# Educational Privatization in the 21st Century: A Global Framework for Understanding Non-government Schools

By

Jonathan Michael Bradley Stern

Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Leadership and Policy Studies

May, 2014

Nashville, Tennessee

Approved:

Stephen P. Heyneman, Ph.D.

William R. Doyle, Ph.D.

Ron W. Zimmer, Ph.D.

Kathryn H. Anderson, Ph.D.

## ACKNOWLEDGEMENTS

I am incredibly grateful for all of the support that I received from my dissertation committee throughout this entire process. Will Doyle, Ron Zimmer and Kathy Anderson: your guidance and feedback was invaluable. Steve Heyneman: I cannot even imagine having gone through this program and dissertation without your mentorship, support and friendship. Additionally, I would like to thank the entire LPO faculty and staff, particularly Tom Smith, Ellen Goldring, Dale Ballou and Rosie Moody.

This work would not have been possible without the generous support of Peabody College, the Graduate School of Vanderbilt University, the ExpERT program and the research opportunities afforded to me by Steve Heyneman. I would also like to thank the Economics department at the University of Sao Paulo for granting me access to their data, as well as USAID for providing me with a great consulting opportunity—both of which were instrumental to this dissertation's completion.

A huge thank you to all of my friends—in Nashville and beyond—who supported me throughout this process. You know who you are. To my cohort (Amanda, Jungmin, Maida, Pete, Ryan and Toby): this place would not have been the same without you. My work may have been delayed by the number of Sporcle quizzes that Toby, Amanda and I took in our office or by the never-ending conversations about methods, design and life that I had with Ryan and Pete…but it was all worth it and I'd do it again in a heartbeat.

Last but so incredibly far from least, I want to sincerely thank my family for everything that they have done for me over the past 5 years (and the 29 years preceding them). Mom, dad and Missy: I love you so very much. And don't worry mom, this dissertation may be behind us but there's still plenty of editing to be done.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

# INTRODUCTION

## The Debate

Due to mounting financial problems and increased pressure from bilateral and international aid organizations, there was an increased use of non-government industries for the provision of historically government-provided services throughout the developing world in the 1980s (Cowan, 1990). Initially, much of this growth began in the health and transportation sectors with the non-government provision of the education sector lagging behind. This primary focus on non-merit goods (i.e. goods that are provided based on an individual's ability and willingness to pay (Musgrave, 1959)), followed the pattern of privatization in advanced countries that began decades, and in some cases centuries, earlier. As a matter of fact, many economists argue that the private sector should not and cannot be responsible for the provision of merit goods such as education, particularly in developing countries (Roth, 1987). For example, Lewin (2007) contends that basic education is a human right that only states can deliver. This argument holds that states have the moral and legal responsibility to protect minorities, promote equity and diminish exclusion. Roth (1987) supports this assertion by noting that some economists believe that only the state can provide an education system that promotes national unity and social cohesion. Additionally, Lewin (2007) claims that if non-subsidized providers in low-income communities depend on community revenue, including tuition, they are essentially drawing down the community's wealth—thus forcing poor families to choose between educational services and other necessities such as food and health services. Accordingly, Watkins (2004) asks, "Should the world's poorest people really be expected to choose between health and the

education of their children? And what is the market rationale to suggest that such choices make sense for the rest of society?" (p. 9).

Another argument against the expansion of non-government schools for low-income families in developing countries is that the claims of greater efficiency, lower cost, higher quality and higher relevance in the non-government sector can only be true under certain conditions. These include "informed choice, transparent accountability, adequate regulation and an effective legal framework," and these rarely, if ever pertain to the reality of the poorest households in developing countries (Lewin, 2007, p. 44). Opponents of non-government schooling claim that without sufficient information (e.g. informed choice) low-cost private schools will simply be taking advantage of poor parents (Probe, 1999; Watkins, 2004). A fourth argument against the use of non-government schools that is raised in the literature is that relying on non-government schools can undermine the public education system. Parents often choose to enroll their children in non-government schools because of shortcomings in the public system. While this may prove to be an appropriate (short-term) fix for the students who move, "failure to address the challenge through increased public investment and improvements in service delivery will inevitably undermine public education" (Watkins, 2004, p. 10).

The final two arguments against this sector are that even low-cost private schools will never be able to accommodate the poorest households and that no OECD or rapidly developing country has depended on non-government provision to achieve universal attendance in basic education (Lewin, 2007; Probe, 1999; Rose & Adelabu, 2007; Srivastava & Walford, 2007; Watkins, 2004).

Despite these arguments and concerns, the trend toward privatization in education in developing countries became apparent in the mid-1990s and the rise of low-fee private schools

has been evident ever since (Phillipson, 2008; Srivastava & Walford, 2007). One of the major arguments for the expansion of this sector is that with scarce government resources and a need to provide a unified education system (often without the ability to specialize for students with differentiated demands for language of instruction or religion) there is ultimately a limit to what the public education sector can provide in developing countries (James, 1993). British professor and researcher James Tooley further argued in a 2004 commentary that:

> Government schools cannot provide quality education for all. If the goal of education for all is to be achieved, the private sector must be encouraged and not squeezed out. Development agencies need to wake up to this because large-scale government education leads to failure on a large scale that can cause serious harm to the poor. (p. 4)

Over the past few years, with a continued expansion of low-fee schools across developing countries, international and bilateral aid agencies have indeed begun to evaluate the role of the sector in assisting countries to meet their Education for All goals. However, much work remains to be done. Little is known about the quality of the low-cost private school sector in most countries and even less research has focused on why certain countries have larger private sectors than others. The purpose of this dissertation is to address both of these gaps in the private school literature via three distinct but interrelated studies on private schooling in developing countries.

## History of Low-fee Private Schools

At one time or another, non-government schools have played a role in nearly every country's educational history. Throughout the world, schools not controlled (or funded) by the government provided the first formal educational opportunities for children—whether begun by individuals, the private sector or religious organizations. However, these were often elite private schools, only accessible to the country's wealthiest citizens. The visible nature of elite private schools has given rise to the common misconception that all non-government schools are for the

wealthy, thus making the mere possibility of low-fee private schools in developing countries seem paradoxical to some. In the modern education age, however, when nearly all nations have accepted that education is a basic human right that should be made available to all, 'private schools for the poor' have become a distinct reality in nearly all developing countries (Tooley, 2004; Tooley and Dixon, 2005; Verspoor, 2008).

While the relative size, support and impact of low-fee private schools vary by country, I posit three primary reasons for the rise of the sector in developing countries. The first reason (paper one) is that inadequate or uneven distribution of government finance leads to demand for schooling that non-government schools can fill (Colclough, 1997). The second reason (paper two) is low quality and/or inefficient public education (Tan, 1985). The third (paper three) addresses the issue of a public education system that fails to meet the diverse, differentiated needs of its students. These needs could include anything from parental demand for teaching in an international language or particular religious emphasis to smaller class sizes and more personalized teaching (James, 1993).

Arguably the greatest contributing factor to the rise of low-cost private schooling is a movement that began, ironically, to ensure that children in all countries had access to free, high-quality basic education. Beginning in 1948, The Universal Declaration of Human Rights stated that "everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall by compulsory". More than 40 years after the adoption of the Universal Declaration of Human Rights, international agencies, NGOs and government officials came together in Jomtien, Thailand for the World Conference on Education for All. Motivated by the fact that more than 100 million children worldwide had no access to primary schooling and an estimated 960 million adults across the globe were illiterate, attendees

at this conference adopted the World Declaration on Education for All—which proclaimed, once again, that education is a fundamental human right and stated that basic education was to be provided to all children, youth and adults. Ultimately, the declaration pledged that by the year 2000 all countries should have achieved universal access to quality education. However, unlike the UDHR it did not call for free education for all. Over the next decade, a large gap stubbornly persisted between the ambitious commitments of many countries and their actual enrollment and literacy rates. With this in mind, governments and organizations met once again at the World Education Forum in Dakar, Senegal (2000), to reaffirm the vision set by the World Declaration on Education for All. The Dakar Framework for Action established six new goals for meeting the basic educational needs of all children, youth and adults around the world by 2015. The most relevant goal for this study is goal two, which aimed to ensure "that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to, and complete, free and compulsory primary education of good quality" (WEF, 2000, p. 15). Furthermore, this most recent declaration of Education for All stated that "for the millions of children living in poverty, who suffer multiple disadvantages, there must be an unequivocal commitment that education be free of tuition and other fees" (p. 15). While this proclamation reaffirmed the views expressed in the Universal Declaration of Human Rights (i.e., free primary education), it represented a departure from the original EFA goals established in Jomtien. Along with the fifth and sixth goals proposed in the Dakar Framework (eliminating gender disparities by 2005 and achieving gender equality by 2015, and improving all aspects of the quality of education, respectively), this new Education for All commitment lies at the heart of the current debate on the role of private basic education in developing countries.

Progress toward EFA has been made since 2000 but it has been slow and inconsistent. The reasons for this include: 1) lack of government capacity and, on occasion, commitment; 2) short-term decreases in donor support/funding; 3) the recent global economic crisis; and 4) the prevalence of post-conflict states (UNESCO, 2010). As a result of this sluggish progress, many countries have turned to the private sector to meet their needs (Musani, 2008; Tooley, 2009; Verspoor, 2008). As Cowan (1990) notes, privatization is a country-by-country choice—with governmental support lying at the crux of the decision.

*Governmental Support*

While some governments have opposed (or even forbidden) the private education sector, others have historically supported it. In Bhutan, Cameroon, Chile, Colombia, Haiti, Aruba, and Trinidad and Tobago, among others, governments appear to have fully accepted that the private sector is necessary and that it can fulfill a role that the public system cannot (or will not)[1]. Perhaps best known is the large-scale Chilean voucher program in which the government provides per-pupil vouchers for students to attend private schools (both those owned by private franchises and those independently owned) (Arenas, 2004; Elacqua et al, 2009; Hsieh & Urquiola, 2006; McEwan & Carnoy, 2000; Somers et al, 2004). There is a smaller scale, more selective voucher program in Cameroon, where the government provides per-student subsidies to faith-based private schools, although not to non-religious private schools, which assists faith-based schools in targeting lower-income students (Backiny-Yetna & Wodon, 2009). In 2009, India adopted The Right To Education Law, which requires that 25 percent of the first grade places in non-government schools be offered to children from low-income families. The government promises to reimburse the cost of tuition for these low-income students. About 10

[1] In cases such as Haiti, Aruba, and Trinidad and Tobago, private primary enrollment rates are upwards of 70-80 percent.

percent[2] of India's children in lower primary and about 25 percent in upper primary attend non-government schools (Ahmed and Govinda, 2010, p. 372).

Taking a less direct approach, the government of Bhutan conducted extensive school-mapping in order to assess the public system's shortcomings and subsequently worked with communities to set up non-government schools to account for the under-supply of public school spaces (Bray, 2002; Kitaev, 2004). In Trinidad and Tobago, the government has taken to purchasing seats in private schools in order to meet excess demand for education (Kitaev, 2004). After an eight-year voucher program that served 125,000 low-income students, the Colombian government instituted a similar plan of purchasing private school seats—although the country's newest approach has consisted of the government contracting out to 'concessionary schools' (privately run) that are required to accept any student from the lowest two socio-economic strata (Angrist et al, 2002; Bettinger, 2005; Cox & Jimenez, 1990; Uribe et al, 2006; Villa & Duarte, 2005).

At the other end of the spectrum are countries like Barbados, Mauritius, Nepal and Uzbekistan. All of these countries (in addition to several other transitional economies) have governments that strongly believe the delivery of education to their nation's children is the sole responsibility of the state. Prior to 1990, most socialist countries of eastern and central Europe forbid the use of non-government schools. Today, one of the most extreme examples of opposition comes from Nepal. The non-government education system in Nepal has faced extreme adversity from the Maoist movement, often in the form of demonstrations against the unfair advantage provided by high-tuition private schools in Kathmandu (Caddell, 2007).

[2] This figure is likely to change with the Right To Education Act, which stipulates that 25 percent of seats in primary school are to be reserved in private schools.

The majority of developing countries in the world fall somewhere between these two categories—with government support and regulatory measures ranging from clearly delineated and strictly enforced to non-existent. Ultimately, decisions about privatization in education appear to revolve around public funding, governmental support, differentiated demand and public school capacity. However, no studies have examined the political, demographic and economic factors that lead to differing rates of private enrolments across countries since the educational landscape began to change so dramatically nearly twenty years ago. The study undertaken for the first paper of this dissertation has been specifically designed to address this gap.

**Paper One**

The most recent comprehensive study of factors impacting the differences in public and private provision of education across countries was produced by Estelle James in 1993. As noted throughout this introduction, much has changed in the education of developing countries since that time. For example, James (1993) finds that the private secondary school sector in developing countries is nearly twice that of advanced countries and finds that one of the most significant predictors of this difference is low public spending on education in developing countries. While this finding was important at the inception of the Education For All movement, it no longer holds today. Based on my analyses in Chapter II, I find that there is no longer even a statistically significant difference in the private secondary school enrolment rates between advanced and developing countries. Moreover, with increases in both public spending and private enrolment rates, public spending is no longer a significant predictor of private enrolment rates across any of the models examined. This finding is important for policy makers who disagree about the role of public versus private schooling in developing countries. More specifically, if increased public

spending decreased private enrolments (thus increasing public enrolments), as found in James (1993), this would provide continued support to those who argue that public schooling is underfunded and that providing additional resources to public sector is the best approach for assisting countries to reach education for all (Lewin, 2007). However, since public spending is no longer predictive of private (or public) enrolment rates, it now appears as though providing additional resources to the public system may well be a misguided approach. While this paper is not designed to assess the merits of public versus private schooling, the findings are instrumental for policy makers and aid organizations interested in supporting the growth of either the public or private education sector in developing countries.

Accordingly, paper one uses longitudinal data from 2002 to 2009 in order to answer two important questions: 1) What are the demographic, economic and political factors that impact the provision of public versus private education in primary/secondary schools across advanced and developing countries? 2) At what level of economic development do we find changes in our significant predictors of private enrolment rates?

The data for this study have been obtained and/or calculated from a variety of sources and provide information on 128 countries over the span of 8 years. For more than just simply updating the data used by James (1993), this paper also provides significant revisions and expansions to the modeling approaches and variables used to asses the impact of spending on private schooling rates. First, I conduct longitudinal analyses in addition to cross-sectional ones, which allows for the estimation of coefficients as covariates change over time. Additionally, while James focused only on the secondary school sector, I conduct all analyses for both primary and secondary schools. Also, this study introduces a variety of covariates into the model that were unavailable in James' dataset. For example, population growth as well as state fragility and

government corruption indexes are tested as potential predictors of private enrolment rates. Ultimately, these new models provide us with groundbreaking findings that contradict the conventional understanding of the interplay between spending and privatization. The inclusion and operationalization of all variables, as well as sample and modeling choices are all discussed in detail in Chapter II.

## Low-cost Private School Quality Studies

While being able to understand the political and economic environments that are most conducive to the expansion of a private schooling sector is important, it is equally important to examine the quality of the private sector that's expanding. If low-cost private schools are on the rise and they are found to be more effective than their public school counterparts, they may warrant further investigation and/or increased support from governments and international aid/development agencies. If, however, these schools are failing to provide any educational benefits above and beyond that of the public sector, it would likely be necessary to find a new approach for assisting countries to meet their Education for All goals.

An increasing number of studies have examined the quality of low-cost private schools over the past decade. Several of these studies have been groundbreaking and most have been beneficial for advancing the field and this line of inquiry. Unfortunately, few (if any) of these studies have provided convincing approaches to account for concerns about selection bias which are inherently problematic across the school choice literature. [Specific studies, along with their limitations are discussed in detail in Chapter III.]

Papers two and three in this dissertation were designed to assess the quality of low-cost private secondary schools in two countries with distinctly different private school sectors, while using modeling techniques that were designed to reduce selection bias. Paper two examines

secondary schools in Brazil—a country that fits a more traditional model of moderate private enrolments (approximately 14%) and relatively low public spending on private schools (less than 10%), with a history of private schools serving the wealthy. Paper three examines secondary schools in Indonesia, where nearly 40% of students are enrolled in private schools and approximately 40% of private funding comes from the public sector.

## Paper Two

Only a few decades ago, secondary schools in Brazil were considered to be the forgotten education sector (Brock & Schwartzman, 2004). The focus of the government was predominantly on primary education with an additional emphasis on supporting those who were fortunate enough to make it to higher education. In recent years, however, the Brazilian government has more than doubled its investment in public secondary education. Specifically, the government increased the public expenditure per pupil as a percent of GDP per capita on secondary education from 9.5% in 1999 to 19.5% in 2008 (World Bank, 2012). However, during these same years, enrolments in private secondary schools increased slightly from 12% to 13% (UNESCO, 2012). With such significant increases in public investment, the question is why is the non-government sector still expanding. The simplest answer is that there is a perception that private schools are of higher quality than public schools. While this is a rational argument for high-tuition schools based on the large literature of private school quality across the globe, the concerns raised in the beginning of this introduction call this assumption into question with regard to low-tuition schools.

Accordingly, in order to understand why there is still such a large demand for private schools despite increased governmental support to the public system, this paper examines the types of students who transfer to low- and high-tuition private schools as well as how they are

achieving compared to their public school counterparts. This study takes advantage of a comprehensive dataset on secondary school students in the state of Sao Paulo, Brazil to answer the research questions: Do students who attend (low-fee) private schools perform better than they would have had they remained in the public system? Furthermore, do these results help to explain the demand for private education in the face of increased government support for public education?

The original model for this study uses ordinary least squares (OLS) regression with baseline test scores and demographic information as controls, transfer to a public school as treatment and test scores on an end of high school exam as the outcome. More specifically, this analysis examines the differences in academic achievement test scores between those who transfer from a public to a private school and those who remain in the public sector. Since there are factors other than test scores and demographic information that are likely to impact both the decision to transfer as well as a student's eventual outcome, this study also employs three different matching methods in order to mitigate against selection bias. Additionally, a Heckman selection model and the introduction of an unobserved confounder are tested in order to assess the robustness of my findings. All sample and modeling decisions, as well as the operationalization of covariates are discussed in detail in Chapter III.

## Paper Three

As indicated in the governmental support section above, private provision of services does not mean that there is no government role whatsoever. In many cases, there is a mix of public and private funding, management and/or oversight (Roth, 1987). Furthermore, privatization can take many forms: full transfer from the public to the private sector; partial state retention of ownership; leasing or franchising or contracting (e.g. vouchers and concessionary

schools); public private partnerships with regard to funding and/or provision of services (Cowan, 1990). Many voucher programs have been researched extensively and a traditional model of near full transfer of responsibility (for funding and provision) from the public to private sector is assessed in the Brazil case study in paper two. This paper alternatively examines a far more unique situation in private educational funding, provision and achievement.

The private education sector in Indonesia is distinctive in many ways. First, private schools can be registered with either of two central government ministries: the Ministry of National Education (MONE) or the Ministry of Religious Affairs (MORA). Additionally, private schools accepting government operational funding are not permitted to charge tuition nor are they allowed to use the money to pay for teacher salaries. Yet, the public sector ultimately only covers about 40% of the funding for private schools. Finally, while approximately 40% of secondary students in Indonesia attend private schools, they tend to perform significantly lower on the Programme for International Student Assessment (PISA) than their public school counterparts (OECD, 2012). The question then is why they attend. By supplementing information from interviews recently conducted in Indonesia with analyses of PISA 2009 data for public and private school students, this paper answers the questions: Given significantly poorer performance on PISA exams, why are private secondary schools in Indonesia in such high demand? Additionally, what implications does this have for international education policy?

PISA data was first used in this study to examine the demographic and socioeconomic differences between public and private school students. Subsequently, analyses were conducted to determine the impact of attending a private school on reading achievement. Since the same selection bias concerns that were discussed in paper two are also relevant for this study, an approach beyond simple OLS is necessary. In order to address these concerns, this study also

uses a variety of matching algorithms to balance across treatment and control groups. Further explanation of these models, as well as the matching approach can be found in Chapter IV.

After analyzing the data and obtaining an accurate estimate of the effect of private schooling on reading achievement, information obtained from interviews with ministry officials, aid organizations, private foundations and school personnel was used to explain why Indonesia appears to have a poor performing private education sector as compared with other developing countries and why students are still enrolling in such high numbers.

## Contribution and Significance

Despite increased governmental efforts to reach the goals set by the Education For All forums in 1990 and 2000, the past few decades have also seen a shift toward non-government provision and funding of services in developing countries. This has caused an interesting phenomenon of increased public spending on education with concomitant increases in private enrolment rates, including an expansion of a burgeoning low-fee private schooling sector across the developing world. The three studies in this dissertation have been developed to address this new trend and to answer three broad questions that have strong policy implications.

Paper one examines the non-government provision of education across the globe and answers the question: Does public spending on education really matter? Paper two analyses low-tuition private schools in Brazil and addresses the question: Why don't public spending increases decrease private school enrolments? Paper three draws upon research on private secondary schools in Indonesia in order to answer the question: Why are there continued high enrolments in private schools despite poor performance?

Ultimately, this dissertation is composed of three high-quality studies, each of which has potential to impact policymakers from governments and aid organizations by addressing

questions about why private schools, particularly those for the poor, expand across the globe in spite of major increases in opportunity in public schools.

## A Note on Terminology

The term ‘non-government schools’ was specifically chosen for the title of this dissertation due to the complexity of the term ‘private’, as well as the connotation that private often means elite and/or for-profit. However, the terms ‘non-government’ and ‘private’ are used interchangeably throughout this dissertation. These terms are used in a broad sense to mean “the production or provision or delivery of services by the private sector in one or more ways” although specific definitions are provided for each of the three main papers in the dissertation (Roth, 1987, p.1).

# CHAPTER II

## PRIVATE PROVISION OF EDUCATION ACROSS COUNTRIES: A GLOBAL APPROACH

Private schools have played a continued role in the educational systems of both developing and advanced countries for centuries. Given this, researchers have conducted studies on nearly all aspects of the private schooling sector across the globe. However, it appears that there is one aspect that has been virtually overlooked in the literature. While there is no shortage of high-quality studies on the impact of private schools in developing countries (including examinations of both inputs and outcomes), little research has been conducted on why countries have different mixes of public and private provision of education. Although government policies in some countries impose significant constraints on the private sector, it is still unclear why countries with similar policies and views on privatization may differ in the rate of expansion of private schools. This question is of increasing importance due to the shifting landscape of educational spending and private enrolments in developing countries over the past few decades. For example, while more than 100 developing countries have made commitments to increase public spending on education (coupled with assistance from aid organizations) as a result of Education for All, many of these countries are seeing a concomitant expansion of their private schooling sector—especially at the primary level (WEF, 2000; UNESCO, 2012). Therefore, I hypothesize that the conventional understanding of the interplay between public funding and private provision of education (i.e. higher levels of public funding are associated with lower levels of private enrolments) is no longer a sufficient explanation for assessing educational privatization across countries in today's educational climate. This study posits a range of national-level predictors for the private provision of education (such as government stability, corruption, economic growth, population growth and distribution of wealth) in order to answer

two main research questions: 1) What are the demographic, economic and political factors that impact the provision of public versus private education in primary/secondary schools across advanced and developing countries? 2) Is there a particular level of development below which public spending on education is predictive of private enrolment rates? While this study is intended to provide some much needed information to development agencies and governmental organizations across all countries, the secondary question is arguably of even greater importance. If the level of public spending on education is predictive of private enrolment rates in a subset of the most economically disadvantaged countries, this work could have a significant impact on targeted aid to education—particularly for those organizations interested in increasing public enrolments.

## Background

There has been a global trend toward the privatization of services over the past few decades. However, this trend has been even stronger in developing countries than it has been in advanced economies. For example, Table 1 shows that while there was a negligible decrease in the proportion of GDP coming from state-owned enterprises (SOE) in high-income countries between 1980 and 1997, the percent of GDP coming from SOEs in low-income countries dropped to one-fifth of what it was in 1980.

Table 1: Change in Percent of GDP from State-owned Enterprises (1980-1997)

| Countries (by Income Group) | 1980 | 1997 | Change |
|---|---|---|---|
| Low Income Countries | 15% | 3% | -12% |
| Lower Middle Income Countries | 11% | 5% | -6% |
| Upper Middle Income Countries | 10.5% | 5% | -5.5% |
| High Income Countries | 6% | 5% | -1% |

Source: Sheshinski & Lopez-Calva, 1999

Although it is unclear whether this change was more the result of an expansion in the number of private enterprises or simply a growth in the size of existing enterprises, the underlying message remains the same: the private sector (particularly in developing countries) is playing an increasingly important role in the provision of services as compared with the public sector. Since there is a dearth of literature on the factors impacting privatization of educational services, it is useful to examine the broader economic literature in order to frame the current study[3].

*Understanding Privatization*

Privatization is a term that is commonly used in economics literature but its meaning can vary significantly from study to study. For example, Brada (1996) offers that there are four main types of privatization: 1) privatization through restitution (e.g. returning publically-seized land to its original owners); 2) privatization through the sale of state property (e.g. direct sales of SOEs); 3) mass or voucher privatization (e.g. individuals bidding for a share in SOEs); and 4) privatization from 'below' (e.g. start-up of new private enterprises). Megginson & Netter (2001) argue that while this taxonomy is useful, there are many other types of privatization that do not fit into one of these four categories. For example, they note that privatization in the United States typically refers to the contracting out of the production of goods and services to private institutions. In addition to the transfer of ownership through sales of assets and the franchising or contracting out of the provision of services previously supplied by the public sector, Andersen (1992) posits a third type of privatization: "Liberalization of market entry to previously regulated markets (which falls into the deregulation category)" (p. 180). It is this definition of the liberalization of market entry and the deregulation of services that is most appropriate for

[3] There is a large literature base on school choice—which offers extensive examinations of the benefits and drawbacks to private education—but this work does not provide information about the national and/or economic factors that lead to the privatization of services.

understanding the changes in privatization across developing countries over the past few decades. For instance, many countries have loosened constraints on entry into the market and have provided opportunities for community organizations, NGOs and individual entrepreneurs to open private schools in order to provide basic educational services to both primary and secondary school children (Phillipson, 2008; Srivastava, 2013). Additionally, competition and deregulation have been found to be more important than more extensive forms of privatization or governance changes for improving performance (Yarrow, King, Mairesse & Melitz, 1986; Kay & Thompson, 1986; Bishop & Kay, 1989; Vickers & Yarrow, 1991; Allen & Gale, 1999). However, it should be noted that while some deregulation is a regular occurrence, full deregulation is quite rare. Andersen (1992) notes in the case of transportation that "the main reason for not introducing such a system has been a strong interest and political will to continue a system of integrated public transport with a uniform fares system for local public transport" (p. 189). This argument appears only to be strengthened when applied to a merit good such as education, which many argue is ultimately the state's responsibility to provide, or at the very least monitor and regulate, such services (Lewin, 2007).

*Factors Impacting Privatization*

A common theme across the literature is that privatization is often a response to the failings of state ownership and that low-quality public services will lead to an increased provision of private services (Bartolotti & Pinotti, 2008; Kayizzi-Mugerwa, 2002; Megginson & Netter, 2001). This is supported by recent literature on low-cost private schooling in developing countries, which shows that private schooling is on the rise due to shortcomings of the public education sector (Heyneman & Stern, 2013; Srivastava & Walford, 2007). Although some of this expansion is driven by the entry of private proprietors into the market, there are also broader

political implications to consider. While some argue that politicians in support of privatization must be assumed to have the greatest public welfare in mind, others believe that politicians in many developing countries often have less altruistic motives. In a comprehensive study on the recent trend toward privatization in sub-Saharan Africa, Kayizzi-Mugerwa (2002) offers that "privatization is directly related to the shares that politicians or their relatives can fetch in the privatized firms to compensate themselves for the loss of rents previously enjoyed under state ownership" (p. 2). Seconding these concerns about bureaucratic collusion, Andersen (1992) claims that the pursuit of self-interest is a strong motivation for political action toward privatization. Studying the timing of privatization via survival analysis, Bartolotti & Pinotti (2008) additionally find that political fragmentation is the biggest predictor of delays in the privatization of failing services. Boehmer, Nash & Netter (2005) further that government stability, political risk and accountability of the government to the public are significant political factors for privatization. Christensen & Laegreid (2005) also claim that government effectiveness and trust in political leaders are likely to be negatively correlated with private provision of services. These arguments offer strong support for the inclusion of measures of government corruption, political stability and governmental effectiveness as predictors for increased privatization across countries.

While political factors are undeniably important for understanding privatization, many studies argue that economic factors are more important than political or ideological ones. This is based on the argument that saving money is the ultimate reason behind all privatization (Andersen, 1992). Bel & Fageda (2009) further in their meta-analysis of studies examining factors that impact privatization, that the conventional hypothesis states that there is a positive relationship between fiscal constraints and the private provision of services. As Boehmer et al

(2005) argue, in order to understand privatization, one must examine the strength of the broader economy, as opposed to just those factors specific to a given sector. For example, several studies use GDP per capita, income levels per household and/or unemployment rates to explain changes in privatization (Bel & Fageda, 2009; Boehmer et al, 2005). Kayizzi-Magerwa (2002) additionally claims that much of the movement toward privatization in sub-Saharan Africa came from donor pressure and increased aid to the private sector. In addition to these economic factors, population, urban density and the size of the sector being privatized are often used as additional demographic predictors of privatization (Bel & Fageda, 2009; Boehmer et al, 2005).

*Prior Work on Educational Privatization*

Estelle James produced the first and arguably last comprehensive study on why countries have different mixes of public and private educational services (James, 1993). Using data from 1975-1981, James examined the factors that led to different public-private mixes of educational services among 12 advanced industrial societies and 38 developing countries. Her main research questions were: a) What demand and supply factors account for private provision differences across societies? b) How does the process of economic development affect the role of the private sector in education? c) To what degree can government policies influence the outcome? More specifically, the study sought to explain the systematically higher proportion of secondary school private enrolment in developing countries (as compared with advanced countries), as well as the apparently random variation across countries, holding level of education and development (i.e. advanced v developing) constant. The models developed for this study were based on two main hypotheses: 1) limited public spending at the secondary level creates excess demand and leads to larger private enrolments in developing countries (as compared with advanced countries); 2) Differentiated demand explains variation within educational levels and stage of development --

e.g. cultural heterogeneity (specifically, religious and linguistic heterogeneity). While these hypotheses were confirmed by James' study, much has changed over the past 20 years in terms of educational spending and provision at both the primary and secondary level. Therefore, I argue that James' findings are no longer relevant today and that a new understanding of the factors impacting educational privatization is needed. This study has been designed to address this need.

## Conceptual framework

One of the foundational elements of James' work is that excess demand is not relevant in advanced countries because of their "open access schools where a space is guaranteed for everyone" (James, 1989, p. 63). Developing countries on the other hand, are subject to excess demand concerns due to their limiting of school spaces. Therefore, the claim is that public spending would be the most specific predictor of systematically higher private enrolment rates in developing countries. There arise, however, two concerns with this claim in today's educational climate. First, the systematic differences in secondary school private enrolment rates found in James (1993) no longer exist today. While James found that developing countries had significantly higher secondary school private enrolments than advanced countries, the average ratio of public to private enrolments between countries at these two levels of development have become nearly equal in the past 15 years. According to James (1993) the mean private secondary enrolment rate across advanced countries was 21.4%, while it was 31.3% in developing countries. By 2009, the gap was narrowed to approximately 4% (i.e. 20.5% developing; 16.4% advanced). This 4% difference was found to be statistically insignificant based on a two-sample t test. In other words, although advanced countries continue to spend more money per pupil (as a percent of GDP) than their developing counterparts, there is no longer a significant difference

between private secondary enrolment rates. Factors other than public spending on education must then be considered as potential predictors of private provision of education. These predictors will be discussed later in this section.

The second issue with James' claim about public spending stems from an examination of the private primary education sector in developing countries over the past two decades. The primary level is hypothesized to tell a different story than that of the secondary level, especially since the majority of public spending on education occurs at the primary level. At this level, there has been increased public spending on education in recent years in the majority of developing countries, yet the proportion of private enrolments has also increased. For example, while James (1993) found slightly higher private enrolment rates in advanced countries (18%), as compared with developing countries (16.1%), by 2009 private primary enrolments in advanced countries (10.8%) were marginally statistically significantly lower than that of developing countries (17.2%). With regard to funding, developing countries have increased the proportion of spending on education from 2.9% in 1999 to 3.8% in 2011 and aid to basic education has doubled since 2002 (UNESCO, 2012). While the increases in public spending have come as a result of commitments made at the Education For All conferences in Jomtien (1990) and Dakar (2000), I hypothesize that the increased private school enrolments are due in large part to the rise of a low-cost private schooling sector that has been seen in nearly all developing countries. The statistics cited above indicate that the rise of private schools in this sector is driven by different factors than just those hypothesized by James. Recent research has shown that factors such as low-quality public education are likely to be more influential than simple excess demand (Phillipson, 2008; Srivastava & Walford, 2007; Tooley, 2009).

