Korea Republic, New Zealand, Slovak Republic, and the United Kingdom), and 1 to the other countries (N=12: Australia, Belgium, Canada, France, Germany, Ireland, Norway, Portugal, Spain, Sweden, Switzerland, and the United States) (see Appendix C).

The quality of education.

Some studies have argued that public investments in education do not increase the quality of formal schooling (Coleman et al., 1966; Dobson, 1977; Jencks, 1972), while others have suggested that an increase in public educational expenditure improves school quality which then increases student achievements that are linked to social and individual developments (UN, 2010). Similarly, Kim and Lee (2001) asserted that the rapid expansion of formal schooling resulted in a lack of educational resources when they analyzed the Korea Institute for Consumer Protection's survey on private tutoring in 1997 and the national statistical office's 1998 annual urban household expenditure survey in Korea. The result, they stated, was that school quality was aggravated. Students might use shadow education in order to supplement the deficits of formal schooling if public education has not met students' educational needs due to lack of sufficient educational investments. In a less developed country, shadow education may be an alternative to supplement the deficits in access to public education (Dawson, 2010; Mori & Baker, 2010). Dawson viewed the expansion of shadow education as the result of low school quality stemming from an imbalance between the supply of and demand for public education. In other words, students' dissatisfaction with low school quality increases their participation in shadow education.

Baker and colleagues (2001) tested whether the development of public education as it relates to public educational expenditure is positively related with shadow education use by analyzing data from 41 participant countries in the 1995 TIMSS. They found that shadow education was more popular in a country with low public educational expenditure. The evidence from the developing countries and the less developed countries in Africa

and East Asia supports Baker et al.'s finding that the low quality of public education is one reason for shadow education use (Bray, 1999; Buchmann, 2002; Dang & Rogers, 2008; Dawson, 2010; Lee & Kim, 2002; Lee & Lee, 2008). These studies suggest that shadow education is used as a supplementary means to formal schooling in countries with less developed public education, and that school quality in terms of public education expenditure is negatively associated with shadow education.

Contrary to the dominant view of the relationship between school quality and shadow education, some scholars have argued that low school quality does not have an influence on shadow education use. For example, Lee and Shouse (2011) stated that low school quality is not associated with shadow education use based on their analysis of the Korean Education and Employment Panel in 2004. Oh (2011)[9] found that the decision on whether to participate in shadow education or not seemed to be more related to the degree of institutionalization of shadow education than school quality, supporting Baker and colleagues' hypothesis that shadow education is more prevalent in a country with a high degree of school quality measured by public education expenditure and elementary and secondary education enrollment rates.

These different arguments and findings suggest that low school quality in terms of public educational expenditure may be associated with shadow education use across countries. To investigate the effect of school quality on shadow education use, this study

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[9] School quality in terms of students' satisfaction with schooling in general and evaluation of teachers did not have a significant effect on the participation in and expenditure for shadow education (Oh, 2011). Tenth graders in Korea who were satisfied with the quality of Korean language classes used shadow education more than those who were not satisfied with the quality. This trend was also shown in math and English among 11th graders, but it was not shown for Korean language classes among 11th graders (ibid).

includes the variable of public education expenditure and investigates its relationship with shadow education alongside higher education expansion and education competition as measured by high-stakes testing. School quality is measured by the rate of public educational expenditure as a percentage of the GDP based on the World Bank database, which ranges from 3.4 percent in Japan to 7.7 percent in Denmark in 2008 (see Appendix C).[10]

GDP per capita.

Although shadow education is prevailing across all countries (Bray, 1999, 2009; Baker et al., 2001), it is more popular in countries with low school quality and low school enrollment (Baker et al., 2001; Dang and Rogers, 2008). This result suggests that a low GDP per capita in a less developed country with low school quality leads to an increase in shadow education use.

Even though GDP per capita is positively related with school enrollment and school quality, and low school quality in terms of low public educational expenditure increases shadow education use (Baker, forthcoming; Baker et al., 2001; Dang & Rogers, 2008), what is less clear is whether the expansion of higher education is significantly associated with shadow education use when GDP per capita is constant. The previous studies suggest that GDP per capita is negatively associated with shadow education use; on the other hand, when considering the development of higher education in countries

[10] The average public education expenditure as a percentage of total government expenditure among the 34 OECD countries in 2008 was 12.7%, ranging from 21.6% in Mexico and 17.5% in Chile to 9.4% in Italy and Japan to 9.2% in Greece (data.worldbank.org).

with a higher GDP per capita compared to those with a lower GDP per capita, it is reasonable for shadow education to more likely prevail in those countries with more developed higher education.

To further examine these inconclusive effects, this study considers the level of economic development across countries, which is measured by GDP per capita, logged, in 2008. The value of GDP per capita was taken from a World Bank dataset and ranges from 9.6 in Hungary to 11.5 in Norway, originally from 15,365 USD in Hungary to 95,190 USD in Norway (see Appendix C).

IRR (the private Internal Rate of Return from higher education).

Although a few scholars have argued that the effect of public education on economic and occupational status is small (Jencks, 1972), other scholars more closely aligned with human capital theory believe there is a direct link between education and job assignment (Bray, 1999; Bills, 2003; Schultz, 1961; Stevenson & Baker, 1992). In addition to the direct relationship between education and the labor market, when education as a primary institution legitimizes every aspect of other institutions, education can singularly determine people's everyday lives as well as their job assignments (Baker, 2009; Meyer, 1977; Schultz, 1961; Stevenson & Baker, 1992). If education and job assignment are tightly linked, and if people acknowledge that academic achievement reflects cognitive ability and the probability of success in the workplace, people may value academic success in formal schooling and educational credentials in their job-seeking activities (Baker, 2011; Bills, 2003; Stevenson & Baker, 1992). In this sense, Baker states,

> "The dominance of educational credentialing for occupation is a central consequence of the educational revolution, both in terms of the educational requirements themselves and in supporting a pervasive logic by which educational credentialing becomes evermore legitimate and pushes aside older, non-education forms of credentialing" (forthcoming, p. 15).

As described earlier, scholars from the technical-functionalists, human capitalists, and conflict theorists would have thought that the economic or social benefits of educational credentials are the main reasons for shadow education use if the scholars with these perspectives had seen shadow education. Contrary to this reasoning, Lee (2003) found that although the cost of shadow education increased and the slots in colleges increased (thus, the rate of return decreased), shadow education use was also increased. In other words, the economic or social benefits seemed to be unrelated to the expansion of shadow education between the 1970s and 2000s in Korea.

Meanwhile, an additional year of schooling brings a higher level of earning (Becker, 1962; Bills, 2003; Coleman, 1988; Hanushek, 1994; Kang, Yoon, & Park, 2011; Thorbecke & Charumilind, 2002). This may be because an educational credential is considered a predictor of a worker's productivity (Baker, forthcoming; Bills, 2003; Schultz, 1961). In this vein, an income gap due to education level is considered as a cause of shadow education in terms of a consumer's rational choice, a choice that is based on the rate of return from education (Bray, 1999, 2003; Kim & Lee, 2001; Woo et al., 2004). For example, in Singapore, the income gap between having no schooling and having higher education was five times, and the income gap between high school graduates and

bachelor degree holders was three times in the mid-1980s. This income gap is a reason for using shadow education (Bray, 1999; Kwan-Terry, 1991, cited in Bray, 1999).

By analyzing the private internal rate of return[11] (IRR) of OECD members, some studies reported that the private internal rate of return has increased over the past century. A recent study on the private internal rate of return from tertiary education compared to upper-secondary education in the 21 OECD countries—Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States—between 1991 and 2005 suggests that an additional year of higher education is more advantageous than secondary education by eight percent or more on average, and that the the private internal rate of return is slightly increasing (Boarini & Strauss, 2007; Brunello, Comi, & Lucifora 2000; Dang & Rogers, 2008; similar result in Psacharopoulos, 2009; Strauss & De la Maisonneuve, 2007). Therefore, the high rate of return from tertiary education is considered a main factor in students' participation in shadow education as a tool for competitive examinations (e.g., college entrance examinations) if there is high stakes testing and competition is high (Bray, 1999, 2007; Dang & Rogers, 2008; Tansel, 2002). Accordingly, it may be inferred that the high IRR influences the demand for shadow education, not only because shadow education users want to enhance their academic careers in formal schooling in order to gain wage

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[11] The private return on tertiary education is the gross wage premium (OECD, 2009d). OECD defines the private internal rate of return as follows: "The private internal rate of return is equal to the discount rate that equalizes the real costs of education during the period of study to the real gains from education thereafter. In its most comprehensive form, the costs equal tuition fees, foregone earnings net of taxes adjusted for the probability of being in employment minus the resources made available to students in the form of grants and loans" (See http://stats.oecd.org/glossary/detail.asp?ID=5412).

premiums, but also because enhanced academic careers will help a student get a decent job with a higher salary (Baker & LeTendre, 2005; Bray, 1999, 2007; Ko, 2011[12]; Stevenson & Baker, 1992). Chung, Lee, & Choi (2004) examined the wage gap between high school and college graduates by analyzing a basic survey of wage structure by education in 25-54-year-old regular workers between 1982 and 2002 in Korea. They reported that a college graduate was more likely to have a higher wage than a high school graduate for the entire period of time. The college graduate's advantage in wage decreased between 1982 and 1994 from 40% or more to 20% or less, and then increased between 1994 and 2002[13] to 25% or more. These fluctuations in the wage premium correspond to time-series data on the rate of return from education based on an analysis of the relationship between years of schooling and earnings.

The expected high the private internal rate of return from public education per annum, in turn, may motivate educated parents to invest more in their children's education. Thus, it is important to examine the relationship between the IRR and shadow education use in order to understand whether the IRR is the cause of shadow education. In other words, the IRR may change the degree of the schooled parents' demands for

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[12] In a single country analysis of the income gap between the top ten colleges and the other colleges in Korea (for a similar phenomenon in Japan, see Amano, 1986; Stevenson & Baker, 1992), the income gap between the two groups increased from 4% in 1999 to 10.8% in 2002, to 20% in 2005, to 23% in 2008 (the wage premium due to a prestigious college persists after controlling for the college entrance score in Korea (Jun et al., 2011)). Ko (2011) asserted that the wage gap might come from the skill-biased technical change (the rate of growth of the demand for more-skilled workers widened the wage structure when the labor market began to diversify in 1980; See Goldin and Katz, 2007). Her argument suggests that high-achievers may use shadow education more than low-achievers in order to enter the top ten colleges. However, if the high-achievers were not the main users of shadow education, these arguments for the effect of economic returns on shadow education could not be substantial.

[13] Although the supply of college graduates increased after 1994, the wage gap between high school graduates and college graduates increased. Chung et al. (2004) attribute this increase in the wage gap to the increase in the demand for college graduates.

shadow education. However, what is less clear is what the relationship is between the IRR (income inequality) and the demand for shadow education from the comparative education perspectives. In this sense, this study examines the IRR alongside the expansion of higher education. The IRR is measured as the relative rate of returns from higher education compared to upper secondary education among the 25-64-year-old population (high school graduate=100). The IRR is used to assess the effect of educational investment between higher education and upper secondary education, using the OECD database (OECD, 2010a). The average IRR among the 21 sampled countries was 153 in 2008, ranging from 118 in New Zealand to 210 in Hungary (see Appendix C).

Public social expenditure.

For the countries with the same IRR, Esping-Andersen's (1990) classification[14] based on welfare regime[15] may suggest that private educational investment in public education and shadow education is likely to be larger in a country in which families take

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[14] Gosta Esping-Andersen (1990) classified the advanced countries into three categories in terms of welfare regime (accent on welfare): the socialist regime (e.g., Sweden), the conservative regime (e.g., Germany), and the liberal regime (e.g., the United States). Decommodification, defamilization, and the welfare state as an employer are differences among the three welfare regimes: 1) Decommodification means that labor revenue is substituted by the welfare state, either as direct income transfers or indirect subsidized goods (services). Decommodification increases the lowest wage rate at which a worker would be willing to accept a particular type of job (Mandel & Shalev, 2009, p.1877); 2) Defamilialization refers to "the state taking responsibility for care work that would otherwise fall primarily on wives and mothers, thereby freeing them to take paid employment" (ibid, p.1878), and 3) the Welfare State as Employer refers to how the welfare state as an employer affects wage inequality (ibid, 1879).

