

# **Crime, Disability and Human Capital Formation in Developing Countries**

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## **Abstract**

This dissertation presents a series of theoretical and empirical studies on the topics of crime and disability in their relationship with human capital accumulation. It focuses on the case of developing countries where research is scarcer due to data limitations. The body of this doctoral thesis is divided in two parts, dedicated to crime and disability respectively. The first part is composed of a theoretical essay and an empirical study for El Salvador. The second part presents two empirical studies, for El Salvador and India, on the existence of disability-related gaps in human capital accumulation and labor market outcomes. The purpose of this dissertation is to provide useful inputs for researchers and policy makers in developing countries who are interested in addressing human capital gaps that arise due to the influence of crime and disability.

## **Introduction**

This dissertation builds upon the effort of many researchers who created the tools for the economic analysis of crime, education and health, which was considered just half a century ago as a revolution in the field. Although these topics have been widely studied since, the breadth of research is not homogeneous, especially due to the scarcity of data. This is especially true for developing countries. As a result, many questions remain unanswered.

An increased effort in recent years to collect more data on these topics has opened new research opportunities, which this dissertation employs to answer important research questions. In particular, it is interested in revealing the effect of crime and disability on the incentives to acquire education and on their effect on labor market outcomes. This dissertation's introductory chapter explains how this research fits in the already vast literature on the Economics of Education, by presenting some of the key researchers and studies that have given shape to the understanding of human capital formation in recent

decades. It also gives a bird's-eye view of the contents of this doctoral thesis and presents its purpose.

## **Part I: Crime**

Part I is dedicated to the understanding of the effect of crime on school attendance and school choice, and attempts to bring some light into questions such as: are children less likely to attend school due to the influence of crime? Are they likely to change their choice of schools due to fluctuations in crime rates? What are the mechanisms that cause such changes? Although crime has been the focus of a large body of literature in Economics, most research concentrates on its role as the explained variable (the incentives to commit a crime), while research on its effect on other variables of interest is rather scarce in the theoretical and empirical fields. This is especially true in its relationship to education.

### **Chapter 1: Crime, School Attendance, School Choice and the Option Value of Education**

Chapter 1 provides a simple theoretical background. It employs a model of educational choices based on Comay, Melnik and Pollatschek (1973), where an agent must decide in a dynamic setting whether to remain in school, or to enter the labor market. Crime shocks are introduced in two ways: as a probability of failing to complete a grade, and as an income loss faced by workers, which depends on their educational level.

This model is employed to evaluate how the decision to advance to further educational grades is affected by variations in the different measures of crime. It shows that an agent is eager to enter the labor market, rather than enrolling in school, when crime increases the probability of failing to complete the additional grade. Furthermore, this effect is larger among more skilled agents. In contrast, it is shown that education can have an additional value when the income loss due to crime is a decreasing function of educational attainment.

This chapter also evaluates how crime levels affect the choice of schools. It explores a situation where agents may choose between high-quality high-cost schools, and low-

quality low-cost schools. It shows that the existence of low-cost schools provides less skilled individuals with the opportunity to attend school in a scenario of rising probabilities of failing a grade due to crime, where they would rather enter the labor market if a low-cost option did not exist. Conversely, this suggests that empirical analyses on the impact of crime on school enrollment and advancement, and on the academic performance of students, must take into consideration the migration of students between public and private schools that is expected to be caused by fluctuations in crime rates.