In other words, while differentiated demand (as characterized by religious and linguistic heterogeneity) may potentially remain a significant predictor of private enrolments, public spending is no longer likely to have a significant effect. Additionally, other factors must be related to the concomitant increases in public spending and private primary enrolment rates in developing countries. For example, increases in per capita income, distribution of wealth and economic growth are all hypothesized to have a positive effect on low-fee private enrolment rates due to an increase in the number of buyers for a purportedly superior product (Bel & Fageda, 2009; Boehmer et al, 2005; Dinavo, 1995; James, 1989; Tan, 1985). Once these characteristics are controlled for, population growth is also likely to have a positive effect on private enrolments. As the population of school age children increases, the public schooling sector may be unable to accommodate this expansion, thus forcing children into the private sector. Conversely, international aid to education is hypothesized to have a non-significant effect on private enrolment rates—based on the same argument as that of public spending (with the majority of international and bilateral aid to education flowing through the government). Cowan (1990) additionally posits that a country's political environment is key to privatization. This could impact private enrolments in one of two ways. While Cowan argues that stable governments are more likely to endorse privatization, it is also possible that less politically stable and/or more corrupt governments will be unable to provide efficient, high-quality public education therefore driving more students to the private sector. Also, primary and secondary enrolment ratios must be included in these models due to the fact that high spending per pupil could simply be the result of low enrolments across the board. Additionally, the impact of urban density is assessed due to the fact that rapid urban growth is likely to be a significant predictor of increased private schooling options. Finally, it's possible that lagged spending may have a

significant impact on private enrolment rates, as current values are likely to be a response to the previous year's enrolment patterns. Therefore I run models with current and lagged spending as independent variables.

## Model Specification

While James (1993) conducted a cross-sectional analysis focused primarily at the secondary level, this study will take advantage of the increased availability of data in order to provide cross-sectional and longitudinal analyses for both primary and secondary schools. For the cross-sectional analyses this study employs ordinary least squares (OLS) models. These models are first run with a dummy variable for "advanced" country status and subsequently run as separate models for developing and advanced countries. The first approach provides information on the impact of country status on private school enrolments while the second allows for an examination of differing predictors by status (without having to use interactions for each covariate in the model). Unlike James (1993), which uses dummy variables for secondary school in a pooled model, the cross-sectional models in this study are run separately for primary and secondary schools. This choice was made in order to be able to examine factors that influence each of these sectors independently, since there are significant differences in the governmental approach to supporting primary and secondary schools.

When using panel data there are several issues that must be considered in order to find the most appropriate approach for conducting longitudinal analyses. The three econometric approaches that are most commonly used are: pooled OLS, random effects and fixed effects. Let us first consider the basic unobserved effects model:

$$Y_{it} = \boldsymbol{x}_{it}\boldsymbol{\beta} + v_{it,} \qquad (1)$$

Where $\boldsymbol{x}_{it}$ contains a vector of covariates that vary by country ($i$) and time ($t$). The error term $v_{it}$ is made up of an idiosyncratic error ($u_{it}$) as well as an unobserved country effect ($c_i$). The idiosyncratic errors, $u_{it}$, also change across country and time and are assumed to be uncorrelated with the vector of covariates **x**. The country effect, $c_i$ is the unobserved effect that presents the key issue with analyzing panel data. The concern revolves around whether or not $c_i$ is uncorrelated with the observed explanatory variables $\boldsymbol{x}_{it}$. Typically, a random effects framework is used if $c_i$ is assumed to be uncorrelated with $\boldsymbol{x}_{it}$, while the fixed effects framework is employed when one wants to allow $c_i$ and $\boldsymbol{x}_{it}$ to be arbitrarily correlated. There are, however, drawbacks to each of these approaches.

The fixed effects framework deals with the potential endogeneity of $\boldsymbol{x}_{it}$ (i.e. the fact that some covariates may be correlated with unobserved factors that do not change over time for the same country ($c_i$)) by subtracting within-group averages. For example, let us rewrite equation (1) with an expanded error term and the inclusion of a time-invariant country-specific covariate $W$:

$$Y_{it} = \boldsymbol{x}_{it}\boldsymbol{\beta} + W_i\boldsymbol{\delta} + c_i + u_{it} \qquad (2)$$

Now, let $\overline{Y}_i$ denote the average of the $Y_{it}$ for country $i$, while $\overline{x}_i$ denotes the average of the $\boldsymbol{x}_{it}$ and $\overline{u}_i$ the average of the $u_{it}$. Inherently, $W_i$ and $c_i$ already represent the country average values because they do not vary over time. We now subtract the within-group averages from (2):

$$Y_{it} - \overline{Y}_i = \boldsymbol{x}_{it}\boldsymbol{\beta} - \overline{x}_i + u_{it} - \overline{u}_i \qquad (3)$$

Although we have now removed one source of endogeneity from our equation, this approach only uses within country variation in $\boldsymbol{x}$ to estimate $\boldsymbol{\beta}$ and drops all time-invariant covariates. Therefore, not only can we no longer identify effects of covariates that do not change over time (some of which may be of interest), but by removing all of the variation between

country means we use up many degrees of freedom and may ultimately produce estimates that are far less precise than OLS (Wooldridge, 2010).

One way to recover the time-invariant covariates is to use a random effects model. In addition to identifying estimates of time-varying and time-invariant covariates, the random effects framework uses a generalized least squares estimator (GLS) by transforming the data so that transformed errors are uncorrelated and homoscedastic. Under ideal circumstances, this approach is more efficient than applying OLS to the non-transformed data. However, GLS is only guaranteed to be more efficient than OLS when we know the exact structure of the error terms and all relevant variances. Since this is almost never true, we instead use assumptions about the structure of the error terms coupled with estimates of the variances. The resulting estimator, known as feasible generalized least squares (FGLS), is not necessarily more efficient than OLS. As a matter of fact, FGLS estimates may actually provide biased estimates of standard errors and test statistics if the error structures are misspecified in our assumptions—and there is no way to ever be fully confident about these assumptions without having full knowledge of the exact structure of the error terms. Therefore, some researchers argue that the best approach is simply to use pooled OLS (Wooldridge, 2010).

Pooled OLS estimates from equation (1) are assumed to be unbiased if $\mathbf{x}_{it}$ is exogenous but the approach will still be inefficient with standard OLS errors. This is due to the fact that OLS programs for statistical packages (such as STATA) are written based on the assumptions that standard errors are uncorrelated and homoscedastic. We know, however, that this is not true with the panel data discussed in equations (1) and (2) above. We assume that errors for each country are correlated with one another but that there is no correlation of errors across countries. With a large number of individuals and timepoints, we would be able to obtain a consistent

estimate of the standard errors by clustering at the country level, regardless of the underlying structure of dependence within each cluster. However, due to the fact that I have 60-100 countries and approximately ten timepoints in any given model, panel-corrected standard errors are used to mitigate against concerns of heteroskedasticity and autocorrelations in the initial regression models (Beck & Katz, 1995).

Ultimately, given the strengths and weaknesses of each, all three approaches are used in this study and compared with one another. While OLS and random effects models will be used to assess which provides greater efficiency based on these data, the fixed effects model is used to test against potential bias in the first two models. In order to determine whether or not the fixed effects framework needs to be used, a Hausman test will be conducted. This is accomplished by estimating both a fixed and random effects model and then comparing the results. While a bias in the random effects model will cause the coefficients to be significantly different from the fixed effect model, an insignificant difference will allow us to be confident that there is no bias and that we can use the more efficient random effects model.

## Data

Data for this study were collected from a variety of sources. The majority of data on expenditures (public, private and international), enrolment rates, economic growth and level of development came from World Bank Data Centre and UNESCO (UIS) databanks. Additional variables were collected and/or calculated from the OECD, Transparency International, the Center for Systemic Peace, Ethnologue, the Economic Intelligence Unit and the CIA World Factbook.

The final longitudinal dataset contains information on 128 countries at the primary level (28 advanced; 100 developing) and 123 countries in secondary (29 advanced; 94 developing)

from 2002 to 2009. As for the cross-sectional analyses, there are 90 countries in primary (26 advanced; 64 developing) and 77 in secondary (23 advanced; 54 developing) in 2008. This year was chosen because it is the most recent year with the highest level of non-missing data for the dependent variable but additional years will also be tested as sensitivity analyses.

Additionally, there is missing data for a number of variables in each of the samples tested. While missing data was minimal for the majority of covariates, it was extensive for several variables in the longitudinal model, such as the GINI index (73%). Therefore, the GINI index is dropped from longitudinal models. For the cross-sectional analyses, the majority of variables were complete although there was up to 28% missing data on public spending (depending on the year and level of schooling). In order to avoid the bias that might be induced by casewise deletion, I multiply impute all missing data and re-estimate the results for all models (Little & Rubin, 2002).

*Dependent Variable*

Two dependent variables are used for this study: percent of private primary enrolments and percent of private secondary enrolments. As previously noted, these variables come from UNESCO Institute for Statistics (UIS). It is important to discuss what is meant by "private" in these data. Does it mean privately financed? Privately managed? Can a school still be considered private if it receives public funding? While there is an entire literature on the definition of privatization (as discussed previously), for this study I rely on the definition set forth by UNESCO. This decision was made as a result of data availability—as no other comprehensive measures of privatization exist for such large-scale cross-country comparisons. "UNESCO regards as 'private' any educational institute that is either controlled and managed by a non-government organization (e.g. religious group, association, enterprise) or its governing body

consists mainly of members not selected by a public agency" (Aga Khan Foundation, 2007). Although UNESCO assumes that all countries use this definition when reporting their private school data, there may be variability across countries. These country-varying definitions resulting from the self-report nature of these statistics are a concern with regard to generalizability but it is ultimately a necessary risk in order to be able to take advantage of large-scale cross-country datasets. In addition to the reliance on available data, perhaps an even more important reason to choose the UNESCO definition is that these same data are used to influence donor decisions worldwide and to assess progress toward EFA goals (in UNESCO's annual Global Monitoring Reports). Since all bilateral and multilateral aid organizations, as well as the majority of international education researchers use the UNESCO definition it is the most appropriate choice for a study that examines the factors impacting enrolment rates across countries.

More specifically, it should be noted that the dependent variables for this study are specified as the share of private enrolments by sector. Although this specification forces a commitment to a specific model, it was ultimately chosen because of the interpretation of overall enrollment increases. For example, if a country increases enrolments in both public and private schools but the share of each remains constant, alternative specifications (such as log enrollment) would treat the dependent variable as increasing. However, since the purpose of this study is to determine the factors impacting private enrolments (as compared with public enrolments) it is only appropriate to measure the dependent variable as a share (as opposed to log or overall).

*Independent Variables*

In order to reanalyze models similar to those of James (1993) with updated data, this study initially uses five independent variables to assess their effect on private enrolments. The

main variable of interest is public spending on education. This variable is operationalized as public spending per pupil as a percentage of gdp per capita. Lagged spending variables are also tested across models. Secondly, the "replication" model incorporates gdp per capita. Additionally, the Gini index for national income distribution is used in order to assess the impact of distribution of wealth on private enrolments. The hypothesis is that as inequality decreases (when controlling for gdp per capita) in developing countries, more people will have fungible wealth to put toward private educational services.

I have also calculated a religious diversity index using the CIA World Factbook. This index is calculated using the following formula (developed by James): $\Sigma R_i \ln 1/R_i$, where $R_i$ is the proportion of each religion in a given country. The higher the index, the larger the number of "strong" religions in the country. This makes intuitive sense based on the fact that a country with one very strong religion will likely have influences of that religion in the public school sector and will not necessarily have a large need for private schooling based on religious needs. However, there are countries such as Indonesia which belie this assumption. While Islam is a major focus even in public schools, private schools are used specifically to train Islamic leaders. In this situation, the religious diversity index would be quite low but the impact of religion on private school enrolment rates would likely be quite high. In order to account for this concern, I will run separate models with the inclusion of a flag (i.e. dummy variable) for countries with a predominance of Muslim citizens. There is no evidence from the literature to suggest that other dominant religions would have the same impact on private enrolment rates.

A linguistic diversity index was retrieved from Ethnologue. Using Greenberg's diversity index, the linguistic measure is calculated such that it provides the probability of two people of the country selected at random having different mother tongue languages. 1 indicates total

diversity (i.e. no two people with the same language), 0 indicates no linguistic diversity at all. The hypothesis once again being that higher linguistic diversity would lead to higher private enrolment rates.

In order to expand the model proposed in James (1993) to account for recent changes in the educational landscape as noted in the conceptual framework section, I include various additional covariates which are hypothesized to effect private enrolments at both the primary and secondary level. For example, political factors such as a state fragility index and a political stability measure are entered as controls. The state fragility index was calculated by the Center for Systemic Peace and it ranges on a 25-point scale to signify the level of fragility for a government across eight indicators (with higher levels on the index meaning a more fragile state). "A country's fragility is closely associated with its state capacity to manage conflict; make and implement public policy; and deliver essential services and its systemic resilience in maintaining system coherence, cohesion, and quality of life; responding effectively to challenges and crises, and continuing progressive development" (Marshall & Cole, 2011, p. 7). The political stability measure comes from the World Bank governance data. It is operationalized as the likelihood that a government will be overthrown by violence and ranges from -2.5 to 2.5 (with -2.5 signifying the most likely governments to be overthrown).

This study also incorporates the corruption perceptions index as developed by Transparency International. This index is on a scale of 0 to 10, where 0 means that a country is perceived to be highly corrupt in its public sector, while 10 means that a country is perceived to be very "clean". This measure has been introduced to the model in order to account for government influence on the provision of educational services. Think of two countries with identical measures of per pupil public expenditures on education. If we had reason to believe that

one of these countries was highly corrupt and that government funding was not actually reaching its intended target, we may expect to see very different educational landscapes. My hypothesis is that government corruption would have a negative impact on the quality of public schooling—thus causing more people to move to the private sector. Therefore, this index is expected to have a negative impact on private enrolment rates (i.e. less corrupt countries (higher on this scale) will have lower private enrolment rates, holding all else constant).

Finally, demographic variables are included in the model. These covariates include total population, population growth, population density, percent rural population, the number of official school age children by level of schooling and the total number public and private enrollees by level of schooling.

## Results

By examining both primary and secondary schools cross-sectionally and longitudinally, this study contains five main sets of analyses. In order to simplify the presentation of these results for the reader, this section will be divided into three parts: primary school analyses, secondary school analyses, and analyses assessing the impact of the level of economic development on private enrolments. Results from the cross-sectional model at the primary level will be presented first, followed by results from the longitudinal model. The same pattern will then be followed for analyses at the secondary level. Results from the level of development analyses will be presented at the end.

### *Primary School Analyses*

In 2008, developing countries had a slightly higher proportion of their primary school students enrolled in private schools than did advanced countries (15% v 11%). This difference,

however, was not statistically significant. Conversely, advanced countries spent a statistically significant 38% more on primary school students (as a percentage of GDP per capita) than developing countries. Based on these numbers, we would expect a naïve estimate of the impact of public spending on private enrolments to be negative (i.e. higher spending leads to lower private enrolments). However, there are many other significant differences in the demographic and economic characteristics of developing and advanced countries that must be accounted for in order to understand the true impact of spending on enrolments. For example, Table 2 shows that advanced countries have less fragile and corrupt governments, higher political stability and GDP per capita with a better human development index and less wealth inequality, smaller rural populations and less annual population growth, as well as less linguistic diversity. All of these variables are therefore used to predict differences in the private provision of primary education across countries.

Table 2: Mean Descriptives by Country Type: Primary Schools in 2008

| | (1) Developing Mean | (2) Advanced Mean |
|---|---|---|
| Private Primary (%) | 15.23 | 10.92 |
| Per Pupil Expend (% GDP/percap) | 14.87* | 20.60* |
| State Fragility | 8.80* | 0.96* |
| GINI | 44.03* | 30.65* |
| Religious Diversity | 0.74 | 0.71 |
| Linguistic Diversity | 0.47* | 0.27* |
| GDP Per Capita (USD) | 7223.38* | 37447.15* |
| Corruption | 3.48* | 7.38* |
| Pop. Rural (%) | 48.33* | 21.49* |
| Pop. Growth Rate (annual %) | 1.56* | 0.84* |
| Political Stability | -0.26* | 0.90* |
| Pop. Total | 22856306.84 | 34670931.85 |
| Pop. Density (per sq.km) | 135.02 | 180.57 |
| Primary Enrolment | 2868966.25 | 2332766.12 |
| HDI | 0.60* | 0.88* |
| N | 64 | 26 |

* $p<0.05$ (Mean difference)

As assumed above, a naïve analysis (in which private schooling rates are regressed on per pupil expenditures with no additional controls) shows that increases in public spending lead to significantly lower rates of private enrolments (Table 3, model 1). More specifically, the naïve model shows that increasing spending from the average developing country level to the average advanced country level would mean an approximate 4% decrease in the private primary enrolment rate. However, prior research has shown that wealth (total and distribution), linguistic and religious heterogeneity and country status are all important predictors of educational privatization, so a 'basic' model was run to account for these covariates in addition to spending (Table 3, model 2). The basic model shows that while linguistic diversity has a strongly significant positive impact on private enrolment rates, per pupil expenditures continue to have a significant negative effect (only marginally smaller than in the naïve model).

The last column in Table 3 shows the results of the 'final' model, which includes additional economic and demographic covariates from the broader privatization literature. By including these controls, the coefficient on spending is further reduced by approximately 25% to a non-significant -0.45. The coefficient on linguistic diversity, on the other hand, actually increases to 18.6 in this model—which means that a 1/5 of a standard deviation increase in linguistic diversity would lead to a 1 percent increase in private primary enrolments. Additionally, population density is found to have a significant positive impact on private enrolments, while population growth and state fragility both have marginally significant effects.

Table 3: OLS Models Predicting Private Enrolments: Primary Schools in 2008

| | (1) Naive | (2) Basic | (3) Final |
|---|---|---|---|
| Per Pupil Expenditure | -0.669* | -0.591* | -0.448 |
| | (0.262) | (0.289) | (0.302) |
| GINI | | 0.243 | 0.112 |
| | | (0.242) | (0.245) |
| Religious Diversity | | 0.899 | 4.329 |
| | | (3.537) | (3.865) |
| Linguistic Diversity | | 14.642* | 18.604** |
| | | (5.771) | (6.417) |
| Advanced (dummy) | | 2.631 | -2.938 |
| | | (7.520) | (8.199) |
| GDP Per Capita | | 0.000 | -0.000 |
| | | (0.000) | (0.000) |
| Corruption | | | 0.094 |
| | | | (1.922) |
| State Fragility | | | -1.324$^{t}$ |
| | | | (0.758) |
| Pop. Rural (%) | | | -0.145 |
| | | | (0.120) |
| Pop. Growth (%) | | | 4.630$^{t}$ |
| | | | (2.523) |
| Political Stability | | | -4.779 |
| | | | (3.622) |
| Pop. Density | | | 0.020* |
| | | | (0.008) |
| Primary Enrolment | | | -0.000 |
| | | | (0.000) |
| Constant | 25.051 | 5.153 | 13.863 |
| | (4.657) | (12.534) | (15.339) |
| $R^2$ | .07 | .16 | .28 |
| N | 90 | 90 | 90 |

$^{t}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$

In addition to the use of a large number of important covariates, this study has another advantage over prior work on the subject: the ability to analyze longitudinal data in order to examine effects over time. Table 4 shows that while the percent of private primary school students was the same across developing and advanced countries in 2002, by 2009 the gap had widened to more than 3.5%. This was due to both a decreasing rate in advanced countries and an

increasing rate in developing countries. During this same time, per pupil expenditures increased across all countries. Why, therefore, does it seem that spending decreased private enrolments in advanced countries but increased them in developing countries?

Table 4: Mean Descriptives by Country Type: Primary Schools (By Year)

| | (1) Developing Mean | (2) Advanced Mean |
|---|---|---|
| Private Primary (%) | | |
| 2002 | 12.93 | 12.44 |
| 2003 | 11.81 | 11.33 |
| 2004 | 14.09 | 12.48 |
| 2005 | 12.05 | 10.42 |
| 2006 | 13.85 | 9.36 |
| 2007 | 13.94 | 10.27 |
| 2008 | 15.11 | 10.92 |
| 2009 | 14.75 | 11.12 |
| Per Pupil Expenditure | | |
| 2002 | 12.91 | 19.37 |
| 2003 | 13.81 | 20.05 |
| 2004 | 13.35 | 20.00 |
| 2005 | 14.56 | 19.86 |
| 2006 | 14.28 | 20.09 |
| 2007 | 14.69 | 20.04 |
| 2008 | 14.73 | 20.60 |
| 2009 | 14.73 | 22.80 |
| N | 482 | 204 |

The naïve and OLS estimates in the basic longitudinal model are similar to those of the cross-sectional model, as shown in Table 5. On the other hand, the random effects model (which is assumed to be more efficient than pooled OLS) shows that the effect of per pupil expenditures disappears entirely and actually becomes positive (although statistically insignificant). The concern with panel data, however, is that there may be unobserved country effects that are constant over time and correlated with the observed covariates in the model, thus causing endogeneity bias. Therefore, a fixed effects model was also used. While a hausman test showed a significant difference in the models when run on the non-imputed data (providing evidence that

the random effects model is biased), the two models provide strikingly similar results on the imputed data[4]. The results from this approach show non-significant coefficients on all variables in the basic model.

Table 5: Basic Models Predicting Private Enrolments: Primary Schools (2002-2009)

| | (1) Naive | (2) OLS | (3) Random Effects | (4) Fixed Effects |
|---|---|---|---|---|
| Per Pupil Expenditure | -0.561* | -0.557* | 0.041 | 0.048 |
| | (0.138) | (0.145) | (0.037) | (0.037) |
| GDP Per Capita | | 0.000 | 0.000 | 0.000 |
| | | (0.000) | (0.000) | (0.000) |
| GINI | | 0.085 | 0.042 | 0.037 |
| | | (0.198) | (0.095) | (0.099) |
| Religious Diversity | | 1.780 | 1.314 | 0.066 |
| | | (3.095) | (1.387) | (0.299) |
| Linguistic Diversity | | 12.702* | 11.015* | |
| | | (4.747) | (4.839) | |
| Advanced (dummy) | | -3.251 | -4.388 | |
| | | (4.428) | (4.147) | |
| Constant | 21.908 | 8.351 | 5.792 | 8.556 |
| | (2.814) | (11.155) | (5.169) | (4.140) |
| N | 686 | 686 | 686 | 686 |

Clustered standard errors in OLS/RE models. Robust standard errors in FE model.
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

While these basic models are illustrative, it is important to also examine the results of the final models in Table 6. These models include the additional demographic and political covariates noted above, as well as dummy variables for each year in order to account for year effects. As with the basic models, some of the significant effects in the pooled OLS model are attenuated in the random and fixed effects models. Ultimately, in the more advanced longitudinal analyses (equations 6 and 7) there is only evidence of two significant predictors: population growth and linguistic diversity—both of which have positive effects on percent of private primary school enrolments.

[4] A hausman test cannot be run on imputed data. Note that linguistic diversity and the advanced dummy are dropped from the fixed effects model because they do not vary over time.

Table 6: Final Models Predicting Private Enrolments: Primary Schools (2002-2009)

| | (5) OLS | (6) Random Effects | (7) Fixed Effects |
|---|---|---|---|
| Per Pupil Expenditure | -0.502* | 0.012 | 0.010 |
| | (0.151) | (0.038) | (0.038) |
| GINI | -0.037 | 0.030 | 0.024 |
| | (0.162) | (0.081) | (0.087) |
| Religious Diversity | 4.027 | 1.720 | 0.143 |
| | (2.662) | (1.702) | (0.700) |
| Corruption | 1.609 | -0.119 | -0.197 |
| | (1.141) | (0.216) | (0.219) |
| State Fragility | -1.293* | -0.092 | -0.037 |
| | (0.566) | (0.145) | (0.153) |
| Primary Enrolment | -0.000 | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) |
| GDP Per Capita | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| Pop. Rural (%) | -0.140 | -0.116 | 0.055 |
| | (0.094) | (0.075) | (0.131) |
| Pop. Growth | 4.480* | 0.960* | 0.862[t] |
| | (1.828) | (0.451) | (0.462) |
| Political Stability | -5.660* | 0.071 | 0.032 |
| | (1.897) | (0.550) | (0.532) |
| Pop. Total | 0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| Pop. Density | 0.018* | 0.013 | -0.008 |
| | (0.006) | (0.008) | (0.022) |
| Linguistic Diversity | 16.859* | 12.736* | |
| | (5.219) | (5.102) | |
| Advanced (dummy) | -6.648 | -2.765 | |
| | (4.541) | (4.092) | |
| Constant | 15.664 | 10.188 | 12.395 |
| | (9.350) | (5.523) | (7.007) |
| N | 686 | 686 | 686 |

Clustered standard errors in OLS/RE models. Robust standard errors in FE model.
Year dummies included in all models (output surpressed)
[*] $p < 0.05$

*Secondary School Analyses*

In 2008, developing countries had a slightly higher proportion of their secondary school students enrolled in private schools than did advanced countries (20% v 16%). This difference, however, was not statistically significant. Conversely, advanced countries spent a statistically

significant 40% more on secondary school students (as a percentage of GDP per capita) than developing countries. Based on these numbers, we would expect a naïve estimate of the impact public spending on private enrolments to be negative (i.e. more spending leads to lower private enrolments). However, as with the analyses of the primary schools, there are many other significant differences in the demographic and economic characteristics of developing and advanced countries that must be accounted for in order to understand the true impact of spending on enrolments. For example, Table 7 shows that advanced countries have significantly less fragile and corrupt governments, higher political stability and GDP per capita with a better human development index and less wealth inequality, smaller rural populations, as well as less linguistic diversity. All of these variables are therefore used to predict differences in the private provision of secondary education across countries.

Table 7: Mean Descriptives by Country Type: Secondary Schools in 2008

| | (1) Developing Mean | (2) Advanced Mean |
|---|---|---|
| Private Secondary (%) | 20.17 | 15.96 |
| Per Pupil Expenditure (% GDP/percap) | 19.00* | 26.50 |
| State Fragility | 8.07* | 0.91 |
| GINI | 44.13* | 30.72 |
| Religious Diversity | 0.77 | 0.71 |
| Linguistic Diversity | 0.44* | 0.28 |
| GDP Per Capita (USD) | 8274.46* | 37878.39 |
| Corruption | 3.65* | 7.31 |
| Pop. Rural (%) | 42.39* | 22.96 |
| Pop. Growth (annual %) | 1.29 | 0.81 |
| Political Stability | -0.22* | 0.87 |
| Pop. Total | 24490102.13 | 38000832.74 |
| Pop. Density (per sq.km) | 120.80 | 142.40 |
| Secondary Enrolment | 2019408.96 | 3038522.39 |
| HDI | 0.64* | 0.88 |
| N | 54 | 23 |

Unlike in the primary school model, a naïve analysis (in which private schooling rates are regressed on per pupil expenditures with no additional controls) shows that increases in public

spending do not lead to significantly lower rates of private secondary enrolments (Table 8, model 1). Furthermore, the basic model, which includes covariates for income inequality, religious and linguistic diversity, country wealth and a flag for advanced countries shows that none of these variables significantly impacts the rate of private secondary enrolment.

Table 8: OLS Models Predicting Private Enrolments: Secondary Schools in 2008

| | (1) Naive | (2) Basic | (3) Final |
|---|---|---|---|
| Per Pupil Expenditure | -0.335 | -0.357 | -0.249 |
| | (0.256) | (0.293) | (0.282) |
| GINI | | 0.267 | 0.226 |
| | | (0.285) | (0.294) |
| Religious Diversity | | -2.559 | -3.465 |
| | | (4.752) | (4.576) |
| Linguistic Diversity | | 10.755 | 9.090 |
| | | (7.446) | (7.373) |
| Advanced (dummy) | | 11.769 | 4.724 |
| | | (9.046) | (8.008) |
| GDP Per Capita | | -0.000 | -0.000 |
| | | (0.000) | (0.000) |
| Corruption | | | 1.780 |
| | | | (1.993) |
| State Fragility | | | -0.422 |
| | | | (0.748) |
| Secondary Enrolment | | | 0.000 |
| | | | (0.000) |
| Pop. Rural (%) | | | -0.132 |
| | | | (0.156) |
| Pop. Growth | | | 8.595* |
| | | | (2.670) |
| Political Stability | | | -1.076 |
| | | | (4.522) |
| Pop. Density | | | 0.063* |
| | | | (0.011) |
| Constant | 26.029 | 14.787 | 0.120 |
| | (5.838) | (14.956) | (17.845) |
| $R^2$ | .02 | .09 | .48 |
| N | 77 | 77 | 77 |

* $p < 0.05$

The last column in Table 8 shows the results of the 'final' model, which includes additional economic and demographic covariates from the broader privatization literature. By including these controls, the coefficient on spending is reduced by approximately 30% to a still non-significant -0.25. There are, however, two variables that are found to have significant effects in this final model: population growth and population density. The large coefficient on population growth shows that a one percent increase in annual population growth coincides with an 8.6% increase in private secondary enrolment rates. To put this into perspective, many African countries in this data set have annual population growth rates of 2-3% higher than the United States. An increase of this magnitude would mean a 17-25% increase in private enrolments.

In addition to the cross-sectional models, this section also reports the results from longitudinal analyses across 123 countries from 2002 to 2009. Table 9 shows that while there was some fluctuation across years, there was no systematic change in the private enrolment rates in developing or advanced from 2002 to 2009. During this same time period, per pupil expenditures increased across all countries, with more significant increases in advanced countries. Since not all countries are consistent across all time points, it is important to use more than simple mean differences to assess the impact of public spending on privatization.

Table 9: Mean Descriptives by Country Type: Secondary Schools (By Year)

| | (1) Developing Mean | (2) Advanced Mean |
|---|---|---|
| Percentage of private enrolment in secondary | | |
| 2002 | 18.40 | 16.81 |
| 2003 | 15.34 | 17.69 |
| 2004 | 18.58 | 17.96 |
| 2005 | 15.65 | 15.23 |
| 2006 | 18.92 | 14.68 |
| 2007 | 18.65 | 15.84 |
| 2008 | 19.68 | 15.96 |
| 2009 | 18.79 | 17.40 |
| Public expenditure per pupil as percent of GDP per capita in secondary | | |
| 2002 | 19.38 | 24.60 |
| 2003 | 20.35 | 24.74 |
| 2004 | 18.23 | 25.80 |
| 2005 | 18.92 | 25.75 |
| 2006 | 21.36 | 25.77 |
| 2007 | 18.90 | 25.48 |
| 2008 | 18.76 | 26.50 |
| 2009 | 21.15 | 28.57 |
| N | 419 | 205 |

The naïve and OLS estimates for the basic longitudinal model are shown in Table 10. As opposed to the cross-sectional model where spending had no impact on private enrolments, it appears that there is evidence of a negative effect of spending on privatization in the panel data analyses. This is due in part to the larger number of data points—as the coefficients on spending in the first two models in Table 10 are nearly identical to those in Table 8 but they have smaller standard errors which now causes them to be significant. On the other hand, the random effects model (which, as we have noted previously, is assumed to be more efficient than pooled OLS) shows that the effect of per pupil expenditures disappears entirely and actually becomes positive (although statistically insignificant). The concern with panel data, however is that there may be unobserved country effects that are constant over time and correlated with the observed

covariates in the model, thus causing endogeneity bias. Therefore, a fixed effects model was also used. While a hausman test showed a significant difference in the models when run on the non-imputed data (providing evidence that the random effects model is biased), the two models provide strikingly similar results on the imputed data[5]. The results from this approach show non-significant coefficients on all variables in the basic model.

Table 10: Basic Models Predicting Private Enrolments: Secondary Schools (2002-2009)

| | (1) Naive | (2) OLS | (3) Random Effects | (4) Fixed Effects |
|---|---|---|---|---|
| Per Pupil Expenditure | -0.334* | -0.373* | 0.028 | 0.033 |
| | (0.163) | (0.160) | (0.025) | (0.025) |
| GDP Per Capita | | -0.000 | 0.000 | 0.000 |
| | | (0.000) | (0.000) | (0.000) |
| GINI | | 0.097 | 0.035 | 0.030 |
| | | (0.296) | (0.042) | (0.041) |
| Religious Diversity | | -0.877 | 1.168 | 0.605 |
| | | (3.213) | (2.473) | (2.706) |
| Linguistic Diversity | | 11.043$^{t}$ | 10.051$^{t}$ | |
| | | (6.218) | (5.225) | |
| Advanced (dummy) | | 6.303 | -2.070 | |
| | | (5.261) | (4.102) | |
| Constant | 24.771 | 18.371 | 10.753 | 13.150 |
| | (4.488) | (18.013) | (4.037) | (2.573) |
| N | 624 | 624 | 624 | 624 |

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

While these basic models are illustrative, it is important to also examine the results of the final models in Table 11. These models include the additional demographic and political covariates noted above, as well as dummy variables for each year in order to account for year effects. As with the basic models, a marginally significant public spending coefficient in the pooled OLS model is attenuated in the random and fixed effects models. Ultimately, in the fixed effects model (which is most appropriate due to concerns about country effects over time), there is evidence of only one significant predictor: population density. This coefficient shows that as

[5] A hausman test cannot be run on imputed data. Note that linguistic diversity and the advanced dummy are dropped from the fixed effects model because they do not vary over time.

population density within a country rises, private enrolment rates actually decrease—which is the opposite direction of the between-country coefficient in the cross-sectional model.