[15] "The welfare state has been approached both narrowly and broadly. Those who take the narrower view see it in terms of the traditional terrain of social amelioration: income transfers and social services, with perhaps some token mention of the housing question. The broader view often frames its questions in terms of political economy, its interests focused on the state's larger role in managing and organizing the economy. In the broader view, therefore, issues of employment, wages, and overall macro-economic steering are considered integral components in the welfare-state complex. In a sense, this approach identifies its subject matter as the 'Keynesian welfare state' or, if you like, 'welfare capitalism'" (Esping-Andersen, 1990, pp. 1-2).

greater responsibility for their welfares (liberal) than in a country that favors national responsibility for the welfare of a household (social-democratic). If a student under a liberal regime does not attend a tertiary institution, he or she may have to endure the consequences of losing wage premium due to higher education and take care of himself/ herself during his/her lifetime. However, a student under a social-democratic regime may have a chance to receive governmental support through a government-structured societal mechanism (e.g., pension and taxation), corresponding to a degree of loss of wage premium if the student does not attend a tertiary institution. As a result, although public education is universal in countries with advanced economies, and although shadow education is prevailing across all countries, the intensive use of shadow education may be related more closely to a welfare regime as it has people take care of themselves further into the future. People in a country with individual responsibility may be more likely to care for themselves in the future than people in a country with national responsibility, so people in a country with individual responsibility may increase their level of education for the sake of their welfares by using shadow education. Meanwhile, Mandel and Shalev (2009) found that the gender wage gap among 25-55-year-old workers is related to welfare state by using the Luxembourg income study[16] for 17 OECD countries.[17] They reported that governmental interventions such as subsidies (e.g., in a social-democratic regime) helped decrease the wage gap.

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[16] "The main data source is the Luxembourg Income Study, a repository of microdata from large-scale surveys of household income and employment that have been harmonized to facilitate cross-national comparison (See www.lisproject.org)."

[17] Conservative (Austria, Belgium, France, Germany, Italy, Ireland, the Netherlands, Spain); Liberal (Australia, Canada, Switzerland, U.K., U.S.A.); Social Democratic (Denmark, Finland, Norway, Sweden)

Schultz (1961)[18] suggested that if the goal of welfare is to achieve equal distribution of personal income in a society, and if public educational investment in human capital is an effective way to remove unequal income distribution, the different levels of income distribution may influence the different levels of welfare in a nation-state. Considering that the realistic income inequality by different levels of human capital is linked with educational credentials, the degree of governmental responsibility for a population's welfare may be negatively related to parents' educational aspirations in terms of investments in not only public education, but also shadow education. Therefore, this study includes welfare state variables when it examines the relationship between the expansion of higher education and shadow education use. A welfare state may have a relationship with shadow education as a means of enhancing academic success in public education. The less governmental support expected by the public, the stronger the aspiration to attend formal schools may be among parents and their students (shadow education use may follow the same track as public education). Therefore, it is valuable to see if a welfare state is related to shadow education use.

Public social expenditure as a proxy for welfare state in 2008 is measured by public expenditure on social affairs as provided by the OECD social expenditure database (SOCX). Public social expenditure consists of nine categories: old age, survivors[19], incapacity-related benefits, health, family, active labor market programs, unemployment,

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[18] "Presumably it turns on ideas about welfare. A strong welfare goal of our community is to reduce the unequal distribution of personal income among individuals and families. Our community has relied heavily on progressive income and inheritance taxation. Given public revenue from those sources, it may well be true that public investment in human capital, notably that entering into general education, is an effective and efficient set of expenditures for attaining this goal. Let me stress, however, that the state of knowledge about these issues is woefully meager." (Schultz, 1961, p. 15)

[19] Survivors include "the spouse or dependent of a deceased person" (OECD, 2007, p.13).

housing, and other social policy areas[20] (OECD, 2007; See stats.oecd.org). The average public social expenditure was 20.7% across the 21 countries between 2000 and 2008, ranging from 6.3% in Korea to 29.6% in France (see Appendix C).

Individual-level variables.

In addition to the national-level variables, the individual-level causes of shadow education have received worldwide attention. To examine the substantial relationship between the expansion of higher education and shadow education, this study examines the effects of the following individual-level variables that are suggested causes of shadow education.

Family's background.

The family as an economic, social, and cultural resource provider has received much attention in educational research (e.g., Bowles & Gintis, 1976; Bourdieu & Patterson, 1977; Collins, 1979; Lee, 2003). Many studies have suggested a stable relationship between parents' education and shadow education use. The more educated parents are, the more their children participate in shadow education (e.g., Bray, 2003; Foondun, 2002; Lee, 2002; Kim, 2004). However, these relationships change depending on the rate of shadow education use by country (Southgate, 2009). By analyzing the 2003 PISA, Southgate (2009) found that parental educational and occupational levels are more often associated with shadow education use in countries with intensive use of shadow

[20] Childcare and early education services are just below 1% of the GDP. The cross-nation variation ranged from about 0.2% of the GDP in Korea to over 2% of the GDP in Denmark (OECD, 2007).

education (e.g., Brazil, Korea), a finding that aligns with a single-country study in Korea (Kim, 2010). Contrary to these findings, some countries have made efforts to help students from low socioeconomic status (SES) families use shadow education (e.g., No Child Left Behind in the United States). Although many researchers suggest that students from high SES families are more likely to use shadow education, these government policies that affirm shadow education may have effects on the use of shadow education among students from low SES families in some countries such as the United States. To understand the relationship between a family's socioeconomic background and shadow education use alongside the expansion of higher education across countries, this study includes aneconomic, social, and cultural background variable in order to control for the effect of SES on the shadow education use. Test-takers' economic, social, and cultural statuses are operationalized by the ESCS (economic, social, and cultural status) index provided by the 2009 PISA. The ESCS index is computed with higher parental occupation (HISEI), higher parental education expressed as years of schooling (PARED), and the index of home possessions (HOMEPOS) (OECD, 2012, pp. 312-315).

Achievement.

In addition, the decision on whether to use shadow education may be related to students' achievement scores. In the 1995 TIMSS and the 2003 PISA, the main users of shadow education were low achievers (Baker et al., 2001; Lee & Lee, 2008; Southgate, 2009). Further, low achievers from low-income families were the main users of shadow education in the 2006 PISA in the United States (Mori, 2012). In contrast, high achievers were more likely to use shadow education in Korea according to Korean national surveys

between 2008 and 2010, although the Korean government had implemented the after school voucher program targeting low achievers from low income families (MEST, 2008, 2009b, 2010). In order to examine the conflicting effects of students' academic achievements on shadow education, this study includes students' achievement scores. The sampled students' achievement scores are measured by summing their scores in reading, mathematics, and science, which are individually provided by the 2009 PISA dataset.

Gender.

Enrollment in secondary schools and higher institution has been higher for women than men since the 1990s (OECD, 2009a; Schofer & Meyer, 2005). Although the private internal rate of return from upper secondary education is higher for women than for men, men's wages have been higher than women's (Boarini & Strauss, 2007; Brunello, Comi, & Lucifora, 2000; Mandel & Shalev, 2009; Psacharopoulos, 2009; Strauss & De la Maisonneuve, 2007). As opposed to the conventional expectation that parents are more likely to invest in the education of boys than girls (Bray, 1999), female students are more likely to participate in shadow education in the 2003 PISA participant countries (Southgate, 2009). Southgate reported that female students were more likely to use shadow education in most, but not all the countries. According to Southgate (2009), in five of the seven countries with a high use of shadow education, female students were more likely to use shadow education than male students. In 14 of the 18 countries with medium shadow education use, female students were more likely to buy shadow

education services than male students. And in 4 of the low-use shadow education countries, there was no female advantage.

Contrary to the single gender's advantage in shadow education use, gender difference in shadow education use is not constant across countries. In Kuwait, Egypt, Malaysia, Malta, and Taiwan, the participation rate in shadow education differed by gender (Bray, 1999), while there was no significant gender gap in Japan and Korea (Lee, 2003; Stevenson & Baker, 1992). On account of these conflicting findings and the trend of female students' advantages in school enrollment and transition rate to tertiary education, this study investigates whether gender has an effect on shadow education use among the 2009 PISA participant countries. In order to measure gender in this study, 1 encodes female students and 0 encodes male students.

Table 3.2 summarizes all the variables used and how they were measured. Table 3.3 presents the descriptive statistics for all variables by using an original value although this study used a grand mean centering method for ESCS, the summated achievement scores in reading, mathematics, and science, AGR, public education expenditure, GDP per capita, IRR, and public social expenditure to analyze the following models.

Table 3.2 How the variables used in this study were measured

	Operational variables	Measures	Database
Dependent variables			
Shadow education use	Whether a student participated in shadow education in any academic subject (mathematics, science, reading, and other school subjects)	1=if a student participated in shadow education in any academic subject 0=non-user	2009 PISA
Independent variables			
The expansion of higher education	The average growth rate of the population with higher education between 1955 and 2005	[[{(1960-1955)/1955} +{(1965-1960)/1960} +{(1970-1965)/1965} +{(1975-1970)/1970} +{(1980-1975)/1975} +{(1985-1980)/1980} +{(1990-1985)/1985} +{(1995-1990)/1990} +{(2000-1995)/1995} +{(2005-2000)/2000}] / 10] x 100	Barro-Lee's educational attainment data set
Other variables			

High-stakes testing	Presence of a high-stakes testing system	Bishop's classification	Bishop (1997)
Quality of education	Public education expenditure	Public education expenditure as % of the GDP in 2008	World Bank
GDP per capita	GDP per capita	GDP per capita, logged, in 2008	World Bank
Private internal rate of return (IRR) from higher education	Private internal rate of return (IRR) from higher education	Rate of return from higher education/rate of return from upper secondary education in 2008	Education at a glance (OECD, 2010)
Public social expenditure	Public social expenditure as a percentage of the GDP	Public social expenditure as a percentage of the GDP in 2008	OECD (SOCX)
Economic, social, and cultural status (ESCS)	ESCS index	ESCS = f(the higher parental occupation (HISEI), the higher parental education expressed as years of schooling (PARED), the index of home possessions (HOMEPOS))	2009 PISA
Achievement score	Summation of plausible values in reading, mathematics, and science	pv1read + pv1math + pv1sci	2009 PISA
Gender	Female or not	Female = 1, Male = 0	2009 PISA

Table 3.3 Descriptive statistics

	N	Mean	SD	Min	Max
Dependent variable					
Shadow education use in any academic subject (user=1, non- user=0)	163,428	.368	.482	0	1
Individual-level variables					
ESCS (Economic, Social, Cultural Status)	163,428	.102	.909	-6.037	3.408
Summated achievement score in reading, mathematics, and science	163,428	1524.552	265.506	240.150	2556.190
Gender (female=1, male=0)	163,428	.502	.500	0	1
National-level variables					
AGR (the average growth rate of the population with higher education between 1955 and 2005)	21	.223	.099	.069	.368
High-stakes testing (yes=1, others=0)	21	.429	.507	0	1
Public education expenditure (% of GDP)	21	5.102	.881	3.4	7.7
GDP per capita (logged, current US $)	21	10.612	.383	9.640	11.464
IRR (Private internal rate of return from higher education)	21	148.973	19.476	118	210
Public social expenditure (% of GDP, 2008)	21	20.915	4.232	8.3	29.8

Methods

To address the research question of whether the expansion of higher education is related to shadow education use in academic subjects across countries, this study employed a two-level Hierarchical Generalized Linear Model (HGLM) instead of the ordinary least squares method not only because the sampled students are nested in 21 countries, but also because the regression coefficients are different from the coefficients of a HGLM model (Heck & Thomas, 2009; Kim & Kang, 2008; Raudenbush & Bryk, 2002).

Although a few scholars have used longitudinal studies when they analyzed the growth of shadow education (e.g., Lee, 2003; Mori & Baker, 2010), many studies have conducted cross-sectional research in terms of the participation rate of shadow education across countries (e.g., Baker et al., 2001). This study also conducted a cross-sectional study not only because it examines the cross-national characteristics of shadow education use alongside the expansion of higher education, but also because some variables, such as shadow education use, do not provide historical data across countries.

The analyses were carried out in steps corresponding to the research question. First, an analysis of the relationship between the expansion of higher education and shadow education use was conducted (Model1). Next, the model included the national- and individual-level variables in order to examine whether the relationship is substantial when they are controlled (Model2-Model5). In this step, high-stakes testing, public education expenditure, and public social expenditure (Model3), and high-stakes testing, GDP per capita, IRR, and public social expenditure (Model4) were included in separate

models. Model5 included all the variables. The summaries of the HGLM model, including all variables, are described below for each level under question. Figure 3.1 presents the conceptual framework based on the research question.

