ESSAYS ON DEVELOPMENT

AND LABOUR ECONOMICS FOR MEXICO

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This thesis is composed of three empirical essays that analyse different development and labour economics issues about Mexico and its emigrant population residing in the United States.

The first essay examines the role of occupational segregation in explaining the low wages among first, second and third generation Mexican immigrants in the United States. Mexican-Americans earn lower wages than blacks mainly because they possess less human capital. With respect to whites, their lower wages are also a product of their smaller rewards for skills and underrepresentation at the top of the occupational structure. Occupational segregation constitutes an important part of the wage gap between natives and Mexican-born immigrants. For subsequent generations, the contribution of occupational segregation to the wage gap varies significantly between groups and according to the decomposition used.

The second essay examines whether Seguro Popular, a free-of-charge publicly provided health insurance program for otherwise uninsured households, crowded-out private transfers in Mexico. Using data from the National Household Income and Expenditure

Survey, the effects of Seguro Popular are identified using the spatial variation in the program's coverage induced by its sequential roll-out throughout Mexico. The results show that Seguro Popular reduced on average a household's probability of receiving private transfers by 5.55 percentage points. This finding appears to be driven by domestic private transfers, since the program's effects are only statistically significant for private transfers originating within Mexico. In addition, Seguro Popular had a weak and not statistically significant negative effect on the amount of private transfers received. Failure to take into account possible changes in private behaviour induced by Seguro Popular may overstate the program's potential benefits or distributional impacts.

Finally, the third essay studies the effect of students' exposure to violent crimes on educational outcomes. Driven by drug-trade related crimes, homicide levels in Mexico have dramatically increased since 2007. Using school level data, a panel of Mexico's primary and secondary schools from 2006 to 2012 is constructed to analyse the effect of exposure to homicides on standardised test scores and grade failure rates. The results show that a one-unit increase in the number of homicides per 10,000 inhabitants reduces average test scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, stronger if the homicide occurs closer to the examination date, and is stable when using either total homicides or drug-trade related homicides to measure crime. Higher homicides rates are also associated with an increase in the grade failure rate. Early exposure to homicides has potential long-term consequences since it may affect educational attainment levels and future income streams.

A mi bella esposa Anabel, todo es por ti y para nuestro futuro

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Acronyms and Abbreviations

BE	Between Explained
BMZ	Brown, Moon and Zoloth
BU	Between Unexplained
CNPSS	National Commission on Social Protection in Health
CNS	National Security Commission
CPS	Current Population Survey
DGSX	Démurger, Gurgand, Shi and Ximing
DTO	Drug-Trafficking Organization
EMIF	Survey on Migration in the North Border of Mexico
ENE	National Employment Survey
ENIGH	National Household Income and Expenditure Survey
ENLACE	National Evaluation of Academic Achievement in Schools
ENOE	National Occupation and Employment Survey
ENUT	National Time-Use Survey
ENVIPE	National Victimization and Perception of Public Safety Survey
FE	Fixed Effects
FG	First Generation Mexican-American or Mexican-born Immigrant
GDP	Gross Domestic Product
HH	Households
IMSS	Mexican Social Security Institute
INEGI	National Institute of Geography and Statistics
ISSSTE	Institute of Security and Social Services for State Workers
IV	Instrumental Variables
LPM	Linear Probability Model
MMP	Mexican Migration Project
MNL	Multinomial Logit
NAFTA	North American Free Trade Agreement
NB	Native Black
NW	Native White
OB	Oaxaca and Blinder
OLS	Ordinary Least Squares
PAN	National Action Party
PEC	Quality School Program
PES	Safe School Program
PETC	Full-Time School Program
PRD	Democratic Revolutionary Party
PRI	Institutional Revolutionary Party
PTSD	Post-Traumatic Stress Disorder
SG-I	Second Generation Mexican-American with One Mexican Parent
SG-II	Second Generation Mexican-American with Two Mexican Parents
SIMBAD	State and Municipal Database System
SMNG	Health Insurance for a New Generation
SP	Seguro Popular
SSA	Ministry of Health and Welfare
TG	Third generation Mexican-American
WE	Within Explained
WU	Within Unexplained

1 Introduction

Mexico's is an upper middle income country and the second largest economy in Latin America. In 2014, the country's population totalled an estimated 123.8 million and its Gross Domestic Product (GDP) per capita stood at 10,361.3 U.S. dollars (World Bank, 2015).

After decades of sustained economic growth, the country began decelerating in the late 1970s. Following a sovereign default in 1982 which resulted in the collapse of the Mexican peso and a sharp reduction in GDP, the country was forced to make important changes to its economic structure. These included an aggressive reduction of the role of the state in the economy and the embrace of global markets by entering the General Agreement on Tariffs and Trade in 1985 and signing the North American Free Trade Agreement (NAFTA) in 1993 (Hanson, 2010).

Mexico's economic transformation was successful in reducing inflation, maintaining fiscal discipline, reducing its external debt burden, and increasing trade as a share of GDP (Hanson, 2010, p. 988). Nevertheless, this was not accompanied by high levels of economic growth, where between 1982 and 2014 the country's GDP grew at an average annual rate of 2.3% (World Bank, 2015). Moreover, income distribution has remained highly unequal, perverse incentives for informality continue to exist, and public resources are still largely dependent on oil resources, where approximately 30.0% of government revenue comes from Mexico's state-owned oil company.

To escape economic hardships in Mexico or because they are in search of a better life, a large fraction of the country's population has migrated to the United States. Historically, migration flows from Mexico to the U.S. have been characterised by the circular movement of workers from the country's western states who maintained their permanent residence in Mexico and seasonally went to engage in unskilled labour activities primarily in Arizona, California, Illinois and Texas. Upon the mediocre performance of the Mexican economy combined with high demographic growth-rates, the development of migrant networks, and the enactment of the Immigration Reform and Control Act in 1986, this phenomenon changed from a geographical sorting specific to a few states and economic sectors to a nationwide matter for both countries (Borjas and Katz, 2007). Furthermore, since migrants are reluctant to go through the bitter experience of crossing the border multiple times, often illegally, they are prone to extend the length of their stay abroad. This has led many to establish deep roots in the U.S., thus decreasing their long-run probability of returning to Mexico. In 2010, an estimated 11.2 million Mexicans were residing in the U.S., accounting for 14.2% of Mexico's working age population and 6.3% of the U.S. labour force.[1]

In addition, to alleviate some of the economic difficulties encountered by the population located at the lower tail of the income distribution and to help reduce poverty levels in Mexico, the federal government put forward a series of social protection programs. In 1997, Progresa was introduced as the first national conditional cash transfer program directed at poor and extremely poor households. The program, which was originally constituted by health, education and nutrition components, gives money to a female household head as an incentive to send her children to school and to health centres for

[1] Figures based on the 2010 Mexican Census and the 2010 American Community Survey (ACS).

periodical medical check-ups. Subsequent high impact social assistance programs implemented by the state include Seguro Popular, a free-of-charge health insurance program for otherwise uninsured households introduced in 2002, and 70 y Más, a non-contributory pension program for the elderly first implemented in 2007, among others.[2]

In the political front, due to the high economic costs involved and its underlying factors related to corruption, low growth and high income inequality, the rise in violent crime and the government's fight against drug trafficking organizations that began in 2006 have dominated the country's political agenda in recent years. Referred to as the "war against drugs", the government's battle against organized crime has proved extremely costly. In terms of human lives, between 2006 and 2012 more than 120,000 homicides and 65,000 drug-trade related homicides were registered in Mexico. In economic terms, the costs can be attributed to both direct factors, including the expenditures made by governments, firms or individuals aimed to prevent or respond to crime, and indirect factors, such as the externalities generated by criminal acts and their effect on economic growth (Enamorado et al., 2014, p. 10). In 2012, the amount allocated to security agencies, criminal justice and judicial institutions represented close to 6.0% of the federal government's budget (DOF, 2012). Furthermore, it is estimated that the costs of crime and insecurity totalled 1.4% of Mexico's GDP in 2012 (INEGI, 2012).

[2] The related literature on Progresa has shown that the program reduced the incidence of child labour (Skoufias et al., 2001) and had a strong positive effect on educational outcomes (Behrman et al., 2005; Attanasio et al., 2011). Studies on Seguro Popular have shown that the program significantly reduce out-of-pocket health expenditures among beneficiary households (King et al., 2009; Barros, 2009; Galárraga et al., 2010). Finally, the literature on 70 y Más has shown that the program increased household spending and consumption (Salinas-Rodríguez et al. 2014), reduced labour force participation rates among elderly adults (Juarez and Pfutze, 2015) and partially crowded-out private support (Amuedo-Dorantes and Juarez, 2015).

This thesis develops three empirical essays that analyse different development and labour economics issues about Mexico and its emigrant population residing in the United States.

The first essay presented in Chapter 2 examines the role of occupational segregation in explaining the low wages among first, second and third generation Mexican immigrants in the United States. Based mainly on household survey data from the Current Population Survey and applying a variety of decomposition techniques, the results show that Mexican-Americans earn lower wages than blacks mainly because they possess less human capital. With respect to whites, the lower wages of Mexican-Americans are also a product of their smaller rewards for skills and under-representation at the top of the occupational structure. The findings show that occupational segregation constitutes an important part of the wage gap between natives and Mexican-born immigrants. For subsequent generations, the contribution of occupational segregation to the wage gap varies greatly between groups and according to the decomposition technique used. The chapter suggests that it is necessary to implement policies that tend to equalise Mexican-American representation across occupations, as well as policies which encourage the undoing of moderately segregated positions within different occupations. Moreover, it is vital for Mexican-born immigrants to acquire the necessary skills and training that will result in an increase in their wages.

The second essay presented in Chapter 3 studies whether Seguro Popular, which provided healthcare coverage to a large fraction of the population, crowded-out international and domestic private transfers in Mexico. Using household survey data, the effects of Seguro Popular are identified using the spatial variation in the program's coverage brought by its roll-out throughout the country between 2000 and 2012. The results show that Seguro

Popular reduced on average a household's probability of receiving private transfers by 5.55 percentage points. This finding appears to be driven by domestic private transfers, since the program's effects are only statistically significant for private transfers originating within Mexico. On the other hand, Seguro Popular did not have a statistically significant effect on the amount of private transfers received. The chapter suggests that failure to take into account possible changes in private behaviour induced by Seguro Popular may overstate the program's potential benefits or distributional impacts.

Finally, the third essay presented in Chapter 4 analyses whether the rise in violent crime observed in Mexico from 2007 onwards affected educational outcomes. Based on school level data, a panel of Mexico's primary and secondary schools from 2006 to 2012 is constructed to analyse the effect of exposure to homicides and drug-trade related homicides on standardised test scores and grade failure rates. The results show that a one unit increase in the number of homicides per 10,000 inhabitants reduces average test scores between 0.0035 and 0.0142 standard deviations. Furthermore, this effect is larger in secondary schools, stronger if the homicide occurs closer to the examination date, and is stable when using either total homicides or drug-trade related homicides to measure crime. Higher homicides rates are also associated with an increase in the grade failure rate. The chapter suggests that early exposure to homicides has potential long-term consequences since it may affect educational attainment levels and future income streams.

The thesis is structured as follows. Chapter 2 presents the first essay titled "Occupational Segregation and the Low-Wages among Mexican-Americans". Chapter 3 presents the second essay titled "Does Access to Free Health Insurance Crowd-Out Private Transfers? Evidence from Mexico's Seguro Popular". Chapter 4 presents the third essay titled

"Crime Exposure and Educational Outcomes in Mexico". Chapter 5 concludes with a summary of the thesis and discusses potential avenues for further research.

2 Occupational Segregation and the Low Wages among Mexican-Americans

2.1 Introduction

In 2012, 20.3 million U.S. residents were either born in Mexico or were of Mexican-origin. Rising to 8.7% of the country's population, Mexican-born immigrants and their descendants, henceforth Mexican-Americans, constitute a substantial and rapidly increasing share of the U.S. working-age population. A product of the great Mexican emigration that began in the early 1960s and a consequence of both legal and illegal immigration, this group is mostly composed by Mexican-born labourers with low levels of human capital whose skills transfer imperfectly into the U.S. labour market. Despite their long history in the U.S., Mexican immigrants have generally performed poorly north of the border. Moreover, the existence of a strong relationship between the earnings of immigrants and the labour market success of their American-born off-spring has led Mexican-Americans to be among the most economically disadvantaged minorities in the country.

A series of studies have previously analysed the reasons behind the poor labour market performance of Mexican-Americans relative to the U.S.-born non-Mexican origin, henceforth native, population (see, e.g. Trejo, 1997; Borjas and Katz, 2007). Common explanations focus on their low productivity enhancing characteristics, including demographic and socioeconomic factors; their unwillingness to assimilate into the U.S., given the proximity to their home country and the historically circulatory nature of their migration; and whether or not they are subject to discrimination originating from natives.

This chapter adds to this literature by re-examining the earnings discrimination debate and analysing the factors behind the low wages of first, second and third generation Mexican-Americans and the sources of their wage differentials with respect to native black and white wage earners, while emphasising the role of occupational segregation.

Comparing Mexican-Americans against blacks and whites provides a benchmark relative to what has historically constituted the country's main disadvantaged minority and against the most privileged cohort in the U.S., respectively. Given that occupational attainment has a significant effect on wages and that there may be important barriers to entry into certain occupations based on non-productivity related factors, the relationship between occupational segregation and the labour market performance of Mexican-Americans merits attention.

The research questions this chapter attempts to answer are: "Why do Mexican-Americans earn low wages and face a significant wage gap with respect to natives?" and "What role does occupational segregation play in explaining the low wages among Mexican-Americans and the magnitude of their wage gap with respect to natives?"

Following the related literature (see, e.g. Liu et al., 2004; Elliot and Lindley, 2008), occupational segregation is said to exist if workers are assigned to different occupations based on non-productivity enhancing characteristics. This is not to be confused with occupational structure, which refers to the distribution of workers between occupations. Differences in the occupational structures of natives and Mexican-Americans do not necessarily imply that there is discrimination in the labour market. Nonetheless, if individuals belonging to a given group face barriers to entry into occupations or if their occupational choices are limited by lower returns to their productivity related characteristics within occupations, then different occupational structures do indeed reflect discrimination (Ehrenberg and Smith, 2012).

The performance of Mexican-American workers has important implications for both the U.S. and Mexico. Regarding Mexican-born immigrants, their degree of success in American territory will affect whether they choose to settle permanently in the U.S., or if they were initially target earners, the amount of time spent abroad. At the same time, this impacts the sum of remittances sent to family members left behind, which have been shown to affect a great deal of labour market outcomes in Mexico (see, e.g. Taylor et al., 2005; Woodruff and Zenteno, 2007). In the case of their descendants, given their predominantly young age and the fact that they will most likely spend their entire life in the U.S., their performance is vital to the long term development of the country's economy. As argued by Borjas (1993, p. 113), the economic impact of immigration is reliant on both how immigrants adapt to the labour market and the adjustment process experienced by their descendants.

Although previous studies have looked at wage differentials between natives and Mexican-Americans, little attention has been given to the role played by occupational segregation. This chapter extends the current literature in several fronts. First, an updated analysis based on the traditional Oaxaca (1973) and Blinder (1973) framework is performed, where the role of occupational attainment is emphasised. Second, the Brown et al. (1980) and Démurger et al. (2009) decompositions are utilised where, unlike the Oaxaca-Blinder (OB) methodologies, occupational attainment is treated as endogenously determined, and earnings differentials are separated into within or between-occupation differences. This allows explicitly seeing the effect that occupational segregation has on the observed wage differentials between natives and Mexican-Americans. Furthermore, the Duncan and Duncan (1955) index of dissimilarity is calculated to provide an objective measure of the degree to which the occupational structures of the different groups analysed vary. While previous studies have applied the Brown et al. (1980) and Démurger et al. (2009) frameworks to analyse earnings differentials between natives and foreign-born residents, I am not aware of any study that has applied these techniques to investigate the wage gap between natives and immigrants, including Mexican-Americans in the United States. Moreover, to the best of my knowledge, this methodology has not been explicitly applied for the case of second and third generation immigrants regardless of their country of origin or residence.

Among the main results it is observed that the low wages of Mexican-Americans are largely a product of their low education levels and young age, the latter being especially relevant in the case of second and third generation workers. Moreover, while significant unexplained wage differentials are present between all three generations of Mexican-Americans and whites, this is not the case with respect to blacks since their returns to observable characteristics generally fall behind those of second and third generation workers. Pertaining to occupational segregation, this does not seem to play an important role in accounting for wage differentials relative to blacks; whereas with respect to whites this constitutes between 6.1% and 10.0% of the observed wage differentials for different generations of Mexican-Americans. Given the use of broadly defined occupational categories, these results may be interpreted as representing a lower-bound of the proportion of the wage gap attributed to occupational segregation.

The chapter proceeds as follows. Section 2.2 reviews the relevant literature that studies the role of occupations in decomposition analyses, theories of labour market discrimination, and the labour market performance of Mexican-Americans. Section 2.3 describes the data. Section 2.4 presents the empirical and econometric methodologies. Section 2.5 presents the results. Section 2.6 reports sensitivity checks and presents some extensions. Section 2.7 concludes with a summary and some policy implications.

2.2 Literature Review

2.2.1 Occupational Attainment and Wage Decomposition Techniques

The majority of studies that focus on the earnings of immigrants and their descendants do not incorporate occupation related variables in the estimated wage equations. This is done under the belief that both wages and occupations may be imperfect measures of the same variable of interest, which is labour market outcome. In such case, occupation of employment would not be an adequate variable in the wage function. However, occupation is an appropriate variable if the study aims to analyse the channels through which wage gains are obtained (Chiswick and Miller, 2009, p. 454).

To identify the role that differences in occupational attainment have on the wage gap, a variety of decompositions can be used. In the Oaxaca (1973) and Blinder (1973) framework, wage differentials are separated into an explained component, attributed to differences in average characteristics, and an unexplained component, which captures differences in the returns to observed characteristics and is usually interpreted as a measure of discrimination. In this type of study, when occupation is inserted as a productivity related variable, the proportion of the wage gap attributed to the explained component tends to increase. Nevertheless, if occupational differences reflect the presence of barriers encountered by Mexican-Americans to enter native dominated occupations, then it would be erroneous to treat occupation as a productivity related characteristic. Under this scenario, employment of the OB methodology is subject to criticism since it treats occupational attainment as exogenous and does not distinguish between wage discrimination and occupational segregation (Liu et al., 2004, p. 396).

To address this issue, an alternative decomposition was developed by Brown et al. (1980). This procedure directly models occupational attainment treating it as endogenously determined. The Brown-Moon-Zoloth (BMZ) methodology decomposes the wage gap into explained and unexplained within-occupation and between-occupation effects, where the role of occupational segregation on observed wage differentials is explicitly accounted for. This may be relevant from a policy perspective since it offers information on whether policies necessary to promote equal pay within occupations ought to be implemented, or instead, what is required are policies which promote equal access to different occupations for all workers irrespective of their ethnic-origin background.

In a similar spirit, Démurger et al. (2009) propose a decomposition technique based on microsimulation that extends the BMZ methodology. This procedure, formally based on occupation allocation models, has the advantage of allowing for the evaluation of direct as well as indirect changes in the occupational structure on the observed wage differentials. While the direct effect refers to changes in the occupational structure under different allocation rules, the indirect effect refers to the fact that changes in the occupational structure also have an impact on within occupation mean wages.[3]

[3] The literature that focuses on the role of occupations in explaining wage differentials between natives and immigrants is small. Studies that use the BMZ decomposition include Liu et al. (2004) for Hong Kong,

2.2.2 Theories of Labour Market Discrimination

Following Lang and Lehmann (2012), discrimination is understood as the unequal treatment of equal people, or the unequal treatment of people for reasons unrelated to their productivity enhancing characteristics. Discrimination may be reflected not only in being paid less to perform the same task, but also in limiting the range of occupations workers have access to.

There are different theoretical explanations regarding the presence of discrimination in the labour market. One of these consists of taste-based discrimination or personal prejudiced models, first put forward by Becker (1957). Under this framework, the mainstream group (e.g. whites) comprised of employers, workers and consumers, dislikes employing, working with, or purchasing goods and services from the pariah group (e.g. Mexican-Americans). Thus economic agents attach an economic cost in order to avoid interactions or transactions with members belonging to the group that faces discrimination. Nonetheless, this model predicts that in the long-run, if the number of employers who do not discriminate is large enough, the wage differential between the two groups will fall to zero. Under this scenario, employers who discriminate only hire individuals from the mainstream group, and those who do not discriminate are indifferent to who they hire since workers from both groups are considered perfect substitutes. While this implies that the labour market would be partially separated, it does not mean that there would be wage discrimination (Lang and Lehmann, 2012, p. 971).

Elliot and Lindley (2008) for the United Kingdom, and Demoussis, Giannakopoulos and Zografakis (2010) for Greece, among others. The literature that has used the Démurger et al. (2009) methodology is limited to the authors' original study, which focuses on internal migrants in China.

Another branch of the discrimination literature focuses on statistical discrimination, which refers to the case where employers discriminate on the basis of imperfect information regarding the worker's skills or productivity. As suggested by Phelps (1972) and Arrow (1973), this arises because employers have a difficult time assessing the productivity levels of the pariah group relative to mainstream workers. Employers use information regarding group membership to infer individual characteristics, where members of the pariah group are treated like their average which tends to be constituted by relatively lower skilled workers. Over time, employers will use the observable characteristic (i.e. ethnic group, race or gender) as a proxy for the unobservable characteristics that generate differences in productivity levels. Nevertheless, as argued by Arrow (1998, p. 6), ethnic groups may in fact differ according to their unobserved characteristics originating from differences in their cultural background or quality of education, among others.

Following Ehrenberg and Smith (2012), a third fragment of the discrimination literature is constituted by models which are based on the presence of non-competitive forces in the labour market. Within this literature, it has been argued that occupational segregation is the result of a measured crowding policy intended to lower wages in certain over-crowded occupations. On the other hand, dual labour market theory states that the labour market is separated into two noncompeting sectors: a primary sector which offers higher wages, stability and job growth, and a secondary sector which offers low wages, instability and dead-end jobs. In both of the explanations presented above, it is assumed that workers are assigned to certain occupational groups from which mobility is restricted or outright impossible (Ehrenberg and Smith, 2012, p. 422). It has also been suggested that employers may engage in collusive behaviour in order to suppress minorities, creating a situation where trough monopsonistic behaviour they can enforce lower wages upon their employees (see, e.g. Reich, 1971).

Finally, in one of the few theoretical linkages between discrimination and occupation of employment, Baldwin et al. (2001) explicitly model the role of occupational segregation and wage determination. In the model, the authors assume that members of the mainstream group dislike working under managers of the pariah group. Furthermore, there exists an occupational sorting function where the occupational hierarchy of the members of the pariah group is a function of their participation in the lower classified occupations, the wages of members of the mainstream group in these occupations, and their distastes towards working under pariah management. Under this framework, it is predicted that as members of the pariah group move up in the job hierarchy, their relative proportion in each occupation declines exponentially. Unlike Becker's taste based discrimination framework, the model is based on the hypothesis that discrimination against the pariah group is a consequence of their position in the job hierarchy instead of just an aversion to work or interact with them.

2.2.3 The Labour Market Performance of Mexican-Americans

Early studies on immigrants and their descendants in the U.S. include Chiswick (1978), where it is observed that among foreign-born workers, those originating from Mexico are usually in the most underprivileged position. Furthermore, it is argued that in general the Mexican ethnic group performs poorly since first, second and third generation Mexican-Americans have lower earnings than white workers of the same immigrant generation. Focusing on Hispanic men, McManus et al. (1983) find that within this cohort Mexicans have the lowest earnings, due to their low schooling completion levels and significant deficiencies in English language proficiency. In analysing the effect of foreign-born parentage on the earnings of U.S.-born white men, Chiswick (1977) shows that second generation Mexican-Americans earn considerably less than their counterparts of non-Mexican descent, while the earnings of second generation whites differ little from those of white males born to native parents. Farley and Alba (2002) find that workers originating from Mexico tend to be situated at the bottom of the socioeconomic ladder, whereas those from Asian, Canadian and European descent are clustered at the top. The similar results regarding current immigrants and their descendants suggests that the economic disadvantage encountered by Mexican-Americans is not a new occurrence, but instead one that has been present for a considerable number of decades.

Among the studies that focus exclusively on Mexican-Americans, Borjas and Katz (2007) show that in recent decades there has been a growing disadvantage of Mexican immigrants at the top and bottom of the educational distribution. It is argued that this is a product of both their low education levels and the rapid growth of native workers and non-Mexican immigrants who have acquired at least a college degree. As a result, Mexican-origin workers are clustered in low skilled occupations where they have encountered a growing disadvantage in their relative wages. Trejo (1997) demonstrates that the primary reason why Mexican-Americans have low wages relative to black and white workers is because they have lower levels of education, significant deficiencies in their English language proficiency, and in the case of first generation immigrants, lower private returns to their observable skills. Based on data from the November 1979 and 1989 Current Population Survey, the author applies an Oaxaca and Ransom (1994) type decomposition to analyse wage differentials among third generation blacks, whites and Mexican-Americans. It is observed that third generation Mexicans with comparable skills to whites only encounter modest levels of discrimination. This is in contrast to the relationship between blacks and whites, where observable measures in human capital do not account for much of their wage differentials. In a similar analysis, Livingston and Kahn (2002) examine the wages of three generations of Mexican-Americans, where the results show that Mexican-born men and women earn less than their second and third generation counterparts. Nonetheless, once human capital controls are included, the wage pattern shows a steady decline for the case of men and stagnation for the case of women. This suggests that current differences in cross-generational wage patterns are not a product of the wage structure, but instead arise due to differences in human capital endowments. Focusing on inter-generational progress among Mexican-Americans, Trejo (2003) observes that there are substantial gains between first and second generation workers, which appear to be a result of their significant surge in both their educational levels and their returns to education. Moreover, third and higher generation labourers do not perform better than second generation workers.

2.3 Data

2.3.1 Current Population Survey

This chapter uses data from the Current Population Survey's Annual Social and Economic Supplement from 1994 to 2012, conducted by the U.S. Census Bureau and collected from King et al. (2010). Besides capturing the population's labour market characteristics, the CPS contains information on immigration status, birthplace of the respondent's parents, and a variable denoting origin which provides information on the individual's ancestry, among others. The survey allows distinguishing up to three different generations of immigrants.

The different cohorts analysed are defined in the following manner. Respondents who were born in Mexico and migrated to the U.S. after they were 18 years of age or older are classified as first generation (FG) Mexican-Americans. This is done in order to omit those immigrants whose decision to move to the U.S. was taken for them.[4] Second generation (SG) immigrants are constituted by U.S.-born citizens that have either two Mexican-born parents (SG-II) or one U.S.-born parent and one Mexican-born parent (SG-I), respectively. Second generation immigrants are divided into these two groups since there appear to be important differences between them depending on whether both parents were born in Mexico or at least one of them was born in the United States. Third generation (TG) denotes U.S.-born residents with American-born parents that report being of Mexican ancestry. Given the construction of the origin variable, this cohort includes third and higher-order generation immigrants. The reference group throughout the analysis is comprised by U.S.-born citizens with American-born parents who do not report being of Mexican ancestry. Referred to as natives, they are distinguished according to their self-reported race, which can either be black (NB) or white (NW). Remaining individuals not belonging to any of the previous groups are excluded.

The study uses hourly wages and is restricted to full-time workers between 18 and 59 years old. It focuses on male labourers to avoid possible biases associated with selection into the labour force based on cultural differences between natives and different generations of Mexican-Americans. In addition, it excludes the self-employed.[5]

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[4] For an analysis on this so called "1.5" generation see Allensworth (1997).

[5] The measurement of years of schooling, denoted by the highest grade completed variable, is not continuous in the CPS. The following recoding is used to compute years of education in the sample: no school completed or preschool = 0 years; first through fourth grade = 2.5 years; fifth or sixth grade = 5.5 years; seventh or eighth grade = 7.5 years; ninth grade = 9 years; tenth grade = 10 years; eleventh grade or twelfth grade without diploma = 11 years; high school graduate = 12 years; some college, no degree = 13 years; associate degree = 14 years; bachelor's degree = 16 years; master's degree = 17 years; professional or doctorate degree = 20 years.

By pooling cross-sections from the CPS it is possible to identify the impact that occupational segregation has on the earnings differentials between Mexican-Americans and black and white workers. Nonetheless, a potential caveat is that the CPS March supplement does not provide information on English language proficiency, which has been shown to be an important variable when explaining wage differentials between natives and first generation immigrants (see, e.g. Trejo, 1997; Chiswick and Miller, 2009). Furthermore, while the versions of the CPS employed by Trejo (1997, 2003) offer more detailed data in this respect given their inclusion of language proficiency variables, their small sample size prevents them from being a viable data source when studying the impact of occupational segregation on wages. Given that the exclusion of this variable may generate shortcomings in the analysis (e.g. omitted variable bias), this issue is addressed in Section 2.6.3 where census data is used to examine how the results vary when English language proficiency is incorporated.

2.3.2 Occupational Classification

Occupations are classified according to a modified version of the 1990 U.S. Census Bureau occupational classification scheme provided by King et al. (2010). This offers a consistent long-term classification of occupations which allows direct comparability throughout the period of study. Given the restrictions of the sample size, workers are grouped into six broadly defined occupational categories taken from the highest level of aggregation presented in the scheme. The categories are: “Managerial and Professional Specialty”; “Technical, Sales and Administrative Support”; “Precision Production, Craft and Repair”; “Service”; “Operators, Fabricators and Labourers”; and “Other”.

2.3.3 Descriptive Statistics

Descriptive statistics are presented in Table 2.1. The group with the highest earnings is composed by whites, with mean log hourly wages of 2.79. This figure is 0.60 log points higher than that of first generation immigrants, who constitute the most disadvantaged group. Blacks and second and third generation Mexican-Americans have similar mean wages, where among these blacks and second generation immigrants with two Mexican-born parents workers have the highest and lowest earnings, respectively. Furthermore, in each of the six occupations whites have the highest earnings and first generation immigrants have the lowest. On the other hand, blacks do not always earn more than Mexican-Americans. It is observed that substantial progress appears to be made between the first and second generation, but not between the second and third. With respect to first generation immigrants, wages increase by 0.24, 0.36 and 0.35 log points for the case of second generation immigrants with two Mexican-born parents, one Mexican-born parent, and third generation immigrants, respectively. Regarding human capital levels, whites have the highest years of education, while Mexican-born workers have the lowest. Similar to the pattern observed with wages, an increase in years of schooling occurs between the first and second generation. Concerning the age structure, whites constitute the oldest group while second generation immigrants with two Mexican parents make up the youngest.

For all generations of Mexican-Americans it is observed that their age and human capital levels are lower than those presented by blacks and whites. These facts suggest that a possible reason why natives have higher wages is because they have more experience and schooling than Mexican-Americans. Thus, it cannot be ruled out that the observed differences in wages may be driven by socioeconomic and demographic characteristics.

Additional elements that should be taken into account include the fact that Mexican-origin workers tend to be concentrated in California and Texas, which have higher wages than those prevalent in the south-eastern part of the U.S. where a large part of the black population resides. Furthermore, although all figures are in real terms, the increase of the Mexican-American population in recent years suggests that the positive trend in wages could also be playing a role.

Table 2.1 Descriptive statistics

Variable	Mexicans by generation				Natives	
	FG	SG-II	SG-I	TG	Black	White
Age	37.32	31.31	36.26	36.73	39.62	39.61
	(9.75)	(9.63)	(10.98)	(10.56)	(10.43)	(10.30)
Years of education	8.86	12.28	12.69	12.61	13.07	13.78
	(3.84)	(2.26)	(2.13)	(2.15)	(1.98)	(2.27)
Wages	2.19	2.43	2.55	2.54	2.56	2.79
	(.512)	(.573)	(.583)	(.573)	(.570)	(.598)
Observations	25,800	5,590	3,631	15,007	42,676	376,187

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Wages represent the natural logarithm of hourly earnings in 1999 USD.

Looking at wages within occupations, some interesting results emerge. As seen in Table 2.2, within all occupations whites have the highest average earnings and Mexican-born immigrants have the lowest. On the other hand, blacks do not always earn more than Mexican-Americans. In the highest paying occupation, which is "Managerial and Professional Specialty", SG-I workers have higher wages than blacks, while in the "Service" category they are once again surpassed by third generation labourers.

While the fact that the third generation cohort seems to perform slightly worse than their SG-I counterparts may seem counterintuitive, this is consistent with the previous literature (see, e.g. Trejo, 2003). This occurrence appears to arise because ethnic identification is endogenous, where individuals self-report in a non-random manner as belonging to a certain group. As argued by Alba and Islam (2009) and Duncan and Trejo (2011) the least successful second generation workers, i.e. those with two parents born in Mexico, are the ones most likely to report being of Hispanic origin. On the contrary, the descendants of immigrants who engage in intermarriage or encounter the most success in the labour market assimilate to such a high degree that they gradually fade away from empirical observation. Evidence of this is presented by Duncan and Trejo (2007) who observe that 97.0% of U.S.-born individuals with Hispanic ancestors on both sides of their family identify themselves as being of Hispanic-origin, while only 21.0% of those with Hispanic ancestors on one side of their family answer in the same manner. Therefore, it is likely that most of the third generation Mexican-Americans included in the sample are descendants of SG-II individuals and not SG-I immigrants.

Table 2.2 Wages by occupation

Occupation	**Mexicans by generation**				**Natives**	
	FG	SG-II	SG-I	TG	Black	White
Managerial and Professional Specialty	2.73	2.84	2.91	2.87	2.90	3.11
	(.682)	(.576)	(.533)	(.567)	(.564)	(.572)
Technical, Sales and Administrative Support	2.37	2.42	2.55	2.55	2.57	2.79
	(.550)	(.555)	(.583)	(.567)	(.544)	(.592)
Precision Production, Craft and Repair	2.28	2.46	2.59	2.58	2.61	2.71
	(.495)	(.524)	(.525)	(.525)	(.515)	(.488)
Service	2.02	2.32	2.36	2.38	2.36	2.52
	(.440)	(.596)	(.604)	(.587)	(.553)	(.590)
Operators, Fabricators and Labourers	2.21	2.32	2.39	2.40	2.43	2.52
	(.489)	(.521)	(.536)	(.508)	(.522)	(.500)
Other	2.00	2.15	2.33	2.24	2.38	2.47
	(.438)	(.493)	(.504)	(.517)	(.520)	(.571)
Observations	25,800	5,590	3,631	15,007	42,676	376,187

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Wages represent the natural logarithm of hourly earnings in 1999 USD.

2.4 Methodology

2.4.1 Oaxaca-Blinder (OB) Decomposition

Before proceeding, the following notation is defined. Two main categories of workers are considered, natives (N) and Mexican-Americans (M), who can be employed in K different occupations denoted by k. Natives are divided into two different ethnic groups indexed by $n \in N = \{\text{NB}, \text{NW}\}$, while Mexican-Americans are separated into four different generation groups indexed by $m \in M = \{\text{FG}, \text{SG} - \text{II}, \text{SG} - \text{I}, \text{TG}\}$. Furthermore, let P_k^n and P_k^m denote the proportion of workers belonging to groups n and m who are employed in occupation k.

In the OB decomposition, the role of the occupational structure in explaining the wage gap between blacks or whites and Mexican-Americans can be calculated through the estimation of a single wage equation for each different group. In this framework, the role of occupations in explaining the wage gap is accounted for through the inclusion of occupation of employment dummy variables in the following manner:

$$w_i^n = X_i^n \hat{\beta}^n + \sum_{k=1}^{K-1} D_{ik}^n \hat{\beta}_{0k}^n + \varepsilon_i^n \quad (2.1)$$

$$w_i^m = X_i^m \hat{\beta}^m + \sum_{k=1}^{K-1} D_{ik}^m \hat{\beta}_{0k}^m + \varepsilon_i^m \quad (2.2)$$

where w_i is the natural logarithm of hourly wages for individual i, X_i is a vector of exogenous variables and $\hat{\beta}$ its vector of corresponding coefficients, D_{ik} is a dummy variable which equals one if the individual is in occupation k, $\hat{\beta}_{0k}$ is the coefficient for the kth occupational dummy, and ε_i is the error term. Since in the OB decomposition only one regression is estimated for each group, the coefficients in the vector $\hat{\beta}$ are constrained to be same for all K occupations, with the exception of the constant term which varies according to the occupation of employment. Once Eqs. (2.1) and (2.2) are estimated using ordinary least squares (OLS), the OB decomposition can be performed:

$$\overline{w}^n - \overline{w}^m = (\bar{X}^n - \bar{X}^m)\hat{\beta}^n + \sum_{k=1}^{K-1}\hat{\beta}_{0k}^n(P_k^n - P_k^m)$$
$$+\bar{X}^m(\hat{\beta}^n - \hat{\beta}^m) + \sum_{k=1}^{K-1}(\hat{\beta}_{0k}^n - \hat{\beta}_{0k}^m)P_k^m \qquad (2.3)$$

where $\overline{w}$ is the mean of the natural logarithm of hourly wages, $\bar{X}$ is a vector of the mean values of the exogenous variables, and $\hat{\beta}$ is the estimated wage equation coefficients. P_k^n and P_k^m enter the decomposition since the sample mean of occupational dummy k is equal to the proportion of individuals in groups n or m belonging to occupation k.

The first component on the right hand side of Eq. (2.3) captures differences in wages arising from differences in observable characteristics, while the second component accounts for dissimilarities in the levels of participation in each occupation. These two terms constitute the explained component or endowment effect. The third component captures different returns to observable characteristics, while the fourth component accounts for compensating differentials related to the occupation of employment. These last two terms constitute the unexplained component or coefficient effect, and are commonly used as a measure of discrimination. Since differences in the coefficients likely capture variations in unobserved characteristics that also impact wages, these terms need to be taken as an upper-bound of the possible discrimination that exists in the labour market.

Nevertheless, the OB methodology is subject to concerns. The first is the index number problem, which refers to fact that the results are dependent on which group is assumed to reflect the true wage structure encountered in the absence of discrimination. In this study, the black and white wage structures are taken as the non-discriminatory standard. A second concern corresponds to the fact that for sets of dummy variables, the detailed decomposition results are dependent on the choice of the omitted group category. Finally, the main disadvantage of the OB decomposition is that it takes the differentials in occupational proportions between groups n and m as exogenous, thus treating them as part of the endowment effect. This approach presents serious deficiencies if the distribution of workers between occupations is affected by discriminatory practice. To minimise this issue, Brown et al. (1980) extend the analysis by treating occupational attainment as endogenous and allowing the wage equation coefficients to vary between occupations.

2.4.2 Brown-Moon-Zoloth (BMZ) Decomposition

Unlike the OB decomposition, the approach developed by Brown et al. (1980) requires the estimation of occupation-specific wage regressions for each group $n \in N$ and $m \in M$:

$$w_{ik}^{n} = X_{ik}^{n}\hat{\beta}_{k}^{n} + \varepsilon_{ik}^{n} \tag{2.4}$$

$$w_{ik}^{m} = X_{ik}^{m}\hat{\beta}_{k}^{m} + \varepsilon_{ik}^{m} \tag{2.5}$$

where $\hat{\beta}_k$ is a vector of wage coefficients specific to occupation $k = 1,2, \dots, K$. Since P_k is the proportion of workers in occupation k, the overall mean wage differential between individuals belonging to groups $n \in N$ and $m \in M$ can be calculated from Eqs. (2.4) and (2.5) in the following manner:

$$\bar{w}^n - \bar{w}^m = \sum_{k=1}^{K}(P_k^n \bar{w}_k^n - P_k^m \bar{w}_k^m) \tag{2.6}$$

$$\bar{w}^n - \bar{w}^m = \sum_{k=1}^{K} P_k^m (\bar{X}_k^n - \bar{X}_k^m)\hat{\beta}_k^n + \sum_{k=1}^{K} \bar{X}_k^n \hat{\beta}_k^n \left(P_k^n - \hat{P}_k^m\right)$$
$$+\sum_{k=1}^{K} P_k^m \bar{X}_k^m \left(\hat{\beta}_k^n - \hat{\beta}_k^m\right) + \sum_{k=1}^{K} \bar{X}_k^n \hat{\beta}_k^n \left(\hat{P}_k^m - P_k^m\right) \tag{2.7}$$

where adding and subtracting terms on the right hand side of Eq. (2.6) and manipulating terms yields Eq. (2.7). In this case, $\hat{P}_k^m$ denotes the proportion of Mexican-American workers $i \in m$ who would be employed in occupation k if they were to face the same occupational structure as that encountered by native workers $i \in n$.

