Endogenous Skill Acquisition and Export Manufacturing in Mexico*

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Abstract

Studies based on firm-level data find that both exporting firms and multinational corporations pay higher wages for a given skill level. However, the literature overlooks the fact that export manufacturing firms may also change the educational choices of the workforce. In this paper, I confirm that for Mexico during the period 1986-2000, the export sector pays higher wages than other sectors, but school drop out increases with the arrival of new export jobs. By the year 2000, the workers induced to enter export manufacturing are earning less than they would have earned had the jobs never appeared and they stayed in school longer. I identify the causal effects by looking within municipalities and examining how the education of different cohorts varies with new factory openings in the municipality at key school-leaving ages. Export manufacturing attracts students by paying high relative wages for unskilled workers, and offering many jobs to low-skill workers straight out of school. The magnitudes I find suggest that for every ten new jobs created, one student drops out of school at grade 9 rather than continuing on through grade 12.

JEL Codes: F16, J24, O12, O14, O19

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1 Introduction

There is a large and growing literature exploring the impact of exporting firms and multinational corporations on the labor market in developing countries. One of the most robust stylized facts to come out of studies of microlevel firm data has been that exporting firms pay higher wages.[1] This was shown for Mexico by Bernard (1995), Zhou (2003) and Verhoogen (2008).[2] From these findings, it is tempting to conclude that worker incomes must also rise with the arrival of new exporting opportunities. However, all of these studies focus on salaries paid by firms, and identify exporter or foreign firm wage premia while controlling for education levels. Meanwhile, individual incomes depend on both the education of the worker and the salary paid at each level of education. Therefore, if the arrival of export manufacturing jobs reduced the skill acquisition of some workers, then higher firm wages may not correspond to higher lifetime incomes.

This paper provides novel empirical evidence that this is indeed what occurred in Mexico. I use variation in the timing of sectoral employment changes at key school leaving ages within municipalities to show that, unlike other formal sector jobs, expanding export industries pulled workers out of school at younger ages, permanently inhibiting their education acquisition. The booming high-tech export manufacturing industries that trade liberalization brought to Mexico did pay high wages conditional upon education levels, but these youths eventually experienced lower incomes due to these new job opportunities. These lower incomes resulted from workers acquiring less education than they would have otherwise, and accordingly received lower salaries by the end of the sample period, commensurate with their observed skill level.

Mexico provides a perfect setting to study the impacts of globalization on the labor force. Over the period spanned by the data (1985-2000), Mexico turned its back on an import substitution strategy and liberalized trade, joining GATT in 1986 and NAFTA in 1994. During these years, Mexico reduced tariffs substantially and many new plants opened, often in the form of Maquiladoras, to manufacture products for export.[3] Total employment in export manufacturing rose from under 900,000 formal

[1] Bernard and Jensen (1995) first presented this fact for the US, and other authors confirmed this fact for many developing countries. Schank, Schnabel, and Wagner (2007) surveys this literature and provides references.

[2] Similarly, Aitken, Harrison, and Lipsey (1996) demonstrate that foreign firms in Mexico pay higher wages compared to domestic firms.

[3] The Maquiladora program allows duty free imports of goods for assembly and re-export. These firms were initially confined to border areas and employed mainly women, but by the year 2000 one quarter of firms were in non-border states and half the employees were male.

sector jobs at the beginning of 1986 to over 2.7 million jobs in 2000. Much of this growth was driven by multinational corporations, with nearly two thirds of manufacturing exports in 2000 originating from foreign affiliates (UNCTAD 2002). In this paper, I demonstrate that this massive expansion in export manufacturing altered the education decisions of Mexico's youth.[4]

A simple conceptual framework guides the empirical work. I modify a Becker (1962) human capital model to include stochastic job opportunities that offer persistent wage premia.[5] I find that my results are consistent with such a modification.[6] This framework illustrates that new employment opportunities have two offsetting effects. On the one hand, when a new firm opens, a student may drop out of school, expecting to be better off by taking the new job rather than by chancing the job market with more education in the future—the opportunity cost of schooling channel.[7] On the other hand, if the student expects that vacancies will continue to be available and these jobs will sufficiently reward skill acquisition, she may choose to stay in school longer—the returns to schooling channel. The net effect of these two channels depends on the wage and availability of jobs at different skill levels in that firm and the likelihood that there will also be vacancies in the future. For example, the student is more likely to drop out of school if the firm is predominantly hiring unskilled workers at attractive wages and does not anticipate hiring a substantial number of additional workers in future.