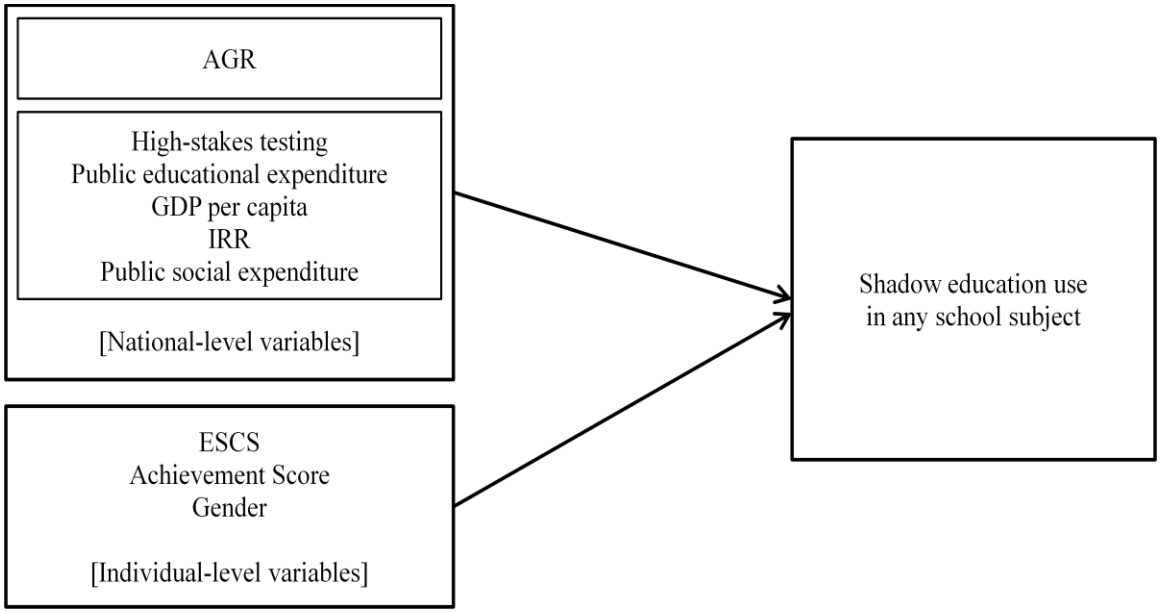

Figure 3.1 Conceptual Framework

To measure whether student participation in shadow education parallels the expansion of higher education, this study employed multilevel logistic regression. The first level estimates the amount of variance in shadow education use that is explained by the individual-level characteristics. The level 1 is formulated as,

$$y_{ij} \sim \text{Bernoulli}(\phi_{ij}) \quad (1)$$

$$\text{logit}(\phi_{ij}) = \eta_{ij} \quad (2)$$

$$\eta_{ij} = ß_{0j} + ß_{1j}\,(\text{ESCS})_{ij} + ß_{2j}\,(\text{Achievement})_{ij} + ß_{3j}\,(\text{Gender})_{ij} \quad (3)$$

where η_{ij} indicates shadow education use for student *i* in country *j*, and $ß_{0j}$ is an estimate of the dependent variable for the student *i* in country *j*. The coefficients $ß_{1j,}$ $ß_{2j,}$ and $ß_{3j}$ represent the effects of student-reported characteristics.

The level-2 model is written as,

$$ß_{0j} = \gamma_{00} + \gamma_{01}(\text{Expansion of higher education})_j + \gamma_{02}(\text{High-stakes testing})_j + \gamma_{03}(\text{Public education expenditure})_j + \gamma_{04}(\text{GDP per capita})_j + \gamma_{05}(\text{IRR})_j + \gamma_{06}(\text{Public social expenditure})_j + U_{0j} \quad (4)$$

$$ß_{kj} = \gamma_{k0} \quad (\text{s. t. } k = 1, 2, 3) \quad (5)$$

where γ_{00} is the mean shadow education use, and U_{0j} is the residual difference between the national-level indicator and the mean scores. The coefficients γ_{k1} through γ_{k6} represent the effects of the national-level variables on the intercept $ß_{0j}$. These models used the ‘xtmelogit’ command in the Stata 12.0 statistics program to conduct the multilevel logistic regression (Rabe-Hesketh & Skrondal, 2012).

CHAPTER 4

RESULTS

This chapter presents the findings on the relationship between the expansion of higher education and shadow education use. First, the cross-national variation in shadow education use for academic subjects is presented. Then the determinants of shadow education use by country in terms of individual-level variables such as ESCS, gender, and academic achievement are examined. Next, the question of whether there is a empirical relationship between the expansion of higher education and shadow education use is addressed (Model 1), followed by the results of the analyses after controlling for the individual-level variables (Model 2) and the individual- and national-level variables (Model 3-5).

Descriptive Findings

Shadow Education Use

Figure 4.1 shows that 36.8% of the 163,438 sampled students used shadow education in at least one academic subject, ranging from 18.4% in Denmark to 52.1% in the United Kingdom to 56.5% in Japan to 80.2% in Korea.

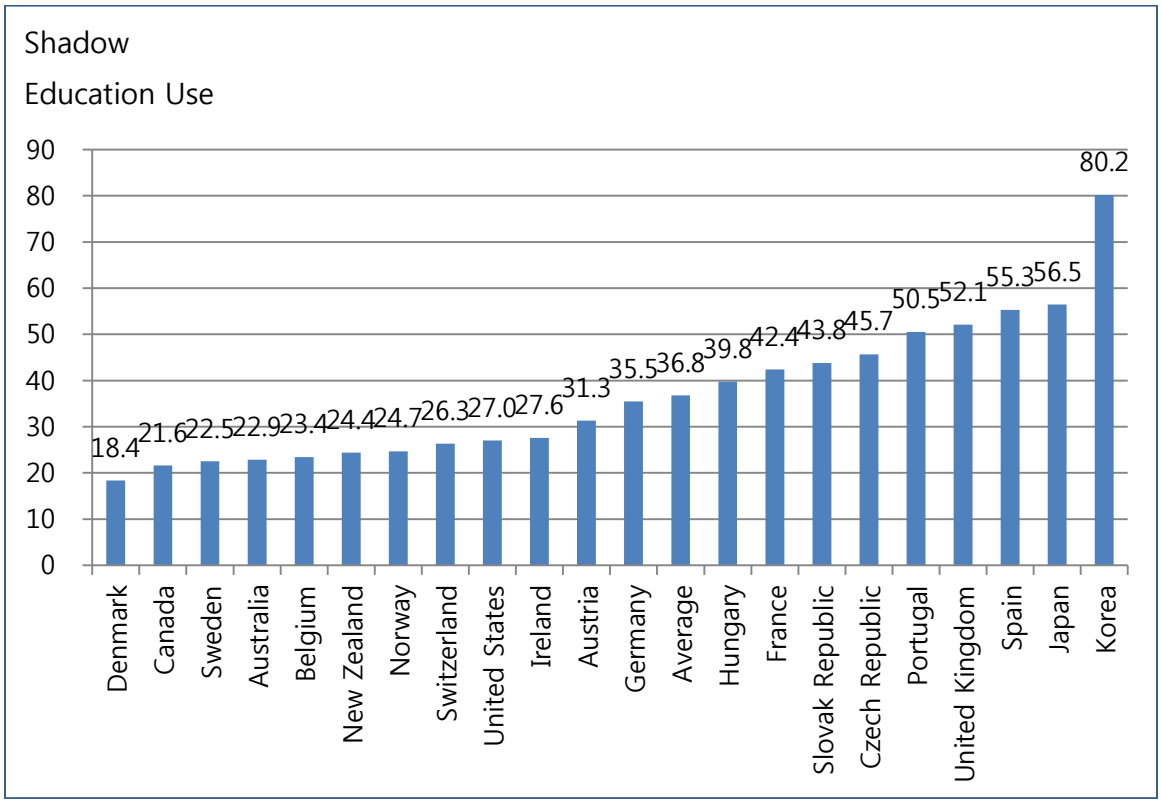

Figure 4.1 The distribution of shadow education use in academic subjects by country for 21 OECD countries in the 2009 PISA

Figure 4.2 presents the distribution of the rate of participation in shadow education in academic subjects. Korea, located in between two standard deviations (SD) and three SDs, seemed to be an outlier in terms of participation rate. Denmark, Japan, and Spain were located in between one SD and two SD. The other 17 countries were within one SD. When Korean students were excluded, the average participation rate dropped by 2.3% point (to 34.5%) in 20 countries. For this reason, the study investigated the relationship between higher education expansion and shadow education use by both including and excluding Korea and therefore presents the results from analyses with 21 and 20 countries.

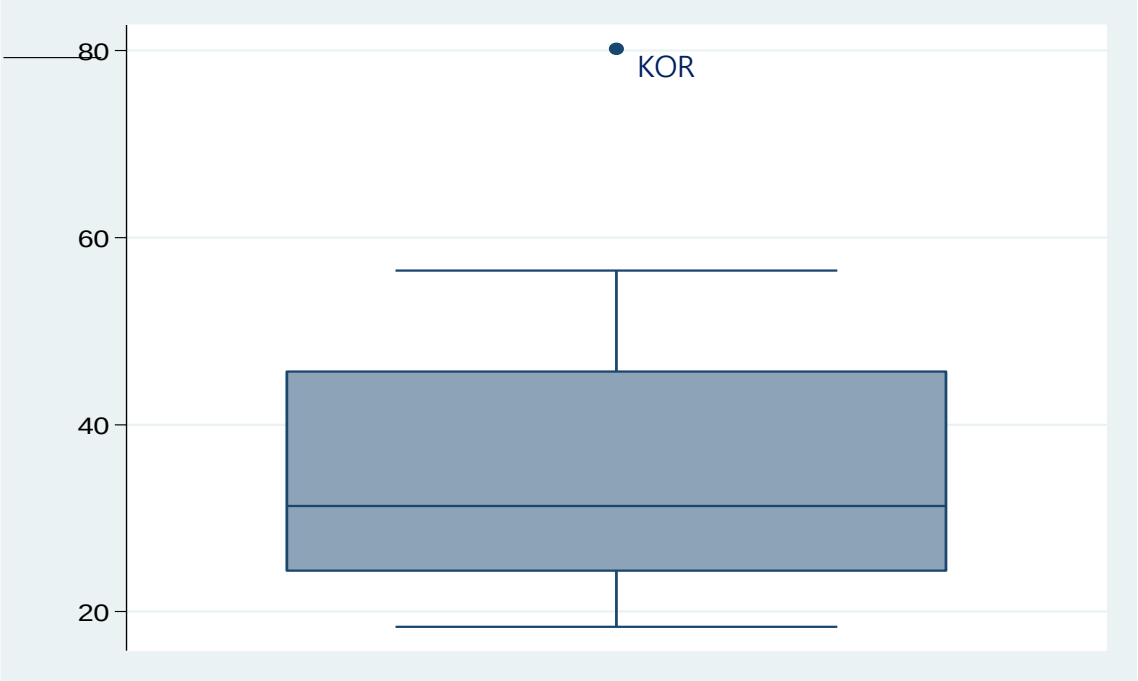

Figure 4.2 The distribution of the rate of participation in shadow education in any academic subject for 21 OECD countries in the 2009 PISA

Cross-national Differences in the Individual-level Determinants of Shadow Education Use

Again, this study examined whether shadow education use varied by country in terms of family background, gender, and academic achievements. Figure 4.3 presents the rate of participation in shadow education by country in terms of family ESCS. In general, students from families with high ESCS[21] were more likely to use shadow education, supporting the previous research that the higher a student's family SES, the more shadow education services he or she will buy (MEST 2009b; Mori & Baker, 2010; Park, Byun, &

[21] Families one third from the top and one third from the bottom in terms of ESCS were classified as high and low ESCS, respectively.

Kim, 2011; Southgate, 2009; Zhang, 2011). However, three Scandinavian countries—Denmark, Norway, and Sweden—and the United States had reverse relationships between ESCS and shadow education use, meaning that students from low ESCS families were more likely to use shadow education than students from middle and high ESCS families. This finding aligns with a previous study based on the 2003 PISA (Southgate, 2009). Regarding the three Scandinavian countries' shadow education use, the network of experts in social sciences of education and training (NESSE) explained, "Scandinavian schools seem to retain the responsibility to serve a full range of ability groups, and to tailor the provision when and where necessary. For this reason, relatively few parents in such countries as Denmark, Finland and Sweden seek private tutoring" (Bray, 2011, p. 55). Accordingly, parents in these countries with high ESCS might not make their children use shadow education as much as parents in other countries, because the quality of public education might meet their educational needs. However, the relationship between school quality and shadow education use across countries is uncertain as shown above.