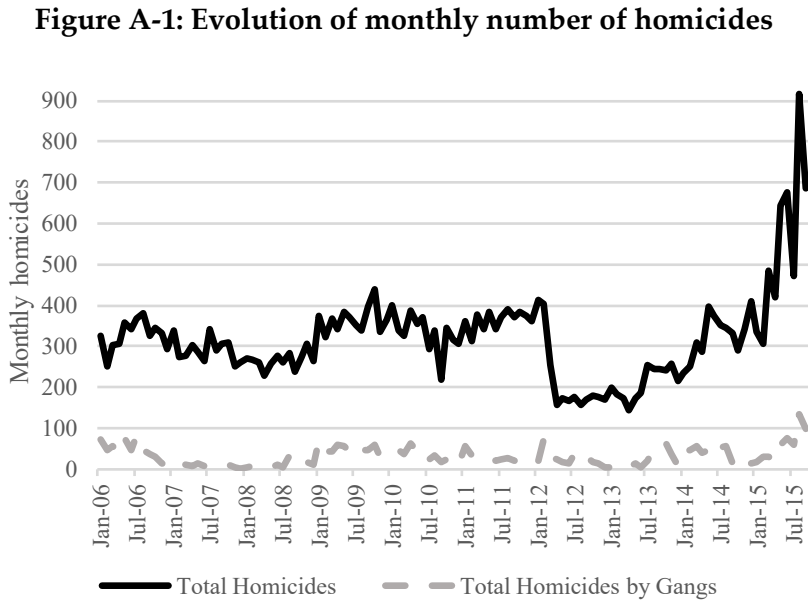
Finally, this chapter evaluates the effect of the different manifestations of crime on the option value of education (i.e., the value of an additional year of education which comes, not from the immediate financial reward, but from the agent's acquired opportunity to decide whether to further advance to upper educational levels). Higher option values mean that a rational agent is likely to opt for enrolling for an additional grade, even when the immediate benefit itself does not justify it.

This chapter also shows that higher probabilities of failing a grade due to crime reduce the option value of education, implying that this measure of crime makes the decision of the agent depend more on the immediate reward of schooling. However, it is also shown that the option value of education may increase when the income loss due to crime is a decreasing function of educational attainment. This reinforces the idea that an agent may choose to attain further education in order to avoid the income loss due to crime, even if the immediate reward would otherwise motivate him to exit the education system. This option value of education that comes from the lower exposure to crime has been largely ignored by the empirical literature. Besides being an interesting topic of research by itself, it is likely to affect the estimates of the internal rate of return of education for the reasons exposed in Heckman, Lochner and Todd (2006).

## **Chapter 2: Crime, School Attendance and School Choice: Empirical Evidence**

Chapter 2 studies the case of El Salvador, one of the countries with the highest crime rates in the world, and digs further into the impact of crime on school enrollment and school choice. High crime rates in El Salvador have been mostly attributed to the violent conflict between the MS-13 gang and the 18th Street gang since their arrival to El Salvador

in the early 1990s. In March 2012, both gangs agreed on a truce, dramatically reducing homicide rates throughout the whole country. Figure A-1 shows the decline in homicide rates around the period of the truce.



In this chapter, I employ household survey data, along with data provided by the National Civil Police of El Salvador. I employ the municipal-level variation in homicide and extortion rates caused by this largely unexpected truce to avoid some sources of endogeneity in measures of crime. Other controls are employed to correct these variations for potential sources of non-randomness. These variations are employed to assess the association between fluctuations in homicide and extortion rates, school enrollment and school choice of Salvadoran children of both genders and in different age brackets, measured one year after the truce came into effect.

The results of multinomial probit regressions show that fluctuations in homicide rates are significantly associated with changes in educational choices regarding enrollment and the choice of schools. Larger drops in homicide rates are associated with a higher probability of attending school, especially private ones, for boys 15-22 years old, for whom the victimization probability is typically larger.

These effects are consistent with the predictions of the model presented in Chapter 1, that state that fluctuations in the probability of failing a grade due to crime lead to changes in the incentives to attend school, and lead to movements across school types. It is also observed that a decline in crime rates is associated with a lower school attendance, especially in public schools, among girls 7-14 years old. Extortion rates were not found to be affected by the 2012 truce, and no significant associations between fluctuations in this measure of crime and measures of school attendance could be observed. Possible extensions and topics of further study are introduced.

