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J. Eduardo Ibarra-Olivo

eduardo.ibarra-olivo@henley.ac.uk

Henley Business School, University of Reading

Whiteknights Campus, Reading, RG6 6UD, United Kingdom

ABSTRACT

Inward foreign direct investment (IFDI) has often been considered to play a prominent role in the development of human capital in the host economy by introducing a foreign wage premium into the labour market. However, extant evidence on IFDI labour market effects is inconclusive, especially in emerging economies. We investigate for the case of Mexico whether foreign wage premia have an effect on educational outcomes of young cohorts that were 15 years old at the time of IFDI arrival in their municipality of residence. Results suggest that increasing foreign wage premium for unskilled jobs, both in manufacturing and services, has negative effects on a cohort's subsequent educational outcomes. The effects of foreign wage premium for skilled workers, however, are not significant but may lead to positive educational outcomes. The long-term implications of losses accruing from low investment in human capital do not only affect individuals but regions as well.

KEY WORDS: Foreign direct investment, Foreign wage premium, Returns to education, Educational outcomes, Human capital development, Mexico

JEL Codes: I26, F21, J24

1. Introduction

Inward foreign direct investment (IFDI) has often been considered to play a prominent role in the development of human capital in the host economy (Blomström & Kokko, 2002; Miyamoto, 2003; Slaughter, 2004). Multinational enterprises (MNEs) are typically expected to pay, on average, higher wages, largely due to higher productivity and technological advantages over domestic firms. This is the so-called foreign wage premium (Lipsey, 2004). One of the chief mechanisms through which IFDI operates is the labour market, as MNE entry is likely to affect both local demand and supply of skilled labour (Blomström & Kokko, 2002; Slaughter, 2004). This paper's focus is on this particular transmission mechanism; i.e., how are FDI-induced changes in the local labour markets likely to affect aggregate educational outcomes (Markusen & Venables, 1997)?

By providing attractive employment opportunities for the skilled, MNEs will modify relative wages, which may incentivise students to continue in formal education, thus increasing the future supply of skills (Blomström & Kokko, 2002; Checchi et al., 2007; Miyamoto, 2003; Slaughter, 2004). If individuals in host countries have access to formal education, they should be able to respond to price signals emerging from the labour market (Slaughter, 2004), so IFDI may arguably contribute to aggregate skill upgrading and human capital formation (Iammarino & McCann, 2013). However, if MNEs increase the demand for low-skilled labour (Braconier et al., 2005), there will be little incentive to continue in formal education, resulting in decreased enrolment rates and educational attainment (Atkin, 2016; Federman & Levine, 2005).

IFDI will have heterogeneous effects depending on the productive sector in which foreign presence concentrates, according to the knowledge intensity of the respective productive process (Checchi et al., 2007). In general terms, the effect of IFDI on educational outcomes in regions experiencing FDI inflows may have two opposing effects (Asali et al., 2016; Atkin, 2016). If foreign presence raises the prospective returns to education – in the form of skilled wages – enough to compensate for the opportunity cost of additional schooling – embodied in forgone unskilled wages – more students will remain in school and progress on to subsequent educational levels, thus increasing the level of education over time. However, if such returns do not outweigh forgone wages, young cohorts at certain educational thresholds are more likely to drop out of school, and hence their average educational attainment will decrease in the long run. The question of which effect tends to predominate

during a period of increasing FDI inflows and changes in sectoral patterns is the one we address here.

Mexico has become one of the largest recipients of IFDI world-wide; the value of IFDI stock as a percentage of national GDP increased from 7.8% in 1990 to over 30% in 2013 (UNCTAD, 2014). Moreover, in recent decades, the sectoral composition of FDI has changed significantly, with the services sector gaining its share at the expense of manufacturing (Ministry for Economics, 2016). As far as the level of educational attainment is concerned, Mexico is still lagging considerably behind other emerging countries, with a working-age population average of 6.6 years of education in 2010 (INEGI, 2010) and only 53 percent of 15-19-year-olds enrolled in education in 2012 (OECD, 2014). Furthermore, regional inequalities and disparities in access to education are still commonplace in the Mexican economy.

Against this background, the potential effects of IFDI may have different effects across sub-national regions, with disproportionate consequences on vulnerable groups of the population, particularly young cohorts that are exposed to IFDI presence earlier in their academic progression. Therefore, it is important for development and educational policy purposes to understand what types of foreign jobs are affecting the relative returns for households to invest in education. The aim of this paper is to explore the effects of foreign wage premia, through relative changes in local wages, on the educational outcomes of cohorts enrolled in the last year of lower secondary education at the time of FDI arrival in their municipality of residence. To this end, we exploit cross-sector FDI-induced temporal variation in returns to education for different types of jobs (skilled and unskilled) across fine-grained geographical units during a period (1990 to 2015) that has seen substantial increases and changes in the sectoral distribution of IFDI.

Most of the evidence regarding IFDI host labour market effects in Mexico points to a significant association between rises in IFDI and higher skilled wages (e.g., Aitken et al., 1996; Feenstra & Hanson, 1997; Ibarra-Olivo, 2019; Noria, 2015; Villarreal & Sakamoto, 2011). Although this body of literature certainly suggests that FDI has the potential to contribute to human capital accumulation, by providing incentives for the local labour force to acquire higher education, it falls short in assessing the full extent of this association: it assumes equal access to education (Scandurra & Calero, 2017); neglects the fact that MNEs also hire unskilled workers at higher wage rates, thus providing a different set of incentives in the labour market; and does not consider any direct measure of human capital.

Furthermore, empirical studies directly exploring the effect of FDI on human capital accumulation are relatively scarcer, and the evidence on educational outcomes is still inconclusive (e.g., Asali et al., 2016; Checchi et al., 2007; Egger et al., 2010; Mughal & Vechiu, 2011). The evidence in Mexico is very sparse, and not up to date. In general, a negative association has been found between increases in low-skilled foreign employment and youth educational outcomes (Abler et al., 1998; Atkin, 2016; Le Brun et al., 2011). While these studies have considered FDI-induced labour market effects on educational outcomes, the focus has been on early stages of foreign low-skilled manufacturing jobs. However, there is evidence that FDI in Mexico has been undergoing sectoral changes, with manufacturing declining and services gaining predominance (Chiatchoua et al., 2016; Nunnenkamp & Bremont Alatorre, 2007; Waldkirch et al., 2009).

The empirical evidence on the relationship between IFDI and educational outcomes via the labour market is thin. The contributions of this paper are twofold. First, this paper bridges the gap between the literature on FDI labour market effects and educational outcomes. In this regard, the paper improves on previous studies by analysing the effects of FDI-induced changes in relative wages on direct measures of human capital – such as cohort enrolment rates and average years of education. Moreover, by using a fine-grained geographical scale, we are able to account for differences in access to education in municipalities across regions. Second, the paper updates the available but incipient evidence of FDI effects on human capital accumulation in Mexico. In this respect, it studies a 25-year period that witnessed important changes in the sectoral composition of FDI inflows, with accompanying spatial relocation of foreign investment. Furthermore, it considers the effects of two types of foreign jobs, accounting for the fact that foreign firms employ both skilled and unskilled workers, thus shedding light on the effects of different types of jobs on human capital accumulation.