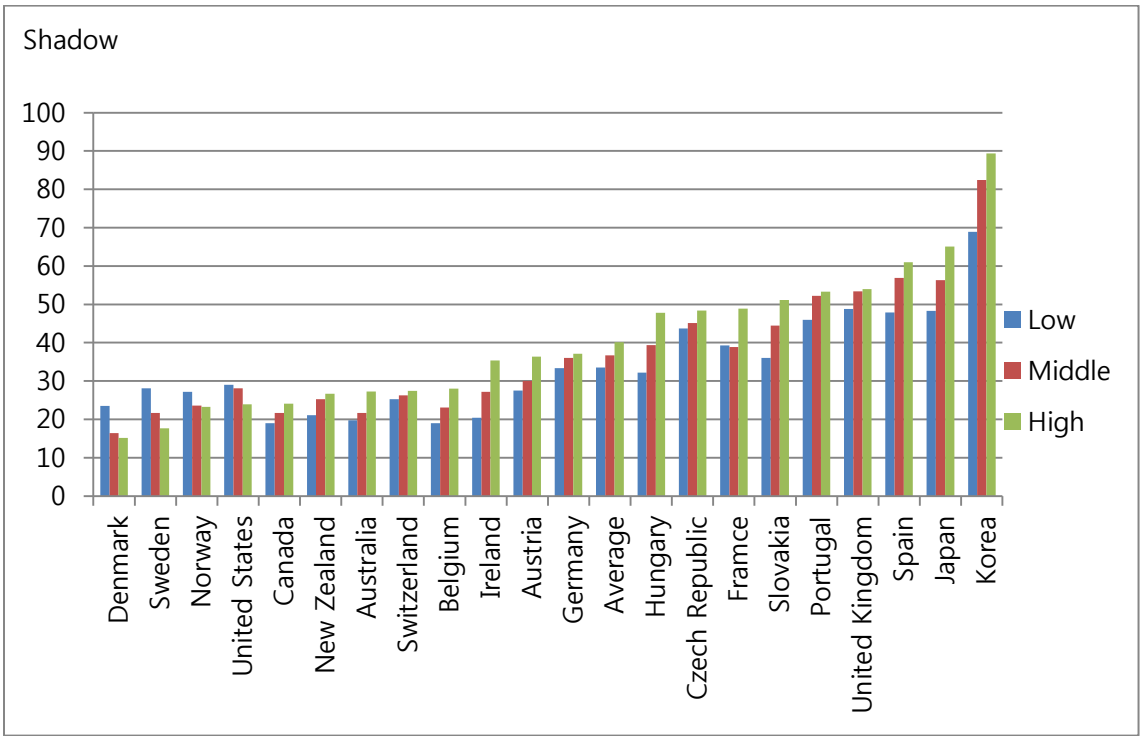

Figure 4.3 Shadow education use in terms of ESCS (low, middle, and high) by country for 21 OECD countries in the 2009 PISA (see Appendix D). Countries are ordered from left to right by absolute degree of high ESCS students' rate of participation in shadow education

Figure 4.4 presents the variation in shadow education use by gender. Female students in 17 countries (except Australia, Denmark, New Zealand, and Norway) used shadow education more than male students, aligning with some previous studies (e.g., Southgate, 2009) and contradicting others (e.g., Bray, 1999). Among the 17 countries in which female students lead shadow education use, the rate of participation in shadow education of female students in the Czech Republic and France excelled that of male students by 16 %. However, male students in Australia, Denmark, New Zealand, and Norway used shadow education more than female students, by 0.1 – 0.7% point.

In terms of school enrollment in secondary and higher education, female students have out-enrolled male students around the globe since the 1990s (OECD, 2009a; Schofer & Meyer, 2005). It seems that female students were more likely to participate in shadow education, corresponding to female students' advantages in school enrollment in secondary and higher education. However, in four countries—Australia, Denmark, New Zealand, and Norway—male students out-enrolled female students in shadow education use. The reason female students fell behind in shadow education use in these four countries is not clear in that in these same four countries female students ranked higher than male students in secondary graduation rate and higher education enrollment in general (OECD, 2010a).

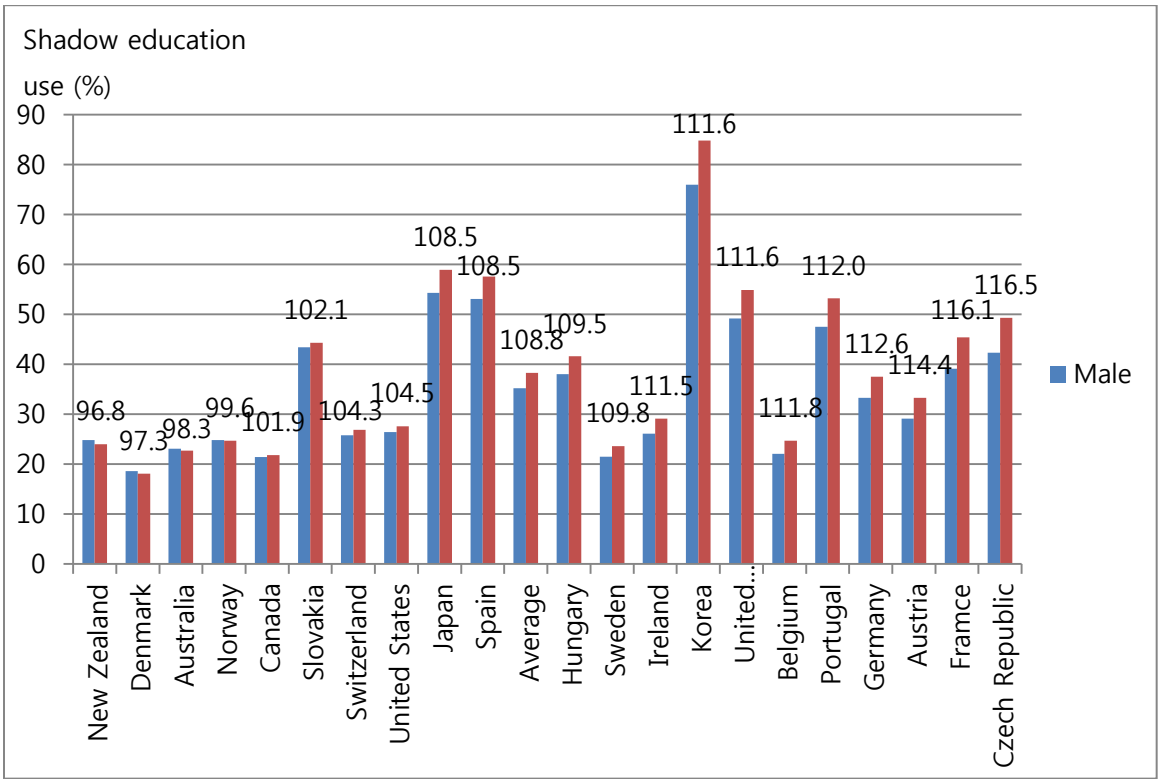

Figure 4.4 Shadow education use by country in terms of gender for 21 OECD countries in the 2009 PISA (see Appendix D). A country closer to the right side has a bigger gender gap in shadow education use than other countries. The figures above female students' shadow education use refer to female students' advantages in terms of the relative rate of shadow education use when male students' shadow education use is 100 by country

Figure 4.5 presents shadow education use by student academic achievement. Low achievers with a remedial motive were more likely to use shadow education in academic subjects than were high achievers with an enrichment motive in terms of the summated scores of mathematics, science, and reading in the 2009 PISA. However, it seemed that the number of countries with students using shadow education with a remedial motive had decreased. In other words, Baker and colleagues (Baker & LeTendre, 2005) reported that enrichment was the main reason for buying shadow education services in only three

countries (Korea, Romania, and Thailand) among the 41 participant countries[22] in the 1995 TIMSS. Japan and Slovakia were classified as countries where shadow education is used with a mixed motive between enrichment and remedial, and Hungary was classified as a country with a remedial motive (ibid). However, shadow education use by high-achievers in four countries (Korea, Japan, Hungary, and Slovakia) in the 2009 PISA excelled that of middle- and low-achievers according to Figure 4.5. It seems that the main motive for using shadow education changed over time in these four countries from remedial or mixed to enrichment. However, additional studies are required, because 8th graders took the 1995 TIMSS, while 15-year-old students (10th graders on average) took the 2009 PISA. In addition, France was classified as a country with a remedial motive in Baker et al.'s (2001) study, but there was not a big gap in shadow education use between low- and high-achievers as shown in Figure 4.5. Three Scandinavian countries (Denmark, Sweden, and Norway), Canada, New Zealand, Switzerland, and the United States showed that low-achievers with a remedial motive were the main users of shadow education in the 2009 PISA. In sum, low-achievers in most countries still outnumbered high-achievers in shadow education use in the 2009 PISA; however, it seems that low-achievers' advantages in shadow education use in the 2009 PISA declined compared to the 1995 TIMSS. In other words, although the present study found an advantage of low-achievers in shadow education use, more exploration is needed into longitudinal changes in shadow education, the expansion of higher education, and the grades of test-takers.

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[22] The enrichment strategy was adopted in Korea, Romania, and Thailand; a mixed strategy was adopted in Latvia (LSS), the Russian Federation, Slovak Republic, Hong Kong, Slovenia, Columbia, Japan, and Lithuania; the remedial strategy was adopted in the Philippines, Singapore, Scotland, U.S.A., Iran, Czech Republic, Portugal, Canada, Kuwait, South Africa, France, Hungary, Australia, Austria, New Zealand, Iceland, Belgium (Fr), Germany, Spain, Ireland, Greece, Switzerland, Cyprus, Belgium(Fl), England, Israel, Norway, Sweden, the Netherlands, and Denmark.

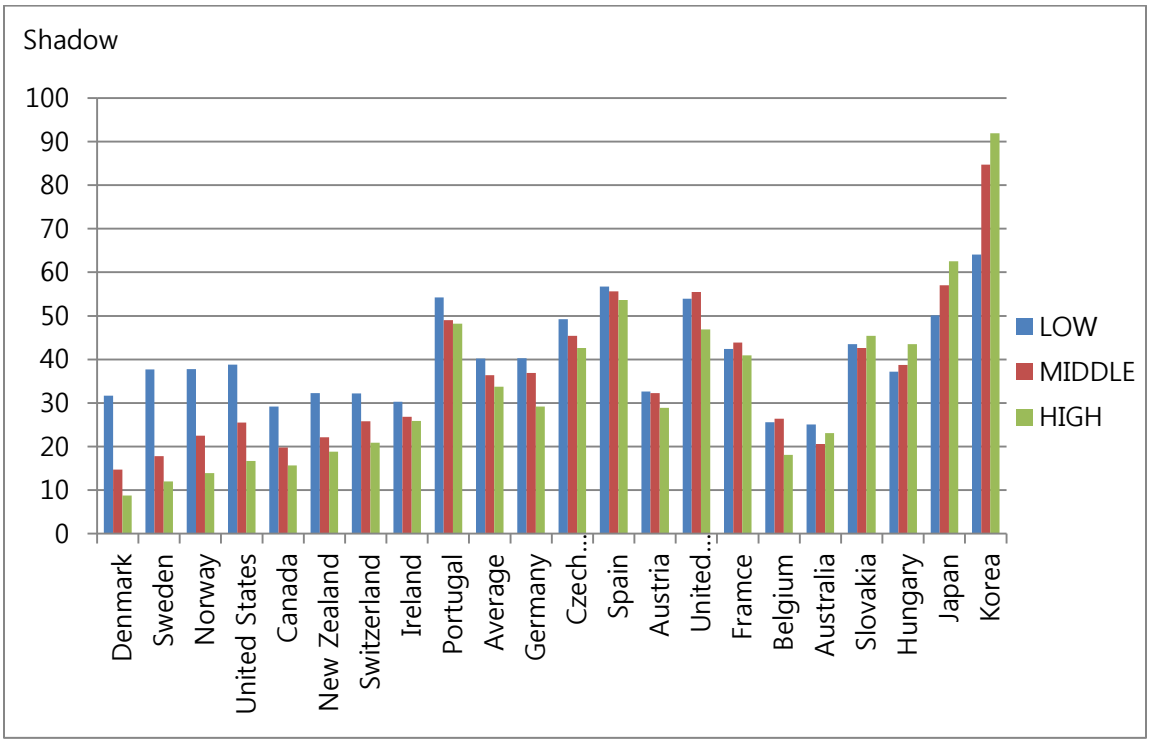

Figure 4.5 Shadow education use in terms of students' achievement scores (low, middle, and high) by country for 21 OECD countries in the 2009 PISA (see Appendix D). The five countries from the right side are ordered in terms of high-achievers' advantages in shadow education. The other countries are ordered from the left side by low-achievers' advantages in shadow education

The Expansion of Higher Education

Figure 4.6 presents the relationship between the expansion of higher education in terms of AGR and shadow education use in the 2009 PISA. Like the correlation coefficients between the expansion of higher education and shadow education use as shown in Table 4.1 and 4.2, there was a modestly positive relationship between the two variables in Figure 4.6.

The X-axis in Figure 4.6 presents AGR by country from 1955 through 2005 as measured every five years. The population with higher education in the 21 countries has grown by 22.9% between 1955 and 2005. Australia and Denmark showed 6.9% and 9.2%, respectively, growth in the percentage of the population with higher education for these fifty years, while higher education in the Czech Republic, Korea, New Zealand, Norway, Spain and the United Kingdom grew over 30% on average for the same period.