The first component on the right hand side of Eq. (2.7) captures wage differentials derived from differences in measured characteristics within occupations, while the second component explains differentials generated by dissimilarities in allocation shares between occupations. These two terms constitute the within explained (WE) and between explained (BE) components, respectively. The third term reflects compensating differentials within occupations, while occupational segregation and different preferences between the two groups are captured by the fourth term. These two terms constitute the within unexplained (WU) and between unexplained (BU) components, respectively.

The BMZ procedure requires the estimation of occupation specific wage regressions and a method for predicting $\hat{P}_k^m$. Given the constraints of the data set, the latter is done through an estimation of a reduced form multinomial logit (MNL) model. The MNL captures how different variables affect the probability of an individual working in an occupation, treating the occupational choice as endogenously determined. This probability may be defined as:

$$P_{ik} = \Pr(y_i = Occ_k) = \frac{\exp(Z_i\hat{\gamma}_k)}{1+\sum_{k=1}^{K-1}\exp(Z_i\hat{\gamma}_k)} + \eta_{ik} \tag{2.8}$$

where Z_i is a vector of labour supply and demand related exogenous variables presumed to determine occupational attainment, $\hat{\gamma}_k$ is a vector of coefficients corresponding to the kth occupation, and η_{ik} is the error term. As stated by Démurger et al. (2009, p. 613), the reduced form MNL captures both supply driven differences in group preferences and demand driven constraints. Both of these factors are likely to generate differences in the estimated coefficients between natives and Mexican-Americans, where the influence of limited access to some occupations for certain groups indicates occupational segregation.

To obtain $\hat{P}_k^m$, estimates of the parameters of Eq. (2.8) are calculated for natives, and the Mexican-American data is subsequently substituted into the estimated equations. This produces for every individual $i \in m$ a vector of predicted probabilities of belonging to each occupation k. Afterwards, these probabilities are added over observations to produce the predicted or non-discriminatory occupational distribution of each group of Mexican-American workers.

Since occupational attainment is determined by the interaction between demand and supply factors where workers may differ among unobservable characteristics between occupations, the samples of individuals observed in each occupation may not be random. Thus, it is necessary to use the information obtained from Eq. (2.8) to adjust the occupation-specific wage equations for potential effects generated by selection bias. Following Lee (1983), the wage equations are modified and conditional on occupation k being chosen are given by:

$$w_{ik} = X_{ik}\hat{\beta}_k + \hat{\theta}_k \lambda_{ik} + \xi_{ik} \tag{2.9}$$

where $\hat{\theta}_k = \sigma_k \rho_k$, $\lambda_{ik} = -\frac{\phi[\tau(Z_{ik}\hat{\gamma}_k)]}{F(Z_{ik}\hat{\gamma}_k)}$ and ξ_{ik} is an error term.

In Eq. (2.9), ϕ is the standard normal probability density function, σ_k is the standard error of the disturbance term, and ρ_k is the correlation between the error terms of Eqs. (2.8) and (2.9). The function τ is a strictly increasing transformation that converts the random variables associated with occupational attainment into a standard normal variant, i.e. $\tau = \Phi^{-1}(F)$, where Φ is the standard normal cumulative distribution function, and F is the distribution function of the MNL as defined in Eq. (2.8). Estimation is carried out in two stages. First, estimates of the coefficient vector in the MNL equation are obtained from Eq. (2.8), and second, these estimated coefficients are used to calculate λ_{ik}. The variables included in Z_{ik} are expected to affect the individual's desire for a particular occupation as well as the willingness of employers to hire an individual. The analysis employs as excluded instruments that identify selectivity indicators for number of children below six and household size. These variables are assumed to shift the probability of being employed in occupation k and not affect wages. Nonetheless, attaining identification in the selectivity model is difficult since no available variable can be considered completely exogenous.[6]

[6] Attaining identification in the selectivity model is, in general, not an easy task. While certain cases offer an obvious instrument or set of instruments to identify the selection effect (e.g. when analysing the wage determination of participating women, it is likely that the age of dependent children will affect the participation decision but not the wage, therefore representing an obvious instrument) other applications may not allow such straightforward solutions. More specifically, it is difficult to find exogenous variables that shift the probability of occupation of employment and not the mean wage. This represents an obvious limitation of the chapter.

2.4.3 Démurger-Gurgand-Shi-Ximing (DGSX) Decomposition

Démurger et al. (2009) extend the BMZ methodology where the authors develop a decomposition based on microsimulation. The procedure decomposes mean wage differentials between two groups into the same four components as the BMZ approach. However, the method proposed by DGSX allows evaluating the effect that both indirect and direct changes in occupation allocations have on wage differentials. While the direct effect corresponds to the BU term in the BMZ procedure, the indirect effect refers to the fact that changes in the occupational structure have an ancillary impact on within occupation mean wages, as they alter the population composition of the different occupations.

Démurger et al. (2009) argue that in the BMZ decomposition, the change in the proportion in each occupation, i.e. $\hat{P}_k^m - P_k^m$, is evaluated at wage $\bar{X}_k^n \hat{\beta}_k^n$, which is the observed average wage rate in occupation k. However, by changing the occupation allocation rule of m from $\hat{\gamma}^m$ to $\hat{\gamma}^n$, mean wages in each occupation are modified accordingly given that the workers allocated into each occupation are no longer the same. To address this issue, the authors propose that each counterfactual occupation proportion be evaluated using mean wages consistent with its counterfactual population structure. Thus, the following decomposition is specified:

$$\bar{w}^n - \bar{w}^m = \sum_{k=1}^{K} P_k^m \left(\bar{X}_k^n - \bar{\bar{X}}_k^m\right) \hat{\beta}_k^n + \sum_{k=1}^{K} \bar{X}_k^n \beta_k^n \left(P_k^n - \hat{P}_k^m\right)$$

$$+\sum_{k=1}^{K} P_k^m \bar{\bar{X}}_k^m \left(\hat{\beta}_k^n - \hat{\beta}_k^m\right) + \sum_{k=1}^{K} \bar{X}_k^n \hat{\beta}_k^n \left(\hat{P}_k^m - P_k^m\right) + \sum_{k=1}^{K} P_k^m \left(\bar{\bar{X}}_k^m - \bar{X}_k^m\right) \hat{\beta}_k^m \quad (2.10)$$

where $\bar{\bar{X}}_k^m \hat{\beta}_k^m$ is the average earnings computed over the individuals $i \in m$ that would be in sector k under the allocation rule of n. The first two terms of Eq. (2.10) represent the

WE and BE components and constitute what Démurger et al. (2009) refer to as the population effect. The third term denotes the WU component and is denoted as the earnings or hourly wage effect. Furthermore, the fourth term symbolizes the BU component, while the fifth term is added by the DGSX approach. The fourth and fifth terms represent the allocation or occupation effect, where the former embodies the direct allocation effect and the latter the indirect effect. The fifth term depends on a gap in average earnings between those individuals $i \in m$ that would be in occupation k under the allocation rule of n and the individuals in $i \in m$ who are initially observed to be in occupation k.

Following Démurger et al. (2009, p. 615), the implementation of the DGSX decomposition requires simulating individual counterfactual occupations. In order to accomplish this, values of η are initially drawn for each worker, conditional on Z_i and the worker's observed occupation. Subsequently, these drawn values are used to determine each individual's allocation into counterfactual occupations. Specifically, if individual $i \in m$ has received $(\hat{\eta}_{i1} \dots \hat{\eta}_{ik})$ compatible with his observed occupation, the occupation allocation counterfactual according to the black or white structure will denote that the worker is employed in occupation k if $(Z_{ik}\hat{\gamma}_k^n + \hat{\eta}_{ik}) = \max_{j \in K}\{Z_{ij}\hat{\gamma}_j^n + \hat{\eta}_{ij}\}$. Finally, wage counterfactuals also incorporate residuals from the occupation specific wage regressions based on observed status.

2.5 Results

2.5.1 Oaxaca-Blinder (OB)

This section presents the first set of estimation based results. OLS regressions are performed where the natural logarithm of hourly wages is taken as the dependent variable. Exogenous variables include years of education, potential experience, potential experience squared and a dummy variable for marriage status. Additional controls include the state of residence unemployment rate, a time trend and regional dummies, including separate dummies for California and Texas. Regional dummy variables are inserted in order to control for geographical differences in labour market characteristics and living costs. These include metropolitan status and the nine census regions.

Table 2.3 OLS log wage regressions

Coefficients	Mexican Americans				Natives	
	FG	SG-II	SG-I	TG	Blacks	Whites
Intercept	1.589***	1.238***	.930***	1.075***	.917***	.941***
	(.050)	(.162)	(.129)	(.075)	(.032)	(.009)
Education	.031***	.079***	.082***	.077***	.086***	.083***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.001)
Experience	.020***	.041***	.036***	.036***	.027***	.041***
	(.001)	(.002)	(.002)	(.001)	(.001)	(.003)
Experience^2/100	-.021***	-.068***	-.055***	-.059***	-.039***	-.071***
	(.002)	(.005)	(.006)	(.003)	(.002)	(.001)
Married	.096***	.183***	.171***	.176***	.151***	.189***
	(.006)	(.014)	(.017)	(.008)	(.005)	(.001)
State unemployment rate	-.002	-.013*	-.000	-.011***	-.006***	-.001**
	(.003)	(.006)	(.008)	(.004)	(.002)	(.000)
In metropolitan area	.023**	.036	.029	.095***	.118***	.141***
	(.009)	(.024)	(.023)	(.011)	(.008)	(.001)
Observations	25,800	5,590	3,631	15,007	42,676	376,187

*p<.1, **p<.05, ***p<.01
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Additional controls include dummy variables for occupations, year, state, and census division.

As seen in Table 2.3, Mexican-born immigrants have substantially lower returns to schooling compared to the U.S.-born population. This is in part due to the fact that FG workers generally obtained their education in a different language (i.e. Spanish) and that they were exposed to a lower quality schooling system in Mexico. Unlike U.S.-born workers, immigrants encounter an imperfect transferability of their skills upon entering the American labour market. Furthermore, the returns to education of SG and TG workers are lower than those of blacks and whites. Previous explanations include the fact that many U.S.-born Mexican-origin workers spend a share of their childhood in Mexico where they receive part of their formal schooling (Rendall and Torr, 2008). Moreover, Trejo (2003) argues that since many FG immigrants are employed in agriculture and similar seasonal industries, their children may be subject to constant movement within the U.S. which may disrupt their education. Additionally, given that a large share of Mexican-Americans live in rural areas, their lower returns to education may be a consequence of their exposure to lower quality schools within the United States.

On the other hand, there is a great deal of variation regarding the returns to potential experience. For the case of Mexican-born workers, their low returns reflect the low premium associated with pre-immigration experience, since the variable captures the returns to job training and work experience in both the U.S. and Mexico. Pertaining to SG and TG workers, their returns to potential experience greatly surpass those of FG immigrants and blacks, while they are slightly lower than those of whites. An explanation for the low returns to experience of blacks is given by the fact that they have lower levels of labour force participation and higher unemployment rates than the other groups, in which case there is a measurement problem where their levels of potential experience are overstated. As an example, during the period of study blacks had a labour force participation rate of 88.0% compared to 95.1% for FG immigrants, while their unemployment rate ascended to 10.8% compared to 5.0% for the case of whites.

Additional controls show that married individuals tend to have higher wages than those who are not married. Regarding the impact of the state unemployment rate, this has a negative effect where the cohorts most sensitive to economic downturns are SG-II and TG workers. Finally, while natives and TG workers who reside in metropolitan areas earn substantially more than their counterparts who live in suburban or rural areas, FG and SG workers have much more heterogeneous wages irrespective of their place of residence.

Table 2.4 OB decomposition: Blacks and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential	.361***	.120***	.003	.014**
	(.004)	(.008)	(.010)	(.005)
Explained: Differences in average characteristics	.319***	.132***	.038***	.040***
	(.007)	(.007)	(.007)	(.005)
Education	.361***	.067***	.031***	.039***
	(.006)	(.002)	(.003)	(.001)
Experience	-.017***	.100***	.041***	.031***
	(.001)	(.002)	(.002)	(.001)
Occupation	.031***	-.004***	-.012***	-.012***
	(.002)	(.001)	(.001)	(.001)
Region	-.028***	-.035***	-.015***	-.006
	(.003)	(.005)	(.004)	(.004)
Period	-.001	.001	.002***	.001**
	(.001)	(.001)	(.001)	(.000)
Unexplained: Differences in coefficients	.042***	-.011	-.035***	-.026***
	(.008)	(.008)	(.009)	(.006)
Education	.486***	.082*	.036	.106***
	(.015)	(.043)	(.058)	(.032)
Experience	.051***	-.098***	-.090***	-.075***
	(.015)	(.016)	(.024)	(.014)
Occupation	.026***	-.006	-.006	-.006
	(.005)	(.011)	(.015)	(.008)
Region	.105**	.307**	.005	.073
	(.046)	(.152)	(.101)	(.067)
Period	.005	.042	.045	.049**
	(.018)	(.028)	(.038)	(.021)
Intercept	-.672***	-.321*	-.013	-.158*
	(.059)	(.166)	(.133)	(.081)

***p<.1, **p<.05, *p<.01

Note: the OLS coefficients of black workers are taken as the non-discriminatory vector.

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.3.

Table 2.4 presents the results of the OB decomposition of log wage differentials between blacks and Mexican-Americans. The total wage gap between blacks and FG workers stands at .361 log points. This difference is reduced to .120 log points for the case of SG-

II workers, whereas SG-I and TG labourers have similar wages to those of African-Americans. For Mexican-born immigrants, the explained component accounts for 88.4% of the total wage gap. Therefore, while FG workers have significantly lower wages than blacks, this is driven by differences in average characteristics and not by differences in the returns to these characteristics. Considering that FG workers tend to have low levels of English language proficiency and that the cohort includes illegal immigrants, Mexican-born workers do not seem to be discriminated against relative to blacks. With respect to second and third generation Mexican-Americans, the results suggest that based on differences in observables their total wage gap with respect to blacks should be larger than what is actually observed. This implies that U.S.-born Mexican-Americans have higher returns to their observable characteristics and could be interpreted as blacks being exposed to a negative wage premium. A partial explanation for this is that blacks are more heavily concentrated in regions of the country where racial prejudice is most severe.

Pertaining to the detailed decomposition, the explained component between blacks and FG workers is dominated by differences in average levels of schooling. On the other hand, for second and third generation Mexican-Americans wage differentials are mostly a product of their lower schooling levels and fewer years of work experience, where the latter is not an issue of concern as it is driven by age differentials. Observing differences in occupational attainment, these explain 8.6% of the total wage gap between blacks and FG immigrants, suggesting that the former are employed in better compensated occupations. Nevertheless, the same cannot be said for U.S.-born Mexican origin workers, since the negative sign of the occupational component implies that it is them who are employed in better remunerated occupations with respect to blacks. The negative effect of the regional term denotes the fact that Mexican-Americans tend to be concentrated in areas with higher mean wages than blacks. Concerning unexplained wage differentials, for the case of FG immigrants these are largely driven by differences in the returns to education, while this effect is also positive for second and third generation immigrants. Furthermore, differences in returns to experience have a positive effect on the unexplained wage gap between blacks and FG workers, while this contributes negatively for the case of SG and TG immigrants. Regarding occupations, blacks have higher returns to occupation of employment than FG immigrants. This is not the case for subsequent generations, where the occupation coefficient effect is not statistically different from zero. Finally, differences in the intercepts between blacks and Mexican immigrants arise because the latter have significantly lower returns to education and experience and thus a much flatter wage profile. A similar relationship occurs for the case of second and third generation immigrants, where their lower returns to education and comparable wages relative to blacks lead to larger intercepts. These results also depend on the base categories elected for the categorical variables.

A different picture emerges when analysing wage differentials between whites and Mexican-Americans. Table 2.5 shows that the largest wage gap observed for any two groups is the one between whites and FG workers, which ascends to .599 log points. Between first and subsequent generation immigrants substantial progress is made. For SG-II workers their total wage gap with respect to whites is .358 log points while for the SG-I population it stands at .247 log points. This accounts for a 40.2% reduction in the total wage gap relative to their direct ancestors for the case of the SG-II population and a 59.8% reduction for the case of SG-I labourers. TG workers present a total wage gap of .252 log points with respect to whites. Relative to the SG-II population, this represents a reduction of the wage gap of 29.6%, yet comparing this to SG-I workers leads to a 4.6%

increase of the total wage gap. Analysing the explained component, the observable characteristics of FG immigrants explain 67.6% of their total wage gap with respect to whites, while for the SG-II and SG-I population this drops to 67.0% and 61.0% respectively, before descending to 58.3% for the case of TG workers. Analogously, these results imply that the magnitude of the unexplained component increases by generation. This is surprising, since it is expected that as different generations of Mexican-Americans assimilate into the U.S. their resemblance to native workers increases in terms of both their observable and unobservable characteristics.

Regarding the detailed decomposition, the endowment effect is largely driven by differences in average education levels. For all generations, this term accounts for at least 49.6% of the explained component. Analysing work experience, FG immigrants are on average more experienced than whites. The negative effect of this component assumes that both pre-immigration and post-immigration experience is remunerated at the same rate that experience is compensated for whites. In the case of U.S.-born Mexican-origin workers, the results suggest that among the reasons whites have higher wages is because they have more years of experience. On the other hand, occupation of employment is significant in explaining wage differentials for all generations, implying that whites occupy better remunerated positions than Mexican-Americans. The negative effect of the region component signifies that the Mexican- origin population is concentrated in areas with higher mean wages than whites. With respect to the unexplained component, differences in returns to education have a large positive effect on the wage gap between whites and Mexican-Americans. Moreover, returns to experience play a similar role to the one found when analysing wage differentials relative to blacks. Concerning the role of occupations, FG workers have lower returns to being employed in the same occupations as whites, while this effect is not significant for succeeding generations. Nevertheless, this does not take into account the possible presence of barriers to entry into different occupations. The negative values of the intercepts are again driven by differences in the wage profile originated by variations in the returns to education and experience.

Table 2.5 OB decomposition: Whites and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential	.599***	.358***	.241***	.252***
	(.003)	(.007)	(.009)	(.004)
Explained: Differences in average characteristics	.405***	.240***	.147***	.147***
	(003)	(.004)	(.005)	(.003)
Education	.390***	.119***	.086***	.093***
	(.002)	(.002)	(.002)	(.001)
Experience	-.019***	.112***	.044***	.030***
	(.001)	(.002)	(.002)	(.001)
Occupation	.090***	.042***	.033***	.034***
	(.001)	(.001)	(.001)	(.001)
Region	-.050***	-.065***	-.038***	-.026***
	(.001)	(.002)	(.002)	(.001)
Period	-.002***	-.004***	.001***	-.001***
	(.001)	(.001)	(.000)	(.000)
Unexplained: Differences in coefficients	.194***	.118***	.093***	.105***
	(.004)	(.006)	(.008)	(.004)
Education	.466***	.040	-.009	.061*
	(.009)	(.039)	(.055)	(.037)
Experience	.160***	-.003	.013	.032***
	(.013)	(.015)	(.023)	(.012)
Occupation	.034***	.012	.014	.013*
	(.004)	(.011)	(.014)	(.007)
Region	.133***	.343**	.033	.099
	(.042)	(.151)	(.099)	(.063)
Period	-.018	.019	.019	.023
	(.014)	(.026)	(.036)	(.018)
Intercept	-.647***	-.297*	.011	-.133*
	(.051)	(.163)	(.129)	(.075)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of white workers are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.3.

To put the results into context, it is observed that the total wage gap between blacks and whites stands at .238 log points, of which .115 log points or 48.3% is attributed to the explained component. Hence if the unexplained component is interpreted as a measure of discrimination, the analysis shows that blacks are exposed to a higher degree of discrimination from whites than first, second and third generation Mexican-Americans. Nevertheless, Trejo (1997, p. 1263) argues that is not necessarily true since the productivity related measures captured in the CPS may be more informative for Mexican-Americans than for blacks.

2.5.2 Brown-Moon-Zoloth (BMZ)

The MNL occupational attainment model specified in Eq. (2.8) is estimated separately for all groups, where the occupational category “Other” is used as the default group. Table 2.6 presents the model’s marginal effects. Among the explanatory variables, education appears to play an important role in predicting employment into the highest paying occupations, where its effect is strongest for natives. An opposite story emerges regarding lower skilled categories, where an additional year of schooling tends to reduce the probability of attachment. Nevertheless, while this is true for all cohorts, for FG immigrants the effect is much weaker at the top and bottom of the occupational distribution. This gives credence to the anecdotal thinking that irrespective of their educational levels Mexican-born workers are clustered in low-skilled jobs.

Regarding potential experience, the model shows that this is generally associated with an increase in the probability of attachment in the “Managerial and Professional Specialty”, “Precision Production, Craft and Repair” and “Operators, Fabricators and Labourers” categories. For other occupations, its effect tends to be negative for low levels of years of experience but positive for higher amounts.

Table 2.6 MNL occupational attainment. Marginal effects

	Mexican Americans				Natives	
Coefficients	**FG**	**SG-II**	**SG-I**	**TG**	**Blacks**	**Whites**
	Managerial and Professional Specialty					
Education	.005***	.053***	.078***	.072***	.080***	.133***
	(.000)	(.002)	(.003)	(.001)	(.001)	(.000)
Experience	.001***	.004***	.001	.003***	.001	.005***
	(.000)	(.001)	(.002)	(.001)	(.001)	(.000)
Experience^2/100	-.000	-.006**	-.001	-.006***	-.001	-.005***
	(.001)	(.003)	(.005)	(.002)	(.001)	(.001)
Married	.002**	.006	.030**	.016**	.018***	.053***
	(.001)	(.008)	(.014)	(.006)	(.004)	(.002)
State unemployment rate	.000	.002	.006*	.003**	.000	.001***
	(.000)	(.001)	(.003)	(.001)	(.000)	(.000)
In metropolitan area	.002**	.015	.032*	.026***	.044***	.052***
	(.001)	(.013)	(.014)	(.007)	(.004)	(.002)
# Children <=5	.001	-.005	-.001	-.001	.011***	.008***
	(.001)	(.006)	(.011)	(.004)	(.004)	(.001)
Household size	-.001***	-.003	-.005	-.005***	-.007***	-.003***
	(.000)	(.002)	(.004)	(.001)	(.001)	(.000)
	Technical, Sales and Administrative Support					
Education	.008***	.043***	.039***	.039***	.036***	.020***
	(.000)	(.003)	(.004)	(.002)	(.001)	(.000)
Experience	.001**	-.008***	-.001	-.004***	-.007***	-.003***
	(.000)	(.002)	(.002)	(.001)	(.001)	(.000)
Experience^2/100	-.000	.019***	.002	.005*	.011***	.006***
	(.001)	(.005)	(.006)	(.003)	(.001)	(.001)
Married	-.000	-.037**	-.054***	-.018**	-.017***	-.017***
	(.003)	(.015)	(.019)	(.009)	(.005)	(.002)
State unemployment rate	.001	.003	.001	-.001	.000	-.001**
	(.001)	(.003)	(.004)	(.002)	(.000)	(.000)
In metropolitan area	.013***	.084***	.022	.086***	.100***	.066***
	(.004)	(.020)	(.022)	(.009)	(.005)	(.001)
# Children <=5	-.002	.001	.003	-.014**	-.001	-.003**
	(.002)	(.011)	(.015)	(.007)	(.005)	(.001)
Household size	.000	-.001	.008*	.001	-.001	-.001**
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
	Precision Production, Craft and Repair					
Education	-.002**	-.032***	-.033***	-.043***	-.020***	-.069***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
Experience	.003***	.006***	.004	.005***	.004***	.004***
	(.001)	(.002)	(.002)	(.001)	(.001)	(.000)
Experience^2/100	-.011***	-.017***	-.005	-008***	-.004***	-.010***
	(.002)	(.005)	(.006)	(.003)	(.001)	(.001)
Married	.028***	.023	.055***	.035***	.020***	.004**
	(.007)	(.014)	(.017)	(.009)	(.004)	(.001)
State unemployment rate	-.009***	.000	-.008*	-.005**	-.001	-.002***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
In metropolitan area	.036***	-.006	-.011	-.040***	-.036***	-.036***
	(.008)	(.020)	(.021)	(.010)	(.005)	(.001)
# Children <=5	.015***	.007	.005	.012*	-.003	.001
	(.005)	(.010)	(.013)	(.006)	(.004)	(.001)
Household size	-.003*	-.000	-.002	-.000	.001	.001***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
	Service					
Education	.001	-.003	-.006	-.002	-.018***	-.013***
	(.001)	(.002)	(.003)	(.001)	(.001)	(.001)
Experience	-.003***	-.002	-.005**	-.003***	-.001	-.003
	(.001)	(.001)	(.002)	(.001)	(.001)	(.001)
Experience^2/100	.005***	.008**	.013**	.008***	.002	.006***
	(.001)	(.004)	(.005)	(.002)	(.001)	(.000)
Married	-.025***	-.001	-.046***	-.023***	-.053***	-.030***
	(.006)	(.012)	(.016)	(.007)	(.005)	(.001)
State unemployment rate	.009***	.002	.000	.005***	.004***	.002***
	(.001)	(.002)	(.003)	(.001)	(.001)	(.000)
In metropolitan area	.093***	.021	-.010	-.000	.031***	-.007***

	(.006)	(.016)	(.017)	(.008)	(.005)	(.001)
# Children <=5	-.006	-.009	.018	-.006	.003	-.001
	(.004)	(.009)	(.011)	(.006)	(.005)	(.001)
Household size	-.004***	-.004	-.005	-.001	.002*	-.001
	(.001)	(.003)	(.003)	(.002)	(.001)	(.001)
	Operators, Fabricators and Labourers					
Education	.001	-.048***	-.070***	-.054***	-.074***	-.066***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.001)
Experience	.002**	.002	.003	.001	.004***	-.001***
	(.000)	(.002)	(.002)	(.001)	(.001)	(.000)
Experience²/100	.000	-.007	-.015**	-.002	-.008***	.002***
	(.002)	(.005)	(.006)	(.003)	(.002)	(.000)
Married	-.009	.001	-.008	-.033***	-.005	-.029***
	(.008)	(016)	(.018)	(.009)	(.005)	(.001)
State unemployment rate	-.001	-.005	.001	-.002	-.002*	.001***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
In metropolitan area	-.009	-.096***	-.022	-.049***	-.115***	-.057***
	(.010)	(.025)	(.022)	(.010)	(.007)	(.001)
# Children <=5	-.010*	-.004	-.027*	.004	-.010*	-.003***
	(.005)	(.011)	(.014)	(.006)	(.005)	(.001)
Household size	.007***	.008**	.003	.006***	.004***	.002***
	(.001)	(.003)	(.004)	(.002)	(.001)	(.000)
	Other					
Education	-.014***	-.011***	-.007***	-.011***	-.020***	-.004***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)
Experience	-.004***	-.001**	-.003***	-.002***	.004***	-.002***
	(.001)	(.000)	(.000)	(.000)	(.001)	(.000)
Experience²/100	.006***	.003	.006***	.003***	.001	.001***
	(.001)	(.002)	(.002)	(.001)	(.001)	(.000)
Married	.003	.007	.023***	.024***	.020***	.019***
	(.005)	(.006)	(.006)	(.003)	(.004)	(.001)
State unemployment rate	.000	-.003**	.001	-.000	-.000	-.001***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)
In metropolitan area	-.136***	-.018*	-.010	-.022***	-.036***	-.017***
	(.009)	(.010)	(.008)	(.004)	(.005)	(.001)
# Children <=5	.003	.010**	.001	.005**	-.003	-.001
	(.003)	(.004)	(.005)	(.002)	(.004)	(.001)
Household size	.001	-.000	.001	-.001	.001	.001***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)
Pseudo-R-squared	.055	.087	.101	.093	.107	.138
Observations	25,800	5,590	3,631	15,007	42,676	376,187

*p<.1, **p<.05, ***p<.01
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Additional controls incorporated in the regressions include a time trend and dummy variables for state, and census division.

On the other hand, variables related to the worker's family situation show that the married population has a higher probability of being employed at the top of the occupational distribution. Nevertheless, there is a great deal of variation in the magnitude of the coefficients for different cohorts. Pertaining to the number of children under age six, this has a positive effect on the probability of working in the "Managerial and Professional Speciality" category for the case of natives, whereas for Mexican-Americans its effect is not statistically different from zero. Moreover, its effect in the "Operators, Fabricators and Labourers" category is negative, except for SG-I workers where it is not significant. In medium and low-skilled categories, no clear pattern emerges. Observing household size, for all workers this has a negative effect on the probability of attachment in the highest paying occupation and a positive effect for the case of the lowest paying occupation.

Additional controls show that an increase in the state unemployment rate is generally associated with a higher probability of being employed at the top of the distribution. Nevertheless, this effect is not statistically significant for the case of blacks, first generation immigrants and SG-II workers. A similar relationship is present in the "Service" category, whereas in the "Precision Production, Craft and Repair" occupation its effect is mostly negative. Furthermore, workers residing in metropolitan areas are less likely to be employed at the bottom of the distribution, except for FG immigrants. In summary, the effect of the explanatory variables on occupational attainment varies significantly between the populations of interest, meaning that natives and Mexican-Americans are allocated quite differently based on their observed characteristics.

Attention now turns to the occupation specific wage regressions presented in Table 2.7. While the results are similar to the ones observed in Table 2.3, not all patterns are consistent between different occupations. For instance, at the top of the occupational distribution the returns to education of FG immigrants are much more similar to those of natives compared to what had been previously observed. This suggests that differences in returns to schooling are in large part driven by the fact that FG immigrants are concentrated in low-paying jobs. Nonetheless, the remaining gap implies that compensating differentials within occupations are also present. Additionally, it can be seen that in the "Operators, Fabricators and Labourers" category the returns to education of whites are lower than those of other cohorts excluding FG immigrants. Regarding returns to potential experience, SG and TG workers are commonly better compensated than whites for low experience levels in the highest paying occupations. In addition, for all categories the returns to experience of blacks and FG immigrants are always low. While this is expected at bottom of the distribution, it is also true for individuals who are higher-up in the occupational ladder. The findings indicate that there is variation in the effects of the covariates on the different groups depending on their occupation of employment.

The results of the BMZ decomposition of log wage differentials between blacks and Mexican-Americans are provided in Table 2.8. For FG immigrants, 79.2% of their total wage gap with respect to blacks can be accounted by the WE and BE components. As with the OB decomposition, this implies that the majority of the wage gap between blacks and Mexican-born workers arises due to differences in the average characteristics of the two groups. These differences are mainly observed among individuals working in the same occupations, where the WE term has the largest effect and rises to 60.1% of the total wage gap. On the other hand, the BU component, which captures the effect of occupational segregation, represents 1.1% of the total wage gap. Given that the BU term is not statistically significant, it can be inferred that occupational segregation does not play a meaningful role in explaining the observed wage differentials between blacks and FG immigrants. For subsequent generations a common situation arises, where wage differentials associated to both explained terms are greater than the total wage gap with respect to blacks. This results in the unexplained components having a negative effect, implying that the total wage gap between blacks and SG-II, SG-I and TG workers should be larger than what is actually observed. Pertaining to the BU term, its negative effect suggests that blacks encounter more barriers to entry into the higher paying occupations than second and third generation Mexican-Americans. Nonetheless, it cannot be discarded that this may also be a product of the different preferences of blacks which limit their occupational attachment at the top of the distribution.

Table 2.9 displays the results of the BMZ decomposition between whites and Mexican-Americans. Substantially different patters emerge relative to those previously obtained. In general, the WE and BE components never jointly represent more than 62.6% of the total wage gap, where this terms carry the most weight for the case of SG-II workers. As a result, even within occupations a large unexplained component that affects the wage gap between whites and Mexican-Americans is present. Regarding FG immigrants, the WE, BE and WU components constitute most of the observed wage differentials, while the BU term is statistically significant and represents 9.3% of the total wage gap. Moreover, for second and third generation Mexican-Americans a different pattern emerges as all four terms play an important role. Among these, the WU represents between 31.3% and 40.5% of the total wage gap for different cohorts, as a result of different compensating differentials within occupations. Finally, the BU term contributes 6.1% to the total wage gap for SG-II workers, 10.0% for SG-I individuals, and 9.5% for the TG population. The results suggest that relative to whites all three generations of Mexican-Americans encounter barriers to attachment into high-paying occupations, which in turn has an adverse effect on the wage levels of Mexican-Americans and therefore increases the wage gap with respect to whites.

Table 2.7 OLS log wage regressions by occupation

Coefficients	**Mexican Americans**				**Natives**	
	FG	SG-II	SG-I	TG	Blacks	Whites
	Managerial and Professional Specialty					
Intercept	1.353***	.778***	1.326***	.788***	.875***	.941***
	(.182)	(.178)	(.206)	(.116)	(.054)	(.014)
Education	.070***	.086***	.067***	.080***	.088***	.085***
	(.005)	(.008)	(.069)	(.005)	(.002)	(.001)
Experience	.010	.037***	.027***	.048***	.029***	.046***
	(.008)	(.007)	(.007)	(.004)	(.002)	(.001)
Experience^2/100	-.001	-.060***	-.032*	-.086***	-.045***	-.081***
	(.020)	(.017)	(.018)	(.009)	(.006)	(.001)
Married	.088*	.169***	.072	.112***	.130***	.173***
	(.050)	(.042)	(.043)	(.022)	(.011)	(.003)
State unemployment rate	.004	-.007	.006	-.002	-.007**	.001*
	(.011)	(.009)	(.010)	(.006)	(.003)	(.000)
In metropolitan area	.175**	.265***	.113**	.144***	.178***	.241***
	(.076)	(.081)	(.057)	(.035)	(.024)	(.003)
R-squared	.192	.288	.660	.242	.202	.233
Observations	894	777	221	2,542	7,847	117,373
	Technical, Sales and Administrative Support					
Intercept	1.451***	.783***	.455**	.540***	.690***	.574***
	(.153)	(.211)	(.213)	(.118)	(.055)	(.017)
Education	.057***	.097***	.098***	.098***	.093***	.097***
	(.004)	(.009)	(.010)	(.006)	(.003)	(.001)
Experience	.021***	.046***	.052***	041***	.032***	.048***
	(.005)	(.004)	(.006)	(.003)	(.002)	(.001)
Experience^2/100	-.020*	-.079***	-.090***	-.073***	-.051***	-.089***
	(.010)	(.013)	(.015)	(.008)	(.004)	(.001)
Married	.107***	.174***	.193***	.215***	.155***	.212***
	(.033)	(.029)	(.040)	(.019)	(.011)	(.004)
State unemployment rate	-.025***	-.014**	-.004	-.009*	-.001	-.001
	(.007)	(.006)	(.008)	(.005)	(.003)	(.001)
In metropolitan area	.047	.117*	.045	.134***	.084***	.163***
	(.049)	(.065)	(.050)	(.027)	(.021)	(.004)
R-squared	.150	.294	.363	.274	.220	.276
Observations	1,401	1,264	768	3,079	8,238	77,093
	Precision Production, Craft and Repair					
Intercept	1.572***	1.126***	.618**	1.046***	1.009***	1.189
	(.047)	(.123)	(.313)	(.087)	(.066)	(.017)
Education	.028***	.070***	.087***	.069***	.078***	.074***
	(.001)	(.006)	(.012)	(.005)	(.004)	(.001)
Experience	.024***	.036***	.032***	.035***	.026***	.035***
	(.002)	(.004)	(.007)	(.003)	(.002)	(.001)
Experience^2/100	-.029***	-.063***	-.046***	-.054***	-.035***	-056***
	(.004)	(.012)	(.017)	(.007)	(.005)	(.001)
Married	.094***	.170***	.148***	.149***	.140***	.167***
	(.013)	(.030)	(.040)	(.018)	(.013)	(.003)
State unemployment rate	-.001	.017**	-.005	.003	-.003	.002**
	(.003)	(.007)	(.009)	(.005)	(.003)	(.001)
In metropolitan area	.018	.006	-.013	.054***	.136***	.092***
	(.017)	(.046)	(.050)	(.020)	(.018)	(.003)
R-squared	.093	.205	.248	.210	.162	.195
Observations	6,740	1,128	719	3,380	5,833	73,432
	Service					
Intercept	1.433***	.556***	.402*	.468***	.421***	.435***
	(.055)	(.194)	(.227)	(.122)	(.066)	(.027)
Education	.028***	.085***	.091***	.097***	.101***	.097
	(.001)	(.010)	(.013)	(.006)	(.004)	(.001)
Experience	.013***	.050***	.028***	.040***	.030***	.044***
	(.002)	(.006)	(.008)	(.004)	(.002)	(.001)
Experience^2/100	-.009*	-.093***	-.045**	-.077***	-.049***	-.085***
	(.004)	(.016)	(.019)	(.010)	(.005)	(.002)

Married	.076***	.219***	.280***	.248***	.143***	.249***
	(.014)	(.042)	(.054)	(.024)	(.012)	(.006)
State unemployment rate	.001	-.017**	-.009	-.000	-.004	-.000
	(.003)	(.010)	(.012)	(.006)	(.003)	(.001)
In metropolitan area	-.006	-.075	-.069	.173***	.101***	.129***
	(.031)	(.067)	(.066)	(.028)	(.019)	(.006)
R-squared	.084	.312	.352	.335	.198	.301
Observations	4,559	675	450	1,860	7,145	29,975
	Operators, Fabricators and Labourers					
Intercept	1.504***	.864***	1.078***	1.073***	1.185***	1.307***
	(.039)	(.128)	(.195)	(.083)	(.046)	(.018)
Education	.027***	.070***	.079***	.054***	.058***	.047***
	(.001)	(.006)	(.009)	(.005)	(.003)	(.001)
Experience	.021***	.036***	.037***	.032***	.024***	.034***
	(.001)	(.004)	(.005)	(.002)	(.001)	(.001)
Experience^2/100	-.023***	-.055***	-.056***	-.046***	-.031***	-.057***
	(.003)	(.011)	(.012)	(.006)	(.003)	(.001)
Married	.117***	.185***	.180***	.162***	.162***	.174***
	(.011)	(.028)	(.037)	(.017)	(.009)	(.004)
State unemployment rate	-.003	.001	-.009	-.004	-.008***	.000
	(.002)	(.006)	.009	(.004)	(.002)	(.001)
In metropolitan area	.000	.007	.094**	.064***	.113***	.082***
	(.015)	(.036)	(.038)	(.019)	(.011)	(.003)
R-squared	.091	.243	.257	.203	.138	.171
Observations	8,712	1,464	885	3,459	12,016	65,543
	Other					
Intercept	1.342***	1.059***	.767***	.847***	.774***	.374***
	(.063)	(.257)	(.243)	(.146)	(.101)	(.034)
Education	.021***	.047***	.107***	.067***	.077***	.103***
	(.002)	(.012)	(.017)	(.008)	(.007)	(.002)
Experience	.018***	.032***	.010	.024***	.031***	.038***
	(.002)	(.008)	(.011)	(.005)	(.004)	(.001)
Experience^2/100	-.022***	-.048**	.009	-.039***	-.058***	-.071***
	(.004)	(.019)	(.028)	(.013)	(.010)	(.004)
Married	.065***	.110*	.071	.195***	.155***	.159***
	(.017)	(.060)	(.084)	(.037)	(.029)	(.010)
State unemployment rate	-.011***	-.039**	-.012	-.023**	-.022***	.001
	(.004)	(.017)	(.021)	(.009)	(.006)	(.002)
In metropolitan area	.076***	.160**	-.048	.156***	.201***	.170***
	(.019)	(.077)	(.087)	(.040)	(.028)	(.009)
R-squared	.080	.209	.381	.289	.278	.328
Observations	3,494	282	149	687	1,597	12,771

*p<.1, **p<.05, ***p<.01

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Additional controls incorporated in the regressions include a time trend and dummy variables for state, and census division.