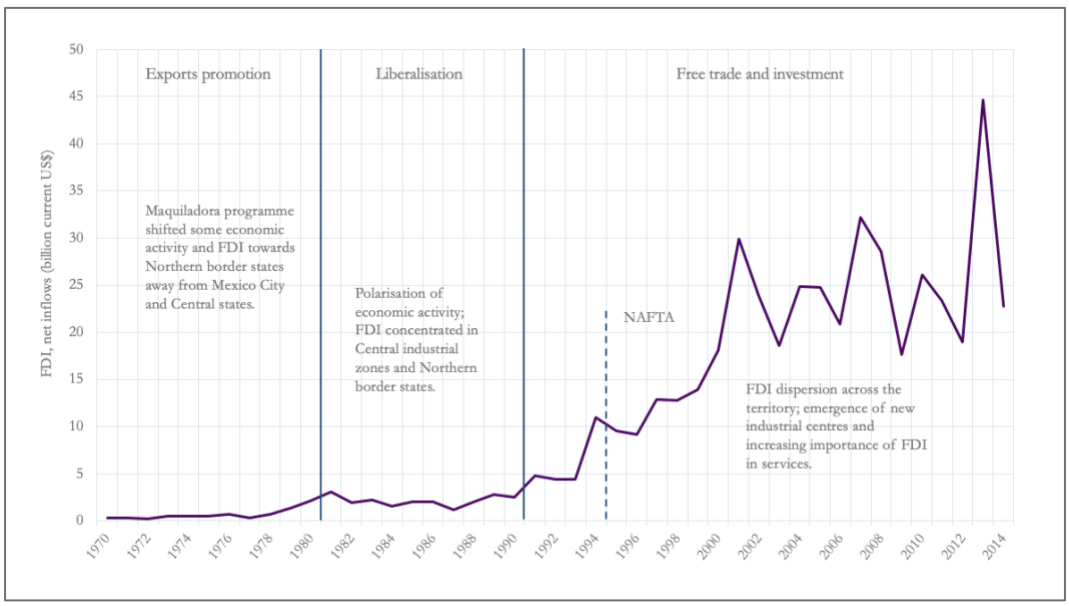
Results suggest that increasing foreign wage premia for unskilled jobs, both in services and manufacturing, have negative effects on a cohort's subsequent educational outcomes. In contrast, the effects of foreign wage premium for skilled workers have no significant effect on educational outcomes, although they may be positive in the case of manufacturing. The labour market effects of foreign entry are not only short-lived, affecting a cohort's school enrolment, but also long-lasting, resulting in lower average years of education in the long run. The remainder of the paper is organised as follows. Section 2 lays the ground for analysis by describing the features of FDI and education in Mexico. Section 3 describes the empirical strategy, including the underlying theoretical model, instrumentation, data and construction

of the variables, along with the threats to internal validity. Results are presented and discussed in Section 4. Final remarks and implications are given in Section 5.

2. FDI and Education in Mexico

In the context of increasing internationalisation of production, Mexico has become one of the largest recipients of FDI inflows world-wide. The value of inward FDI stock as a percentage of national GDP increased from 7.8% in 1990 to over 30% in 2013 (UNCTAD, 2014). Although IFDI flows began increasing with the liberalisation of the economy in the 1980s, it was the onset of the North American Free Trade Agreement (NAFTA) in 1994 that marked the beginning of a steadily rising inflow of FDI into Mexico (see Figure 1). In subsequent decades, yearly net inflows have fluctuated around an average of 25 billion US dollars.

Figure 1 – Mexico: Total FDI Net inflows 1970–2014

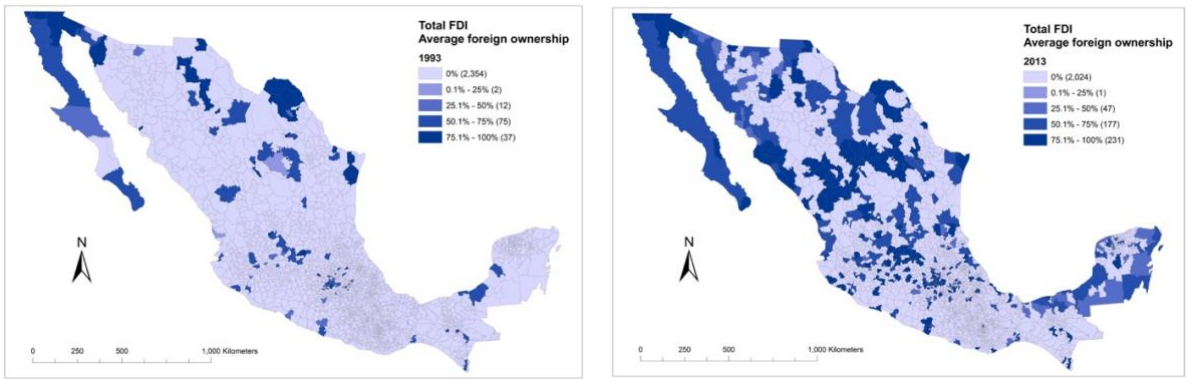


Notes: Net inflows of foreign direct investment to Mexico from 1970 to 2014. Source: Author, using World Bank data. Annotations from López-Villafañe (2004) and Cárdenas (2000)

The geographic distribution of foreign firms, and economic activity as a whole, have experienced noticeable changes during the last four decades. Prior to the introduction of policies of trade promotion in the mid 1980s, the distribution of economic activity was concentrated in and around Mexico City, which represented the single largest domestic market (Krugman & Livas Elizondo, 1996). Although export promotion policies under the

maquiladora programme[1] date back to the early 1970s, it was not until the early 1980s that the regional distribution of foreign activity shifted dramatically away from Mexico City and towards the northern states. In the wake of NAFTA (1993), the bulk of FDI was concentrated in municipalities[2] along the northern border and some central regions with industrial history (see Panel A in Figure 2). By the end of the 1990s, a second stage of FDI redistribution had begun. Even though foreign investment was still significant along the northern border, MNEs were beginning to spread to other parts of the country. By 2013, twenty years later, the spatial distribution of total FDI was far less concentrated (Panel B in Figure 2).

Figure 2 – Total FDI in Mexico: Average foreign ownership by municipality, 1993–2013



(A) (B)

Notes: Maps show total FDI as the average foreign ownership in private firms. Source: Author, with data from Economic Census, *Censos Economicos* (INEGI, 1994, 2014)

The relocation of economic activity was accompanied by important sectoral shifts in the composition of foreign investments. Even though manufacturing still accounted for a significant share of incoming FDI, the services sector began undergoing considerable expansion following the implementation of NAFTA. In 2001, the services sector accounted for 77 percent of total inward FDI, and since then its share has averaged 45 percent of the annual inward foreign capital flows (see Figure A1 in Appendix). These sectoral shifts were also reflected in changes in the geography of foreign investment by sector. At the end of

[1] In 1971, the Mexican government launched the programme that enabled the establishment of *maquiladoras* in the territories along the northern border, which became a platform for the export of manufactured goods assembled in the country with raw materials and components imported duty-free in largely foreign-owned plants (Lopez Villafañe, 2004).

[2] This administrative unit represents the third tier of government, after the state and federal administrations. It is equivalent to US counties. There are 2,457 municipalities in Mexico. All municipalities are autonomously governed by popularly elected town councils.

2013, FDI in manufacturing remained concentrated in and around traditional manufacturing hot-spots, while in services it increased in medium-sized cities and tourist destinations.