To be more specific, 4.8% of the population in the 21 sampled countries had experienced higher education in 1955, ranging from 0.9% in the Czech Republic to 14.9% in the United States to 16.0% in Australia (see Appendix C). Although several countries, such as the Czech Republic, Denmark, Germany, Japan, Switzerland, and the United Kingdom, experienced a few retreats in growth in the rate of the population with higher education, higher education had expanded enough to reach the whole population in the 21 OECD countries. In 2005, more than one-fourth of the people had attended higher education, ranging from 11.2% in Portugal to 45.0% in New Zealand, to 53% in the United States. This growth in the percentage of the population with higher education in these 21 countries corresponds to the growth of higher education around the globe (Schofer & Meyer, 2005).

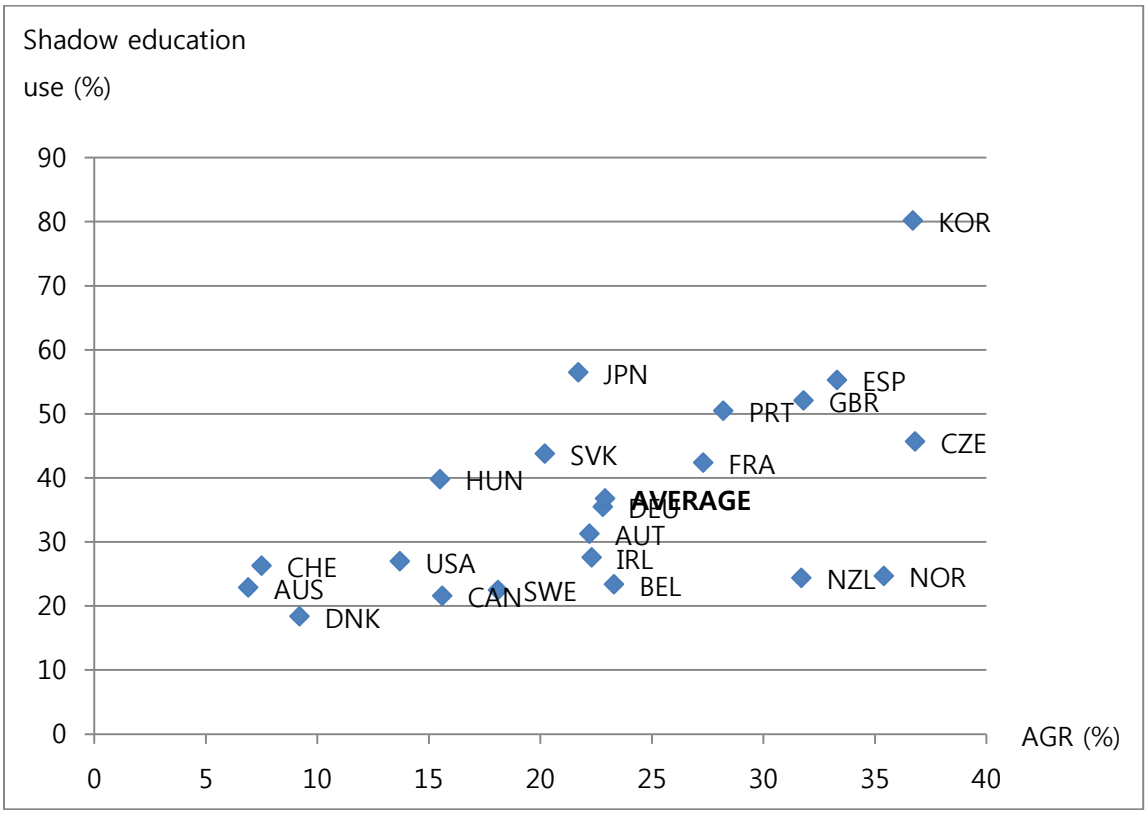

Figure 4.6 The relationship between AGR (the expansion of higher education in terms of average growth rate of the population aged over 25 with higher education between 1955 and 2005) and shadow education use among 21 countries in the 2009 PISA

The Relationships among the Variables

Table 4.1 and 4.2 present the correlation coefficients at the national level for shadow education use, the expansion of higher education, and the national-level variables (e.g., high-stakes testing, public education expenditure, GDP per capita, IRR, and public social expenditure) for both 21 and 20 countries (i.e., including and excluding Korea). Although the correlation coefficients varied by nation, this study found a modest

relationship between shadow education use and the expansion of higher education in terms of AGR, which ranged from .234 in 21 countries to .206 in 20 countries.

This study examined whether there were multicollinearity problems among the variables described in Tables 4.1 and 4.2. The correlation coefficients between GDP per capita and public education expenditure were .510 in 21 countries and .522 in 20 countries, and the correlation coefficients between GDP per capita and IRR were -.593 in 21 countries and -.598 in 20 countries. The correlation coefficients between public education expenditure and public social expenditure were .492 in 21 countries and .540 in 20 countries,. These correlation coefficients seem to imply multicollinearity problems, because the variables are associated. Therefore additional analyses were conducted in order to minimize or eliminate the multicollinearity problems by excluding GDP per capita and IRR (Model 3) and by excluding public education expenditure (Model 4). All variables are included in Model 5.

Table 4.1 The correlation coefficients between shadow education use and the national-level variables for 21 OECD countries

	A	B	C	D	E	F	G
A	1.000						
B	0.234	1.000					
C	0.109	0.250	1.000				
D	-0.143	-0.119	-0.024	1.000			
E	-0.197	-0.415	-0.430	0.510	1.000		
F	0.100	0.071	0.347	-0.311	-0.593	1.000	
G	-0.033	0.132	-0.066	0.492	0.208	-0.157	1.000

A: Shadow education use; B: AGR (the expansion of higher education); C: High-stakes testing; D: Public education expenditure; E: GDP per capita, F: IRR; G: Public social expenditure

Table 4.2 The correlation coefficients between shadow education use and the national-level variables for 20 OECD countries (excluding Korea)

	A	B	C	D	E	F	G
A	1.000						
B	0.206	1.000					
C	0.075	0.199	1.000				
D	-0.137	-0.108	-0.009	1.000			
E	-0.157	-0.361	-0.379	0.522	1.000		
F	0.088	0.048	0.335	-0.307	-0.598	1.000	
G	0.055	0.316	0.076	0.540	0.040	-0.125	1.000

A: Shadow education use; B: AGR (the expansion of higher education); C: High-stakes testing; D: Public education expenditure; E: GDP per capita, F: IRR; G: Public social expenditure

Multi-level Regression Findings

The Relationship between the Expansion of Higher Education and Shadow Education (Model 1)

Tables 4.3 and 4.4 present the relationship between the expansion of higher education and shadow education use in 21 and 20 countries, respectively. As shown in Model 1 in Tables 4.3 and 4.4, there is a statistically positive relationship between the expansion of higher education and shadow education use, meaning that the higher the average growth rate of higher education in a country, the more students used shadow education and vice versa. When the average growth rate of the population with higher education increased by one unit, shadow education use increased by 4.6% in 21 countries (Table 4.3) and 3.3% in 20 countries (Table 4.4) at a significant level of $p<.01$. These results support the hypothesized statement that shadow education is more popular in a country with a higher degree of expansion of higher education than in a country with a low level of expansion of higher education. They are also consistent with Baker and Mori's (2010) argument that shadow education is a supplementary institution to formal education, and is more popular in a country where formal schooling is more developed. However, the relationship between AGR and shadow education use may be explained from other perspectives. As discussed in a previous chapter, functionalists and human capitalists may argue that shadow education is a tool for satisfying minimum academic requirements for higher education, while competition theorists may assert that shadow education assists students in the competition for entrance to higher institutions.

Table 4.3 The relationship between shadow education use and the expansion of higher education for 21 OECD countries

Shadow education use	Model1		Model2		Model3	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.609*** (.123)	.544	-.700*** (.135)	.497	-.762*** (.141)	.467
Individual-level variables						
Economic, social and cultural status			.279*** (.007)	1.322	.279*** (.007)	1.322
Achievement			-.001*** (.000)	.999	-.001*** (.000)	.999
Female			.166*** (.011)	1.181	.166*** (.011)	1.181
National-level variables						
AGR (higher education expansion)	.045** (.013)	1.046	.048 ** (.015)	1.049	.038** (.012)	1.039
High-stakes testing					.281 (.217)	1.324
Public Education expenditure					-.313** (.119)	.731
GDP per capita						
IRR						
Public social expenditure					-.015 (.024)	.985

^ p<.10 * p<.05, ** p<.01, *** p<.001

Table 4.3 (continued)

Shadow education use	Model4		Model5	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.742*** (.144)	.476	-.728*** (.138)	.483
Individual-level variables				
Economic, social and cultural status	.279*** (.007)	1.322	.279*** (.007)	1.322
Achievement	-.001*** (.000)	.999	-.001*** (.000)	.999
Female	.166*** (.011)	1.181	.166*** (.011)	1.181
National-level variables				
AGR (higher education expansion)	.037** (.012)	1.038	.036** (.011)	1.037
High-stakes testing	.045 (.241)	1.046	.099 (.232)	1.104
Public education expenditure			-.190 (.131)	.827
GDP per capita	-.587* (.354)	.556	-.421 (.356)	.657
IRR	.004 (.006)	1.004	.003 (.006)	1.003
Public social expenditure	-.030 (.022)	.971	-.016 (.023)	.984

^ p<.10 * p<.05, ** p<.01, *** p<.001

Table 4.4 The relationship between shadow education use and the expansion of higher education for 20 OECD countries (excluding Korea)

Shadow education use	Model1		Model2		Model3	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.677*** (.105)	.508	-.774*** (.115)	.461	-.814*** (.092)	.443
Individual-level variables						
Economic, social and cultural status			.277*** (.007)	1.319	.277*** (.000)	1.319
Achievement			-.001*** (.000)	.999	-.001*** (.000)	.999
Female			.158*** (.011)	1.172	.158*** (.011)	1.171
National-level variables						
AGR (higher education expansion)	.032** (.012)	1.033	.034** (.013)	1.035	.023** (.008)	1.023
High-stakes testing					.164 (.143)	1.178
Public education expenditure					-.470*** (.082)	.625
GDP per capita						
IRR						
Public social expenditure					.056** (.021)	1.058

^ p<.10 * p<.05, ** p<.01, *** p<.001

Table 4.4 (continued)

Shadow education use	Model4		Model5	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.817*** (.129)	.442	-.828*** (.092)	.437
Individual-level variables				
Economic, social and cultural status	.277*** (.007)	1.319	.277*** (.007)	1.319
Achievement	-.001*** (.000)	.999	-.001*** (.000)	.999
Female	.158*** (.011)	1.172	.158*** (.011)	1.172
National-level variables				
AGR (higher education expansion)	.030** (.011)	1.030	.025** (.008)	1.025
High-stakes testing	.023 (.210)	1.023	.127 (.152)	1.135
Public Education expenditure			-.412*** (.095)	.662
GDP per capita	-.420 (.314)	.657	.029 (.248)	1.029
IRR	.007 (.005)	1.007	.006 (.004)	1.006
Public social expenditure	.005 (.023)	1.005	.054** (.020)	1.055

^ p<.10 * p<.05, ** p<.01, *** p<.001

The Relationship between the Expansion of Higher Education and Shadow Education Use after Controlling for Individual- and National-level variables (Model2 - Model5)

Model 2 in Tables 4.3 and 4.4 presents the results of testing whether the relationship between the expansion of higher education and shadow education use was substantial after controlling for the individual-level variables. As shown in Tables 4.3 and 4.4, the relationship was substantial in Model 2 at a significant level of $p<.01$. For a one unit increase in the average growth rate in higher education, shadow education use increased by 4.9% in 21 countries, and by 3.5% in 20 countries ($p<.01$). These findings support the hypothesis statement that shadow education is more popular in a country where the expansion of higher education is higher than in a country with a low level of higher education expansion.

Model 5 was conducted in order to investigate whether the association between higher education expansion and shadow education use was substantial after holding the individual- and national-level variables constant. As shown in Model 5 in Tables 4.3 and 4.4, the association between shadow education use and the expansion of higher education was significant in both 21 and 20 countries ($p<.01$),. A student's tendency to buy shadow education services increased by 3.7% in 21 countries ($p<.01$) and 2.5% in 20 countries ($p<.01$).

The Relationships between Shadow Education Use and Other Variables (Model2 – Model5)

In Tables 4.3 and 4.4, Model 2 presents the associations between the individual-level variables and shadow education use. First, a student from a family with high ESCS was more likely to use shadow education than a student from a family with low ESCS in both 21 and 20 countries ($p<.001$). With a one-unit increase in ESCS in the analysis with 21 countries, shadow education use increased by 32.2% in Model 2 through Model 5, as shown in Table 4.3. Similar results were found in the analysis with 20 countries. With a one-unit increase in ESCS, shadow education use increased by 31.9% in Model 2 through Model 5 ($p<.001$), as shown in Table 4.4. These results align with previous research (MEST, 2009b; Park et al., 2011). Second, low and high achievers in the 2009 PISA did not have different level of shadow education use for 21 countries. The finding was substantial in the analysis with 20 countries as shown in Table 4.4 ($p<.001$). These results seem to contradict previous studies (e.g., Baker et al., 2001) in that low achievers are not a main user of shadow education. Instead, high achievers emerged as big players in the shadow education market. Third, female students participated in shadow education more than male students by 18.1% in Model 2 through Model 5 for 21 countries ($p<.001$). For 20 countries, the gap was about 17% in Model 2 through Model 5 ($p<.001$). These results coincide with previous research that found that female students are more likely than male students to use shadow education (Southgate, 2009). In sum, a female student from a family with high SES was more likely to use shadow education than a male student from a family with low SES.