Table 2.8 BMZ decomposition: Blacks and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential	.361***	.120***	.003	.014***
	(.011)	(.006)	(.005)	(.005)
Explained: Differences in average characteristics				
Within	.217***	.122***	.047***	.047***
	(.010)	(.006)	(.005)	(.005)
Between	.069***	.022***	.010***	.013***
	(.002)	(.001)	(.001)	(.001)
Unexplained: Differences in average coefficients				
Within	.070***	-.004	-.028***	-.020***
	(.011)	(.009)	(.009)	(.006)
Between	.004	-.020***	-.025***	-.027***
	(.003)	(.001)	(.001)	(.001)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of blacks are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.7.

Table 2.9 BMZ decomposition: Whites and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential	.599***	.358***	.241***	.252***
	(.004)	(.002)	(.001)	(.001)
Explained: Differences in average characteristics				
Within	.209***	.151***	.077***	.072***
	(.003)	(.002)	(.001)	(.001)
Between	.139***	.073***	.050***	.054***
	(.001)	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients				
Within	.194***	.112***	.089***	.102***
	(.004)	(.006)	(.008)	(.004)
Between	.056***	.022***	.024***	.024***
	(.001)	(.001)	(.001)	(.001)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of whites are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.7.

2.5.3 Démurger-Gurgand-Shi-Ximing (DGSX)

Table 2.10 presents the results of the DGSX decomposition for blacks and Mexican-Americans. Some important differences arise with respect to the BMZ methodology, as the WE, WU and BU components are now different. In particular, I focus on the BU term as it partly reflects occupational segregation. For FG immigrants the BU component accounts for 22.2% of the total wage gap, while for SG-II workers this rises to 27.5% of the total wage gap but the term is not statistically different from zero. Furthermore, for

SG-I workers the BU term is also larger yet it is still negative and not significant. Regarding the TG population, the BU component substantially increases more than the doubling the observed total wage gap. The increase in the BU term present for all groups is a consequence of the indirect allocation effect. Specifically, the Mexican-born workers who would be in occupation k if they were to follow the same occupational structure as blacks have on average higher mean wages than those Mexican-born workers who are actually observed to be in occupation k. Furthermore, this is true not only for FG immigrants but for all generations of Mexican-Americans.

Table 2.10 DGSX decomposition: Blacks and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential with respect to blacks	.361***	.120***	.003	.014
	(.023)	(.031)	(.034)	(.020)
Explained: Differences in average characteristics				
Within	.045***	.060***	.010	-.001
	(.012)	(.009)	(.008)	(.009)
Between	.069***	.022***	.010***	.013***
	(.002)	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients				
Within	.166***	.004	-.008	-.028***
	(.013)	(.015)	(.016)	(.011)
Between	.080***	.033	-.009	.029**
	(.014)	(.025)	(.028)	(.013)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of blacks are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.7.

Table 2.11 shows the results of the DGSX decomposition relative to whites. In the BMZ decomposition results the BU component had in all cases a positive effect on the total wage gap. Nevertheless, in the DGSX decomposition the BU term is reduced considerably, so much so that for U.S.-born Mexican-origin workers the effect of this component is negative. Specifically, for FG immigrants this goes from representing 9.3% of the total wage gap down to 3.5%. The reason behind the reduction in the BU term is in essence a product of Mexican-born immigrants being pushed-up the occupational ladder.

The intuition is that, if Mexican-born workers were to follow the same occupational structure as whites, then many more of them would be employed in the higher skilled occupations as entry into these categories would now be easier. This implies that people with lower observed productivity enhancing characteristics would be employed in higher paying occupations, therefore reducing mean wages in these categories. On the other hand, only the workers with the lowest skills or human capital measures are left in the bottom occupations, hence lowering mean wages in these categories. Analogously, this is also the case for second and third generation Mexican-Americans.

Table 2.11 DGSX decomposition: Whites and Mexican-Americans

	FG	SG-II	SG-I	TG
Total log wage differential with respect to whites	.599***	.358***	.241***	.252***
	(.019)	(.025)	(.037)	(.017)
Explained: Differences in average characteristics				
Within	.182***	.193***	.129***	.145***
	(.003)	(.002)	(.002)	(.002)
Between	.139***	.073***	.050***	.053***
	(.001)	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients				
Within	.257***	.122***	.107***	.099***
	(.008)	(.011)	(.015)	(.007)
Between	.021	-.029	-.046	-.045***
	(.016)	(.023)	(.033)	(.015)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of whites are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table 2.7.

Finally, an important caveat is that given the broad definition of the occupational categories, it is likely that part of the within occupation wage differentials in both the BMZ and DGSX decompositions are actually a product of between occupation differences.

2.5.4 Differences in the Occupational Structure

Table 2.12 presents observed and predicted occupational distributions for natives and Mexican-Americans. In the simulated structures, the allocation rules of blacks and whites derived from Eq. (2.8) are used in order to obtain the predicted distributions. This can be interpreted as natives and Mexican-Americans having similar preferences and the labour market providing equal opportunity and occupational access to all groups. Moreover, the Duncan and Duncan (1955) index of dissimilarity is used to provide a better understanding of the degree of differences in the occupational structures between natives and Mexican-Americans. The index for any two groups is given by:

$$D = (1/2) \sum_{k=1}^{K} |P_k^m - P_k^n| \tag{2.11}$$

Eq. (2.11) is interpreted as measuring the proportion of workers in group m required to change occupations to obtain the same occupational distribution generated by the workers in group n. An index value equal to zero reflects that there is no occupational dissimilarity between both groups. An index equal to one indicates that the members of n and m are never in the same occupations.

The Duncan and Duncan (1955) index of dissimilarity is employed due to its direct interpretation and because it constitutes one of the most broadly used measures of segregation. The index allocates equal weights to each occupation, irrespective of the occupation's relative share of the total workforce.[7] Nonetheless, in spite of its popularity,

[7] Previous studies that have used the Duncan index of dissimilarity include Butler (1987) for the U.S., Reilly (1991) for Ireland, Watts (1998) for the U.K. and Salardi (2012) for Brazil, among others.

alternative measures of occupational segregation have been proposed in the literature (see, e.g. Moir and Selby-Smith, 1979; Karmel and Maclachlan, 1988) (Salardi, 2012).

Table 2.12 Distribution by occupation. Observed and predicted

Occupation	FG	SG-II	SG-I	TG	NB	NW
			Observed			
Managerial & Professional Specialty	3.3	14.0	17.5	16.8	17.0	30.7
Technical, Sales & Administrative Support	5.2	23.7	22.2	21.1	19.4	21.0
Precision Production, Craft & Repair	26.2	20.2	19.3	22.2	13.7	19.4
Service	17.7	11.7	12.6	12.7	16.8	8.1
Operators, Fabricators & Labourers	33.6	25.9	24.8	22.9	29.9	17.9
Other	13.9	4.5	3.6	4.4	3.3	3.0
D_{blacks}	28.8	11.1	8.3	10.9	---	19.9
D_{whites}	42.8	17.3	13.0	14.3	19.9	---
			Predicted according to black structure			
Managerial & Professional Specialty	6.1	13.7	16.2	15.6	18.3	25.5
Technical, Sales & Administrative Support	11.3	23.4	21.4	20.6	19.3	18.5
Precision Production, Craft & Repair	14.5	11.5	12.8	13.1	13.7	12.4
Service	16.1	18.5	17.1	17.0	16.7	14.2
Operators, Fabricators & Labourers	46.2	26.6	26.8	27.8	28.1	24.1
Other	5.8	6.2	5.7	5.9	3.7	5.3
$\widehat{D}_{blacks}$	20.9	8.4	4.4	3.8	---	8.6
			Predicted according to white structure			
Managerial & Professional Specialty	7.9	17.0	21.0	20.3	23.3	31.2
Technical, Sales & Administrative Support	10.8	21.0	21.4	21.2	21.5	20.5
Precision Production, Craft & Repair	30.9	24.2	23.4	24.0	22.4	19.5
Service	6.5	10.8	9.7	9.6	9.4	8.0
Operators, Fabricators & Labourers	41.3	22.4	20.6	21.1	20.5	17.4
Other	2.5	4.6	3.9	3.9	3.0	3.4
$\widehat{D}_{whites}$	35.3	14.2	10.2	10.9	8.3	---

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Predicted distribution by occupation denotes the proportion of workers who would be in each occupation if they were to follow the same occupational sorting function as natives, based on the estimation of MNL models of occupational attainment for black and white workers.

With respect to the observed distribution, a clear hierarchy emerges between groups. FG immigrants are mostly allocated in low-paying occupations in traditional sectors covering low-level service work and labour intensive professions. Blacks and SG and TG workers have higher participation levels in high-paying occupations, but also employ a substantial number of workers in low-skilled categories. Whites constitute the most privileged group where its largest shares of workers are employed in the “Managerial and Professional Specialty” and “Technical, Sales and Administrative Support” categories. The Duncan index shows that more than 28.8% of the Mexican-born workforce would need to change occupations in order to obtain the same occupational distribution as blacks. On the other hand, the SG and TG populations have a structure that is much more similar to that of blacks as the index never surpasses 11.1%. Looking at how Mexican-Americans compare to whites, 42.8% of Mexican immigrants would need to change occupations to equalise the structures of both groups. Relative to FG workers, the U.S.-born Mexican origin population has a distribution that more closely resembles that of whites. Nonetheless, differences still remain as the index never drops below 13.0%. Among Mexican-Americans, SG-I workers represent the group whose occupational structure most closely resembles that of natives.

Comparing observed distributions to predicted ones, according to the black allocation rule FG immigrants are underrepresented at the top of the occupational structure. On the other hand, SG and TG workers are actually over-represented at the top of the distribution and under-represented at the bottom. Unsurprisingly, when Mexican-Americans have the same sorting function as blacks, the Duncan index is reduced. According to the white occupational structure, all three generations of Mexican-Americans are under-represented at the top and medium parts of the occupational distribution. Furthermore, when Mexican-Americans follow the sorting function of whites the index is reduced by a smaller amount relative to the black structure, where on average this drops by 20.1% for all groups. This implies that a larger part of the differences in the occupational structures between whites and Mexican-Americans are driven by differences in observed characteristics.

The evidence suggests that Mexican immigrants do not engage in the same occupations as the U.S.-born population. Nonetheless, when they do, they follow an occupational distribution that is much more similar to that of blacks than of whites. While differences are also observed for SG and TG workers, these are considerable smaller than those previously encountered. Yet, it is not unexpected that Mexican-Americans, especially FG workers, present a significant degree of occupational dissimilarity with respect to natives. Differences in occupational structures may arise because natives and Mexican-Americans differ in characteristics such as culture, way of life, work habits and wealth, among others.

2.6 Sensitivity Checks and Extensions

2.6.1 Selectivity Corrected Decompositions

Given that both the BMZ and DGSX methodologies require modelling occupational attainment as being endogenously determined, it cannot be discarded that workers are non-randomly allocated into different occupations. To analyse the effect that self-selection into each occupational category has on the on previous findings, this section performs decompositions based on selectivity corrected wage regressions following the Lee (1983) methodology.[8]

Before proceeding to the decomposition results, wage regression estimations and the intuition behind them are briefly discussed.[9] Following the related literature (see, e.g. Gyourko and Tracy, 1988; Reilly, 1991), the impact of the selection term in the wage

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[8] Nevertheless, a couple of caveats arise with the use of this procedure. First, the literature has commonly found that the results are quite sensitive to the specification of the MNL model in the first stage (see, e.g. Miller, 1987; Kidd and Shannon, 1994). Second, the arbitrariness of the chosen instruments implies that the identifying assumptions in the two-stage procedure are commonly only weakly satisfied.

[9] First-stage occupation specific wage regressions are presented in Table A.2.4 in the Appendix.

regression can be computed by multiplying the selection coefficient, by the mean value of the selection variable. The non-statistical significance of the correction term may be interpreted as the occupational choice being largely random in the sample.

Among the main findings, it is observed that in the “Managerial and Professional Specialty” category, the selectivity bias term is positive for FG and SG-II workers and not statistically significant for other cohorts. This indicates that the unobservable characteristics that predict attachment into the highest paying occupation are positively correlated with the wage levels. The result is not surprising considering the substantial barriers to entry into high-paying occupations that FG and SG-II workers face, suggesting that only those who perform best in the labour market are able to gain entry. At the other end of the distribution, the negative selection term observed for whites in the “Operators, Fabricators and Labourers” category portrays the opposite picture. This denotes that on average, the wages of whites employed in the lowest-paying occupation are lower than those obtained by an average worker drawn at random from the population. However, the high values of the estimated selectivity term coefficients suggest that the results require a cautions interpretation.

In the forthcoming decomposition analysis, the correction term is not considered as constituting part of the explained or unexplained components and instead is examined separately. Furthermore, the four previously defined terms of the BMZ and DGSX methodologies are grouped and demarcated as representing the wage offer gap or unconditional wage differential. This is equivalent to setting the selectivity effects to zero in each equation, where the wage offer gap is taken to mean the wage a worker randomly drawn from the population would receive if selected into the occupational category in question (Gyourko and Tracy, 1988).

**Table 2.13 BMZ decomposition:
Blacks and Mexican-Americans with Lee (1983) correction**

	FG	SG-II	SG-I	TG
Total log wage differential	.361***	.120	.003	.014
	(.120)	(.100)	(.110)	(.057)
Explained: Differences in average characteristics				
Within	.189***	.121***	.046***	.047***
	(.014)	(.006)	(.005)	(.005)
Between	.122***	.045***	.026***	.033***
	(.016)	(.007)	(.004)	(.004)
Unexplained: Differences in coefficients				
Within	.162	.020	.148	.158*
	(.130)	(.115)	(.124)	(.081)
Between	.062**	-.058***	-.065***	-.069***
	(.023)	(.014)	(.012)	(.014)
Wage offer gap	.537***	.129	.156	.170***
	(.134)	(.116)	(.125)	(.083)
Selection term differential	-.175	-.009	-.153	-.156***
	(.115)	(.098)	(.109)	(.056)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of blacks are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table A.2.4.

**Table 2.14 BMZ decomposition:
Whites and Mexican-Americans with Lee (1983) correction**

	FG	SG-II	SG-I	TG
Total log wage differential	.599***	.358***	.241**	.252***
	(.123)	(.106)	(.116)	(.067)
Explained: Differences in average characteristics				
Within	.255***	.151***	.077***	.073***
	(.006)	(.002)	(.001)	(.001)
Between	.053***	.060***	.039***	.040***
	(.008)	(.002)	(.002)	(.002)
Unexplained: Differences in coefficients				
Within	.396***	.201*	325***	.340***
	(.123)	(.107)	(.117)	(.069)
Between	.141***	.026***	.023***	.026***
	(.010)	(.001)	(.002)	(.001)
Wage offer gap	.846***	.439***	.466***	.480***
	(.124)	(.107)	(.117)	(.069)
Selection term differential	-.247**	-.080	-.224*	-.227***
	(.121)	(.106)	(.116)	(.067)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of whites are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table A.2.4.

Tables 2.13 and 2.14 present the results of the BMZ decomposition corrected for self-selection between Mexican-Americans and blacks and whites, respectively. It can be seen that the selection term differential is always negative, implying that the wage offer gap is larger than the total wage gap and that wage differentials between natives and Mexican-Americans are larger after correcting for self-selection. Relative to blacks, the selection term differential is only significant for the case of TG workers. Focusing on the BU component, it is observed that for FG immigrants this represents 11.5% of the wage offer gap, while for second and third generation Mexican-Americans the contribution of this term to the unconditional wage differentials is negative. With respect to whites, the selection term differential is significant for all cohorts except SG-II workers. The magnitude of the BU term in accounting for the wage offer gap ranges from 16.7% for FG immigrants to 4.9% for SG-I workers.

Finally, Tables 2.15 and 2.16 present the results of the DGSX decomposition between Mexican-Americans and blacks and whites, respectively. Given that the MNL model estimated in the first stage and the selectivity corrected wage regressions are the same as the ones employed in the BMZ methodology, the unconditional wage differentials do not change. With respect to blacks, the biggest change is observed for FG immigrants, where the contribution of the BU term to the observed wage differential is now larger. For subsequent generations the effect of this term is small and not statistically different from zero. With respect to whites in the case of FG workers the BU component accounts for 17.5% of the wage offer gap, yet this term is not significant for any of the three generations of Mexican-Americans.

Table 2.15 DGSX decomposition: Blacks and Mexican-Americans with Lee (1983) correction

	FG	SG-II	SG-I	TG
Total log wage differential with respect to whites	.361***	.120	.003	.014
	(.093)	(.076)	(.065)	(.070)
Explained: Differences in average characteristics				
Within	-.043**	.036***	-.007	-.023**
	(.021)	(.011)	(.010)	(.011)
Between	.122***	.045**	.026**	.033***
	(.039)	(.018)	(.011)	(.011)
Unexplained: Differences in coefficients				
Within	.294***	.066	.157	.154**
	(.113)	(.103)	(.114)	(.073)
Between	-.163*	-.019	-.019	.005
	.084	(.065)	(.054)	(.047)
Wage offer gap	.537***	.129	.156	.170*
	(.148)	(.124)	(.127)	(.088)
Selection term differential	-.175*	-.009	-.153	-.156***
	(.115)	(.098)	(.109)	(.054)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of whites are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regressions presented in Table A.2.4.

Table 2.16 DGSX decomposition: Whites and Mexican-Americans with Lee (1983) correction

	FG	SG-II	SG-I	TG
Total log wage differential with respect to whites	.599***	.358***	.241***	.252***
	(.065)	(.025)	(.019)	(.016)
Explained: Differences in average characteristics				
Within	.211***	.197***	.132***	.149***
	(.009)	(.003)	(.003)	(.003)
Between	.053***	.060***	.039***	.040***
	(.020)	(.007)	(.004)	(.005)
Unexplained: Differences in coefficients				
Within	.432***	.216**	.300***	.300***
	(.096)	(.094)	(.104)	(.059)
Between	.148	-.034	-.006	-.010
	(.096)	(.053)	(.054)	(.035)
Wage offer gap	.846***	.439***	.466***	.480**
	(.138)	(.109)	(.118)	(.069)
Selection term differential	-.247**	-.080	-.224*	-.227***
	(.121)	(.106)	(.116)	(.067)

***p<.1, **p<.05, *p<.01
Note: the OLS coefficients of whites are taken as the non-discriminatory vector.
Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Decomposition based on OLS regression results presented in Table A.2.4.

2.6.2 Sensitivity of the Results to the Level of Occupational Aggregation

In this section, the main results of the OB and BMZ methodologies are presented under various levels of occupational aggregation to examine the sensitivity of the results to the number of occupational categories.[10] Given the consistency of the results and in order to economise space the outcomes for SG-II and SG-I workers are neither presented nor discussed.

Table 2.17 Effect of different levels of occupational aggregation. OB decomposition

Occupation	**FG**		**TG**	
Dummies	Explained	Unexplained	Explained	Unexplained
	Relative to blacks			
Six	.319	.042	.040	-.026
	(88.4)	(11.6)	(285.7)	(-185.7)
Fourteen	.323	.038	.037	-.023
	(89.5)	(10.5)	(264.3)	(-164.3)
Nineteen	.346	.015	.042	-.028
	(95.8)	(4.2)	(300.0)	(-.200.0)
	Relative to whites			
Six	.405	.194	.147	.105
	(67.6)	(32.4)	(58.3)	(41.7)
Fourteen	.435	.164	.155	.097
	(72.6)	(27.4)	(61.5)	(38.5)
Nineteen	.448	.151	.156	.096
	(81.5)	(18.5)	(61.9)	(38.1)

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Figures in parentheses represent the percentage of the total wage gap.

Table 2.17 shows that in the case of the OB methodology, expanding the number of occupational categories generally increases the proportion of the total wage gap attributed to the explained component. Relative to blacks, for FG immigrants going from six to 19 occupations augments the explained term from 88.4% to 95.8% of the total wage gap, while for TG immigrants this grows from 285.7% to 300.0%. With respect to whites, for FG workers going from six to 19 occupations increases the explained term from 67.6%

[10] A DGSX decomposition that employs more than six occupational categories could not be computed as a large number of counterfactual-occupation cells were not populated, therefore making it impossible to construct counterfactual wages for certain occupation-group cells.

to 81.5% of the total wage gap, while for TG workers this rises from 58.3% to 61.9%. The results support the belief that the use of broadly defined categories conceals the importance of occupations when performing wage decompositions (Kidd and Shannon, 1996, p. 324).

Table 2.18 Effect of different levels of occupational aggregation. BMZ decomposition

Occupation	**FG**				**TG**			
Equations	Explained		Unexplained		Explained		Unexplained	
	WE	BE	WU	BU	WE	BE	WU	BU
	Relative to blacks							
Six	.217	.069	.070	.004	.047	.013	-.020	-.027
	(60.1)	(19.1)	(19.4)	(1.1)	(335.7)	(92.9)	(-142.9)	(-192.9)
Fourteen	.165	.094	.090	.011	.044	.016	-.015	-.031
	(45.7)	(26.0)	(24.9)	(3.1)	(314.3)	(114.3)	(-107.1)	(-221.4)
Nineteen	.097	.105	.117	.040	.035	.012	-.012	-.021
	(26.9)	(29.1)	(32.4)	(11.1)	(250.0)	(85.7)	(-85.7)	(-150.0)
	Relative to whites							
Six	.209	.139	.194	.056	.072	.054	.102	.024
	(34.9)	(23.2)	(32.4)	(9.3)	(28.6)	(21.4)	(40.5)	(9.5)
Fourteen	.171	.149	.188	.089	.065	.056	.097	.033
	(28.5)	(24.9)	(31.4)	(14.9)	(25.8)	(22.2)	(38.5)	(13.1)
Nineteen	.120	.154	.210	.114	.062	.057	.097	.035
	(20.0)	(25.7)	(35.1)	(19.0)	(24.6)	(22.6)	(38.5)	(13.9)

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Figures in parentheses represent the percentage of the total wage gap.

In the case of the BMZ methodology, Table 2.18 shows that augmenting the number of occupational categories has the opposite effect, as this tends to decrease the proportion of the total wage gap attributed to the explained component. Focusing on the four terms that constitute the BMZ decomposition it can be seen that in general the BU component increases with the number of categories. Relative to blacks, for FG immigrants going from six to 19 occupations augments the BU term from 1.1% to 11.1% of the total wage gap, while for TG workers the effect is still negative but now closer to zero. With respect to whites, going from six to 19 occupations increases the BU term from 9.3% to 19.0% of the total wage gap, while for TG workers this rises from 9.5% to 13.9%. Summarising, the results of the BMZ decomposition appear quite sensitive to the number of occupational categories. Given that the BU component tends to rise with the level of aggregation, the main findings may be interpreted as offering a lower-bound of the effect played by occupational segregation in observed wage differentials.[11]

2.6.3 The Role of English Language Proficiency

An important variable not regularly included in the CPS March supplement and not incorporated in Section 2.5 is English language proficiency. Given that the literature has previously presented ample evidence of its importance, this section employs a 5.0% sample from the 2000 U.S. Census to analyse the proportion of the wage gap between natives and Mexican-born workers attributed to differences in language skills.

The census asks respondents how well do they speak English, in which case they can respond "very well", "well", "not well" or "not at all". To compare the results with those previously obtained, estimations where language skills are not included are also presented based on the census and 2000 CPS.[12]

Table 2.19 presents results for the decomposition of log wage differentials between natives and Mexican-born immigrants. Relative to the census, the CPS slightly overstates observed wage differentials, especially those pertaining to African-Americans. Relative to blacks (whites), the CPS presents a wage gap that rises to .425 (.622) log points, while

[11] A caveat associated with the MNL is that it imposes the Independence of Irrelevant Alternatives (IIA) property. This is problematic when the different outcomes are closely related to one another in the sense that they can be considered close substitutes. Estimations of the BMZ and DGSX decompositions while utilizing an Ordered Probit (OP) to model occupational attainment were also performed. The OP model does not impose the IIA property, but does require that the outcomes be ordered in one way or another. Using an OP model did not significantly alter the results.

[12] The 2000 U.S. Census does not ask respondents about the birthplace of their parents and therefore does not allow distinguishing between second and higher generation order immigrants. Because of this, in this section I only compare natives to first generation immigrants. Nonetheless, this should not be an issue under the plausible assumption that natives and second and third generation Mexican-Americans have similar language skills.

the census presents one which is situated at .361 (.618) log points. With respect to explained differences, these account for approximately 81.0% of the total wage gap relative to blacks in both the census and the CPS. Concerning whites, the explained component is much larger in the census as it rises to 73.9% of the total wage gap, compared to the CPS where it is situated at 65.8%. As expected, the inclusion of language variables increases the proportion of the explained component in terms of the total wag gap, which rises from 81.2% to 83.4% with respect to blacks, and from 73.9% to 78.5% relative to whites. White these results suggest that some of the previously unexplained differentials are actually accounted for by differences in language proficiency, these explain less than 5.0% of the observed wage differentials.

Table 2.19 OB decomposition:
Natives and FG Mexican-Americans with language dummies

	Relative to Blacks		Relative to Whites	
	CPS	**Census**	**CPS**	**Census**
Total log wage differential	.425***	.361***	.622***	.618**
	(.019)	(.002)	(.015)	(.002)
Without English Dummies				
Explained: Differences in average characteristics	.347***	.293***	.409***	.457***
	(.040)	(.004)	(.015)	(.001)
Unexplained: Differences in coefficients	.078*	.068***	.213***	.161***
	(.042)	(.004)	(.019)	(.002)
With English Dummies				
Explained: Differences in average characteristics	---	.301***	---	.485***
		(.039)		(.011)
Unexplained: Differences in coefficients	---	.060***	---	.133***
		(.040)		(.011)
Observations	2,914	218,323	17,121	1,555,625
(% Black/White)	(58.0%)	(71.5%)	(92.8%)	(96.0%)

***p<.1, **p<.05, *p<.01
Note: The OLS coefficients of blacks and whites are taken as the non-discriminatory vector in the first two and last two columns respectively.
Source: Author's elaboration based on the CPS March Supplement 2000 and the 2000 U.S. Census. Standard errors are in parentheses. Decomposition based on OLS regressions results which include as independent variables years of education, potential experience, potential experience squared, the state unemployment rate and dummy variables for occupations, metropolitan status, state, census division, marriage and English language proficiency.

Table 2.20 presents results of the BMZ decomposition based on census data with and without language dummies. Relative to blacks, including language skills decreases the proportion of the explained component and increases the share of the unexplained term. This implies that within certain occupations, Mexicans have better language skills and higher returns to these skills than blacks. Nevertheless, the differences in the unexplained and explained components with and without English language proficiency are not statistically different from zero, suggesting that the variable is not robust in explaining wage differentials between blacks and Mexicans. On the other hand, the results pertaining to white workers are as expected. The inclusion of language variables reduce the explained components and increase the unexplained components. Most importantly, the BU terms drops from .070 to .065 log points, or from representing 11.3% to 10.5% of the total wage gap.

Table 2.20 BMZ decomposition:
Natives and FG Mexican-Americans with language dummies

	Relative to Blacks		Relative to Whites	
Total log wage differential	.361***	.361***	.618***	.618***
	(.006)	(.014)	(.002)	(.012)
Explained: Differences in average characteristics				
Within	.186***	.182***	.228***	.253***
	(.005)	(.014)	(.002)	(.012)
Between	.057***	.059***	.136***	.142***
	(.001)	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients				
Within	.093***	.097***	.182***	.157***
	(.006)	(.014)	(.002)	(.012)
Between	.024***	.022***	.070***	.065***
	(.001)	(.001)	(.001)	(.001)
English language dummies	No	Yes	No	Yes
Observations	218,323	218,323	1,555,625	1,555,625
(% Black/White)	(71.5%)	(71.5%)	(96.0%)	(96.0%)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the 2000 U.S. Census. Standard errors are in parentheses. Decomposition based on six occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared, the state unemployment rate, and dummy variables for metropolitan status, state, census divisions, marriage and English language proficiency.

Furthermore, Table 2.21 displays the results of the DGSX methodology. Relative to blacks, introducing language skills substantially decreases the WE component and marginally increases the BE term. Unlike the BMZ decomposition, under the DGSX framework the reduction in the WE component not only responds to a different set of average characteristics, but also to a different sorting function which changes the individuals predicted to be in each occupation. As a result, the decrease in the WE component compounds these two effects. The increase in the WU component suggests that within certain occupations Mexicans have better language skills and receive higher returns for these skills than blacks. Moreover, while the BU component is reduced by .011 log point a hypothesis test that the magnitude of this term is the same under both the BMZ and DGSX methodologies cannot be rejected. Finally, regarding white labourers results in line with those previously presented with the BMZ decomposition are obtained. Introducing English language variables reduces the BU term from .052 to .049 log points or from accounting 8.4% to 7.9% of the total wage gap.

Table 2.21 DGSX decomposition:
Natives and FG Mexican-Americans with language dummies

	Relative to Blacks		Relative to Whites	
Total log wage differential	.361***	.361***	.618***	.618***
	(.017)	(.032)	(.012)	(.021)
Explained: Differences in average characteristics				
Within	.087***	.050***	.161***	.212**
	(.008)	(.021)	(.002)	(.013)
Between	.057***	.059***	.136***	.142***
	(.001)	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients				
Within	.159***	.206***	.267***	.214***
	(.009)	(.021)	(.005)	(.013)
Between	.057***	.046***	.052***	.049***
	(.010)	(.009)	(.011)	(.009)
English Language Dummies	No	Yes	No	Yes
Observations	218,323	218,323	1,555,625	1,555,625
(% Black/White)	(71.5%)	(71.5%)	(96.0%)	(96.0%)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the 2000 U.S. Census. Standard errors are in parentheses. Decomposition based on six occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared, the state unemployment rate, and dummy variables for metropolitan status, state, census divisions, marriage and English language proficiency.

2.6.4 Wage Differentials between Legal and Illegal Immigrants

A factor that affects the wage gap between natives and Mexican-born immigrants is that the latter includes individuals who are not lawfully authorised to work in the United States. While there is ample evidence that unauthorised workers are represented in both the CPS and the census, it is not possible to identify in either data source who is a legal worker and who is not. Different studies have found that after controlling for observable characteristics, undocumented status reduces wages by up to 20.0% (see, e.g. Kossoudji and Cobb-Clark, 2002). Among the studies that perform wage decompositions among legal and illegal Mexican immigrants, Rivera-Batiz (1999) employs both cross-sectional information and a longitudinal database which allows seeing the impact of legalisation on the previously undocumented workforce. After inserting a number of controls, including occupation related variables, the author shows that illegal immigrants tend to be clustered in low-paying occupations and that differences in observable characteristics of legal and illegal immigrant men explain 48.0% of their total wage gap. This implies that unexplained wage differentials between natives and first generation workers are accentuated by the inclusion of unauthorised workers. Specifically, the estimation of the impact of occupational segregation is likely to be affected given that, due to their legal status and predominantly low levels of human capital, illegal immigrants tend to be concentrated in specific low-wage activities in the agricultural and service sectors. As a consequence of the passage of the Immigration Reform and Control Act in 1986, employers face the risk of incurring in additional expenses when they hire unauthorised workers. Thus, not all firms will employ illegal workers; those who do, will only hire them if their wages are low enough to compensate for the potential penalties they may incur in.

While ideally a data set which includes natives and explicitly distinguishes between legal and illegal immigrants would be used, I am not aware of any survey which satisfies these conditions. Given this limitation, the present section solely focuses on the wage gap between legal and illegal workers. In order to do this, the Encuesta sobre Migración en la Frontera Norte de México (EMIF, Survey on Migration in the Northern Border of Mexico) is employed. The EMIF is a cross-sectional survey which is similar in design to the United Kingdom's International Passenger Survey. The survey's occupation classification scheme is based on the Mexican Classification of Occupations, which is not directly comparable to the scheme employed in the CPS. Because of sample size restrictions, workers are grouped into high, medium and low skilled occupations.

Additionally, there may be important unobserved differences between authorised and unauthorised workers. For example, if legal status is granted to those with higher unobserved ability, then unexplained differences between the two groups will be overstated, since part of this differential is a result of the higher skill levels of lawful workers. In order to reduce these differences, the sample is restricted to the comparison of legal and illegal workers who initially entered the U.S. without legal authorisation to work. Moreover, the analysis is limited to immigrants who state that their country of residence is the U.S. (i.e. permanent immigrants).

Table 2.22 presents the OB decomposition of the wage gap between legal and illegal workers. The first column displays the results for the period ranging from 1994 to 2008 where language proficiency is not included, while columns two and three present the results for the years 2004-2008 without and with language dummies. For brevity, I will discuss the results pertaining to the third column. It can be seen that there are significant wage differentials between legal and illegal immigrants. The total wage gap between these two cohorts ascends to .172 log points, of which 62.8% is explained by differences in average characteristics.

Table 2.22 OB decomposition: Legal and illegal FG Mexican-Americans

	EMIF 1994-2008	EMIF 2004-2008	
Total log wage differential	.150***	.172***	.172***
	(.010)	(.013)	(.013)
Explained: Differences in average characteristics	.038***	.078**	.108***
	(.008)	(.015)	(.015)
Education	.003**	.007***	.005***
	(.001)	(.002)	(.001)
Experience	.027***	041***	.042***
	(.004)	(.008)	(.008)
Occupation	.027***	.029***	.026***
	(.002)	(.003)	(.003)
Time in the U.S.	-.029***	-.020*	-.015
	(.004)	(.011)	(.011)
Region	.002	.003	.001
	(.001)	(.003)	(.003)
Period	-.012***	-.000	.001
	(.001)	(.001)	(.001)
English	---	---	.027***
			(.003)
Unexplained: Differences in coefficients	.112***	.093***	.064***
	(.011)	(.019)	(.019)
Education	.010	-.027	-.036
	(.026)	(.037)	(.038)
Experience	.055	.133***	.135***
	(.037)	(.051)	(.051)
Occupation	-.055	-.036	-.031
	(.037)	(.053)	(.058)
Time in the U.S.	-.010	-.038**	-.030
	(.009)	(.018)	(.018)
Region	.070	-.034	-.025
	(.132)	(.170)	(.169)
Period	.051*	.088***	.084***
	(.027)	(.023)	(.023)
English	---	--	-.174***
			(.066)
Intercept	-.019	-.010	.125
	(.152)	(.023)	(.217)
English language dummies	No	No	Yes
Observations	13,985	5,594	5,594
(% Legal)	(81.3%)	(77.9%)	(77.9%)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the EMIF. Standard errors are in parentheses. Decomposition based on OLS regressions which include as independent variables years of education, potential experience, potential experience squared, years since immigration, the state unemployment rate, and dummy variables for occupations, metropolitan status, year, state, census divisions, marriage and English language proficiency.

Among the terms belonging to the explained component, potential experience has the largest effect, while occupation of employment and language proficiency also account for a significant part of the wage differential. Moreover, years of education does not play a large role as the variable does not differ much between legal and illegal immigrants. Regarding the unexplained component, it is observed that illegal immigrants have higher returns to schooling than their legal counterparts. Nonetheless, this term is not statistically different from zero. A similar result is obtained regarding occupation of employment. Furthermore, potential experience and language skills play an important role in the unexplained component, where the former is far more rewarding for authorised workers and the latter generates higher returns for unauthorised immigrants.

Table 2.23 BMZ decomposition: Legal and illegal FG Mexican-Americans

	EMIF 1994-2008	**EMIF 2004-2008**	
Total log wage differential	.150***	.172***	.172***
	(.007)	(.018)	(.018)
Explained: Differences in average characteristics			
Within	-.010***	.020	.051***
	(.007)	(.018)	(.018)
Between	.004***	.009***	.015***
	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients			
Within	.127***	.117***	.085***
	(.012)	(.022)	(.022)
Between	.028***	.024***	.019***
	(.001)	(.003)	(.002)
English Language Dummies	No	No	Yes
Observations	13,985	5,594	5,594
(% Legal)	(81.3%)	(77.9%)	(77.9%)

***p<.1, **p<.05, *p<.01

Source: Author's elaboration based on the EMIF. Standard errors are in parentheses. Decomposition based on three occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared, the state unemployment rate, and dummy variables for metropolitan status, state, census divisions, marriage and English language proficiency.

Table 2.24 DGSX decomposition: Legal and illegal FG Mexican-Americans

	EMIF 1994-2008	EMIF 2004-2008	
Total log wage differential	.150***	.172***	.172***
	(.026)	(.037)	(.038)
Explained: Differences in average characteristics			
Within	.016*	.047***	.077***
	(.009)	(.019)	(.020)
Between	.004***	.009***	.015***
	(.001)	(.001)	(.001)
Unexplained: Differences in coefficients			
Within	.125***	.131***	.078***
	(.016)	(.025)	(.025)
Between	.004	-.015	.001
	(.018)	(.019)	(.021)
English Language Dummies	No	No	Yes
Observations	13,985	5,594	5,594
(% Legal)	(81.3%)	(77.9%)	(77.9%)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the EMIF. Standard errors are in parentheses. Decomposition based on three occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared, the state unemployment rate, and dummy variables for metropolitan status, state, census divisions, marriage and English language proficiency.

As seen in Table 2.23, the application of the BMZ decomposition decreases the proportion of the total wage gap attributable to the explained component relative to the OB decomposition, which is reduced from 62.8% to 38.3%. Under the BMZ framework, the majority of the wage gap between legal and illegal immigrants is attributed to the WU term, which ascends to .085 log points or 49.4% of the total wage gap. Furthermore, the BU component arises to .019 log points or 11.0% of the total wage gap. Considering that individuals are only divided into three occupations, the result suggests that the occupational segregation encountered by illegal workers helps explain a significant part of their wage differentials with respect to their legal counterparts.

On the other hand, the implementation of the DGSX methodology generates substantially different results. As seen in Table 2.24, under this framework differences in average characteristics explain 53.5% of the total wage gap, which are mostly attributable to the WE component. Regarding the WU term, it ascends to .078 log points accounting for

45.3% of the total wage gap. Finally, the BU component is equal to .001 log points and not statistically different from zero. Since this value is lower to the one obtained with the BMZ decomposition, it signifies that the indirect effect in the BU term is negative. Consequently, when taking into account the indirect effect of the BU component in the DGSX decomposition, the effect of occupational segregation on wage differentials between authorised and unauthorised migrants disappears.

2.7 Conclusions

This chapter has examined the role that occupational segregation plays in explaining the low wages among Mexican-Americans and their wage differentials with respect to black and white workers in the United States.

The study shows that the occupational structure of Mexican-born immigrants differs substantially from that of natives. Moreover, the occupations of employment of first, second and third generation Mexican-Americans are much more similar to that of blacks than of whites. In terms of wages, significant progress is made between first and second generation labourers. This is especially true for those individuals who are a product of intermarriage between a Mexican-born and a U.S.-born individual. Nonetheless, between second and third generation Mexican-Americans progress appears to stall or even regress.

While most, if not all, of the wage differentials between blacks and Mexican-Americans can be explained by differences in observable characteristics, a large unexplained component remains relative to whites, who throughout the analysis are always in a more advantageous position. It is observed that Mexican-born immigrants encounter a similar degree of discrimination as blacks, while second and third generation Mexican-Americans appear to be in a more privileged position than African-American workers. Pertaining to occupational segregation, Mexican-Americans are underrepresented at the top of the occupational structure relative to whites. This implies a “glass-ceiling”, where Mexican-Americans face significant barriers into high-paying occupations. These restrictions, partly manifested through the BU term in the BMZ and DGSX decompositions, account from 6.1% to 10.0% of the total wage gap between different generations of Mexican-Americans and whites according to the BMZ methodology.

As a caveat, it is important to remember that when using the OB decomposition, it is not possible to identify the effects of occupational segregation on wage differentials since the decomposition treats occupational attainment, and therefore the underlying occupational structure, as exogenously given. In the BMZ and DGSX decompositions, the estimated MNL models are reduced forms that capture the propensities to be found working in a given occupation. These propensities can be demand driven, i.e. they may be a product of restricted access to certain occupations for some groups and hence be explained by occupational segregation, or supply driven, i.e. they may reflect different preferences across the two groups or depend on the workers’ expected income in occupation k (Démurger et al., 2009). Hence, while it is not possible to separate the effects of occupational segregation from those of the occupational structure in the OB decomposition, it is to a large extent possible to do so with the BMZ and DGSX decompositions. Moreover, to control for the possible presence of selectivity bias in the occupational wage equations, the chapter used the method outlined in Lee (1983). This was done by integrating the information obtained in the estimation of an occupational attachment equation, i.e. the MNL model, with the occupational wage equations used in the BMZ and DGSX decompositions.