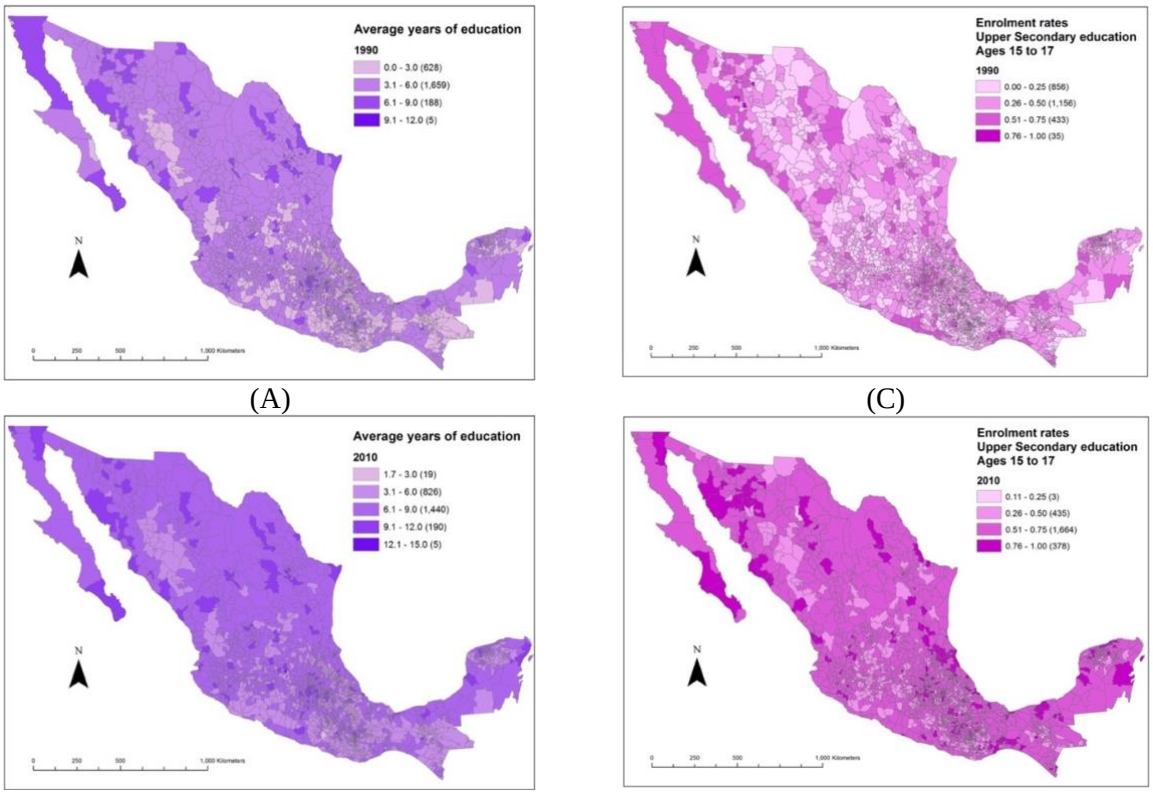
On the education side, Mexico's educational attainment has increased steadily since the 1970s. A relatively rapid catch-up until the 1990s was the result of increases in the coverage of basic education[3] and the reduction of primary school dropout rates (López-Acevedo, 2006). However, enrolment and educational attainment have continued to lag behind, and still remain below the international trend line. Only 63 percent of adults have completed lower secondary education; and the proportion of those who have completed at least upper secondary education is as little as 37 percent (OECD, 2014).[4] While access to primary and secondary is universal and compulsory, Mexico has one of the smallest proportions of 15 to 19-year-olds enrolled in education – 53 percent – among OECD countries. Students in Mexico tend to leave education early. In 2012, only 66 percent of 15-year-olds participated in education while only 62 percent of 16-year-olds were enrolled (OECD, 2014).

Differences in educational attainment in Mexico are still strongly tied to regional income inequalities and differences in access to education. In 1990, the national average education was 3.9 years for the working age population. Higher educational attainment was generally found in the northern regions and in Mexico City (Panel A in Figure 3). While two decades later the national average had risen to 6.6 years of education, the spatial trend remained relatively unchanged as the southern regions continued to lag behind (Panel B in Figure 3). Inequalities are also evident in access to education, in terms of enrolment in upper secondary. At the national level, only 33 percent of youths aged 15 to 17 years old were enrolled in their correct year of schooling in 1990. Overall, the north–south divide is still present, although enrolment rates tend to vary more, and pockets of low enrolment are scattered across the country (Panel C in Figure 3). The national average of this rate rose to 62 percent of youths in 2010, but the spatial patterns remained virtually unchanged (Panel D in Figure 3). The present situation still presents bleak prospects regarding the availability and quality of human capital in Mexico: whilst average education of the workforce rose from incomplete to complete primary schooling, school enrolments for 15 to 17-year-olds are still far from being complete, despite upper secondary education being compulsory (World Bank, 2007).

[3] Basic education in Mexico refers to pre-tertiary education, usually 12 years of education; 6 years of primary, 3 of lower secondary, and 3 of upper secondary education.

[4] Typically, lower secondary education refers to grades 7 to 9, and upper secondary comprises grades 10 to 12.

Figure 3 – Educational attainment and enrolments by municipality, 1990–2010



Notes: (i) Maps A and B show average years of education for the working age population (ages 15 to 64); (ii) maps C and D show enrolment rates in upper secondary education (for youths aged 15 to 17); (iii) the two variables are plotted at the beginning and end of our study period (1990–2010) for the 2,457 municipalities. Source: Author, with data from Population Census, *Censos de Población y Vivienda* (INEGI, 1990, 2010)

In the context of large disparities in access to education, economic opportunities will be likely captured by the educated, thus reinforcing pre-existing patterns of inequality (Rodríguez-Pose & Tselios, 2009). Whilst the main source of inequality in access to educational opportunities lies in unequal access to a range of resources among families of different backgrounds (Scandurra & Calero, 2017), inequality of opportunities has been consistently associated with higher income inequalities and lower investment in human capital (Mejía & St-Pierre, 2008). Therefore, existing differences in labour market conditions and educational opportunities across regions are expected to affect educational outcomes differently (Levison et al., 2001). Choices available to disadvantaged youth are limited by financial and social barriers, hindering investment in education and perpetuating inequality (Binder & Woodruff, 2002).

3. Empirical Strategy

Against this background, IFDI will have different effects across municipalities, with disproportionate consequences on vulnerable groups in the population. In particular, we investigate the labour market effects of IFDI on the educational outcomes of young cohorts, at a particular threshold of formal education, that are more exposed to foreign presence. We considered two types of jobs – skilled and unskilled – in both manufacturing and services sectors.

3.1. Theoretical framework

Expected returns to education lie at the heart of the theories of human capital accumulation and skill acquisition. The underlying theoretical model we adopt is a general utility maximisation problem in which households make educational choices for their young members depending on a number of factors (Atkin, 2016; Becker, 1965; Becker & Tomes, 1986; Levison et al., 2001; Mincer, 1995): *individual* characteristics such as gender and age; *household* features such as family size, income and parental labour force participation as well as educational background; and *regional* level determinants such as foreign firms' labour market conditions and sectoral composition. Since different skill levels are rewarded differently, returns to education will also vary across labour markets (Attanasio, 2015). Therefore, educational choices are also a function of the expected returns from formal schooling, which might translate into higher future income for educated children (Birdsall, 1999).

When making educational choices, individuals attempt to maximise their net earnings, which equate to the difference between potential earnings and forgone wages (Becker, 1962). Forward-looking individuals will trade off the forgone earnings from continuing in school and progressing to the next academic level – the opportunity cost of schooling – against the future wage benefits from more education – the returns of schooling (Atkin, 2016). For young individuals that have not completed basic education, a rise in the availability of highly-paid low-skilled jobs increases the opportunity cost of remaining in school, which may in turn lead to declining enrolment in subsequent levels of education, particularly for poorer households in more deprived locations (Le Brun et.al., 2011).

The underlying general assumption is that educational choices for youth are affected by changes in the local labour market as well as other socioeconomic characteristics. Without loss of generality, such theoretical models allow us to explore the aggregate effects of foreign

wage premia on cohorts' educational outcomes – enrolment and average years of education – by exploiting a particular institutional feature of the Mexican education system.

3.2. Instrumentation

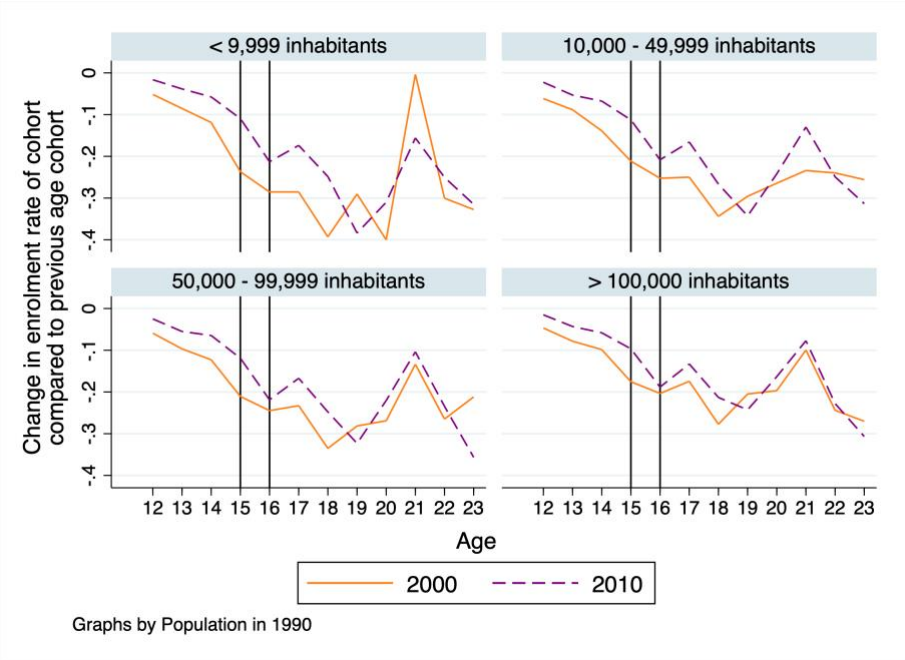
The motivation for our empirical strategy stems from the recent spatial redistribution of FDI across Mexico and shifts in sectoral trends that in unison with the institutional context of the Mexican educational system may be disproportionately affecting particularly young cohorts by early exposure to foreign presence. In the Mexican educational system, there are at least two times during secondary education when students face higher risks of dropping out of school; the first is between lower and upper secondary education, grade 9, and the second is at the end of grade 12. Until 2012, compulsory schooling in Mexico covered only nine years of education, so we use the threshold between lower and upper secondary education (grade 9) to identify the effects of FDI on youths that are disproportionately exposed to foreign presence.[5]