Table 11: Final Models Predicting Private Enrolments: Secondary Schools (2002-2009)

| | (5) OLS | (6) Random Effects | (7) Fixed Effects |
|---|---|---|---|
| Per Pupil Expenditure | -0.265[t] | 0.024 | 0.020 |
| | (0.157) | (0.025) | (0.024) |
| GINI | 0.140 | 0.023 | 0.027 |
| | (0.193) | (0.049) | (0.046) |
| Religious Diversity | 1.984 | 1.532 | 0.572 |
| | (2.875) | (2.557) | (2.708) |
| Corruption | 1.053 | -0.246 | -0.301 |
| | (1.145) | (0.394) | (0.393) |
| State Fragility | 0.225 | 0.259 | 0.241 |
| | (0.442) | (0.157) | (0.153) |
| Secondary Enrolment | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| GDP Per Capita | -0.000 | 0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| Pop. Rural (%) | -0.129 | -0.067 | -0.105 |
| | (0.102) | (0.090) | (0.301) |
| Pop. Growth | 2.952* | 0.112 | 0.306 |
| | (1.269) | (0.307) | (0.304) |
| Political Stability | -4.379[t] | -1.227[t] | -1.098 |
| | (2.459) | (0.673) | (0.609) |
| Pop. Total | 0.000 | 0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| Pop. Density | 0.040* | 0.017 | -0.070* |
| | (0.015) | (0.011) | (0.033) |
| Linguistic Diversity | 4.124 | 7.555 | |
| | (6.577) | (5.627) | |
| Advanced (dummy) | 7.225 | 0.515 | |
| | (5.102) | (4.161) | |
| Constant | 4.335 | 11.407 | 31.366 |
| | (9.411) | (5.373) | (13.218) |
| N | 624 | 624 | 624 |

Clustered standard errors in OLS/RE models. Robust standard errors in FE model.
Year dummies included in all models (output surpressed)
[*] $p < 0.05$

*Level of Development*

Preliminary analyses showed the possibility of "cut-offs" at particular levels of development for certain predictors in the primary school model. In other words, while some predictors were significant for developing countries, they were statistically insignificant for advanced countries. As a result of these findings, I hypothesize that while public spending on education does not impact private enrolment rates across all countries, there may be a certain subset of countries for which increases in spending could decrease private enrolment rates. This is similar to the work of Heyneman & Loxley (1983) who found that the effect of school quality on student achievement was moderated by level of economic development. This type of work however, requires a definition of "development." While the IMF does not use a specific metric for assigning development status to countries (IMF, 2012 – World Outlook), in my analyses I use the United Nations Development Programme's human development index (HDI). This index is unique in that it combines indicators of health (i.e. life expectancy), educational attainment (i.e. mean years of schooling and expected years of schooling), and living standards (i.e. gross national income per capita). HDI was chosen over other measures because of its policy relevance and measurement of both social and economic development.

Table 12 shows the results from these analyses. In the first model, which uses the 25$^{th}$ percentile of HDI as a cutoff for being considered "Low HDI", we see that public spending on primary education has a significant negative effect on private primary enrolments. More specifically, a 1% increase per pupil expenditures as a percent of GDP per capita corresponds to an approximate 1% decrease in private enrolment rates. Model two shows that when using mean HDI as the cut-off, per pupil expenditures continue to have a significant negative impact on private enrolments. However, in the third model, which includes all 64 developing countries, the

coefficient decreases by approximately 40% and becomes non-significant. In other words, while spending was not found to have a significant impact on private enrolment rates across all countries (or even within developing countries), it appears that there is an effect for those countries with the lowest levels of development as measured by HDI. This finding is important for policy makers and aid organizations who are interested in increasing public primary enrolments in countries facing some of the most difficult economic hardships.

Table 12: Private Primary Enrolments by Level of Development: 2008

| | (1) Low HDI | (2) Mean HDI | (3) Developing |
|---|---|---|---|
| Per Pupil Expenditure | -1.095* | -1.056** | -0.634 |
| | (0.385) | (0.325) | (0.384) |
| GINI | -0.547 | -0.119 | 0.093 |
| | (0.418) | (0.256) | (0.286) |
| Religious Diversity | -18.670* | -10.743* | 2.989 |
| | (6.945) | (4.872) | (5.117) |
| Linguistic Diversity | 50.652** | 28.263** | 15.834$^{t}$ |
| | (14.678) | (7.543) | (8.362) |
| Corruption | 3.116 | -2.067 | -1.371 |
| | (6.915) | (3.830) | (2.980) |
| State Fragility | 0.586 | 0.369 | -1.222 |
| | (1.195) | (0.919) | (1.110) |
| Primary Enrolment | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) |
| GDP Per Capita | -0.003 | -0.001 | 0.001 |
| | (0.004) | (0.001) | (0.001) |
| Pop. Rural (%) | 0.184 | -0.007 | -0.005 |
| | (0.250) | (0.160) | (0.164) |
| Pop. Growth (%) | -5.140 | -2.359 | 4.877 |
| | (3.891) | (2.983) | (3.166) |
| Political Stability | 5.019 | 3.199 | -2.962 |
| | (4.922) | (3.992) | (4.659) |
| Pop. Density | 0.061* | 0.019$^{t}$ | 0.014 |
| | (0.022) | (0.010) | (0.013) |
| Constant | 29.040 | 37.415 | 13.821 |
| | (38.806) | (17.779) | (20.877) |
| N | 23 | 39 | 64 |

$^{t}$ $p<0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$

## Sensitivity Analyses

Although there is no variable in this dataset to account for public spending for private education, the Organization for Economic Co-operation and Development (OECD) has recently produced a report that provides a breakdown of the share of public support to private schooling for OECD (and OECD partner countries) who took the Programme for International Student Assessment (PISA) exam in 2009 (OECD, 2012). Separate analyses were run for these countries in the 2009 data set, with the inclusion of the public assistance variable. While the amount of public spending on education was found to be a significant predictor of PISA achievement in naïve models, neither overall spending nor public spending on private education were found to have significant effects on test scores or private enrolment rates. This result was consistent for primary and secondary schools.

A second concern is with regard to inaccurate private enrolment data. Much recent work has shown not only that low cost private school enrolments are on the rise in developing countries but that their numbers are regularly underestimated by governments. This is due in large part to the fact that many low-fee schools are either unregistered entirely or registered as something other than a standard school with the Ministry of Education. In order to account for this concern, I ran sensitivity analyses in which I artificially increased private enrolment rates to assess the robustness of the initial findings to variations in underestimated private enrolment rates. While this approach has the limitation of assuming that all developing countries underreport in the same manner (and to the same extent), it provides one avenue of assessing the issue of underreporting. By artificially increasing private enrolment rates across developing countries (and separately for those with lowest levels of HDI) by as much as 25%, some coefficients changed in certain models but the substantive findings remained consistent.

Additional sensitivity analyses were run to test the impact of lagged spending on private enrolments—with the hypothesis that changes in private enrolment rates may actually be a response to increases or decreases in spending from prior years. However, there was no evidence of additional effects from these lagged spending variables. Finally, all longitudinal models were re-estimated after accounting for singletons (i.e. countries that appear in the dataset for only one time period). Both the coefficients and standard errors changed slightly across models but once again, the substantive findings remained consistent.

## Discussion

Nearly 13 years ago, more than 100 countries met in Dakar, Senegal in order to sign a pledge to provide high-quality basic education for all children by the year 2015. As a result of this Education For All framework, governments and aid organizations in the majority of developing countries have increased their share of spending on public education since 2000. However, recent studies have found that despite these increases in spending, private schooling rates are on the rise across developing countries. Therefore, this study was undertaken to challenge the conventional understanding of the interplay between public funding and private provision of education (i.e. that higher levels of public funding will lead to lower levels of private enrolments). I hypothesized that while public spending on education is undoubtedly important, it should no longer be considered a significant predictor of differences in private schooling rates across countries. Ultimately, this study posits a new model for understanding educational privatization in primary and secondary schools, by incorporating traditional predictors such as spending, linguistic and religious heterogeneity and income distributions, with new measures such as political stability, corruption, population growth, population density and state fragility. This study is timely due to the fact that many education researchers and aid

organizations are currently debating the role of private education in developing countries. While some believe that private schools provide a complement to an overburdened public sector, others argue that the provision of basic educational services (particularly for those most in need) is the sole responsibility of the state and that the focus of aid and innovation should be on increasing public enrolments. For those in this latter category, it is important to know if increases in per pupil expenditures will effectively increase public enrolments or if other approaches may be more appropriate to meet their goals.

In the primary school analyses, I find an effect of public spending on private enrolment rates for both the naïve and basic cross-sectional models. However, once a more comprehensive set of covariates is included (which nearly doubles the amount of variance explained by the model), the effect becomes small and non-significant. This provides the first evidence in support of my hypothesis that conventional models of predicting private enrolment rates are no longer valid in today's educational climate. This is further supported by similar non-significant coefficients on public spending across all final models (for both cross-sectional and longitudinal analyses of primary and secondary schools). While the cross-sectional models show null effects of public spending on private enrolment rates across countries, the fixed effects models show that there is no evidence that increases in public spending over time within countries impact private enrolments. These results are due to both the availability of more extensive national-level data as well as recent changes in the provision and structure of private education in developing countries. These findings are groundbreaking in that they contradict the results of previous studies on educational privatization.

While public spending was once predictive of private enrolments, this study finds population growth and population density (as well as linguistic diversity) to be more appropriate

modern-day predictors. Interestingly, while population growth has a positive effect on private enrolment rates in all models (having at least marginal significance in three of four), population density has a positive effect in the cross-sectional models but a negative effect in the fixed effects model for secondary schools. In other words, increases in population always tend to be associated with increased private enrolments. This follows basic economic theory, which states that an oversupply of students will lead to an increased demand for schooling (much of which will be offered by the private sector when holding spending constant). However, while increased population density leads to increased privatization across countries (which follows the same explanation of supply and demand), it appears that increases in population density over time within countries actually leads to decreased rates of private schooling. One potential explanation for this phenomenon is that within a country's borders, increased population density results from families moving from rural to urban areas where there are more public schooling options.

The final set of analyses for this study attempted to examine whether or not the effect of spending on private enrolment rates was moderated by economic development. In other words, despite the fact that there is no overall effect, is it possible that there is a particular level of economic development below which public spending on education is predictive of private enrolment rates? Since the coefficients on spending in the overall secondary school models were so far from significant, it was likely that if a moderated effect existed, it would only be found for primary schools. The natural first step was to see if there was an effect for developing countries. However, much like in the overall model the coefficient on spending was negative but insignificant. In order to further limit the sample based on level of development, I examined countries based on their human development index (HDI). Ultimately, when using mean HDI as the cut-off for economic development, per pupil expenditures had a significant negative impact

on private enrolments. Therefore, I find that while spending was insignificant across all countries (or even within developing countries), there is an effect for those countries with the lowest levels of development. This finding is critical for policy makers and aid organizations interested in increasing public primary enrolments in countries facing some of the most difficult economic hardships. While increased spending alone will not have a significant impact on public enrolment rates in the majority of countries, this is not the case for the most economically disadvantaged countries. Therefore, organizations seeking to increase public primary enrolments through spending should target their aid on countries with the lowest levels of economic development.

This study fills an important gap in the literature and provides policy makers and aid organizations with a more complete understanding of the role of spending (as well as many other economic and political factors) on educational privatization across the globe, by bringing to light new findings that contradict conventional wisdom about spending and public versus private schooling. This paper does not, however, make any claims about the relative value of public versus private education. While there is no evidence that spending or private enrolment rates have an impact on student achievement as measured by PISA reading and math assessments, these should be considered only preliminary findings. Much work is still needed on the impact of spending on educational attainment, as well as the quality of educational opportunities provided by private primary and secondary schools in developing countries. The next two chapters of this dissertation have been designed to address this latter issue.

# CHAPTER III

## THE IMPACT OF PRIVATE SCHOOLS ON EDUCATIONAL ATTAINMENT IN THE STATE OF SAO PAULO: HOW IMPORTANT IS TUITION?

Privatization has grown substantially in the developing world over the past few decades. Beginning in the 1980s as a result of mounting financial problems and increased pressure from bilateral and international aid organizations, increased use of non-government industries for the provision of historically government-provided services became a common theme across developing countries (Cowan, 1990). Initially, much of this growth began in the health and transportation sectors with the non-government provision of the education sector lagging behind. This primary focus on non-merit goods (i.e. goods that are provided based on an individual's ability and willingness to pay (Musgrave, 1959)), followed the pattern of privatization in advanced countries that began decades, and in some cases centuries, earlier. However, while many economists argue that the private sector should not and cannot be responsible for the provision of merit goods such as education, particularly in developing countries, the rise of low-fee private schools has been a distinct reality in the majority of developing countries since the mid-1990s (Phillipson, 2008; Srivastava & Walford, 2007; Srivastava, 2013). With this rapid expansion of low-fee schools, international and bilateral aid agencies have recently begun to evaluate the role of the sector in assisting countries to meet their Education for All goals. Ultimately, the decision about whether or not to assist private schools is based not only on the extent to which the public sector is failing but also on the belief that private schools can provide superior education with the benefits outweighing the costs (Tan, 1985). Therefore, this study has been designed to assess the quality of the private schooling sector (with a particular focus on low-tuition schools) in one of the world's most rapidly developing countries. Using data from the

state of Sao Paulo, Brazil, this paper answers the question: What is the impact of private school enrolment on educational attainment in Brazil? Does this differ by level of tuition? Furthermore, do these results help to explain the country's demand for private education in the face of increased government support for public education?

## Previous Studies on Private School Quality

Many high-quality studies have been conducted on the impact of private schools in developing countries. On average, these studies have consistently found evidence of private school advantages on academic outcomes when compared with public schooling opportunities (Alcott & Ortega, 2009; Angrist et al, 2002; Asadullah, 2009; August & Valenzuela, 2003; Bedi & Garg, 2000; Cox & Jimenez, 1990; Das et al, 2006; Gallegos, 2004; Sapelli, 2003; Sapelli & Vial, 2002; Vandenberge & Robin, 2004). Although there have been exceptions to these findings, private schools in developing countries are typically purported to produce increased academic achievement, often with additional claims of greater efficiency (Bray, 1997; James et al, 1996; Lassibille & Tan, 2001; Lassibille & Tab, 2003; Tan & Sumra, 2000). However, while the literature on the private sector in general is vast, far fewer studies have specifically examined the impact of schools established to serve students from low-income families. This is due in large part to the relatively recent expansion of the sector, as well as difficulties in accessing accurate data. While the perceived quality of private low-cost schooling is high (which is the underlying assumption on which the majority of the school choice literature is based), there is little rigorous empirical evidence of the sector's quality with regard to educational attainment.

*Low-cost private school quality*

The majority of studies that have been conducted on the quality of low-cost private schools are either observational in nature or use convenience sampling from an existing list of schools in order to assess the impact of enrolment on educational outcomes. These studies are therefore illustrative but do not provide unbiased estimates of private school effects due to student self-selection into schools. For example, Fennell (2013) uses a non-random sample of youth and adult interviews in Pakistan in order to gain a better understanding of the perceptions of low-fee private schools in Sargodha and Charsadda. She ultimately concludes that private schools are perceived as having more dedicated teachers, more individualized attention and more accountability, while public schools benefit from better infrastructure and resources. Other studies have similarly found that lower teacher absenteeism and smaller class sizes were some of the greatest assets of private schools in Pakistan (Alderman et al, 2001; Andrabi et al, 2008). As far as school output is concerned, Das et al (2006) found private school students had higher test score results in mathematics, Urdu and English (after accounting for observable characteristics). Additionally, Asadullah (2009) found that private school students had future earnings advantages over public school students. Despite these findings, however, a Save the Children study ultimately concluded that while parents perceive private schools to be of higher quality than government schools, "on balance, children in private education institutions in Nepal and Pakistan are not provided with the quality of education as defined within the CRC[6]" (Save the Children, 2002, p. 8). Mixed findings have also been found in Indonesia, where private schools for the poor have been argued to provide greater access than the public sector but where concerns are often raised about their quality (King, 1997; Heyneman & Stern, 2013). Voicing similar concerns

[6] Convention on the Rights of the Child. For an explanation of the CRC's measures of educational quality, see CRC Article 29.

about the quality of low-fee private schools in Malawi, Rose (2005) offers that limited government control over educational privatization resulted in "the mushrooming of low-cost, low-quality unregistered schools" (p. 164). Although this conclusion is based on significant differences in test scores, it is important to note that these were simple mean differences with no additional covariates in the model.

On the more positive end of the quality spectrum, Tooley and Dixon (2005) found achievement gains for low-cost private school students when compared with similar public school students in India, Nigeria, Ghana and Kenya, after controlling for a variety of background characteristics. In India, Tooley and Dixon (2005) found that private schools had lower teacher absenteeism and ultimately concluded that there were significant gains in math, English and Hindi for private, unaided students. Similar results were found in Nigeria for math, English and social studies. Based on work conducted in Ghana's Ga district, they found that raw test scores for private school students (in both registered and unregistered schools) were higher than their public school counterparts in mathematics, English and religious/moral education. Once again, however, it should be noted that such mean differences in test scores (even with controls for student backgrounds) do not account for the fact that there are likely to be differences between those students who choose to enroll in private schools and those who decide to remain in the public system. While the authors offer that there is forthcoming work using a Heckman selection procedure to account for selection bias, eight years later no such results are available. In a more recent re-analysis of Tooley and Dixon's 2005 study in Kenya, Dixon et al (2013) find that private school students scored better in math and Kiswahili than their public school counterparts, based on a multilevel model (which provides some benefits over their original analyses but still neglects to take selection into account). Stern and Heyneman (2013) also offer that low-fee

private schools throughout Kenya appear to be performing at least as well as their nearby public school counterparts on national exams. Heyneman and Stern (2013) assert that similar results were found in Jamaica—although both papers are based on a larger study that used convenience sampling and are therefore subject to the same concerns about selection as the rest of the studies in this section.

Ultimately, while these studies have been important for examining low-cost private schools in developing countries, none have provided rigorous enough sampling or analyses to convincingly find unbiased private school effects. It is this gap in the literature that this study seeks to address, using a comprehensive, longitudinal dataset on secondary students in the state of Sao Paulo, Brazil.

*Private schools in Brazil*

Although no studies have been conducted to assess the quality of low-cost private schools in Brazil, several important studies on private school quality do exist. In 1990, Lockheed and Bruns used a multilevel modeling procedure to examine achievement differences between public and private secondary school students. They ultimately found that private school students outperformed public school students in mathematics and concluded that this was in large part a result of peer composition and self-selection into high-SES private schools (Lockheed & Bruns, 1990). This study was, however, undertaken at a time when funding for public schools was extremely low and only the wealthiest of students could afford to attend private school. This is quite a departure from Brazil's modern educational make-up.

Somers et al (2004) used a 1997 UNESCO assessment of nationally representative third and fourth grade students to assess the impact of private schools on language and mathematics achievement in Brazil. While they initially found significant advantages for private school

students in both subjects, they concluded that after accounting for peer characteristics, the private school effect became negative (and non-significant). This finding was consistent across ten of the thirteen countries studied and it provides further support to a relatively large literature on the importance of peer effects for educational attainment.

Another more recent high-quality study on private schools in Brazil came from Vandenberghe & Robin (2004). Using PISA 2000 results, this study employed three methods to account for selection bias (instrumental variables, Heckman's two-stage approach and propensity score matching). While they found a consistently positive private school advantage on mathematics, the results were mixed for science and reading (with insignificant differences in the propensity matching models).

While all three of these studies provide high-quality assessments of the private schooling sector in Brazil, there are significant limitations with regard to their relevance for today's educational climate. First,, all of these studies used external assessments from 2000 or earlier. Additionally, none of the studies used high-stakes examinations or assessments that would be tied to public or private school curricula. Lastly, these studies examine the overall impact of private schools but do not provide any information about the quality of the burgeoning low-cost private sector. The current study serves as an important addition to the literature by addressing all three of these issues.

## Brazilian Context

Located in eastern South America, Brazil is the fifth most populous country in the world with over 200 million residents. The official and most widely spoken language is Portuguese and approximately 90% of the population self-identify as Christians (CIA, 2012). While Brazil saw a yearly decrease in GDP of approximately 4% and an unprecedented inflation rate of over 4000%

in 1990, its economy has made an impressive recovery over the past two decades and the country is now considered to be South America's leading economic power (Triami, 2012).

The largest city in Brazil (and in the Americas) is Sao Paulo. With a municipal population of over 11 million and a metropolitan population of nearly 20 million, Sao Paulo ranks seventh in the world by population (IBGE, 2010). As of 2011, there were 5,500 schools and 7 million students enrolled in primary and secondary schools in Sao Paulo, making the student body roughly the same size as the entire population of Hong Kong (Menezes-Filho & Tavares, 2011).

*Education – Structure*

Education in Brazil is highly centralized and overseen by the federal Ministry of Education. More specifically, all schools must meet the rules and regulations set out in the 1996 national education law. This law, which was created in order to "establish the guidelines and bases for national education" provides detailed information about the structure of school leadership, educational goals, guidelines for establishing and registering a new school and rules regarding monitoring and reporting (Cardoso, 1996, p.1). Although private schools do not receive public funding in Brazil, they are required to follow the national education law, which offers the coexistence of public and private schools as one of its founding principles. Accordingly, unlike in many other countries, teachers and school leaders are required to have the same training and qualifications as public school teachers in order to gain employment in private schools. However, there are several ways in which private schools are considered to have more flexibility than public schools. Aside from charging tuition (which is actually regulated by the MOE), they are also able to define their own pedagogical approach and can accept any students who wish to attend—unlike the public sector, where students are required to attend the school

located nearest their home (AngloINFO, 2012). Additionally, private school students are not required to take the same national or state examinations as public school students[7].

In the state of Sao Paulo, there are two main examinations that are taken by primary and secondary school students enrolled in public schools: the Sistema de Avalaiacao de Rendimento Escolar do Estado de Sao Paulo (SARESP) and the Exame Nacional do Ensino Medio (ENEM). Both will be used for this study and therefore will be discussed in detail.

Introduced initially in all grades in 2005, the SARESP is a high-stakes exam (i.e. used for grade advancement) that has been given to public school students in grades 2, 4, 6, 8 and 11 since 2007. It is possible for a student to take the exam a second time if they do not make a proficient score (i.e. 50 percent), although this is at the discretion of the school (Ferrer, 2006). The exam originally tested students in reading, mathematics and Portuguese language although it has tested reading, math, science and humanities since 2008. Lastly, SARESP results are publicized by the state government and are used to calculate each school's IDESCP, which is the official quality index that is used in the state's pay for performance program instituted in 2008 (Menezes-Filho & Tavares, 2011).

The ENEM is an end of high school exam that was introduced by the Ministry of Education in 1998. Although some refer to this as a high school exit exam, I prefer the term "end of high school exam" because it is voluntary and not an actual requirement for graduation from secondary school. While the ENEM started as a low-stakes exam, this began to change in 2004 with the introduction of the ProUni (College for All) federal scholarship program—as ENEM became the main criterion for scholarship award. This award is only available to students attending tuition-free high schools. However, many universities in the country began to use

[7] This has, not surprisingly, made it difficult for researchers to undertake studies that assess the quality of the private school sector in Brazil.

ENEM scores as part of the application/decision process for university acceptance. While paying to attend a private high school will exclude a student from receiving the ProUni, the choice is likely made in the hopes of raising test scores and securing a place in a more prestigious university. ENEM results are public and highly publicized—increasing the need for private schools to keep scores up (at least relative to their competitors and nearby public schools). The exam is comprised of two sections: an "objective" (i.e. multiple choice) section and a writing section.

*Education – Secondary Schools*

Regardless of private/public status, the education system is broken down into four sections: pre-school (educacao infantil), primary (ensino fundamental), secondary (ensino medio) and higher education (ensino superior). Under the current structure, secondary schools consist of grades 9-11 and are typically for students aged 15 to 18.

Less than twenty five years ago, secondary school in Brazil "was considered to be the most forgotten education level…[and] geared for the education of the elites" (Brock & Schwartzman, 2004, p. 89). Accordingly, the secondary gross enrolment rate was only 33.3 in 1980 and private school enrolments accounted for nearly half of the overall secondary school enrolments in that year. With large investments by the Brazilian government throughout the 1980s and 1990s, the proportion of private secondary school students dropped to 12% by 1999 and the country's gross enrolment rate reached 100% by 2003 (UNESCO, 2012). These investments in secondary education continued to increase over the next decade, when the government increased public spending per pupil as a percent of GDP per capita from 9.5% in 1999 to 19.5% in 2008 (World Bank, 2012). Private secondary enrolment rates grew slightly during that time from 12% to 13%.

Overall, Brazil has relatively low private secondary school enrolments compared to the rest of Latin America but the sector has steadied over the past decade and remains an important option for both high and low-income families who feel that the public sector is not meeting their needs. Also, unlike its South American neighbors, private secondary schools in Brazil are not a purely urban phenomenon. However, private secondary enrolment rates are higher in Sao Paulo than they are in the country as a whole. According to INEP data from 2006, the national private secondary enrolment rate was approximately 12% while 14% of Sao Paulo's secondary students were enrolled in private schools (INEP, 2012). While there have been increasing numbers of low-tuition private primary and secondary schools in Brazil over the past few decades, no studies have examined the impact of these schools.

## Theory and Model Specification

As expected, simple mean comparisons of achievement test results between public and private school secondary students in Brazil demonstrate that, on average, those attending private schools achieve at higher levels than their public school counterparts (INEP, 2012). Although this difference could be the result of greater efficiency and test preparation by private schools, it is also possible that there are other factors impacting both private school enrolment and academic achievement. For example, students who choose to enroll in private schools may have more highly motivated and/or involved parents, which would also likely be associated with higher test scores. Therefore, a naïve comparison between these two groups may well be picking up inherent differences in the student populations that are unrelated to the effectiveness and preparation of the private schools themselves. This self-selection concern holds for both traditional private enrollees, as well as public to private transfer students. Accordingly, I compare achievement

results for public to private transfer students with scores of very similar public school stayers in order to find an accurate estimate of the effect of private schooling on academic achievement in Brazil.

Using a standard counterfactual model, there are two potential outcomes for any individual: $Y_1$ and $Y_0$ (Holland, 1986; Rubin, 1974). In this model, $Y_1$ represents the outcome for students who transfer to a private school, while $Y_0$ represents the outcome for that same student if he/she were unable to transfer (i.e. remained a public school stayer). The causal impact of private school transfer, therefore, is simply the difference between these two outcomes (Smith & Todd, 2001):

$$\Delta = Y_1 - Y_0$$

Unfortunately, we can never observe both of these outcomes for the same individual. While causal inference is based on the difference between what happened to an individual compared with what would have happened had that individual been in the other group, I can only observe students who transferred to a private school and those who remained in the public sector. Accordingly, I will let $z = 1$ represent those students who transferred, while $z = 0$ represents those who did not. However, there are likely to be factors beyond the simple act of transfer (or enrolment in private schools) that explain the academic outcomes for these students. These additional factors can be summarized as a vector of student characteristics, $\mathbf{x}$. The mean impact of the average treatment on the treated (ATT) estimates the effect for those receiving treatment (i.e. private schooling) compared with what the outcome for these individuals would have been had they not received treatment. ATT (Smith & Todd, 2001) can be expressed as:

$$\text{ATT} = E(\Delta \mid \mathbf{x}, z = 1) = E(y_1 - y_0 \mid \mathbf{x}, z = 1) =$$

$$E(y_1|\mathbf{x}, z = 1) - E(y_0|\mathbf{x}, z = 1)$$

While I have complete data on the mean outcomes for the treated group [$E(y_1|\mathbf{x}, z=1)$], I am unable to obtain data on the counterfactual outcome for this same group [$E(y_0|\mathbf{x}, z=1)$]. In a randomized study, these data are provided in the control group, assuming randomization across **x** (Heckman et al., 1998). In a non-randomized study such as this one, researchers have implemented several different approaches such as instrumental variables, Heckman's model for accounting for selection in treatment, and regression discontinuity designs (Heckman, 1979; Imbens & Lemieux, 2008).

For this study, I employ matching techniques, which involve a comparison of the treated group with a selected subset of the control group (i.e. those who did not receive treatment). The basic idea behind matching is to replace the average outcome of the counterfactual group [$E(y_0|\mathbf{x}, z=1)$] with outcomes from a subset of the untreated population whose observable characteristics (**x**) are as close as possible to those of the treated group. In essence, the following assumption is being made:

$$\Delta = E(y_1 - y_0 \mid z = 1) =$$

$$E(y_1 \mid z = 1) - E_{p|z=1}E_y(y \mid z = 1, p) =$$

$$E(y_1 \mid z = 1) - E_{p|z=1}E_y(y \mid z = 0, p)$$

Where $p$ is defined as the propensity to receive treatment, or in the case of this study, the probability that a student transfers to a private school. The propensity $p$ is defined as a function of **x** (Smith & Todd, 2001):

$$PR(z = 1 \mid \mathbf{x}), \quad 0 < p < 1 \quad \forall \mathbf{x}$$

There is one final assumption that needs to be met in order for this approach to be valid. The observed information about individuals contained in **x** must be sufficient to support the following assertion:

$$Y \perp z \mid \mathbf{x}$$

The basic idea behind this conditional independence assumption is that once the information from **x** is taken into account, there is no additional information about the outcome that can be obtained simply from knowing whether or not an individual was in the treatment group. This is a strong assumption but it can and will be tested. Once this assumption is met, it is possible to use the outcome of the untreated group (conditional on **x**) as the equivalent of the counterfactual outcome:

$$E(y_0 \mid z = 1, p) \equiv E(y_0 \mid z = 0, p)$$

In this study, I utilize four different methods to estimate the treatment effect. First, I estimate a standard OLS regression, controlling for a set of covariates. Since these estimates do not meet the assumptions noted above, they are used primarily as baseline estimates for the models which incorporate matching techniques.

Due to the large sample and abundance of covariates, exact matching is not feasible for this study. Therefore, the second estimate of the treatment effect employs a matching method that uses a Mahalanobis metric. The Mahalanobis method was invented prior to the method of propensity score matching and is a multivariate method of measuring the distance between two matrices (Guo et al, 2005). In this approach, I have combined the Mahalanobis metric with a caliper from the propensity score. The first step is to run a logit model with treatment as the dependent variable. This provides a probability (or propensity) for being in the treatment group. Calipers are then established for the purpose of designating how close probabilities should be in order for a match to be made. According to the literature, an appropriate caliper is ¼ of a standard deviation of the propensity score (Rosenbaum & Rubin, 1985). In this method, all subjects are randomly ordered and the first treated subject is selected. Non-treated subjects

within the predefined caliper are then selected and the subject with the minimized Mahalanobis distance is then selected as a match. In other words, students who transferred to private school are matched with public school stayers who have the smallest Mahalanobis distance between them within a given caliper. This method is argued to produce the best balance of covariance between the two groups (Guo et al, 2006).

The third method used to estimate a treatment effect is a nearest neighbor propensity score matching approach. Once again a propensity score is calculated and a caliper is determined. This time, however, each treated subject is matched with a predetermined number of non-treated subjects. I begin by matching each transfer student with five public stayers (which has become the industry standard) but I also run analyses for single matches and ten matches in order to assess the impact of choosing the "correct" number of matches.

The fourth and final method used for this study is kernel matching. Unlike the mahalanobis and nearest neighbor approaches, which use calipers to determine a small number of matches (as few as one per treated case), the kernel matching algorithm is based on a nonparametric regression model and therefore allows for the use of as many of the control cases as possible. By calculating a weighted average of the outcome for all non-treated participants and differencing it from the outcome of the treated case, a treatment effect is estimated across all treated and non-treated cases (with the latter being down-weighted based on their distance from each treated case).

Finally, it should be noted that all analyses use standard errors that are clustered at the school level (using the school in which students are tested). This is done because there is reason to believe that errors within schools are likely to be dependent on one another.