Models 3 and 4 included the national-level variables, with the exception of one or two variables. Model 5 included all the national-level variables. First, high-stakes

testing did not have a significant relationship with shadow education use in the analyses with 21 and 20 countries, consistent with Baker et al.'s (2001) research on the 1995 TIMSS dataset which also showed that high-stakes testing did not have a significant relationship with shadow education use. Second, the results demonstrate that public education expenditure has a negative relationship with shadow education use in Model 3 as shown in Table 4.3 ($p<.01$) and Table 4.4 ($p<.001$). The negative relationship in the analysis with 20 countries was significant, even after controlling for GDP per capital and IRR as shown by Model 5 in Table 4.3 ($p<.001$), while a significant relationship did not exist for the 21 countries in Model 5 as shown in Table 4.3. The result of the analysis with 20 countries is consistent with the results of the previous studies (Baker et al., 2001; Dawson, 2010). In other words, it seems that shadow education was less prevalent in countries with developed public education in terms of public education expenditure. Third, GDP per capita was not significantly associated with shadow education use in the analyses with 21 and 20 countries, aligning with the prevalence of shadow education around the globe (ibid). Fourth, IRR did not have a significant relationship with shadow education use in the analyses with 21 and 20 countries, respectively, suggesting that the level of salary gap by education at a specific point in time did not augment the demands for shadow education. However, this study's supplementary analysis with 19 countries (excluding Korea and Japan) reveals that IRR has a positive relationship with shadow education use in academic subjects combined ($p<.10$) (see Model 5 in Appendix E). Fifth, public social expenditure was not significantly associated with shadow education use in the analysis with 21 countries. However, in the analysis with 20 countries, public social expenditure had a positive association with shadow education use ($p<.01$). The finding

for 20 countries does not concur with this study's hypothesized statement that the higher public social expenditure in a country, the fewer students who use shadow education, meaning that although a country has a higher public social expenditure than other countries, public social expenditure does not cause parents to reduce their investments in shadow education. Rather, the parents in a country with high public social expenditure consume shadow education services more than parents in other countries. It is necessary to explore the reason for these parents' choices.

CHAPTER 5

DISCUSSION

This chapter discusses the results about the relationship between the expansion of higher education and shadow education use and whether this relationship was substantial after holding the individual- and national-level variables constant in the analyses with 21 and 20 countries. In contrast to the majority of research that has focused on individual-level determinants (e.g., Lee, 2004) or studies only single countries (e.g., Lee & Shouse, 2011; Mori & Baker, 2010), this study provides evidence for these relationships by focusing on both the individual- and national-level variables across 21 OECD countries. By doing so, this study provides evidence for the overall trend in shadow education use in parallel to the expansion of higher education over the past fifty years. The policy and theoretical implications for this study will now be discussed, followed by its limitations.

This study found that the higher the AGR in a country, the more students participated in shadow education and vice versa, controlling for the individual- and national-level variables. In other words, this study provides evidence that the degree of the institutionalization of higher education in terms of AGR was related to shadow education use. Thus, it seems that if higher education is expected to continue growing in the coming decades, it is likely that shadow education use will also increase, and the relationship between higher education as a part of the public educational system and the shadow education system will be tighter than ever before. This finding supports Baker and colleagues' prediction that shadow education is more prevalent in a country where

public education is more developed than in a country with less developed public education (Baker et al., 2001; Baker & LeTendre, 2005; Mori & Baker, 2010).

Meanwhile, the other scholars' perspectives might be different from the neo-institutionalists' viewpoints regarding the relationship between the expansion of higher education and shadow education use. For example, a student might compete with other students in order to enter a prestigious university even when higher education is generalized to all the population. This kind of status competition might result in the growth of shadow education.

The Three Theories' Relevance to Evidence

In the literature review, the main arguments and inferences from functionalism and human capitalism, status competition theory, and the neo-institutionalist perspectives were presented. From a human capitalist's perspective, it can be inferred that students buy shadow education in order to acquire economic benefits in terms of IRR. If IRR increases in a country, a student in that country is then likely to participate in shadow education to increase the possibility of getting admitted to a college, because shadow education may supplement that student's academic deficits and help the student meet the college's minimum school-entrance qualifications. Among the 21 and 20 countries investigated here, IRR did not have a significant relationship with shadow education use in academic subjects combined. In a follow-up analysis with 19 countries (excluding Korea and Japan), IRR had a modestly positive association with shadow education use (logistic coefficient =.007, $p<.10$) (see Model 5 in Appendix E). However, the findings

do not seem to affirm that students in these 19 countries buy shadow education services for academic subjects on account of IRR, because the relationship was not found in supplementary analyses with shadow education use for individual subjects—mathematics, science, and reading (see Appendix G). In sum, the inference from the human capitalism perspective did not seem relevant to explain the empirical relationship between shadow education use and IRR, at least among the 21 and 20 countries investigated.

It can be inferred that shadow education use is related to the mismatch between students' educational needs and the quality of public education. The results show that public education expenditure as a proxy for the quality of public education had a negative relationship with shadow education use for 20 countries (excluding Korea). Although school quality cannot be measured solely by public education expenditure, this result seems to suggest that if a country increases public education expenditure, school quality will improve (UN, 2010), and then the increased school quality may be related to a reduction in shadow education use. However, even if public educational expenditure as a percentage of GDP increases by a few points, it is uncertain that shadow education use will decrease in accordance. The demand for shadow education, on one hand, is related to public education expenditure as shown in the results section; on the other hand, the demand for shadow education is related to the development of public education in terms of the institutionalization of public education (Baker et al., 2001; Oh, 2011). Thus, it does not seem that the negative relationship between shadow education use and increasing public education expenditure guarantees a reduction in shadow education. In this regard, it remains inconclusive whether the negative relationship supports the inference from functionalism that low school quality instigates a demand for shadow education. So on

the one hand, the positive relationship between AGR and shadow education use seems to be better explained by functionalism and human capitalism. However, IRR as a motive for using shadow education from these perspectives did not function as expected. Thus, it is doubtful whether these theories are reasonable to explain the entire relationship between AGR and shadow education use.

From the status competition theorists' perspective, if a country is in a period of growth in higher education, shadow education use as a supplementary tool to improve one's chances of college admission should have been reduced, because the number of slots in colleges increased during the period (Lee, 2003). Contrary to this reasoning, this study found evidence that students in a country with high AGR were more likely to use shadow education than were students in a country with low AGR. Specifically, some countries such as Korea, Spain, and the United Kingdom, with a 30% or more AGR, had 50% or more of the population participating in shadow education, while other countries such as Australia, Denmark, and Switzerland, with a 10% or less AGR, had 30% or less of the population using shadow education. In sum, there was a positive association between AGR and shadow education use. These findings correspond to single-country studies of Korea and Japan (Lee, 2003; Mori & Baker, 2010), which showed that shadow education use grew when higher education expanded. Furthermore, the positive relationship between AGR and shadow education use seems to be explained by status competition theories, in that although the chance of college admission increased in the period of higher education growth, students were required to take out-of-school lessons to compete with their contemporaries.

In addition, whether a country had an educational system with high-stakes testing did not have a significant association with shadow education use in the analyses with 21 and 20 countries. Thus, it was uncertain that 15-year-old students used shadow education in order to prepare for a high-stakes test. Status competition theory also seems to be relevant to explain this finding. However, shadow education does not seem to be a means to prepare for high-stakes testing, so there is some doubt whether this theory is indeed better than the others in explaining the overall evidence provided by in this study.

While it did not seem that economic and social benefits, in terms of IRR and school quality, and status competition for extended educational credentials, instigated shadow education use in the analyses with 21 and 20 countries, the expansion of higher education did have an association with shadow education use. The positive relationship between the expansion of higher education and shadow education use can be explained by the neo-institutionalism perspective. Corresponding to Baker and colleagues' prediction that shadow education is prevalent in a country where formal schooling is more developed than other countries (e.g., Mori & Baker, 2010), students in a country with a high AGR were more likely to use shadow education than those in a country with low AGR. It seems that students' and parents' growing expectations for the continuous expansion of higher education influenced their demands for shadow education in terms of academic success within formal schooling. In other words, as higher education became a normative institution, shadow education also became a part of education based on the expectation that higher education will grow as will the importance of having a college diploma. Thus, shadow education was more prevalent in a country with high AGR than in a country with low AGR, because students and their parents confronting this high AGR

seemed to accept higher education as a normative institution more than those in countries with a low AGR, while simultaneously considering shadow education as a normative institution that supplements formal schooling. Once shadow education becomes an institution supplementary to public education, if a student does not use shadow education, the student may hypothetically be considered an outcast. According to a survey in Korea, more than one-third of students bought shadow education services because the other students did (Sung, Kim, & Kim, 1999). Accordingly, shadow education use was higher in a country with high AGR than in a country with low AGR. However, shadow education being a normative institution does not mean that there should be no SES difference in its use. In other words, even if shadow education has become a normative institution, parents with different levels of SES may react differently to shadow education.

Shadow Education Use and Individual-level Variables

Although a few governments' policy measures supply after school programs to students mainly from families with low SES, students with high ESCS excelled those with low ESCS in terms of shadow education use across the 21 OECD countries. If this inclination of privileged students' to use shadow education continues, shadow education may function as a tool for maintaining existing social orders through academic success within public education, rather than providing educational opportunity to low-achievers to supplement their academic deficits. In this regard, further investigation into the meaning of shadow education in the schooled society for low-achievers in terms of educational opportunity is needed. In addition, exploring the reasons why students with

low ESCS were more likely to use shadow education than those with high ESCS in the United States and the three Scandinavian countries could be helpful.

The result that shadow education use did not differ by students' achievement scores seems to be a new finding, one that does not align with the previous studies (e.g., Baker et al., 2001). High-achievers emerged as a big consumer of shadow education. In addition, although the main users of shadow education came from low-achievers in most countries, there were cross-national differences in shadow education use by achievement score. Thus, it is recommended that a future study explore what factors influence these different levels of shadow education use by country.

Female students were more likely to use shadow education than male students in 17 countries (except Australia, Denmark, New Zealand, and Norway), corresponding to females' advantages in public education attendance rate. This lead of female students in shadow education use suggests that the trend of parents investing more in the education of boys than girls did not hold in these 17 countries. More work is needed to understand the meaning of female students' advantage in shadow education use compared to that of male students to explore the whole process of the school-to-work transition.

Implications

Policy implications

The advent of mass shadow education in the schooled society

The fact that more than one-third of the students in the 21 sampled OECD countries who were test-takers in the 2009 PISA participated in shadow education means that a period of mass shadow education has come. Although there were cross-national differences in the participation rate in shadow education, it has been situated as a normative learning activity for the goal of achieving long-term success in life within a system of public education.

Shadow education exists only when public education exists (Bray, 1999; Stevenson & Baker, 1992). In order to see the attributes of shadow education, policymakers should pay attention to the phenomenon of mass shadow education across these 21 countries. Shadow education in the schooled society should be understood as an institution within a public area. In other words, shadow education becomes an object of public policy (Baker & LeTendre, 2005; Bray, 1999, 2009, 2011; Bray & Lykins, 2012; Mori & Baker, 2010). Policymakers should consider shadow education as a normative institution in the schooled society, even when they make a policy on formal education, because shadow education is a response to public education.

Shadow education as a policy subject

To policymakers across these 21 OECD countries, shadow education should not be prohibited, because shadow education is an institution that is supplementary to public education. Also, artificial prohibition may have unintended results. For example, the Korean government viewed shadow education as a social evil (Kim et al., 1981; Kim, Kim, Jeon, Park, & Son, 2007). The government implemented a series of policies for the absolute prohibition of shadow education from 1980 through 2000 based on the premise

that shadow education created social pathologies such as distrust in formal schooling, a vicious circle of housing economy due to private educational expenditure on shadow education, and increased conflicts between shadow education users and non-users (Kim, 1996; Kim et al., 1981; Kim et al., 2007). However, these prohibitive government policies against shadow education did not achieve their intended goals or reduce parents' demands and costs for shadow education, because the policies caused negative externalities. In other words, a black market for shadow education emerged as a reaction to the absolute prohibitive policies. Students from families with high ESCS were the main users of black market shadow education, while students from families with low ESCS were excluded from this market, because the price of shadow education in the black market was higher than it was before the services were provided secretly (Kim et al., 2007; Lee, 1993). Therefore, if a low achiever came from a family with low ESCS, he or she would not have a chance to use shadow education for the purpose of supplementing his/her academic deficits due to a lack of money. Accordingly, shadow education must have functioned as a tool for maintaining an existing social order related to academic success within public education. This study suggests that it would be useful for policymakers to recognize the attributes of shadow education as a normative and supplementary institution in the schooled society and to provide relevant supplementary shadow education services, such as after school programs, to low achievers with low ESCS to create equal educational opportunities. Indeed, policymakers should recognize the trend of the expansion of higher education in their respective countries. If a country has a high rate of expansion of higher education, policymakers should expect that growing expectations for higher education will prevail in the country, that shadow

education will expand to students in general, and that, if necessary, they should prepare a relevant policy measure corresponding to this growing shadow education use.