The argument for choosing grade 9 unfolds as follows. Students enrolled in this grade, the last year of lower secondary education, are typically 15 years old. By the time they complete their current course they will be allowed to work, since the legal working age in Mexico is 16. We argue that these youths are more likely to drop out before the beginning of the next academic year if they observe an increase in the foreign wage premium for unskilled jobs offered by MNEs, such that the returns of further education are not enough to compensate for the opportunity cost (in the form of forgone wages) of continuing on to upper secondary education through to grade 12. In Mexico, the opportunity cost of this next level of education is particularly high to begin with. On one hand, lower and upper secondary are administratively two separate educational systems and progression requires students to take a nation-wide admission exam – *Examen Nacional de Ingreso* – that sorts them into their different school choices according to performance. Furthermore, the two systems are seldom located together physically and students may sometimes have to commute elsewhere. On the other hand, even though public schooling is free of charge, there are still significant costs – averaging 15 percent of median yearly household income – associated with attending upper secondary (Binelli & Rubio-Codina, 2013). In sum, the opportunity cost of progression at this

[5] The 2012 educational reform included making upper secondary education mandatory, raising the years of compulsory schooling from 9 to 12 (Political Constitution of the United Mexican States, amended 2012). In the Results section we explain why this does not constitute a problem for our identification strategy.

threshold is particularly high: the inflow of new highly paid foreign jobs is more likely to outweigh the returns of further education and lead to a reduction in enrolment rates and average years of education for these young cohorts. Figure 4 depicts this threshold for 2000 and 2010, by municipalities grouped by population size. Naturally, enrolment rates fall with age, however, the dip in enrolment seems to be quite pronounced between 15 and 16 years old across all municipality sizes.[6] Not surprisingly, the drop in the proportion of enrolled 16-year-olds compared to the previous age cohort is largest for small rural municipalities and smallest for large urban agglomerations. Even when municipalities experienced decreases in enrolment of 16-year-olds across the board compared to the previous age cohort, there is significant spatial variation in enrolment rates changes in 2010 (see Figure A2 in the Appendix).

Figure 4 – The 15/16-year-old threshold by municipality population size.



Notes: Changes in enrolment rates of age cohort relative to previous age cohort are plotted from age 12 to 23. Graphs are shown for the 2000 and 2010 census by municipality population size. Source: Author, with Population Census data (INEGI, 2000, 2010).

One of the strengths of the paper is that it explores FDI-induced labour market effects on educational outcomes for one country, as opposed to cross-country studies. The

[6] Other considerable drops in enrolment occur around the ages of 18-19, which correspond to the end of upper secondary education; and around the 21-22-years-old threshold which coincides with the end of a typical four-year undergraduate degree in Mexico.

instrumentation of the empirical strategy hinges on an institutional setting particular to the Mexican context, involving a specific group of the population. Nonetheless, the insights of our results may be generalised – with caution – to other emerging or developing countries, provided that these are also experiencing similar trends in IFDI and sectoral shifts in foreign wage premia, as well as pre-existing inequalities both in income and access to education.

3.3. Threats to internal validity

Three main sources of endogeneity are identified that might yield inconsistent estimates of the effect of foreign wage premia on cohort educational outcomes. Given our data, we attempt to deal with these threats in turn; nonetheless, results should still be taken with caution. The first is reverse causality between FDI and the initial level of education of the working age population. IFDI locational decisions could be driven by pre-existing levels of education in recipient municipalities. An upward bias will occur if MNEs are attracted to locations with higher levels of human capital. Conversely, if FDI is flowing to municipalities with lower levels of education, the coefficient will have a downward bias. We carry out an indirect test to gauge whether such correlations exist in our sample of municipalities by regressing foreign job creation on the 3-year-lag of average years of education by municipality in first differences (see Table A2 in the Appendix). Changes in initial average years of education do not seem to be correlated with subsequent foreign job creation, even when including the squared term of education and year fixed effects. Furthermore, the significantly low R-squared coefficient suggests that changes in educational attainment do not explain the variation in subsequent FDI flows. Finally, by using data for different years in both sides of the equation in the main specifications, we ameliorate the simultaneous determination problem of our variables.

A second obvious threat to internal validity stems from omission of time-varying variables that may be correlated with both FDI inflows and educational attainment. Many such variables exist, but one is considered to be the most relevant. The concern is that increases in the local government's revenue from MNEs may lead to more expenditure in public education, thus affecting educational attainment levels. Whilst there is no municipality data to control for this, it is quite plausible that this constitutes a non-issue due to the fact that provision of public basic education is planned and budgeted at the federal level in consultation with states, with municipalities having a limited role in these decisions. Since the majority of tax revenue is federal, the link between local prosperity and federal transfers is rather weak (Helper et al., 2006). Furthermore, one could safely assume that increased

expenditure in education will not disproportionately affect our cohorts at the threshold, since such expenditures are likely to affect all enrolled cohorts simultaneously or perhaps affect younger cohorts that will spend more time in school even more. To the extent that other omitted variables evolve slowly over time, their effect will be swept away by either fixed effects or first-difference estimations.

Thirdly, unobservable characteristics for particular cohort–municipalities might also bias our estimates. To this end, time-invariant characteristics will be removed by means of first-differencing and fixed effects. The cohort–municipality fixed effect will capture differences across municipalities; for example, municipalities with upward educational trends or better infrastructure for education. Year-specific shocks affecting all municipalities in the sample will be accounted for by the year dummies. These year shocks are the rolling out of the conditional cash-transfer social programme *Oportunidades* in 2000 which required students to be enrolled in school up to grade 12 and the educational reform of 2012 increasing compulsory education to 12 years. These are further explored in the results section to rule out any potential bias in educational outcomes arising from these events.

3.4. Data description and variables

In order to answer the empirical question at hand, we constructed rich datasets by combining two sources of information. Firstly, we use the Population and Housing Census (INEGI, 1990, 2000, 2010), which contains data from the universe of Mexican households, conducted every ten years by the statistical bureau (INEGI). The censuses cover a 20-year period, from 1990 to 2010, and collect data on a number of variables related to income, expenditure, education and employment for households and individuals within them. Secondly, we use data from the Economic Census (INEGI, 1994, 1999, 2004, 2009) regarding foreign ownership, employment creation and wages. Data for these censuses are collected every 5 years from the universe of economic units in the country. These cover a 15-year period from 1993 to 2008. The data obtained is aggregated at the municipality level and by manufacturing and services sector following confidentiality principles.[7] We construct two datasets to provide evidence on the relationship between foreign wage premia and educational

[7] Wherever there are three or fewer economic units in an industry–municipality observation, data is concealed to prevent the identification of individual firms.

outcomes.[8] Summary statistics are reported separately for the model on cohort enrolments and cohort average years of education (Table A1 in the Appendix).