## Data

The data used for this study were obtained from a variety of restricted-use, longitudinal datasets for primary and secondary school students in the state of Sao Paulo, Brazil. Specifically, four datasets on secondary school students and schools from 2005-2007 were used for the purpose of this investigation. The first dataset included pre-test scores (SARESP), as well as demographic and background information on all public school students throughout the state. This dataset was combined with matriculation data, which provided demographic information for private school students. Additionally, I incorporated ENEM scores for all students (public and private) from a third dataset and merged it with the final dataset which included tuition data for private schools in Sao Paulo.

*Sample*

While various samples are used throughout the analyses, the most comprehensive sample consists of public school students enrolled in ninth or tenth grade in 2005. These students were then followed for two years in order to assess drop-outs, repetition, transfers to private schools and ENEM test takers in 2006 and 2007. Ninth and tenth grade public school students in 2005 were chosen because only these students could provide baseline data and still be followed through the $11^{th}$ grade ENEM. Final analyses are conducted on a sample of 137,012 students with objective outcome test score data (1527 of whom are transfer students; 110 low-fee) and 129,915 students with writing outcome test score data (1476 of whom are transfer students; 109 low-fee). The control groups in these final samples consist only of students enrolled in public schools from which students transferred to private schools in 2006 or 2007. This decision is supported by previous work on charter schools by the Center for Research on Education Outcome (CREDO) at Stanford University (CREDO, 2009). In order to account for year effects,

an overall model is run with dummy variables for year and individual models are run by grade (which is a proxy for year based on the setup of the data). Sensitivity analyses are also run for more comprehensive and restricted samples—all of which are discussed later in this paper. Additionally, although there was missing data for a number of variables in each of the samples tested, it was minimal for each individual variable. In order to avoid the bias that might be induced by casewise deletion, I re-estimate all models after multiple imputation of the missing data (Little & Rubin, 2002).

*Dependent Variable(s)*

The dependent variable for these analyses is an optional end of high school exam that is available to all graduating secondary school students. The ENEM is intended to measure five different competencies (among them language fluency, problem fluency and building arguments) but there is little information on these competencies and typically only overall scores are reported. There are, however, two main sections of the exam: writing and "objective" (i.e. multiple choice). While treatment and independent variables are the same across models, separate models are run for each section of the ENEM. Although the models for each dependent variable are identical, sample sizes do change slightly across models, as some students only take the writing or objective section. Since no comparisons are being made across models, different samples are not problematic for drawing any conclusions in this study.

*Treatment Variable*

Most broadly, the treatment variable for this study is transfer from a public to private secondary school. Any student enrolled in ninth or tenth grade in a public school in 2005 who transferred to a private school in 2006 or 2007 was be placed into the treatment group (regardless of whether or not they transferred back to a public school in a later year). This provides us with

intent to treat effects. In order to answer the question about the impact of low-tuition private schools, separate analyses were run with a treatment group consisting only of those students who transferred to a private school with tuition below the 50$^{th}$ percentile of the tuition distribution. This cutoff was chosen because it equals the monthly minimum wage in Sao Paulo and it provides a large enough treatment group to conduct the same analyses as those conducted on the full sample.

*Control Variables*

After conducting naïve analyses, control variables are introduced into the OLS and matched models in order to obtain more accurate estimates of the impact of private schools on academic achievement.

Three pretest measures are used for this study. In 2005 all public school students in Sao Paulo took the SARESP exam, which consisted of separate tests in mathematics, writing and Portuguese language. While the math and Portuguese exams were scored continuously (on a scale of 1 to 100), the writing test was scored by level of proficiency (from 0 to 3—with 0 being insufficient and 3 signifying advanced status). All three tests are used as baseline achievement across all models.

Income data was not collected for students in Sao Paulo until 2007. Therefore, the main socio-economic measures for this study consist of race, parental education and a variety of household characteristics. Although race in Brazil is much more closely related to skin color than ethnicity, the SARESP questionnaire only provided the options of white, black, brown, Asian, indigenous and no race. Approximately 90% of the final sample self-identified as white or brown with an additional 8% identifying as black. Parental education was recorded separately for mothers and fathers and was operationalized as a categorical variable with the following levels:

no school, primary education (or less), secondary education, college and beyond. Family size is also included as a demographic control (i.e. number of people living in the student's house, including the student). Additionally, there are a number of household items which are used as a proxy for income: number of tvs, dvd players, computers, washing machines, cell phones and bathrooms, as well as the availability of piped water, electricity, newspapers/magazines, dictionaries and internet access at home. Also, car ownership is used as an excluded instrument in a Heckman selection model that is run as a sensitivity analysis.

The final demographic controls used for this study are gender and age (as well as age-squared). Additionally, grade repetition, number of years in a private school (which can only be one or two for treatment group members) and year dummies are used in some models. Several of these controls become irrelevant when analyses are conducted by cohort (e.g. year/grade).

## Results

By separately examining the effects of all private schools and low-fee private schools on two different outcomes (i.e. objective and writing scores), this study contains four main sets of analyses. In order to simplify the presentation of these results, this section will be divided into two parts: overall private school analyses and low-fee private school analyses. Results from the objective test for overall private schools will be presented first, followed by results from the writing exam. The same pattern will then be followed for analyses of low-fee private schools.

### *Private Schools (All) - Objective*

On average, private school students scored about 14 points (or nearly a full standard deviation) higher on the Objective section of the ENEM exam than their public school counterparts. However, we would expect much of the difference in test scores to be accounted

for by factors such as prior achievement, parental education and home resources. For example, Table 13 shows that private school students tended to perform better on all three pre-tests (i.e. Portuguese, math and writing), are more likely to have internet in their homes and have significantly higher levels of both maternal and paternal education.

Table 13: Descriptives by Private School Status: Objective Exam[8]

| | Public | Private | Total |
|---|---|---|---|
| Objective | 40.15 | 54.29 | 40.31 |
| | (14.26) | (16.35) | (14.36) |
| Portuguese | 61.51 | 69.55 | 61.60 |
| | (13.08) | (11.85) | (13.10) |
| Math | 36.45 | 43.46 | 36.53 |
| | (10.05) | (12.55) | (10.11) |
| Writing | 1.596 | 1.911 | 1.600 |
| | (1.016) | (1.001) | (1.016) |
| Age | 15.62 | 15.14 | 15.61 |
| | (1.339) | (0.634) | (1.334) |
| Male | 0.395 | 0.403 | 0.395 |
| | (0.489) | (0.491) | (0.489) |
| White | 0.611 | 0.754 | 0.613 |
| | (0.487) | (0.431) | (0.487) |
| Black | 0.0735 | 0.0257 | 0.0730 |
| | (0.261) | (0.158) | (0.260) |
| Brown | 0.286 | 0.168 | 0.285 |
| | (0.452) | (0.374) | (0.451) |
| Asian | 0.0198 | 0.0435 | 0.0201 |
| | (0.139) | (0.204) | (0.140) |
| Indigenous | 0.00814 | 0.00642 | 0.00812 |
| | (0.0899) | (0.0799) | (0.0898) |
| Internet | 0.409 | 0.716 | 0.413 |
| | (0.492) | (0.451) | (0.492) |
| Mother Ed | 1.618 | 2.102 | 1.623 |
| | (0.743) | (0.782) | (0.745) |
| Father Ed | 1.633 | 2.125 | 1.639 |
| | (0.757) | (0.783) | (0.759) |
| Grade Repeat | 0.0259 | 0.0193 | 0.0258 |
| | (0.159) | (0.138) | (0.158) |
| *N* | 121586 | 1401 | 122987 |

mean coefficients; sd in parentheses

[8] Many covariates have been suppressed in this table in order to save space. Internet has been included as a proxy for home resources. A full table can be found in the appendix.

In order to account for these differences, an OLS regression was run with a large set of controls (see appendix for full list). These results are shown in Table 14, model 2. By adding controls to the model, the private school effect is reduced from 14.14 to 4.99 points. However, due to self-selection into private schools, it is likely that there are some unobserved characteristics (such as motivation) that are correlated with both selection into private schools and a student's score on their end of high school exam. One way to mitigate against this bias is to balance treatment and control samples through propensity score matching.

Table 14: Models for All Private Schools: Objective

| | (1) OLS | (2) OLS | (3) Mahalanobis | (4) Mahalanobis | (5) Nearest Neighbor | (6) Nearest Neighbor | (7) Kernel | (8) Kernel |
|---|---|---|---|---|---|---|---|---|
| Private | 14.143* | | 4.658* | | 4.416* | | 4.766* | |
| | (0.384) | | (0.610) | | (0.481) | | (0.443) | |
| Private | | 4.993* | | 4.742* | | 4.530* | | 4.425* |
| | | (0.352) | | (0.455) | | (0.369) | | (0.345) |
| Controls | | X | | X | | X | | X |
| Observations | 122987 | | 2758 | | 7784 | | 122954 | |
| $R^2$ | 0.563 | | 0.532 | | 0.541 | | 0.548 | |
| Adjusted $R^2$ | 0.563 | | 0.527 | | 0.540 | | 0.548 | |

Clustered standard errors in parentheses * $p < 0.05$

Table 15: Models for All Private Schools with Interactions by Year: Objective

| | (1) OLS | (2) OLS | (3) Mahalanobis | (4) Mahalanobis | (5) Nearest Neighbor | (6) Nearest Neighbor | (7) Kernel | (8) Kernel |
|---|---|---|---|---|---|---|---|---|
| Private | 14.143* | | 4.658* | | 4.416* | | 4.766* | |
| | (0.384) | | (0.610) | | (0.481) | | (0.443) | |
| Private | | 2.373* | | 3.255* | | 3.133* | | 3.041* |
| | | (0.500) | | (0.691) | | (0.547) | | (0.506) |
| Private*2007 | | 3.768* | | 2.130* | | 1.995* | | 1.998* |
| | | (0.630) | | (0.893) | | (0.699) | | (0.641) |
| Controls | | X | | X | | X | | X |
| Observations | 122987 | | 2758 | | 7784 | | 122954 | |
| $R^2$ | 0.563 | | 0.533 | | 0.542 | | 0.549 | |
| Adjusted $R^2$ | 0.563 | | 0.528 | | 0.540 | | 0.548 | |

Clustered standard errors in parentheses * $p < 0.05$

The results from three different matching methods are presented in Table 14, models 3 through 8. Specifically, models 3, 5 and 7 provide a standard estimate of the average treatment effect on the treated for the mahalanobis, nearest neighbor and kernel matching models, respectively. These three methods each begin with the calculation of a conditional probability of being in a private school (for all students) but differ in the algorithm that is ultimately used for matching private (treatment) and public (control) students. Next, t-tests of group equivalence were run in order to assess balance across matched samples (the full results of which can be found in Appendix A at the end of this chapter). Balance was found across all but one variable in the Mahalanobis model and across all variables for the other two balancing metrics. Models 4, 6, 8 provide the corresponding estimates for each matching algorithm after re-running a regression with the inclusion of all covariates. While we would not expect these models to differ greatly from one another, the additional step of adding covariates back into the model is taken in order to ensure balance across treatment and control groups. This allows us to have the greatest assurance of bias reduction. Table 14 shows a slight reduction in the private school effect for all matching methods, as compared with the original OLS model (column 2). However, all models still show a statistically significant private school effect of approximately 4.5 points. In other words, attending a private school is found to increase objective test scores by about 4.5 points (which is nearly 1/3 of a standard deviation).

More interesting than the overall effect, however, is the fact that the effect is moderated by year. Table 15 shows that the effect of attending a private school on objective scores is estimated to be approximately 3 points in 2006 but that there is an additional 2 point effect for private school students in 2007. Further analyses indicate that the interaction effect is more than just the effect of being in a private school for an additional year. While the inclusion of a dummy

variable for those students enrolled in a private school for two years is significant (and does reduce the interaction term slightly), the additional effect of taking the exam in 2007 remains positive and significant. This provides some evidence that private schools may have altered their pedagogy or approach to test preparation for the 2007 school year. Possible explanations and implications are offered in the discussion section.

*Private Schools (All) - Writing*

The large difference in test scores for public and private school students that was so apparent on the objective exam, appears to be much smaller for the writing exam. Table 16 shows that the mean difference on the writing exam between public and private school students is approximately 4.5 points. While there is slightly less variation in writing scores overall, this seems insufficient to explain the significantly smaller mean difference—especially since the differences across the other covariates in Table 16 are strikingly similar to those in Table 13. Therefore by adding pre-test, demographic and economic controls to our regression model, we would expect a similarly large reduction in the effect from the naïve estimate.

Table 16: Descriptives by Private School Status: Writing Exam

| | Public | Private | Total |
|---|---|---|---|
| Writing | 54.88 | 59.28 | 54.93 |
| | (12.15) | (12.31) | (12.16) |
| Portuguese | 62.00 | 69.69 | 62.09 |
| | (12.92) | (11.85) | (12.93) |
| Math | 36.66 | 43.46 | 36.74 |
| | (10.10) | (12.52) | (10.16) |
| Writing | 1.622 | 1.907 | 1.625 |
| | (1.012) | (1.002) | (1.012) |
| Age | 15.58 | 15.13 | 15.58 |
| | (1.279) | (0.624) | (1.275) |
| Male | 0.387 | 0.397 | 0.387 |
| | (0.487) | (0.489) | (0.487) |
| White | 0.614 | 0.750 | 0.616 |
| | (0.487) | (0.433) | (0.486) |
| Black | 0.0727 | 0.0266 | 0.0722 |
| | (0.260) | (0.161) | (0.259) |
| Brown | 0.285 | 0.171 | 0.284 |
| | (0.452) | (0.377) | (0.451) |
| Asian | 0.0193 | 0.0435 | 0.0196 |
| | (0.138) | (0.204) | (0.139) |
| Indigenous | 0.00799 | 0.00664 | 0.00798 |
| | (0.0890) | (0.0813) | (0.0890) |
| Internet | 0.411 | 0.714 | 0.415 |
| | (0.492) | (0.452) | (0.493) |
| Mother Ed | 1.621 | 2.094 | 1.627 |
| | (0.742) | (0.781) | (0.745) |
| Father Ed | 1.638 | 2.120 | 1.643 |
| | (0.757) | (0.785) | (0.759) |
| Grade Repeat | 0.0247 | 0.0199 | 0.0247 |
| | (0.155) | (0.140) | (0.155) |
| *N* | 115727 | 1355 | 117082 |

mean coefficients; sd in parentheses

As expected, column 2 from Table 17 shows that the addition of these control variables reduced the private school effect to approximately 1.7 points. Unlike in the objective analyses, however, the propensity score matching models do not provide a further reduction of the treatment effect for writing scores. Although samples for each method are balanced across all variables based on post-estimation bias reduction (see Appendix A), these matching models do no appear to provide any further reduction of bias as compared with the OLS model. One

possible reason for this result is that there is a significant amount of 'overlap' in the sample. Prior research has shown that when there is a large amount of overlap (i.e. many subjects with similar conditional probabilities in both treatment and control), pooled OLS estimates can actually be more efficient than propensity score matching models. This is due to the fact that propensity scores are based only on observed covariates and that overlap causes OLS samples to be balanced (on said covariates) even without matching. Ultimately, all models show that there is a private school effect of approximately 1.7-1.8 points on the writing exam. Although a moderation model similar to the one used for the objective analyses was tested, there were no significant interaction effects by year. It should be noted, however, that while the variables included in the objective analyses accounted for more than half of the variance in objective test scores, these same variables only appear to account for approximately 12-13% of the variation in writing scores. In other words, more than 85% of the variation in writing test scores cannot be accounted for with the variables in these models.

Table 17: Models for All Private Schools: Writing

| | (1) OLS | (2) OLS | (3) Mahalanobis | (4) Mahalanobis | (5) Nearest Neighbor | (6) Nearest Neighbor | (7) Kernel | (8) Kernel |
|---|---|---|---|---|---|---|---|---|
| Private | 4.399* | | 1.868* | | 1.849* | | 1.834* | |
| | (0.332) | | (0.477) | | (0.372) | | (0.340) | |
| Private | | 1.682* | | 1.965* | | 1.864* | | 1.740* |
| | | (0.335) | | (0.456) | | (0.364) | | (0.335) |
| Controls | | X | | X | | X | | X |
| Observations | 117080 | | 2668 | | 7469 | | 117051 | |
| $R^2$ | 0.135 | | 0.141 | | 0.126 | | 0.128 | |
| Adjusted $R^2$ | 0.135 | | 0.132 | | 0.122 | | 0.128 | |

Clustered standard errors in parentheses * $p < 0.05$

*Low-fee Private Schools - Objective*

Although a private school effect was found for both the objective and writing exams across all private schools, one of the main contributions of this paper is an examination of the low-fee private schooling sector. Table 18 shows that while students in low-fee private schools do not perform as well on the objective exam as students across all private schools (see table 13), they outperform public school students by more than 10 points. As with the overall private school sample, low-fee private school students tend to have higher pre-test scores in Portuguese, mathematics and writing. They also tend to be slightly wealthier (with regard to home resources) with higher levels of parental education. Lastly, low-fee private schools tend to be disproportionately white and Asian, as compared with the public sector. These factors are all expected to impact objective scores and are therefore hypothesized to reduce the low-fee private school effect when added as controls in a regression model. However, it should be noted that the sample for the low-fee private school analyses is considerably smaller than that of the overall sample—with just under 100 low-fee private school students for both the objective and writing exams. There are two potential implications of the reduced sample size: 1) the students in this sample may be unique (and not representative of average students in the low-fee sector); 2) variance of the estimates could be increased in the matching models (making it even more difficult to find an effect). The generalizability implication is not as large a concern in this study because the appropriate comparison group is students who remain in the public sector. The latter implication is problematic and does impact the findings (particularly in the mahalanobis model, which uses only one match per treated student).

Table 18: Descriptives by Low-fee Private School Status: Objective Exam

| | Public | Low-Fee Private | Total |
|---|---|---|---|
| Objective | 40.82 | 51.47 | 40.87 |
| | (14.48) | (16.03) | (14.51) |
| Portuguese | 61.36 | 68.12 | 61.39 |
| | (13.21) | (12.32) | (13.21) |
| Math | 35.18 | 39.09 | 35.19 |
| | (9.033) | (10.48) | (9.043) |
| Writing | 1.438 | 1.760 | 1.439 |
| | (0.985) | (0.891) | (0.984) |
| Age | 15.66 | 15.13 | 15.66 |
| | (1.562) | (0.679) | (1.560) |
| Male | 0.387 | 0.323 | 0.387 |
| | (0.487) | (0.470) | (0.487) |
| White | 0.566 | 0.635 | 0.567 |
| | (0.496) | (0.484) | (0.496) |
| Black | 0.0955 | 0.0312 | 0.0952 |
| | (0.294) | (0.175) | (0.293) |
| Brown | 0.303 | 0.250 | 0.303 |
| | (0.460) | (0.435) | (0.459) |
| Asian | 0.0231 | 0.0625 | 0.0233 |
| | (0.150) | (0.243) | (0.151) |
| Indigenous | 0.0111 | 0.0208 | 0.0112 |
| | (0.105) | (0.144) | (0.105) |
| Internet | 0.495 | 0.698 | 0.496 |
| | (0.500) | (0.462) | (0.500) |
| Mother Ed | 1.713 | 2.031 | 1.714 |
| | (0.748) | (0.746) | (0.748) |
| Father Ed | 1.732 | 2.167 | 1.734 |
| | (0.773) | (0.763) | (0.774) |
| Grade Repeat | 0.0317 | 0.0312 | 0.0317 |
| | (0.175) | (0.175) | (0.175) |
| *N* | 22226 | 96 | 22322 |

mean coefficients; sd in parentheses

As expected, the introduction of a large set of control variables reduced the low-fee private school effect from 10 points to fewer than 3 points (see Table 19, below). However, this OLS estimate may still be biased due to self-selection into low-fee private schools. In order to account for this bias, propensity score matching models have been designed to estimate a low-fee private school effect while using balanced samples. Three different approaches are used

throughout these analyses: mahalanobis metric, nearest neighbor and kernel matching. As with the overall private school sample, balance was found across all but one variable in the Mahalanobis model and across all variables for the other two balancing metrics (see Appendix A). Models 4, 6 and 8 (in Table 19) show the low-fee schooling effect for each of these three methods, respectively. All three models show a reduction in the treatment effect, as compared with the OLS model. The model using the mahalanobis metric (model 4) shows a non-significant treatment effect of just over 2 points, while the nearest neighbor and kernel matching models find significant effects of between 2.2 and 2.5 points. The non-significant effect in the mahalanobis model is likely a result of the small treatment sample and the use of only one matched control per treatment subject (hence the corresponding standard error that is nearly 50% larger than any of the other models). Overall, these models provide strong evidence of a low-fee private school effect of slightly more than 2 points (which is approximately 1/6 of a standard deviation).

Table 19: Models for Low-fee Private Schools: Objective

| | (1) OLS | (2) OLS | (3) Mahalanobis | (4) Mahalanobis | (5) Nearest Neighbor | (6) Nearest Neighbor | (7) Kernel | (8) Kernel |
|---|---|---|---|---|---|---|---|---|
| Low-Fee | 10.048* | | 2.332 | | 1.986 | | 2.664 | |
| | (1.384) | | (2.180) | | (1.782) | | (1.668) | |
| Low-Fee | | 2.795* | | 2.136 | | 2.223* | | 2.462* |
| | | (0.997) | | (1.529) | | (1.119) | | (0.950) |
| Controls | | X | | X | | X | | X |
| Observations | 22291 | | 191 | | 553 | | 16195 | |
| $R^2$ | 0.568 | | 0.601 | | 0.585 | | 0.598 | |
| Adjusted $R^2$ | 0.568 | | 0.526 | | 0.561 | | 0.598 | |

Clustered standard errors in parentheses * $p < 0.05$

*Low-fee Private Schools - Writing*

While the mean difference in writing scores between low-fee private and public schools is smaller than that of objective scores, the distribution of the remaining variables in Table 20 are strikingly similar to those in Table 18. Accordingly, we would expect a similar reduction in the low-fee private school effect when these variables are added into our regression model as controls. The results shown in Table 21 confirm this hypothesis.

Table 20: Descriptives by Low-fee Private School Status: Writing Exam

| | Public | Low-Fee Private | Total |
|---|---|---|---|
| Writing | 55.16 | 60.24 | 55.18 |
| | (12.19) | (10.36) | (12.19) |
| Portuguese | 61.83 | 68.10 | 61.86 |
| | (13.05) | (12.38) | (13.05) |
| Math | 35.37 | 39.13 | 35.39 |
| | (9.097) | (10.52) | (9.107) |
| Writing | 1.459 | 1.768 | 1.461 |
| | (0.982) | (0.893) | (0.982) |
| Age | 15.62 | 15.12 | 15.62 |
| | (1.477) | (0.673) | (1.475) |
| Male | 0.381 | 0.316 | 0.381 |
| | (0.486) | (0.467) | (0.486) |
| White | 0.569 | 0.632 | 0.569 |
| | (0.495) | (0.485) | (0.495) |
| Black | 0.0946 | 0.0316 | 0.0943 |
| | (0.293) | (0.176) | (0.292) |
| Brown | 0.302 | 0.253 | 0.302 |
| | (0.459) | (0.437) | (0.459) |
| Asian | 0.0227 | 0.0632 | 0.0228 |
| | (0.149) | (0.245) | (0.149) |
| Indigenous | 0.0112 | 0.0211 | 0.0113 |
| | (0.105) | (0.144) | (0.106) |
| Internet | 0.498 | 0.695 | 0.499 |
| | (0.500) | (0.463) | (0.500) |
| Mother Ed | 1.718 | 2.021 | 1.719 |
| | (0.747) | (0.743) | (0.747) |
| Father Ed | 1.737 | 2.158 | 1.739 |
| | (0.772) | (0.762) | (0.773) |
| Grade Repeat | 0.0303 | 0.0316 | 0.0303 |
| | (0.171) | (0.176) | (0.171) |
| *N* | 21179 | 95 | 21274 |

mean coefficients; sd in parentheses

Table 21: Models for Low-fee Private Schools: Writing

| | (1) OLS | (2) OLS | (3) Mahalanobis | (4) Mahalanobis | (5) Nearest Neighbor | (6) Nearest Neighbor | (7) Kernel | (8) Kernel |
|---|---|---|---|---|---|---|---|---|
| Low-Fee | 4.248* | | 1.064 | | 2.152 | | 2.480* | |
| | (1.171) | | (1.739) | | (1.214) | | (1.107) | |
| Low-Fee | | 2.370* | | 1.488 | | 2.743* | | 2.654* |
| | | (1.208) | | (1.981) | | (1.339) | | (1.176) |
| Controls | | X | | X | | X | | X |
| Observations | 21247 | | 188 | | 555 | | 14738 | |
| $R^2$ | 0.143 | | 0.153 | | 0.172 | | 0.160 | |
| Adjusted $R^2$ | 0.142 | | -0.009 | | 0.125 | | 0.159 | |

Clustered standard errors in parentheses * $p < 0.05$

The basic OLS model with controls (Table 20, column 2) shows an approximate 40% reduction in the treatment effect from the naïve estimate. As with all previous analyses, however, the treatment effect is re-estimated via a variety of matching models in order to account for selection bias. Additionally, as with the overall private school sample for writing, balance was found for all variables across all three matching models (see Appendix A). While the mahalanobis metric matching model shows a non-significant effect for low-fee private schooling, this is likely due (once again) to the small sample and relatively large standard error of the estimate. Interestingly, the nearest neighbor and kernel matching approaches both provide evidence of a slight increase in the low-fee private school effect for writing scores. This is similar to the finding for the overall private school effect on writing, although the increase is even more apparent in this set of analyses. While this finding is somewhat surprising, it nevertheless provides consistent evidence of a low-fee private schooling effect of approximately 2.7 points on the writing exam (which is the equivalent of nearly ¼ of a standard deviation).

**Additional modeling decisions**

As previously noted, there were several ways in which the final sample could have been created for this study. While the final sample consists of a control group limited to those students who began in a public school from which a student transferred to a private school in either 2006 or 2007, all models were re-estimated using alternative samples. First, a "full" sample was tested—which included all control students, not just those who began in schools that had a student transfer to a private institution in 2006 or 2007. Additionally, a more restricted sample was used in which all students were required to have outcome data for both the objective and writing sections of the ENEM. While the results from these alternative samples did not change any of the substantive findings of this study, the "full" model did produce some slight changes in

the coefficients that are worth discussing. Most notably, both the overall and low-fee private school effects for objective and writing scores were larger in the full sample than in the final sample. While the ultimate decision to use only control students from schools with transfer students was based on the theoretical hypothesis that these students serve as more appropriate controls, it is worth noting that the private school effects presented throughout this paper should be seen as conservative estimates (i.e. lower-bound estimates as compared with alternative sampling options).

Another modeling decision that needed to be made was whether to conduct analyses for overall samples with year dummies or to design the study as a cohort analysis—where cohorts are defined by grade in the baseline year (2005). Ultimately, the combined approach was chosen for the main analyses due to concerns about sample size in the cohort models. However, private school effects were re-estimated using a cohort design for the overall and low-fee analyses. While the low-fee cohort analyses produced no significant results (due to extremely small samples), the cohort design did provide interesting results for the overall private school effect. For the objective test, a significant private school effect was found for both cohorts (with a slightly larger effect for the $9^{th}$ grade cohort—which is not surprising due to the significant interaction effects presented in Table 15). For the writing exam, on the other hand, a significantly positive private school effect was only found for the grade 9 cohort, with non-significant results in the $10^{th}$ grade cohort. This provides clear evidence to support the hypothesis that the overall private school effect was largely driven by the students taking the ENEM in 2007. The implications of this will be discussed further in the following section.

Although five neighbors were selected for primary analyses in the nearest neighbor matching approach, alternative numbers are tested as well: namely one and ten. The main impact

of altering the number of matches was on the standard errors. Ultimately, using one match provided estimates that were similar to the mahalanobis metric models (which also used only one match), while using ten matches provided estimates quite similar to the five match estimates presented above.

All analyses were conducted as intent-to-treat. In other words, if students transferred to a private school in 2006 but then back to a public school in 2007, they were considered a part of the treatment group for all analyses. This decision was made because the transfer back to the public sector could still be considered an impact of the private school itself. Although this only accounts for a small number of students, analyses are also run in two alternative ways: 1) with a dummy variable for those who transfer back; and 2) by dropping students who transfer back to the public sector. Neither method provided any significant changes to the estimates or resulting conclusions.

Finally, while little information was available in these data regarding the peers of students in the transfer school, it was possible to examine average income by school. For example, while public school students did not have family incomes that differed from their school means, overall private school students in this sample (i.e. those who transferred from a public school) tended to move to private schools with higher mean income levels than their own level of family income. This provides some evidence that part of the private school effect may be the result of a peer effect. However, while those students transferring to low-fee private schools did have higher incomes (on average) than their public school counterparts, they did not tend to transfer to schools with mean family income levels above their own income level.

## Sensitivity Analyses

Due to concerns about selection bias, two additional sensitivity analyses were conducted above and beyond the variety of matching strategies. First of all, propensity score matching can only account for differences based on observed covariates. Although the matched treatment and control groups are balanced across covariates based on their propensities (to be in private school), it is possible that there is still some unobserved characteristic that impacts both selection into treatment as well as eventual outcome scores. Let's take the example of two students who had the same conditional probability of enrolling in a private school based on all of our observed covariates. One of these students was actually enrolled in a private school while the other was in a public school. Therefore, these two students would be matched based on the assumption that the only difference between them is that one happens to be in a public school and one happens to be in a private school. However, what if the reason they were in different schools was motivation (i.e. the more highly motivated student enrolled in the private school). This motivation would also likely cause this student to perform better on the ENEM, regardless of which school he was in. Now let's extend this scenario to all students. That is, students who enroll in private schools are more motivated than their matched public school counterparts. An estimation of the private school effect would then be larger than it would if we could account for motivation in our model. Fortunately, Inchino, Mealli and Nannicini (2008) developed a method of estimating the impact of unobserved confounders on treatment effects. By introducing a potential binary confounder into the model, they found it is possible to examine the impact of an unobserved characteristic such as motivation on achievement. This confounder can either be created to mimic an existing variable (e.g. if the confounder behaved similarly to gender, what would it do to the treatment effect?) or it can be defined by its relative impact on selection into treatment and on the outcome.

In this section, I simulate an unobserved covariate that mimics a set of binary covariates that I already have in the original models (namely, internet access, car ownership, computer ownership, race and year). Table 22 shows the results for the impact of these simulated confounders on the private school effect for writing scores. The first row in the table shows the nearest neighbor estimate of the treatment effect (ATT) with no confounder. The remaining rows each show the newly estimated treatment effects with the introduction of binary confounders mimicking the corresponding covariates in column 1. For example, the row that begins with "Black" shows that this variable is positively associated with the objective scores (i.e. outcome effect) but that the odds of being in a treatment school are low (i.e. selection effect). If our unobserved factor followed this same pattern, it would provide only a slight reduction in the ATT estimate. This is true across all simulated confounders. In other words, even if our unobserved confounding variable (e.g. motivation) were equal to our current covariates with regard to its impact on selection into treatment and increased objective scores, it would have little impact on our treatment effect. Therefore, we can be confident that our treatment effects for both objective and writing scores are robust to omitted variable bias.

Table 22: Sensitivity Analysis Introducing Unobserved Binary Confounder: Writing

| | p11 | p10 | p01 | p00 | Outcome Effect (Γ) | Selection Effect (Λ) | ATT | SE |
|---|---|---|---|---|---|---|---|---|
| No Confounder | 0.00 | 0.00 | 0.00 | 0.00 | -- | -- | 1.904 | 0.399 |
| *Confounder-Like* | | | | | | | | |
| Black | 0.03 | 0.02 | 0.09 | 0.08 | 1.028 | 0.302 | 1.689 | 0.495 |
| Brown | 0.16 | 0.19 | 0.31 | 0.30 | 1.051 | 0.437 | 1.710 | 0.500 |
| White | 0.77 | 0.74 | 0.58 | 0.59 | 0.933 | 2.358 | 1.750 | 0.496 |
| Repeat | 0.15 | 0.03 | 0.17 | 0.03 | 6.144 | 0.914 | 1.784 | 0.499 |
| Cell Phone | 0.67 | 0.64 | 0.46 | 0.46 | 1.006 | 2.313 | 1.658 | 0.498 |

Additionally, a Heckman selection model was run by using car ownership as the excluded instrument to predict self-selection into having an observable outcome. In other words, we can

initially only test the impact of a private school on achievement for those students with outcome data but there is reason to believe that there are factors that lead to this final sample being different than the original sample. This is especially important in a situation where the outcome of interest is a voluntary exam. In these data, we can use car ownership to predict whether or not students took the exam (since exams are given off-site and those with cars are more likely to be able to make it to the exam, after controlling for wealth) and re-estimate the private school effect for all students. Table 23 shows the Heckman selection models for the overall private school models. We can see from this table that the private school effect on objective scores does not change from previous models and that the effect on writing is slightly smaller. Table 24, on the other hand, shows that low-fee private school effects for both objective and writing scores were potentially biased downward in the original models. This provides evidence that the marginal effect of low-fee private schools may actually be larger than original estimates if we were to observe outcome scores for all students in the sample.