The findings suggest that it is necessary to implement policies that tend to equalise Mexican-American representation across occupations, as well as policies which encourage the undoing of moderately segregated positions within different occupations. Moving forward, measures that guarantee that the most qualified workers gain access into high-wage occupations irrespective of their ethnic-origin background must continue to be implemented and closely monitored. However, in the case of Mexican-born immigrants it is unclear exactly how much of their wage disadvantage is due to discrimination or is a product of other factors such as the imperfect transferability of their human capital. Nonetheless, it is vital for first generation immigrants that they acquire the skills and training that will result in an increase in wages.

Given that the great Mexican emigration has begun to slow-down in recent years, the focus of political and academic discussions will continue to shift from Mexican-born workers to second and third generation immigrants who will influence a wide range of aspects of the U.S. economy, including government spending, employment opportunities and wages, among others. If Mexican-Americans are unable to make significant intergenerational improvements in terms of their education levels, occupations, and earnings at a significant rate, social anxiety and political pressure to more carefully monitor immigration will continue to increase. Therefore, a poor labour market performance by first, second and third generation workers will hinder Mexican immigrants in their quest to obtain an easier path towards legally entering the U.S. or gaining legal status for those already in the country. In summary, it is of the upmost importance for both Mexican and U.S. authorities that Mexican-Americans perform successfully north of the border.

3 Does Access to Free Health Insurance Crowd-Out Private Transfers? Evidence from Mexico's Seguro Popular

3.1 Introduction

A number of developing countries have implemented social assistance programs with the purpose of benefiting the population located in the lower tail of the income distribution. Understanding the impact of these programs and how they compare to other public policies is central to the development process. This issue is especially salient in Mexico, a country with a per capita income approximately one-third of the U.S. and a high degree of income inequality, characterised by being at the forefront in putting into effect large public assistance programs whose objective is to increase its population's human development levels. Given that such policies are often overlaid on top of pre-existing private support networks, various studies have analysed whether public assistance programs displace or crowd-out private transfers (e.g. Cox and Jimenez, 1992; Rosenzweig and Wolpin, 1994; Attanasio and Ríos-Rull, 2000; Jensen, 2003). The present chapter contributes to this literature by examining whether the introduction of Seguro Popular, a free-of-charge publicly provided health insurance program for informal sector workers, crowded-out private transfers in Mexico.[13]

Seguro Popular covers the costs of 284 unique health care interventions and more than 300 medicines, where the program's implementation was accompanied with increased resources to state health ministries and the allocation of federal funds for personal and

[13] An individual is considered uninsured or an informal sector worker if she or he is not registered with one of Mexico's public social security institutions. According to census data, in 2010 the number of individuals eligible for Seguro Popular equalled 63.2 million or 56.5% of Mexico's population.

non-personal health services (King et al., 2009). For more than 52 million people, Seguro Popular offers a generous means of support since it functions as a source of protection against catastrophic health expenditures, and provides a safety net to many of the country's most vulnerable households. The program has been studied at length by researchers, who have mostly focused on its impact on health expenditures, health outcomes and sector of employment (e.g. King et al., 2009; Barros, 2009; Galárraga et al., 2010; Barofsky, 2011; Sosa-Rubí et al., 2009; Azuara and Marinescu, 2013).[14]

The reduction in health expenditures derived from being affiliated in Seguro Popular may be large enough to influence the receipt of private transfers. If households receive private transfers to alleviate budget constraints, it might be expected that those enrolled in Seguro Popular receive fewer private transfers or stop receiving them altogether, since being affiliated to the program is likely to reduce health expenditures and help alleviate budget constraints by increasing disposable income. Alternatively, if private transfers are not a result of budget constraints or are used for other purposes unrelated to health expenditures, then private transfers might not be affected by enrolment in Seguro Popular. As a result, it is an empirical question whether and to what extent expenses not incurred in resulting from being affiliated to Seguro Popular affect the receipt of private transfers.

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[14] Among the studies that have examined the impact of Seguro Popular on health expenditures, King et al. (2009) using an intent to treat approach observe in treated localities a 23.0% decrease in catastrophic health expenditures compared to a 8.4% decrease in control localities. Barros (2009) finds that Seguro Popular reduces both the likelihood of having a positive expenditure on primary health care as well the size of the primary health care expenditures households incur in. Galárraga et al. (2010) observe that households insured with Seguro Popular spent 171 pesos less on outpatient services and 360 pesos less on medicines per year relative to non-enrolled households. Barofsky (2011) finds that the introduction of Seguro Popular generated a 28.0% reduction in out-of-pocket health spending among households located in the top quartile of the health expenditure distribution. Sosa-Rubí et al. (2009) evaluate the impact of Seguro Popular on pregnant women's access to obstetrical services. The scholars show that women affiliated to the program had a preference for having a baby in a Seguro Popular sponsored unit rather than paying out-of-pocket for a private delivery. Participation in Seguro Popular was also associated with a preference for delivering in the private sector rather than at a state-run clinic. Finally, Azuara and Marinescu (2013) use the roll-out of Seguro Popular to estimate the program's effect on choice of sector of employment. The study shows that the program had no effect on the informality levels of the overall population.

If the program crowds-out private support, then the study is relevant for policy makers who must take into account this unintended effect of Seguro Popular, since some of the program's goals, including reducing the risk among vulnerable households of incurring in catastrophic health expenses, might have been partially hampered.[15]

The choice to remit is typically preceded by the decision to migrate. Individuals migrate due to a variety of reasons related to income maximisation, minimising risks to family income, or overcoming capital constraints, among others. Prior to the implementation of Seguro Popular, vulnerable households commonly encountered out-of-pocket and catastrophic health expenditures attributed to outpatient care and medication, constraining them to reduce expenses in food, shelter, or education (Galárraga et al., 2010). Migrating and subsequently remitting represented a plausible alternative to overcome these difficulties.

Although declining in recent years, international private transfers represent a significant source of income for Mexican households, accounting for 1.8% of Mexico's gross domestic product (GDP) in 2012.[16] According to information from the Mexican Migration Project (MMP) 143, Mexican migrants residing in the U.S. commonly claim that one of their main motives for remitting is to cover health expenditures in Mexico.

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[15] Prior to the implementation of Seguro Popular in 2000, there were significant differences between receivers and donors of private transfers. For instance, households not covered by social security institutions were more likely to receive private transfers relative to those who were covered. Whereas 19.4% of uninsured households received private transfers, this figure stood at 6.9% among those that were insured. Furthermore, among households receiving a positive amount of private transfers, uninsured households received on average 29.4% more than insured households. With respect donors, the opposite pattern was observed. While 18.2% of households with access to social security institutions were donors, this figure dropped to 10.5% among those that did not have access. Moreover, among households that remitted a positive amount, uninsured households donated on average 281.4 pesos per month compared to 425.2 among insured households.

[16] At the household level, in 2000 the sum of domestic and international private transfers represented on average 5.0% of total household income. Among households receiving a positive amount of private transfers, they accounted for 32.0% of their total income.

Table 3.1 shows that, when asked to report up to five reasons why they send private transfers to family members left behind, 39.2% of respondents state as one of their reasons that they send money to Mexico to cover health expenses. This category is only surpassed by food and maintenance, which is claimed to be one of the motives for remitting for 41.8% of the U.S. based remitters included in the MMP. On the contrary, education expenses are only reported as one of the reasons for remitting 12.1% of the time. Consequently, various studies have analysed the relationship between private transfers and health expenditures, generally finding a positive correlation among the two variables (e.g. Airola, 2007; Valero-Gil, 2008; Amuedo-Dorantes and Pozo, 2011).[17]

Table 3.1 Motives for remitting

Motives	Percentage of remitters
Food and maintenance	41.83
Health expenses	39.23
Construction or repair of house	15.40
Education expenses	12.11
Debt payment	7.99
Purchase of consumer goods	7.14
Other	5.07
Savings	3.12
Purchase of house or lot	2.63
Start/expand business	1.54
Purchase of livestock	0.83
Purchase of agricultural inputs	0.79
Purchase of vehicle	0.73
Recreation/entertainment	0.71
Finance a special event	0.42
Purchase of tools	0.34
Unknown	20.30

Source: Author's elaboration based on the MMP 143. Figures based on 5,922 respondents, i.e. household heads, who report up to five reasons for remitting.

[17] Amuedo-Dorantes and Pozo (2011) find that a 100 pesos increase in private transfer income is associated with a 6 pesos increase in health expenditures. In contrast, for other sources of income, a 100 pesos increase is associated with a 2 pesos increase in health expenses. Valero-Gil (2008) estimates that approximately 10.0% of private transfer income is spent on health care. Moreover, the author observes that while only 2.0% of households covered by social security institutions receive private transfers, 7.3% of non-covered households receive private transfers. Finally, Airola (2007) observes that private transfer income is associated with a 44.0% rise in the consumption share of health care.

Given the significant segment of the population that Seguro Popular aimed to cover, the program was expanded gradually throughout Mexico. The variation in Seguro Popular's availability and intensity over time and space generated by its roll-out allows identifying its causal effects, where differences between regions permit circumventing issues of selection into treatment among the uninsured population. While the expansion of Seguro Popular was not completely random, several studies have relied on the timing and rate of the program's implementation to identify its impact on different outcomes (Bosch, Cobacho, and Pagés, 2012).

To date, evidence on the impact of Seguro Popular on private transfers is non-existent, as the literature on Mexico has focused on whether social assistance programs such as Prospera, previously called Progresa and Oportunidades, or 70 y Más, both of which include a cash transfer component, crowd-out private support (e.g. Attanasio and Ríos-Rull, 2000; Albarran and Attanasio, 2003; Amuedo-Dorantes and Juarez, 2015).

The related international literature is limited to the study by Klohn and Strupat (2013), who investigate whether informal transfers in Ghana were affected by the introduction of the National Health Insurance Scheme (NHIS). Based on the fifth wave of the Ghanaian Living Standard Household Survey, the study uses a difference-in-difference framework comparing individuals living in districts where the NHIS was already in place with individuals residing in areas where it was not yet available. The scholars estimate a linear probability model and a quantile regression model to evaluate the extent to which the introduction of the NHIS influenced informal transfers at the extensive and intensive margins, respectively. The results show that the policy affected the likelihood of making or receiving informal transfers and their monetary equivalents.

The present chapter shows that among households eligible for the program, a 1.0% increase in the Seguro Popular coverage rate reduced the probability of receiving private transfers by 0.0555 percentage points. This finding appears to be driven by domestic private transfers, since the program's effect is statistically significant for private transfers originating within Mexico, but is not significant for private transfers sent by foreign based migrants. Moreover, the results show that Seguro Popular had a weak and non-significant negative effect on the amount of private transfers received. The study suggests that an unintended consequence of Seguro Popular is that the program partially crowds-out private transfers by reducing the likelihood of receiving them.

The chapter proceeds as follows. Section 3.2 discusses the motives for remitting and how Seguro Popular may affect private transfers. Section 3.3 provides background information on the social security system in Mexico and Seguro Popular. Section 3.4 describes the data. Section 3.5 presents the methodology. Section 3.6 discusses the main results. Section 3.7 tests the sensitivity of the results. Section 3.8 concludes.

3.2 Conceptual Framework

When studying the motives for remitting, the theoretical literature has mainly focused on altruism (e.g. Barro, 1974; Becker, 1974) and exchange (e.g. Bernheim, Shleifer, and Summers, 1985; Cox, 1987). Altruistic private transfers take place because the donor cares about the utility of the recipient. Private transfers motivated by exchange compensate the recipient for providing services to the donor, such as providing informal care or obeying parental rules (Juarez, 2009). These alternative motives for remitting can imply drastically different outcomes for public policies that reallocate income (Cox, 1987).

Under the altruistic framework, enrolling in Seguro Popular may crowd-out private support as recipients enjoy higher disposable incomes. Barro (1974) and Becker (1974) argue that if households are linked through extensive networks, then changes in private inter-household transfers could completely neutralise the effects of public income redistribution programs. This result arises because in the altruistic model, conditional on remitting, an increase in the recipient's income together with an equal decrease in the donor's income unambiguously causes a decrease in the same amount in the transfer paid to the recipient. Moreover, an increase in the recipient's income keeping the donor's income constant would also cause a decrease in private transfers but to a lesser degree (Juarez, 2009).

If private transfers are not motivated by altruism, but instead are part of an explicit exchange of services between recipients and donors, crowding-out may not occur. The reasoning is that an increase in the recipient's income would decrease her or his supply of services and generate an upward movement along the donor's demand, raising the implicit price of services and decreasing the quantity (Juarez, 2009). Consequently, the impact of a direct or indirect public transfer on the amount of private transfers received depends on the elasticity of the donor's demand for the services provided by the recipient. In the case where demand is inelastic, which may arise because the services provided are not easily substituted, the amount of private transfers received would increase along with income, reinforcing the effects of the policy (Bernheim et al., 1985; Cox, 1987).

Other motives for remitting include a longing to secure access to family resources such as an inheritance (see, e.g. Bernheim et al., 1985; Lucas and Stark, 1985), or the desire to invest in physical or financial assets to self-insure or to earn higher economic returns (see, e.g. Durand, Kandel, Parrado, and Massey, 1996). On the other hand, private transfers may also be a product of informal risk-sharing agreements between donors and recipients (see, e.g. Rosenzweig, 1988). If private transfers are sent for risk-sharing purposes, enrolling in Seguro Popular might have an effect on them since the program provides protection against some of the financial costs associated with ill health. Finally, people may remit simply because the mere act of giving provides them utility or to comply with social norms (Jensen, 2003). Under some of these motives, private transfers might not be displaced by increases in the recipient's disposable income.

3.3 Background

3.3.1 Social Security System and Health Insurance in Mexico

Among the events that helped shape Mexico's health care system was the creation of the Instituto Mexicano del Seguro Social (IMSS, Mexican Social Security Institute) in 1943. The IMSS grouped together the pre-existing union-based and industry-based coverage schemes that offered health services for registered private sector workers (OECD, 2005). Subsequently, the Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE, Institute of Security and Social Services for State Workers) was created for registered public sector workers in 1960.[18] While IMSS and ISSSTE were created for registered workers, the Secretaría de Salubridad y Asistencia (SSA, Ministry of Health

[18] A number of systems were also created to provide health insurance to specific industry groups such as workers of Mexico's oil state enterprise PEMEX in 1942 or to armed and naval forces personnel, i.e. citizens enrolled in SEDENA or SEMAR.

and Welfare) was created in 1943 to serve the uninsured population outside of the formal sector. This system left workers without formal salaried contracts (i.e. the self-employed, urban informal sector workers, the rural population, the unemployed, and those out of the labour force) and their families generally without health insurance and dependent of the services provided by the SSA (OECD, 2005).

Consequently, access to health care in Mexico has been historically linked to work status. Formal sector workers and their families, through social security institutions such as IMSS or ISSSTE, have the right to health services and a range of prescription drugs, and are entitled to a spectrum of benefits including day care, maternity leave, work-risk and retirement pensions, and housing loans, among others.

Since the role of the SSA was of social assistance, there was no explicit package of health benefits that the uninsured population was entitled to. In practice, the services provided by the SSA were limited by health budget allocations and the availability of health facilities and medical personnel (Bonilla-Chacín and Aguilera, 2013). As a result, the services provided by the SSA were described as limited, frequently unavailable, and often requiring out-of-pocket expenditures (Lakin, 2010).

While the health insurance schemes provided by social security institutions were financed by a tripartite arrangement derived from federal government, employer and employee contributions, the SSA was underfunded as it was financed through a combination of federal and state resources.[19] Due in part to the differences in their financing schemes,

[19] The term "states" is used as shorthand to refer to Mexico's 31 states and one Federal District, i.e. Mexico City. Each state is divided into municipios, i.e. municipalities. In 2010, there were 2,456 municipalities in Mexico.

public health expenditures for individuals covered by social security institutions were twice as high as the expenditures for the uninsured (OECD, 2005). These differences led to a lower quality in the health care services provided by the SSA compared to social security institutions.

By 2000, according to census data, 33.0% of Mexico's 97 million residents were covered by IMSS, 6.0% were covered by ISSSTE and 2.2% were covered by another public or private health insurer. The remaining 57.8% of the population did not have health coverage and were lacking social protection against the financial consequences of ill health (Frenk, González-Pier, Gómez-Dantés, Lezana, and Knaul, 2006).

3.3.2 Reform and Description of Seguro Popular

In the early 2000s, Mexico implemented a reform to its health system with the intent of achieving universal basic health coverage. At the centre of this reform was Seguro Popular, which represented the most ambitious effort to expand basic health protection since the creation of IMSS (Parker, Scott, Rubalcava, and Teruel, 2010). The program was aimed at uninsured families not covered by social security institutions or without access to any other mechanism of social health insurance.

Seguro Popular was established with the objective of promoting the advanced payment of medical services, encouraging preventing care, and reducing catastrophic health expenses among vulnerable households (DOF, 2003). The implementation of Seguro Popular was accompanied by an increase in public health expenditures. Between 2000 and 2010, the SSA budget increased 142.0%, the budget of IMSS grew 42.0%, and that of ISSSTE grew 103.0%. In terms of per capita health expenses, this narrowed the gap between individuals covered by social security institutions and the uninsured population (Knaul et al., 2012).

Funding for Seguro Popular is multilateral, as it is financed by the federal government, state governments and beneficiary families. The provision of services included under Seguro Popular is responsibility of each state's health service administration (DOF, 2002). Moreover, state governments are responsible for the management of Seguro Popular resources, and they are free to choose the use of the transfers they receive (Barros, 2009).

Seguro Popular offers primary, secondary and more advanced medical interventions, as well as access to medications and laboratory clinical studies, all provided free of charge. These interventions are classified into six general groups (i.e. public health, general family health and specialty services, dentistry, emergencies, hospitalisation and general surgery) covering more than 90.0% of all hospital interventions. The program also covers 58 interventions contained in the Fondo de Protección contra Gastos Catastróficos (Protection Fund against Catastrophic Expenses), which includes treatment for prematurely born babies, childhood leukaemia, cervical cancer and HIV.

To register, applicants must reside in Mexico, not be entitled to coverage from a social security institution, present a birth certificate or unique population registration code, and provide a utility bill. Enrolments are formalised at orientation modules located in health centres, clinics and hospitals. Affiliation is not conditioned on health status, pre-existing illness, or co-payments according to type of health care.

Seguro Popular has a progressive affiliation fee, which substitutes the payment of subsequent services. The program is free to families located at the bottom four deciles of the income distribution. Since the majority of families enrolled in the program have low income levels, according to data provided by the Comisión Nacional de Protección Social en Salud (CNPSS, National Commission on Social Protection in Health), during the fourth quarter of 2008 Seguro Popular was free to more than 99.0% of its beneficiaries.[20]

To determine whether families are required to pay the affiliation fee, they are subject to a socioeconomic evaluation. Before being handed an affiliation card, the state's health service administration must confirm that the applicant is not registered in any institution's social security database (DOF, 2002). In practice however, applicants are simply asked whether they are affiliated to a social security institution, where at the time of enrolment this information is not verified (Parker et al., 2010).

By 2010, the budget for Seguro Popular ascended to 48.8 billion pesos, i.e. 3.9 billion U.S. dollars. As seen in Figure 3.1, at the end of 2002 the number of families enrolled in Seguro Popular stood at 295,513. By 2007, 7.3 million families and 21.8 million people were affiliated to the program. By 2012, the number of families and individuals enrolled in Seguro Popular ascended to 20.2 and 52.9 million, respectively, from a pool of approximately 60 million potential beneficiaries.

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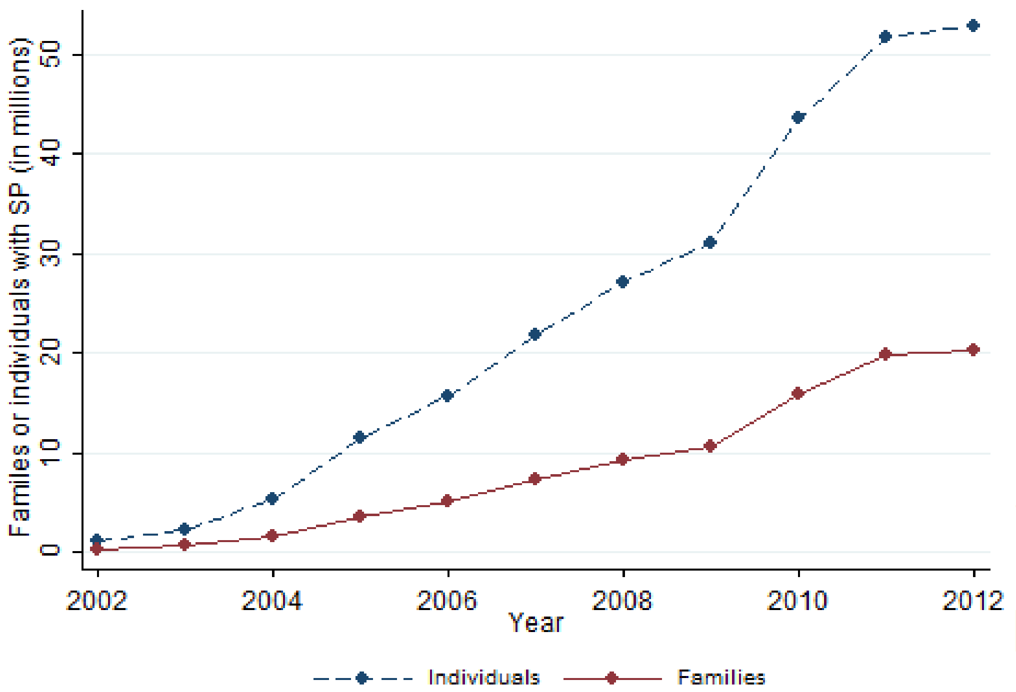
[20] Nevertheless, Scott (2006) shows that in 2004 65.0% of the households affiliated to Seguro Popular were non-poor. Lakin (2010) states that upon the introduction of Seguro Popular, applicants were unwilling to pay the program's affiliation fee. Consequently, to increase participation rates and meet affiliation targets, state governments misclassified families who were subject to the contributory fee as being poor. States have high incentives to enrol a large segment of the population in Seguro Popular since their health service administrations receive federal funds in proportion to the number of families that are affiliated to the program at the beginning of each year.

<u>3.3.3 Implementation of Seguro Popular</u>

Given the substantial segment of the population that Seguro Popular aimed to reach, the program was rolled-out and expanded gradually. Seguro Popular was first put into effect in 2002 as a pilot program in selected localities in five states, i.e. Aguascalientes, Campeche, Colima, Jalisco and Tabasco. These localities were selected based on their social security coverage, their capacity to provide the program's services, their urban and semi-urban concentrations, and the existence of groups already enrolled in assistance programs provided by the federal government (DOF, 2002).

Figure 3.1 Families and individuals affiliated to Seguro Popular: 2000-2012



Source: Author's elaboration based on administrative data provided by CNPSS.

In the program's initial rules of operation, it was stated that to implement Seguro Popular, the federal government would subscribe coordination agreements with participating states. Nevertheless, during 2002 and 2003 a number of states started implementing

Seguro Popular without having signed a formal agreement. This was possible before 2004 if the municipal government agreed to offer the program (Bosch and Campos-Vázquez, 2014). Furthermore, the program's rules of operation established that the future selection of states and regions into Seguro Popular would be based on their proportion and number of uninsured people in the bottom six deciles of the income distribution, the incidence and prevalence of diseases, the existence of the health facilities required to offer the services covered under Seguro Popular, the potential demand for the program's health insurance scheme, and per capita federal contributions (DOF, 2002).

In 2003, Seguro Popular was formally established as the Sistema de Protección Social en Salud (Social Protection System in Health). The program's rules of operation were modified where it was stated that Seguro Popular would gradually expand throughout Mexico according to resource availability (DOF, 2003). Furthermore, it was specified that the expansion of Seguro Popular would be prioritised in localities according to the set of criteria defined in DOF (2002), while taking into account the explicit request of state authorities to enrol in the program (DOF, 2003). At the end of 2004, 30 out of 32 states had signed the coordination agreement with the federal government formalising their participation in Seguro Popular. The remaining two states, i.e. Durango and Mexico City, signed the agreements in 2005.

Additionally, a number of different factors played a role in Seguro Popular's roll-out process. Díaz-Cayeros, Estévez, and Magaloni (2006) argue that political reasons were an important element during the expansion of Seguro Popular. Barros (2009) also shows that political factors affected the program's expansion and claims that because of logistical and political factors that influenced the phase-in process, the size of the program supply was not related to initial levels of economic development or health requirements across states. Bosch and Campos-Vázquez (2014) find that municipalities with larger populations and those located in smaller states joined Seguro Popular at earlier stages. The authors also observe that the implementation date of Seguro Popular and the political affiliation of state governors in post-pilot municipalities are correlated. Nevertheless, in general the scholars do not find evidence towards targeting of Seguro Popular in specific municipalities, since covariates associated with social security coverage, income and industrial structure are not significant in predicating the date of entry into the program. Finally, Aterido, Hallward-Driemeier, and Pages (2011) and Azuara and Marinescu (2013) show that levels of informality in the labour market prior to Seguro Popular being introduced were not correlated with the program's entry date. In general, these studies conclude that the introduction of Seguro Popular was close to random and rely on the variation in the program's expansion or implementation date to identify its effects (Bosch et al., 2012).

3.4 Data

3.4.1 Encuesta Nacional de Ingresos y Gastos de los Hogares

To study the effect of Seguro Popular on private transfers, the Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH, National Household Income and Expenditure Survey) is used. The ENIGH is a nationally representative cross-sectional household survey carried out by Mexico's national statistical agency.

The ENIGH captures individual-level information on each household member's socioeconomic characteristics and different sources of income, including international and domestic private transfers. Nonetheless, the survey does not include information on the characteristics or locality of donors. All net income flows received by the respondent over the previous six months are registered. At the household level, the ENIGH captures expenditure data for up to the previous six months. All income and expenditure data are self-reported. The study uses the 2000, 2004, 2005, 2006, 2008, 2010 and 2012 editions of the ENIGH, which allows examining the impact of Seguro Popular as the program grew larger.[21] The sample used is limited to economically inactive households and the uninsured, i.e. households not covered by a social security institution and who are therefore eligible for Seguro Popular.

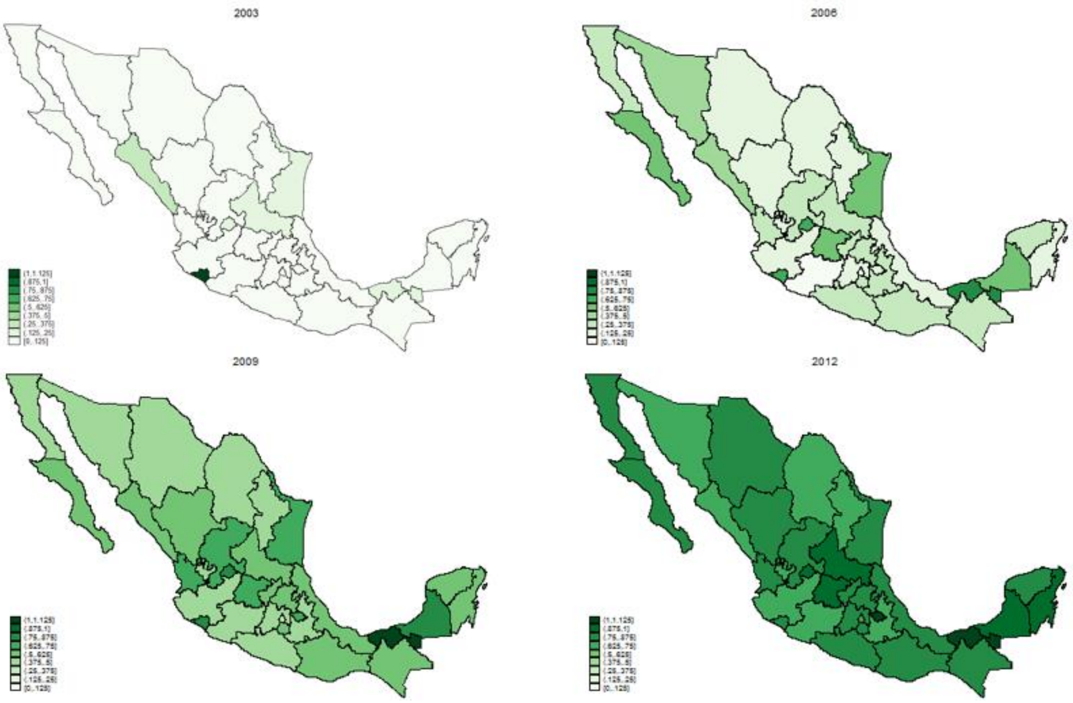
3.4.2 Expansion of Seguro Popular

To calculate the expansion of Seguro Popular, a similar strategy to the one put forward by Grogger, Arnold, León, Ome, and Triyana (2011) is used. First, administrative data provided by the CNPSS on the number of individuals affiliated to Seguro Popular by state and quarter was collected. Subsequently, this information was converted into coverage rates by dividing it by quarterly estimates of the number of individuals eligible for Seguro Popular in each state. Data on the number of eligible or uninsured individuals was drawn from the Encuesta Nacional de Empleo (ENE, National Employment Survey) and from the Encuesta Nacional de Ocupación y Empleo (ENOE, National Occupation and Employment Survey). Coverage rates were constructed for 2004, 2005, 2006, 2008, 2010 and 2012.

[21] The 2002 edition of the ENIGH is excluded from the study since there is little information regarding Seguro Popular's rules of operation and coverage during its pilot period (Barros, 2009). Furthermore, administrative data on the program's coverage was only provided for the fourth quarter of 2002 onwards. Thus, it is not clear what Seguro Popular's coverage was when the ENIGH 2002 was collected between August and November 2002.

Figure 3.2 presents the expansion of Seguro Popular at the state level, expressed as the proportion of the eligible population covered by the program in 2003, 2006, 2009 and 2012. Although Seguro Popular started in 2002, the program's initial expansion was low, since at the end of 2003 the average coverage rate within each state stood at 8.0%. Nevertheless, Seguro Popular rapidly expanded in the following years, where the program's coverage increased to 33.4% in 2006, 57.5% in 2009, and 82.5% in 2012. Additionally, states were introduced to Seguro Popular at different periods, where the program grew at different rates within each state. For example, while at the end of 2002 Colima had a coverage rate of 57.3%, during the same period 12 states had a coverage rate of zero. Finally, while in 2004 Nuevo Leon and Zacatecas had similar coverage rates of 6.7% and 7.1%, respectively, by 2010 this figures had grown and diverged to 62.6% and 81.3%, respectively.

Figure 3.2 Seguro Popular coverage as percentage of total eligible population by State



Source: Author’s elaboration based on administrative data provided by the CNPSS.

3.4.3 Descriptive Statistics

Table 3.2 displays the means of selected variables of the uninsured households included in the study. It can be seen that in 2000, 19.4% of households received private transfers. By 2006 this figure had risen to 25.6%, but by 2012 it had declined to 25.0%. Disaggregating total private transfers, it can be seen that during these three periods the percentage of households receiving domestic private transfers increased from 14.1% in 2000, to 18.1% in 2006, and 19.7% in 2012. On the other hand, the number of households receiving international private transfers increased from 6.2% in 2000 to 8.9% in 2006. Nonetheless, this figure dropped to 5.9% in 2010 before increasing to 6.6% in 2012. This pattern is likely related to the economic crisis that began in the U.S. in 2007, which forced a large number of Mexican workers towards unemployment and in some cases back to their country of origin. Concerning the amount of private transfers received, a similar but more pronounced pattern is detected. In 2000, the average amount of private transfers received stood at 387.9 pesos per month. By 2006, this figure had increased to 569.5, but by 2012 it had declined to 264.2 pesos per month. Distinguishing between the amount of international and domestic private transfers received, it is observed that they both followed a similar pattern to that of total private transfers.

Table 3.2 Descriptive statistics

Variable	2000	2004	2005	2006	2008	2010	2012
Received private transfers (%)	.194	.209	.211	.256	.218	.205	.250
Received international private transfers (%)	.062	.057	.068	.089	.077	.059	.066
Received domestic private transfers (%)	.141	.160	.151	.181	.155	.155	.197
Private transfers received	387.9	458.7	449.1	569.5	355.7	311.5	264.2
International private transfers received	140.6	168.9	184.0	286.1	176.8	137.6	105.2
Domestic private transfers received	247.3	289.8	265.0	283.4	178.9	173.8	159.0
Rural locality (%)	.435	.300	.342	.349	.343	.345	.530
HH head male (%)	.823	.782	.783	.767	.791	.806	.799
HH head years of schooling	5.68	7.40	7.17	7.21	7.05	7.05	6.41
Total income	7692.3	9764.3	9109.7	9327.3	9251.5	7020.4	6604.8
Total expenditures	7534.1	10052.6	8909.1	9586.5	8105.4	7360.6	6707.1
Health expenditures	194.9	257.5	224.9	264.5	175.9	139.9	122.1
Seguro Popular coverage by state (%)	0	.136	.254	.334	.538	.759	.825
Observations	4,779	9,142	9,984	8,759	9,850	8,864	3,476

Source: Author’s elaboration based on the ENIGH. HH denotes households. Monetary figures are per month and in real 2006 Mexican pesos.

With respect to other variables, it is observed that while household income increased by 21.3% between 2000 and 2006, it encountered a sharp decline between 2006 and 2012 falling by 29.2%. Household expenditures faced a similar pattern increasing by 27.2% between 2000 and 2006, and subsequently declining by 30.0% between 2006 and 2012. As a result, during the period of study, the average household included in the sample went from being a net saver to a net debtor. On the other hand, household health expenditures, which stood at 194.8 pesos per month in 2000, increased to 264.5 in 2006, but decreased to 122.1 pesos per month in 2012. Nevertheless, looking at the raw data it is not possible to identify how much of this decline is due to a reduction in household income or is a result of the implementation of Seguro Popular. Concerning the socio-demographic variables included in the table, it is noteworthy to mention that the proportion of households located in rural areas varies significantly between years. This variation in the sampling likely affects other variables such as the average years of schooling of the household head, and highlights the importance of controlling for additional factors when performing the econometric analysis. Finally, looking at the Seguro Popular coverage rate by state, in 2006 an average of 33.4% of the households in each state were enrolled in the program. By 2012, the coverage rate had grown to 82.5%.

3.5 Methodology

3.5.1 Identification Strategy

To examine whether Seguro Popular crowds-out private transfers among eligible households, the program's expansion throughout Mexico is exploited. Seguro Popular was introduced at different points and with different coverage rates between states, as the program's availability and the share of eligible individuals covered by Seguro Popular varied between regions.

The variation in the expansion of Seguro Popular has been widely used (e.g. Barros, 2009; Aterido et al., 2011; Grogger et al., 2011; Azuara and Marinescu, 2013; Bosch and Campos-Vázquez, 2014). To make use of this variation over time and space, I put forward a strategy similar to Grogger et al. (2011) and estimate the following model:

$$y_{hst} = \gamma SP_{st} + X_{hst}\beta + W_{mt}\theta + Z_{st}\lambda + \delta_t + \mu_s + \epsilon_{hst} \qquad (3.1)$$

where y_{hst} denotes the amount of total, international or domestic private transfers received by household h in state s in year t; SP_{st} represents the Seguro Popular coverage rate in state s in year t; X_{hst} denotes a vector of household level characteristics that may affect private transfer receipt; W_{mt} and Z_{st} represent vectors of municipality and state level variables, respectively; δ_t represents a time period dummy which helps control for national trends in private transfer receipt; μ_s denotes state fixed effects that capture time-invariant characteristics which may affect private transfer receipt and the availability or scope of Seguro Popular coverage in the state; and ϵ_{hst} is a random error term assumed to be uncorrelated with SP_{st}, X_{hst}, W_{mt} and Z_{st}.[22]

To analyse the impact of Seguro Popular on the amount of private transfers received, i.e. the intensive margin, Eq. (3.1) is estimated using ordinary least squares (OLS). When studying the effect of Seguro Popular on the probability of receiving private transfers, i.e.

[22] Various regressions presented in sections 3.6 and 3.7 include μ_m, which denotes municipality fixed effects, in place of μ_s.

the extensive margin, Eq. (3.1) is estimated using OLS as a linear probability model (LPM). In the latter case, y_{hst} represents a binary variable that takes the value of one if household h receives a positive amount of private transfers or zero otherwise. Both models include as covariates the Seguro Popular coverage rate at the state level; the household head's age, years of schooling and gender; the number of household members under age 12; the number of household members age 65 and older; indicator variables for low quality roofs, floors, and walls in the household; a dichotomous variable denoting whether the household is located in a rural locality; and a set of state or municipality and year dummy variables. Municipality level controls introduced in Eq. (3.1) include government revenue, number of housing credits granted and number of workers affiliated to IMSS. State level variables include the state population and binary variables indicating the political affiliation of the Governor.[23] Eq. (3.1) also includes an indicator variable denoting whether any of the household's members receives a scholarship or transfer from Prospera. Prospera is a poverty reduction cash transfer program with education and health components, where households receive transfers conditional on sending their children to school and visiting health clinics.[24] Eq. (3.1) is estimated separately for total, international and domestic private transfers.[25] Standard errors are clustered by state to account for possible correlation among households.[26]

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[23] Information on the political affiliation of state Governors was taken from the CIDAC electoral data base. See http://www.cidac.org/eng/Electoral_Database.php.

[24] Beneficiaries of Prospera are also eligible for Seguro Popular. The original Prospera program included a health component which covered 13 medical interventions. Frenk et al. (2006) argue that while Prospera proved to be a valuable instrument in reducing poverty and improving health levels, a large portion of the cash transfers received by affiliated families were used to finance medical care not included in the program's catalogue of interventions.

[25] Distinguish between international and domestic private transfers is important since they may be crowded-out to different degrees as a result of differences in donor characteristics, motivation, or information about the program (Amuedo-Dorantes and Juarez, 2015).

[26] While some studies exploit the municipality level variation in the availability of Seguro Popular, this study mainly focuses on the program's expansion at the state level. Obtaining the coverage ratio of Seguro Popular at the municipality level is problematic because information on the number of individuals eligible for Seguro Popular at the municipality level can only be obtained from either the 2000 and 2010 censuses or the 2005 population count. Nevertheless, subsection 3.7.2 exploits the municipality level variation of Seguro Popular by using the program's availability instead of its coverage rate.

3.5.2 Challenges to Identification

Prior to analysing whether Seguro Popular crowds-out private support, it is important to examine if the identification strategy used in this study, i.e. the exogeneity of Seguro Popular's implementation across regions, is valid. The test is relevant because using the expansion and availability of Seguro Popular as a source of identification assumes that these two factors are not correlated with the outcomes of interest. The endogeneity of Seguro Popular is examined by testing whether the program's quarter and year of introduction and expansion rates in 2005 and 2010 are predicted by pre-program municipality and state level characteristics compiled from Mexico's 2000 Census.[27] The test is performed by estimating the following model by OLS:

$$y_m = X_m\beta + Z_s\delta + \varepsilon_m \qquad (3.2)$$

where y_m denotes either the quarter and year of introduction of Seguro Popular in municipality m, expressed as an index equal to one beginning in the fourth quarter of 2002 which increases by one unit each quarter, or is a continuous variable between zero and one that indicates the proportion of the eligible population enrolled in Seguro Popular in municipality m in 2005 or 2010. X_m and Z_s are vectors of municipality and state level characteristics in 2000, respectively; and ε_m is the error term.[28] The municipality level covariates included in Eq. (3.2) are population size, the share of insured population, the share of urban population, the median wage, the population's average years of schooling,

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[27] The analysis performed in this subsection is conducted at the municipality level and not the state level given that performing it at the state level limits the sample to 32 observations. The small sample size implies that the estimated regressions would be unlikely to have sufficient power to adequately distinguish between zero and non-zero coefficients. Nevertheless, the estimation of Eq. (3.2) was also performed at the state level are presented in the Appendix in Tables A.3.1 and A.3.2.