Our variable of interest, the foreign wage premium (W^P) in each sector, accounts for the fact that MNEs might pay higher wages than domestic firms for identical workers.[9] We construct this variable by taking the change in the log differences between average foreign (w_m^f) and domestic (w_m^d) wages between years $t + x$ and t in municipality m as follows;

$$\Delta W_{mt}^P = \left(w_m^f - w_m^d\right)_{t+x} - \left(w_m^f - w_m^d\right)_t \qquad \text{Equation (1)}$$

The difference in foreign wage premium, ΔW_{mt}^P, is calculated both for skilled and unskilled workers, separately in services and manufacturing.

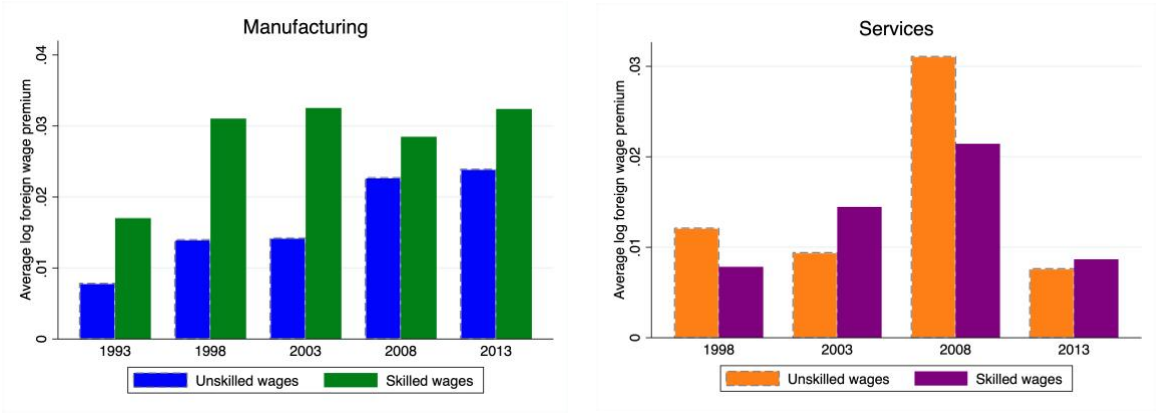
The four foreign wage premia are plotted in Figure 5 below. According to the data source, groups of skilled and unskilled workers are defined in terms of production and non-production employment.[10] In the manufacturing sector, the foreign wage premium exhibits an increasing trend, and is considerably larger for skilled workers. In the services sector, the foreign wage premia also follow a rising trend, albeit less closely. Nonetheless, in some years, the foreign wage premium for unskilled workers exceeds that for skilled workers. It seems that, on average, MNEs in Mexico tend to pay higher wages than their domestic counterparts. These wedges in the prices of labour and their temporal changes constitute our source of variation to identify the labour market effects of IFDI on educational outcomes.

[8] Due to the different periodicity of the two data sources, we use linear interpolation to obtain the values for intermediate years. This commonly used technique does not pose a threat to our estimates. First, in our model for cohort enrolments, the interest is in long first-differences between foreign wage premia and enrolments in ten-year periods (see Figure 6). Second, in our model for cohort average years of education, although the analysis is done on yearly changes (see Figure 7), linear interpolation assumes that the variables change smoothly over time following a linear trend. As shown in Figure 5, foreign wage premia generally follow an upward linear trend.

[9] Foreign jobs and wages are considered to be those for which the aggregate of firms has a strictly positive foreign participation in the ownership of total assets at the municipality–sector level.

[10] It is acknowledged that these are coarse categories for skill sets; unfortunately, these are the only data available from the economic census. Nonetheless there is support in the literature suggesting that production and non-production groups are closely related to knowledge intensity of the job activities (Berman et al., 1994; Slaughter, 2000).

Figure 5 – Foreign wage premium by sector and type of worker, 1993–2013.



(A) (B)

Notes: (i) bar charts plot the average in the logarithm of foreign wage premia (as defined by Equation 1), for skilled and unskilled workers, from 1993 to 2013, both in manufacturing and services; (ii) data on unskilled jobs in 1993 was not recorded for services. Source: Author, with data from Economic Census, *Censos Economicos* (INEGI, 1994, 1999, 2004, 2009, 2014).

Our dependent variable is a given educational outcome depending on the specification – the cohort's average enrolment rate and average years of completed education. They are all defined for age cohorts that were 15 years old at the time of foreign job arrival. These are constructed by collapsing census data by municipality and year of birth using the associated sampling weights where necessary. Based on the aforementioned theoretical framework, our vector of controls includes, for each cohort–municipality, percentage of females in the cohort, changes in the percentage of employment, average of parents' years of education, whether both parents work, household income and household size.

4. Results and discussion

To the extent that FDI modifies the local labour market conditions, we test the general hypothesis of whether foreign wage premium raises the returns to education such that they exceed the opportunity cost of schooling, hence leading to higher educational outcomes for exposed cohorts in each municipality, against the alternative in which FDI-induced returns to education do not offset the opportunity costs, thus resulting in negative effects on educational outcomes. To account for this trade-off facing youths, we include foreign wage premia for skilled and unskilled jobs in the same equation. The former represents the returns to further education in terms of future wages, while the latter constitutes the opportunity cost in terms of forgone wages. Arguably, the simultaneous inclusion of both wages might induce multicollinearity problems due to a high correlation between the skilled and unskilled wage

variables. We provide some tests and rule out a significant presence of this issue.[11] Lastly, to account for sector heterogeneity of FDI, the foreign presence variable is broken down into manufacturing and services, since each economic activity has different knowledge intensities according to the sector (Checchi et al., 2007). In the following, the analysis is done first for cohort enrolment rates and then for cohort average years of education.

4.1. Foreign wage premia and cohort enrolment rates

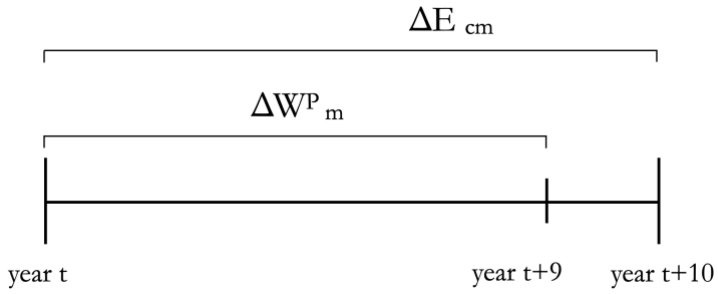
Do municipalities with increases in foreign wage premium have lower enrolment rates? As we posited from the beginning, our hypothesis is that MNEs not only introduce new jobs to the local labour markets, but that on average, these jobs pay higher wages than domestic jobs. Our main variable allows for the comparison between foreign and domestic wages in both the manufacturing and services sectors. Estimating the effect of FDI on educational outcomes from the repeated cross-section of individuals will result in a biased coefficient because of unaccounted heterogeneity, since we can only observe each individual once in time. To overcome this complication, we construct a pseudo-panel that allows us to control for time-invariant individual characteristics (Cameron & Trivedi, 2005).

Although individuals cannot be tracked over time, it is possible to follow cohorts defined by year of birth at the time of foreign job arrivals. To this end, we convert individual-level data into cohort-level by averaging across members of the cohort.[12] The time series variation from the sample average of cohorts constitutes the basis of our specification along three census rounds (1990, 2000 and 2010). We first obtain the 16-year-olds cohort–municipality average of enrolment rates, E, both in year t and $t + 10$. Then the corresponding changes in foreign wage premium, W^P, are obtained from year t to $t + 9$, one year before we observe enrolment rates again. The logic is presented in the diagram in Figure 6 below.

[11] The correlation coefficients between skilled and unskilled wages are moderate (0.2980 in services and 0.3508 in manufacturing). Furthermore, to test for multicollinearity, mean variance inflation factors (VIFs) are calculated for each model and reported in Tables 1 and 2. All in all, evidence suggest that the wage variables are not highly correlated with each other, or with other independent covariates.

[12] For large samples, successive census waves will generate random samples of members of each cohort.