Table 23: Heckman Selection for all Private Schools (Selection = Car Ownership)

| | (1) Objective | (2) Writing |
|---|---|---|
| Private | 4.606* | 1.256* |
| | (0.281) | (0.325) |
| Rho | 0.719 | 0.448 |
| | (0.007) | (0.025) |
| $\chi^2$ | 1283.65* | 60.08* |
| Observations | 631029 | 631029 |
| Censored Obs | 407002 | 419003 |

Standard errors in parentheses: * $p < 0.05$

Table 24: Heckman Selection for Low-Fee Private Schools (Selection = Car Ownership)

| | (1) Objective | (2) Writing |
|---|---|---|
| Low-Fee Private | 4.627* | 3.414* |
| | (1.071) | (1.212) |
| Rho | 0.724 | 0.462 |
| | (0.006) | (0.023) |
| $\chi^2$ | 1331.30* | 59.13* |
| Observations | 628066 | 628066 |
| Censored Obs | 405256 | 417213 |

Standard errors in parentheses: * $p < 0.05$

## Discussion

Despite recent increases in public educational spending, private schools have been on the rise in developing countries for the past decade. In recent years, much of this increase has been driven by the expansion of a low-fee private schooling sector for primary and secondary school students. However, little research exists on the quality of these educational opportunities. Therefore, this study was designed to answer two main research questions: What is the impact of (low-fee) private school enrolment on educational attainment in Brazil? Furthermore, do these results help to explain the country's demand for private education in the face of increased government support for public education?

Based on data from the state of Sao Paulo, I find that private school students (across all levels of tuition) perform better than their public school counterparts on both the objective and writing portions of the ENEM high school exit exam. This private school effect remains positive and significant after accounting for sample selection bias via a variety of propensity score matching models. Additionally, sensitivity analyses show that these results are robust to the possibility of potential unobserved confounding variables (such as motivation). Ultimately, this leads me to conclude that both low-fee and high-fee private secondary schools in Brazil provide significant achievement gains as compared with public schools. However, the data used for this

study did not allow for an in-depth exploration of the reasons for these achievement gains—be it teacher preparation, resources, peer effects, autonomy, et cetera. This is an area of study that requires future attention. While it is important for policy makers and researchers to know whether or not low-fee private schools are providing high-quality educational opportunities in developing countries, it is arguably even more important to understand why/how these schools are able to provide these achievement gains with minimal resources (at least with regard to tuition/fees). The only evidence as to what might be driving the private school effects in Brazil comes from a cursory examination of school mean incomes and the moderation analyses conducted for the overall private school sample. More specifically, some evidence of a peer effect (and/or resource effect) surfaced when it was found that students were transferring into private schools with peers who were, on average, wealthier than themselves, although this was not found to be the case for students in low-fee private schools. With regard to the moderation analyses, it was found that much of the private school effect was driven by the 2007 exam-taking cohort. This cohort effect appears to be the result of two factors: 1) enrolling in a private school for two years (as opposed to just one); and 2) the adaptability of private schools to prepare their students for an exam that started to become more important for access to college in 2007 than it was in 2006. Additionally, it should be noted that the private school effect for writing scores was smaller than for objective scores. One hypothesis for this finding is that it is easier in the span of only one or two years to improve a student's skills and/or preparation for a multiple choice exam than it is to improve their writing skills.

Ultimately, this paper provides two important contributions to the literature. First, the findings support the hypothesis that despite increases in government support for public education, private educational opportunities are still chosen (at least in part) by an increasing

number of students/families because of their promise to provide gains in academic achievement. Second, this study provides some of the first evidence of achievement gains for low-fee private schools in a developing country via rigorous quantitative analyses that account for bias due to self-selection. This is essential information for policy makers, researchers and aid organizations considering the role and impact of low-fee private schools in Brazil (and across developing countries, in general). While these results and conclusions should not be interpreted as advocacy for the expansion of low-cost private schooling, they do offer some explanation for the rationale behind this expansion and further provide some credence to recent hypotheses that low-cost private schools may indeed serve as useful complements to over-burdened public schooling sectors. It should be understood, however, that these results pertain to a singular exam for secondary school students in a specific country and that much research is still needed in order to fully understand the comprehensive benefits and drawbacks to private schooling for low-income children.

# CHAPTER IV

## PRIVATE SECONDARY SCHOOLS IN INDONESIA: PERFORMANCE VERSUS DEMAND

Private schooling for the poor has been on the rise in developing countries over the past two decades. While some contend that private schools provide a necessary complement to the overburdened public education sector, others argue that the disenfranchised should never be forced to use scarce private resources in order to obtain a public good (Lewin, 2007; Roth, 1987). This paper provides an examination of the private secondary education sector in a country that appears, on the surface, to provide a compromise between these competing ideologies. With a decentralized education sector in which private schools receive a significant proportion of their funding directly from the central government, Indonesia offers the assurance of state regulation with the purported flexibility of private provision. Furthermore, private schools accepting government operational funding in Indonesia are not permitted to charge tuition, which should alleviate concerns about drawing down on the wealth of poor families. Despite this unique approach to privatization, however, a recent OECD report found that private secondary school students in Indonesia tend to perform significantly lower on the Programme for International Student Assessment (PISA) than their public school counterparts (OECD, 2012). Yet, more than 40% of students at the secondary level continue to enroll in private schools. This leads us to ask why they attend. By supplementing information from interviews recently conducted in Indonesia with analyses of PISA 2009 data for public and private school students, this paper answers the questions: What factors can explain the differences in performance between public and private schools in Indonesia? Why are private secondary schools in Indonesia in such high demand

despite concerns about quality and academic preparedness? Additionally, what implications does this have for international education policy?

## Background

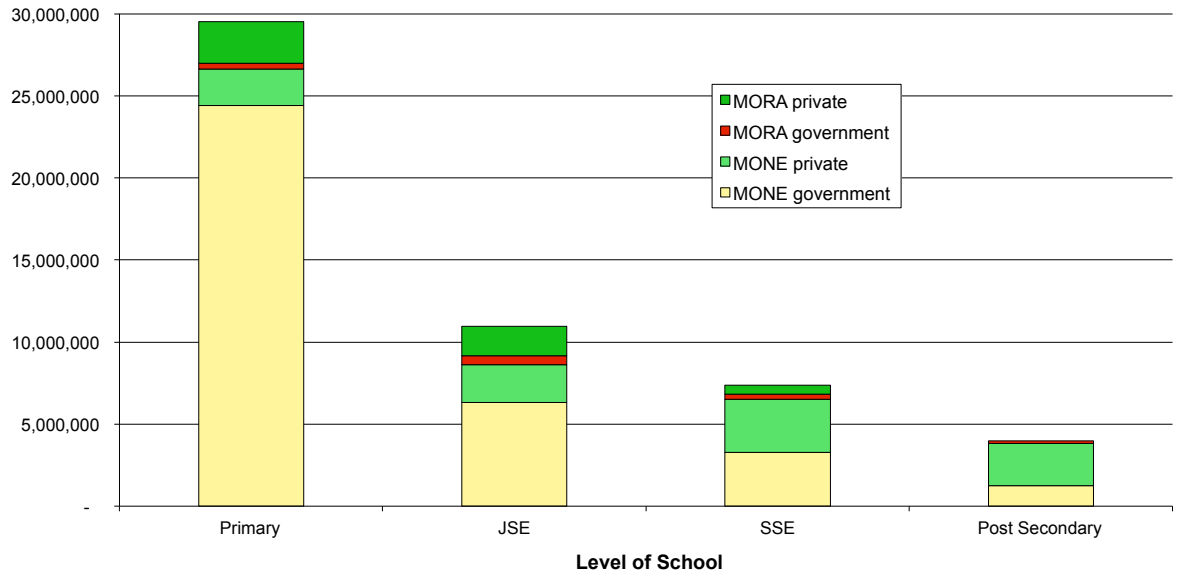
In many countries around the world, there is a distinct divide between the public and private education sectors. However, privatization can take many forms, with a mix of public and private funding, management and/or oversight (Roth, 1987). In Indonesia, private schools are run by non-governmental organizations but many still receive government funding. While the unique nature of the Indonesian educational system often causes the line between public and private education to be blurred from a traditional standpoint, private schools have historically played an important role in improving access to education for underserved communities—and their future role in assisting the country in meeting its universal basic education goals and expanding secondary school access for those in need has become a reality that is apparent based on the government's support for this sector. Prior to examining the state of private education in Indonesia, however, it is first necessary to understand the underlying educational context in which it functions.

### *Universal Basic Education*

Much like the education systems in other developing countries, basic education in Indonesia is comprised of nine years of compulsory schooling—incorporating both primary (grades 1-6) and junior secondary education (grades 7-9). While the Government of Indonesia (GoI) was able to achieve nearly universal primary education by the 1970s, in 1994 efforts were turned toward achieving Nine Year Universal Basic Education (NYUBE). With significant support from the Indonesian government and numerous aid organizations, they were able to

increase the gross enrolment rate for NYUBE to 92.5% by 2008. However, this rate was not consistent by region or level of schooling. For example, 111 of Indonesia's 440 districts were still below the minimum GER district target of 80% by 2008 and only about half of the students from the country`s poorest economic quintile complete basic education (Weston, 2008). Additionally, the transition rate of primary school graduates to junior secondary school actually dropped to just under 76% by 2008, from 82% the year before (Cannon and Arlianti, 2009). With junior secondary enrolment rates continuing to lag behind the universal rates at the primary level, it is not surprising that a large proportion of private secondary schools in the country are found in the secondary schooling sector. For example, Figure 1 shows that while only about 16% of schools at the primary level are private, more than 37% of junior secondary schools are private. Furthermore, according to a recent OECD report on PISA results, the percentage of students attending privately managed secondary schools may be as high as 43% (OECD, 2012). Combined with the recent focus on increasing junior secondary enrolments, this points to the growing importance of the private sector in assisting Indonesia to achieve its goal of universal basic education.

Figure 1: Number of schools by sector, ministry and level




## Regulations, Monitoring and Support

The structure of the Indonesian educational system is unique in that it is both monitored and managed by two separate ministries: the Ministry of National Education (MONE) and the Ministry of Religious Affairs (MORA). The majority of schools under MONE are characterized as public, non-religious schools and the majority of MORA institutions are private madrasahs[9]. More specifically, approximately 8% of MONE schools are private, while around 88% of MORA schools are private. In other words, despite the prevalence of private schools in MORA (and public schools in MONE), both ministries are responsible for the registration and oversight of public and private schools. Regardless of the ministry with which a private school registers, it is required for all private schools to be run by a private foundation (known as a yayasan). These foundations provide varying amounts of support to their schools, which can lead to disparities in

[9] A madrasah differs from an Islamic school only in that it is registered with MORA, as opposed to MONE.

private school funding and infrastructure. This issue will be discussed further in the final section of this paper.

As a result of the National Education System Law (20/2003), public and private schools under both MONE and MORA are subject to the same regulations (i.e. registration and accreditation procedures, following the national curriculum, provision of textbooks to all students, etc.) and are even supported by many of the same government programs. This does not mean, however, that the two sectors are entirely indistinguishable from one another or that they are equivalent in all aspects of management, funding, support and production. For example, while all schools are required to follow the national curriculum, private religious schools can supplement the curriculum with additional religious education. Additionally, while both MONE and MORA are subject to the same regulations, funding channels and administrative authority for the two ministries have remained separate under the aforementioned national education law (RTI, 2009). This separation is readily apparent with regard to the recent government policies and development projects working toward decentralized basic education. Although these policies and programs are intended to affect both public and private schools, this is complicated by the fact that decentralization has occurred for MONE but not for MORA. For instance, while the enforcement of minimum service standards (MSS) takes place at the district level for both MONE and MORA schools, the majority of administrative procedures and funding structures for MORA still operate in a hierarchical, centralized system.

While funding channels remain distinct between the two ministries, funding sources for basic operating costs have, to some extent, been unified. For example, the School Operational Funding subsidy (Bantuan Operasional Sekolah/BOS) is a government program that is available

to all public and private secondary schools offering basic education (including pondok pesantren, a.k.a. religious boarding school). According to RTI (2009):

> It was explicitly stated that BOS would ``free students from the burden of school operational costs … [for] registration, tuition, examination fees and materials and costs of laboratory and workshop sessions." The goal of BOS was to provide assistance to schools in order to "permit them to eliminate student fees while still maintaining the level of educational quality" (p. 89).

By accepting the BOS, schools agree to relieve low-income students of all costs and fees. Those schools without low-income students must use the funds to reduce fees. In practice, however, it is not often possible for schools to fully operate on BOS funds alone, so fees or community donations may still be expected by some primary or junior secondary schools. Since 2009, all government schools have been required to accept the BOS, while private schools still have the opportunity to opt out—as long as they can ensure that poor students will be able to attend their school.

While the level of the BOS is equal (per student) across public and private schools, teacher salaries in public schools are mainly paid for by the government while those in private schools are mainly covered out of each school's individual budget. An exception to this pattern is the professional allowance available to certified teachers in both public and private schools. While many schools serving low-income students have little choice but to pay their teachers relatively low salaries out of the BOS, a recent investment has been made by the Government of Indonesia to certify all 2.7 million teachers by 2015. All teachers, whether in a public or private school are expected to become certified and supplemental salaries (or professional allowances) will be paid to them by the government. These allowances can double the salary of teachers in public schools and increase the salaries of teachers in private schools by more than 10 times. Aside from concerns about the government's ability to pay the professional allowances of so

many additional teachers, many see this as an important step toward equity. However, these allowances still remain hypothetical at this time. As a matter of fact, a recent World Bank report on spending trends in Indonesia claims that converting all teachers to civil servants and providing certification allowances would be fiscally unfeasible (World Bank, 2013). Therefore, it is necessary to examine the effectiveness of the private sector as it currently functions. Accordingly, the following section provides a brief overview of the literature pertaining to the effectiveness of the private schooling sector in Indonesia.

## Private School Quality

The intended purpose of nine-year universal basic education is not only to provide students with access to a desk, chair and teacher but to provide all children with an opportunity to obtain a high-quality education (Cannon and Arlianti, 2009). In recent years, several researchers have attempted to assess the relative quality of public versus private schools in Indonesia. This section examines some of the widely held beliefs about private schools and provides a summary of the most relevant empirical studies to-date, the results of which have been mixed.

Much of the work published on private-public schooling comparisons in Indonesia concludes that from the provision of textbooks to the education level of teachers, public schools have higher quality inputs (often with more funding) than do private schools (Newhouse and Beegle, 2006; Strauss et al, 2004; World Bank, 1998).

However, while there is a general belief in Indonesia that private schools are of lower quality than public schools, in terms of inputs and outputs, two of the earliest empirical pieces on educational effectiveness in Indonesia found results more in favor of private schools. Using an instrumental variables approach to examine the impact of spending on sixth grade national

examination results in math and Indonesian language, James, King and Suryadi (1996) found that increased spending lead to gains in performance across subjects. More interestingly, however, James et al conclude that private schools were more efficient with their spending than public schools. However, there is a selection bias concern in this study, based on the fact that madrasahs were excluded from the survey on which the analyses were based—thereby limiting the sample of private schools. Specifically, private schools serving poorer students (i.e. those with which most current researchers are concerned) were not examined in this study. This is likely to have provided a positive bias in the effectiveness of private schooling. Additionally, this study is subject to potential selection bias from parents making a choice to send their children to private schools.

Complementing James et al's (1996) work, Bedi and Garg (2000) used household survey data to find that after controlling for (observable) student characteristics, including prior test scores (to account for school selection effects), non-religious, private secondary school graduates actually performed better in the labor market than public school graduates and that students who attended Islamic private schools performed worse. These results show that while public secondary school students tend to be more advantaged than their private school counterparts, selection-corrected earnings differences tended to favor private non-religious schools in terms of efficiency. There are also potential problem with sample selection bias in this study. Specifically, Bedi and Garg examine the economic returns to schooling for students who have between 7 and 12 years of education, thus ignoring those who attend higher education. If public schools students (who are found to be of higher ability and better family background) are more likely to enroll in institutions of higher education than private school students, Bedi and Garg's (2000) findings would be biased toward finding favorable results for private schools. The results also

have limited generalizability to the current Indonesian education system, where the vast majority of private schools are madrasahs (managed by MORA) or independent private schools run by a religious organization (managed by MONE). Additionally, Fahmi (2009a) re-estimated Bedi and Garg's estimation (on the same Indonesia Family Life Survey (IFLS) data) and found contradictory effects when using a different sample selection correction method (see Bourguignon et al. (2007), with public school graduates receiving higher labor market returns than their private school counterparts.

In yet another study using the IFLS, Newhouse and Beegle (2006) find that junior secondary public school graduates scored between 0.17 and 0.3 standard deviations higher on the Ebtanas national exam than did private school students, after controlling for family background, location and student characteristics (e.g. gender, work status, prior scores). Furthermore, while they find no significant difference between public madrasah students and public secular students (nor between private madrasah and private secular), students in non-Muslim private schools performed better than those in madrasahs. Similarly, Fahmi (2009b) uses the IFLS 2000 to estimate the effectiveness of junior secondary education in Indonesia. Ultimately, he finds that students from public schools receive 25% and 35.2% higher future earnings than private non-religious and madrasah students, respectively. Private Christian school students, however, had slightly higher returns to education than public school students. This once again speaks to the mixed evidence on the effectiveness of public versus private schools depending on sector.

In 2010, Ali et al conducted a study on the quality of madrasah education in Indonesia and found that teacher qualifications and certification levels were highly correlated with student achievement. Additionally, school resources (defined as the number of resources such as science labs, staff rooms, first aid kits, electricity, etc.) were found to have significant effects on between

school achievement in English across a sample of 150 secondary-level madrasahs, even after controlling for student background characteristics in an HLM.

Finally, the OECD's most recent report on PISA examined the differences in achievement for public and private schools across all tested countries. While they found that nearly all countries showed higher PISA scores for private school students, there were a few countries where the opposite was true. Indonesia was one of those countries. Ultimately, they found that private school students in Indonesia were outperformed by public school students on the PISA reading exam by approximately 18 points, or nearly $1/5^{th}$ of a standard deveiation (OECD, 2012). However, this finding was simply based on mean test score differences, with no controls—and is thus subject to selection bias. Additionally, they found that Indonesia was one of only a few countries in which private school students were not more socio-economically advantaged than their public school counterparts. Therefore, it is likely that this finding is biased and that effectively controlling for background characteristics and self-selection will provide a more accurate overall public school effect. Finally, it is important to note that the OECD report treats all private schools equally—whereas prior research has shown that there are distinct differences in resources, student selection and achievement across types of private schools.

The current study was undertaken in order to rigorously examine the private secondary sector in Indonesia in order to fill two gaps in the literature. First, by using OLS regression and propensity score matching, this study will attempt to return less biased estimates of the effect of private schools on academic achievement. Secondly, while it is apparent that private secondary schools in Indonesia are in high demand, none of the previous studies have attempted to address the question of why so many students choose to enroll (particularly in light of the fact that private madrasahs in particular tend to produce lower achievement than their public school

counterparts). Therefore, this study will provide a qualitative explanation for why private schools continue to be in such high demand despite concerns of poor academic performance.

## Data

Data for the quantitative analyses were obtained from the 2009 Programme for International Student Assessment (PISA). The final dataset available for Indonesia contains 4,652 students in 180 schools. These data contain 2,555 students in 85 public schools and 2,097 students in 95 private schools. The private school data can actually be broken down one step further into private independent and private dependent schools. The former receive less than 50% of their funding from public sources, while the latter receive between 50% and 100% of their funding from public sources. There are 1,422 private independent students in 60 schools and 675 private dependent students in 35 schools in the final dataset.

### *Dependent Variables*

There are three dependent variables for this study: mathematics, reading and science scores from the PISA 2009 exam. All models are run separately for each of these three dependent variables. PISA uses plausible values for their cognitive assessments. In other words, each student actually has five outcomes scores for each exam. While conducting analyses on one plausible value will provide unbiased estimates, the standard error will be underestimated. Therefore, all models are run on all five plausible values and standard errors are calculated accordingly. Specifically, the coefficients are averaged across all plausible value estimates while the standard errors are computed by taking the square root of the sum of the sampling variance and the imputation variance. This is done with the *pv* command in Stata for means and simple regressions but it had to be calculated independently for more advanced models.

*Independent Variables*

The main independent variable of interest for this study is a dummy variable for private school enrolment (i.e. private = 1; public = 0). This is sometimes referred to as the 'treatment' variable in the results section. Models are initially run with all private school students but additionally analyses are conducted for independently for private-dependent school students.

A large number of student-level covariates are used across models as controls. These are standard covariates in educational achievement literature and include such variables as: gender, age, grade, parental education (i.e. highest grade finished by either parent), wealth, home educational resources (international index), joy of reading (self-reported), as well as indices of economic, social and cultural status.

Additional analyses on school-level covariates are conducted in order to examine the extent to which they can explain the effect of private school enrolment on PISA scores. These variables are: student-teacher ratio, proportion of teacher shortages, school size, school location (categorical: 1 village; 2 small town; 3 town; 4 city; 5 large city), use of resources (international scale of efficiency), percent of female students, proportion of certified and qualified teachers, computer access and the number of nearby schools (i.e. within 1km).

*Qualitative Data*

The data for the qualitative portion of this study come from the interviews conducted in Indonesia during July 2010. We interviewed principals, school committee heads and teachers from 28 non-government schools (16 of which were junior secondary; 11 primary and 1 full basic). This represented schools registered with both MONE (7) and MORA (21). The schools were located across the country in East Java (Surabaya, Sidoarjo, Bangkalan and Bojonegoro) and Banten (Lebak). Although we obtained lists of private schools in each district from USAID,

UNICEF and/or RTI officials, due to limited time and resources we ultimately had to settle for convenience sampling to choose which schools to interview. Therefore, the qualitative analyses in this study are not purported to be nationally representative but instead provide findings that should be considered illustrative for a more nuanced understanding of the system than can be provided through the quantitative analyses alone, particularly with regard to the demand for private secondary schools.

For the purposes of this study, the most pertinent questions from our school interview protocol come from the governance and funding/support sections. More specifically, we asked questions about registration (i.e. MORA or MONE), BOS funding, parental fees (as well as assistance to very poor children), teacher credentials and certification, school resources and donor support.[10]

## Methodology

This study incorporates two distinct methodologies: quantitative analyses of PISA 2009 data and qualitative analyses of interviews conducted during recent fieldwork in Indonesia.

*Quantitative – PISA 2009*

The Programme for International Student Assessment (PISA) is an international study that was introduced by the Organisation for Economic Co-Operation and Development (OECD) in 2000. In 2009, PISA conducted its 4$^{th}$ survey in 74 countries (including all OECD countries along with various partner countries and economies). PISA consists of a student questionnaire, a parent questionnaire, a school questionnaire and a cognitive assessment. The cognitive assessment tests skills in reading, mathematics and science for 15 year olds. This age, which was chosen because it represents the upper end of compulsory education in many countries, falls right

[10] Specific questions are available upon request.

at the end of junior secondary school in Indonesia—making it an ideal measure of academic performance for this study. Although it should be noted that while some students will be in 9th grade for this exam, others will likely have already started 10th grade (i.e. senior secondary school).

PISA provides test data and questionnaires for a nationally representative sample of 15 year old students in both public and private schools in Indonesia. The questionnaires will first be used to examine demographic and socioeconomic differences between public and private school students. Subsequently, these variables will be used as controls in models that will regress test scores on public/private enrolment status.

*Theory and Model Specification*

In addition to using ordinary least squares (OLS), this study will also use propensity score matching in an effort to reduce the effect of selection bias and to obtain a more accurate estimate of public/private school effects. For this study, we employ matching techniques, which involve a comparison of the treated group with a selected subset of the control group (i.e. those who did not receive treatment). The basic idea behind matching is to replace the average outcome of the counterfactual group [$E(y_0|\mathbf{x}, z=1)$] with outcomes from a subset of the untreated population whose observable characteristics ($\mathbf{x}$) are as close as possible to those of the treated group.

Ultimately, we utilize four different methods to estimate the treatment effect. First, we estimate a standard OLS regression, controlling for a set of covariates. These estimates are then compared against the models that incorporate matching techniques in order to determine whether or not we can reduce the amount of bias by using balanced samples.

Accordingly, the second estimate of the treatment effect employs a matching method that uses combines the Mahalanobis metric with a caliper from the propensity score. The first step is to run a logit model with treatment as the dependent variable and all aforementioned independent variables as predictors. This provides a probability (or propensity) for being in the treatment group. Calipers are then established for the purpose of designating how close probabilities should be in order for a match to be made. According to the literature, an appropriate caliper is ¼ of a standard deviation of the propensity score (Rosenbaum & Rubin, 1985). In this method, all subjects are randomly ordered and the first treated subject is selected. Nontreated subjects within the predefined caliper are then selected and the subject with the smallest Mahalanobis distance is then selected as a match. In other words, students in private schools are matched with public school students who have the smallest Mahalanobis distance between them within a given caliper. This method is argued to produce the best balance of covariates between the two groups (Guo et al, 2006).

The third method used to estimate a treatment effect is a nearest neighbor propensity score matching approach. Once again a propensity score is calculated and a caliper is determined. This time, however, each treated subject is matched with a particular number of nontreated subjects. We begin by matching each private school student with 10 public school students but we also run analyses for alternative numbers of matches in order to assess whether or not differences in estimates occur across the number of matches.

The fourth and final method used for this study is kernel matching. Unlike the mahalanobis and nearest neighbor approaches, which use calipers to determine a small number of matches (as few as one per treated case), the kernel matching algorithm is based on a nonparametric regression model and therefore allows for the use of as many of the control cases

as possible. By calculating a weighted average of the outcome for all non-treated participants and differencing it from the outcome of the treated case, a treatment effect is estimated across all treated and non-treated cases (with the latter being down-weighted based on their distance from each treated case).

Additionally, PISA sampling and replicate weights are used across all models. Final student weights are used for all analyses. Since PISA uses a two-stage sampling procedure, the Fay's variant of the Balanced Repeated Replication (BRR) is used to compute standard errors for all population estimates. Specifically, PISA data include 80 replicates and a Fay's coefficient of 0.5.

*Qualitative – Fieldwork*

After conducting an extensive literature review on the country's private schooling sector, Dr. Thomas Smith and I traveled to Indonesia to conduct our fieldwork in July 2010. During this fieldwork we interviewed representatives of donor programs and aid organizations, the Government of Indonesia, a large private school foundation and private school principals, teachers, and committee members. All interviews were semi-structured and our interview protocol can be found in the appendix. The names and contact information of representatives from donor programs and aid organizations, as well as government officials were provided by the United States Agency for International Development's (USAID) Indonesian country office, which was supporting our work there. Ultimately, we interviewed representatives from USAID, Australian Agency for International Development (AusAID), The World Bank, United Nations Children's Fund (UNICEF), Save the Children and Research Triangle Institute (RTI). Unlike the school interviews which were designed to obtain information on the characteristics of schools, students and teachers, the purpose of these interviews was to ascertain the perceptions of the

business and finance management capacities of schools, as well as the extent to which aid organizations and NGOs work with (and/or provide funding to) private schools.

From the Government of Indonesia, we interviewed members of the Ministry of National Education (MONE), Ministry of Religious Affairs (MORA), as well as several district and sub-district education officers. In these interviews we asked questions pertaining to: the registration, monitoring and inspection of private schools by both MONE and MORA; governmental support for private schools; the regulatory framework for private schools (including teacher credentialing and professional development) and; data collection for private schools. The private school foundation heads that we interviewed were from Jakarta's largest foundation: Ma'arif NU.[11]

## Results

As noted in the OECD's 2012 report, private school students in Indonesia were outperformed by public school students on the 2009 PISA reading exam. The first three rows of Table 25 show that in addition to reading, the approximate 15 point (i.e. 23% of a standard deviation) advantage for public school students was found on the PISA 2009 math and science assessments as well. The remainder of the table shows that public and private school students were quite similar on a range of covariates available in the PISA dataset. The only differences appear to come in the form of parental education, SES and attitudes toward schooling, all of which tend to be slightly higher for public school students. However, this table (and the OECD report) contains students in both high-fee private schools which serve students from some of the country's wealthiest families, as well as government subsidized private schools which tend to serve lower-income students. Based on the varied private education sector in Indonesia, it is important to examine these same test scores and covariates across the different levels of private schooling.

[11] A list of interviewees and interview questions can be provided upon request.

Table 25: Descriptives by Private School Status: PISA 2009

| | Public | Private |
|---|---|---|
| Reading | 412.52 | 396.91 |
| | (63) | (66) |
| Math | 381.19 | 366.11 |
| | (69) | (70) |
| Science | 393.93 | 376.40 |
| | (66) | (66) |
| Age | 15.74 | 15.77 |
| Home Possessions | -1.85 | -1.88 |
| Wealth | -1.75 | -1.78 |
| Attitude (School) | 0.54 | 0.47 |
| SES Index | -1.47 | -1.60 |
| Home Ed Resources | -1.04 | -1.07 |
| Joy of Reading | 0.43 | 0.44 |
| Grade | 9.43 | 9.50 |
| Male | 0.47 | 0.50 |
| Preschool | 0.56 | 0.52 |
| Parental Education | 10.15 | 9.66 |
| *N* | 2555 | 2097 |

As seen in Table 26, there is a large divide between the reading, math and science scores in private government dependent schools and private independent schools. Test scores of private independent school students and public school students are very similar, whereas the test score difference between private dependent and public school students ranges from 40 to 48 points, which is 2.5 to 3 times greater than the overall difference between public and private school students. Additionally, while there was little difference in the covariates between public and private school students, there are some large differences between private dependent and public (as well as private independent) school students. For example, private dependent students tend to have lower scores on the home possessions, wealth and SES scales, with less favorable attitudes toward schooling, lower rates of preschool attendance and less parental education. Although students across all three school types are the same age (because of the PISA sampling frame), students in private dependent schools average a full year less schooling than their private

independent school counterparts (and more than half a year less than public school students). All of these variables are therefore included as controls in the following analyses, which were designed to examine the factors may explain the differences in achievement on PISA reading, math and science scores for public and private school students.

Table 26: Descriptives by Private School Status: PISA 2009

| | Public | Private Independent | Private Dependent |
|---|---|---|---|
| Reading | 412.52 | 413.14 | 365.13 |
| | (63) | (65) | (56) |
| Math | 381.19 | 381.72 | 335.56 |
| | (69) | (70) | (57) |
| Science | 393.93 | 390.16 | 349.45 |
| | (66) | (67) | (56) |
| Age | 15.74 | 15.80 | 15.73 |
| | (.27) | (.30) | (.29) |
| Home Possessions | -1.85 | -1.65 | -2.34 |
| | (1.09) | (1.12) | (1.02) |
| Wealth | -1.75 | -1.50 | -2.33 |
| | (1.21) | (1.21) | (1.20) |
| Attitude (School) | 0.54 | 0.53 | 0.38 |
| | (.85) | (.95) | (.91) |
| SES Index | -1.47 | -1.36 | -2.07 |
| | (1.07) | (1.14) | (.91) |
| Home Ed Resources | -1.04 | -0.92 | -1.37 |
| | (.97) | (1.14) | (.90) |
| Joy of Reading | 0.43 | 0.44 | 0.45 |
| | (.47) | (.56) | (.49) |
| Grade | 9.43 | 9.86 | 8.81 |
| | (.71) | (.71) | (.60) |
| Male | 0.47 | 0.48 | 0.53 |
| | (.48) | (.53) | (.51) |
| Preschool | 0.56 | 0.60 | 0.36 |
| | (.48) | (.52) | (.49) |
| Parental Education | 10.15 | 10.24 | 8.52 |
| | (3.30) | (3.61) | (3.32) |
| *N* | 2555 | 1422 | 675 |

Standard deviations in parentheses.

Beginning with standard OLS regressions, Table 27 displays the of overall private school enrolment on reading, math and science scores. Column 1 shows the naïve estimate for private

schooling on reading scores, while column two shows the same estimate after controlling for student level characteristics. Likewise, columns 3-4 and 5-6 provide the same models for math and science, respectively. Although there are slight differences across outcome exam, the conclusions are ultimately the same for each subject. Therefore, the remainder of this section will focus on reading scores.