[28] A similar analysis is conducted by Azuara and Marinescu (2013) and Bosch and Campos-Vázquez (2014), who investigate whether the implementation of Seguro Popular affected participation rates in the formal-informal labour markets.

the unemployment rate, and demographic and industry composition shares. The state level regressors are population size, the political party of the Governor, and state dummies. Eq. (3.2) also includes the share of households that receive international and domestic private transfers, the median of international and domestic private transfers received, and the average number of international migrants per household. The estimations are performed for all municipalities and for those municipalities included in the ENIGH.

The endogeneity analysis results are presented in Table 3.3. In column (1), the dependent variable is an index denoting the quarter and year of implementation of Seguro Popular. It can be seen that the municipality's date of entry into Seguro Popular is negatively related with its population size and positively related with the state's population size. Moreover, the date of entry is positively associated with the share of the population covered by a social security institution. Additionally, the date of entry is negatively related with having a Governor from the PRI party and with demographic variables pertaining to the share of the population under the age of 24 and between the ages of 24 and 40. Above all, the municipality's initial quarter and year of participation in Seguro Popular is not associated with any of the study's main outcomes of interest.

Columns (2) and (3) in Table 3.3 presents regression results where the dependent variable is the proportion of eligible individuals covered by Seguro Popular at the municipality level in 2005 and 2010, respectively. It is observed that the expansion is not related to the municipality's population size or to the state's population size. Although not significant, the negative signs of the state population variable are in line with the arguments put forward by Díaz-Cayeros et al. (2006) and Bosch and Campos-Vázquez (2014). The scholars claim that prior to the 2006 presidential election, smaller states were given preference to achieve full coverage so that the federal government could declare that it had achieved universal coverage in these states. Municipalities with low median wages also had lower expansion rates in 2010. It could be that poorer municipalities which have lower median wages have a scarcity of health facilities which are a requirement for implementing Seguro Popular. Furthermore, the expansion of Seguro Popular in 2005 was slower in states governed by the PRD left-wing party, the main opposition of the ruling right-wing PAN party. With respect to the variables of interest, as in column (1), the expansion of Seguro Popular in 2005 and 2010 is not correlated with the average number of international migrants per household, the log medians of international or domestic private transfers, or the shares of the population that receive international or domestic private transfers.

While the implementation of Seguro Popular was not completely exogenous, Table 3.3 does not provide evidence suggesting that the program was targeted in specific municipalities in relation to the outcomes of interest, since they have no effect on the date of entry or on the expansion of Seguro Popular.[29] In summary, the results support the identification strategy used in this study. Nevertheless, the fact that there was no randomisation in the implementation of Seguro Popular implies that it is not possible to rule out the potential existence of other treats to the identification of the program's effects. This represents an important limitation of the study.

[29] Estimations of Eq. (3.2) using more flexible specifications were also performed. These included incorporating nonlinearities and interactions between municipality and state level controls, among others. The results were generally similar to those reported in Table 3.3.

Table 3.3 Determinants of SP date of entry and expansion by municipality

Variable	(1)	(2)	(3)
	Date of entry	Expansion 2005	Expansion 2010
Log population	-1.303***	.0025	-.0064
	(.1720)	(.0100)	(.0093)
Log state population	4.250***	-.0241	-.0075
	(.2960)	(.0205)	(.0208)
Share of insured population	3.780***	-.1370	.0371
	(1.269)	(.0889)	(.0819)
Share of urban population	.6660	.0243	-.0692
	(.6540)	(.0543)	(.0548)
Log median wage	.8370	-.0517	-.1380***
	(.5540)	(.0516)	(.0509)
Unemployment rate	-10.81	.8010	1.022
	(9.754)	(.6360)	(.7590)
PRI Governor	-3.074***	.0242	-.0096
	(.8050)	(.0788)	(.0593)
PRD Governor	-.7550	-.4140***	-.0826
	(1.469)	(.0674)	(.0600)
Share of population under age 24	-7.431*	.0430	.1700
	(4.222)	(.2700)	(.2400)
Share of population between ages 24 and 40	-15.38*	.4290	-.8850
	(8.597)	(.5520)	(.5570)
Avg. number of international migrants per HH	1.139	.0250	.1820
	(1.962)	(.1320)	(.1390)
Log median international private transfers	.0463	.0104	.0030
	(.0880)	(.0080)	(.0055)
Log median domestic private transfers	-.1230	-.0168	.0056
	(.2580)	(.0270)	(.0176)
Share of pop. that receives int. private transfers	-2.775	-1.048	-.0737
	(9.886)	(.6900)	(.7310)
Share of pop. that receives dom. private transfers	12.75	.9480	-.1160
	(10.27)	(.7260)	(.6840)
Observations	1,161	569	597

*** p<0.01, ** p<0.05, * p<0.1

Note: In column (1) the dependent variable is an index beginning in the fourth quarter of 2002 that denotes the municipality's date of entry into SP, and includes all the municipalities in the ENIGH. In columns (2) and (3) the dependent variable is the proportion of eligible individuals covered by SP at the municipality level in 2005 and 2010, respectively, and include all the municipalities in the ENIGH in those years. Data on the number of eligible individuals was taken from the 2005 Population Count and the 2010 Census. Data on the number of individuals covered by SP was provided by the CNPSS. Explanatory variables are drawn from the 2000 Census. The regressions also include variables denoting average years of schooling and share of male population in the municipality, state dummies, and industry share dummies by municipality. Robust standard errors are in parentheses.

3.6 Results

Results of the effect of Seguro Popular on private transfers based on Eq. (3.1) are presented in Table 3.4. In all columns, the first row shows the coefficient of the Seguro Popular (SP) coverage rate at the state level. It can be seen in column (1) that Seguro Popular had a negative but not statistically significant effect on the amount of private transfers received. Under the preferred specification presented in column (2), which includes a full set of controls as well as municipality fixed effects, it is estimated that Seguro Popular reduced on average the monthly amount of private transfers received by 50.86 pesos. While the coefficients are negative, since they are not statistically significant, it is not possible to state that the implementation of Seguro Popular affected the amount of private transfers received.[30]

Focusing on other variables, it is observed that male headed households receive a lower amount of private transfers than female headed households. Moreover, residing in a household located in a rural locality is positively and statistically significantly associated with the amount of private transfers received. Additional variables which influence the amount of private transfers received include indicators of the quality of the household and the number of years of schooling of the household head, which are positively associated with the outcome of interest; and the age of the household head, which is negatively associated with the dependent variable.

[30] On the other hand, when Eq. (3.1) is estimated using health expenditures as the dependent variable, the effect of Seguro Popular is that the program reduced health expenditures by 92.03 pesos per month. This estimation includes a full set of controls as well as municipality fixed effects and is statistically significant at the 10.0% level. Moreover, this result is always significant and is relatively consistent across different specifications. See Table A.3.3 in the Appendix.

Table 3.4 SP coverage and total private transfers

Variable	(1)	(2)	(3)	(4)
	OLS: Amount of private transfers received		LPM: Probability of receiving private transfers	
SP coverage at the state level	-118.6	-50.86	-.0577*	-.0555*
	(116.8)	(128.8)	(.0333)	(.0297)
HH head age	-4.128***	-4.345***	.0012***	.0011***
	(1.260)	(1.325)	(.0003)	(.0003)
HH head years of schooling	34.18***	33.89***	-.0009*	-.0005
	(4.657)	(4.422)	(.0005)	(.0006)
HH head male	-1058.5***	-1041.5***	-.3220***	-.3150***
	(74.22)	(73.60)	(.0140)	(.0137)
HH enrolled in Prospera	-3.860	-.0155	-.0112**	-.0160***
	(17.67)	(17.18)	(.0048)	(.0044)
HH members under age 12	-14.19	-16.32*	-.0032	-.0031
	(9.195)	(9.115)	(.0020)	(.0020)
HH members age 65 and older	19.66	13.50	.0440***	.0425***
	(19.79)	(21.73)	(.0070)	(.0069)
Good quality walls in the HH	35.38	47.61**	.0130	.0183*
	(21.90)	(22.73)	(.0110)	(.0099)
Good quality roofs in the HH	141.8***	130.6***	.0196***	.0158***
	(17.12)	(18.29)	(.0053)	(.00513)
Good quality floors in the HH	95.42***	66.16***	.0341***	.0241***
	(18.55)	(19.91)	(.0063)	(.0059)
Rural locality	166.9***	173.9***	.0511***	.0446***
	(31.57)	(57.87)	(.0081)	(.0083)
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes
Observations	54,854	54,854	54,854	54,854

* p<0.10; ** p<0.05; *** p<0.01.
Source: Author's elaboration based on the ENIGH. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Table 3.4 also presents results where the relationship between Seguro Popular and the likelihood of receiving private transfers is analysed. It is observed in column (3) that the relationship between Seguro Popular and the probability of receiving private transfers is negative and statistically significant. Column (4) shows that when a full set of controls are introduced, including municipality fixed effects, the estimated effect of Seguro Popular is that a 1.0% increase in its coverage rate reduced the probability of receiving private transfers by 0.0555 percentage points, where this coefficient is significant at the 10.0% level.

Additionally, since the crowding-out effect is only observed at the extensive margin, it is possible to quantify this estimate in pesos. This is done by multiplying the effect reported in column (4) by the mean amount of private transfers received by uninsured households prior to the program's introduction. Since the mean amount of private transfers received by households in 2000 was 387.9 pesos per month, multiplying this amount by the estimated coefficient of -.0555 produces a reduction of 21.5 pesos per month, which is equal to 23.3% of the estimated effect of Seguro Popular on health expenditures. Concerning the other variables, male headed households have a lower probability of receiving private transfers than female headed households. Moreover, households located in rural localities have a higher likelihood of receiving private transfers than those located in urban settings. Additional controls which affect the probability of receiving private transfers include indicators of the quality of the household, the age of the household head, and the number of household residents over 65, all of which are positively associated with the probability of receiving private transfers; and being enrolled in Prospera, which is negatively associated with the dependent variable.[31]

[31] The main results are robust to the use of a tobit model when analysing the effect of Seguro Popular on the amount of private transfers received, and to the use of a logit specification when studying its impact on the likelihood of receiving private transfers. See Table A.3.4 in the Appendix. Moreover, Table A.3.5 in the Appendix allows for a more flexible specification of Eq. (3.1), where the program's effects are assumed to differ by year.

To study whether the previous findings are driven by private transfers originating from Mexico or abroad, Table 3.5 presents estimations where private transfers are classified as international or domestic according to the sender's country of residence. It is observed that the introduction of Seguro Popular did not have a statistically significant effect on either the amount of international private transfers received or on the probability of receiving them. In fact, when a full set of control are added the coefficient becomes positive although not significant. Focusing on domestic private transfers, it can be seen that under all the different specifications the relationship between Seguro Popular and the amount of domestic private transfers received is negative. When a full set of controls are introduced, including municipality fixed effects, it is estimated that the program reduced the amount of domestic private transfers received by 72.48 pesos per month. Nonetheless, this coefficient is not significant. Turning our attention to the probability of receiving private transfers, when a full set of controls are included, the estimated effect of Seguro Popular is that it reduced the likelihood of receiving domestic private transfers by 6.25 percentage points, where this coefficient is statistically significant at the 10.0% level.

These results suggest that the findings presented in Table 3.4 are driven by domestic private transfers, since Seguro Popular does not have an effect on international private transfers at either the intensive or extensive margins. The previous findings may arise because most senders located within Mexico are aware of Seguro Popular and therefore changed their remitting behaviour upon the program's introduction. This is likely to be case since the program was widely publicised by the federal government. On the other hand, a large number of senders located in foreign countries may not be aware of the program and consequently did not alter their remitting behaviour. Alternatively, domestic and international donors may have different motives for remitting and thus reacted differently upon the implementation of Seguro Popular.[32]

Table 3.5 SP coverage and international and domestic private transfers

Variable	(1)	(2)	(3)	(4)
	International		Domestic	
	OLS: Amount of private transfers received			
SP coverage at the state level	-43.57	21.62	-75.03	-72.48
	(57.06)	(71.12)	(114.0)	(115.4)
	LPM: Probability of receiving private transfers			
SP coverage at the state level	-.0107	-.0021	-.0540*	-.0625*
	(.0237)	(.0248)	(.0313)	(.0321)
HH level controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes
Observations	54,854	54,854	54,854	54,854

* p<0.10; ** p<0.05; *** p<0.01.
Source: Author's elaboration based on the ENIGH. HH level controls include the variables presented in Table 3.4. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

3.7 Sensitivity Checks

3.7.1 Different Subsamples

To further examine the sensitivity of the results, Table 3.6 presents estimations of Eq. (3.1) when focusing on different population groups or when the ENIGH's survey weights are used.[33] Panel A presents the results obtained in Table 3.4, so that comparisons with

[32] This result is similar to that obtained by Amuedo-Dorantes and Juarez (2015), who analyse whether the 70 y Más program for the rural elderly in Mexico crowded-out private transfers. In their study, the scholars observe a crowding-out effect at the extensive margin but not at the intensive margin. Moreover, their results are largely driven by a reduction in the likelihood of receiving domestic private transfers.

[33] With the exception of the results presented in Table 3.6 column F, estimations presented throughout the chapter do not include sample weights. According to Solon, Haider and Wooldridge (2015, p. 302), potential motives for weighting when attempting to estimate causal effects include: 1) to achieve more precise estimates by correcting for heteroskedasticity; 2) to obtain consistent estimates by correcting for

the study's main findings can be more easily made. Panels B to G report sensitivity checks for different subsamples analysed according to the gender of the household head; the household's urban-rural status, income level and health expenditure level; when using survey weights; and when limiting the sample to households that received a positive amount of private transfers.

Panel B shows that Seguro Popular had different effects which varied according to the gender of the household head. The program had a stronger impact in female headed households at both the intensive and extensive margins. Nonetheless, when a full set of controls are included, due to the large standard errors, the estimated coefficients are generally not significant. It is only in column (3), when estimating the program's effect on the probability of receiving private transfers for women and when state fixed effects are included, that a negative and significant effect of 11.6 percentage points is observed.

Panel C analyses the effect of Seguro Popular in urban and rural localities. These coefficients are similar to one another and to the one displayed in Panel A. Moreover, even though the coefficients are not significant, it can be seen in column (2) that when a full set of controls are added, the program's effect is larger in urban settings. This result may be related to the finding presented in Grogger et al. (2011), where the authors state that the program's impact is stronger in urban localities, since health centres and hospitals located in cities are better equipped and generally offer all of the interventions covered under Seguro Popular. On the other hand, health facilities located in rural localities are frequently limited in the amount of the services they provide. Consequently, the impact of Seguro Popular on health expenditures tends to be lower in rural localities.

endogenous sampling; and 3) to identify average partial effects in the presence of heterogeneous effects. For further discussion, see Solon et al. (2015).

Nevertheless, column (4) shows that the program's effect on the likelihood of receiving private transfers, although not significant, is larger in absolute value in rural areas.

Table 3.6 SP coverage and private transfers. Subsamples

Sample	**(1)**	**(2)**	**(3)**	**(4)**
	OLS: Amount of Private transfers received		LPM: Probability of receiving private transfers	
A. Main				
	-118.6	-50.86	-.0577*	-.0555*
	(116.8)	(128.8)	(.0333)	(.0297)
B. Men-Women				
Men	-44.01	.1090	-.0474	-.0506
	(81.18)	(104.4)	(.0334)	(.0347)
Women	-548.6	-499.0	-.1160*	-.0892
	(430.7)	(471.0)	(.0623)	(.0662)
C. Urban-Rural				
Urban	-125.6	-124.5	-.0488	-.0444
	(152.6)	(166.4)	(.0334)	(.0347)
Rural	-65.11	-8.376	-.0759	-.0776
	(173.4)	(202.1)	(.0509)	(.0512)
D. Low and high income households				
Low	-74.72*	-42.91	-.0516	-.0677
	(38.18)	(42.02)	(.0437)	(.0436)
High	-110.3	-21.58	-.0592*	-.0457
	(211.8)	(234.8)	(.0345)	(.0341)
E. Low and high health expenditure households				
Low	-249.9**	-222.3*	-.0628	-.0762*
	(113.3)	(122.4)	(.0432)	(.0383)
High	33.27	145.1	-.0458	-.0273
	(156.3)	(185.0)	(.0365)	(.0370)
F. Weighted results				
	-99.26	-38.66	-.0236	-.0285
	(129.4)	(123.8)	(.0440)	(.0332)
G. Conditional on receiving a positive amount of private transfers				
	-100.9	126.1	---	---
	(443.1)	(535.9)		
HH level controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01.

Source: Author's elaboration based on the ENIGH. Figures presented represent coefficient estimates for SP coverage at the state level. HH level controls include the variables presented in Table 3.4. Low and high income households refer to the households located above and below the median of the household income distribution, respectively. Low and high health expenditure households refer to the households located above and below the median of the household health expenditure distribution, respectively. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Panel D differentiates between low and high income households. The program's effect is relatively stable throughout the income distribution, where the effect of Seguro Popular at both the intensive and extensive margins is similar for both groups. Moreover, these effects closely resemble those presented in Panel A, where their weaker significance is partly driven by their smaller sample sizes.[34]

Panel E separates households according to whether they incur in high or low health expenditures. The program's effect is much stronger in low health expenditure households. When focusing on the effect of Seguro Popular on the amount of private transfers received, it is observed that the estimated coefficients are negative and significant in low health expenditure households. Moreover, it can be seen in column (2) that when a full set of controls are included, the program's effect rises to 222.3 pesos per month. For high health expenditure households, the coefficients are not significant. Focusing on the extensive margin, column (4) shows that in low health expenditure households the introduction of Seguro Popular reduced the likelihood of receiving private transfers by 7.62 percentage points, where this coefficient is statistically significant at the 10.0% level. In high health expenditure households, it is estimated that a 1.0% increase in the program's coverage reduced the probability of receiving private transfers by 0.0273 percentage points. Nonetheless, this coefficient is not significant.

Panel F makes use of the household weights included in the ENIGH. The results show that, when household weights are used, the impact of Seguro Popular on the amount of

[34] Since the division of low and high income households according to whether they are below or above the median may seem arbitrary, estimations were also performed where households were classified depending on whether they fall below or above the mean. Households were also grouped by quartiles, where a comparison was made between those located at the lowest and highest quartiles. The results presented in Panel D in Table 3.6 are robust to these different specifications.

private transfers received is generally negative and not statistically significant. Concerning the program's impact on the likelihood of receiving private transfers, it can be seen in columns (3) and (4) that when a full set of controls are included, although negative, neither of the coefficients are significant.

Finally, Panel G focuses on households that report receiving a positive amount of private transfers. When state fixed effects are used along with a full set of controls, it is estimated that Seguro Popular reduced private transfers by 100.9 pesos per month. When municipality fixed effects are used, the effect of Seguro Popular is limited to an increase of private transfer income of 126.1 pesos per month. Nevertheless, neither of these two coefficients are statistically significant. These results offer additional evidence that the introduction of Seguro Popular did not affect the amount of private transfers received.

3.7.2 Municipality Level Variation

This section exploits the municipality level variation in the availability of Seguro Popular. Defining the availability of Seguro Popular in each municipality involves outlining an arbitrary threshold, since there is no official record of when the program's services were initially offered in each municipality.[35] In this study, a municipality is considered as having direct access to Seguro Popular when in its first observed in any given period that 10 or more of its households are affiliated to the program.

[35] In each state where Seguro Popular was introduced, it was up to the local government to undertake the actions required to identify beneficiary groups, their affiliation and the programs diffusion within their state (DOF, 2002). Thus, the decision of which municipalities were affiliated first was based on agreements with local governments, where each state decided to implement Seguro Popular according to its own goals, while generally satisfying the rules of operation of the program (Bosch and Campos-Vázquez, 2014). Moreover, the extent of Seguro Popular's coverage within each municipality was decided by the municipal governments and was based on numerous factors including the availability of resources related to health infrastructure and health personnel.

Table 3.7 presents results of Eq. (3.1) at both the intensive and extensive margins, where the availability of Seguro Popular at the municipality level is introduced as a binary variable in place of the program's coverage rate at the state level. Panel A includes all households in the sample. Panels B through E divide the sample by quartiles according to the household's position in the income distribution.[36]

Table 3.7 SP availability and private transfers. Municipality level variation. Full sample and divided by position in the income distribution

Sample	(1)	(2)	(3)	(4)
	OLS: Amount of private transfers received		LPM: Probability of receiving private transfers	
A. Full sample				
	-28.05	2.660	-.0097	-.0145*
	(28.56)	(36.43)	(.0081)	(.0084)
B. First quartile				
	-46.57***	-37.80**	-.0249*	-.0358**
	(13.88)	(18.54)	(.0129)	(.0178)
C. Second quartile				
	-14.72	5.351	.0004	-.0128
	(25.91)	(28.94)	(.0137)	(.0158)
D. Third quartile				
	-64.15*	-53.92	-.0190	-.00611
	(38.05)	(41.23)	(.0130)	(.0148)
E. Fourth quartile				
	83.41	88.26	-.0031	-.0067
	(91.44)	(126.0)	(.0143)	(.0165)
HH level controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01.

Source: Author's elaboration based on the ENIGH. Figures presented represent coefficient estimates for SP availability at the municipality level. HH level controls include the variables presented in Table 3.4. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the municipality level.

[36] While generally consistent, when using Seguro Popular's availability at the municipality level as the main explanatory variable, the magnitude of the estimated coefficients is dependent on which threshold is used to denote when the program first became available in each municipality. Furthermore, using the program's availability instead of its coverage rate conceals substantial information, particularly considering that the study covers a period of both low and high Seguro Popular coverage. Due to these shortcomings, estimations when using the program's state coverage rate instead of its municipality availability are presented as the main results.

Column (1) of Panel A shows that when a full set of controls are introduced jointly with state fixed effects, the negative effect of Seguro Popular on the amount of private transfers received stands at 28.05 pesos per month, where this effect is not statistically significant. When municipality fixed effects are used as in columns (2), this effect becomes positive but remains non-significant. Focusing on the extensive margin, it is observed in column (4) that, when a full set of controls are included along with municipality fixed effects, the program reduced the likelihood of receiving private transfers by 1.45 percentage points, where this result is statistically significant at the 10.0% level. Consequently, an analysis that uses the program's availability at the municipality level provides further evidence that Seguro Popular did not crowd-out private transfers at the intensive margin. On the other hand, it supports the finding that the program had weak but statistically significant effect at the extensive margin.

Focusing on households located at different parts of the income distribution, Panel B shows that the program's effect was stronger among households located in the bottom quartile. Column (1) shows that at the intensive margin, when a full set of controls are introduced including state fixed effects, it is estimated that Seguro Popular reduced the amount of private transfers received by 46.57 pesos per month, where this coefficient is statistically significant at the 1.0% level. Moreover, when municipality fixed effects are used, it is observed in column (2) that the program reduced private transfers by 37.80 pesos per month, where this coefficient is significant at the 5.0% level. At the intensive margin, similar results are found. Column (3) shows that, when a full set of controls are used including state fixed effects, it is estimated that the program reduced the likelihood of receiving private transfers by 2.49 percentage points. When municipality fixed effects are incorporated, it can be seen in column (4) that Seguro Popular reduced the likelihood of receiving private transfers by 3.58 percentage points, where this coefficient is significant at the 5.0% level. Finally, regarding the households located in the top three quartiles of the income distribution, Panels C, D and E show that in general Seguro Popular did not affect private transfers at either the intensive or extensive margins. The program's effect might be larger among low income households given that they are actually more likely to be enrolled in Seguro Popular relative to higher income households. Furthermore, the fact that the program crowds-out private support among low-income households but not among those located higher in the income distribution may be a result of differences in the motives for remitting among donors depending on the receiving household's level of income.[37]

3.7.3 Donors

Since the ENIGH collects information on household expenditures, it is possible to focus on donors instead of recipients and examine the effect of Seguro Popular on the amount of private transfers sent and on the probability of remitting a positive amount.[38] To calculate the effect of Seguro Popular on donors, Eq. (3.1) is again estimated where the dependent variable is either the monthly amount of private transfers sent or a dichotomous variable that takes the value of one if the household remitted a positive amount during the

[37] Since the introduction of Seguro Popular partially crowded-out private transfers and the program reduced health expenditures by an even larger amount, the matter of how households used their additional income derived from being affiliated to the program was also examined. Eq. (3.1) was estimated with a full set of controls with the dependent variable being household savings or a variety of expenditure categories such as food, clothing, housing, transportation or education. In results not presented, the estimated equations show that the introduction of Seguro Popular did not affect household savings, suggesting that the additional resources were likely used for consumption purposes. The different expenditure categories were also unaffected by the program's introduction. These results are likely to arise because health expenditures constitute a very small fraction of total household expenses. Thus, even if Seguro Popular reduced health expenditures, its effect may not be large enough to influence household expenses in other categories. Nonetheless, this result may also be a product of measurement error which is a common issue when working with expenditure data.

[38] While it is likely that the majority of the private transfers sent by the donors included in the ENIGH are directed towards families residing within Mexico, the survey does not contain information on the characteristics of beneficiary households.

previous six months or zero otherwise. Additionally, to minimise unobserved heterogeneity that may affect remitting behaviour, households are classified according to whether they are eligible or ineligible for Seguro Popular.

Table 3.8 SP coverage and total private transfers sent

Variable	(1)	(2)	(3)	(4)
	SP eligible HH		SP ineligible HH	
	OLS: Amount of private transfers sent			
SP coverage at the state level	10.92	18.48	-149.7*	-157.6*
	(13.67)	(12.89)	(82.30)	(82.85)
	LPM: Probability of sending private transfers			
SP coverage at the state level	.0231	.0301	-.0438	-.0293
	(.0227)	(.0251)	(.0396)	(.0428)
HH level controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes
Observations	54,854	54,854	55,478	55,478

* p<0.10; ** p<0.05; *** p<0.01.
Source: Author's elaboration based on the ENIGH. HH level controls include the variables presented in Table 3.4. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Table 3.8 shows that among households eligible for Seguro Popular, when a full set of controls are introduced along with state fixed effects, it is estimated that the program increased the amount of private transfers sent by 10.92 pesos per month, where this effect is not statistically significant. When municipality fixed effects are included, the effect increases to 18.48 pesos per month but is once again non-significant. With respect to the program's effect on the probability of remitting, a similar relationship is observed. Whether state or municipality fixed effects are included along with a full set of controls, it is estimated that Seguro Popular increased the probability of remitting, where this effect is never statistically significant.

Concerning how the introduction of Seguro Popular affected the remitting behaviour of households that were not eligible for the program, a different pattern is observed. Column (3) shows that, when state fixed effects are used, it is estimated that Seguro Popular reduced the amount of private transfers sent by 149.7 pesos per month, where this coefficient is significant at the 10.0% level. When municipality fixed effects are incorporated jointly with a full set of controls, it is estimated that the program's introduction reduced the amount of private transfers sent by 157.6 pesos per month, where this effect is once again significant at the 10.0% level. With respect to the probability of remitting, it is observed that Seguro Popular reduced the probability of remitting among ineligible households between 2.93 and 4.38 percentage points. Nevertheless, these coefficients are not statistically significant.

In summary, the results show that while the introduction of Seguro Popular did not affect the remitting behaviour of households that were eligible for the program, it did affect the remitting behaviour of households that were not eligible to enrol in Seguro Popular. This may be driven by the fact that households covered by social security institutions were much more likely to remit relative to those that were uninsured. It may also be that households have different motives for remitting depending on whether they have access to a social security institution or not.

Focusing on recipients and donors, it can be seen that Seguro Popular affected both recipients of private transfers as well as donors residing in Mexico and the United States.

Nevertheless, the effect on donors is limited to households that were not eligible for the program. Furthermore, since they were not affiliated to Seguro Popular, donor households ineligible for the program did not experience a reduction in health expenses. Whether these households encountered welfare gains or losses is uncertain, since this is likely a function of the relationship between the increase in taxes they were subject to in order to finance Seguro Popular and the amount by which they decreased their donations of private transfers. Concerning households ineligible for Seguro Popular, it is clear that they were subject to a positive welfare effect. This arises because Seguro Popular facilitated access to health facilities, reduced health expenses and while the program did partially crowd-out private support, this figure only represents one-fifth of the reduction in health expenses. Moreover, since eligible households are outside the formal sector, they were largely unaffected by the potential increase in taxes incurred in order to finance Seguro Popular.

3.8 Conclusions

This study examined the empirical question of whether the implementation of Seguro Popular affected the amount of private transfers received and the likelihood of receiving private transfers among Mexico's uninsured households. The effects of Seguro Popular were identified using the spatial variation in the program's coverage induced by its sequential roll-out throughout Mexico.

Based on multiple waves of the ENIGH, the results show that among households eligible for the program Seguro Popular had no effect on the amount of private transfers received. This may be due to the fact that prior to the program's implementation in 2000, health expenditures only accounted for 2.6% of total household expenditures. On the other hand, the implementation of Seguro Popular reduced on average a household's probability of receiving private transfers by 5.55 percentage points, a 28.6% reduction with respect to the .194 probability that uninsured households had of receiving private transfers prior to the program's introduction in 2000. This estimate is driven by domestic private transfers, since international private transfers were not affected by the program’s implementation at either the intensive or extensive margins. Seguro Popular’s negative effect on the likelihood of receiving private transfers is robust to the use of the program's state level expansion or municipality level availability.

The fact that Seguro Popular had a clear social welfare improving effect has been well documented, since the program has provided millions of Mexicans access to health care. Nonetheless, the finding that an unintended consequence of Seguro Popular is that it partially crowds-out private support highlights the importance of looking at unexpected outcomes when analysing public policies, since the presence of crowding-out effects has important implications for the effectiveness of redistributive policies. The crowding-out effect suggests that the net effect of Seguro Popular is smaller than when just analysing its impact on health expenditures or health outcomes. Consequently, an evaluation of the effects of Seguro Popular should take into account possible changes in private behaviour. Failure to do so may overstate the program’s potential benefits or distributional impacts.

4 Crime Exposure and Educational Outcomes in Mexico

4.1 Introduction

Driven by drug-trade related crimes, homicide levels in Mexico have dramatically increased in recent years. From 2007 to 2012, the annual homicide and drug-trade related homicide rate per 100,000 inhabitants in Mexico increased by 192.8% and 439.6%, respectively. Moreover, during this period 121,613 homicides and 66,217 drug-trade related homicides were committed in the country.[39] The rise in crime and insecurity has proved extremely costly, totalling 1.4% of Mexico's GDP in 2012 (INEGI, 2012). Since violence affects not only those directly involved in illegal activities but also reaches a much broader segment of society, it is likely to have important welfare effects. In the short run, these include negatively affecting school enrolment rates, the number of contact hours, academic performance and grade failure rates, among others. In the long run, it may influence educational attainment levels and income streams. This study examines the effect of students' exposure to local homicides on educational outcomes in Mexico. The effects of crime exposure are investigated for both standardised test scores and grade failure rates.[40]

[39] Author's calculation based on the Sistema Estatal y Municipal de Bases de Datos (SIMBAD, State and Municipal Database System) and the Comisión Nacional de Seguridad (CNS, National Security Commission).

[40] In Mexico, basic education is divided into primary school (first to sixth grade) and secondary school (seventh to ninth grade). Since 1993, education has been compulsory until ninth grade. This was modified in 2013 becoming compulsory until twelfth grade. In 2009, Mexico ranked in the 48th position among 65 countries that undertook the Programme for International Student Assessment (PISA) test (OECD, 2010). In 2010, public expenditure in education as percentage of the country's GDP stood at 5.2% (World Bank, 2015).

The mechanisms linking violent crime exposure and educational outcomes operate across different channels. At the individual level, it may affect educational attainment due to changes in behaviours or mental health. Children and adolescents exposed to different types of violence frequently display a number of symptoms related to acute or post-traumatic stress disorder (PTSD) (Martinez and Richters, 1993; Berman et al., 1996; Osofsky et al., 2004). These characteristics, which include intensified levels of stress, anxiety, interrupted sleep, a lack of awareness, aggressive behaviour and difficulty concentrating, have been shown to affect educational outcomes (Margolin and Gordis, 2000; Ding et al., 2009). Nevertheless, Di Tella et al. (2015) state that individuals who are victimised or are regularly exposed to violence may become “vaccinated” or develop “immunity” against the psychological effects of crime.

At the household level, being exposed to violent crime may also affect parents’ time preferences. For example, parents exposed to high levels of crime may shift their focus to ensure the basic safety of their children, dedicating less time and energy towards improving their education (Harding, 2010). Parents may resort to bounding techniques, which limit children to the home setting while restraining access to neighbourhood relations and influences (Jarret, 1997). This may reduce social ties between households, teachers and the community, all of which help monitor children and are generally associated with better educational outcomes (Bryk et al., 2010). Furthermore, parents that have previously undergone a traumatic experience are more likely to have children with PTSD symptoms, since they may transmit the effects of their experiences to them (Linares et al., 2004).

High levels of violent crime may also impact educational outcomes by affecting both current and expected outside opportunities. Studies for Mexico have shown that the rise in homicides increased the unemployment rate, led to a contraction of wages and reduced labour force participation rates, therefore deterring economic growth in the short-run and possibly in the long-run (see, e.g. Enamorado et al., 2014; Robles et al., 2014; Dell, 2015).

Furthermore, the rise in violent crime has been largely concentrated among males. Dell (2015) reports that approximately 95.0% of drug-trade related homicide victims are male and 45.0% are under 30 years of age. This asymmetric increase in homicides may lead to changes among parents in their perceptions of the dangers encountered by their male children. As a result, intra-household resource reallocation may occur, thereby affecting gender differences in human capital accumulation.

Extreme crime related events can also affect the school routine by causing closings and temporarily interrupting classes. Since in Mexico unionised primary and secondary teachers' salaries are largely unaffected by the number of days they are absent from work, violence may lead to high levels of attrition and absenteeism.[41] Staff turnover may also increase given that managing a school in a locality with high levels of crime can be difficult as well as risky (Monteiro and Rocha, 2013, p. 15). If exposure to violent crimes leads to short term interruptions of classes, an implication is that children and adolescents exposed to these incidents are likely to function at a consistently lower level over the entire school year (Sharkey et al., 2014, p. 203).

[41] Due to the substantial power that the Sindicato Nacional de Trabajadores de la Educación (SNTE, National Educational Workers Union) has in Mexico, affiliated teachers are highly protected. Their benefits include frequently receiving their full wage even if they are absent from work for a significant amount of time.

Table 4.1 Due to fear of being a crime victim, did you stop…?

Action	Yes	No	Observations
Going out at night	54.5%	45.5%	61,177
Let underage kids go out	59.9%	40.1%	35,950
Visit family or Friends	33.1%	66.9%	64,220
Take a taxi	27.6%	72.4%	40,833
Use public transportation	16.5%	83.5%	51,838
Carry money in wallet	44.5%	55.5%	64,238
Go to school	7.2%	92.8%	7,237
Go to the cinema or theatre	30.8%	69.2%	31,561
Go for a walk	31.6%	68.4%	55,864
Wear jewellery	59.6%	40.4%	36,709
Go out for dinner	26.9%	73.1%	52,381
Carry credit or debit card	36.5%	63.5%	34,496

Source: Author's elaboration based on ENVIPE 2011.

Table 4.2 Due to fear of being of crime victim, did you stop going to school?

Violence level by municipality	Yes	No	Observations
Total homicides			
High	8.9%	91.1%	1,006
Medium	5.8%	94.2%	2,173
Low	3.6%	96.4%	4,058
Drug-trade related homicides			
High	10.4%	89.6%	3,301
Medium	5.2%	94.8%	3,025
Low	2.5%	97.5%	911

Source: Author's elaboration based on ENVIPE 2011. Municipalities with high, medium and low violence levels refer to those located in the upper, medium and lower tercile, respectively, of the homicide distribution.

Students may also attempt to side-step attending school due to safety concerns. Based on the Encuesta Nacional de Victimización y Percepción Seguridad Pública (ENVIPE, National Victimization and Perception of Public Safety Survey), Table 4.1 shows that in 2011 approximately 7.2% of Mexico's students self-reported that they stopped going to school due to fear of being a crime victim. Furthermore, it can be seen in Table 4.2 that this figure is positively related to the homicide level in the municipality of residence.

A number of recent studies have examined the relationship between violence and educational outcomes in Mexico.[42] Caudillo and Torche (2014) investigate the effect of

[42] Among the studies that have examined the effects of the rise in crime in Mexico, Dell (2015) finds that municipalities that elected a mayor from the Partido Acción Nacional (PAN, National Action Party), the

crime on grade failure among first to sixth grade students. Based on school level data covering the 1990 to 2010 period, the authors estimate a series of fixed effects, first difference and group-specific intercepts and slopes models. The study shows that a one-unit rise in the homicide rate per 10,000 inhabitants increases the failure rate between 0.027 and 0.089 percentage points. Michaelsen and Salardi (2013) quantify the effects of the rise in violent crime on standardised test scores among third to sixth grade students. Focusing on the years 2007 to 2011 and estimating fixed effects models, the scholars observe that the rise in homicides negatively affected test scores.[43] The study also distinguishes between the effects of recent violent events and the impact of accumulated events before the exams took place, generally obtaining similar results. Furthermore, the findings show that the occurrence of at least one homicide in the seven days prior to the examination week reduces the attendance rate during the test by 0.3 percentage points. Finally, Márquez-Padilla et al. (2015) examine the effects of homicides and drug-trade related homicides on school enrolment, migration, employment and test scores. Covering the 2009 to 2011 period, the authors estimate a series of fixed effect models. The study shows that higher homicide rates lead to a small reduction in enrolment rates among high school-age individuals. Nonetheless, the scholars do not find an effect of the rise in violence on standardised test scores among third to ninth grade students.[44]

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party of President Felipe Calderón (2006-2012), encountered an upsurge in crime rates in the months following the election relative to those municipalities where PAN lost by a small margin. The authors also observes that the rise in violence led to a reduction in female force participation rates and a contraction in wages among men employed in the formal sector. Enamorado et al. (2014) exploit cross-municipal income and crime data and observe that from 2005 to 2010 drug-trade related crimes deterred economic growth. Focusing on the 2006-2010 period, Robles et al. (2014) assess the economic costs of drug-trade related violence. Using electricity consumption as an indicator of the level of economic activity, the study finds that marginal increases in homicide rates negatively affected labour force participation rates and increased the proportion of unemployed workers in an area.

[43] Specifically, with an average score of 514 in the standardised test, the scholars observe that a one-unit increase in the homicide rate per 1,000 inhabitants reduces average scores between 1.96 and 2.22 points.

[44] Table A.4.1 in the Appendix explicitly presents the characteristics of the present study and the work by Caudillo and Torche (2014), Michaelsen and Salardi (2013) and Márquez-Padilla et al. (2015).

This study contributes to the literature on crime and educational outcomes in Mexico in several ways. First, the period of investigation is updated and extended as it focuses on the years covering from 2006 to 2012. Second, the econometric analysis controls for different school and household level programs implemented by the federal government which have been shown to strongly affect educational outcomes in Mexico, and which surprisingly have been mostly ignored in the literature. Third, with respect to standardised test scores, different subsamples of the population are examined. Among secondary schools, heterogeneous effects depending on when the homicide occurred with respect to examination date are investigated and potential spillover effects originating from homicides registered in nearby municipalities are analysed. Fourth, regarding grade repetition, the study includes secondary schools, distinguishes between homicides and drug-trade related homicides, examines different population groups and investigates spillover effects. Fifth, the potential endogeneity of the homicide rate is addressed by using the instrument first proposed by Castillo et al. (2014), based on the proximity of Mexico's municipalities to the U.S. border interacted with information on cocaine seizures in Colombia. Sixth, evidence is provided on the mechanisms driving the negative relationship between crime exposure and educational outcomes. This is done by focusing on the effects of violence on the number of contact hours and the amount of time spent performing school related activities in the household. Lastly, from a public policy standpoint the study provides evidence regarding the fact that non-educational policies, such as those concerning the country's security, affect educational outcomes.