Figure 6 – Diagram: Changes in foreign wage premium and enrolment



We fit a first-difference model to account for unobserved time-invariant cohort–municipality characteristics. The specification in first differences takes the following form;

$$\Delta E_{cmt+10} = \beta_u \Delta UW^P_{mt+9} + \beta_s \Delta SW^P_{mt+9} + \gamma \Delta Z_{cmt+9} + \delta \Delta X_{cmt+9} + \alpha_{t+10} + \Delta u_{cit+9} \quad \text{Equation (2)}$$

where ΔE are the changes in the 16-year-old cohort–municipality cm enrolment rates. Our parameters of interest, β_u and β_s, estimate the effect of net changes on foreign wage premium for unskilled and skilled workers respectively. γ captures the effect of a cohort's average individual characteristics; δ is the coefficient of the effect of average household characteristics. Finally, α is a year dummy for each census round; it absorbs differences in enrolment across time. The estimates for this specification are shown in Table 1. We examine FDI heterogeneous effects by fitting the model for manufacturing and services.

The effect of the foreign wage premium for unskilled workers is significantly associated with lower enrolment rates. This suggests that in municipalities in which foreign wages increased relative to domestic wages, fewer youths were enrolled in upper secondary education at the end of the period. This result holds both for manufacturing and services alike. The foreign wage premium for skilled jobs in either sector had no significant effect on enrolment rates. It would seem that young individuals are not affected by changes in the relative wages for skilled jobs. The rolling out of the conditional cash-transfer programme *Oportunidades* in 2000, which required students to be enrolled up to 12th grade, may bias our results. To this end, we estimate the equations by splitting the sample into before and after 2000 (Table A3). The results are robust and allow us to rule out changes in enrolment stemming from the programme.

Table 1 – Effects of foreign wage premia on cohorts' enrolment rates.

Dependent variable: Δ Enrolment rate	Manufacturing (1)	Services (2)
Δ *Unskilled foreign wage premium*	-0.040***	-0.032***
	(0.009)	(0.007)
Δ *Skilled foreign wage premium*	0.007	-0.005
	(0.006)	(0.008)
Δ Employed	-0.470***	-0.470***
	(0.025)	(0.023)
Δ Female	-0.168***	-0.154***
	(0.031)	(0.030)
Δ Parents' average education	0.010***	0.011***
	(0.002)	(0.002)
Δ Both parents work	0.047	0.067***
	(0.033)	(0.024)
Δ Household size	-0.007*	-0.007
	(0.004)	(0.004)
Δ Household income	0.001	0.002
	(0.002)	(0.002)
Observations	3,312	3,339
Year dummies	yes	yes
R-squared	0.220	0.227
F-test	57.51	63.50
Mean VIF	1.24	1.26

Notes: Models in First differences estimated on a sample of 16-year-old cohort-municipalities; clustered standard errors by cohort-municipality in parentheses. F-test of joint significance is reported. Mean VIF (Variance Inflation Factor) reported to test for multicollinearity. Both Mean VIFs and individual variable VIFs (not reported here) are very close to one. *** p<0.01, ** p<0.05, * p<0. 1

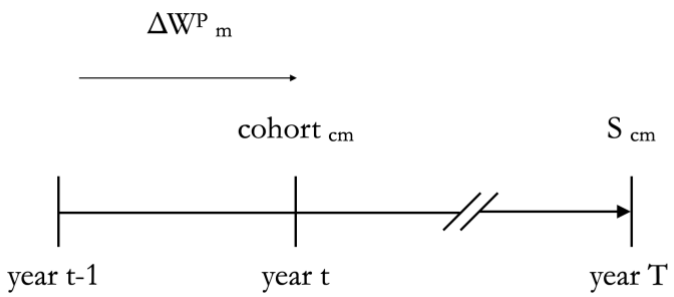
We also control for the usual predictors of educational outcomes. They all turn out to behave in the expected direction and similarly across sectors. We include the percentage of the cohort that is employed to account for the possibility that if more youths drop out of school they might have taken a job instead. The negative and significant coefficient confirms this assumption. Unfortunately, although we cannot know whether these young individuals were hired by an MNE or found work in a domestic firm, we know that they are working in the formal sector. Consistently, the percentage of females in the cohorts is negatively and significantly associated with enrolment across specifications. In the Mexican context, young females are still expected to work at home and thus tend to have lower school attendance rates than males (Abler et al., 1998). Furthermore, parental background seems to play an important role in educational outcomes. Similarly to Levison et al. (2001), higher parental educational background is significantly associated with positive changes in enrolment rates, suggesting that parents may transfer occupation-specific resources to their children (van der

Vleuten et al., 2018). However, having both parents participating in the labour market does not seem to have a significant effect on youth educational outcomes, thus suggesting a family outlook in which decisions are less centralised (Federman & Levine, 2005). Household size is negatively associated with enrolment; resources in larger households are scarcer and hence investment in education for all its members becomes more burdensome (Tharmmapornphilas, 2013). Finally, higher income households are more likely to invest in their children's education. Although the coefficient is not significant, we decided to include it to reduce the omitted variable bias.

4.2. Foreign wage premia and cohort educational attainment

Do exposed young cohorts have lower average years of completed education later in time? We now consider the long-term effect of FDI exposure on the educational attainment of young cohorts, following the rationale shown in Figure 7 below to identify this effect. Let cohort cm be that of individuals born in year c, who were 15 years old in year t in and residents in municipality m. At this point we have records on changes in foreign wage premia, ΔW_{mt}^{P}, in municipality m between years $t-1$ and t. We then match the average years of completed education S for each exposed cohort–municipality cm some years later, specifically in year T.

Figure 7 – Diagram: Changes in foreign wage premium and average years of education



We use the inter-census representative survey for 2015 (INEGI) to increase the number of observations in the sample. Therefore, the cohorts' educational outcome is observed in T = 2015. The resulting sample comprises 20 cohorts in ~2,457 municipalities. The oldest cohort was born in 1978 and the youngest in 1997. The group variable is cohort–municipality, and the specification has the following functional form,

$$S_{cm} = \beta_u \Delta UW_{mt}^{P} + \beta_s \Delta SW_{mt}^{P} + \lambda_c + \lambda_m \lambda_c + \epsilon_{cm} \qquad \text{Equation (3)}$$

where S_{cm} is the average years of education for the exposed cohort in T. β_u and β_s measure the effect of changes in the foreign wage premium for unskilled and skilled jobs respectively. λ_c is a cohort fixed effect and $\lambda_m \lambda_c$ is a cohort–municipality linear time trend to account for municipalities' pre-existing educational trends. Note that year and cohort fixed effects are equivalent since we only observe each cohort once at the end of the sample period. ϵ_{cm} is the remaining unobservable error term. The resulting estimates of foreign wage premia on young cohorts' educational attainment are presented in Table 2.

Table 2 – Effects of foreign wage premia on cohorts' average years of education.

Dependent variable:	Manufacturing	Services
Average years of education	(1)	(2)
Δ Unskilled foreign wage premium	-0.141***	-0.109***
	(0.027)	(0.016)
Δ Skilled foreign wage premium	0.080***	-0.009
	(0.022)	(0.016)
Observations	45,390	43,638
R-squared	0.892	0.904
F-test	383.9	564.2
Cohort controls	yes	yes
Cohort fixed effects	yes	yes
Municipality linear time trends	yes	yes

Notes: Models with fixed effects estimated on a sample of 20 cohorts in ~2,457 municipalities. Cohorts are defined by year of birth and they are 15 years old at the time of exposure. Mean VIF (Variance Inflation Factor) are calculated to test for multicollinearity, before controlling for cohort fixed effects and municipality linear trends. Mean VIFs are 1.78 and 1.45, respectively. Individual variable VIFs (not reported here) are also very close to one. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The estimated relationship between foreign wage premia and educational attainment is negative for unskilled jobs. Cohorts at the threshold that were exposed to increasing unskilled foreign wage premia, both in manufacturing and services, are expected to have lower average number of completed years of education. These results suggest that the effects of being exposed to foreign presence are not short-lived, but in fact translate into longer-term lower educational outcomes for groups of individuals at the critical threshold of secondary

education.[13] These findings echo those by Atkin (2016) on foreign *maquiladora* employment; however, we expand the evidence by providing findings for the broader manufacturing sector and services. Conversely, exposure to foreign wage premia for skilled jobs in manufacturing is associated with higher cohort average years of education. Put differently, the returns of highly paid skilled employment prospects may outweigh the opportunity cost of schooling, incentivising young students at the threshold to remain in school, although the magnitude of the effect is considerably smaller compared to unskilled wages. This result highlights the potential of IFDI in contributing to aggregate skill upgrading and human capital formation in the host labour market (Iammarino & McCann, 2013). Finally, in line with the previous model, increasing foreign wage premia in services has no significant effect on educational attainment of young cohorts.