In this paper, I find that the characteristics of export manufacturing firms place them in the former category, in which new job arrivals induce school dropout. The magnitudes I find suggest that for every ten high-tech export jobs that arrived, one student dropped out at grade 9 rather than continuing on through grade 12. In contrast, the arrival of new non export manufacturing and service jobs induce greater skill acquisition. The most likely explanation is that, compared to the other industries, export manufacturing offers an abundance of low-skill jobs that pay relatively high wages to workers with low levels of schooling. Additionally, job vacancies in the export manufacturing industry are the least likely to persist into the future. Therefore, an influx of such jobs raises the opportunity cost of schooling

[4]Most of my analysis relates to youths deciding how much secondary school to obtain, the relevant margin for export manufacturing jobs in Mexico where 80 percent of employees had less than 12 years of schooling in the year 2000.

[5]These wage premia originate from well-documented firm and cohort-specific non-compensating wage differentials.

[6]In a neoclassical labor market setting, job flows only affect education decisions by changing the relative demand for skill. However, I find several result that are inconsistent with the neoclassical labor market model. In this sense, the paper relates to recent work that explores the impacts of trade in non-neoclassical labor market settings. See for example, Davis and Harrigan (2007) and Helpman, Itskhoki, and Redding (2008). Frias, Kaplan, and Verhoogen (2009) provides empirical evidence on the importance of these non-neoclassical features.

[7]In this paper, I use the term drop out to refer to leaving school at any point when additional educational attainment is possible.

for youths to a larger degree than the returns to schooling. Consistent with this interpretation, I find that once these industry characteristics are controlled for, new jobs in export-intensive sectors actually encourage students to stay in school relative to similar industries.[8]

A unique data set makes this analysis possible. I merge firm-level employment data for the universe of formal sector firms with 10 million schooling records from the 2000 Mexican census. These data only allow me to focus on one component of human capital, schooling.[9] Accordingly, I match each cohort's average education to the job growth in their municipality at ages 15 and 16, the age at which compulsory education concludes and formal employment is first possible. Having cohort-specific schooling and local employment measures at a very disaggregated level allows me to look within 1,808 municipalities and plausibly identify the causal impacts of job availability on education decisions in Mexico.

I compare cohorts within a municipality who reached their key school leaving age at the time of substantial factory openings to slightly younger or older cohorts who did not. The main empirical difficulty is reverse causation; that local skill levels may determine formal firm employment decisions. To address this issue, I instrument for job growth with large factory openings/expansions or closings/contractions. My strategy assumes that the decision for a firm to open/expand or close/contract a factory in a region is not an outcome of cohort-specific changes in the local labor supply. This assumption seems reasonable as such sizable expansions or contractions are associated with large fixed costs and are not plausibly driven by changes in the labor supply of a single cohort of youths. This is especially true in Mexico, where a large quantity of migrant and informal labor ensures that changes in the dropout decisions of a single cohort comprise a very small part of the potential labor that a firm can hire.[10]

In this paper, I focus on educational acquisition. Clearly there are other dimensions of skill. For example, export firms may offer on-the-job training which is more valuable to workers than additional years of schooling. Accordingly, I also investigate the impact of these educationl decision on earned income in the final year of my sample period. It is a well-known stylized fact that exporting firms pay higher wages, conditional on education levels.[11] However, I find that despite the high wages on offer

[8]However, the fact that export manufacturing firms use low-skill labor intensively is not a coincidence. The Heckscher-Ohlin theorem predicts that Mexico will export products intensive in this relatively abundant factor.

[9]New firm arrivals may induce skill acquisition through other means, e.g. on the job training (Acemoglu and Pischke 1998) or knowledge spillovers (Keller 2004).

[10]The informal sector comprises between one third and two thirds of Mexican employment. Around 20 percent of my sample are migrants. In this paper, I focus only on non-migrants, and results pertain only to that group.