The results show that a one-unit increase in the homicide rate per 10,000 inhabitants reduces average standardised test scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, grows stronger if the homicide occurs closer to the examination date, and is relatively stable when using either total homicides or drug-trade related homicides to measure crime exposure. Higher homicides rates are also associated with an increase in the grade failure rate.

The study proceeds as follows. Section 4.2 reviews the related international literature. Section 4.3 discusses the main motives behind recent increases in homicides and drug-trade related crimes in Mexico. Section 4.4 describes the data and presents summary statistics. Section 4.5 outlines the econometric methodology. Section 4.6 discusses the results. Section 4.7 tests the robustness of the results. Section 4.8 concludes.

4.2 Literature Review

Within the international literature that examines the impact of crime exposure on educational outcomes, a series of studies have focused on the effects of school level violence (see, e.g. Grogger, 1997; Abouk and Adams, 2013; Beland and Kim, 2014; Poutvaara and Ropponen, 2010). These investigations tend to observe that bringing weapons to school, fights between students and school shootings are associated with lower enrolment rates, a reduction in attendance and graduation rates and lower scores in national standardised tests.[45] Nevertheless, while these studies focus on violence

[45] Focusing on the U.S., Grogger (1997) finds that moderate levels of violence, including fights between students and bring weapons to school, reduce the likelihood of high school graduation by 5.1 percentage points and the probability of attending college by 6.9 percentage points. Abouk and Adams (2013) analyse high school shootings and observe that public school shootings tend to be followed by a 10.0% to 12.0% increase in private high school enrolment rates. Beland and Kim (2013) examine how fatal shootings in high schools affect test scores and enrolment, graduation, attendance and suspension rates. The authors find that homicidal shootings decrease the enrolment of students in ninth grade as well as test scores in English and Mathematics. Potvaara and Ropponen (2010) perform a similar analysis for Finland and observe that average test scores among male students tend to decline due to the school shootings, whereas for female students no effect is observed.

occurring within the school, the present chapter examines exposure to violent crime outside the school.

Another strand of the literature has centred on the effects of widespread conflict. Armed conflict has been shown to have strong long term effects on primary school completion rates in Timor-Leste (Justino et al., 2014), to affect human capital accumulation in Guatemala (Chamarbagwala and Morán, 2011) and Peru (León, 2012), to increase school drop-out rates and labour force participation rates in Colombia (Rodríguez and Sánchez, 2012) and to decrease women's enrolment rates and mandatory schooling completion rates in Tajikistan (Shemyakina, 2011), among others.

Furthermore, a series of studies have examined the effects of violent crimes and illegal activities. Focusing on Colombia, Gerardino (2014) observes that teenage males are less likely to be enrolled at secondary school relative to girls when male-biased violence is high. Monteiro and Rocha (2013) analyse the impact of armed struggles between drug gangs in Rio de Janeiro on student achievement, and show that the negative effects of violence increase with its intensity, duration, and proximity to the examination dates. Finally, Sharkey et al. (2014) study the impact of exposure to violent crime on students' standardised test scores in New York City, where the authors observe that violence reduces performance on English assessments but has no effect on Mathematics scores. Furthermore, the effect of exposure to violent crime is stronger among African-Americans and reduces their grade passing rates by approximately 3.0 percentage points.

4.3 Violence in Mexico

The increase in violent crime observed in Mexico in recent years is a result of a long-term political and economic process. Characterised by being a chaotic decade long episode, the Mexican revolution scarred the country and resulted in the creation of strong state led by the Partido Revolucionario Institucional (PRI, Institutional Revolutionary Party). The PRI suppressed political opposition by integrating different groups of society including labourers, peasants, businessmen, academics, and the armed forces into its organisation. It granted concessions and monopolies to private-sector supporters, paid off labour leaders, and assigned numerous well remunerated public-sector jobs to proponents. Backed by a strong repressive capacity, the PRI used its patronage machine to subdue rebellious voices and control Mexico for decades (O'Neil, 2009, p. 65).

Links between the PRI and drug trafficking organizations (DTOs) date back to the 1920s during the Prohibition era, a relationship that grew stronger and had been solidified by the 1950s. Through the Secretariat of the Interior, local governments and the federal police, the state created patron-client relationships with different sectors of society including the DTOs. This agreement minimised the number of violent acts committed against government officials, high-ranking drug-traffickers and the general population, while also defining the rules of operation for DTOs and guaranteeing that police investigations did not reach kingpins or other cartel leaders (O'Neil, 2009, p. 65). These conditions allowed organised crime groups to be virtually unchallenged by the government, permitting them to operate with relative liberty and grow into highly powerful consortiums (Astorga and Shirk, 2010, p. 8). While the PRI did not generally accept criminal activity, such behaviour was more likely to go unpunished when public officials were more easily accessible for bribes and corruption. This association remained true even in the 1970s and 1980s when drug trafficking and production intensified throughout the country (O'Neil, 2009; Astorga and Shirk, 2010).

The equilibrium in the relationship between government authorities, including law enforcement, and DTOs began to change during Mexico's decentralization and democratization process in the late 1980s and 1990s. By losing a number of state governorships and subsequently failing to obtain absolute majority in Congress in 1997, the PRI lost its political monopoly as well as control over the drug trade. Once different political parties started coming into power, it invalidated the previous understanding requiring DTOs to negotiate with the new political establishment and encouraging rival crime groups to bid for market opportunities. With the election of President Vicente Fox (2000-2006), candidate of the right wing PAN, the old model dependent on PRI control was shattered (O'Neil, 2009). In certain instances, the country's political transformation provided the necessary impulse to spur accountability, transparency, better governance and a head on approach towards DTOs. In other cases, it simply unsettled political connections to favour one DTO over another. Nevertheless, it is noteworthy to mention that none of Mexico's major political parties have been immune from acts of corruption, as this is a widespread occurrence in the country (Astorga and Shirk, 2010, p. 8).

The political opening in Mexico allowed DTOs the opportunity to gain autonomy and put a halt to their subordination to government authorities. Instead of buying off the necessary public servants, organised crime groups implemented a strategy of intimidation to ensure the safe passage of their merchandise. The rise of democratic competition also affected the state's capacity to react forcefully. As the influence of Congress increased, legislative gridlock weakened the later years of President Ernesto Zedillo's term (1994-2000) as well as the administration of Vicente Fox, delaying the judicial and police reforms needed by the country. Moreover, since they often belonged to different parties, problems often emerged between federal and local governments due to a lack of information being shared and the absence of coordinated policies (O'Neil, 2009). Consequently, when the Mexican state was divided into many different units that had different objectives, criminal behaviour became more violent since the probability of being punished decreased (Rios, 2014b, p. 4).

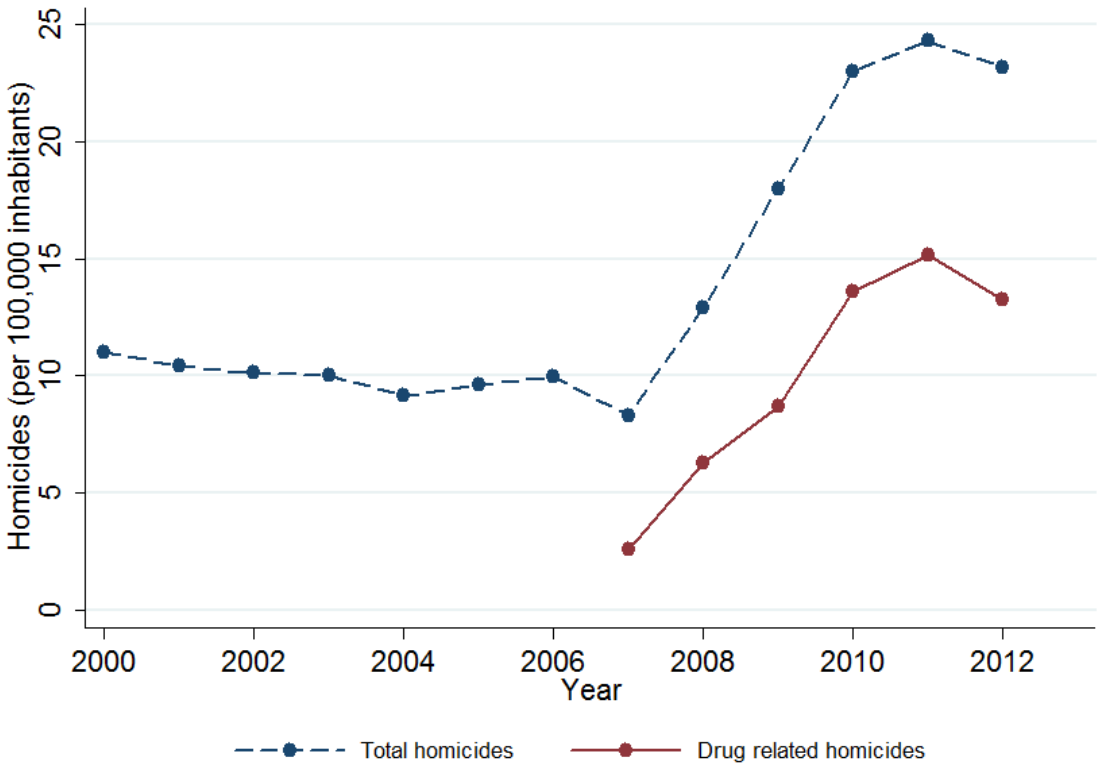
The relationship between government authorities and DTOs was radically altered in 2006. Following a closely contested election and just a few days after coming into power, President Felipe Calderón made the fight against organised crime groups, commonly referred to as the "war against drugs", the centrepiece of his administration by sending troops to state of Michoacán in December 2006.[46] While initially 6,500 troops were deployed to fight the DTOs, by the end of Calderón's administration this figure had risen to 45,000. The crackdown was largely unanticipated as the election made narrow mention of security issues in Mexico (Dell, 2015).

The "war against drugs" was largely based on the non-selective arrest of criminal leaders, which in turn led to the fragmentation of DTOs and the emergence of violent conflicts between crime organisations. Without their heads, a power vacuum emerged in many DTOs. Oftentimes, aspiring leaders who worked as part of the enforcement arms of the illegal drug trafficking organisations resorted to the use of high levels of violence to try

[46] Between 2006 and 2012 troops were also deployed to the states of Baja California, Chihuahua, Coahuila, Durango, Guerrero, Morelos, Nuevo León, Sinaloa, Tamaulipas, and Veracruz. In 2009, the Mexican government spent 9 billion U.S. dollars to fight drug trafficking (Keefer and Loayza, 2010).

to gain control of the fragmented markets, which resulted in a significant increase in the number of homicides. The neutralisation of kingpins and leaders was especially high between 2008 and 2010, while actions related to drug seizures and crop eradication remained stagnant (O'Neil, 2009; Guerrero-Gutiérrez, 2011).

Figure 4.1 Homicides per 100,000 inhabitants in Mexico, 2000-2012



Source: Author's elaboration based on SIMBAD and CNS.

Figure 4.1 shows that in 2000, the homicide rate in Mexico per 100,000 inhabitants stood at 11.0. Beginning in 2008, the homicide rate grew significantly, reaching a maximum of 24.3 in 2011. The increase in the homicide rate was largely driven by an escalation in the number of drug-trade related homicides. It can be seen that the trend in the homicide rate is very similar to the one observed for drug-trade related homicides.[47]

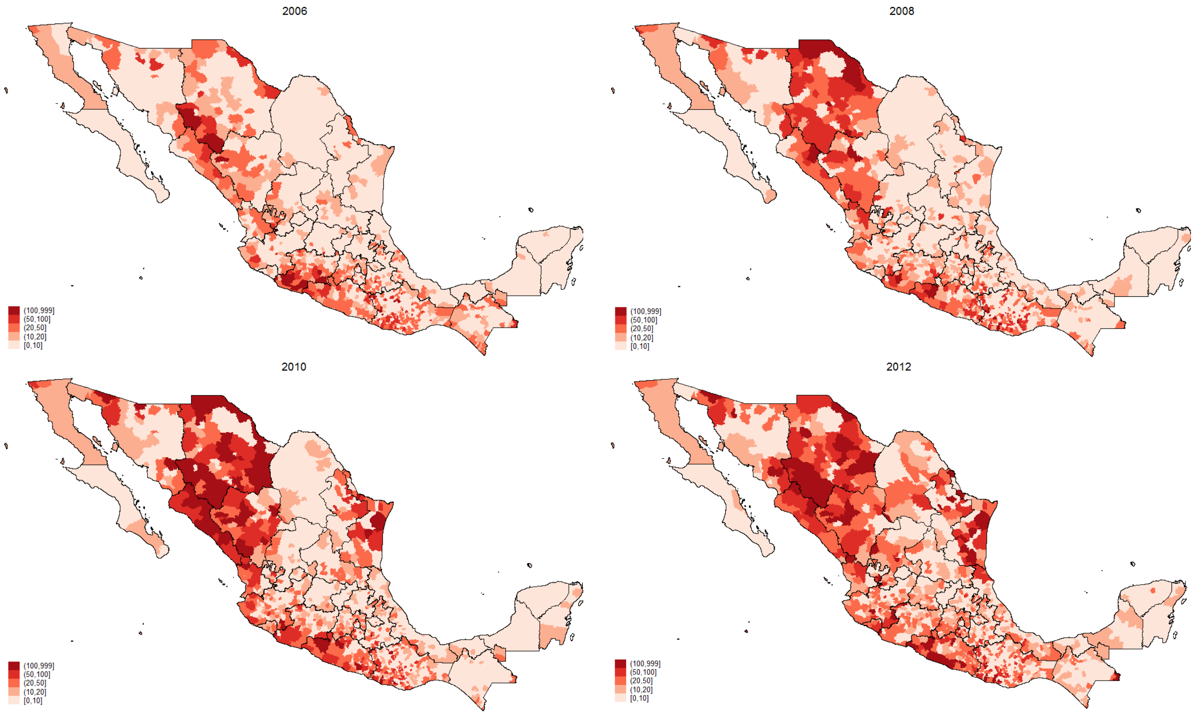
Since the approach taken by President Calderón was to go after all DTOs, this strategy resulted in intensified and geographically dispersed conflict (Guerrero-Gutiérrez, 2011). Figure 4.2 shows the geographic distribution and intensity of the homicide rate per 100,000 inhabitants by municipality from 2006 to 2012. While initially concentrated in a few states, homicides became more spatially diverse over time. Furthermore, a large part of drug-trade related homicides occur in areas close to drug trafficking routes and in border cities such as Ciudad Juárez or Tijuana, since the most lucrative part of the drug trafficking business chain takes place at border crossing points (Rios, 2014a, p. 201).[48]

In addition to the increase in the homicide rate, a rise in the number of illegal activities targeting the general population was also observed. When the leaders of the DTOs were neutralised, crime organisations often lost the ability to operate their international drug trafficking routes in an effective and economic manner. Thus, remaining members commonly turned against civilians to extract economic resources through exploitative criminal acts (Robles et al., 2014, p. 3). These included kidnappings, extortions, assault and car-thefts, among others.

[47] A large part of the violence among DTOs consist of drug traffickers killing each other, where this represents over 85.0% of all drug-trade related homicides (Dell, 2015).

[48] Dell (2015) reports that in 2008 in 68.0% of the country's municipalities there was either a major DTO or a local drug gang operating within its territory. Figure A.4.1 in the Appendix presents the geographic distribution of drug-trade related homicides in Mexico.

Figure 4.2 Homicides per 100,000 inhabitants by Municipality



Source: Author's elaboration based on SIMBAD.

Other major changes also occurred around the same time President Calderón took office, both of which affected the illegal drug market and homicide rates in Mexico. As explained by Castillo et al. (2014), in 2006 the Colombian government redefined its anti-drug strategy changing from a policy that emphasised attacking coca crops, which produce lower value added, to one that focused on the confiscation of drug shipments and well as the destruction of cocaine processing labs. This resulted in an increase in the amount of cocaine seized in Colombia, Mexico's main cocaine supplier. This created scarcity of cocaine and increased drug-trade related violence in Mexico. Another factor that also contributed to the increase in violent crime was the expiration of the U.S. Federal Assault Weapons Ban in 2004. Dube et al. (2013) observe that this made semiautomatic weapons more accessible to DTOs in Mexican states along the U.S. border, except for Baja California. Thus, the Mexican municipalities located near the non-California border states encountered differential increases in homicides and gun-related homicides after 2004.

While on the campaign trail, President Enrique Peña Nieto (2012-2018) had promised to cut down on the government's dependence on the counter-drug tactics used by the previous administration. Nonetheless, Peña Nieto has continued to heavily rely on the military while targeting the arrest of major DTO figures (Heinle et al., 2014).

4.4 Data and Descriptive Statistics

4.4.1 Data

Academic performance is measured using the scores obtained in the yearly national standardised test Evaluación Nacional de Logros Académicos en Centros Escolares (ENLACE, National Evaluation of Academic Achievement in Schools). First implemented in 2006, the test is taken by primary school students from third to sixth grade, and by secondary school students from seventh to ninth grade.[49] ENLACE evaluates students' knowledge and abilities in the subjects of Spanish and Mathematics. Since 2008, it also includes a third subject which changes on a rotating basis.[50] The test was initially implemented with the purpose of providing information on how to better structure and improve course outlines, and to help identify the skills-training needed by teachers.[51] ENLACE is measured on a scale ranging from 200 to 800. An advantage of the test is that it allows for a single and direct comparison between all evaluated students and schools. School level figures on ENLACE scores were obtained from the Secretaría de Educación Pública (SEP, Ministry of Public Education).[52]

Information on grade repetition rates were taken from the Estadística de Educación Primaria y Secundaria database, commonly referred to as Estadísticas 911 (i.e. Statistics 911). The dataset includes information on students, teachers, school characteristics and other elements of the educational system from all the schools in Mexico.

Statistics on the number of homicides at the municipality level were obtained from SIMBAD. Total homicides per 10,000 inhabitants were constructed using population

[49] Beginning in 2008, twelfth grade students also started taking the ENLACE test. Nevertheless, given that we were unable to obtain data for these schools, they were not included in the study.
[50] Specifically, in 2008 the third subject was Natural Sciences, in 2009 was Civics and Ethics, in 2010 was History, in 2011 was Geography, and in 2012 was once again Natural Sciences.
[51] ENLACE has undergone important changes since its inception. In 2006, the test was conceived solely as a tool that would allow to detect deficiencies among students, where its results could be used by teachers and parents to modify study habits and course outlines. Since ENLACE was not a "high impact instrument", the test was supervised by teachers and parents who did so on a voluntary basis. This was modified for the 2008-2009 school year, where the personnel conducting the test was no longer linked to the school being evaluated. Moreover, ENLACE scores were also linked to teacher compensation and school accountability, the latter by making its results public and creating school rankings (Backhoff, 2014).
[52] Although the ENLACE test does not determine if a student passes onto the next grade, Campos and Urbina (2011) show that its scores are closely related with bimonthly test results at the classroom level. Thus, the authors conclude that what is taught and learned in the classroom is reflected in the scores obtained in ENLACE.

figures derived from the 2005 Population Count and the 2010 Census of Population and Housing, both conducted by the Instituto Nacional de Geografía y Estadística (INEGI, National Geography and Statistics Institute). For years for which there are no population figures, the data was extrapolated assuming a constant yearly population growth-rate. Furthermore, the same yearly growth-rate observed between 2005 and 2010 was taken for 2010 to 2012.

To properly identify the effect of crime exposure on educational outcomes, a series of school, municipality and state level controls are introduced. Information on narcotics sentences at the municipality level and the unemployment rate and GDP per capita at the state level was taken from SIMBAD. Data on school level characteristics such as the number of students, groups, and the student-teacher ratio, among others, were obtained from Statistics 911. Information on whether the school participates in the Programa Escuela de Calidad (PEC, Quality School Program), Programa Escuela Tiempo Completo (PETC, Full-Time School Program) or the Programa Escuela Segura (PES, Safe School Program) was taken from SEP.[53] Cabrera-Hernandez (2015) observes that the implementation of the PEC and PETC had positive effects on ENLACE scores among primary school students. Data on the Seguro Popular coverage rate was obtained from the Comisión Nacional de Protección Social en Salud (CNPSS, National Commission of Social Protection in Health). Alcaraz et al. (2013) show that the expansion of Seguro Popular positively affected ENLACE scores. Finally, information regarding the Prospera coverage rate was taken from the Coordinación Nacional de Prospera Programa de Inclusión Social (CNPPIS, National Coordination of Prospera Social Inclusion Program).

[53] The PETC extends the school day from four or five hours to between six and eight hours per day. The PEC allows each school to design an education improvement plan which includes teacher training and additional course materials, among others. The PES grants economic and technical resources to schools which may be used on training, course materials or equipment related to school safety.

A number of studies have noted that Prospera has had a strong positive effect on educational outcomes in Mexico (see, e.g. Behrman et al., 2005; Attanasio et al., 2011).[54]

The period examined covers from 2006 to 2012. The analysis is limited to primary and secondary schools in which the ENLACE test was applied in all of the years included in the study. In total, there are 59,673 and 22,932 primary and secondary schools, respectively, in the sample, each observed for six periods.[55]

4.4.2 Descriptive Statistics

Table 4.3 displays the means and standard deviations of selected variables included in the econometric analysis. Regarding the outcomes of interest, for all years ENLACE scores in Mathematics are slightly larger than those in Spanish. Additionally, between 2006 and 2012 ENLACE scores steadily increased each year for both subjects. The opposite relationship is observed with respect to the grade failure rate, which gradually decreased during the period analysed.

Among school level controls, it is observed that the total number of students per school encountered a modest decrease between 2006 and 2012, dropping from 192.9 to 188.1, respectively. On the other hand, the average number of school groups per school remained relatively constant at around 7.9. The fact that the number of school groups is highly correlated with the number of classrooms used signals that classrooms are generally not

[54] Seguro Popular is a free-of-charge publicly provided health insurance program for otherwise uninsured households. Prospera, previously called Progresa and Oportunidades, is a poverty reduction cash-transfer program with education and health components, where households receive transfers conditional on sending their children to school and visiting health clinics.

[55] Data for 2008 was not included since at the time of writing I was unable to obtain for this year ENLACE scores separated by subject. Furthermore, the state of Oaxaca is excluded from the analysis since the ENLACE test was not applied in the state in some of the years included in the study.

shared among different school groups. Moreover, since there are between 4.0 and 4.1 teachers per every 100 students, this implies that on average there are close to 25 students per every teacher. Focusing on the different school level programs, Table 4.3 shows that the coverage rate of both the PETC and PES increased each year between 2006 and 2012. Specifically, while the coverage of the PETC was 0.0% in 2006, by 2012 this figure had increased to 2.2%. Furthermore, the PES which started in 2007 increased its coverage rate from 1.1% in its initial year to 35.0% in 2012. The PEC followed a less predictable pattern, where its coverage rate varied between 22.4% and 30.5% during the period of study.

Turning our attention to municipality and state level characteristics, it is observed that the total number of homicides per 10,000 inhabitants more than doubled during the period of analysis. While this figure stood at 0.9 in 2006, it escalated to 2.1 in 2011 and 2012. Moreover, the increase in the total homicide rate was largely driven by a rise in the number of drug-trade related homicides, which stood at 0.2 in 2007 and reached a maximum of 1.5 in 2011. While not as pronounced, there was also an increase in the number of narcotics sentences per 10,000 inhabitants, which rose from 1.2 in 2006 to 1.7 in 2011. Regarding different social assistance programs, it can be seen that the expansion of Seguro Popular coincided with the period analysed. In 2006, 21.6% of the population was enrolled in Seguro Popular. By 2012, this figure had more than doubled and stood at 55.9%. On the other hand, the coverage rate of Prospera remained fairly stable between 30.9% and 33.4%, as its main expansion occurred before 2006.

Table 4.3 Descriptive statistics

	2006	2007	2009	2010	2011	2012
School characteristics						
ENLACE test scores: Spanish	487.4	492.7	502.7	508.4	515.4	522.8
	(57.8)	(61.3)	(57.7)	(61.2)	(65.5)	(70.4)
ENLACE test scores: Mathematics	491.6	497.6	506.4	516.4	529.6	554.4
	(57.5)	(61.4)	(61.9)	(65.6)	(70.2)	(77.4)
Grade failure rate (%)	3.2	3.0	2.8	2.5	2.3	1.8
	(4.3)	(4.2)	(4.1)	(4.0)	(3.9)	(3.5)
Number of students	192.9	193.2	192.2	190.8	189.3	188.1
	(195.0)	(195.3)	(194.4)	(193.1)	(192.0)	(191.3)
Number of school groups	7.9	7.9	8.0	8.0	7.9	7.9
	(4.4)	(4.4)	(4.4)	(4.4)	(4.4)	(4.4)
Teachers per 100 students	4.0	4.0	4.0	4.1	4.1	4.1
	(3.0)	(3.0)	(3.2)	(3.4)	(3.4)	(3.3)
Number of classrooms used	7.9	7.9	8.0	8.0	8.0	8.0
	(6.1)	(6.0)	(6.4)	(5.8)	(5.9)	(5.7)
Principal is also a teacher (%)	41.6	41.6	41.2	40.7	40.4	40.6
	(49.3)	(49.3)	(49.2)	(49.1)	(49.1)	(49.1)
PEC (%)	24.7	25.1	22.4	24.3	30.5	26.7
	(43.1)	(43.4)	(41.7)	(42.9)	(46.0)	(44.2)
PETC (%)	0.0	0.0	0.4	0.8	0.9	2.2
	(0.0)	(0.0)	(6.6)	(8.9)	(9.3)	(14.6)
PES (%)	0.0	1.1	14.9	25.8	31.1	35.0
	(0.0)	(10.3)	(35.6)	(43.8)	(46.3)	(47.7)
Municipality and State characteristics						
Homicides per 10,000 pop.	0.9	0.8	1.6	2.0	2.1	2.1
	(1.1)	(1.0)	(3.0)	(3.8)	(3.4)	(3.4)
Drug homicides per 10,000 pop.	0.0	0.2	0.8	1.3	1.5	1.3
	(0.0)	(1.0)	(2.4)	(4.0)	(3.6)	(2.8)
Narcotics sentences per 10,000 pop.	1.2	1.2	1.0	1.6	1.7	1.5
	(2.1)	(1.8)	(1.7)	(2.7)	(3.2)	(2.9)
Seguro Popular coverage (%)	21.6	28.2	36.8	48.3	55.2	55.9
	(19.8)	(21.1)	(21.3)	(22.9)	(22.8)	(22.5)
Prospera coverage (%)	33.4	32.3	30.9	32.5	32.1	31.8
	(28.5)	(27.6)	(25.5)	(25.8)	(25.6)	(25.6)
State unemployment rate (%)	3.6	4.0	5.3	5.6	5.5	5.2
	(1.1)	(1.5)	(1.8)	(1.8)	(1.5)	(1.6)
GDP per capita/1000	108.1	109.2	102.1	105.5	107.7	110.1
	(111.0)	(103.1)	(86.3)	(82.3)	(79.6)	(78.5)
Observations	82,619	82,619	82,619	82,619	82,619	82,619

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). GDP per capita is in 2010 pesos. Standard errors are in parenthesis.

Finally, the state unemployment rate fluctuated between 3.6% in 2006 and 5.6% in 2010. With respect to GDP per capita, it reached its lowest point in 2009, when it dropped to approximately 102,100 pesos per year. The reduction in GDP per capita was largely driven by the global economic crisis where in 2009 Mexico's GDP contracted by 4.7% (World Bank, 2015).[56]

4.5 Methodology

To estimate the effect of crime exposure on standardised test scores and grade repetition rates, the variation in homicide rates across municipality and time is exploited. This is done by estimating a fixed effects (FE) model specified in the following manner:

$$y_{imt} = \gamma Crime_{mt} + X_{imt}\beta + W_{mt}\delta + Z_{st}\lambda + \alpha_i + \mu_t + \epsilon_{imt} \quad (4.1)$$

where y_{imt} denotes either the average ENLACE score obtained in Spanish or Mathematics or the grade repetition rate observed in school i in municipality m in year t; $Crime_{mt}$ represents the homicide rate per 10,000 inhabitants in municipality m in year t; X_{imt} denotes a vector of school level characteristics that may affect ENLACE test scores or grade repetition rates; W_{mt} and Z_{st} represent vectors of municipality and state level variables, respectively; μ_t denotes a time period dummy which helps control for national trends in homicide rates; α_i represents school fixed effects that capture time-

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[56] Table A.4.2 in the Appendix presents descriptive statistics at different percentiles of the distribution. It shows that the observed annual increase in ENLACE scores in both Spanish and Mathematics did not solely occur at the mean but also at different points of the distribution. Furthermore, homicide rates and drug-trade related homicide rates remained unchanged at the 10th percentile and relatively stable at 50th percentile. On the other hand, a significantly larger increase in both variables, with respect to what occurs at the mean, is observed at the 90th percentile.

invariant characteristics which may affect the educational outcomes of interest; and ϵ_{imt} is a random error term assumed to be uncorrelated with $Crime_{mt}$, X_{imt}, and Z_{st}.[57]

In addition to the homicide rate at the municipality level, the model includes as covariates school level characteristics such as total number of students, number of groups, number of teachers per 100 students, number of classrooms used, and dummy variables denoting whether the principal is also a teacher and whether the school participates in the PEC, PETC and PES. Municipality and state level covariates include the number of narcotics sentences per 10,000 inhabitants, the Seguro Popular and Prospera coverage rates at the municipality level, and the unemployment rate and GDP per capita at the state level. Eq. (4.1) is estimated separately for primary and secondary schools, and for ENLACE scores in Spanish and Mathematics and grade repetition rates. Standard errors are clustered by municipality to account for possible correlation among schools in some unknown way.

4.6 Results

4.6.1 Homicides and Academic Performance

Table 4.4 presents the effects of homicides on ENLACE scores in Spanish and Mathematics for primary and secondary school students.[58] Columns (1) and (2) show that among primary school students, an increase of one unit in the number of homicides per 10,000 inhabitants reduces average standardised test scores in Spanish and Mathematics

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[57] When focusing on grade repetition rates, y_{imt} represents a continuous variable between 0 and 100 that captures the proportion of students from 3rd to 6th grade in primary schools and from 7th to 9th grade in secondary schools that failed the grade during the current academic year.

[58] The homicide rates presented in Tables 4.4, 4.5, 4.7, 4.8, 4.9 and 4.10 were calculated based on the total number of homicides registered in the municipality where the school is located in the 12 months prior to the ENLACE test being taken. In 2006 ENLACE was applied from June 5 to 9, in 2007 from April 23 to 27, in 2008 from April 14 to 18, in 2009 from April 23 to 29, in 2010 from April 19 to 23, in 2011 from May 23 to 27, and in 2012 from June 4 to 8.

by 0.0035 and 0.0039 standard deviations, respectively. Regarding secondary school students, columns (3) and (4) show that the effect of homicides is again negative and statistically significant. Specifically, an increase of one unit in the number of homicides per 10,000 inhabitants reduces ENLACE scores in Spanish and Mathematics by 0.0089 and 0.0142 standard deviations, respectively. The stronger effect in secondary schools may be a result of older students being more generally aware of the violence around them.

Table 4.4 Homicides and academic performance

Variable	(1)	(2)	(3)	(4)
	ENLACE test scores: Primary		ENLACE test scores: Secondary	
	Spanish	Math	Spanish	Math
Homicides per 10,000 pop.	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
Number of students/100	0.036***	0.043***	0.093***	0.058***
	(0.008)	(0.008)	(0.011)	(0.011)
Number of groups	-0.014***	-0.014***	-0.003	0.005
	(0.003)	(0.003)	(0.005)	(0.005)
Teachers per 100 students	1.570***	1.950***	0.580***	0.628***
	(0.202)	(0.224)	(0.133)	(0.138)
Number of classrooms used	0.017***	0.016***	0.005*	0.007***
	(0.002)	(0.003)	(0.003)	(0.003)
Principal is also a teacher	-0.009	0.003	-0.047***	-0.051***
	(0.007)	(0.008)	(0.013)	(0.014)
PEC	0.015***	0.015***	0.022***	0.024***
	(0.005)	(0.006)	(0.008)	(0.008)
PETC	0.126***	0.124***	0.233***	0.256**
	(0.025)	(0.025)	(0.081)	(0.101)
PES	-0.011	-0.012	-0.056***	-0.011
	(0.013)	(0.013)	(0.020)	(0.023)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
R-squared	0.218	0.270	0.082	0.169
Observations	358,038	358,052	137,592	137,592

* p<0.10; ** p<0.05; *** p<0.01
Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). Standard errors are in parenthesis and are clustered at the municipality level.

Focusing on other controls, it is observed that in all cases the number of students at the school and the number of classrooms used are positively associated with standardised test scores. On the other hand, the number of school groups is negatively related with ENLACE scores in primary schools, but is not significant for secondary schools. The number of teachers per 100 students is positively associated with standardised test scores, where this variable is highly significant and is especially strong for primary schools. This finding implies that students have better academic performance when the student-teacher ratio is lower. With respect to the school's Principal also being teacher, under this scenario secondary school students tend to perform worse in both Spanish and Mathematics, whereas for primary schools there is no effect. The fact that the Principal is also a teacher may be signalling that there exists a shortage of teachers in the school.

Turning our attention to the different federal programs that were in effect during the period of study, it can be seen in all four columns that the PEC and PETC are positively associated with ENLACE scores. These results are in line with those reported by Cabrera-Hernandez (2015), who shows that students benefit from spending more hours at school. Finally, the PES is negatively related with standardised test scores, although this variable is generally not significant.

Table 4.5 shows how homicides affect the distribution of ENLACE scores within each school. For primary schools, an increment of one unit in the number of homicides per 10,000 inhabitants increases the proportion of students obtaining a score in the "Insufficient" category by 0.078 percentage points for Spanish and 0.089 percentage points for Mathematics. Thus, for primary schools violent crime seems to mostly affect the performance of students located in the lower part of the ENLACE score distribution. Concerning secondary schools, increasing the number of homicides per 10,000 inhabitants by one unit generates a rise in the percentage of students obtaining an

"Insufficient" score by 0.153 percentage points for Spanish and 0.251 percentage points for Mathematics. Homicides also affect the upper part of the score distribution, by reducing the proportion of students in the "Good" and "Excellent" categories. Consequently, for secondary schools an increase in violent crime levels produces a strong shift to the left of the ENLACE score distribution.

Table 4.5 Homicides and the distribution of scores

Sample	(1)	(2)	(3)	(4)
	Insufficient	Elemental	Good	Excellent
	Dependent variable: Proportion of students in each score range			
Primary				
Spanish	0.0784***	-0.0298	-0.0433	-0.0047
	(0.0289)	(0.0290)	(0.0275)	(0.0209)
Math	0.0886***	-0.0364	-0.0582*	0.0008
	(0.0314)	(0.0296)	(0.0316)	(0.0241)
Secondary				
Spanish	0.1532**	0.0043	-0.1753***	-0.0194***
	(0.0666)	(0.0371)	(0.0377)	(0.0059)
Math	0.2514***	-0.0265	-0.1332***	-0.1281***
	(0.0690)	(0.0430)	(0.0302)	(0.0349)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* $p<0.10$; ** $p<0.05$; *** $p<0.01$
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table 4.6 presents how the effects of homicides vary depending on their timing and how close they occur to the date the ENLACE test was taken. In general, it can be seen that the effects of homicides grow stronger if they occur closer to the examination date. For primary schools, whereas homicides registered during the entire academic year reduce Spanish test scores by 0.0043 standard deviations, homicides committed in the week prior to the test being taken decrease average scores by 0.0214 standard deviations. A similar relationship is observed for ENLACE scores in Mathematics, where homicides committed the week before the exam reduce average scores by 0.0325 standard deviations compared to 0.0048 for homicides committed during the entire academic year. Among secondary schools, the relationship between Spanish scores and the timing of the homicides remains fairly stable over the different time periods. On the other hand, the effect of homicides on Mathematics scores stands at 0.0155 standard deviations for homicides committed during the entire academic year and gradually rises to 0.0203 for homicides registered during the 3 months prior to the ENLACE test. The larger impact of homicides as they occur closer to the examination date may be indicating that the emotional and psychological effects of being exposed to a violent crime gradually decrease over time. On the other hand, it could also be signalling that classes missed closer to the examination date have a stronger effect on test performance than classes that were cancelled earlier in the academic year.

Table 4.6 Homicides and academic performance. Different effects by time

Dependent variable:	**(1)**	**(2)**	**(3)**	**(4)**
	Academic Year	6 months	3 months	Week
	Primary school			
ENLACE scores: Spanish	-0.0043**	-0.0049*	-0.0042	-0.0214*
	(0.0021)	(0.0028)	(0.0038)	(0.0119)
ENLACE scores: Math	-0.0048**	-0.0057*	-0.0066	-0.0325***
	(0.0022)	(0.0032)	(0.0043)	(0.0125)
	Secondary school			
ENLACE scores: Spanish	-0.0098***	-0.0094**	-0.0121**	-0.0097
	(0.0033)	(0.0042)	(0.0054)	(0.0137)
ENLACE scores: Math	-0.0048**	-0.0057*	-0.0066	-0.0325***
	(0.0022)	(0.0032)	(0.0043)	(0.0125)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

To examine if there are heterogeneous effects, Table 4.7 focuses on different subsamples of schools. It can be seen it columns (1) and (2) that for both primary and secondary schools, the effect of violent crime is stronger when schools are based in a locality with high marginality levels. This likely reflects the fact that homicides are more likely to occur in highly deprived areas. Moreover, the negative effects of homicides are larger in schools located in rural areas compared to those registered in urban localities, where for the latter there is generally no significant effect. Additionally, the effects of homicides tend to be larger for schools teaching in the morning session compared to those that teach in the afternoon session. The stronger effect in the morning session may due to the fact that because homicides tend to occur at night, bodies are usually discovered in the early morning leading to classes being suspended in the morning session and resumed by the time the afternoon session starts.

For primary schools, the negative effect of homicides is larger among public schools relative to private schools. Moreover, among private schools it is estimated that an increase in the homicide rate actually increases ENLACE test scores in both subjects, although the coefficient is only significant for Spanish. This result may be signalling that pupils studying in private schools, due to their generally privileged socioeconomic status, are being compensated in some manner (e.g. by being given private tutoring) in order to minimise the adverse effects of being exposed to homicides or to keep them away from the perceived dangers brought by an increase in the levels of violent crime. On the contrary, due to hesitation driven by resource constraints or because some parents may not perceive their children to be aware of the situation or at risk due to their young age, it may be that students attending public schools are not being compensated in the same manner. Nonetheless, academic performance in indigenous schools appears to be greatly affected by increases in violent crime levels, where an increase of one unit in the homicide rate per 10,000 inhabitants reduces ENLACE scores in Spanish and Mathematics by 0.0264 and 0.0236 standard deviations, respectively. Indigenous schools tend to be situated in small communities located in isolated areas with high poverty rates and low levels of schooling. Hence, it may be that in these communities there are higher levels of kinship or affinity among its residents, where the effects of an increase in the homicide rate are more widely felt among its inhabitants relative to schools located in larger or more densely populated areas. Moreover, due to a lack of economic resources or geographical isolation, there may not be any type of compensating mechanisms in place for pupils attending indigenous schools.

Among secondary schools, the estimated coefficients of the effect of homicides on test scores are positive for public and private schools, but negative for telesecundarias.[59] The positive effect for both public and private schools may be signalling that, unlike in primary schools, parents may decide to implement compensating mechanisms irrespective of their socioeconomic status. This may arise because given the ages of secondary school students, who are normally between 12 and 15 years old, they are more likely to be aware of their surroundings and therefore encounter a higher risk of being affected by high levels of violent crime.

Finally, the lagged effects of homicides are small for primary schools and completely disappear after two years. On the other hand, lagged effects are strong for secondary schools, where these only become non-significant after three years. The strong impact of lagged effects may be signalling the lasting impacts of crime exposure.

[59] Telesecundarias are distance education schools that provide secondary school education mainly through television broadcasts in rural or difficult to access areas in Mexico.