5. Concluding remarks

By examining the effects of FDI-induced labour market changes on educational outcomes of youths, this paper adds to the scarce empirical evidence on IFDI and its potential role in shaping human capital development in host regions, in the context of emerging economies. The period under scrutiny, 1990 to 2010, has seen significant increases in IFDI flows and shifts in the industrial sectors in which it concentrates. Concurrently, the evolution of educational outcomes for individuals in their early academic advancement has not seen major improvements. In order to study the effects of different types of IFDI jobs on educational outcomes, we explicitly consider the labour market, in terms of foreign wage premia, by exploiting FDI-induced temporal variation in the returns to education across fine-grained geographical units and sectors. To the extent that this IFDI-driven externality arises, foreign presence is likely to have an effect on the incentives to acquire further formal schooling (Blomström & Kokko, 2002). The findings herein are in line with the literature suggesting that FDI-induced changes in the labour market will have different effects on the human capital development of a host region largely depending on the types of jobs and the sector in which they are being offered (Atkin, 2016; Checchi et al., 2007). Building on our results, we

[13] We also test whether our results may be biased by the rolling out of *Oportunidades* in 2000 or the 2012 educational reform (Table A4). For the former we drop 2000 from our sample. For the latter we exclude 2012 as the last exposure year. The results are robust and allow us to rule out changes in average years of education stemming from these events.

advance some implications and room for policy action pertaining to the repercussions of low investment in human capital both for individuals and regions.

First, FDI-induced labour market effects may be polarising the educational and income distribution. Since MNEs do not only hire skilled workers but unskilled workers as well, the resulting dispersion of schooling among the labour force will tend to enhance income inequality (Park, 1996). In a country with high levels of inequality in human capital and access to education, it seems important for development and educational policy to understand what types of foreign jobs are affecting the relative returns for households to invest in education, particularly for disadvantaged youths. As has been suggested for the case of Mexico, returns to higher levels of education are not fully realised, due partly to education–occupation mismatches (Quinn & Rubb, 2006). The consistency of the FDI-induced effects is particularly worrisome since they indicate that for the average 15-year-old, a highly paid unskilled job more than outweighs the returns of higher education, making her more susceptible to dropping out of school. These youths' life-long earning potential might be truncated, as dropping out of school early closes off future professional development paths. While formal education is one way of accumulating human capital, technical and vocational training may constitute an important alternative to schooling (Miyamoto, 2003) worth exploring in future research for Mexico.

Second, consequences of early drop-outs are negative and long-lasting, not only for individuals but for societies as well (Rumberger, 1987). Whereas individuals might struggle to find steady and better-paying jobs over their lifetimes (Angrist & Krueger, 1991; Becker, 1962), aggregate losses might stem from lower human capital, lower taxes and higher demand for social services. In the latter case, schooling has been found to be associated with sizable human capital externalities (Acemoglu & Angrist, 2000; Moretti, 2004); and higher human capital, particularly attained through education, implies more skilled and productive workers, which may be associated with economic growth (Barro & Lee, 2001). When it comes to public policy, findings suggest that educational policies should be strengthened around critical thresholds of the academic progression to ensure rising levels of individual investment in education. As previously mentioned, grade 9 in the Mexican context is a problematic one, especially due to initially high opportunity costs. Ensuring that vulnerable youths continue investing in education is crucial to maintaining an upward development path. While focusing on educational outcomes is a useful approach to human capital development,

these measures do not account for the quality of formal education or the occupational skills of the population (M. Wang & Wong, 2011); more research is needed in this regard.

Finally, low levels of human capital may hinder the potential technology transfers from IFDI. The human capital of the workforce is a crucial factor facilitating the adoption of new and more productive technologies (Nelson & Phelps, 1966). While the presence of MNE subsidiaries does not guarantee technology transfer, the process of absorption and assimilation of foreign technology entails substantive domestic efforts (Iammarino et al., 2008). In order to enhance the learning capabilities, educational policies that improve labour skills are key to encourage higher technology transfers from the MNE to its subsidiaries (J.-Y. Wang & Blomström, 1992). For example, in the electronics industry in Jalisco, Mexico, higher local capabilities in the region have been critical to attract more complex types of technology (Padilla-Pérez, 2008). Whilst increasing human capital availability may enable regions to improve their locational attractiveness for more skill-intensive FDI (Noorbakhsh et al., 2001), government policy should aim to attract the appropriate higher value-adding FDI to boost their human capital level and stage of development (Bartels & de Crombrugghe, 2009). By upgrading the skill content of their economic activities, regions may enhance their competitiveness and move up the value chain (Giuliani et al., 2005), while developing their human capital and local technological capabilities for long-term sustainable growth.

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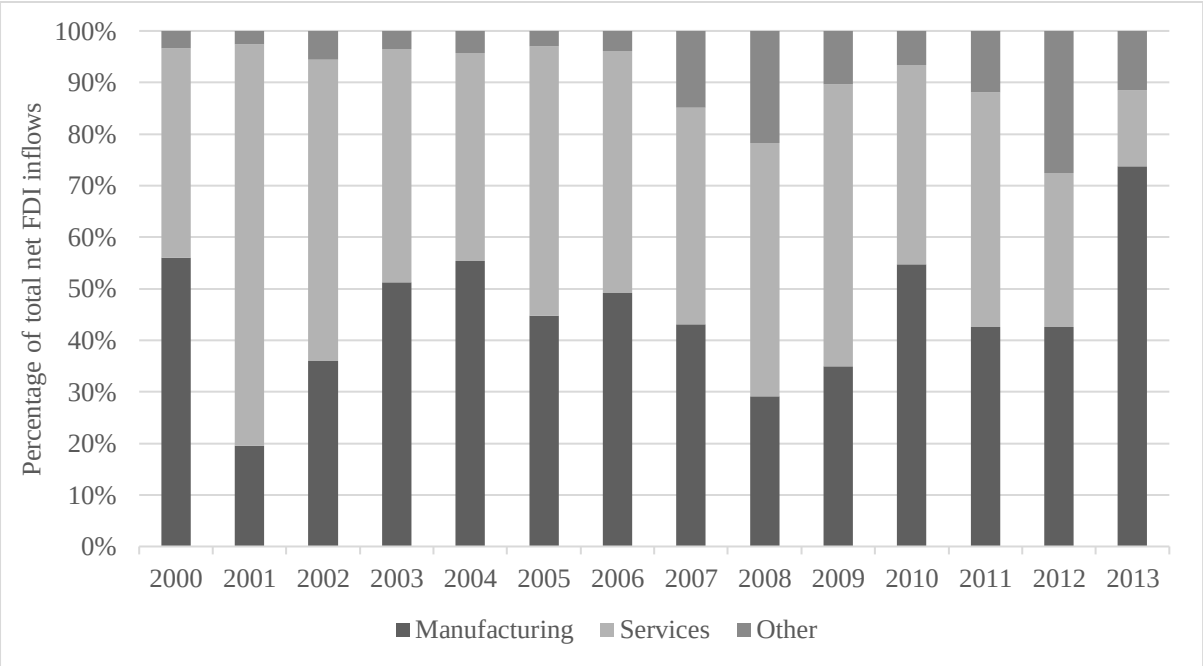
7. Appendix

Figure A1 – Mexico: Sectoral composition of inward FDI, 2000–2013



Source: Author, with data from the Ministry for Economics, *Secretaría de Economía, Gobierno de México* (2016)