Shadow education use and the other variables

The study results showed that high-stakes testing did not have a substantial relationship with shadow education. Although Lee and Lee (2008) argued (using the 1995 TIMSS dataset) that high-stakes testing had a significant relationship with shadow education use among 12th graders in some countries such as Russia, Greece, Denmark, and Australia, this study contends that high-stakes testing in and of itself does not seem to increase or decrease the demand for shadow education among 15-year-old students (approximately 10th graders). It does not seem that the demand for shadow education is a reaction to either the introduction or elimination of a high-stakes test. Thus, policymakers should know that high-stakes testing is not a main facilitator for the demand for shadow education, at least among 15-year-old students in these 21 OECD countries.

In addition, the results in this study about the relationship between high-stakes testing and shadow education use do not seem to correspond to Bray's argument (Bray, 2011, p. 36) that students in Finland without high-stakes tests do not use shadow education as much as those in the other countries with high-stakes tests. However, Denmark has high-stakes testing and is one of the Scandinavian countries in this study where shadow education use is the lowest. Thus, it is not correct to conclude that high-stakes testing itself instigates shadow education use.

In the analyses with 20 countries (excluding Korea), this study's results show that the higher public education expenditure is, the shadow education is used. Even though it

is important that policymakers recognize this relationship, the relationship does not have a meaning beyond a correlation, as described in the discussion section. In other words, although the current study shows that shadow education had a negative relationship with public education expenditure, it should be further examined whether a high quality of public education results in a reduction in the demand for shadow education, because it seems that the institutional power of shadow education related to public education is bigger than the influence of increased public education expenditure.

The study also demonstrated that IRR was unrelated to the participation rate in shadow education in the analyses with 21 and 20 countries. Regardless of the initial level of IRR, policymakers should recognize that a reduction in IRR will not likely result in a decrease in shadow education use. Even though shadow education use has a modestly positive relationship with IRR in the analysis with 19 countries (excluding Korea and Japan), shadow education use is more strongly and consistently associated with an expansion of higher education (AGR). For this reason, it is uncertain that educational and/or social policies for reducing IRR, based on the premise that a high IRR will cause a high level of shadow education use, will have the effect of decreasing the demand for shadow education. In addition, policymakers should be cautious in interpreting the relationship between economic returns in terms of IRR and shadow education use, because shadow education may be a function of lifetime expected returns rather than IRR at any one time (Woo et al., 2004).

In the analysis of 20 countries (excluding Korea), higher public social expenditure corresponded to higher shadow education use. However, policymakers should again be cautious in interpreting the relationship between these two variables,

because this relationship may be mediated or distorted by other variables that were not explored in this study. In other words, the findings do not seem to affirm that public social expenditure increases shadow education use, because a country with a high level of public social expenditure as a percentage of the GDP may already have a high level of developed public education (r=.316 for 20 countries).

The relationships between shadow education use and the individual-level variables have the following implications. First, a student from a family with high ESCS was more likely to use shadow education than a student from a family with middle or low ESCS in most countries in this study. Admitting that shadow education is helpful to reduce academic deficits in academic subjects and that low achievers mainly come from families with low ESCS (Mori, 2012; Sirin, 2005), public interventions, such as a supply of remedial programs to low-achievers from families with low ESCS, will be helpful in terms of enhancing the equality of chances for continued education and better job placements (Baker, 2009; Kim, 2012a). In this regard, government-initiated shadow education in the United States and Korea, such as NCLB and after school programs, may enhance low achievers' academic achievements if the policies can meet their needs.[23] Regardless of the fact that these policies seemed to achieve their intended goals, policymakers should be cautious while assessing the effects of those policies, because it is not likely that providing supplementary shadow education for a short period of time will meet the policy subjects' needs enough to remedy the accumulated deficits in low-

[23] Mori (2012) did not find statistically significant effects of NCLB on enhancing low-achievers' achievements in the United States. However, according to Kim (2012a), although the Educational Welfare Priority Zone Project in Korea had not resulted in an improvement of policy subjects' academic achievements in terms of a standardized test, the projects had shown positive results with various dimensions such as self-confidence and concentration for academic work.

achievers from families with low ESCS. Thus, policymakers should pay attention to the whole process of the growth in supplementary shadow education as much as public education itself.

Second, this study found that high achievers participated in shadow education almost as much as low achievers. This finding seems to contradict some previous studies' findings that low achievers were the main users of shadow education. The gap in shadow education use between low and high achievers seemed to decrease even though low achievers still outnumbered high achievers in the shadow education service market. Consequently, this study recommends that policymakers in each country and international educational organization acknowledge high achievers as big consumers of shadow education.

Third, female students were more likely to buy shadow education services than male students in all countries except Australia, Denmark, New Zealand, and Norway. An increased school enrollment and rate of participation in shadow education, on the one hand, seem good for female students in terms of entrance to college and the labor market. However, the higher school enrollment for females does not always seem to link with an advantage for females in the labor market as seen in the previous research (e.g., Nozaki, Aranha, Domingues, & Nakajima, 2009). In other words, even though it seems that enhanced academic success usually leads to overall occupational success for both female and male students, an advanced economy still has a barrier in the labor market and an income gap by gender (Mandel & Shalev, 2009). Although a minority of female students may get professional jobs based on merit, the majority of them may encounter practical barriers in managerial and blue-color jobs in particular. Thus, a female student may

compete with other female students in order to acquire the limited job positions allocated to women. Accordingly, policymakers should be cautious in interpreting the fact that female students were more likely to participate in shadow education, as it relates to academic and job-related success.

Theoretical implications for future research

This study has theoretical applications based on the evidence that the degree of institutionalization of shadow education in terms of participation rate is higher in a country with a high rate of expansion of higher education as measured by AGR. Shadow education has evolved into an educational institution instead of being simply a competitive tool for economic and social gains[24], meaning that shadow education has become a normative type of learning activity, as the following prediction by Mori & Baker hypothesized:

> "[W]hat will most likely happen in the near future is that shadow education will be absorbed into the education culture in general; its institutional status will go (and partially already has gone) from "outsider to insider"" (2010, p. 46).

IRR had a modestly positive association with shadow education use in an analysis with 19 countries, excluding Korea and Japan (see Appendix E), while the relationship was not substantial in the analyses with 21 and 20 countries. Thus, the next

[24] This statement does not deny the fact that some students may compete with other students in order to maintain their socioeconomic background or climb a social ladder through entering a prominent college even though shadow education has become a normative institution in parallel with public education.

step will be additional research on the relationship between economic returns, including lifetime expected return, and shadow education by using either a different dataset and sampled countries or longitudinal data.

In the United States and three Scandinavian countries (Denmark, Norway and Sweden), students from a high ESCS family were less likely to use shadow education, meaning that the relationship between shadow education use and ESCS is the opposite of that in the other 17 countries. A follow-up study will be necessary in order to explore whether a high level of school quality is related to this reverse relationship between shadow education use and ESCS in these countries.

In addition, further researcher is needed to explore the relationship between shadow education use and the overall institutionalization of public education. Although this relationship does not seem fully exclusive with a relationship between shadow education use and the expansion of higher education, it will expand our knowledge of the institutional characteristics of shadow education.

The insignificant variables in this study, such as high-stakes testing, need to be explored in a future study in that high achievers with an enrichment motive emerged as a big consumer of shadow education, and there was almost no difference in shadow education use between high and low achievers in this study. Further studies are needed to examine whether this finding is stable across countries beyond the sampled 21 countries and the reasons for using shadow education of both types of students. In addition, a follow-up study is needed to explore the reason female students' shadow education use in four countries (Australia, Denmark, New Zealand, and Norway) shows different patterns from the other 17 countries.

Limitations

The current study has several limitations that should be recognized while interpreting the results. First is how the variables used were measured. The main variable of the expansion of higher education was measured by the average growth rate in the population aged 25 and over with higher education between 1955 and 2005 (AGR). Although the dataset used to measure this variable came from Barro-Lee's educational attainment dataset, which is recommended by World Bank[25], it is uncertain that this is the best measure of the expansion of higher education. The population with higher education may reveal the overall degree of higher education's institutionalization in a country, but higher education enrollment does not consider the previously accumulated higher education graduates in a country. Accordingly, it is necessary to be cautious in interpreting the results of this study by considering these aspects. Further study is necessary to investigate the association between the expansion of higher education and the use of shadow education by using various proxies for higher education expansion. In addition, public education expenditure as a percentage of the GDP may not explain the overall aspects of school quality of public education. For this reason, other proxies for school quality should be explored when scholars examine the relationship between shadow education use and school quality.

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25 http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATION/EXTDATASTATISTICS/EXTEDSTATS/0,,contentMDK:22572747~pagePK:64168445~piPK:64168309~theSitePK:3232764,00.html

Second, there may be disagreement on the measurement of time period in this study. While the expansion of higher education was measured for the past fifty years, the other variables (except high-stakes testing) were measured as of 2008. Because this study did not investigate the relationship between shadow education use and the expansion of higher education using longitudinal data for all variables, this different measurement in time span may cause distortion of genuine relationships. In addition, high-stakes testing was measured by Bishop's (1997) classification based on whether a country had a Curriculum-based External Exit Exam System (CBEEES) in mathematics and science. However, Bishop's CBEEES does not provide information on the recent system, and it does not consider reading and other subjects. For the reason, this study has limitations in the interpretation of the relationship between shadow education use and high-stakes testing.

Third, the rate of participation in shadow education was measured by counting a student who uses shadow education in any academic subject as a shadow education user in order to investigate the general relationship between the expansion of higher education and shadow education use. However, there is a possibility of getting a different result by focusing on a specific subject (e.g., mathematics), because a certain subject may be emphasized in a country, with different subjects being emphasized in different countries, and this emphasis may influence the demand for shadow education in that particular subject.

Fourth, this study controlled national-level variables such as high-stakes testing, public education expenditure, GDP per capita, IRR, and public social expenditure when examining the relationship between the expansion of higher education and shadow

education use. However, there is a chance that an important variable related to this relationship was missed. Thus, researchers and policymakers should be cautious in interpreting the results of this study.

Fifth, this study analyzed the models for 21 and 20 countries. The results for 21 and 20 countries as shown in the results section are similar, but not identical. This may be because the number of sampled countries is small. In order to avoid the fallacy of generalization of the results of this study, their interpretations and implications should be narrowed to the sampled 21 OECD countries. Including the 13 other countries of the 34 total OECD countries may change the results. Sixth, this study examines the correlations among the national- and individual-level variables. The causal relationships, however, are beyond the scope of this study.

Lastly, this study has a limitation in concluding that neo-institutionalism is the best theory to explain the evidence for the relationship between higher education expansion and shadow education use. Although the evidence seems to be more relevant to neo-institutionalists' perspectives than those of other theories, the evidence is limited. Thus, it is suggested that scholars and policymakers pay attention to the relationship between higher education expansion and shadow education use and continue to analyze the relationship by using comprehensive datasets and larger samples of countries.

Although this study has some limitations as described above, it may contribute to the literature by providing empirical evidence for the relationship between the expansion of higher education and shadow education across 21 OECD countries. Researchers and policymakers in each country and international educational agencies should consider this positive relationship between the expansion of higher education and shadow education

use in order to understand the reasons for using shadow education in these 21 OECD countries and to increase educational opportunity.

APPENDIX

A. Students' Questionnaire on Shadow Education in the PISA 2009 (OECD, December 2008, p.19)

Q31. What type of <out-of-school-time lessons> do you attend currently?

These are only lessons in subjects that you are also learning at school, that you spend learning extra time outside of normal school hours. The lessons may be given at your school, at your home or somewhere else.