[11]Schank, Schnabel, and Wagner (2007) surveys this literature and provides references. This fact was shown for Mexico by Bernard (1995), Zhou (2003) and Verhoogen (2008). All of these studies focus on salaries paid by firms, and identify exporter or foreign firm wage premia while controlling for education levels.

in this sector, earned incomes in the year 2000 are still lower for the youths induced to forgo education by new export opportunities, commensurate with their lower schooling levels. Any additional skills that these cohorts acquired out of the schooling system were insufficient to monetarily compensate for the lower schooling levels, at least by the year 2000.

This paper provides evidence that lends support to models of trade with endogenous skill acquisition. For example, Findlay and Kierzkowski (1983) incorporates human capital decisions into a Heckscher-Ohlin model and shows that trade exacerbates initial skill differences across countries by raising the return to the abundant skill—the Stolper–Samuelson effect—exactly as I find.[12] Trade can induce divergent growth paths if positive externalities to education are incorporated into such a model (Stokey 1991).

My findings are consistent with the literature on trade and wages in Mexico. The various stages of trade liberalization in Mexico have been associated with an initial rise in the skill premium until the mid 1990's, followed by a skill premium decline.[13] My schooling results follow a similar inverse-U pattern with time. The reduction in schooling from new export manufacturing jobs primarily occurred with job arrivals in the latter period of my sample, a time when returns to high school were falling. It should be noted that new export manufacturing jobs can increase school dropout even if they raise the high-skill to low-skill wage ratio. Risk averse or impatient youths may rationally choose a newly available low-skill export job today over more schooling and the (uncertain) possibility of a high-paying high-skill export job in future.[14]

The results are also consistent with the findings of studies in labor economics. Several studies use panels of region or state-level unemployment rates to show that students stay in school longer during a recession.[15] In the development context, Goldin and Katz (1997) show that industrialization slowed educational growth in the early 20th century United States, while Federman and Levine (2005) and Le Brun, Helper, and Levine (2009) find industrialization increased enrollments in Indonesia and had mixed effects in Mexico.[16]

[12] Ambiguous results obtain when credit constraints are introduced to such a model (Chesnokova and Krishna 2009).

[13] This is a large literature including Cragg and Epelbaum (1996), Hanson and Harrison (1999), Feenstra and Hanson (1997), Robertson (2004), Airola and Juhn (2005) and Lopez-Acevedo (2006). Verhoogen (2008) finds skill upgrading within non-Maquiladora exporters in the mid 1990's.

[14] The probability of obtaining a high-skill export job may be quite small as 85 percent of formal sector employees in my two export industries (defined in section 3.1) have less than a high school education. In reality, youths are likely to be trading off a job in manufacturing if they dropout of school for a job in services if they acquire more education.

[15] See Card and Lemieux (2000) and Kahn (2007) for the US and Clark (2009) for the UK.

[16] Le Brun, Helper, and Levine (2009) compare municipality education changes between the 1990 and 2000 with total manufacturing growth over that period. Manufacturing growth is associated with increased education for younger children but reduced education for girls aged 16 to 18.

Finally, a complementary recent literature looks at the educational impacts of the arrival of IT service jobs in India. Munshi and Rosenzweig (2006), Shastry (2008), **?** and Oster (2010) all find positive enrollment impacts from the arrival of relatively high-skilled service job opportunities in India. Such opportunities raised the returns to education, and similarly, I observe that new formal-sector service jobs increase education acquisition in Mexico. However, India's experience may be regarded as the exception rather than the rule, as it is far more common for a developing country to have a revealed comparative advantage in low-skill manufacturing rather than comparatively high-skill services.

This paper improves on the existing studies in several ways. First, by drawing on a richer data set to assemble a very large panel (1,808 municipalities) and by using an instrumentation strategy, I am able to control for potential reverse causality that comes from endogenous firm location choices. Second, these rich data allow me to separately identify the educational impacts of local job availability across all formal sector industries. Third, guided by my conceptual framework, I am able to separate the educational impact of periods of job declines from periods of job growth and to identify the industry characteristics that determine whether new job arrivals either encourage or discourage additional schooling.[17]

My findings have important, albeit nuanced, policy implications for Mexico and many other countries. From an individual perspective, my results are entirely consistent with rational and perfectly informed youths choosing to take a good job opportunity when it arrives. However, from a macro perspective, many countries pursuing export-led growth strategies also want to upgrade the skill level of their workforce, believing that the positive externalities from education drive long-run growth rates (Lucas 1988). I show that there is a tradeoff between these two goals, at least in the Mexican context, as the export manufacturing firms attracted by such strategies possessed characteristics that discouraged skill acquisition.