Table A1 – Summary statistics by specification

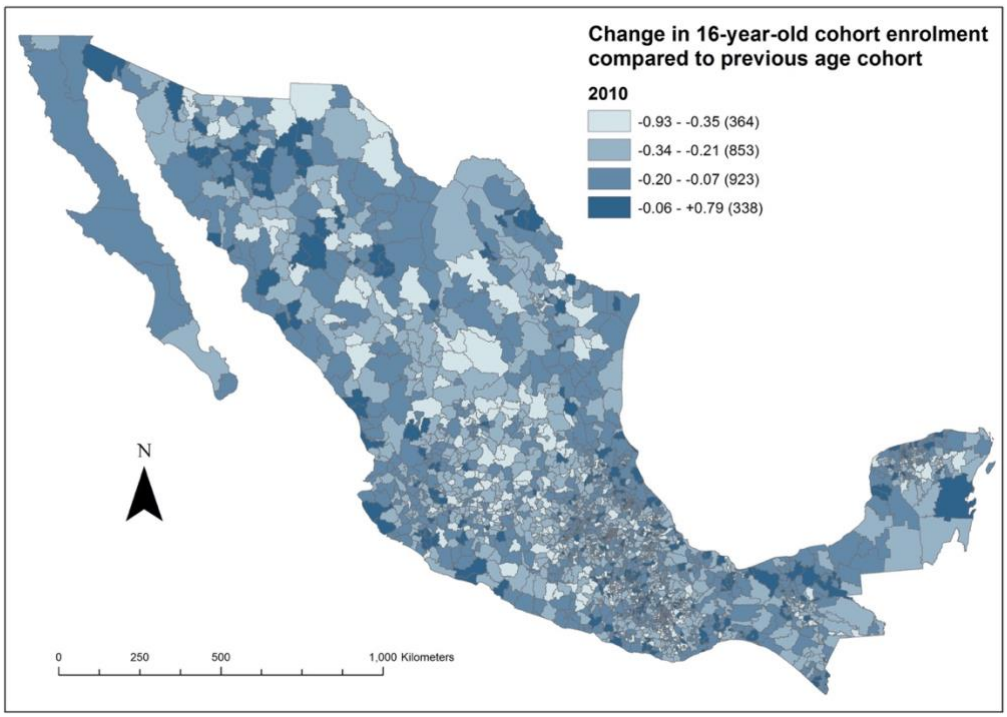
Model 1 First differences: Cohort enrolment rates

	Manufacturing				Services			
	(1) mean	(2) sd	(3) min	(4) max	(5) mean	(6) sd	(7) min	(8) max
Dependent variable								
Enrollment rate 16 y-o	0.533	0.169	0.000	1.000	0.533	0.166	0.030	1.000
Main regressors								
Unskilled foreign wage premium	0.0386	0.2008	-2.4448	2.3621	0.0178	0.2076	-2.5295	2.3805
Skilled foreign wage premium	0.0241	0.1487	-1.3032	1.5725	0.0273	0.2069	-0.8858	2.6158
Controls								
Female	0.498	0.074	0.150	0.863	0.498	0.071	0.198	0.837
Employed	0.282	0.123	0.000	0.946	0.279	0.120	0.000	0.770
Parents' average education	5.331	2.018	0.231	14.333	5.413	1.989	0.231	14.333
Both parents work	0.173	0.122	0.000	1.000	0.165	0.114	0.000	0.794
Household size	5.935	0.778	3.708	9.269	5.919	0.777	3.708	8.911
Household income	9.761	1.638	4.544	13.498	9.851	1.597	5.580	13.472
	N = 3,312				N = 3,339			

Model 2. Fixed effects: Cohort average years of education

	Manufacturing				Services			
Manufacturing	(1) mean	(2) sd	(3) min	(4) max	(5) mean	(6) sd	(7) min	(8) max
Dependent variable								
Average years of education	9.1382	1.6938	0.0000	17.000	9.1794	1.6660	0.9765	17.000
Main regressors								
Changes in Unskilled foreign wage premium	0.0025	0.0969	-1.0379	1.0777	0.0049	0.2558	-2.0858	9.6346
Changes in Skilled foreign wage premium	0.0033	0.1160	-1.2620	1.2282	0.0007	0.0972	-1.2650	1.3928
	N = 45,390				N = 43,638			

Figure A2 – Change in 16-year-old cohort compared with previous age cohort, 2010.



Source: Author, with Population Census data (INEGI, 2000, 2010)

Table A2 – Reverse causality: Average years of education on Foreign jobs

Dependent variable: Δ Foreign jobs	(1)	(2)	(3)
Δ Av. Years of education	0.218	0.142	0.132*
	(0.146)	(0.088)	(0.076)
Δ (Av. Years of education)^2		0.049	0.047
		(0.053)	(0.052)
Observations	4,837	4,837	4,837
R-squared	0.001	0.001	0.001
Municipality FE	yes	yes	yes
Year FE	no	no	yes

Note: The model fitted is in first differences, changes in the independent regressor are measured 3 years before changes in the dependent variable. Municipality clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A3 – Robustness checks: Effects of foreign wage premia on cohorts' enrolment rates.

	Manufacturing			Services		
	Baseline			*Baseline*		
Dependent variable:	1990-2010	Before 2000	After 2000	1990-2010	Before 2000	After 2000
Δ Enrolment rate	(1)	(2)	(3)	(4)	(5)	(6)
Δ *Unskilled foreign wage premium*	-0.040***	-0.020	-0.046***	-0.032***	-0.039***	-0.021**
	(0.009)	(0.015)	(0.012)	(0.007)	(0.008)	(0.009)
Δ *Skilled foreign wage premium*	0.007	-0.010	0.022**	-0.005	0.015	-0.014
	(0.006)	(0.010)	(0.009)	(0.008)	(0.013)	(0.009)
Δ Employed	-0.470***	-0.476***	-0.469***	-0.470***	-0.458***	-0.493***
	(0.025)	(0.036)	(0.027)	(0.023)	(0.031)	(0.026)
Δ Female	-0.168***	-0.217***	-0.091***	-0.154***	-0.180***	-0.105***
	(0.031)	(0.044)	(0.032)	(0.030)	(0.043)	(0.029)
Δ Parents' average education	0.010***	0.009**	0.011***	0.011***	0.007**	0.013***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Δ Both parents work	0.047	0.069	0.026	0.067***	0.152***	0.015
	(0.033)	(0.061)	(0.025)	(0.024)	(0.037)	(0.026)
Δ Household size	-0.007*	0.006	-0.034***	-0.007	0.004	-0.031***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)
Δ Household income	0.001	0.001	0.001	0.002	0.003	-0.000
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Observations	3,312	1,644	1,668	3,339	1,667	1,672
R-squared	0.220	0.184	0.239	0.227	0.180	0.259
F-test	57.51	26.14	58.77	63.50	33.35	64.56
Year dummies	yes	-	-	yes	-	-

Notes: Estimated on a sample of 16-year-old cohort-municipalities; clustered standard errors by cohort-municipality in parentheses. Models (1) and (4) are the baseline reported in Table 1. The rest of the specifications are estimated on separate subsamples: before and after 2000. *** p<0.01, ** p<0.05, * p<0. 1

Table A4 – Robustness Checks: Effects of foreign wage premia on cohorts' average years of education.

	Educational Reform		Conditional cash-transfer programme	
Dependent variable:	Manufacturing	Services	Manufacturing	Services
Average years of education	(1)	(2)	(3)	(4)
Δ Unskilled foreign wage premium	-0.122***	-0.112***	-0.138***	-0.115***
	(0.027)	(0.015)	(0.027)	(0.016)
Δ Skilled foreign wage premium	0.075***	-0.016	0.081***	-0.004
	(0.021)	(0.015)	(0.022)	(0.016)
Observations	43,118	41,455	43,118	41,455
R-squared	0.906	0.917	0.896	0.908
F-test	319.8	481.6	364	529.9
Cohort controls	yes	yes	yes	yes
Cohort FE	yes	yes	yes	yes
Municipality linear time trends	yes	yes	yes	yes

Notes: Models (1) and (2) exclude the year 2012 as the last exposure year to rule out any anticipation effects of the educational reform that increased compulsory education to 12th grade. Models (3) and (4) exclude the year 2000 to rule out effects of the rolling out of conditional cash-transfer programme *Oportunidades*, that required students to be enrolled up to 12th grade. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1