## **Part II: Disability**

Part II of this doctoral thesis is dedicated to the study of disability in its connection with educational and labor gaps. The topic of educational and labor opportunities for persons with disabilities has been studied mostly in developed countries, especially in the United States. However, this is a rather under-studied topic in developing countries, due to the small size of the population of persons with disabilities, which makes it hard to obtain the necessary data. As a result, existing studies rely on small samples, and measures of disability that are not easily comparable.

### **Chapter 3: School Resources and the Enrollment of Children with Disabilities**

Chapter 3 attempts to fill a gap in the study of educational opportunities for children with disabilities in El Salvador, country for which similar research is scarce, and is based mostly on local case studies with small samples and inconsistent data. This chapter, is based on my work with Professor Hiroko Araki, from Kindai University. It employs data from the Schools Census of El Salvador, a countrywide survey collected by the Ministry of Education, which includes most of the schools (public and private) in the country.

This administrative dataset contains information on the resources of schools, such as the availability of working electrical facilities, access to clean water, the availability of libraries, toilets and other infrastructure. It also offers information on the educational

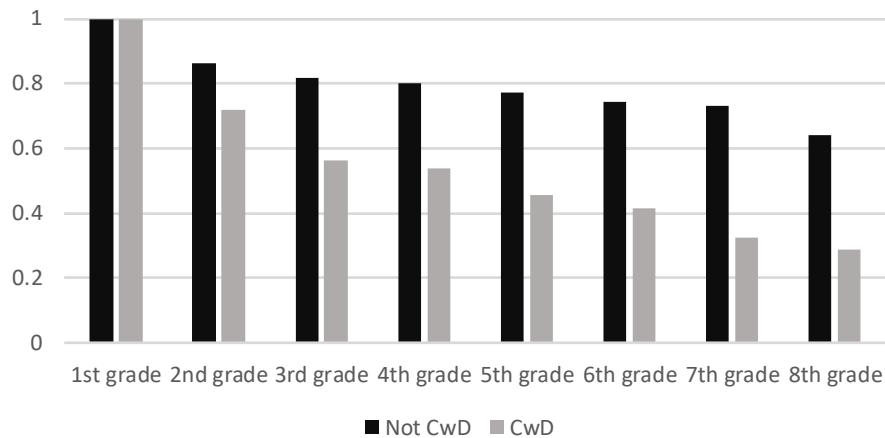
status of the students, and collects information on their health condition, which allows to identify whether a given student suffers some kind of disability.

The empirical analysis performed in this chapter employs data for the period 2006-2014, which allows us to create panel datasets to the school and municipality levels. Counting with such a rich dataset allows us to obtain insights that apply for the whole country, and allows us to explore variation across municipalities, overcoming some of the challenges encountered by previous research.

This chapter performs first a descriptive analysis of the data, identifying educational gaps experienced by Salvadoran children with disabilities at different points of their academic careers, with an emphasis on primary education.

Figure A-2 shows that children with disabilities (CwD) tend to exhibit lower advancement rates than children without disabilities (Not CwD):

**Figure A-2: Students by Disability Status: 2007 Cohort (1st grade of 2007 = 1)**



Descriptive statistics also show that Salvadoran children with disabilities are more likely to be considered overage or to repeat a grade, and that these gaps are born at the very beginning of primary education.