(Please tick only one box in each row)

		Yes	No
a)	<Enrichment lessons> in <test language>	☐1	☐2
b)	<Enrichment lessons> in <mathematics>	☐1	☐2
c)	<Enrichment lessons> in <science>	☐1	☐2
d)	<Enrichment lessons> in other school subjects	☐1	☐2
e)	<Remedial lessons> in <test language>	☐1	☐2
f)	<Remedial lessons> in <mathematics>	☐1	☐2
g)	<Remedial lessons> in <science>	☐1	☐2
h)	<Remedial lessons> in other school subjects	☐1	☐2
i)	Lessons to improve your <study skills>	☐1	☐2

B. The Expansion of the Population Aged Over 25 with Higher Education by Country

	1955	1960	1965	1970	1975	1980	1985	1990	1995
Australia	16.0	17.4	18.7	21.5	23.9	26.4	26.0	26.1	26.5
Austria	2.1	2.2	2.4	2.6	2.9	3.3	4.3	6.1	8.2
Belgium	3.4	3.8	4.5	5.2	6.8	8.8	11.1	17.4	19.9
Canada	11.1	13.1	13.9	14.0	16.2	17.9	19.3	21.4	24.0
Czech R.	0.9	2.4	2.9	4.1	4.6	6.0	9.4	13.7	11.2
Denmark	7.7	8.3	9.1	10.3	12.0	13.8	18.6	14.9	17.5
France	1.8	2.1	3.0	4.5	6.7	8.5	9.4	11.4	13.7
Germany	3.2	3.3	3.4	3.1	5.5	6.9	7.7	13.0	16.5
Hungary	3.0	3.4	3.5	5.1	5.9	7.0	8.6	10.1	11.0
Ireland	3.7	4.1	4.5	4.6	6.1	7.9	11.8	14.6	19.1
Japan	5.5	6.3	5.7	5.5	10.8	14.3	17.9	21.1	24.4
Korea	1.5	2.6	3.6	5.7	6.9	8.9	11.7	19.6	21.1
New Zealand	4.2	4.6	4.9	11.9	20.1	26.5	33.2	39.1	39.9
Norway	1.7	1.9	4.2	7.4	9.1	11.9	14.7	18.3	20.5
Portugal	1.0	1.1	1.4	1.6	2.3	3.5	5.5	7.7	8.4
Slovakia	2.0	2.4	3.1	4.1	4.8	6.0	7.4	9.5	11.2
Spain	1.5	1.7	2.0	2.3	5.1	7.1	7.8	8.4	12.3
Sweden	5.5	6.0	6.7	7.4	12.3	14.4	16.3	18.9	21.7
Switzerland	9.0	9.4	9.1	9.5	10.2	11.0	12.7	15.1	17.4
U.K.	1.6	1.8	4.3	7.5	9.7	9.3	9.9	10.7	12.0
U.S.A.	14.9	16.5	18.7	21.3	27.1	30.0	38.9	45.2	46.5
OECD	4.8	5.4	6.2	7.6	10.0	11.9	14.4	17.3	19.2

Source: Barro-Lee's educational attainment dataset

B. (continued)

	2000	2005	Mean*
Australia	27.7	30.9	6.9
Austria	11.5	16.0	22.2
Belgium	22.8	26.8	23.3
Canada	26.9	43.9	15.6
Czech R.	10.2	12.5	36.8
Denmark	16.7	17.1	9.2
France	17.0	19.8	27.3
Germany	19.7	20.5	22.8
Hungary	12.6	12.2	15.5
Ireland	25.2	27.8	22.3
Japan	28.4	32.3	21.7
Korea	26.8	32.0	36.7
New Zealand	42.0	45.0	31.7
Norway	24.5	28.2	35.4
Portugal	9.9	11.2	28.2
Slovakia	11.7	12.2	20.2
Spain	18.1	23.6	33.3
Sweden	23.1	27.0	18.1
Switzerland	19.1	18.3	7.5
U.K.	14.6	17.9	31.8
U.S.A.	52.0	53.0	13.7
OECD	21.9	25.2	22.9

*Mean (the average growth rate in the population aged 25 and over with higher education) was calculated by the author using the following equation: [[{(1960-1955)/1955} +{(1965-1960)/1960} +{(1970-1965)/1965} +{(1975-1970)/1970} +{(1980-1975)/1975} +{(1985-1980)/1980} +{(1990-1985)/1985} +{(1995-1990)/1990} +{(2000-1995)/1995} +{(2005-2000)/2000}] / 10] x 100

C. National Contexts across 21 OECD Countries

Country	A*	B	C	C'	D	E
Australia	0	4.4	49,379	10.81	131	17.8
Austria	1	5.5	49,679	10.81	160	26.8
Belgium	0	6.4	47,376	10.77	133	27.3
Canada	0	4.8	45,100	10.72	142	17.6
Czech R.	1	4.1	21,627	9.98	183	18.1
Denmark	1	7.7	62,596	11.04	125	26.8
France	0	5.6	43,992	10.69	150	29.8
Germany	0	4.6	44,132	10.69	167	25.2
Hungary	1	5.1	15,365	9.64	210	23.1
Ireland	0	5.7	59,574	10.99	155	19.7
Japan	1	3.4	37,972	10.54	148	19.9
Korea	1	4.8	19,028	9.85	160	8.3
New Zealand	1	5.6	30,611	10.33	118	19.8
Norway	0	6.4	95,190	11.46	128	19.8
Portugal	0	4.9	23,716	10.07	177	23.1
Slovak R.	1	3.6	18,109	9.80	181	15.7
Spain	0	4.6	34,976	10.46	138	22.9
Sweden	0	6.8	52,731	10.87	126	27.5
Switzerland	0	5.4	65,800	11.09	154	18.4
U.K.	1	5.4	42,935	10.67	154	21.8
U.S.A.	0	5.5	46,760	10.75	177	17.0
Average	0.43	5.3	43,174	10.57	153	21.3

* This study follows Baker et al.'s (2001) classification of high-stakes testing based on Bishop (1997). A country coded as '1' had a Bishop's Curriculum-Based External Exit Exam System (CBEEES) both in math and science. Otherwise countries are coded as '0.'

A: High-stakes testing, B: Public educational expenditure in 2008, C: GDP per capita in 2008, C': GDP per capita in 2008 (logged), D: Private internal rate of return from higher education in 2008 (High school graduate: 100), E: Public social expenditure in 2008

D. Shadow Education Use in terms of ESCS, Achievement, and Gender by Country

	Shadow ED. use	ESCS			Achievement			Gender	
		Low	Middle	High	Low	Middle	High	Male	Female
Australia	22.9	19.8	21.7	27.3	25.1	20.6	23.1	23.1	22.7
Austria	31.3	27.5	30.0	36.4	32.6	32.3	28.9	29.1	33.3
Belgium	23.4	19.0	23.1	28.0	25.6	26.4	18.1	22.1	24.7
Canada	21.6	19.0	21.7	24.1	29.2	19.8	15.7	21.4	21.8
Czech R.	45.7	43.7	45.1	48.4	49.2	45.4	42.6	42.3	49.3
Denmark	18.4	23.5	16.4	15.2	31.7	14.7	8.8	18.6	18.1
France	42.4	39.3	38.9	48.9	42.4	43.9	40.9	39.1	45.4
Germany	35.5	33.4	36.0	37.1	40.3	36.9	29.2	33.3	37.5
Hungary	39.8	32.2	39.4	47.8	37.2	38.7	43.5	38.0	41.6
Ireland	27.6	20.4	27.2	35.4	30.3	26.8	25.9	26.1	29.1
Japan	56.5	48.3	56.3	65.1	50.1	57.0	62.5	54.3	58.9
Korea	80.2	68.9	82.4	89.4	64.1	84.7	91.9	76.0	84.8
New Zealand	24.4	21.1	25.3	26.7	32.3	22.1	18.8	24.8	24.0
Norway	24.7	27.2	23.6	23.3	37.8	22.5	13.9	24.8	24.7
Portugal	50.5	46.0	52.2	53.3	54.2	49.0	48.2	47.5	53.2
Slovakia	43.8	36.0	44.5	51.1	43.5	42.6	45.4	43.4	44.3
Spain	55.3	47.9	56.9	61.0	56.7	55.6	53.6	53.1	57.6
Sweden	22.5	28.1	21.7	17.7	37.7	17.8	12.0	21.5	23.6
Switzerland	26.3	25.3	26.3	27.4	32.2	25.8	20.9	25.8	26.9
U.K.	52.1	48.8	53.4	54.0	53.9	55.5	46.9	49.2	54.9
U.S.A.	27.0	29.0	28.1	23.9	38.8	25.5	16.7	26.4	27.6
Average	36.8	33.5	36.7	40.1	40.2	36.4	33.7	35.2	38.3

E. The relationships between shadow education use in academic subjects and the expansion of higher education for 19 OECD countries (excluding Korea and Japan)

Shadow education use	Model1		Model2		Model3	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.728*** (.098)	.483	-.833*** (.106)	.435	-.821*** (.093)	.440
Individual-level variables						
Economic, social and cultural status			.279*** (.007)	1.321	.279*** (.007)	1.321
Achievement			-.001*** (.000)	.999	-.001*** (.000)	.999
Female			.158*** (.011)	1.171	.158*** (.011)	1.171
National-level variables						
Higher education expansion (AGR)	.032** (.011)	1.033	.034** (.012)	1.035	.024** (.008)	1.024
High-stakes testing					.131 (.375)	1.140
Public Education expenditure					-.437*** (.092)	.646
GDP per capita						
IRR						
Public social expenditure					.053* (.021)	1.054

^ p<.10 * p<.05, ** p<.01, *** p<.001

E. (continued)

Shadow education use	Model4		Model5	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-.819*** (.098)	.441	-.826 (.086)	.438
Individual-level variables				
Economic, social and cultural status	.279*** (.007)	1.321	.279*** (.007)	1.321
Achievement	-.001*** (.000)	.999	-.001*** (.000)	.999
Female	.158*** (.011)	1.171	.158*** (.011)	1.171
National-level variables				
Higher education expansion (AGR)	.031*** (.008)	1.032	.027*** (.007)	1.028
High-stakes testing	-.171 (.168)	.842	-.020 (.160)	.981
Public Education expenditure			-.272* (.114)	.762
GDP per capita	-.463^ (.240)	.629	-.149 (.248)	.861
IRR	.009^ (.004)	1.009	.007^ (.004)	1.007
Public social expenditure	.013	1.014	.042* (.019)	1.043

^ p<.10 * p<.05, ** p<.01, *** p<.001

F. The relationships between shadow education use in mathematics, science, and reading and the expansion of higher education (Model5) for 19 OECD countries (excluding Korea and Japan)

Shadow education use	Mathematics		Science		Reading	
	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio	Logistic coefficient	Odds ratio
Intercept	-1.342*** (.082)	.261	-2.519*** (.142)	.081	-2.114*** (.131)	.121
Individual-level variables						
Economic, social and cultural status	.236*** (.008)	1.266	.176*** (.010)	1.193	.040*** (.010)	1.041
Achievement	-.005*** (.000)	.995	-.005*** (.000)	.995	-.008*** (.000)	.993
Female	.073*** (.013)	1.076	.057** (.018)	1.059	-.276*** (.017)	.759
National-level variables						
Higher education expansion (AGR)	.021** (.007)	1.021	.036** (.012)	1.037	.018 (.011)	1.018
High-stakes testing	-.193 (.153)	.824	-.151 (.263)	.860	-.063 (.243)	.939
Public Education expenditure	-.261* (.109)	.770	.073 (.187)	1.076	-.253 (.173)	.776
GDP per capita	-.140 (.237)	.869	-.365 (.408)	.694	-.069 (.376)	.933
IRR	.005 (.004)	1.005	-.001 (.006)	.999	-.002 (.006)	.998
Public social expenditure	.043* (.019)	1.044	-.045 (.032)	.956	.005 (.029)	1.005

^ p<.10 * p<.05, ** p<.01, *** p<.001

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Hyung-Kee Kim
Deputy Director
Seoul Metropolitan Office of Education
Songwol-Gil 48, Jongno-Gu
Seoul, Korea, 110-781
82-10-4288-0135
carpediem.kim.2010@gmail.com

Education

Ph. D. Educational Theory and Policy, The Pennsylvania State University (2011-2013). Dissertation: An Analysis of the Causes of Shadow Education in the Era of the Schooled Society

Completion Master Program. Public Policy, Graduate School of Public Administration, Seoul National University, Seoul, Korea (1998-2001).

B.A. Education, Hanyang University, Seoul, Korea (1991-1998).

Professional Experience

2004-present	Deputy Director, Ministry of Education and Human Resource Development, Korea; Ministry of Education, Science and Technology, Korea; Seoul Metropolitan Office of Education, Seoul, Korea
2003-2004	Lecturer, Education, Chunchukwan and Taehakkwan, Seoul, Korea
2000	Research Assistant, Korea Research Institute for Vocational Education and Training, Seoul, Korea
1999	Lecturer, Social Studies, a private tutoring academy, Gyeonggi, Korea
1996	Intern Teacher, National Ethics, Gangneung High School, Gangwon, Korea

Scholarly Works

Kim, H. K. (March 2013). A multilevel analysis on the causes of shadow education in the era of the schooled society. The 57th annual conference of the comparative and international education society (CIES 2013). New Orleans, Louisiana

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