Table 4.7 Homicides and academic performance. Subsamples

Sample	(1)	(2)	(3)	(4)
	ENLACE test scores: Primary		ENLACE test scores: Secondary	
	Spanish	Math	Spanish	Math
A. Main	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
B. Marginality Level				
High	-0.0087**	-0.0065	-0.0183***	-0.0196**
	(0.0041)	(0.0041)	(0.0059)	(0.0088)
Medium	-0.0037	-0.0027	0.0033	-0.0036
	(0.0037)	(0.0042)	(0.0052)	(0.0058)
Low	0.0004	0.0005	0.0072***	0.0018
	(0.0011)	(0.0012)	(0.0022)	(0.0017)
C. Locality Size				
Urban	-0.0015	-0.0019	0.0024	-0.0031*
	(0.0015)	(0.0016)	(0.0019)	(0.0017)
Rural	-0.0057**	-0.0041	-0.0161***	-0.0191***
	(0.0027)	(0.0029)	(0.0037)	(0.0049)
D. Session				
Morning	-0.0040**	-0.0043**	-0.0103***	-0.0151***
	(0.0019)	(0.0019)	(0.0029)	(0.0034)
Afternoon	-0.0013	-0.0017	0.0127***	0.0052
	(0.0017)	(0.0020)	(0.0041)	(0.0034)
E. School Type				
Public	-0.0032*	-0.0032*	0.0086***	0.0041**
	(0.0018)	(0.0019)	(0.0023)	(0.0021)
Private	0.0062**	0.0044	0.0143**	0.0130***
	(0.0028)	(0.0032)	(0.0060)	(0.0049)
Indigenous	-0.0264***	-0.0236***	---	---
	(0.0066)	(0.0071)		
Telesecundaria	---	---	-0.0178***	-0.0220***
			(0.0037)	(0.0048)
F. Lagged Homicide Rate				
t-1	-0.0034*	-0.0033	-0.0109***	-0.0177***
	(0.0019)	(0.0021)	(0.0031)	(0.0038)
t-2	-0.0013	-0.0004	-0.0063**	-0.0139***
	(0.0018)	(0.0019)	(0.0032)	(0.0048)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01
Source: Coefficients reported in the table correspond to the total number of homicides per 100,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Spillover effects generated by homicides committed outside of the municipality where the school is located are also explored. Table 4.8 shows the effects of homicides registered away from the municipality but within a 20, 30 or 40 km radius. In general, it can be seen that there are negative spillover effects brought about by homicides committed outside of the municipality, where the estimated coefficients are generally statistically significant. Nevertheless, relative to homicides registered within the municipality, these effects are quite small. Furthermore, as would be expected, the spillover effects grow smaller as a larger area away from the municipality is considered.

Table 4.8 Homicides and academic performance. Spillover effects

Homicides occurring:	**(1)**	**(2)**	**(3)**	**(4)**
	ENLACE test scores: Primary		ENLACE test scores: Secondary	
	Spanish	Math	Spanish	Math
In Municipality	-0.0035**	-0.0039**	-0.0089***	-0.0142***
	(0.0018)	(0.0019)	(0.0029)	(0.0032)
Outside Municipality, 20 km	-0.0002*	-0.0003*	-0.0006*	-0.0008*
	(0.0001)	(0.0002)	(0.0003)	(0.0004)
Outside Municipality, 30 km	-0.0002	-0.0003**	-0.0006***	-0.0007***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Outside Municipality, 40 km	-0.0002*	-0.0002**	-0.0002	-0.0002*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* $p<0.10$; ** $p<0.05$; *** $p<0.01$
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Finally, Eq. (4.1) is again estimated where the main explanatory variable of interest is no longer the homicide rate per 10,000 inhabitants at the municipality level. Instead, it includes four categorical variables constructed according to the total number of homicides in the municipality. This allows analysing if the results are consistent when using an alternative measure of the homicide variable and examining for the potential presence of non-linear effects.

Table 4.9 shows that, with respect to the reference category of having zero homicides in the municipality, having between 1 and 15 homicides or between 16 and 30 homicides does not affect average ENLACE scores. When a municipality has between 31 and 60 homicides, violent crime exposure has a small impact on academic performance, particularly in primary schools. Furthermore, when a municipality registers more than 60 homicides in a 12-month period, ENLACE scores in primary and secondary schools are both strongly and negatively affected. This suggests that the negative effect of violent crime exposure on academic performance is highly non-linear and concentrated in the municipalities with the highest number of total homicides.

Table 4.9 Non-linear effects: Homicides and academic performance

Variable	(1)	(2)	(3)	(4)
	ENLACE test scores: Primary		ENLACE test scores: Secondary	
	Spanish	Math	Spanish	Math
0 < Homicides ≤ 15	0.0069	0.0128	0.0185	0.0194
	(0.0078)	(0.0087)	(0.0156)	(0.0156)
15 < Homicides ≤ 30	-0.0171	-0.0191	-0.0132	-0.0256
	(0.0150)	(0.0166)	(0.0278)	(0.0283)
30 < Homicides ≤ 60	-0.0418**	-0.0435*	-0.0332	-0.0464
	(0.0209)	(0.0238)	(0.0399)	(0.0382)
Homicides > 60	-0.0768***	-0.0908***	-0.1140**	-0.1360***
	(0.0253)	(0.0282)	(0.0443)	(0.0434)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
R-squared	0.218	0.270	0.083	0.169
Observations	358,038	358,052	137,592	137,592

* p<0.10; ** p<0.05; *** p<0.01

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. The reference category for the Homicides dummy variables is constituted by municipalities where there where zero registered homicides during the 12 months prior to the ENLACE examination date. Standard errors are in parenthesis and are clustered at the municipality level.

4.6.2 Homicides and Grade Repetition

Attention now turns to effect of homicides on grade repetition. Based once again on Eq. (4.1) and according to the results presented in Table 4.10, it can be seen that an increase of one unit in the homicide rate per 10,000 inhabitants is associated with a rise in the grade failure rate of 0.028 percentage points for primary schools and 0.027 percentage points for secondary schools.

Column (1) shows that for primary schools, the effect of homicides is only significant for schools located in areas with low marginality levels. Nevertheless, although not significant, the estimated coefficient is largest for schools situated in high marginality areas. For schools located in areas with medium marginality levels, although negative, the estimated coefficient is highly non statistically significant. Moreover, the stronger effect among schools situated in high marginality localities might be a result of these schools being located in areas exposed to higher homicides rates. Concerning the locality size, the effect of violent crime is significant in schools located in both urban and rural localities, where the effect of homicides is stronger among schools located in rural settings. With respect to whether classes are taught in the morning or afternoon session, the effect of homicides is slightly larger for schools that teach in the afternoon. Regarding the school type, the effect of crime exposure is stronger in public schools compared to private schools. The larger impact of crime exposure on grade repetition in public schools relative to private schools may be a result of classes having a higher likelihood of being suspended in the former upon the occurrence of a violent crime. Specifically, while unionised public school teachers are highly likely to receive their wages even if classes are cancelled, this is not the case with private school teachers whose wages are more dependent on them going to work and teaching. In indigenous schools the results show than an increase in the homicide rate is negatively associated with the grade failure rate, although the estimated coefficient is not statistically significant. On the other hand, the lagged homicide rate is positively related with grade repetition rates for up to two periods.

Table 4.10 Homicides and grade repetition

Sample	(1)	(2)
	Primary	Secondary
A. Main	0.0282***	0.0268***
	(0.0070)	(0.0082)
B. Marginality Level		
High	0.0151	0.0545***
	(0.0140)	(0.0209)
Medium	-0.0016	0.0041
	(0.0151)	(0.0252)
Low	0.0129**	0.0196**
	(0.0058)	(0.0093)
C. Locality Size		
Urban	0.0172***	0.0220**
	(0.0066)	(0.0104)
Rural	0.0276***	0.0403***
	(0.0086)	(0.0132)
D. Session		
Morning	0.0273***	0.0269***
	(0.0073)	(0.0085)
Afternoon	0.0309***	0.0258
	(0.0096)	(0.0164)
E. School Type		
Public	0.0293***	0.0168**
	(0.0073)	(0.0072)
Private	0.0137*	0.0279
	(0.0075)	(0.0246)
Indigenous	-0.0576	---
	(0.0522)	
Telesecundaria	---	0.0447***
		(0.0151)
F. Lagged Homicide Rate		
t-1	0.0357***	0.0277***
	(0.0074)	(0.0083)
t-2	0.0362***	0.0306***
	(0.0083)	(0.0075)
School level controls	Yes	Yes
School fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Municipality level controls	Yes	Yes
State level controls	Yes	Yes

* $p<0.10$; ** $p<0.05$; *** $p<0.01$

Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Turning our attention to secondary schools, it can be seen in column (2) that the effect of homicides on grade repetition rates is larger in schools based in localities with high marginality levels. Once again, the negative effect of violent crime is stronger in rural areas compared to urban settings. Further, the effect of homicides on grade repetition rates is stronger for secondary schools that teach in the afternoon session. Moreover, while there is no significant effect for private schools, crime exposure does increase the grade repetition rate for public schools and telesecundarias or distance education secondary schools. Finally, one- and two-year lagged values of the homicide rate significantly affect current grade repetition rates.[60]

4.7 Robustness Checks and Mechanisms

4.7.1 Drug-trade Homicides and Instrumental Variable Estimations

Since the increase in homicide levels observed from 2007 onwards was largely driven by a rise in drug-trade related homicides, this section examines their effect on educational outcomes. Provided by the CNS, data on drug-trade related homicides is available on an annual basis starting in December 2006. Unlike the homicide level information obtained from the SIMBAD, this dataset does not provide information on the date when the homicide occurred or when it was registered. Instead, only information regarding the total number of drug homicides at the municipality level during the calendar year is available.

This section also addresses the different challenges to identification that arise when attempting to estimate the effect of crime exposure on educational outcomes. First,

[60] The effects of homicide rates on grade repetition separated by different time periods and the analysis of spillover effects are also examined. See Tables A.4.3 and A.4.4 in the Appendix, respectively. Moreover, Table A.4.5 analyses non-linear effects of homicides on grade repetition.

regardless of the inclusion of a wide range of school, municipal and state level controls, unobserved variables may jointly determine educational outcomes and variations in the homicide rate. Factors such as institutions may generate a downward bias on the coefficient if municipalities with weak institutions offer lower quality schooling and have poorer educational outcomes, while also being exposed to larger increases in crimes levels due to less effective police and judicial services (Basu and Pearlman, 2014, p. 18). Second, the potential reverse causality between educational outcomes and violent crime levels cannot be disregarded. Whereas an increase in the homicide rate is likely to negatively affect academic performance and grade repetition rates, it is plausible to assume that violent crime levels are higher where educational outcomes are worse. This is likely to arise because DTOs may more easily employ adolescents who study at badly-performing schools (Michaelsen and Salardi, 2013). Lastly, while measurement error in homicide variables is not generally considered a serious problem compared to other types of crime, evidence suggests that this could be a problematic issue for the case of Mexico. According to official government data, between 2006 and 2013 an estimated 1,273 bodies, of which only 142 were identified, were found in different clandestine graveyards throughout the country (PGR, 2014). Moreover, it is highly probable that there many other illegal graveyards that have not yet been discovered and never will be. Measurement error in the homicide rate biases the coefficient towards zero. That is, it leads to attenuation bias by overestimating, or estimating as more positive, a negative coefficient. Considering all the factors mentioned above, the potential direction of the bias is uncertain.

To address the endogeneity issues, this study follows a similar strategy to the one first put forward by Castillo et al. (2014). Specifically, an instrumental variable (IV) model is estimated using as a source of exogenous variation the interaction of a municipality's proximity to the U.S. border with the percentage of cocaine seized in Colombia. Castillo et al. (2014) state that when the Colombia government seizes large quantities of cocaine, its price rises due to a reduction in supply. This increases the market value of cocaine, even more so in localities close to the U.S. border. Mexican municipalities that are close to the border have a comparative advantage due to their strategic geographic location since the U.S. is the final market. It is assumed that it will be these municipalities that see the highest increase in homicide levels because their control is more valuable to the DTOs.[61] In the IV model, the exclusion restriction is upheld if the change in the proportion of total cocaine production seized in Colombia jointly with the municipality's proximity to the U.S. border only affects homicide levels and therefore does not directly impact educational outcomes after controlling for all the covariates. This assumption is plausible, even though it cannot be tested directly.[62]

[61] Information on cocaine seizures in Colombia was obtained from UNODC (2014). Figure A.4.2 in the Appendix presents the relationship between homicide levels in Mexico and the proportion of cocaine seized in Colombia.

[62] It may be argued that change in the proportion of total cocaine production seized in Colombia, and the subsequent variation in cocaine prices, not only affects violent crime levels but also the value of the criminal involvement outside option, thus making organised crime activities potentially more attractive. However, Márquez-Padilla et al. (2015) show that the "war against drugs" was not accompanied with either a decrease or an increase in enrolment rates among primary or secondary school students.

Table 4.11 First stage results of IV-FE estimation

Variable	(1)	(2)	(3)	(4)
	Homicides		Drug-trade homicides	
	Primary	Secondary	Primary	Secondary
	Dependent variable: Homicides per 10,000 inhabitants			
(Proximity to U.S. border)*(% Colombian cocaine seized)	0.0091***	0.0074***	0.0089***	0.0070***
	(0.0019)	(0.0015)	(0.0015)	(0.0011)
Number of students/100	-0.326**	-0.022	-0.240***	-0.065
	(0.131)	(0.039)	(0.084)	(0.055)
Number of groups	-0.012	-0.047**	-0.004	-0.025
	(0.014)	(0.019)	(0.014)	(0.017)
All grades	-0.086	0.225**	-0.143**	-0.014
	(0.054)	(0.091)	(0.063)	(0.152)
Number of classrooms used	-0.010	-0.003	-0.004	0.008
	(0.013)	(0.011)	(0.012)	(0.008)
Principal is also a teacher	-0.031	-0.040	0.046*	0.027
	(0.027)	(0.032)	(0.027)	(0.038)
Student/Teacher ratio	0.147	0.371	0.268	0.831**
	(0.775)	(0.388)	(0.922)	(0.413)
PEC	0.072	0.044	0.066	0.070**
	(0.057)	(0.033)	(0.044)	(0.034)
PETC	-0.212**	-0.292*	-0.191	-0.335*
	(0.102)	(0.163)	(0.128)	(0.193)
PES	0.423**	0.262***	0.161	0.034
	(0.169)	(0.094)	(0.131)	(0.076)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
R-squared	0.185	0.157	0.133	0.103
F-test on instrument	21.74	25.47	37.37	38.50
Observations	358,038	137,592	358,038	137,592

* p<0.10; ** p<0.05; *** p<0.01
Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911), SIMBAD and CNS 2006, 2007, 2009, 2010, 2011 and 2012. PEC denotes the Programa de Escuelas de Calidad (Quality Schools Program). PETC denotes the Programa Escuelas Tiempo Completo (Full-time School Program). PES denotes the Programa Escuela Segura (Safe School Program). Standard errors are in parenthesis and are clustered at the municipality level. The reported F statistic is the Kleibergen-Paap rk Wald F statistic, which is robust to the presence of clustering in the data.

Table 4.11 presents the first stage results of the instrumental variable estimations. In all cases, the interaction of the municipality's proximity to the U.S. border and the percentage of cocaine seized in Colombia is positive.[63] This relationship is of the expected sign, since it is assumed that if a municipality is closer to the U.S. its homicide rate will

[63] The municipality's proximity to the border variable is in kilometres. The variable was constructed using the maximum distance within Mexico to the U.S. border and subtracting from this value the municipality's distance to the border. Moreover, the percentage of Colombian cocaine seized variable is between 0 and 1.

be higher. It is also expected that if the percentage of cocaine seized increases, more homicides will occur. Furthermore, the interaction term is a strong predictor of the homicide rate at the municipality level, where the coefficient is in all models significant at the 1.0% level. For example, the municipality of Tijuana has a value of 1,345.9 in the proximity to the U.S. border variable. Hence, the estimated coefficient in the first row of column (1) says that a one percentage point increase in the percentage of Colombian cocaine seized variable increases the homicide rate per 10,000 inhabitants in Tijuana by 0.1225 units. On the contrary, for Cancun which is located in the municipality of Benito Juarez, this figure drops to 0.0135 units. Finally, the value of the F statistic is comfortably above the rule of thumb of 10 commonly used in the literature and the Stock-Yogo critical values at the 10.0% significance level.

Fixed effects and instrumental variable estimations of the effects of drug-trade related homicides on educational outcomes are presented in Table 4.12. Results for the effects of total homicides during the last calendar year are also presented in order to have a directly comparable measure of the two violent crime variables. Table 4.12 shows in columns (1) and (3) that among primary school students, concerning ENLACE scores in Spanish and Mathematics, the negative effect of total homicides is larger than that of drug-trade related homicides. For grade repetition the same pattern is observed, where the effect of drug homicides is smaller relative to that of total homicides. Among secondary schools students, although negative, the fixed effects results suggest that ENLACE scores are not affected by drug homicides. Nonetheless, grade repetition rates increase with the drug homicide level, where this coefficient is significant at the 1.0% level. The stronger effect of homicides with respect to drug-trade related homicides may be signalling the presence of nonlinearities, where the impact of a one-unit increase in the homicide rate is larger as it increases. With respect to the instrumental variable estimations presented in columns (2) and (4), it is observed that when instrumenting for the homicide variables using the interaction of a municipality's proximity to the U.S. border with the percentage of cocaine seized in Colombia, the effect is again negative and highly significant. Additionally, for secondary school students the relationship between drug homicides and ENLACE scores in Spanish and Mathematics is now significant at the 1.0% level. The larger size of the total homicides and drug-trade related homicides coefficients when using instrumental variable models suggest that the fixed effect estimations may be downwardly biased. Moreover, since the IV results are local average treatment effects, it may only be identifying the more violent municipalities' conditions.

Table 4.12 Homicides and drug-trade related homicides

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	Homicides		Drug-trade homicides	
	FE	IV	FE	IV
	Primary			
ENLACE: Spanish	-0.0035**	-0.0470***	-0.0021**	-0.0483***
	(0.0016)	(0.0164)	(0.0010)	(0.0143)
ENLACE: Math	-0.0039**	-0.0584***	-0.0021*	-0.0601***
	(0.0018)	(0.0186)	(0.0011)	(0.0159)
Grade Repetition/100	0.0239***	0.3612***	0.0190***	0.3711***
	(0.0068)	(0.0888)	(0.0053)	(0.0779)
	Secondary			
ENLACE: Spanish	-0.0059**	-0.1552***	-0.0005	-0.1631***
	(0.0026)	(0.0420)	(0.0015)	(0.0401)
ENLACE: Math	-0.0099***	-0.1471***	-0.0017	-0.1540***
	(0.0027)	(0.0409)	(0.0019)	(0.0383)
Grade Repetition/100	0.0288***	0.1782***	0.0199***	0.1883***
	(0.0073)	(0.0477)	(0.0055)	(0.0446)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01
Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911), SIMBAD and CNS 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

4.7.2 Mechanisms

Attention now turns to the mechanisms by which crime exposure affects educational outcomes. It is hypothesised that exposure to violent crime affects academic performance and grade repetition rates partly because it leads to a reduction in contact hours. To examine this, data from the Encuesta Nacional de Uso del Tiempo (ENUT, National Time-Use Survey) is used.[64] Table 4.13 explores the relationship between attending school, the number of contact hours, engaging in school related work at home, the number of hours doing schoolwork at home, and state level homicide rates.[65] Column (1) shows that among individuals between 8 and 16 years of age, homicide rates are not associated with the decision to attend school. Nonetheless, it can be seen in column (2) that higher homicide rates are indeed related with a reduction in the number of hours spent at school. As a result of the decrease in contact hours, families could compensate by increasing the amount of school related activities performed at home. Column (3) shows that the homicide rate is not associated with whether or not children and adolescents perform schoolwork at home. However, it can be seen in column (4) that higher homicide rates are negatively associated with the number of hours students spend performing school related activities in the household. Thus, families do not compensate for the reduction in the number of contact hours by making their children study more outside of the school. On the contrary, these two mechanisms appear to reinforce one another, further accentuating the negative effects of crime exposure on educational outcomes.[66]

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[64] The ENUT is a nationally representative household survey. Its objective is to obtain information on the time-use of men and women 12 years of age and older. The survey includes questions regarding whether respondent's go to school, the number of hours per week spent at school, whether students engage in schoolwork at home, and the number of hours per week students engage in schoolwork, among others. On the other hand, while the ENLACE dataset includes information on how many of the enrolled students did not take the test, neither it nor Statistics 911 include information on school assistance rates or contact hours.

[65] Unfortunately, the ENUT does not contain information on the type of school the respondent attends, which would allow examining the presence of heterogeneous effects depending on the type of school.

[66] Instrumental variable estimations of the effect of homicides on school attendance, contact hours and schoolwork were also performed. The instrument used was constructed by interacting the state's proximity to the U.S. border and the proportion of cocaine seized in Colombia. The results, which are largely similar

Table 4.13 Homicides, school attendance, contact hours and schoolwork

Variable	(1)	(2)	(3)	(4)
	Attending school (Yes = 1, 0 =No)	Hours at school	Schoolwork at home (Yes = 1, 0 = No)	Hours doing schoolwork at home
Homicides per 10,000 inhabitants	0.0037	-0.1414*	0.0026	-0.1823***
	(0.0028)	(0.0765)	(0.0027)	(0.0522)
Observations	10,242	6,607	10,242	6,429
R-squared	0.264	0.010	0.242	0.030

* p<0.10; ** p<0.05; *** p<0.01
Source: Author's elaboration based on ENUT 2002 and 2009. Estimations based on individuals between 8 and 16 years of age. Coefficients correspond to the total number of homicides per 10,000 inhabitants at the state level. All regressions include as additional controls age and gender of the respondent, number of persons in the household, indicators of quality of the roof, wall and floor in the household, time and size of locality dummies, and a constant. Standard errors are in parenthesis and are clustered at the state level.

High levels of violent crime in a municipality are also likely to affect the characteristics of the schools located within their limits. Table 4.14 explores the relationship between homicides, teacher and student mobility, and teachers' education levels. It can be seen in column (1) that an increase in the homicide rate is negatively related with the number of teachers per school. Moreover, column (2) shows that a rise in homicide levels is also negatively associated with the number of students enrolled per school. Students may fail to attend school for different reasons such as a fear of violence or because they are involved in violent crime. Nevertheless, Márquez-Padilla et al. (2015) show that for the 2000-2010, 2005-2010 and 2007-2010 periods the rise in homicide levels did not affect the enrolment rates of primary and secondary school students. Thus, it can be inferred that instead of dropping-out, some students transferred from primary and secondary schools located in municipalities with high homicide rates to schools located in other municipalities. These statistically significant results suggest that crime exposure affects both teacher and student composition. Column (3) presents the effects of the homicide

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to those presented in Table 4.13, show that a one-unit increase in the homicide rate per 10,000 inhabitants reduces the number of hours spent at school by 0.764 and the number of hours doing schoolwork at home by 0.476, where the latter coefficient is significant at the 10.0% level. Moreover, homicides rates do not have a significant effect on the decisions to attend school or do schoolwork at home. Additionally, the effect of crime on the number of hours a primary or secondary school teacher works was also examined. It was observed that a one-unit increase in the homicide rate per 10,000 inhabitants is associated with a reduction of 0.58 in the number of hours teachers work per week.

rate on the student-teacher ratio, where higher incidences of violent crime are associated with a reduction in the number of students per teacher. This finding may be partially a result of the higher mobility that students have to change schools relative to teachers. Column (4) shows that the relationship between homicides and the percentage of teachers with graduate studies, interpreted here as a very broad measure of teacher quality, is not statistically significant.[67]

Table 4.14. Homicides, mobility and school characteristics

Variable	(1)	(2)	(3)	(4)
	No. of teachers at school	No. of students at school	Student-teacher Ratio	Percentage of teachers with graduate studies
Homicides per 10,000 inhabitants	-0.0127***	-.6410***	-0.0183*	-0.0245
	(0.0033)	(0.1601)	(0.0106)	(0.0152)
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes
Observations	495,660	495,693	452,424	495,714
R-squared	0.043	0.019	0.053	0.017

* p<0.10; ** p<0.05; *** p<0.01
Source: Author's elaboration based Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are clustered at the municipality level.

Finally, previous evidence suggests that the rise in violent crime influenced the migration behaviour and mental health status of different segments of the population. Rios (2014) observes that a one-unit increase in the drug-related homicide rate per 100,000 inhabitants is associated with 6.34 Mexicans fleeing their municipality of residency. To minimise the effects of this phenomenon, Eq. (4.1) was estimated for schools where the difference in the total number of students in any two years during the 2006-2012 period was never larger than five, ten or twenty. The results obtained from these subsamples were similar

[67] Instrumental variable estimations show that a one-unit rise in the homicide rate per 10,000 inhabitants reduces the number of teachers per school by 0.0356 and the number of students per school by 2.148, where these coefficients are significant at the 5.0% level. On the other hand, no significant effect is observed on the student-teacher ratio or on the percentage of teachers with graduate studies.

to those reported in Table 4.4. The findings are also robust to the elimination of schools located in states bordering the United States. Arceo-Gómez (2012) presents evidence on how the escalation of violence led some Mexicans living close to the U.S. to migrate north of the border. On the other hand, Michaelsen (2012) shows than the high crime rates in Mexico affected the depression and anxiety levels of both men and women. The fact that the rise in homicide rates is associated with some segments of the population being displaced from their municipality of residence and with an increase in PTSD levels implies that, besides the reduction in contact hours, these two factors are also likely to be explaining why being exposed to violent crimes is negatively associated with educational outcomes.

4.8 Conclusions

This study examined the effects of crime exposure on the educational outcomes of primary and secondary school students in Mexico. To measure crime, homicides rates at the municipality level were constructed. Educational outcomes were analysed based on the scores obtained in the ENLACE test in Spanish and Mathematics and on grade repetition rates. The econometric analysis was performed using fixed effects and instrumental variable models. The results show that a one-unit increase in the number of homicides per 10,000 inhabitants reduces average ENLACE scores between 0.0035 and 0.0142 standard deviations. This effect is larger in secondary schools, grows stronger if the homicide occurs closer to the examination date, and is relatively stable when using either total homicides or drug-trade related homicides to measure crime exposure. In addition, the effect of crime exposure on academic performance is highly non-linear and concentrated in the municipalities with the highest number of total homicides. Higher homicides rates are also associated with an increase in the grade failure rate. It is hypothesised that the negative effects of crime exposure on educational outcomes are partly due to a reduction in the number of contact hours, where students do not compensate for this by studying more outside of the school.

Concerning the related literature, fixed effects estimations on the effects of crime exposure on educational outcomes are similar to those previously obtained. While the present chapter found that a one unit increase in the homicide rate per 10,000 inhabitants increases the grade repetition rate by 0.0239 and 0.0288 percentage points in primary and secondary schools, respectively, Caudillo and Torche (2014) obtain a 0.0270 percentage point increase in primary schools. With respect to the effects of violence on academic performance, the present chapter found a decrease in average ENLACE scores in Spanish of 0.2287 points and in Mathematics of 0.2727 points, while Michaelsen and Salardi (2013) obtain a decrease in ENLACE scores between 0.1957 and 0.2221 points. Finally, it was observed that a one-unit increase in the drug-trade related homicide rate per 10,000 inhabitants decreases average ENLACE scores in Spanish by 0.1368 points and in Mathematics by 0.1471 points in primary schools, while no effect is observed in secondary schools. Márquez-Padilla et al. (2015), focusing on ENLACE scores in Mathematics, do not find an effect. The discrepancy in the results between studies is likely to be a consequence of the different time periods analysed and a product of including or not a series of important school and municipality level controls. Moreover, none of these related studies examine different subsamples of schools, perform instrumental variable estimations or use time-use surveys to identify the mechanisms driving the results.

The negative and wide-ranging effects of the “war against drugs” and the increase in homicide levels in Mexico from 2007 onwards have been well documented. This study has provided evidence on the fact that non-educational policies affect educational outcomes. In addition to the short-term effects observed, it can be inferred that the increase in violence will have medium and long-term effects since, by affecting current educational outcomes, early exposure to homicides is likely to impact subsequent educational attainment levels and thus the future income streams of the country’s youth. Moreover, since the effects of crime exposure are stronger in public schools and in higher marginalized areas, these negative consequences are potentially amplified among students residing in households located at the bottom-part of the income distribution. Given that educational attainment plays a central role in explaining differences in earnings and general economic well-being, this may generate higher inequality in the future by widening the gap in human capital attainment levels between the rich and the poor.

5 Conclusions

The present thesis conducted three empirical essays related to development and labour economics issues about Mexico and its emigrant population residing in the United States. This section presents a brief summary of each essay and discusses potential avenues for further research.

The first essay presented in Chapter 2 examined the role that occupational segregation plays in explaining the low wages among Mexican-Americans and their wage differentials with respect to black and white workers in the United States.

The study showed that the occupational structure of Mexican-born immigrants differs substantially from that of natives. Moreover, the occupations of first, second and third generation Mexican-Americans are more similar to that of blacks than of whites. In terms of wages, significant progress is made between first and second generation immigrants. This is especially true for individuals who are a product of intermarriage between a Mexican-born and a U.S.-born individual. Nonetheless, between second and third generation Mexican-Americans progress appears to stall or even regress. While most of the wage differentials between blacks and Mexican-Americans can be explained by differences in observable characteristics, a large unexplained component remains relative to whites. It is observed that Mexican-born immigrants encounter a similar degree of discrimination as blacks, while second and third generation Mexican-Americans appear to be in a more privileged position than African-Americans. Pertaining to occupational segregation, Mexican-Americans are underrepresented at the top of the occupational structure relative to whites. This implies a “glass-ceiling”, where Mexican-Americans face significant barriers into high-paying occupations. These restrictions, partly manifested through the between unexplained term in the BMZ and DGSX decompositions, account from 6.1% to 10.0% of the wage gap between different generations of Mexican-Americans and whites according to the BMZ methodology.

The chapter's findings suggest that it is necessary to implement policies that tend to equalise Mexican-American representation across occupations, as well as policies that encourage the undoing of moderately segregated positions within different occupations. Measures that guarantee that the most qualified workers gain access into high-wage occupations irrespective of their ethnic-origin background must continue to be implemented and closely monitored. Furthermore, it is vital for Mexican-born immigrants that they acquire the skills and training that will result in an increase in wages.

While this chapter focused on wage differentials at the mean, an avenue for further research would be to examine the wage gap between Mexican-Americans and natives at different points of the wage distribution. This could be done performing quantile decompositions based on the methodologies proposed by Machado and Mata (2005) or Firpo et al. (2009), among others. Furthermore, while wage differentials between authorised and unauthorised Mexican-born immigrants were analysed, a dataset that includes information on the legal status of first generation Mexican-Americans and incorporates natives would not only shed information on the percentage of the wage gap attributed to authorised status, but would also allow for a more robust estimation of the role of occupational segregation in explaining wage differentials between first generation immigrants and natives. Nevertheless, I am unaware of any dataset that satisfies these conditions.

The second essay presented in Chapter 3 examined whether the implementation of Seguro Popular affected the amount of private transfers received and the likelihood of receiving private transfers among Mexico's uninsured households. The effects of Seguro Popular were identified using the spatial variation in the program's coverage induced by its roll-out throughout Mexico.

Based on the ENIGH, the chapter showed that among households eligible for Seguro Popular, the program had no effect on the amount of private transfers received. On the other hand, the implementation of Seguro Popular reduced on average a household's probability of receiving private transfers by 5.55 percentage points, a 28.6% reduction with respect to the .194 probability that uninsured households had of receiving private transfers prior to the program's introduction in 2000. This estimate is driven by domestic private transfers, since international private transfers were not affected by the program's implementation at either the intensive or extensive margins. This result may arise because most senders located within Mexico were aware of Seguro Popular and therefore changed their remitting behaviour upon the program's introduction. On the contrary, a large number of senders located outside of Mexico were potentially unaware of the program and consequently did not alter their behaviour. The chapter's findings are similar to those obtained in the related international literature, where Klohn and Strupat (2013) show that the NHIS in Ghana affected the likelihood of making or receiving informal transfers and their monetary equivalents.

The fact that Seguro Popular had a clear social welfare improving effect has been well documented, given that the program has provided millions of Mexicans access to health care. Nonetheless, the fact that the program partially crowds-out private support highlights the importance of looking at unexpected outcomes when analysing public policies, since the presence of crowding-out effects has important implications for the effectiveness of redistributive policies. The crowding-out effect suggests that the net impact of Seguro Popular is smaller than when just analysing its impact on health expenditures or health outcomes.

To better identify the magnitude in which Seguro Popular crowds-out private support, it would be of relevance to incorporate information on the distance between the household and the nearest health facility that offered the program's services. While information on the household's geographic location is recorded in the ENIGH, this is not publicly available, therefore making it impossible to estimate dwelling to health facility distances. Furthermore, the ENIGH does not include information on the locality where the household is situated. Instead, it only provides information on the municipality and state. This is problematic due to the vast sizes of municipalities, thus making it impossible to estimate dwelling to health facility distances.

The third essay presented in Chapter 4 examined the effects of crime exposure on the educational outcomes of primary and secondary school students in Mexico. To measure crime, homicides rates at the municipality level were constructed. Educational outcomes were analysed based on the scores obtained in the national standardised ENLACE test and on grade repetition rates. The econometric analysis was performed using fixed effects and instrumental variable models. The results showed that a one unit increase in the homicide rate per 10,000 inhabitants reduces average ENLACE scores between 0.0035 and 0.0142 standard deviations. Higher homicides rates are also associated with an increase in the grade failure rate. In comparison, Cabrera-Hernandez (2015) shows that the Full-Time School Program, which extended the school day from four or five hours to between six and eight hours per day, increased average ENLACE scores by up to 0.1100 standard deviations.

It is hypothesised that the negative effect of crime exposure on educational outcomes is partly due to a reduction in the number of contact hours, where students do not compensate for this by studying more outside of the school. Moreover, it was observed that homicides affect school composition by reducing the average number of students and teachers per school. Finally, based on the work of Michaelsen (2012) who finds that the rise in violent crimes in Mexico increased depression and anxiety levels, it can be inferred that the higher levels of PTSD among the country's men and women was one of the channels by which crime exposure negatively affects educational outcomes.

In addition to the short-term effects, it is expected that the increase in violence will have medium and long-term effects since, by affecting contemporary educational outcomes, early exposure to homicides is likely to impact subsequent educational attainment levels and thus the future income streams of current primary and secondary school students. As more data becomes available, it will be important to analyse the medium and long-term consequences of the rise in violent crime and the "war against drugs" on the country's present day youth.

A natural extension to the chapter includes performing the analysis at the student level and incorporating data from 2008. While this information exists and has been requested on multiple occasions to the Ministry of Education, it has not yet been provided.

Including student level information would allow examining potential heterogeneous effects by gender and would provide further information on the effects of the rise in homicides on test scores at different points of the distribution. Incorporating data from 2008 would not only increase the sample size but would also permit analysing if test scores in Natural Sciences, for which an exam was applied in both 2008 and 2012, were also affected.

As a further robustness check, it may be of relevance to examine the impact of crime exposure on academic performance based on the results obtained in the PISA test or the Plan Nacional para las Evaluaciones de los Aprendizajes (PLANEA, National Plan for the Assessment of Learning) test. Nevertheless, the PISA and PLANEA tests have the disadvantage of either not providing nationally representative data or only being applied in a limited number of years, among others.

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Appendix

Appendix A.2

A.2.1 Long-Run Wage Differentials and Intergenerational Progress over Time

Chapter 2 examined wage differentials between natives and Mexican-Americans by mainly using pooled CPS data from 1994 to 2012. Nonetheless, there may be important underlying changes in the economy and in the composition of the different groups that occurred during this time period which until now have not been accounted for.

To study this issue, the sample was divided into three different time periods, i.e. 1994-1999, 2000-2006 and 2007-2012. It was observed that between 1994 and 2012, there were important changes in the U.S. economy's occupational structure, where workers in general shifted into less labour intensive and better remunerated positions. Given that these changes were relatively homogenous among natives and Mexican-Americans, the wage differentials between the different groups only encountered modest variations during these three time periods. As a result, the findings are in line with those presented in Section 2.5.

While the wage gap between natives and Mexican-Americans remained relatively stable between 1994 and 2012, I now focus on a longer time frame to analyse if this was also the case in the long-run. This is done using data from the 1940 and 1970 U.S. censuses and the 1998-2002 CPS. Specifically, for 1940 a 1.0% random sample of the U.S. population is used; while for 1970 a 2.0% random sample is employed. Given that these two data sources contain more limited information than the CPS, a broader definition of the earnings variable is required compared to the one that has been previously used. Therefore, this subsection focuses on monthly wages, where the same construction of the wage variable is employed for 1940, 1970 and 2000.

A long-run analysis of wage differentials has the advantage of allowing for a different measure of intergenerational progress among Mexican-Americans. By employing data from different periods, it is possible to compare the outcomes of immigrants in the past with the current performance of their descendants. To analyse intergenerational progress over time, FG immigrants are matched with their U.S.-born offspring, i.e. the SG population, that entered the labour market 30 years later, and their grandchildren, i.e. TG workers, who did so a few decades afterwards. This is done for FG immigrants who were employed in 1940, 1970 and 2000, and their descendants that were working in the years 1970 and 2000.

An additional advantage of using data from different time periods is that relying solely on a cross-sectional comparison may generate misleading results when analysing intergenerational progress if there are differences in skill compositions across generations. As argued by Borjas (1993), if previous cohorts of FG workers had higher skills than those of current immigrants, given that these are partly-transmitted to their offspring, this would be reflected in a better labour market performance of current SG workers, thus overstating the progress between generations relative to current FG immigrants. This result would be further accentuated if only the most successful FG workers were the ones who permanently settled in the United States. Additionally, the sample of FG workers analysed also includes immigrants who just recently arrived in the U.S. and who do not have any descendants currently in the labour market; while the SG and TG workers studied are the offspring of immigrants who arrived in the country at least 20 and 40 years earlier, respectively. Nonetheless, relying on information from different points in time also has it disadvantages. The cross-section approach from a single period has the benefit of holding constant the socioeconomic environment, whereas comparing different periods can give misleading results when there are substantial differences between points in time (Trejo, 2003, p. 476).

The OB decomposition of long-run wage differentials is presented in Table A.2.1. It can be seen that the wage gap between Mexican-Americans and natives, especially blacks, changed considerably during the last 60 years of the 20th century. In 1940, the wages of Mexican-born immigrants were .349 log points higher than those of blacks. The negative sign of the explained and unexplained components signal that FG immigrants had higher levels of human capital and were better compensated for their productivity related characteristics than blacks. By 1970, the average wages of FG immigrants were .050 log points higher than those of blacks. Moreover, the positive sign of the endowment effect implies that from 1940 to 1970 blacks made significant progress in terms of their average characteristics relative to FG immigrants. With respect to SG and TG workers, the wage disadvantage of blacks was larger in 1940 and 1970 as it stood at .196 and .116 log points, respectively. By the year 2000 a significantly different picture had emerged, where the wages of all three generations of Mexican-Americans were lower than those of blacks. It is likely that this result is largely driven by the civil rights movements that started in the 1960s, which substantially affected the wages of black workers. Thus, while African-American workers made substantial gains relative to whites, they also improved relative to Mexican-Americans. On the other hand, wage differentials between whites and Mexican-Americans remained much more stable between 1940 and 2000, where they were never lower than .204 log points. Concerning FG immigrants, between 1940 and 1970 the wage gap with respect to whites decreased from .440 to .350 log points. Nonetheless, between 1970 and 2000 this increased from .350 to .613 log points. A similar story is observed with respect to SG and TG workers, where their wage gap with respect to whites increased by more than .100 log points between 1970 and 2000. In general, the results are similar to those observed from 1994 to 2012, where Mexican-Americans appear to make substantial progress between the first and the second generation, but not between the second and the third generation.