First, it is interesting to note that while the majority of the covariates in the model are found to be significantly predictive of PISA reading scores, the coefficient on private schools decreases only slightly. In other words, the private school gap on reading scores cannot be explained by the variables in this model. There are two potential explanations for this finding: 1) there are still unobserved factors that impact both selection into private schools and PISA scores; 2) private schools provide lower quality educational opportunities and academic training to their students than public schools. The first of these explanations will be explored using a variety of matching models (with regard to producing balanced samples for analysis); the second will be addressed first via an examination of school level covariates in the PISA data and subsequently through the qualitative findings resulting from our school interviews (such that we will discuss some of the perceived shortcomings and/or quality concerns in the dependent private school sector).

Table 27: OLS Estimates for Private Schools by PISA Exam

| | Reading (1) | Reading (2) | Math (3) | Math (4) | Science (5) | Science (6) |
|---|---|---|---|---|---|---|
| Private | -15.62* | -14.48* | -15.08* | -14.23* | -17.54* | -17.40* |
| | (6.99) | (4.92) | (7.70) | (5.52) | (7.12) | (5.42) |
| Age | | -5.33 | | -13.12* | | -3.03 |
| | | (4.05) | | (5.52) | | (3.89) |
| Parental Education | | -0.21 | | -0.95 | | -0.53 |
| | | (0.88) | | (1.00) | | (0.92) |
| Home Possessions | | -10.03* | | -9.53* | | -2.63 |
| | | (2.63) | | (3.10) | | (3.22) |
| Wealth | | 10.58* | | 8.56* | | 5.13* |
| | | (2.42) | | (2.25) | | (2.42) |
| School Attitude | | 7.38* | | 4.88* | | 6.78* |
| | | (1.52) | | (1.58) | | (1.50) |
| SES Index | | 7.45 | | 13.56* | | 7.07 |
| | | (4.23) | | (4.54) | | (4.52) |
| Joy of Reading | | 11.83* | | 9.52* | | 11.66* |
| | | (2.55) | | (3.13) | | (2.93) |
| Male | | -25.66* | | 8.98* | | 1.63 |
| | | (2.70) | | (2.66) | | (3.24) |
| Grade | | 24.49* | | 25.47* | | 24.54* |
| | | (2.97) | | (3.33) | | (3.38) |
| Preschool | | 24.58* | | 28.38* | | 23.26* |
| | | (3.41) | | (3.87) | | (3.65) |
| $R^2$ | 0.014 | 0.303 | 0.012 | 0.240 | 0.016 | 0.216 |
| N = 4652 | | | | | | |

Standard errors in parentheses: * $p < 0.05$

In order to balance samples for a potential reduction in bias due to selection, three matching estimates are calculated: nearest neighbor (with five neighbors), mahalanobis metric and kernel matching. As can be seen in the post estimation results for bias reduction, there is balance of all covariates across all three matching approaches for the overall private school sample (see Appendix B). The results from these models are displayed in columns 3-5 in Table 28. While the results from the mahalanobis model show a slightly decreased impact of private

schooling on reading scores, there is no evidence of selection bias in the other two approaches. (As a matter of fact, the private school effect even increases slightly in the kernel matching model.) Ultimately, there is still an approximate 13-16 point disadvantage for students attending private schools, even after controlling for student level covariates (and attempting to control for self-selection). However, as noted in the descriptive statistics above, this effect may be largely driven by a particular subset of private schools. Therefore, these models are re-estimated for students in government-dependent private schools, as opposed to all private schools.

Table 28: Matching Estimates for Private Schools: PISA Reading

| | Naïve | OLS | N. Neighbor | Mahalanobis | Kernel |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Private | -15.62* | -14.48* | -14.49* | -12.94* | -16.36* |
| | (6.99) | (4.92) | (4.96) | (4.89) | (5.71) |
| Controls | | X | X | X | X |
| $R^2$ | 0.014 | 0.303 | 0.308 | 0.301 | 0.300 |
| N | 4652 | 4652 | 4538 | 3318 | 4648 |

Standard errors in parentheses: * $p < 0.05$

Column 1 of Table 29 (below) shows once again that the mean difference in reading scores between private dependent school students and public school students is nearly 50 points (or 3 times greater than the overall private school difference). In column 2 we see that after controlling for the same covariates used in all previous regressions, this private school disadvantage is decreased to 20 points. Similar to the overall private school models, we find that the mahalanobis matching algorithm provides the largest reduction in the coefficient on private-dependent schooling. This time, nearest neighbor matching also shows a nearly 2 point reduction in the impact of private dependent schools. However, it should be noted that the best balance across matching methods comes from the kernel model. While the nearest neighbor approach provided an unbalanced sample for two covariates, the mahalanobis metric had a lack of balance

across six variables (see Appendix B). This points to evidence that the matching models provide little reduction in bias over the OLS model. Overall, there is still a disadvantage for private dependent school students of about 15 to 19 points on the PISA reading exam. Confirming the hypothesis that the overall effect was driven by these government dependent schools, additional models were run for only private independent school students. No significant private school effect was found in any of these models.

Table 29: Matching Estimates for Government-Dependent Private Schools: PISA Reading

| | Naïve | OLS | N. Neighbor | Mahalanobis | Kernel |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Private | -47.39* | -19.96* | -18.18* | -14.82* | -19.28* |
| | (6.92) | (6.66) | (6.72) | (7.50) | (6.45) |
| Controls | | X | X | X | X |
| $R^2$ | 0.082 | 0.335 | 0.228 | 0.203 | 0.198 |
| N | 3230 | 3230 | 1969 | 1164 | 3151 |

Standard errors in parentheses: * $p < 0.05$

One potential explanation for these findings comes from an examination of school level covariates across schooling types. Table 30 shows that despite being significantly smaller institutions, private dependent schools have higher student-teacher ratios, greater teachers shortages and a smaller proportion of qualified and certified teachers than both public and private independent schools. Additionally, they have lower quality educational resources (which is scaled across PISA countries) and they are more likely to be found in villages and small towns, as opposed to large cities. The school location variable is categorical on a scale of 1-5 (where 1 equals village; 2 small town; 3 town; 4 city; 5 large city). Furthermore, by introducing these variables into our OLS model, we find that the private school effect disappears entirely. The most significant school-level predictors become school size and educational resources, while the percent female and proportion of certified teachers are both marginally significant. Although these findings provide some evidence of why private dependent school students score lower on

the PISA reading exam than their public school counterparts, information obtained from our interviews allows us to make more nuanced conjectures and suggests a rationale for why students continue to enroll despite this poor performance.

Table 30: School-Level Covariates by School Status: PISA 2009

| | Public | Private Independent | Private Dependent |
|---|---|---|---|
| Student-Teacher Ratio | 16.72 | 17.03 | 18.09 |
| Teacher Shortage[12] | 0.11 | 0.33 | 0.96 |
| School Size | 708.32 | 435.31 | 228.41 |
| Educational Resources[13] | -1.09 | -1.11 | -1.71 |
| Percent Female | 52.66 | 49.36 | 48.16 |
| Certified Teachers (%) | 54 | 46 | 29 |
| Qualified Teachers[14] (%) | 74 | 68 | 48 |
| School Location | 2.44 | 2.69 | 1.81 |
| *N* = 4913 | | | |

*Interview Findings*

Through our interviews with donor organizations, ministry officials, private school foundations and school personnel, we obtained useful information regarding the quality of educational inputs in junior secondary schools targeting low-income children (i.e. government dependent secondary schools). The issue that became apparent almost immediately was the limited access to funding for schools that serve the poorest students. Although the BOS subsidy does provide a consistent source of funding for public and government-dependent private schools, it often appears insufficient for maintaining a school. For example, while the majority of teachers in state schools are civil servants, private schools often resort to using the BOS funds for teacher salaries, leaving even less for operating expenses. Coupled with the fact that those

[12] Index on teacher shortage was derived from the principal's perception of a lack of qualified science, math, language and 'other' teachers that adversely impacts instruction at the school. Higher values indicate higher rates of teacher shortage.
[13] Scaled index computed on the basis of seven measures of resource inadequacies that could adversely impact instruction. Higher scores indicate higher levels of educational resources.
[14] Certification is obtained from a government authority, while 'qualified' refers to UNESCO's ISCED 5A qualification.

accepting BOS funding are required to eliminate all school fees for parents, further limits the amount of money available for rent, infrastructure and resources. As a result, we found that 20% of the schools we visited were continuing to charge school fees, despite their explicit ban. Not surprisingly, these fee-charging schools tended to serve slightly more advantaged families and had higher accreditation grades than non-fee charging schools. The 'free' schools that we visited served noticeably poorer populations, paid their teachers less, suffered from shortages of educational materials and had more infrastructure issues. This lack of funding in those private schools most heavily dependent on government funding also led to concerns regarding teacher preparedness.

The PISA results suggest that private dependent schools were less likely to have certified and qualified teachers than public schools. Accordingly, government dependent private schools often paid teachers extremely low salaries (as low as 50,000 Rp. per month, less than $6.00, in a school that we visited). Thus, while private schools have the advantage of autonomy in teacher hiring, limited budgets for teacher salaries make it difficult for private schools to fill their rosters with certified and/or trained teachers. Additionally, pre-service training for teachers in madrasas (i.e. the majority of schools we visited) was often in religious rather than academic subjects in Islamic colleges or universities. Therefore, while we found no shortage of teachers in the private schools that we visited, many principals noted that the content and pedagogical knowledge of teachers was inadequate for providing high quality educational opportunities to their students. Finally, there was severely limited access to professional development opportunities for teachers in private schools serving the poorest students. While some districts include teachers from public and private madrasahs in in-service training, this practice is not consistent across districts and professional development opportunities are often limited for private schools and their

teachers who cannot afford to pay for these services out of pocket. Among the schools that we visited, only those participating in donor funded programs (such as USAID's Decentralizing Basic Education (DBE)) had received any significant professional development. While teachers in some schools participated in district sponsored activities, most only participated in training offered by NGOs, where the costs were the responsibility of either the school or individual teachers.

Another important finding from our interviews and school site visits was that while student-teacher ratios were relatively low in private schools, class sizes were significantly larger than expected. This might seem paradoxical at first but it is the result of inefficient staffing in many of the poorer private schools. For example, while public secondary teachers are expected to teach only one subject, private schools do not often have enough qualified full-time teachers to cover all subjects. Therefore, private schools are actually more likely to hire a large number of part-time teachers, some of whom were found to be government teachers (teaching an entire load in public schools). By employing a large number of teachers relative to the per student BOS subsidy, private schools end up paying even lower teacher salaries—many of whom work multiple shifts or other jobs, including working in other schools.

Despite these issues with funding, teacher quality, staffing, infrastructure and materials, private schools were still found to be in high demand—some of the schools we visited were even oversubscribed. The vast majority of the junior secondary private schools that we visited were founded to provide families in their community with greater access to education, either for students whose primary-level exit examination scores were too low to get them into public schools or because there had been no lower secondary options in the community prior to establishment of the school. More than 50% of principals in the schools we visited reported that

there was a public school within 1 kilometer of their school. Therefore, perhaps more important than the overall issue of access is the fact that many private madrasahs, particularly in rural areas, were founded by local religious leaders or groups that have connections to local mosques. While a 1989 education law required that all schools, including private madrasahs and other religious schools, follow the national curriculum, many parents choose to enroll their children in these private schools because of the additional focus on religious education and training that they will provide. Additionally, while some principals noted that parents do use information about exit exam passage rates when choosing the right school for their children, the reputation of the school's yayasan was also an important factor in this decision. In other words, many parents choose to send their children to private madrasahs for reasons other than academic performance.

## Discussion

Private schooling accounts for approximately 40% of the secondary school enrolments in Indonesia. However, recent evidence from the OECD suggests that students in public schools significantly outperform those in private schools (at least with regard to PISA reading scores). Therefore, this study was designed to answer two main questions: 1) What factors can be used to explain this apparent private school disadvantage? 2) Why are private schools still in such high demand despite concerns about school quality?

As the OECD report used simple mean differences for their claim of poor private school performance, the first step in this study was to determine the impact of private school attendance on PISA reading scores, controlling for relevant student-level control variables in an OLS regression. Next, matching models were run in order to mitigate against concerns about bias due to self-selection into public and private schools. Ultimately, all models still showed a public

school advantage of about 15 points on reading scores. However, this finding was driven by almost entirely by the poor performance of students in government dependent private schools. These schools (in which at least 50% of funding comes from government sources) tend to enroll the poorest secondary school students, thus providing educational opportunities to those most in need. These analyses were somewhat limited by the fact that the dataset contained no baseline achievement or pre-test measures (which are generally the most predictive of future performance and could help to provide more balanced groups for analyses). While there was a meta-cognition variable in the data (and the inclusion of this variable did cause the private school effect to become non-significant across models), this variable is endogenous in that it measures not just innate ability but a particular approach to answering questions that is likely to be taught to students in higher-performing schools (or those with higher-quality pedagogical approaches). Therefore, these analyses were reliant on the demographic and socio economic factors available in PISA. Based on these data, our models show that it is more than just students' socio economic status that is causing the gap in achievement between private government dependent and public schools. For example, an examination of school level variables in the PISA data showed that much of the private school effect was explained by school size (or something correlated with it, like the overall resources), the quality of educational resources, percent female and the proportion of certified teachers. While the impact of higher quality of educational resources and a larger proportion of certified teachers on educational attainment seems intuitive, the other two factors seem less straightforward. It is most likely that school size and the percent of female students do not directly impact learning but are simply highly correlated with the poorest performing schools. As learned through our interviews, these are often small schools (with few resources), located in rural areas where females are still likely to enroll in lower numbers.

Information obtained from our interviews also helped to further explain why government dependent junior secondary schools appear to be providing lower quality educational opportunities to their students.

Our interviews with principals of schools that charged no fees (and therefore received nearly all of their funding from government sources) brought to light the issue of limited access to funding for those schools serving the poorest students. While the BOS subsidy provides government dependent schools with a steady stream of income it is insufficient to cover all teacher salaries and operational costs but comes with a high price tag (i.e. the elimination of school fees). Since the majority of schools we interviewed claimed to receive no regular assistance from their yayasan (some even noted that their yayasan charged management fees and/or rent) it is not surprising that these schools are struggling to meet the educational standards of fully-funded public schools. These funding shortages impact schools in a variety of ways. First and foremost is the poor infrastructure and shortage of educational materials in many private madrasahs. Additionally, inconsistent (and insufficient) income has had a major effect on the ability of schools to hire high-quality teachers. Furthermore, teachers in private madrasahs are often unable to participate in professional development opportunities due to their inability to pay for the services (as opposed to public school teachers who attend for free). Although there is a new initiative to certify all teachers in public and private schools by 2015, there are significant concerns about the educational backgrounds of teachers in government dependent schools as well as concerns about the ability of the government to fund such an initiative. Whether this initiative is successful or not, the issues of school funding and teacher quality must be addressed, however, if private schools are expected to provide equal educational opportunities to those offered in public schools.

The question remains, however, as to why private schools continue to enroll so many students when they provide lower quality education. Part of the answer may be obvious: private schools have increased access to basic education by providing opportunities for students who were unable to enroll in public schools. While this excess demand explanation is useful it still only tells part of the story. Although private madrasahs must follow the national curriculum, they do have flexibility in their ability to provide additional learning opportunities for students. One of the most commonly cited reasons for enrolling children in these schools, therefore, was the demand for religious training and education. For example, while parents noted exam scores are part of their selection criteria, the reputation of a private madrasah's yayasan was also found to be a factor. Therefore, the idea of what makes a school 'good' in the eyes of some Indonesian parents may be very different than our traditional view of academic performance above all else.

Based on these findings, there are a few main conclusions to be drawn. First of all, there is an important distinction to be made in Indonesia between private dependent and private independent schools. While the former tend to serve some of the country's poorest students and are outperformed on the PISA exams by public schools, the latter are more likely to provide educational opportunities to some of the country's elite and provide educational opportunities on par with the public sector. Accordingly, researchers must always take caution to be clear about what is meant by a 'private' school—and not just in Indonesia. The sector looks different in all settings and therefore must be clearly understood and defined in any examination of its impact and approach. Second, one of the largest factors impacting the public-private divide was the grade of students sitting for the PISA exam. Despite the fact that all students were 15 years of age at the time of the test, those in private independent schools had received a full additional year of schooling as compared with students in private dependent schools. While some researchers

have voiced concerns about the ability to compare students across countries with PISA (e.g. is a 15 year old in Japan really the same as a 15 year old in Azerbaijan?), this study takes that concern one step further to ask, "Are 15 year olds the same within countries, particularly across schooling sectors?"

Third, government dependent private schools were found to provide increased educational access but relatively low PISA scores. One of the most important policy questions that arises from this finding is the importance of access in the short term. While increased funding and professional development opportunities for teachers in private madrasahs are necessary for long-term academic success (using a metric such as exam scores), the fact that these schools are providing educational access to those student without other opportunities should be considered an achievement in and of itself—not to mention the fact that there is still likely an upward bias in the achievement gap due to a selection problem. Lastly, a focus on religious education and training in MORA private schools raises questions about both performance and demand. Although these schools are required to follow the national curriculum and are therefore supposed to provide additional religious education without sacrificing the academic content taught in public schools, this is not always the case. By hiring teachers who have had more religious than educational or pedagogical training, private dependent schools are often limited in their ability to offer high-quality academic content. Additionally, many parents appear to be choosing these schools (at least in part) due to their focus on religious training and education. This brings up a question about the appropriateness of using PISA scores as the sole assessment of school quality. While it is clear that public school students are outperforming their private dependent school counterparts on PISA's reading, math and science exams, perhaps studies of private school quality in Indonesia should also focus on parental satisfaction with

moral/religious training as well as religious job placement rates, instead of relying solely on academic exams.

Whatever the metric, however, one thing is clear: many private schools in Indonesia are underfunded with a high proportion of uncertified, underpaid teachers who have little access to training and professional development opportunities. If there are to be any expectations for these private schools to provide educational attainment on par with public schools, these issues must be addressed.

# CHAPTER V

# CONCLUSIONS

This dissertation is comprised of three distinct but interrelated studies examining the provision and quality of non-government schooling (particularly for low-income children) across countries. The ordering of these three essays was intentional. The first paper was used to provide a broad overview of the changing landscape of non-government schools across countries, at the most general level. In order to provide a more nuanced examination of the sector, papers two and three were designed to assess the impact of private schools for low-income children on academic achievement. Beginning with Brazil, the second paper provides an impact study for a country that is in many way representative of a large number of rapidly growing developing countries (both in terms of student enrolments and economic development). The third paper uses data from Indonesia in order to provide an examination of the private schooling sector in a country with a more unique structure of funding and provision. This was done in order to show the importance of context in these types of studies and to provide credence to the argument that there is no 'silver bullet' solution to provide high-quality educational services to low-income children across countries (whether public or private). In this final chapter, I review the key findings and implications for each of these three studies. I then discuss the overall contributions of this work to theory and practice before providing some directions for future research.

## Findings and Implications

*Private Provision of Education Across Countries*

Contradicting findings from prior work on educational privatization, I find that public spending on education is no longer predictive of private enrolment rates. This finding holds for both primary and secondary schools across longitudinal and cross-sectional models. Instead, this study finds that population growth, population density and linguistic heterogeneity are now the most consistently significant predictors of differences in private enrolment rates across (and within) countries. This means that private enrolment rates in primary and secondary schools are impacted by factors of excess demand (i.e. population growth and population density) as well as differentiated demand (i.e. linguistic heterogeneity). More specifically, increases in population growth and population density are associated with increases in educational privatization across countries because of the oversupply of students for overburdened public schools. Linguistic diversity, on the other hand, impacts privatization based on the need for educational services in diverse languages in countries with large numbers of speakers of multiple languages. This can also be explained as the inability of the public education sector to provide services in a sufficient number of languages to satisfy the demand of its diverse student base.

Although public spending on education was not found to be predictive of private enrolments across all countries in the data set, perhaps the most important finding is that spending did have an impact in countries with low levels of social and economic development. Using mean HDI as the cut-off for economic development, per pupil expenditures as a percent of GDP per capita were founds to have a significant negative impact on private enrolments. This finding is critical for policy makers and aid organizations interested in increasing public primary enrolments in countries facing some of the most difficult economic hardships. While increased

spending alone will not have a significant impact on public enrolment rates in the majority of countries, this is not the case for the most economically disadvantaged countries. In other words, organizations seeking to increase public primary enrolments through spending should target their aid on countries with the lowest levels of economic development. Ultimately, this study fills an important gap in the literature and provides policy makers and aid organizations with a more complete understanding of the role of spending (as well as many other economic and political factors) on educational privatization across the globe, by bringing to light new findings that contradict conventional wisdom about spending and public versus private schooling.

*The Impact of Private Schools on Educational Attainment in Brazil*

Based on data from the state of Sao Paulo, this study finds that private school students (regardless of tuition level) perform better than their public school counterparts on both the objective and writing sections of the ENEM high school exit exam. This private school effect remains positive and significant after accounting for sample selection bias via a variety of propensity score matching models. Additionally, sensitivity analyses show that the results for the overall private school effect are robust to the possibility of potential unobserved confounding variables (such as motivation). This led me to conclude that both low-fee and high-fee private secondary schools in Brazil provide significant achievement gains as compared with public schools. With these data it was not possible to examine the school-specific factors that cause private schools to be more effective, although there is evidence that peer effects are likely to play a role (seeing as students were transferring into private schools with peers who were, on average, wealthier than themselves). This did not seem to be the case, however, for those transferring to schools with tuition in the bottom half of the cost distribution. Therefore, effects of low-tuition private schools are assumed to result more from teacher and structural impacts, as opposed to

peer effects. When moderation effects were tested, it was found that the much of the private school effect was driven by the 2007 exam-taking cohort. This cohort effect appears to be the result of two factors: 1) enrolling in a private school for two years (as opposed to just one); and 2) the adaptability of private schools to prepare their students for an exam that started to become more important for access to college in 2007 than it was in 2006. Additionally, it should be noted that the private school effect for writing scores was smaller than for objective scores. This is likely the result of the fact is that it is easier to improve a student's skills and/or preparation for a multiple choice exam in a year or two than it is to improve their writing skills in such a short timespan.

In the end, this paper provides two important contributions to the literature. First, the findings support the hypothesis that despite increases in government support for public education, private educational opportunities are still chosen (at least in part) by an increasing number of students/families because of their promise to provide gains in academic achievement. Secondly, this study provides some of the first evidence of achievement gains for low-fee private schools in a developing country, via rigorous quantitative analyses that account for bias due to self-selection. This is essential information for policy makers, researchers and aid organizations considering the role and impact of low-fee private schools in Brazil (and across developing countries, in general), as they provide credence to recent hypotheses that low-cost private schools may indeed serve as useful complements to over-burdened public schooling sectors.

*Private Secondary Schools in Indonesia*

Private secondary school students in Indonesia underperform on the PISA reading, math and science assessments as compared with their public school counterparts. These findings are robust to a variety of matching algorithms. Furthermore, the negative private school effect is

driven by government dependent private schools (i.e. schools that receive at least 50% of their funding from public sources). An examination of school level variables in the PISA data showed that much of this private school effect was explained by school size, the quality of educational resources, percent female and the proportion of certified teachers. While the impact of higher quality of educational resources and a larger proportion of certified teachers on educational attainment seems intuitive, the other two factors seem less straightforward. It is most likely that school size and the percent of female students do not directly impact learning but are simply highly correlated with the poorest performing schools. As learned through our interviews, these are often small schools (with few resources), located in rural areas where females are still likely to enroll in lower numbers. Information obtained from our interviews also helped to further explain why government dependent junior secondary schools appear to be providing lower quality educational opportunities to their students.

For example, we found that one of the major stumbling blocks of government dependent schools is their reliance on the BOS subsidy and subsequent issues with funding shortages. This is due to the fact that the BOS is insufficient to cover all operating costs but acceptance of the subsidy requires schools to abolish all fees. Therefore, there is often only a small pot of money that is expected to cover materials, infrastructure upgrades and perhaps most importantly, teacher salaries. In addition to concerns about funding shortages leading to the inability to hire certified and qualified teachers, those who are hired by private madrasahs continue to fall behind because they are often unable to participate in professional development opportunities due to their inability to pay for the services (as opposed to public school teachers who attend for free). While there is a new initiative to certify all teachers in public and private schools by 2015, there are

significant concerns about the educational backgrounds of teachers in government dependent schools as well as concerns about the ability of the government to fund such an initiative.

Lastly, this study found that despite poor performance on PISA exams, government dependent private junior secondary schools are still in such high demand in Indonesia for two main reasons: 1) their ability to increase access to basic education by providing opportunities to students who would be unable to enroll in public schools; 2) the demand for religious training and education. These findings point to important distinctions that must be made among types of private schooling (even within a country's borders). For example, while private dependent school students tend to perform significantly worse than their public school counterparts, private independent school students score as well on the PISA exam as public school students. Therefore, simply claiming that private schools underperform when compared with public schools in Indonesia would be extremely misleading. Additionally, these findings raise questions about the importance of access versus performance. If schools are providing access to educational opportunities that are otherwise unavailable, should this be seen as a measure of success…even if these schools are not performing at the highest standards? Finally, this study brings up questions about the appropriateness of using PISA scores as a measure of school quality. The first part of this issue comes from differences in the fifteen year old population by schooling sector (e.g. those in private dependent schools tend to be a full year behind those in private independent schools); the second is the fact that private madrasahs in Indonesia focus much of their efforts on religious training and education. Therefore, it may be more appropriate to measure quality by parental approval ratings of religious training as well as religious job placement rates, as opposed to measures of reading, math and science performance. This is not to

say that these subjects are unimportant but simply that using them as the sole outcomes may neglect to examine an important aspect of what private madrasahs are seeking to accomplish.

*Contributions and Future Research*

This dissertation is comprised of three high-quality studies, each of which has potential to impact policymakers from governments and aid organizations by addressing questions about why private schools, particularly those for low-income students, expand across the globe in spite of major increases in funding and access in public schools. With a clearer understanding of the factors that impact educational privatization across countries, aid organizations interested in increasing public enrolments can more effectively direct their efforts based on these findings. For example, contrary to prior research, this study finds increasing spending on education is unlikely to impact privatization across all countries. However, focusing educational spending efforts on countries with the lowest scores on the human development index may be an effective and efficient way to decrease private enrolments at the primary level.

Additionally, this dissertation provides some much needed insight into the impact of private schools for the poor on educational attainment. This fills an important gap in the literature on high-quality studies of low-cost private schools. The structure of the Brazilian education system makes it likely that the lessons learned from the examination of schools in Sao Paulo will be applicable to other systems as well. Therefore, this study provides evidence of the fact that the introduction of low-tuition private schools can serve as a useful complement to an overburdened public school sector. Most important of all, this claim is based not on ideology but on the impact of low-tuition private schools on academic performance. Indonesia, on the other hand, tells a different story. With a unique funding and management structure for private schools, the specific results of Indonesia are unlikely to be generalizable but the more general

findings have implications for all researchers on this topic. Most directly, this work points to the importance of clearly understanding and explaining what is meant by 'private schooling' and strengthens the argument that PISA scores (while illustrative) may be insufficient measures of educational quality in diverse settings.

These three studies also pave the way for two key areas of future research. First, the quality of educational opportunities provided by low-fee private schools should be assessed in other countries. Although the Brazilian findings are likely to be relevant in other settings, not two countries are identical. As such a rapidly growing sector, low-cost private schools are important in many countries throughout the world and a thorough examination of these effectiveness is required. Second, I plan to conduct follow-up work on the findings in Brazil. Specifically, it is essential to understand how and why private schools are positively impacting educational attainment among their students. Therefore, I plan to examine how public and private schools in Sao Paulo differ in school structure, teacher practices and student engagement in order to learn why private schools are more effective—and to assess what practices can be replicated in the public sector. After all, the ultimate goal of this line of research is not only to understand the private schooling sector but also to learn from both public and private schools in order to improve education for all students.

# REFERENCES


Aga Khan Foundation. (2007). Non-state providers and public-private-community partnerships in education. *Paper commissioned for the EFA Global Monitoring Report 2008*.

Ahmed, M. and Govinda, R. (2010). Universal primary education in South Asia: A right which remains elusive. *UNESCO Prospects Vol*. 40, pp. 321–335.

Alderman, H., Orazem, P. F., and Paterno, E. M. (2001). School quality, school cost, and the public/private school choices of low-income households in Pakistan. *Journal of Human Resources*, pages 304–326.

Ali, M., Kos, J., Lietz, P., Nugroho, D., Furqon, Zainul, A., & Emilia, E. (2010). Quality of education in Madrasah: Main study. Final Report. Ministry of Education: Indonesia.

Allcott, H. V. and Ortega, D. (2009). The performance of decentralized school systems: Evidence from Fe y Alegria in Venezuela. World Bank Policy Research Working Paper 4879.

Allen, F., & Gale, D. (1999). *Corporate governance and competition*. University of Pennsylvania.

Andersen, B. (1992). Factors affecting European privatisation and deregulation policies in local public transport: the evidence from Scandinavia. *Transportation Research Part A: Policy and Practice*, *26*(2), 179-191.

Andrabi, T., Das, J., and Khwaja, A. I. (2008). A dime a day: The possibilities and limits of private schooling in Pakistan. *Comparative Education Review*, 52(3):329–355.

Angrist, J., Bettinger, E., Bloom, E., King, E., and Kremer, M. (2002). Vouchers for private schooling in Colombia: Evidence from a randomized natural experiment. *The American Economic Review*, 92(5):1535–1558.

Arenas, A. (2004). Privatization and vouchers in Colombia and Chile. *International Review of Education/Internationale Zeitschrift für Erziehungswissenschaft/Revue internationale l'éducation*, 50(3):379–395.

Asadullah, M. N. (2009). Returns to private and public education in Bangladesh and Pakistan: A comparative analysis. *Journal of Asian Economics*, 20(1):77–86.

Backiny-Yetna, P. and Wodon, Q. (2009). Comparing the performance of faith-based and government schools in the Democratic Republic of Congo. In Barrera-Osorio, F., Patrinos, H. A., and Wodon, Q. (2009). *Emerging Evidence on Vouchers and Faith-Based Providers in Education: Case Studies from Africa, Latin America, and Asia*. World Bank, Washington, DC.

Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American political science review*, 634-647.

Bedi, A. S. and Garg, A. (2000). The effectiveness of private versus public schools: The case of Indonesia. *Journal of Development Economics*, 61(2):463–494.

Bel, G., & Fageda, X. (2009). Factors explaining local privatization: a meta-regression analysis. *Public Choice*, *139*(1-2), 105-119.

Bettinger, E. (2005). Lessons from private-school vouchers in Colombia. *A Federal Reserve Bank of Cleveland Research Conference,* 5-9.

Bishop, M. R., & Kay, J. A. (1989). Privatization in the United Kingdom: lessons from experience. *World Development*, *17*(5), 643-657.

Boehmer, E., Nash, R. C., & Netter, J. M. (2005). Bank privatization in developing and developed countries: cross-sectional evidence on the impact of economic and political factors. *Journal of Banking & Finance*, *29*(8), 1981-2013.

Bourguignon, F., Fournier, M., & Gurgand, M. (2007). Selection bias corrections based on the multinomial logit model: Monte Carlo comparisons. *Journal of Economic Surveys*, *21*(1), 174–205.

Bortolotti, B., & Pinotti, P. (2008). Delayed privatization. *Public Choice*, *136*(3-4), 331-351.

Brada, J. C. (1996). Privatization is Transition--Or is it?. *The Journal of Economic Perspectives*, *10*(2), 67-86.

Bray, M. (1997). "Community financing of education: Rationales, mechanisms, and policy implications in less developed countries." in Colclough, C. (ed.) *Marketizing education and health in developing countries: Miracle or mirage?*. Oxford University Press, USA.

Bray, M. (2002). *The costs and financing of education: Trends and policy implications*. Asian Development Bank.

Brock, C., & Schwartzman, S. (2004). *The Challenges of education in Brazil*. Symposium Books, United Kingdom.

Caddell, M. (2007). "Private Schools and Politcal Conflict in Nepal," pp. 187-207 in Srivastava, P. and Walford, G. (Eds.) *Private schooling in less economically developed countries: Asian and African perspectives*. Oxford: Symposium Books.

Calónico, S. and Nopo, H. (2007). Returns to private education in Peru. *IZA Discussion Papers*.

Cannon, R. and Arlianti, R. (2009). Transition and participation in junior secondary education. USAID Research Report; DBE 3. Jakarta: Indonesia.

Christensen, T., & Lægreid, P. (2005). Trust in government: The relative importance of service satisfaction, political factors, and demography. *Public Performance & Management Review*, *28*(4), 487-511.

Colclough, C. (1997). *Marketizing education and health in developing countries: Miracle or mirage?* Oxford University Press, USA.

Cowan, L. G. (1990). *Privatization in the developing world*. Greenwood Press New York.