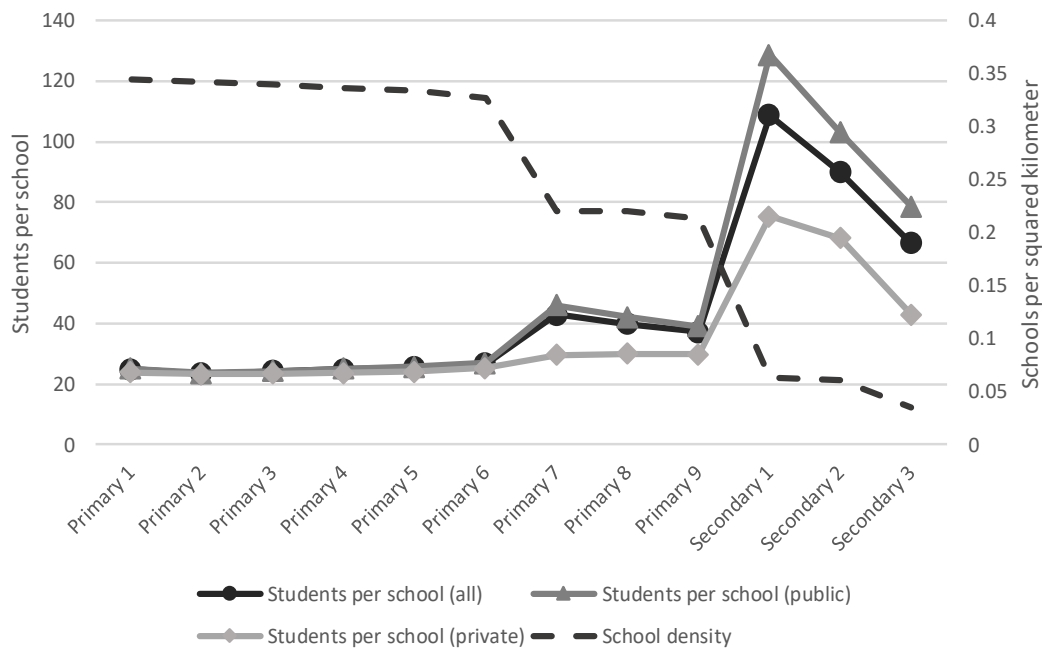
This chapter also studies the association between supply-side inputs, the choice of schools for children with disabilities and disability-based advancement gaps. Probit regression analysis for a panel dataset of schools obtained from the census suggests that

students with disabilities are more likely to attend schools with better availability of basic infrastructure. It is observed that, although some types of handicap infrastructure are associated with a higher probability of enrollment of children with disabilities, limitations in the availability of working electrical facilities and the provision of clean water can be important barriers.

It also evaluates whether the availability of schools is associated with the lower advancement rates observed for children with disabilities. Figure A-3 below presents data on the number of students-per-school ratio per grade for each type of school, and the number of schools per squared kilometer in the country. We observe that the supply of public schools relative to the number of children in the education system tends to decrease considerably towards the last grades of primary education and the beginning of secondary education. This effect is especially large in the case of public schools, which accommodate the largest share of students, especially in rural areas. This means that a given student at those levels has to travel a longer distance and share school resources with more students. This may have an effect in educational outcomes, especially for children with disabilities.

A panel dataset of municipalities is created, and measures of the drop in the educational supply, both in terms of the geographical density of schools, and in the number of students that attend each school are obtained. Regression analysis is then performed to evaluate whether differences in advancement rates by disability status are affected by said fluctuations in measures of the educational supply. The results suggest that increasing the availability of schools for a given number of students is associated with a relatively larger improvement in advancement rates among children with disabilities. This effect is especially larger for public schools.

**Figure A-3: School density and number of students per school by grade and type of school**



Our analysis contributes to fill a gap in the literature about the educational status of children with disabilities in El Salvador. It suggests that public schools play an important role at promoting the enrollment of children with disabilities. Our findings also suggest that investments that benefit all students, such as improvements in the availability of public schools in rural areas and investments in basic infrastructure, can be an important policy tool towards achieving higher enrollment rates among children with disabilities.

However, there are many points of potential improvement in our analysis. In particular, although the Schools Census is a rich dataset, it is still limited in the sense that it only contains information on children who attend school, leaving open the possibility of sample selection bias, despite our efforts to account for it. This chapter is intended then to uncover research questions, policy issues and methodological challenges, and to motivate researchers and policy-makers to dig deeper into these topics in the future, by incorporating other sources of data. This chapter presents many suggestions in terms of future research topics, and makes recommendations regarding the collection, standardization and provision of data that can improve the quality of future research. A particular effort is made to point out specific areas of improvement in the existing data on disability, including the standardization of the definition of disability across datasets,



which could help to uncover patterns in school attendance of children with disabilities across municipalities.