Table A.2.1 OB decomposition:
Natives and Mexican-Americans, 1940, 1970 and 2000

	FG 1940	**SG 1970**	**TG 2000**	**FG 1970**	**SG 2000**	**FG 2000**
			Relative to Blacks			
Total differential	-.349***	-.196***	.035**	-.050***	.137***	.329***
	(.024)	(.008)	(.014)	(.010)	(.017)	(.009)
Explained	-.060**	-.030***	.073***	.062***	.159***	.413***
	(.025)	(.006)	(.012)	(.007)	(.015)	(.018)
Unexplained	-.289***	-.165***	-.038**	-.113***	-.021	-.084***
	(.027)	(.008)	(.015)	(.010)	(.018)	(.019)
Observations	13,190	55,729	11,300	54,024	9,986	16,946
(% Black)	(94.6%)	(91.1%)	(72.5%)	(93.9%)	(82.1%)	(48.4%)
			Relative to Whites			
Total differential	.440***	.204***	.470***	.350***	.421***	.613***
	(.023)	(.007)	(.078)	(.009)	(.015)	(.006)
Explained	.429***	.134***	.251***	.257***	.345***	.568***
	(.017)	(.004)	(.048)	(.005)	(.011)	(.007)
Unexplained	.011	.069***	.219***	.092***	.076***	.045***
	(.020)	(.006)	(.059)	(.009)	(.013)	(.008)
Observations	113,986	409,305	83,878	407,600	85,573	92,533
(% White)	(99.3%)	(98.7%)	(98.9%)	(99.2%)	(97.9%)	(90.5%)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the 1940 U.S. Census, 1970 U.S. Census and the 1998-2002 CPS March Supplement. Wages are in monthly figures. Standard errors are in parentheses. Decomposition based on OLS regressions which include as independent variables years of education, potential experience, potential experience squared and dummy variables for occupations, metropolitan status, state of residence and marriage.

Shifting our attention to the BMZ decomposition results, it can be seen in Table A.2.2 that in general occupational segregation has not played an important role in the observed wage gap between blacks and Mexican-Americans. It is only for the case of FG immigrants in the year 2000 that occupational segregation has a positive contribution to the wage gap, as it rises to 3.9% of the wage differential with respect to blacks. In other instances, this term is negative and actually favours Mexican-Americans, implying that it is blacks who encounter more barriers into occupations. On the other hand, the fact that in 1940 Mexican-born immigrants had higher wages than blacks is primarily a product of the formers' higher returns to observable characteristics as captured by the WU term. By the year 2000, the lower wages of FG immigrants were mainly a result of differences in the WE and BE components. With respect to SG and TG workers, in 1970 the magnitude of the BE component suggests that U.S.-born Mexican-Americans were employed in similar occupations as blacks. During this period, the higher wages of second and third generation workers were mostly a result of their higher compensations within occupations. Moreover, while the BE component still favoured SG and TG workers in 2000, their lower wages with respect to blacks were mostly a product of the WE term. Pertaining to whites a different picture is observed, where the BU component has always had a positive contribution to the total wage gap between whites and Mexican-Americans. The same is true for the three other components of the BMZ decomposition, suggesting that from 1940 to 2000 the lower wages of Mexican-Americans were a product of their poorer endowment of productivity related characteristics, lower compensation within occupations and their employment in lower remunerated positions.

Finally, Table A.2.3 presents the DGSX decomposition results. It is observed that due to the indirect allocation effect, the BU component in the wage decomposition between blacks and Mexican-born workers in 1940 is now positive. Concerning the factors driving the wage gap between blacks and second and third generation workers, the results do not change much with respect to those observed in the BMZ decomposition. With respect to whites, some subtle differences arise. Among these, in 1970 the BU term with respect to FG immigrants is not statistically significant from zero, whereas for SG and TG immigrants this component is now negative.

Table A.2.2 BMZ decomposition:
Natives and Mexican-Americans, 1940, 1970 and 2000

	FG 1940	SG 1970	TG 2000	FG 1970	SG 2000	FG 2000
			Relative to Blacks			
Total differential	-.349***	-.196***	.036***	-.050***	.138***	.329***
	(.020)	(.005)	(.013)	(.006)	(.014)	(.027)
Explained						
Within	-.065***	-.001	.089***	.039***	.163***	.241***
	(.020)	(.004)	(.013)	(.006)	(.014)	(.026)
Between	.032***	.013***	.015***	.035***	.034***	.119***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.005)
Unexplained						
Within	-.259***	-.168***	-.041**	-.102***	-.023	-.044*
	(.027)	(.008)	(.017)	(.010)	(.020)	(.027)
Between	-.057***	-.039***	-.027***	-.023***	-.035***	.013***
	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)
			Relative to Whites			
Total differential	.444***	.208***	.331***	.354***	.433***	.625***
	(.008)	(.002)	(.004)	(.003)	(.005)	(.010)
Explained						
Within	.130***	.027***	.092***	.096***	.196***	.156***
	(.007)	(.002)	(.004)	(.003)	(.005)	(.010)
Between	.183***	.064***	.076***	.095***	.107***	.198***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)
Unexplained						
Within	-.001	.084***	.101***	.123***	.086***	.133***
	(.019)	(.006)	(.010)	(.009)	(.013)	(.011)
Between	.131***	.031***	.061***	.038***	.043***	.136***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the 1940 U.S. Census, 1970 U.S. Census and the 1998-2002 CPS March Supplement. Wages are in monthly figures. Standard errors are in parentheses. Decomposition based on three occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared and dummy variables for occupations, metropolitan status, state of residence and marriage.

The results presented in this subsection show that the disadvantaged encountered by Mexican-Americans dates back to at least 1940. Unlike the descendants of European immigrants that arrived in the U.S. in the latter part of the 19th century and early 20th century whose wages subsequently converged to those of U.S.-born whites, Mexican-

Americans have not assimilated in their entirety into the United States. Instead, they continue to face many of the same disadvantages encountered by their ancestors who participated in the labour market many decades before them.

Table A.2.3 DGSX decomposition:
Natives and Mexican-Americans, 1940, 1970 and 2000

	FG 1940	SG 1970	TG 2000	FG 1970	SG 2000	FG 2000
	Relative to Blacks					
Total differential	-.349***	-.196***	.036	-.050**	.138***	.329***
	(.050)	(.017)	(.035)	(.020)	(.038)	(.051)
Explained						
Within	-.226***	.041***	.111***	.076***	.152***	.278***
	(.023)	(.005)	(.017)	(.007)	(.017)	(.035)
Between	.032***	.013***	.015***	.035***	.034***	.119***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.005)
Unexplained						
Within	-.227***	-.158***	-.048**	-.118***	-.034	-.078*
	(.033)	(.011)	(.024)	(.013)	(.025)	(.036)
Between	.071***	-.092***	-.041**	-.044***	-.014	.010
	(.028)	(.011)	(.019)	(.013)	(.022)	(.007)
	Relative to Whites					
Total differential	.444***	.208***	.331***	.354***	.433**	.625***
	(.027)	(.026)	(.029)	(.030)	(.033)	(.025)
Explained						
Within	.148***	.189***	.185***	.270***	.259***	.348***
	(.008)	(.003)	(.006)	(.004)	(.005)	(.015)
Between	.183***	.064***	.076***	.095***	.107***	.198***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)
Unexplained						
Within	-.040**	.030**	.062***	.007	.039**	-.002
	(.020)	(.014)	(.018)	(.017)	(.020)	(.017)
Between	.152***	-.077***	.007	-.019	.026	.080***
	(.016)	(.021)	(.022)	(.024)	(.026)	(.010)

***p<.1, **p<.05, *p<.01
Source: Author's elaboration based on the 1940 U.S. Census, 1970 U.S. Census and the 1998-2002 CPS March Supplement. Wages are in monthly figures. Standard errors are in parentheses. Decomposition based on three occupation specific OLS regressions which include as independent variables years of education, potential experience, potential experience squared and dummy variables for occupations, metropolitan status, state of residence and marriage.

Table A.2.4 Log wage regressions by occupation with MNL selection

Coefficients	Mexican Americans				Natives	
	FG	SG-II	SG-I	TG	Blacks	Whites
	Managerial and Professional Specialty					
Intercept	5.564***	3.527	-.165	1.042	1.081***	.969***
	(1.354)	(1.407)	(.967)	(.702)	(.305)	(.058)
Education	-.089*	.039	.141	.068**	.078***	.073***
	(.051)	(.065)	(.048)	(.033)	(.014)	(.002)
Experience	-.003	.022**	.029**	.047**	.029***	.046***
	(.010)	(.010)	(.007)	(.004)	(.002)	(.001)
$Experience^2/100$	.004	-.036*	-.036**	-.085***	-.045***	-.081***
	(.020)	(.021)	(.018)	(.010)	(.006)	(.001)
Married	.060	.169***	.099**	.110***	.129***	.173***
	(.051)	(.042)	(.046)	(.022)	(.012)	(.003)
State unemployment rate	-.003	-.013	.013	-.002	-.007**	.001*
	(.011)	(.009)	(.010)	(.006)	(.003)	(.000)
In metropolitan area	.087	.225***	.149**	.139***	.172***	.240***
	(.083)	(.083)	(.060)	(.037)	(.025)	(.004)
Lambda	-.960***	-.509**	.308	-.047	-.039	-.006
	(.304)	(.256)	(.191)	(.125)	(.057)	(.012)
R-squared	.200	.293	.225	.242	.202	.233
Observations	894	777	221	2,542	7,847	117,373
	Technical, Sales and Administrative Support					
Intercept	-1.849	.893**	.363	.491*	.967***	.465***
	(.150)	(.454)	(.384)	(.273)	(.147)	(.035)
Education	.125***	.094***	.110***	.099***	.089***	.098***
	(.033)	(.014)	(.013)	(.008)	(.004)	(.001)
Experience	.032***	.047***	.051***	.040***	.035***	.047***
	(.007)	(.006)	(.006)	(.003)	(.002)	(.001)
$Experience^2/100$	-.027**	-.081***	-.090***	-.073***	-.054***	-.088***
	(.011)	(.015)	(.015)	(.009)	(.005)	(.001)
Married	.097***	.178***	.189***	.214***	.163***	.209***
	(.033)	(.033)	(.041)	(.021)	(.012)	(.004)
State unemployment rate	.016*	-.014**	-.004	-.009*	-.001	-.001
	(.008)	(.006)	(.008)	(.005)	(.003)	(.001)
In metropolitan area	.149*	.107	.047	.140***	.041	.174***
	(.068)	(.078)	(.051)	(.040)	(.029)	(.005)
Lambda	.995*	-.050	.050	.024	-.141**	.066***
	(.471)	(.176)	(.162)	(.118)	(.067)	(.018)
R-squared	.155	.294	.363	.274	.221	.276
Observations	1,401	1,264	768	3,079	8,238	77,093
	Precision Production, Craft and Repair					
Intercept	1.297***	1.044	.730*	1.010***	1.102	1.130***
	(.179)	(.167)	(.409)	(.108)	(.103)	(.019)
Education	.026***	.061***	.092***	.065***	.085***	.086***
	(.002)	(.011)	(.019)	(.008)	(.007)	(.002)
Experience	.026***	.038***	.030***	.036***	.024***	.032***
	(.002)	(.005)	(.007)	(.003)	(.003)	(.001)
$Experience^2/100$	-.034***	-.070***	-.044***	-.056***	-.032***	-.050***
	(.005)	(.014)	(.016)	(.007)	(.006)	(.001)
Married	.109***	.181***	.136***	.154***	.133***	.160***
	(.016)	(.033)	(.052)	(.021)	(.014)	(.003)
State unemployment rate	-.006	.017**	-.003	.002	-.003	.003***
	(.004)	(.007)	(.010)	(.005)	(.003)	(.001)
In metropolitan area	.037*	.006	-.010	.049**	.144***	.100
	(.020)	(.046)	(.050)	(.022)	(.019)	(.003)
Lambda	.219	.155	-.095	.057	-.101	-.156***
	(.137)	(.186)	(.231)	(.102)	(.088)	(.018)
R-squared	.093	.206	.248	.210	.162	.196
Observations	6,740	1,128	719	3,380	5,833	73,432
	Service					
Intercept	.808***	-.572	.123	-.067	.296***	.457
	(.248)	(.566)	(.396)	(.189)	(.089)	(.041)

Education	.028***	.081***	.100***	.092***	.100	.098***
	(.001)	(.009)	(.013)	(.006)	(.008)	(.002)
Experience	.009***	.046***	.026***	.037***	.030***	.045***
	(.002)	(.007)	(.009)	(.004)	(.002)	(.001)
Experience^2/100	-.002	-.081***	-.039*	-.072***	-.049***	-.086***
	(.005)	(.018)	(.021)	(.010)	(.005)	(.002)
Married	.037*	.193***	.247***	.212***	.121***	.252***
	(.020)	(.044)	(.064)	(.026)	(.018)	(.007)
State unemployment rate	.011**	-.012	-.009	.006	-.002	-.000
	(.004)	(.010)	(.012)	(.006)	(.003)	(.001)
In metropolitan area	.118**	-.051	-.090	.165***	.118***	.129***
	(.057)	(.068)	(.070)	(.027)	(.022)	(.006)
Lambda	.370***	.480**	.180	.352***	.149	-.020
	(.141)	(.212)	(.210)	(.101)	(.092)	(.031)
R-squared	.085	.318	.353	.340	.199	.301
Observations	4,559	675	450	1,860	7,145	29,975
	Operators, Fabricators and Labourers					
Intercept	1.727***	.860***	1.158***	1.072***	1.258***	1.115***
	(.108)	(.127)	(.204)	(.083)	(.066)	(.032)
Education	.208***	.074***	.048*	.033***	.046***	.077**
	(.001)	(.011)	(.038)	(.010)	(.008)	(.044)
Experience	.020***	.036***	.040***	.033***	.025***	.034***
	(.002)	(.004)	(.006)	(.002)	(.001)	(.001)
Experience^2/100	-.023***	-.054***	-.066***	-.051***	-.033***	-.058***
	(.003)	(.011)	(.016)	(.006)	(.004)	(.001)
Married	.117***	.184***	.167***	.147***	.161***	.188***
	(.011)	(.028)	(.039)	(.018)	(.009)	(.004)
State unemployment rate	-.002	.002	-.008	-.005	-.008***	-.000
	(.002)	(.006)	(.009)	(.004)	(.002)	(.001)
In metropolitan area	.004	.014	.085**	.042**	.096***	.108***
	(.015)	(.041)	(.039)	(.021)	(.016)	(.005)
Lambda	-.231**	-.050	.248	.086	.086	-.166***
	(.100)	(.130)	(.222)	(.060)	(.060)	(.023)
R-squared	.091	.246	.258	.205	.138	.172
Observations	8,792	1,464	885	3,549	12,016	65,543
	Other					
Intercept	1.094***	.980***	.660**	.585**	.291**	.037
	(.280)	(.277)	(.258)	(.289)	(.129)	(.052)
Education	-.002	.030	.080***	.034	.048***	.087***
	(.025)	(.027)	(.029)	(.022)	(.009)	(.002)
Experience	.010	.028**	.002	.015**	.023***	.031***
	(.090)	(.010)	(.012)	(.008)	(.004)	(.001)
Experience^2/100	-.011	-.042*	.019	-.026	-.062***	-.069***
	(.012)	(.022)	(.028)	(.016)	(.010)	(.004)
Married	.077***	.138*	.150	.300***	.375***	.242***
	(.021)	(.080)	(.113)	(.088)	(.052)	(.014)
State unemployment rate	-.011***	-.045**	-.010	-.023**	-.035***	-.005**
	(.004)	(.020)	(.021)	(.009)	(.006)	(.002)
In metropolitan area	-.093	.131	-.070	.070	.099***	.124***
	(.188)	(.090)	(.090)	(.074)	(.036)	(.010)
Lambda	.400	.203	.317	.400	.460***	.291***
	(.081)	(.314)	(.277)	(.297)	(.093)	(.034)
R-squared	.081	.210	.385	.295	.289	.333
Observations	3,494	282	149	687	1,597	12,771

*p<.1, **p<.05, ***p<.01

Source: Author's elaboration based on the CPS March Supplement 1994-2012. Standard errors are in parentheses. Additional controls incorporated in the regressions include a time trend and dummy variables for state, and census division.

Appendix A.3

Table A.3.1 Determinants of SP coverage by State. All controls

Variable	2004	2005	2006	2008	2010	2012
Log state population	-.106	-.158*	-.174**	-.163**	-.115**	-.082**
	(.067)	(.075)	(.074)	(.055)	(.045)	(.030)
Share of insured population	.631	.557	.715	.417	.047	.113
	(.770)	(.867)	(.817)	(.617)	(.505)	(.303)
Share of urban population	-.604	-.544	-.465	-.166	.064	-.132
	(.693)	(.845)	(.776)	(.634)	(.413)	(.315)
Log median wage	-.668***	-.669	-.269	-.249	-.141	.002
	(.297)	(.416)	(.389)	(.280)	(.234)	(.198)
Years of schooling	-.002	-.040	-.170	-.068	-.035	-.023
	(.128)	(.162)	(.149)	(.119)	(.115)	(.087)
Unemployment rate	1.49	36.8	49.1	38.4	32.9	19.4
	(28.3)	(33.6)	(30.9)	(26.4)	(21.0)	(15.2)
PRI Governor	-.123	-.213*	-.204*	-.134	-.073	-.059
	(.088)	(.110)	(.109)	(.083)	(.082)	(.051)
PRD Governor	-.057	-.231	-.139	-.121	-.115	-.090
	(.109)	(.159)	(.141)	(.118)	(.089)	(.068)
Share of population under age 24	5.83	4.34	3.24	2.63	2.33	2.94**
	(3.78)	(4.04)	(3.74)	(2.94)	(1.94)	(1.31)
Share of population between ages 24 and 40	11.8	9.31	5.17	1.54	2.43	3.42
	(8.09)	(7.95)	(8.33)	(6.06)	(4.33)	(2.38)
Share of male population	-12.7	-8.41	-5.13	.270	.942	-2.60
	(10.4)	(9.98)	(10.4)	(7.65)	(6.25)	(3.80)
Avg. number of international migrants per HH	-3.65	-3.01	-2.12	-.987	-.314	-.731
	(2.89)	(3.20)	(3.06)	(2.42)	(1.75)	(1.09)
Log median international private transfers	-.330	-.366	-.301	-.004	-.139	.128
	(.274)	(.292)	(.303)	(.193)	(.198)	(.148)
Log median domestic private transfers	-.030	.059	.031	-.006	-.006	-.198
	(.268)	(.278)	(.271)	(.218)	(.191)	(.099)
Share of pop. that receives int. private transfers	23.6	15.0	2.56	.625	-1.90	1.71
	(20.0)	(20.7)	(21.5)	(16.2)	(11.5)	(6.21)
Share of pop. that receives dom. private transfers	19.9	15.5	19.5	10.1	4.59	1.13
	(13.9)	(13.9)	(14.0)	(10.2)	(7.89)	(6.21)
Observations	32	32	32	32	32	32

*** p<0.01, ** p<0.05, * p<0.1

Note: Table presents regressions where the dependent variable is the proportion of eligible individuals covered by Seguro Popular at the state level in 2004, 2005, 2006, 2008, 2010 and 2012. Explanatory variables are drawn from the 2000 Census. Robust standard errors are in parentheses.

Table A.3.2 Determinants of SP coverage by State. Controls of interest

Variable	2004	2005	2006	2008	2010	2012
Avg. number of international migrants per HH	-.169	.059	.257	-.251	-.114	.398
	(1.99)	(2.03)	(1.97)	(1.45)	(1.16)	(.816)
Log median international private transfers	-.233	-.365	-.445*	-.167	-.225	.094
	(.181)	(.216)	(.253)	(.275)	(.219)	(.153)
Log median domestic private transfers	.083	.062	.079	-.015	-.118	-.101
	(.089)	(.111)	(.113)	(.096)	(.082)	(.062)
Share of pop. that receives int. private transfers	.516	-2.33	-5.08	.113	-1.43	-2.34
	(12.0)	(11.7)	(11.3)	(8.86)	(7.35)	(4.58)
Share of pop. that receives dom. private transfers	4.74	.628	1.25	-3.29	-5.22	-7.29
	(5.05)	(7.96)	(8.11)	(8.34)	(5.99)	(5.29)
F-test	.996	.998	1.22	.126	1.11	1.93
Observations	32	32	32	32	32	32

*** p<0.01, ** p<0.05, * p<0.1

Note: Table presents regressions where the dependent variable is the proportion of eligible individuals covered by Seguro Popular at the state level in 2004, 2005, 2006, 2008, 2010 and 2012. Explanatory variables are drawn from the 2000 Census. Robust standard errors are in parentheses.

Table A.3.3 OLS: SP coverage and total health expenditures

Variable	(1)	(2)	(3)	(4)	(5)
SP coverage at the state level	-116.6***	-105.5**	-108.8**	-99.91*	-92.03*
	(16.31)	(49.47)	(51.25)	(49.13)	(49.43)
HH head age				5.107***	5.116***
				(.6400)	(.5780)
HH head years of schooling				23.52***	23.46***
				(3.633)	(3.381)
HH head male				28.50***	30.76***
				(10.32)	(10.81)
HH enrolled in Prospera				-58.78***	-50.33***
				(8.528)	(8.693)
HH members under age 12				17.74***	18.33***
				(2.993)	(2.921)
HH members age 65 and older				61.79***	63.08***
				(21.95)	(22.21)
Good quality walls in the HH				7.329	5.388
				(9.164)	(9.971)
Good quality roofs in the HH				52.31***	52.96***
				(8.378)	(8.486)
Good quality floors in the HH				38.83***	19.35
				(12.55)	(11.43)
Rural locality				14.16	-9.466
				(8.581)	(18.96)
Year fixed effects	No	Yes	Yes	Yes	Yes
State fixed effects	No	Yes	No	Yes	No
State level controls	No	No	No	Yes	Yes
Municipality fixed effects	No	No	Yes	No	Yes
Municipality level controls	No	No	No	Yes	Yes
Observations	62,882	62,882	62,882	62,882	62,882

Source: Author's elaboration based on the ENIGH. HH denotes households. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Table A.3.4 SP coverage and total private transfers. Marginal effects

Variable	(1)	(2)	(3)	(4)
	Tobit: Amount of private transfers received		Logit: Probability of Receiving private transfers	
SP coverage at the state level	-206.4**	168.0*	-.0669*	-.0654*
	(102.2)	(87.35)	(.0343)	(.0342)
HH head age		2.111***		.0013***
		(.7987)		(.0003)
HH head years of schooling		9.817***		-.0010*
		(1.973)		(.0005)
HH head male		-1100.8***		-.3280***
		(61.87)		(.0083)
HH enrolled in Prospera		-22.96*		-.0099**
		(12.63)		(.0048)
HH members under age 12		-13.07**		-.0035
		(5.812)		(.0022)
HH members age 65 and older		84.34***		.0391***
		(15.09)		(.0059)
Good quality walls in the HH		45.51		.0152
		(29.37)		(.0123)
Good quality roofs in the HH		77.97***		.0190***
		(12.97)		(.0053)
Good quality floors in the HH		89.17***		.0341***
		(14.23)		(.0061)
Rural locality		150.31***		.0538***
		(23.73)		(.0079)
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
State level controls	No	Yes	No	Yes
Municipality fixed effects	No	No	No	No
Municipality level controls	No	Yes	No	Yes
Observations	54,854	54,854	54,854	54,854

Source: Author’s elaboration based on the ENIGH. For the tobit, figures reported denote the unconditional marginal effects. HH denotes households. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Table A.3.5 SP coverage and private transfers. Different effects by year

Year	(1)	(2)	(3)	(4)
	OLS: Amount of private transfers received		LPM: Probability of receiving private transfers	
SP * 2004	-54.11	38.44	-.0728	-.0691
	(176.7)	(161.1)	(.0467)	(.0429)
SP * 2005	-49.06	43.41	-.0736**	-.0592**
	(91.21)	(94.86)	(.0315)	(.0289)
SP * 2006	-103.6	15.05	-.0530	-.0383
	(140.3)	(144.2)	(.0405)	(.0385)
SP * 2008	-212.9	-240.5	-.0452	-.0825
	(215.0)	(210.6)	(.0591)	(.0532)
SP * 2010	-254.8	-264.5*	-.0240	-.0350
	(153.7)	(151.4)	(.0505)	(.0412)
SP * 2012	159.8	75.19	.0008	.0292
	(178.0)	(178.7)	(.2000)	(.2060)
HH level controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
State level controls	Yes	Yes	Yes	Yes
Municipality fixed effects	No	Yes	No	Yes
Municipality level controls	Yes	Yes	Yes	Yes
Observations	54,854	54,854	54,854	54,854

Source: Author's elaboration based on the ENIGH. Figures presented represent coefficient estimates for SP coverage at the state level. HH level controls include the variables presented in Table 3.2. State level controls include the state population size and binary variables that indicate the political affiliation of the Governor. Municipality level controls include government revenue, number of housing credits granted and number of workers affiliated to IMSS. Monetary figures are in real 2006 pesos. Standard errors are clustered at the state level.

Appendix A.4

Table A.4.1 Summary of the literature on violence and educational outcomes in Mexico

Paper	Summary	Period	Observations	Data	Methodology	Results	Other
Caudillo and Torche (2014) (earlier draft presented at the 2013 meeting of the Population Association of America, April 11-13)	Examines the effects of homicides at the municipality level on grade failure in primary schools (grades first to sixth)	1990 to 2010	84,404 primary schools per year	Statistics 911 (for construction of grade failure rates and school level controls); SIMBAD (for homicide information at the municipality level); Census 1990, 2000 and 2010 and Population Count 1995 and 2005 (for population values at the municipality level)	Fixed effects; First differences; Group-specific intercepts and slopes	Increase in 1 homicide per 1,000 population in the municipality where a school is located results in an increase between .003 and .009 in the elementary school failure rate	Examines lagged effects of homicides and different effects by grade (both available in the Online Appendix)
Michaelsen and Salardi (2013)	Examines the effects of homicides at the municipality/locality level on academic performance in primary schools (grades third to sixth)	2007 to 2011	28,632 primary public schools per year	ENLACE administrative dataset and SEP (for construction of academic performance variable, number of teachers and students by grade variables and exam attendance variable); SALUD (for homicide information at the municipality/locality level); Census 2010 (for population values at the municipality/locality level); SIMBAD (cited as INEGI, for municipality level controls)	Fixed effects	Increase by one homicide per 1,000 inhabitants decreases the average ENLACE score between 1.957 and 2.221 points.	Examines the differential effects of homicides depending on their occurrence with respect to the examination period and the geographical distance to the school. Examines the effect of violence on the attendance rate on the day of the ENLACE test (also used as a proxy for migration)
Márquez-Padilla, Pérez-Arce and Rodríguez-Castelán (2015)	Examines the effects of homicides and drug related homicides on enrolment, migration, employment and academic performance in primary and	2000 to 2010; 2006-2010 (enrolment rates); 2009 to 2011 (academic performance)	78,830 primary schools per year and 25,984 secondary schools per year	SEP (for construction of total school enrolment variable); SIMBAD (for homicide information at the municipality level and municipal and state level controls); CNS (for drug homicide information at the municipality level); Statistics 911 (unclear); Census 2000 and 2010 and	Fixed effects	Increase of 8 homicides per 100,000 individuals is associated with no decrease in the number of enrolled students in basic education and a 0.3%	Examines differential impacts of violence on enrolment by age group; on enrolment rates, migration and employment by age group and gender; and on the number of teachers

	secondary schools (grades first to twelve)			Population Count 2005 (for construction of enrolment rate variable, migration variable and municipality level controls and characteristics); ENOE (for construction of enrolment rate variable; ENLACE administrative dataset (for construction of academic performance variable)		decrease in the number of enrolled students in secondary school (grades 10 to 12). Effect explained by migration and not by changes in enrolment. No effect on test scores	and schools by municipality
Orraca (2015)	Examines the effect of homicides and drug related homicides on academic performance and grade failure in primary schools (grades third to sixth) and secondary schools (grades seventh to ninth). Explores the effects of homicides on time-use (i.e. time spent at school and time spent performing school-related activities in the household)	2006 to 2012	59,673 primary schools per year and 22,932 secondary schools per year	ENLACE administrative dataset (for construction of academic performance variable); Statistics 911 (for construction of grade failure rates and school level controls); SIMBAD (for homicide information at the municipality level and municipality and state level controls); Census 2010 and Population Count 2005 (for population values at the municipality level); CNS (for drug homicide information at the municipality level); UNODC (for drug seizure information in Colombia); Site of Christopher Woodruff (for municipality's distance to U.S. border); ENUT (for construction of time-use variables); SEP (for PES, PEC, PETC school level controls); CNPPIS administrative dataset (for Prospera coverage variable at the municipality level); CNPSS administrative dataset (for Seguro Popular coverage variable at the municipality level); ENVIPE (for public safety perception descriptives)	Fixed Effects; IV; OLS	Increase of one unit in the number of homicides per 10,000 inhabitants reduces test scores between 0.0035 and 0.0142 standard deviations. Higher homicides rates also associated with an increase in the grade failure rate. Negative effect of crime on the number of contact hours, where students do not compensate for this by studying more outside of the school	Examines heterogeneous effects by subject (i.e. Spanish or Math); by municipality's/school type or characteristics (i.e. marginality level; locality size; session; school type); time period (i.e. lagged homicide rate); date of homicide with respect to the examination period; explores spillover effects; analyses the effects of homicides on the distribution of scores; and explores effects of violence on the number of teachers per school, the number of students per school, the student teacher ratio and the "quality" of teachers

Table A.4.2 Descriptive statistics. Different percentiles of the distribution

Variable	2006	2007	2009	2010	2011	2012
			10th percentile			
ENLACE test scores: Spanish	412.0	410.8	426.6	427.9	428.3	431.8
ENLACE test scores: Mathematics	419.0	417.0	424.9	431.2	438.5	456.0
Grade failure rate (%)	0.0	0.0	0.0	0.0	0.0	0.0
Teachers per 100 students	1.51	1.01	1.02	1.01	1.01	1.01
Homicides per 10,000 pop.	0.0	0.0	0.0	0.0	0.0	0.0
Drug homicides per 10,000 pop.	0.0	0.0	0.0	0.0	0.0	0.0
			50th percentile			
ENLACE test scores: Spanish	483.5	486.8	497.9	501.4	508.5	514.3
ENLACE test scores: Mathematics	486.0	492.0	502.1	510.5	522.2	545.8
Grade failure rate (%)	1.72	1.53	1.20	0.93	0.72	0.53
Teachers per 100 students	3.57	3.59	3.62	3.66	3.68	3.68
Homicides per 10,000 pop.	0.61	0.52	0.91	0.83	1.05	1.16
Drug homicides per 10,000 pop.	0.0	0.0	0.16	0.27	0.46	0.42
			90th percentile			
ENLACE test scores: Spanish	562.0	571.0	579.3	592.0	606.1	619.5
ENLACE test scores: Mathematics	566.0	576.5	587.9	603.1	624.8	657.7
Grade failure rate (%)	8.87	8.88	8.11	7.27	6.88	5.33
Teachers per 100 students	6.61	6.66	7.05	7.14	7.14	7.14
Homicides per 10,000 pop.	2.13	2.03	4.54	6.18	6.37	5.64
Drug homicides per 10,000 pop.	0.0	0.58	2.16	3.83	5.04	3.89

Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD. Standard errors are in parenthesis.

Table A.4.3 Homicides and grade repetition. Different effects by time and space

Homicides within:	**(1)**	**(2)**	**(3)**	**(4)**
	Academic Year	6 months	3 months	Week
		Primary		
Municipality	0.0357***	0.0406***	0.0591***	0.1433***
	(0.0082)	(0.0112)	(0.0165)	(0.0529)
10 km	0.0190***	0.0243***	0.0264**	0.0481
	(0.0053)	(0.0079)	(0.0121)	(0.0308)
20 km	0.0035*	0.0059*	0.0079**	0.0266
	(0.0019)	(0.0031)	(0.0039)	(0.0163)
30 km	0.0008	0.0023*	0.0032	0.0021
	(0.0007)	(0.0013)	(0.0022)	(0.0069)
		Secondary		
Municipality	0.0326***	0.0464***	0.0715***	0.1852***
	(0.0099)	(0.0137)	(0.0212)	(0.0462)
10 km	0.0076	0.0156*	0.0209**	0.0742**
	(0.0051)	(0.0081)	(0.0104)	(0.0293)
20 km	0.0034**	0.0072**	0.0102**	0.0334**
	(0.0017)	(0.0031)	(0.0039)	(0.0134)
30 km	0.0013**	0.0039***	0.0053***	0.0289***
	(0.0006)	(0.0013)	(0.0015)	(0.0086)
School level controls	Yes	Yes	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Municipality level controls	Yes	Yes	Yes	Yes
State level controls	Yes	Yes	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

Table A.4.4 Homicides and grade repetition. Spillover effects

Homicides occurring:	**(1)**	**(2)**
	Primary	Secondary
In Municipality	0.0282***	0.0268***
	(0.0070)	(0.0082)
Outside Municipality, 20 km radius	0.0005	0.0019***
	(0.0005)	(0.0007)
Outside Municipality, 30 km radius	0.0003	0.0012***
	(0.0005)	(0.0004)
Outside Municipality, 40 km radius	0.0006*	0.0007**
	(0.0003)	(0.0004)
School level controls	Yes	Yes
School fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Municipality level controls	Yes	Yes
State level controls	Yes	Yes

* p<0.10; ** p<0.05; *** p<0.01
Source: Coefficients reported in the table correspond to the total number of homicides per 10,000 inhabitants. Grade failure rate is measured on a scale from 0 to 100. Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. Standard errors are in parenthesis and are clustered at the municipality level.

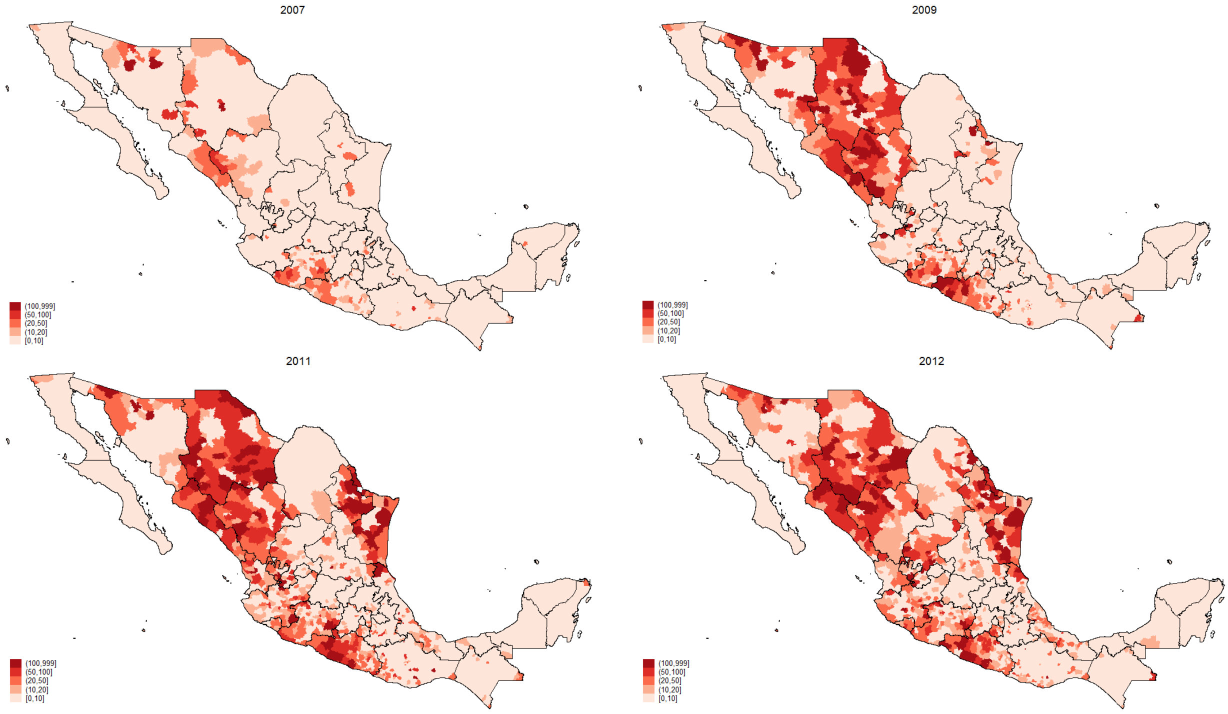
Table A.4.5 Homicides and grade repetition. Non-linear effects

Variable	(1)	(2)
	Primary	Secondary
0 < Homicides ≤ 15	-0.0732*	0.0236
	(0.0422)	(0.0265)
15 < Homicides ≤ 30	-0.0910	0.0551
	(0.0758)	(0.0491)
30 < Homicides ≤ 60	-0.0399	0.0626
	(0.114)	(0.0648)
Homicides > 60	0.1490	0.0607
	(0.1230)	(0.0845)
School level controls	Yes	Yes
School fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Municipality level controls	Yes	Yes
State level controls	Yes	Yes
R-squared	0.044	0.004
Observations	358,038	137,592

* p<0.10; ** p<0.05; *** p<0.01

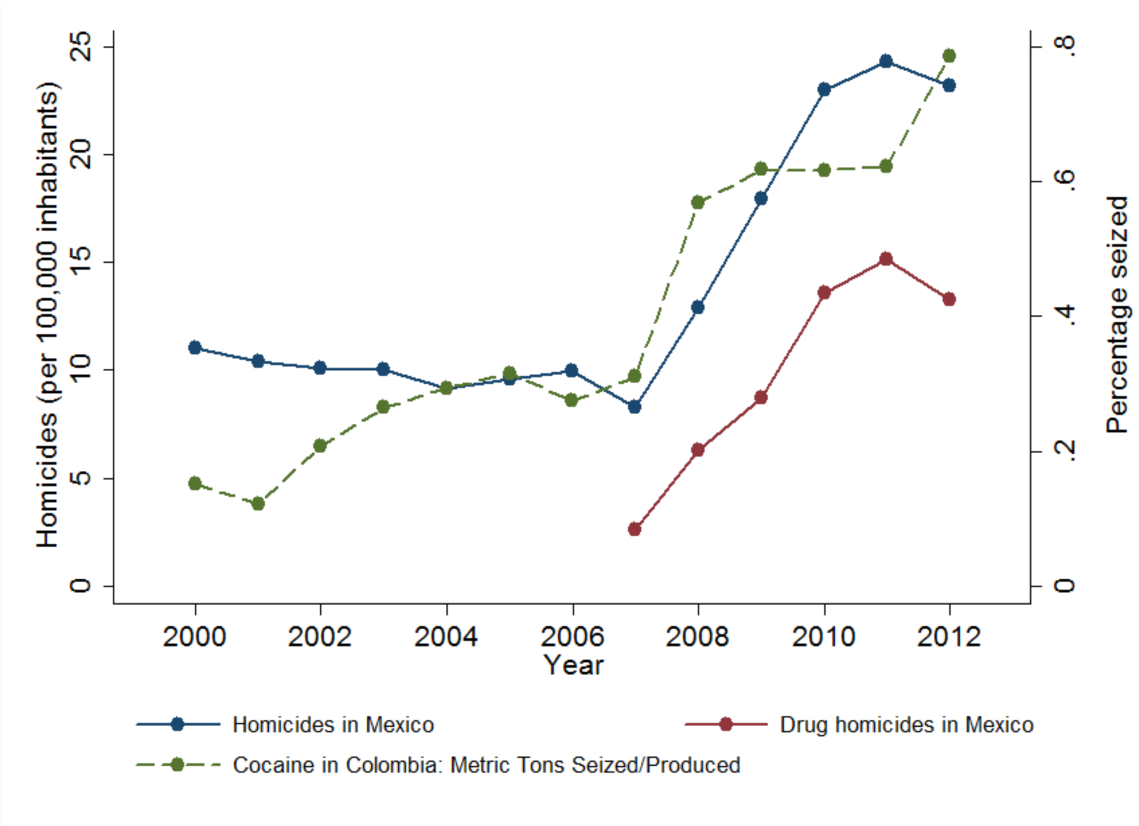
Source: Author's elaboration based on ENLACE administrative data, Estadísticas 911 (Statistics 911) and SIMBAD 2006, 2007, 2009, 2010, 2011 and 2012. The reference category for the Homicides dummy variables is constituted by municipalities where there were zero registered homicides during the 12 months prior to the ENLACE examination date. Standard errors are in parenthesis and are clustered at the municipality level.

Figure A.4.1 Drug related homicides per 100,000 inhabitants by Municipality



Source: Author's elaboration based on data provided by the CNS.

Figure A.4.2: Homicides in Mexico and cocaine seizures in Colombia, 2000-2012



Source: Author's elaboration based on SIMBAD, CNS and UNODC.