Cox, D. and Jimenez, E. (1990). The relative effectiveness of private and public schools: Evidence from two developing countries. *Journal of Development Economics*, 34(1-2):99–121.

Das, J., Pandey, P., and Zajonc, T. (2006). Learning levels and gaps in Pakistan. Policy Research Working Paper 4067. World Bank. Washington, DC.

DBE. (2010). Education Sector Working Group. Powerpoint Presentation: January 27, 2010. Jakarta: Indonesia.

Dinavo, J. V. (1995). *Privatization in developing countries: its impact on economic development and democracy*. Praeger Publishers.

Elacqua, G., Contreras, D., and Salazar, F. (2009). The effectiveness of franchises and independent private schools in Chile's national voucher program. In Barrera-Osorio, F., Patrinos, H. A., and Wodon, Q. (2009). *Emerging Evidence on Vouchers and Faith-Based Providers in Education: Case Studies from Africa, Latin America, and Asia*. World Bank, Washington, DC.

Fahmi, M. (2009a). The effectiveness of private versus public schools in Indonesia: Comment. *Working Paper 200913. Center for Economics and Development Studies. Bandung, Indonesia.*

Fahmi, M. (2009b). School choice and earnings: A case of indonesia. *Working Paper 200914. Center for Economics and Development Studies. Bandung, Indonesia.*

Faulhaber, I. (2008). Affordable private school initiative research in Latin America. Gray Matters Capital Foundation Document.

Ferrer, J. G. (2006). *Educational assessment systems in Latin America: Current practice and future challenges*. Preal.

Gauri, V. and Vawda, A. (2004). Vouchers for basic education in developing economies. *World Bank Research Observer*, 19(2):259–280.

Guo, S., Barth, R. P., & Gibbons, C. (2006). Propensity score matching strategies for evaluating substance abuse services for child welfare clients. *Children and Youth Services Review*, *28*(4), 357–383.

Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, *47*(1), 153–162.

Heckman, J., Ichimura, H., Smith, J., & Todd, P. (1998). Characterizing Selection Bias Using Experimental Data. *Econometrica*, 1017–1098.

Heyneman, S. P., & Loxley, W. A. (1983). The effect of primary-school quality on academic achievement across twenty-nine high-and low-income countries. *American Journal of sociology*, 1162-1194.

Heyneman, S. P., & Stern, J. (2013). Low cost private schools for the poor: What public policy is appropriate?. *International Journal of Educational Development*.

Holland, P. W. (1986). Statistics and causal inference. *Journal of the American statistical Association*, 945–960.

Hsieh, C. T. and Urquiola, M. (2006). The effects of generalized school choice on achievement and stratification: Evidence from Chile's voucher program. *Journal of Public Economics*, 90(8-9):1477–1503.

Imbens, G. W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of Econometrics*, *142*(2), 615–635.

James, E. (1989). *The Nonprofit sector in international perspective: studies in comparative culture and policy*. Oxford University Press, USA.

James, E. (1993). Why do different countries choose a different public-private mix of educational services? *Journal of Human resources*, 571–592.

James, E., King, E. M., and Suryadi, A. (1996). Finance, management, and costs of public and private schools in indonesia. *Economics of Education Review*, 15(4):387–398.

Kay, J. A., & Thompson, D. J. (1986). Privatisation: a policy in search of a rationale. *The economic journal*, *96*(381), 18-32.

Kayizzi-Mugerwa, K. S. (2002). *Privatization in Sub-Saharan Africa: On Factors Affecting Implementation*. World Institute of Development Economic Research Discussion Paper No. 2002/12. Helsinki.

King, E.M. (1997). "Who Really Pays for Education? The Roles of Government and Families in Indonesia' in Colclough, C. (ed.) *Marketizing education and health in developing countries: Miracle or mirage?*. Oxford University Press, USA. pp. 165-182.

Kitaev, I. (2004). EFA and private education: Some regional experiences and findings. *Economic Affairs*, *24*(4), 27–30.

Lassibille, G. and Tan, J. P. (2003). Student learning in public and private primary schools in Madagascar. *Economic Development and Cultural Change*, 51(3):699–717.

Lewin, K. (2007). "The Limits to Growth of Non-government Private Schooling in sub-Saharan Africa," pp. 41 – 67 in Srivastava, P. and Walford, G. (Eds.) *Private Schooling in Less Economically Developed Countries: Asian and African Perspectives*. Oxford: Symposium Books.

Little, R. J. A., & Rubin, D. B. (1987). *Statistical analysis with missing data* (Vol. 4). Wiley New York.

Marshall, M., & Cole, B. (2011). State fragility index. *Center for Systemic Peace*.

McEwan, P. J. and Carnoy, M. (200our0). The effectiveness and efficiency of private schools in Chile's voucher system. *Educational Evaluation and Policy Analysis*, 22(3):213.

Megginson, W. L., & Netter, J. M. (2001). From state to market: A survey of empirical studies on privatization. *Journal of economic literature*, *39*(2), 321-389.

Menezes-Filho, N., & Tavares, P. A. (2011). Noise in Education Pay for Performance Programs: Evidence using Independent Measures of School Outcomes. Retrieved from http://mirage.cedeplar.ufmg.br/noticias/2011/Seminario_Dia_17%20.pdf

Musani, Y. (2008). Study of the Kenya Independent Schools Association (KISA). Gray Matters Capital Foundation Working Paper.

Newhouse, D. and Beegle, K. (2006). The effect of school type on academic achievement: Evidence from Indonesia. *Journal of Human Resources*, 41(3):529.

OECD. (2012). Public and Private Schools: How Management and Funding Relate to their Socio-economic Profile. OECD Publishing.

Pfeffermann, D., & Landsman, V. (2011). Are private schools better than public schools? Appraisal for Ireland by methods for observational studies. *The annals of applied statistics*, *5*(3), 1726.

Phillipson, B., Shukla, S., Joshi, P., Umar, A., Smith, I., and Kisira, S. (2008). *Low-cost Private Education: Impacts on Achieving Universal Primary Education*. Commonwealth Secretarial.

Probe Team, The (1999) *Public Report on Basic Education in India*, Oxford and New Delhi: Oxford University Press.

Psacharopoulos, G., Arieira, C. R., and Mattson, R. (1997). Private education in a poor country: The case of urban Bolivia. *Economics of Education Review*, 16(4):395–406.

Rose, P. (2005). Privatisation and decentralisation of schooling in Malawi: Default or design? *Compare*, 35(2):153–165.

Rose, P. and Adelabu, M. (2007). Private sector contributions to education for all in Nigeria. In Srivastava, P. and Walford, G. (Eds). Private schooling in less economically developed countries: Asian and African perspectives. *Symposium Books*.

Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician*, 33–38.

Roth, G. (1987). *The private provision of public services in developing countries*. Oxford University Press New York.

RTI. (2009). Study of the legal framework for the Indonesian basic education sector. Special Report for DBE 1. September 2009.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology; Journal of Educational Psychology*, *66*(5), 688.

Save the Children (2002). Private sector involvement in education: A perspective from Nepal and Pakistan. Submission to "The Committee on Rights of the Children Theme Day 2002".

Smith, J. A., & Todd, P. E. (2001). Reconciling conflicting evidence on the performance of propensity-score matching methods. *The American Economic Review*, *91*(2), 112–118.

Somers, M. A., McEwan, P. J., and Willms, J. D. (2004). How effective are private schools in Latin America? *Comparative Education Review*, 48(1):48–69.

Srivastava, P. (Ed.) Low-fee Private Schooling: aggravating equity or mitigating disadvantage? (Symposium Books, Oxford, 2013)

Srivastava, P. and Walford, G. (2007). Private schooling in less economically developed countries: Asian and African perspectives. *Symposium Books*.

Strauss, J., Beegle, K., Dwiyanto, A., Herawati, Y., Pattinasarany, D., Satriawan, E., Sikoki, B., Sukamdi, and Witoelar, F. (2004). *Indonesian Living Standards Before and After the Financial Crisis: Evidence from Indonesia Family Life Survey*. Rand Corporation, USA and Institute of Southeast Asian Studies.

Tan, J. P. (1985). Private enrollments and expenditure on education: some macro trends. *International Review of Education*, *31*(1), 103–117.

Tooley, J. (2004). Private education and 'Education for All'. *Economic Affairs*, *24*(4), 4–7.

Tooley, J. (2009). *The Beautiful Tree: A Personal Journey Into How the World's Poorest People Are Educating Themselves*. Cato Institute.

Tooley, J. and Dixon, P. (2005a). Is private education good for the poor? *Cato Institute. Washington DC*.

Tooley, J. and Dixon, P. (2005b). Private education is good for the poor: A study of private schools serving the poor in low-income countries. *Washington DC: Cato Institute*.

UNESCO (2010). *Reaching the marginalized.* EFA Global Monitoring Report. UNESCO: Paris.

UNESCO (2012). UNESCO Institute for Statistics. Data downloaded from: http://www.uis.unesco.org/Pages/default.aspx

United Nations (1948). Universal Declaration of Human Rights.

Uribe, C., Murnane, R. J., Willett, J. B., and Somers, M. A. (2006). Expanding school enrollment by subsidizing private schools: Lessons from Bogotá. *Comparative Education Review*, 50(2):241–277.

Vandenberghe, V., & Robin, S. (2004). Evaluating the effectiveness of private education across countries: a comparison of methods. *Labour economics*, *11*(4), 487–506.

Verspoor, A. (2008). The power of Public-Private partnership: Coming together for secondary education in Africa. *Working Document Draft, Association for the Development of Education in Africa, Paris*.

Vickers, J., & Yarrow, G. (1991). Economic perspectives on privatization. *The Journal of Economic Perspectives*, *5*(2), 111-132.

Villa, L. and Duarte, J. (2005). "Concessionary public schools in Bogotá: An innovation in school management in Colombia." pp. 95-130. in Wolff, L., Navarro, J. C., and Gonzalez, P. (Eds.). *Private education and public policy in Latin America*. PREAL, Washington, DC.

Watkins, K. (2004). Private education and 'Education For All" - Or how not to construct an evidence-based argument: A reply to Tooley. *Economic Affairs*, 24(4):8–11.

WEF (World Economic Forum). (2000). *The Dakar Framework for Action – Education for All: Meeting our Collective Commitments.* Paris: UNESCO.

Weston, S. (2008). A Study Of Junior Secondary Education In Indonesia. A Review of the Implementation of Nine Years Universal Basic Education. Report to USAID, Decentralized Basic Education – 3. Jakarta.

Wooldridge, Jeffrey M. *Econometric analysis of cross section and panel data: 2nd Edition*. The MIT press, 2010.

World Bank (1998). *Indonesia: Education in Indonesia, from Crisis to Recovery, Report No. 18651- IND,*. East Asia and Pacific Regional Office, Country Department III, Washington, D.C.

World Bank (2010). *Reform of Secondary Education Project II (Jamaica)*. Implementation Completion and Results Report. World Bank: Caribbean Country Management Unit.

World Bank (2012). Education Statistics. Retrieved from http://ddp-ext.worldbank.org/ext/DDPQQ/report.do?method=showReport

Yarrow, G., King, M., Mairesse, J., & Melitz, J. (1986). Privatization in theory and practice. *Economic policy*, 324-377.

# APPENDIX A

## BALANCE CHECKS FOR MATCHING MODELS: BRAZIL

Table 31: Private Schools (All) - Objective - Mahalanobis

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75411 | .76555 | -2.5 | -0.71 | 0.479 |
| black | .02573 | .0243 | 0.7 | 0.24 | 0.809 |
| brown | .16869 | .17155 | -0.7 | -0.20 | 0.841 |
| asian | .0436 | .03145 | 7.0 | 1.69 | 0.091 |
| indig | .00643 | .00572 | 0.8 | 0.24 | 0.808 |
| portuguese | 69.538 | 69.35 | 1.5 | 0.42 | 0.675 |
| math | 43.428 | 43.665 | -2.1 | -0.48 | 0.628 |
| mother_ed | 2.1008 | 2.1044 | -0.5 | -0.12 | 0.902 |
| father_ed | 2.1237 | 2.1272 | -0.5 | -0.12 | 0.903 |
| has1tv | .22945 | .21444 | 3.3 | 0.96 | 0.340 |
| has2tv | .75482 | .77127 | -3.6 | -1.02 | 0.307 |
| has1dvd | .64403 | .65547 | -2.4 | -0.63 | 0.526 |
| has2dvd | .25447 | .23874 | 4.0 | 0.96 | 0.335 |
| has1pc | .66619 | .6669 | -0.1 | -0.04 | 0.968 |
| has2pc | .12866 | .13438 | -2.0 | -0.45 | 0.655 |
| has1wash | .81773 | .79056 | 6.8 | 1.81 | 0.070 |
| has2wash | .10865 | .13438 | -8.7 | -2.08 | 0.037 |
| has1cel | .27734 | .29092 | -2.9 | -0.80 | 0.426 |
| has2cel | .65118 | .6376 | 2.8 | 0.75 | 0.453 |
| has1car | .56326 | .56326 | 0.0 | -0.00 | 1.000 |
| has2car | .28878 | .29736 | -2.2 | -0.50 | 0.618 |
| has1bath | .35954 | .37527 | -3.2 | -0.86 | 0.388 |
| has2bath | .63617 | .6183 | 3.7 | 0.98 | 0.329 |
| piped | .98642 | .98999 | -2.6 | -0.88 | 0.381 |
| electric | .99285 | .995 | -2.2 | -0.73 | 0.466 |
| magpaper | .58113 | .56469 | 3.3 | 0.88 | 0.380 |
| diction | .97641 | .97141 | 2.6 | 0.83 | 0.407 |
| internet | .71551 | .71194 | 0.8 | 0.21 | 0.834 |
| write_prof | 1.9092 | 1.8906 | 1.8 | 0.50 | 0.620 |
| age | 15.141 | 15.123 | 1.7 | 0.74 | 0.458 |
| repeat | .0193 | .02645 | -4.8 | -1.26 | 0.206 |
| fam_size | 4.3102 | 4.3142 | -0.3 | -0.09 | 0.932 |
| male | .40243 | .41673 | -2.9 | -0.77 | 0.442 |
| y2007 | .69693 | .70622 | -1.9 | -0.54 | 0.591 |

Table 32: Private Schools (All) - Objective – Kernel

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75411 | .74775 | 1.4 | 0.39 | 0.697 |
| black | .02573 | .02903 | -1.5 | -0.53 | 0.593 |
| brown | .16869 | .17335 | -1.1 | -0.33 | 0.744 |
| asian | .0436 | .04163 | 1.1 | 0.26 | 0.796 |
| indig | .00643 | .00637 | 0.1 | 0.02 | 0.985 |
| portuguese | 69.538 | 69.26 | 2.2 | 0.62 | 0.532 |
| math | 43.428 | 43.219 | 1.8 | 0.43 | 0.664 |
| mother_ed | 2.1008 | 2.0886 | 1.6 | 0.41 | 0.678 |
| father_ed | 2.1237 | 2.1136 | 1.3 | 0.34 | 0.732 |
| has1tv | .22945 | .2348 | -1.2 | -0.33 | 0.738 |
| has2tv | .75482 | .74956 | 1.1 | 0.32 | 0.747 |
| has1dvd | .64403 | .64424 | -0.0 | -0.01 | 0.991 |
| has2dvd | .25447 | .249 | 1.4 | 0.33 | 0.739 |
| has1pc | .66619 | .65595 | 2.1 | 0.57 | 0.567 |
| has2pc | .12866 | .12769 | 0.3 | 0.08 | 0.939 |
| has1wash | .81773 | .81332 | 1.1 | 0.30 | 0.764 |
| has2wash | .10865 | .11042 | -0.6 | -0.15 | 0.881 |
| has1cel | .27734 | .27967 | -0.5 | -0.14 | 0.891 |
| has2cel | .65118 | .64541 | 1.2 | 0.32 | 0.750 |
| has1car | .56326 | .55546 | 1.6 | 0.42 | 0.678 |
| has2car | .28878 | .28432 | 1.1 | 0.26 | 0.794 |
| has1bath | .35954 | .36756 | -1.7 | -0.44 | 0.659 |
| has2bath | .63617 | .62737 | 1.8 | 0.48 | 0.630 |
| piped | .98642 | .98614 | 0.2 | 0.06 | 0.949 |
| electric | .99285 | .99247 | 0.4 | 0.12 | 0.906 |
| magpaper | .58113 | .5757 | 1.1 | 0.29 | 0.771 |
| diction | .97641 | .97463 | 0.9 | 0.31 | 0.760 |
| internet | .71551 | .70363 | 2.5 | 0.69 | 0.489 |
| write_prof | 1.9092 | 1.9008 | 0.8 | 0.22 | 0.823 |
| age | 15.141 | 15.161 | -1.9 | -0.74 | 0.458 |
| repeat | .0193 | .0192 | 0.1 | 0.02 | 0.985 |
| fam_size | 4.3102 | 4.333 | -1.8 | -0.50 | 0.620 |
| male | .40243 | .40426 | -0.4 | -0.10 | 0.922 |
| y2007 | .69693 | .68858 | 1.7 | 0.48 | 0.633 |

Table 33: Private Schools (All) - Objective – Nearest Neighbor

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75411 | .76083 | -1.5 | -0.41 | 0.679 |
| black | .02573 | .02759 | -0.9 | -0.31 | 0.760 |
| brown | .16869 | .16326 | 1.3 | 0.39 | 0.699 |
| asian | .0436 | .03817 | 3.1 | 0.73 | 0.468 |
| indig | .00643 | .00758 | -1.3 | -0.36 | 0.717 |
| portuguese | 69.538 | 69.487 | 0.4 | 0.12 | 0.908 |
| math | 43.428 | 43.479 | -0.5 | -0.11 | 0.915 |
| mother_ed | 2.1008 | 2.0991 | 0.2 | 0.06 | 0.953 |
| father_ed | 2.1237 | 2.1324 | -1.1 | -0.30 | 0.765 |
| has1tv | .22945 | .22931 | 0.0 | 0.01 | 0.993 |
| has2tv | .75482 | .75425 | 0.1 | 0.04 | 0.972 |
| has1dvd | .64403 | .65147 | -1.5 | -0.41 | 0.681 |
| has2dvd | .25447 | .2426 | 3.0 | 0.73 | 0.468 |
| has1pc | .66619 | .67505 | -1.8 | -0.50 | 0.618 |
| has2pc | .12866 | .1238 | 1.7 | 0.39 | 0.699 |
| has1wash | .81773 | .80643 | 2.8 | 0.76 | 0.445 |
| has2wash | .10865 | .11494 | -2.1 | -0.53 | 0.598 |
| has1cel | .27734 | .27963 | -0.5 | -0.13 | 0.893 |
| has2cel | .65118 | .65018 | 0.2 | 0.06 | 0.956 |
| has1car | .56326 | .5664 | -0.6 | -0.17 | 0.867 |
| has2car | .28878 | .28549 | 0.8 | 0.19 | 0.848 |
| has1bath | .35954 | .36955 | -2.1 | -0.55 | 0.583 |
| has2bath | .63617 | .62573 | 2.2 | 0.57 | 0.567 |
| piped | .98642 | .98728 | -0.6 | -0.20 | 0.842 |
| electric | .99285 | .99385 | -1.0 | -0.33 | 0.745 |
| magpaper | .58113 | .57241 | 1.8 | 0.47 | 0.641 |
| diction | .97641 | .9757 | 0.4 | 0.12 | 0.902 |
| internet | .71551 | .71122 | 0.9 | 0.25 | 0.802 |
| write_prof | 1.9092 | 1.9132 | -0.4 | -0.11 | 0.915 |
| age | 15.141 | 15.124 | 1.7 | 0.72 | 0.474 |
| repeat | .0193 | .02102 | -1.2 | -0.32 | 0.747 |
| fam_size | 4.3102 | 4.3357 | -2.0 | -0.56 | 0.578 |
| male | .40243 | .40772 | -1.1 | -0.28 | 0.776 |
| y2007 | .69693 | .70379 | -1.4 | -0.40 | 0.692 |

Table 34: Private Schools (All) - Writing – Mahalanobis

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75018 | .76497 | -3.2 | -0.90 | 0.370 |
| black | .02661 | .02513 | 0.7 | 0.24 | 0.809 |
| brown | .17147 | .15817 | 3.2 | 0.93 | 0.351 |
| asian | .04361 | .04065 | 1.7 | 0.38 | 0.702 |
| indig | .00665 | .00887 | -2.6 | -0.66 | 0.511 |
| portuguese | 69.681 | 70.184 | -4.1 | -1.14 | 0.253 |
| math | 43.434 | 43.66 | -2.0 | -0.46 | 0.647 |
| mother_ed | 2.0931 | 2.0983 | -0.7 | -0.17 | 0.863 |
| father_ed | 2.119 | 2.1109 | 1.1 | 0.27 | 0.784 |
| has1tv | .23134 | .24464 | -2.9 | -0.81 | 0.417 |
| has2tv | .75314 | .74353 | 2.1 | 0.58 | 0.565 |
| has1dvd | .64523 | .64597 | -0.2 | -0.04 | 0.968 |
| has2dvd | .25203 | .24834 | 0.9 | 0.22 | 0.824 |
| has1pc | .66814 | .67258 | -0.9 | -0.25 | 0.806 |
| has2pc | .12417 | .10939 | 5.3 | 1.20 | 0.231 |
| has1wash | .82336 | .8337 | -2.6 | -0.71 | 0.475 |
| has2wash | .10347 | .08795 | 5.3 | 1.37 | 0.170 |
| has1cel | .2816 | .29786 | -3.5 | -0.93 | 0.351 |
| has2cel | .64671 | .64154 | 1.1 | 0.28 | 0.779 |
| has1car | .56245 | .56393 | -0.3 | -0.08 | 0.938 |
| has2car | .28899 | .27568 | 3.3 | 0.77 | 0.442 |
| has1bath | .36364 | .35698 | 1.4 | 0.36 | 0.719 |
| has2bath | .63267 | .64302 | -2.1 | -0.56 | 0.576 |
| piped | .98596 | .9867 | -0.5 | -0.17 | 0.869 |
| electric | .99261 | .9963 | -3.8 | -1.29 | 0.196 |
| magpaper | .58167 | .55728 | 4.9 | 1.28 | 0.200 |
| diction | .97561 | .97118 | 2.3 | 0.72 | 0.474 |
| internet | .71397 | .69771 | 3.4 | 0.93 | 0.354 |
| write_prof | 1.9054 | 1.9283 | -2.3 | -0.59 | 0.552 |
| age | 15.129 | 15.139 | -1.0 | -0.43 | 0.667 |
| repeat | .01996 | .02439 | -3.0 | -0.78 | 0.434 |
| fam_size | 4.3245 | 4.333 | -0.7 | -0.18 | 0.854 |
| male | .3969 | .38877 | 1.7 | 0.43 | 0.665 |
| y2007 | .71101 | .69623 | 3.1 | 0.84 | 0.400 |

Table 35: Private Schools (All) - Writing – Kernel

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75018 | .74378 | 1.4 | 0.38 | 0.702 |
| black | .02661 | .02987 | -1.5 | -0.51 | 0.609 |
| brown | .17147 | .17627 | -1.2 | -0.33 | 0.742 |
| asian | .04361 | .04165 | 1.1 | 0.25 | 0.801 |
| indig | .00665 | .00656 | 0.1 | 0.03 | 0.977 |
| portuguese | 69.681 | 69.402 | 2.2 | 0.62 | 0.536 |
| math | 43.434 | 43.231 | 1.8 | 0.42 | 0.677 |
| mother_ed | 2.0931 | 2.0819 | 1.5 | 0.38 | 0.707 |
| father_ed | 2.119 | 2.1083 | 1.4 | 0.36 | 0.722 |
| has1tv | .23134 | .23623 | -1.1 | -0.30 | 0.764 |
| has2tv | .75314 | .74837 | 1.0 | 0.29 | 0.774 |
| has1dvd | .64523 | .64487 | 0.1 | 0.02 | 0.984 |
| has2dvd | .25203 | .24689 | 1.3 | 0.31 | 0.757 |
| has1pc | .66814 | .65804 | 2.1 | 0.56 | 0.578 |
| has2pc | .12417 | .12317 | 0.4 | 0.08 | 0.937 |
| has1wash | .82336 | .81808 | 1.3 | 0.36 | 0.721 |
| has2wash | .10347 | .10601 | -0.9 | -0.22 | 0.829 |
| has1cel | .2816 | .28347 | -0.4 | -0.11 | 0.914 |
| has2cel | .64671 | .64144 | 1.1 | 0.29 | 0.775 |
| has1car | .56245 | .5547 | 1.6 | 0.41 | 0.685 |
| has2car | .28899 | .28487 | 1.0 | 0.24 | 0.813 |
| has1bath | .36364 | .3706 | -1.4 | -0.38 | 0.707 |
| has2bath | .63267 | .62501 | 1.6 | 0.41 | 0.680 |
| piped | .98596 | .98581 | 0.1 | 0.03 | 0.974 |
| electric | .99261 | .99229 | 0.3 | 0.10 | 0.923 |
| magpaper | .58167 | .57623 | 1.1 | 0.29 | 0.775 |
| diction | .97561 | .97402 | 0.8 | 0.26 | 0.792 |
| internet | .71397 | .70225 | 2.5 | 0.67 | 0.503 |
| write_prof | 1.9054 | 1.9 | 0.5 | 0.14 | 0.887 |
| age | 15.129 | 15.147 | -1.8 | -0.69 | 0.489 |
| repeat | .01996 | .01964 | 0.2 | 0.06 | 0.954 |
| fam_size | 4.3245 | 4.3463 | -1.7 | -0.47 | 0.640 |
| male | .3969 | .3987 | -0.4 | -0.10 | 0.924 |
| y2007 | .71101 | .7015 | 2.0 | 0.54 | 0.587 |

Table 36: Private Schools (All) - Writing — Nearest Neighbor

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .75018 | .74797 | 0.5 | 0.13 | 0.894 |
| black | .02661 | .02897 | -1.1 | -0.37 | 0.708 |
| brown | .17147 | .17073 | 0.2 | 0.05 | 0.959 |
| asian | .04361 | .04316 | 0.3 | 0.06 | 0.955 |
| indig | .00665 | .00739 | -0.9 | -0.23 | 0.818 |
| portuguese | 69.681 | 69.902 | -1.8 | -0.50 | 0.616 |
| math | 43.434 | 43.228 | 1.8 | 0.42 | 0.671 |
| mother_ed | 2.0931 | 2.09 | 0.4 | 0.10 | 0.917 |
| father_ed | 2.119 | 2.1283 | -1.2 | -0.31 | 0.754 |
| has1tv | .23134 | .22055 | 2.4 | 0.67 | 0.502 |
| has2tv | .75314 | .76467 | -2.5 | -0.70 | 0.483 |
| has1dvd | .64523 | .64331 | 0.4 | 0.10 | 0.917 |
| has2dvd | .25203 | .25469 | -0.7 | -0.16 | 0.874 |
| has1pc | .66814 | .66208 | 1.3 | 0.33 | 0.738 |
| has2pc | .12417 | .12506 | -0.3 | -0.07 | 0.944 |
| has1wash | .82336 | .8133 | 2.5 | 0.68 | 0.498 |
| has2wash | .10347 | .11205 | -2.9 | -0.72 | 0.472 |
| has1cel | .2816 | .28751 | -1.3 | -0.34 | 0.733 |
| has2cel | .64671 | .64582 | 0.2 | 0.05 | 0.962 |
| has1car | .56245 | .55935 | 0.6 | 0.16 | 0.871 |
| has2car | .28899 | .28943 | -0.1 | -0.03 | 0.980 |
| has1bath | .36364 | .3561 | 1.6 | 0.41 | 0.683 |
| has2bath | .63267 | .64139 | -1.8 | -0.47 | 0.637 |
| piped | .98596 | .9867 | -0.5 | -0.17 | 0.869 |
| electric | .99261 | .99409 | -1.5 | -0.47 | 0.636 |
| magpaper | .58167 | .56807 | 2.7 | 0.72 | 0.474 |
| diction | .97561 | .97324 | 1.2 | 0.39 | 0.697 |
| internet | .71397 | .7017 | 2.6 | 0.70 | 0.483 |
| write_prof | 1.9054 | 1.9171 | -1.2 | -0.30 | 0.761 |
| age | 15.129 | 15.121 | 0.8 | 0.32 | 0.753 |
| repeat | .01996 | .01951 | 0.3 | 0.08 | 0.934 |
| fam_size | 4.3245 | 4.3492 | -1.9 | -0.53 | 0.596 |
| male | .3969 | .39911 | -0.5 | -0.12 | 0.906 |
| y2007 | .71101 | .71101 | 0.0 | 0.00 | 1.000 |

Table 37: Low-fee Private Schools - Objective – Mahalanobis

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .63542 | .54167 | 19.2 | 1.32 | 0.189 |
| black | .03125 | .03125 | 0.0 | 0.00 | 1.000 |
| brown | .25 | .35417 | -23.3 | -1.57 | 0.117 |
| asian | .0625 | .0625 | 0.0 | 0.00 | 1.000 |
| indig | .02083 | .01042 | 8.3 | 0.58 | 0.563 |
| portuguese | 68.125 | 68.611 | -3.8 | -0.29 | 0.770 |
| math | 39.087 | 37.925 | 11.9 | 0.81 | 0.418 |
| mother_ed | 2.0313 | 2.0104 | 2.8 | 0.19 | 0.847 |
| father_ed | 2.1667 | 2.1979 | -4.1 | -0.27 | 0.784 |
| has1tv | .21875 | .23958 | -4.8 | -0.34 | 0.733 |
| has2tv | .78125 | .76042 | 4.7 | 0.34 | 0.733 |
| has1dvd | .59375 | .6875 | -19.4 | -1.35 | 0.178 |
| has2dvd | .29167 | .15625 | 32.1 | 2.27 | 0.024 |
| has1pc | .69792 | .70833 | -2.2 | -0.16 | 0.875 |
| has2pc | .13542 | .11458 | 6.9 | 0.43 | 0.665 |
| has1wash | .875 | .88542 | -2.8 | -0.22 | 0.825 |
| has2wash | .04167 | .02083 | 8.7 | 0.83 | 0.409 |
| has1cel | .30208 | .28125 | 4.5 | 0.32 | 0.752 |
| has2cel | .60417 | .61458 | -2.1 | -0.15 | 0.883 |
| has1car | .54167 | .48958 | 10.4 | 0.72 | 0.473 |
| has2car | .25 | .22917 | 5.3 | 0.34 | 0.737 |
| has1bath | .44792 | .42708 | 4.2 | 0.29 | 0.773 |
| has2bath | .55208 | .57292 | -4.2 | -0.29 | 0.773 |
| electric | .98958 | 1 | -10.8 | -1.00 | 0.319 |
| magpaper | .63542 | .65625 | -4.2 | -0.30 | 0.764 |
| internet | .69792 | .72917 | -6.5 | -0.48 | 0.634 |
| write_prof | 1.7604 | 1.7708 | -1.1 | -0.08 | 0.937 |
| age | 15.133 | 15.061 | 6.2 | 0.78 | 0.437 |
| repeat | .03125 | .0625 | -18.0 | -1.02 | 0.308 |
| fam_size | 4.2448 | 4.2083 | 2.8 | 0.20 | 0.839 |
| male | .32292 | .32292 | 0.0 | 0.00 | 1.000 |
| y2007 | .71875 | .72917 | -2.2 | -0.16 | 0.873 |

Table 38: Low-fee Private Schools - Objective – Kernel

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .63542 | .63126 | 0.8 | 0.06 | 0.953 |
| black | .03125 | .03414 | -1.2 | -0.11 | 0.911 |
| brown | .25 | .248 | 0.4 | 0.03 | 0.975 |
| asian | .0625 | .06996 | -3.7 | -0.21 | 0.836 |
| indig | .02083 | .01664 | 3.4 | 0.21 | 0.831 |
| portuguese | 68.125 | 68.07 | 0.4 | 0.03 | 0.975 |
| math | 39.087 | 38.742 | 3.5 | 0.23 | 0.819 |
| mother_ed | 2.0313 | 2.0589 | -3.7 | -0.26 | 0.798 |
| father_ed | 2.1667 | 2.1737 | -0.9 | -0.06 | 0.949 |
| has1tv | .21875 | .21536 | 0.8 | 0.06 | 0.955 |
| has2tv | .78125 | .78464 | -0.8 | -0.06 | 0.955 |
| has1dvd | .59375 | .61335 | -4.1 | -0.28 | 0.783 |
| has2dvd | .29167 | .28463 | 1.7 | 0.11 | 0.915 |
| has1pc | .69792 | .70626 | -1.7 | -0.13 | 0.900 |
| has2pc | .13542 | .1408 | -1.8 | -0.11 | 0.914 |
| has1wash | .875 | .88404 | -2.5 | -0.19 | 0.848 |
| has2wash | .04167 | .03969 | 0.8 | 0.07 | 0.945 |
| has1cel | .30208 | .3155 | -2.9 | -0.20 | 0.842 |
| has2cel | .60417 | .59916 | 1.0 | 0.07 | 0.944 |
| has1car | .54167 | .5651 | -4.7 | -0.32 | 0.746 |
| has2car | .25 | .23105 | 4.9 | 0.31 | 0.760 |
| has1bath | .44792 | .44167 | 1.3 | 0.09 | 0.931 |
| has2bath | .55208 | .55833 | -1.3 | -0.09 | 0.931 |
| electric | .98958 | .99158 | -2.1 | -0.14 | 0.887 |
| magpaper | .63542 | .63919 | -0.8 | -0.05 | 0.957 |
| internet | .69792 | .70821 | -2.1 | -0.16 | 0.877 |
| write_prof | 1.7604 | 1.7543 | 0.7 | 0.05 | 0.964 |
| age | 15.133 | 15.146 | -1.1 | -0.13 | 0.897 |
| repeat | .03125 | .03591 | -2.7 | -0.18 | 0.859 |
| fam_size | 4.2448 | 4.2419 | 0.2 | 0.02 | 0.987 |
| male | .32292 | .32558 | -0.6 | -0.04 | 0.969 |
| y2007 | .71875 | .71352 | 1.1 | 0.08 | 0.936 |