#### **Chapter 4: Disability, Human Capital Gaps and Their Effect on Labor Market Outcomes**

Chapter 4 is based on my work with Professor Kamal Lamichhane, from Tsukuba University. It explores how disability-related gaps in human capital formation translate into labor market gaps. This chapter employs data from the Human Development Survey 2005, a large countrywide household survey collected in India, including information on several types of disabilities by employing questions that follow the recommendations by the Washington Group on Disability Statistics.

Compared to other similar studies performed for India, this research goes beyond the mean in an attempt to evaluate the existence of wage gaps at different points of the distribution of wages. This is an important addition to the literature because it allows to evaluate whether the wages of persons with disabilities grow in a similar way to that of their peers. It is also important in the context of a country where the legislation on the inclusion of persons with disabilities is heavily based on affirmative action measures.

An analysis of summary statistics suggest the existence of educational and labor gaps. A significant disability-related gap in years of schooling and English language proficiency is observed. Correspondingly, the analysis in this chapter finds that working-age individuals with disabilities in India are more likely to report having no occupation, thus depending more on income from remittances and pensions than their peers, or to be employed in agriculture. As a result, wages are lower among persons with disabilities.

The following stage of the analysis evaluates the connection between disability, human capital gaps and labor market outcomes. Regression analysis on the probability of being in different categories of productive activities shows that, even after controlling for human capital levels and determinants of the labor supply, persons with disabilities are still significantly less likely to engage in productive activities, suggesting that differences in characteristics are not the only component explaining the gap. This conclusion is confirmed by a non-linear Oaxaca decomposition of the probability of engaging in

productive activities. This suggests that there is little relationship between human capital gaps and employment gaps.

Wage equations are estimated employing Ordinary Least Squares and quantile regression in order to evaluate the existence of wage gaps by disability status. We observe that the wage gap is not significant after controlling for measures of human capital, suggesting that the gap observed in descriptive statistics is mostly associated with differences in the characteristics of workers. Quantile regression is employed to perform a decomposition of differences in wage quantiles by disability status.

This analysis suggests the existence of significant wage gaps by disability status. The observed gaps are especially large above the median of the distribution of wages, indicating that persons with disabilities who have a job might still find it comparatively difficult to ascend towards higher income brackets. Furthermore, 60% to 80% of the wage gap observed above the median is attributable to differences in the characteristics of workers, including the educational level and English language proficiency. In other words, human capital gaps play an important role at explaining the observed wage gaps. Affirmative action policies may allow persons with disabilities to obtain a job, but their professional advancement may be limited if underlying human capital gaps are not addressed.

These results stress the connection between human capital gaps and wage gaps. They also show that policy-makers in India still face important challenges despite the measures currently in place by the existing legislation. From the methodological point of view, they also suggest the importance of looking at the whole distribution of income, rather than only the mean, when evaluating the magnitude of wage gaps.

One important point that is observed through most of the research contained in this dissertation is the importance of data. What cannot be measured cannot be improved, and data is a primordial ingredient for the elaboration of public policy. Through the experience at putting together the empirical studies presented so far, this author finds that improvements in the collection and provision of administrative data by government entities can greatly improve the quality of research that can be made in developing countries.

For this reason, this dissertation concludes with some remarks regarding the importance of administrative data as a valuable input for researchers. It is focused on El Salvador (country for which most empirical analysis in this thesis is carried out) and includes some recommendations regarding the collection and provision of public data from the user's point of view. It is suggested that the needs of researchers are taken into consideration in the Salvadoran government's data pipeline, so that administrative data can become a more useful input not just for the daily operation of government agencies, but for academic research and policy-making.

It is my hope that the contents of this doctoral thesis will provide useful inputs for policy makers and that its imperfections will motivate other researchers to dig deeper into these topics. Finally, I wish that the effort put into this manuscript eventually translates into better standards of living for those who see their choices limited by crime, violence and illness.