Table 39: Low-fee Private Schools - Objective – Nearest Neighbor

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .63542 | .60347 | 6.5 | 0.45 | 0.651 |
| black | .03125 | .01875 | 5.2 | 0.55 | 0.581 |
| brown | .25 | .29635 | -10.4 | -0.72 | 0.474 |
| asian | .0625 | .06059 | 0.9 | 0.05 | 0.956 |
| indig | .02083 | .02083 | 0.0 | -0.00 | 1.000 |
| portuguese | 68.125 | 68.836 | -5.6 | -0.41 | 0.681 |
| math | 39.087 | 38.484 | 6.1 | 0.41 | 0.682 |
| mother_ed | 2.0313 | 2.0778 | -6.2 | -0.44 | 0.663 |
| father_ed | 2.1667 | 2.1595 | 0.9 | 0.06 | 0.949 |
| has1tv | .21875 | .21302 | 1.3 | 0.10 | 0.924 |
| has2tv | .78125 | .78698 | -1.3 | -0.10 | 0.924 |
| has1dvd | .59375 | .63247 | -8.0 | -0.55 | 0.584 |
| has2dvd | .29167 | .25087 | 9.7 | 0.63 | 0.527 |
| has1pc | .69792 | .74288 | -9.4 | -0.69 | 0.490 |
| has2pc | .13542 | .11337 | 7.3 | 0.46 | 0.646 |
| has1wash | .875 | .8684 | 1.8 | 0.14 | 0.892 |
| has2wash | .04167 | .05556 | -5.8 | -0.45 | 0.657 |
| has1cel | .30208 | .27326 | 6.2 | 0.44 | 0.661 |
| has2cel | .60417 | .62882 | -5.0 | -0.35 | 0.727 |
| has1car | .54167 | .56198 | -4.1 | -0.28 | 0.779 |
| has2car | .25 | .23958 | 2.7 | 0.17 | 0.868 |
| has1bath | .44792 | .43594 | 2.4 | 0.17 | 0.868 |
| has2bath | .55208 | .56406 | -2.4 | -0.17 | 0.868 |
| electric | .98958 | .99375 | -4.3 | -0.32 | 0.752 |
| magpaper | .63542 | .6441 | -1.8 | -0.12 | 0.901 |
| internet | .69792 | .75052 | -10.9 | -0.81 | 0.417 |
| write_prof | 1.7604 | 1.8215 | -6.5 | -0.46 | 0.648 |
| age | 15.133 | 15.146 | -1.1 | -0.12 | 0.903 |
| repeat | .03125 | .03681 | -3.2 | -0.21 | 0.833 |
| fam_size | 4.2448 | 4.272 | -2.1 | -0.15 | 0.881 |
| male | .32292 | .31042 | 2.6 | 0.19 | 0.853 |
| y2007 | .71875 | .71563 | 0.7 | 0.05 | 0.962 |

Table 40: Low-fee Private Schools — Writing — Mahalanobis

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .6383 | .58511 | 10.9 | 0.75 | 0.457 |
| black | .03191 | .04255 | -4.4 | -0.38 | 0.702 |
| brown | .25532 | .2766 | -4.8 | -0.33 | 0.743 |
| asian | .06383 | .04255 | 10.5 | 0.65 | 0.518 |
| indig | .01064 | .05319 | -33.8 | -1.66 | 0.098 |
| portuguese | 67.953 | 69.908 | -15.4 | -1.15 | 0.252 |
| math | 39.118 | 40.51 | -14.1 | -0.85 | 0.395 |
| mother_ed | 2.0426 | 1.9574 | 11.4 | 0.79 | 0.431 |
| father_ed | 2.1489 | 2.117 | 4.2 | 0.28 | 0.778 |
| has1tv | .2234 | .21277 | 2.4 | 0.18 | 0.861 |
| has2tv | .7766 | .78723 | -2.4 | -0.18 | 0.861 |
| has1dvd | .58511 | .61702 | -6.6 | -0.44 | 0.657 |
| has2dvd | .29787 | .25532 | 10.1 | 0.65 | 0.517 |
| has1pc | .69149 | .70213 | -2.2 | -0.16 | 0.875 |
| has2pc | .1383 | .09574 | 14.1 | 0.90 | 0.367 |
| has1wash | .87234 | .8617 | 2.9 | 0.21 | 0.831 |
| has2wash | .04255 | .04255 | 0.0 | 0.00 | 1.000 |
| has1cel | .29787 | .34043 | -9.2 | -0.62 | 0.534 |
| has2cel | .60638 | .55319 | 10.8 | 0.74 | 0.463 |
| has1car | .55319 | .56383 | -2.1 | -0.15 | 0.884 |
| has2car | .24468 | .26596 | -5.4 | -0.33 | 0.740 |
| has1bath | .43617 | .42553 | 2.1 | 0.15 | 0.884 |
| has2bath | .56383 | .57447 | -2.1 | -0.15 | 0.884 |
| electric | .98936 | .97872 | 11.0 | 0.58 | 0.563 |
| magpaper | .62766 | .62766 | 0.0 | 0.00 | 1.000 |
| internet | .69149 | .64894 | 8.8 | 0.62 | 0.537 |
| write_prof | 1.766 | 1.7447 | 2.3 | 0.15 | 0.877 |
| age | 15.124 | 15.128 | -0.3 | -0.03 | 0.975 |
| repeat | .03191 | .03191 | 0.0 | 0.00 | 1.000 |
| fam_size | 4.2606 | 4.4787 | -16.7 | -1.19 | 0.235 |
| male | .31915 | .30851 | 2.2 | 0.16 | 0.876 |
| y2007 | .7234 | .74468 | -4.5 | -0.33 | 0.743 |

Table 41: Low-fee Private Schools – Writing - Kernel

| Variable | Mean Treated | Mean Control | %bias | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|
| white | .6383 | .64074 | -0.5 | -0.03 | 0.972 |
| black | .03191 | .03363 | -0.7 | -0.07 | 0.948 |
| brown | .25532 | .26106 | -1.3 | -0.09 | 0.929 |
| asian | .06383 | .04513 | 9.3 | 0.56 | 0.575 |
| indig | .01064 | .01944 | -7.0 | -0.49 | 0.622 |
| portuguese | 67.953 | 68.157 | -1.6 | -0.12 | 0.908 |
| math | 39.118 | 39.041 | 0.8 | 0.05 | 0.960 |
| mother_ed | 2.0426 | 2.032 | 1.4 | 0.10 | 0.922 |
| father_ed | 2.1489 | 2.1584 | -1.2 | -0.09 | 0.932 |
| has1tv | .2234 | .22149 | 0.4 | 0.03 | 0.975 |
| has2tv | .7766 | .77851 | -0.4 | -0.03 | 0.975 |
| has1dvd | .58511 | .60451 | -4.0 | -0.27 | 0.788 |
| has2dvd | .29787 | .28189 | 3.8 | 0.24 | 0.810 |
| has1pc | .69149 | .71361 | -4.6 | -0.33 | 0.742 |
| has2pc | .1383 | .12758 | 3.6 | 0.22 | 0.830 |
| has1wash | .87234 | .88415 | -3.2 | -0.25 | 0.806 |
| has2wash | .04255 | .0412 | 0.6 | 0.05 | 0.963 |
| has1cel | .29787 | .29775 | 0.0 | 0.00 | 0.999 |
| has2cel | .60638 | .6089 | -0.5 | -0.04 | 0.972 |
| has1car | .55319 | .5685 | -3.1 | -0.21 | 0.834 |
| has2car | .24468 | .23628 | 2.1 | 0.13 | 0.894 |
| has1bath | .43617 | .44702 | -2.2 | -0.15 | 0.882 |
| has2bath | .56383 | .55298 | 2.2 | 0.15 | 0.882 |
| electric | .98936 | .98883 | 0.5 | 0.03 | 0.972 |
| magpaper | .62766 | .63638 | -1.8 | -0.12 | 0.902 |
| internet | .69149 | .70615 | -3.0 | -0.22 | 0.828 |
| write_prof | 1.766 | 1.7884 | -2.4 | -0.16 | 0.869 |
| age | 15.124 | 15.124 | 0.1 | 0.01 | 0.994 |
| repeat | .03191 | .02833 | 2.1 | 0.14 | 0.886 |
| fam_size | 4.2606 | 4.2473 | 1.0 | 0.07 | 0.942 |
| male | .31915 | .31272 | 1.4 | 0.09 | 0.925 |
| y2007 | .7234 | .72412 | -0.2 | -0.01 | 0.991 |

Table 42: Low-fee Private Schools – Writing – Nearest Neighbor

| | Mean | | | t-test | |
|---|---|---|---|---|---|
| Variable | Treated | Control | %bias | t | p>\|t\| |
| white | .6383 | .66791 | -6.0 | -0.42 | 0.672 |
| black | .03191 | .03404 | -0.9 | -0.08 | 0.935 |
| brown | .25532 | .23741 | 4.0 | 0.28 | 0.777 |
| asian | .06383 | .03936 | 12.1 | 0.76 | 0.451 |
| indig | .01064 | .02128 | -8.5 | -0.58 | 0.563 |
| portuguese | 67.953 | 69.117 | -9.2 | -0.66 | 0.509 |
| math | 39.118 | 40.015 | -9.1 | -0.56 | 0.574 |
| mother_ed | 2.0426 | 2.03 | 1.7 | 0.12 | 0.907 |
| father_ed | 2.1489 | 2.1363 | 1.6 | 0.11 | 0.910 |
| has1tv | .2234 | .20248 | 4.8 | 0.35 | 0.728 |
| has2tv | .7766 | .79752 | -4.8 | -0.35 | 0.728 |
| has1dvd | .58511 | .59823 | -2.7 | -0.18 | 0.856 |
| has2dvd | .29787 | .29699 | 0.2 | 0.01 | 0.989 |
| has1pc | .69149 | .70337 | -2.5 | -0.18 | 0.860 |
| has2pc | .1383 | .13706 | 0.4 | 0.02 | 0.980 |
| has1wash | .87234 | .88085 | -2.3 | -0.18 | 0.860 |
| has2wash | .04255 | .04255 | 0.0 | 0.00 | 1.000 |
| has1cel | .29787 | .28457 | 2.9 | 0.20 | 0.842 |
| has2cel | .60638 | .6289 | -4.6 | -0.32 | 0.752 |
| has1car | .55319 | .58741 | -6.8 | -0.47 | 0.638 |
| has2car | .24468 | .23812 | 1.7 | 0.10 | 0.917 |
| has1bath | .43617 | .44291 | -1.4 | -0.09 | 0.926 |
| has2bath | .56383 | .55709 | 1.4 | 0.09 | 0.926 |
| electric | .98936 | .98936 | 0.0 | 0.00 | 1.000 |
| magpaper | .62766 | .63422 | -1.3 | -0.09 | 0.926 |
| internet | .69149 | .71436 | -4.7 | -0.34 | 0.733 |
| write_prof | 1.766 | 1.8092 | -4.6 | -0.32 | 0.750 |
| age | 15.124 | 15.117 | 0.6 | 0.07 | 0.941 |
| repeat | .03191 | .02766 | 2.5 | 0.17 | 0.865 |
| fam_size | 4.2606 | 4.3164 | -4.3 | -0.30 | 0.763 |
| male | .31915 | .31578 | 0.7 | 0.05 | 0.961 |
| y2007 | .7234 | .73298 | -2.0 | -0.15 | 0.883 |

# APPENDIX B

## BALANCE CHECKS FOR MATCHING MODELS: INDONESIA

Table 43: Private (All) – Reading – Mahalanobis

| Variable | Unmatched / Matched | Mean Treated | Mean Control | %bias | %reduct \|bias\| | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|---|---|
| Age | Unmatched | 15.778 | 15.738 | 14.0 | | 4.75 | 0.000 |
| | Matched | 15.778 | 15.787 | -3.2 | 77.3 | -1.03 | 0.304 |
| pared | Unmatched | 9.7473 | 10.289 | -15.9 | | -5.40 | 0.000 |
| | Matched | 9.7505 | 9.8158 | -1.9 | 87.9 | -0.61 | 0.543 |
| homepos | Unmatched | -1.8792 | -1.8276 | -4.7 | | -1.59 | 0.111 |
| | Matched | -1.8785 | -1.8823 | 0.3 | 92.8 | 0.11 | 0.912 |
| wealth | Unmatched | -1.7698 | -1.7288 | -3.3 | | -1.13 | 0.257 |
| | Matched | -1.7698 | -1.7869 | 1.4 | 58.3 | 0.45 | 0.654 |
| atschl | Unmatched | .46801 | .55694 | -10.0 | | -3.39 | 0.001 |
| | Matched | .46823 | .48829 | -2.3 | 77.4 | -0.73 | 0.466 |
| escs | Unmatched | -1.5816 | -1.4334 | -13.6 | | -4.63 | 0.000 |
| | Matched | -1.5808 | -1.5644 | -1.5 | 88.9 | -0.49 | 0.627 |
| hedres | Unmatched | -1.0736 | -1.0248 | -4.9 | | -1.67 | 0.096 |
| | Matched | -1.0727 | -1.0805 | 0.8 | 83.9 | 0.26 | 0.798 |
| joyread | Unmatched | .43492 | .44807 | -2.6 | | -0.89 | 0.373 |
| | Matched | .43474 | .42433 | 2.1 | 20.8 | 0.68 | 0.500 |
| male | Unmatched | .49738 | .46732 | 6.0 | | 2.04 | 0.041 |
| | Matched | .49761 | .50429 | -1.3 | 77.8 | -0.43 | 0.665 |
| grade | Unmatched | 9.5246 | 9.4399 | 11.4 | | 3.90 | 0.000 |
| | Matched | 9.5243 | 9.5262 | -0.3 | 97.7 | -0.08 | 0.934 |
| preschool | Unmatched | .52265 | .56321 | -8.1 | | -2.77 | 0.006 |
| | Matched | .5229 | .52385 | -0.2 | 97.6 | -0.06 | 0.951 |
| st21q02 | Unmatched | 2.2089 | 2.2434 | -5.1 | | -1.73 | 0.084 |
| | Matched | 2.209 | 2.2004 | 1.3 | 75.2 | 0.41 | 0.680 |
| st21q01 | Unmatched | 2.7086 | 2.7847 | -7.4 | | -2.50 | 0.012 |
| | Matched | 2.709 | 2.7023 | 0.6 | 91.2 | 0.21 | 0.834 |
| st20q12 | Unmatched | 1.0553 | 1.0521 | 1.4 | | 0.49 | 0.623 |
| | Matched | 1.0549 | 1.0558 | -0.4 | 70.8 | -0.14 | 0.893 |
| st19q01 | Unmatched | 1.6061 | 1.6407 | -7.1 | | -2.43 | 0.015 |
| | Matched | 1.6064 | 1.5926 | 2.9 | 60.0 | 0.91 | 0.361 |

Table 44: Private (All) — Reading — Kernel

| Variable | Unmatched / Matched | Mean Treated | Mean Control | %bias | %reduct \|bias\| | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|---|---|
| Age | Unmatched | 15.778 | 15.738 | 14.0 | | 4.75 | 0.000 |
| | Matched | 15.777 | 15.778 | -0.3 | 98.1 | -0.08 | 0.932 |
| pared | Unmatched | 9.7473 | 10.289 | -15.9 | | -5.40 | 0.000 |
| | Matched | 9.7555 | 9.7709 | -0.5 | 97.2 | -0.14 | 0.885 |
| homepos | Unmatched | -1.8792 | -1.8276 | -4.7 | | -1.59 | 0.111 |
| | Matched | -1.8785 | -1.8793 | 0.1 | 98.4 | 0.02 | 0.981 |
| wealth | Unmatched | -1.7698 | -1.7288 | -3.3 | | -1.13 | 0.257 |
| | Matched | -1.7702 | -1.7754 | 0.4 | 87.3 | 0.14 | 0.891 |
| atschl | Unmatched | .46801 | .55694 | -10.0 | | -3.39 | 0.001 |
| | Matched | .46842 | .47013 | -0.2 | 98.1 | -0.06 | 0.950 |
| escs | Unmatched | -1.5816 | -1.4334 | -13.6 | | -4.63 | 0.000 |
| | Matched | -1.58 | -1.5756 | -0.4 | 97.0 | -0.13 | 0.895 |
| hedres | Unmatched | -1.0736 | -1.0248 | -4.9 | | -1.67 | 0.096 |
| | Matched | -1.0722 | -1.0727 | 0.0 | 99.0 | 0.02 | 0.987 |
| joyread | Unmatched | .43492 | .44807 | -2.6 | | -0.89 | 0.373 |
| | Matched | .43458 | .43693 | -0.5 | 82.1 | -0.15 | 0.880 |
| male | Unmatched | .49738 | .46732 | 6.0 | | 2.04 | 0.041 |
| | Matched | .49809 | .49923 | -0.2 | 96.2 | -0.07 | 0.941 |
| grade | Unmatched | 9.5246 | 9.4399 | 11.4 | | 3.90 | 0.000 |
| | Matched | 9.5224 | 9.5089 | 1.8 | 84.0 | 0.59 | 0.553 |
| preschool | Unmatched | .52265 | .56321 | -8.1 | | -2.77 | 0.006 |
| | Matched | .5234 | .51527 | 1.6 | 80.0 | 0.53 | 0.599 |
| st21q02 | Unmatched | 2.2089 | 2.2434 | -5.1 | | -1.73 | 0.084 |
| | Matched | 2.2096 | 2.2058 | 0.6 | 88.7 | 0.19 | 0.851 |
| st21q01 | Unmatched | 2.7086 | 2.7847 | -7.4 | | -2.50 | 0.012 |
| | Matched | 2.7096 | 2.6959 | 1.3 | 82.0 | 0.43 | 0.667 |
| st20q12 | Unmatched | 1.0553 | 1.0521 | 1.4 | | 0.49 | 0.623 |
| | Matched | 1.0544 | 1.0565 | -0.9 | 36.1 | -0.29 | 0.768 |
| st19q01 | Unmatched | 1.6061 | 1.6407 | -7.1 | | -2.43 | 0.015 |
| | Matched | 1.6065 | 1.6031 | 0.7 | 90.1 | 0.23 | 0.820 |

Table 45: Private (All) — Reading — Nearest Neighbor

| Variable | Unmatched / Matched | Mean Treated | Mean Control | %bias | %reduct \|bias\| | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|---|---|
| Age | Unmatched | 15.739 | 15.738 | 0.4 | | 0.09 | 0.926 |
| | Matched | 15.739 | 15.732 | 2.6 | -542.2 | 0.48 | 0.631 |
| pared | Unmatched | 8.563 | 10.289 | -52.1 | | -11.94 | 0.000 |
| | Matched | 8.563 | 8.2973 | 8.0 | 84.6 | 1.53 | 0.125 |
| homepos | Unmatched | -2.3306 | -1.8276 | -47.9 | | -10.74 | 0.000 |
| | Matched | -2.3306 | -2.3985 | 6.5 | 86.5 | 1.27 | 0.206 |
| wealth | Unmatched | -2.3216 | -1.7288 | -49.1 | | -11.16 | 0.000 |
| | Matched | -2.3216 | -2.3397 | 1.5 | 96.9 | 0.29 | 0.772 |
| atschl | Unmatched | .37952 | .55694 | -20.1 | | -4.64 | 0.000 |
| | Matched | .37952 | .38753 | -0.9 | 95.5 | -0.17 | 0.867 |
| escs | Unmatched | -2.0642 | -1.4334 | -63.3 | | -13.80 | 0.000 |
| | Matched | -2.0642 | -2.1461 | 8.2 | 87.0 | 1.73 | 0.083 |
| hedres | Unmatched | -1.3504 | -1.0248 | -34.8 | | -7.81 | 0.000 |
| | Matched | -1.3504 | -1.4333 | 8.9 | 74.5 | 1.71 | 0.088 |
| joyread | Unmatched | .44193 | .44807 | -1.3 | | -0.30 | 0.768 |
| | Matched | .44193 | .43648 | 1.1 | 11.2 | 0.22 | 0.829 |
| male | Unmatched | .54519 | .46732 | 15.6 | | 3.61 | 0.000 |
| | Matched | .54519 | .55847 | -2.7 | 82.9 | -0.49 | 0.624 |
| grade | Unmatched | 8.8741 | 9.4399 | -85.4 | | -18.87 | 0.000 |
| | Matched | 8.8741 | 8.8966 | -3.4 | 96.0 | -0.68 | 0.499 |
| preschool | Unmatched | .36593 | .56321 | -40.3 | | -9.24 | 0.000 |
| | Matched | .36593 | .36711 | -0.2 | 99.4 | -0.05 | 0.964 |
| st21q02 | Unmatched | 1.9733 | 2.2434 | -42.7 | | -9.46 | 0.000 |
| | Matched | 1.9733 | 1.9908 | -2.8 | 93.5 | -0.58 | 0.561 |
| st21q01 | Unmatched | 2.2652 | 2.7847 | -52.2 | | -11.71 | 0.000 |
| | Matched | 2.2652 | 2.2282 | 3.7 | 92.9 | 0.72 | 0.472 |
| st20q12 | Unmatched | 1.0874 | 1.0521 | 13.9 | | 3.46 | 0.001 |
| | Matched | 1.0874 | 1.1031 | -6.2 | 55.5 | -0.98 | 0.325 |
| st19q01 | Unmatched | 1.7319 | 1.6407 | 19.7 | | 4.46 | 0.000 |
| | Matched | 1.7319 | 1.7435 | -2.5 | 87.2 | -0.49 | 0.628 |

Table 46: Private (Government Dependent) – Reading – Mahalanobis

| Variable | Unmatched / Matched | Mean Treated | Mean Control | %bias | %reduct \|bias\| | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|---|---|
| Age | Unmatched | 15.739 | 15.738 | 0.4 | | 0.09 | 0.926 |
| | Matched | 15.739 | 15.732 | 2.4 | -506.5 | 0.46 | 0.647 |
| pared | Unmatched | 8.563 | 10.289 | -52.1 | | -11.94 | 0.000 |
| | Matched | 8.563 | 8.077 | 14.7 | 71.9 | 2.85 | 0.004 |
| homepos | Unmatched | -2.3306 | -1.8276 | -47.9 | | -10.74 | 0.000 |
| | Matched | -2.3306 | -2.5107 | 17.2 | 64.2 | 3.39 | 0.001 |
| wealth | Unmatched | -2.3216 | -1.7288 | -49.1 | | -11.16 | 0.000 |
| | Matched | -2.3216 | -2.4596 | 11.4 | 76.7 | 2.20 | 0.028 |
| atschl | Unmatched | .37952 | .55694 | -20.1 | | -4.64 | 0.000 |
| | Matched | .37952 | .38182 | -0.3 | 98.7 | -0.05 | 0.961 |
| escs | Unmatched | -2.0642 | -1.4334 | -63.3 | | -13.80 | 0.000 |
| | Matched | -2.0642 | -2.2436 | 18.0 | 71.6 | 3.88 | 0.000 |
| hedres | Unmatched | -1.3504 | -1.0248 | -34.8 | | -7.81 | 0.000 |
| | Matched | -1.3504 | -1.4946 | 15.4 | 55.7 | 2.99 | 0.003 |
| joyread | Unmatched | .44193 | .44807 | -1.3 | | -0.30 | 0.768 |
| | Matched | .44193 | .41294 | 6.1 | -372.3 | 1.19 | 0.235 |
| male | Unmatched | .54519 | .46732 | 15.6 | | 3.61 | 0.000 |
| | Matched | .54519 | .56741 | -4.5 | 71.5 | -0.82 | 0.412 |
| grade | Unmatched | 8.8741 | 9.4399 | -85.4 | | -18.87 | 0.000 |
| | Matched | 8.8741 | 8.9244 | -7.6 | 91.1 | -1.50 | 0.134 |
| preschool | Unmatched | .36593 | .56321 | -40.3 | | -9.24 | 0.000 |
| | Matched | .36593 | .36148 | 0.9 | 97.7 | 0.17 | 0.865 |
| st21q02 | Unmatched | 1.9733 | 2.2434 | -42.7 | | -9.46 | 0.000 |
| | Matched | 1.9733 | 1.9689 | 0.7 | 98.4 | 0.15 | 0.885 |
| st21q01 | Unmatched | 2.2652 | 2.7847 | -52.2 | | -11.71 | 0.000 |
| | Matched | 2.2652 | 2.1615 | 10.4 | 80.0 | 2.03 | 0.042 |
| st20q12 | Unmatched | 1.0874 | 1.0521 | 13.9 | | 3.46 | 0.001 |
| | Matched | 1.0874 | 1.1067 | -7.6 | 45.5 | -1.20 | 0.232 |
| st19q01 | Unmatched | 1.7319 | 1.6407 | 19.7 | | 4.46 | 0.000 |
| | Matched | 1.7319 | 1.7585 | -5.8 | 70.7 | -1.12 | 0.261 |

Table 47: Private (Government Dependent) – Reading – Kernel

| Variable | | Mean | | %reduct | t-test | |
|---|---|---|---|---|---|---|
| | Unmatched / Matched | Treated | Control | %bias \|bias\| | t | p>\|t\| |
| Age | Unmatched | 15.739 | 15.738 | 0.4 | 0.09 | 0.926 |
| | Matched | 15.739 | 15.727 | 4.2 -946.2 | 0.78 | 0.437 |
| pared | Unmatched | 8.563 | 10.289 | -52.1 | -11.94 | 0.000 |
| | Matched | 8.563 | 8.391 | 5.2 90.0 | 0.99 | 0.321 |
| homepos | Unmatched | -2.3306 | -1.8276 | -47.9 | -10.74 | 0.000 |
| | Matched | -2.3306 | -2.3596 | 2.8 94.2 | 0.54 | 0.592 |
| wealth | Unmatched | -2.3216 | -1.7288 | -49.1 | -11.16 | 0.000 |
| | Matched | -2.3216 | -2.3149 | -0.6 98.9 | -0.11 | 0.916 |
| atschl | Unmatched | .37952 | .55694 | -20.1 | -4.64 | 0.000 |
| | Matched | .37952 | .3865 | -0.8 96.1 | -0.15 | 0.884 |
| escs | Unmatched | -2.0642 | -1.4334 | -63.3 | -13.80 | 0.000 |
| | Matched | -2.0642 | -2.1119 | 4.8 92.4 | 1.00 | 0.315 |
| hedres | Unmatched | -1.3504 | -1.0248 | -34.8 | -7.81 | 0.000 |
| | Matched | -1.3504 | -1.4075 | 6.1 82.5 | 1.17 | 0.240 |
| joyread | Unmatched | .44193 | .44807 | -1.3 | -0.30 | 0.768 |
| | Matched | .44193 | .43607 | 1.2 4.4 | 0.23 | 0.816 |
| male | Unmatched | .54519 | .46732 | 15.6 | 3.61 | 0.000 |
| | Matched | .54519 | .56958 | -4.9 68.7 | -0.90 | 0.367 |
| grade | Unmatched | 8.8741 | 9.4399 | -85.4 | -18.87 | 0.000 |
| | Matched | 8.8741 | 8.8911 | -2.6 97.0 | -0.51 | 0.612 |
| preschool | Unmatched | .36593 | .56321 | -40.3 | -9.24 | 0.000 |
| | Matched | .36593 | .36533 | 0.1 99.7 | 0.02 | 0.982 |
| st21q02 | Unmatched | 1.9733 | 2.2434 | -42.7 | -9.46 | 0.000 |
| | Matched | 1.9733 | 1.9969 | -3.7 91.3 | -0.77 | 0.441 |
| st21q01 | Unmatched | 2.2652 | 2.7847 | -52.2 | -11.71 | 0.000 |
| | Matched | 2.2652 | 2.2435 | 2.2 95.8 | 0.42 | 0.676 |
| st20q12 | Unmatched | 1.0874 | 1.0521 | 13.9 | 3.46 | 0.001 |
| | Matched | 1.0874 | 1.0981 | -4.2 69.7 | -0.68 | 0.498 |
| st19q01 | Unmatched | 1.7319 | 1.6407 | 19.7 | 4.46 | 0.000 |
| | Matched | 1.7319 | 1.7368 | -1.1 94.6 | -0.21 | 0.837 |

Table 48: Private (Government Dependent) – Reading – Nearest Neighbor

| Variable | Unmatched / Matched | Mean Treated | Mean Control | %bias | %reduct \|bias\| | t-test t | t-test p>\|t\| |
|---|---|---|---|---|---|---|---|
| Age | Unmatched | 15.796 | 15.738 | 20.5 | | 6.18 | 0.000 |
| | Matched | 15.796 | 15.796 | -0.3 | 98.5 | -0.08 | 0.936 |
| pared | Unmatched | 10.309 | 10.289 | 0.6 | | 0.18 | 0.857 |
| | Matched | 10.326 | 10.644 | -9.4 | -1476.0 | -2.50 | 0.012 |
| homepos | Unmatched | -1.6648 | -1.8276 | 15.0 | | 4.51 | 0.000 |
| | Matched | -1.6661 | -1.5968 | -6.4 | 57.4 | -1.68 | 0.093 |
| wealth | Unmatched | -1.5079 | -1.7288 | 18.5 | | 5.53 | 0.000 |
| | Matched | -1.5078 | -1.4273 | -6.7 | 63.5 | -1.82 | 0.069 |
| atschl | Unmatched | .51002 | .55694 | -5.3 | | -1.59 | 0.111 |
| | Matched | .50696 | .50823 | -0.1 | 97.3 | -0.04 | 0.970 |
| escs | Unmatched | -1.3525 | -1.4334 | 7.4 | | 2.24 | 0.025 |
| | Matched | -1.3495 | -1.254 | -8.8 | -18.2 | -2.29 | 0.022 |
| hedres | Unmatched | -.94215 | -1.0248 | 8.2 | | 2.50 | 0.012 |
| | Matched | -.94453 | -.90568 | -3.9 | 53.0 | -1.01 | 0.312 |
| joyread | Unmatched | .43159 | .44807 | -3.2 | | -0.98 | 0.325 |
| | Matched | .42864 | .41292 | 3.1 | 4.6 | 0.81 | 0.421 |
| male | Unmatched | .47468 | .46732 | 1.5 | | 0.45 | 0.656 |
| | Matched | .47383 | .46262 | 2.2 | -52.2 | 0.60 | 0.550 |
| grade | Unmatched | 9.8333 | 9.4399 | 58.6 | | 17.40 | 0.000 |
| | Matched | 9.8218 | 9.8361 | -2.1 | 96.4 | -0.61 | 0.542 |
| preschool | Unmatched | .59705 | .56321 | 6.9 | | 2.07 | 0.039 |
| | Matched | .5983 | .60866 | -2.1 | 69.4 | -0.56 | 0.573 |
| st21q02 | Unmatched | 2.3207 | 2.2434 | 11.2 | | 3.41 | 0.001 |
| | Matched | 2.3239 | 2.3505 | -3.9 | 65.6 | -1.01 | 0.314 |
| st21q01 | Unmatched | 2.9191 | 2.7847 | 13.2 | | 3.96 | 0.000 |
| | Matched | 2.9194 | 2.9707 | -5.1 | 61.8 | -1.36 | 0.174 |
| st20q12 | Unmatched | 1.0401 | 1.0521 | -5.7 | | -1.70 | 0.090 |
| | Matched | 1.0403 | 1.0403 | 0.0 | 100.0 | -0.00 | 1.000 |
| st19q01 | Unmatched | 1.5464 | 1.6407 | -19.3 | | -5.86 | 0.000 |
| | Matched | 1.546 | 1.5425 | 0.7 | 96.3 | 0.18 | 0.853 |