The next section lays out the conceptual framework. Section 3 introduces the rich data set and discuss the methodology. Section 4 presents the basic regression results, and robustness checks are shown in section 5. Section 6 uses the conceptual framework to explain why I find that only export manufacturing jobs induce school dropout. Section 7 looks at income effects. Finally, section 8 discusses policy implications and concludes. Appendix A explores potential biases due to migration.

[17] My conceptual framework suggests that such an asymmetry may be present during this time period if students correctly predicted that periods of job declines were likely to reverse, yet periods of growth were likely to continue.

2 A Conceptual Framework for Understanding Educational Choices

I briefly discuss a conceptual framework that clarifies the channels through which new employment opportunities in different industries affect a student's education choice. In a standard education decision model, a student trades off the higher future wage profile available to more educated workers for the immediate income that employment today brings. If the student has a sufficiently high discount rate, she will rationally decide to drop out of school and start earning despite knowing that her wage will be lower in future. In a neoclassical labor market setting, new job arrivals will increase the demand for the types of labor that those particular jobs require and alter the relative attractiveness of the skilled and unskilled wage profiles. Thus, new job arrivals in two industries that demand a similar distribution of skills should have identical effects on the student's schooling decision. My empirical findings are inconsistent with this prediction. I find that new export manufacturing job opportunities encourage students to drop out of school, while new opportunities in other similarly skilled sectors encourage additional schooling. Therefore, in order to highlight the industry characteristics that can induce such heterogeneity in the response of education to new job opportunities, I outline a decision making-process in the context of stochastic job vacancies.

First, I describe a stylized decision making process. A forward-looking student must make two sequential decisions: whether to drop out of school; and if he or she drops out of school, which industry i to enter. For clarity in this simplified exposition, I will assume both decisions are irreversible, although I can easily relax this assumption without altering the main implications.[18] If a student drops out of school at t, with s years of schooling and enters industry i, she receives income $\varepsilon_{ist} y_{is,\tau-t}$ for each year τ thereafter. A stochastic year-of-entry wage premium ε_{ist} is multiplied by an historic industry wage profile, $y_{is,\tau-t}$, that does not depend on the year of entry.[19] The year-of-entry wage premium summarizes the job vacancies in the industry available to a particular student in a given year. These year-of-entry wage premia exist as only certain firms will offer a particular worker a job in any given year. If the student receives no job offers in that industry that year, then $\varepsilon_{ist} = 0$. The formal sector of employment in Mexico is characterized by firm-specific non-compensating wage differentials and job

[18]Relaxing the assumption of irreversible school dropout reduces the option value of staying in school and so increases dropout when new jobs arrive. Incorporating job separations into the model reduces dropout with new jobs arrive since a student can change job and industry in future if better opportunities arise. In this case, equation 1 should be expressed with value functions that include the possibility of returning to school or changing industry in future, both at some cost.

[19]The historic industry wage profile depends only on education, s, and experience, $\tau - t$.

rationing.[20] Therefore, the wage a worker receives will depend on which firm hires her.[21] In a year when more firms are hiring and more vacancies are posted, a student is more likely to be able to obtain a job at a firm that pays persistently higher wages.[22,23] Accordingly, the year-of-entry wage premium is a weakly increasing function of the net new jobs, l_{it}, created in industry i that year; $\varepsilon_{ist} = \varepsilon_{is}(l_{it})$, $\varepsilon'_{is}(l_{it}) \geq 0$.

The education decision corresponds to an optimal stopping model. The student decides whether to take the best job available or to wait one more period and choose again. If she waits, she consumes the at-school income equivalent, $\overline{y}_t$, and retains the option to choose again next period with one more year of schooling, when there may also be more firms hiring.[24] The student cannot borrow or save, discounts at the rate ρ and has constant relative risk aversion utility with risk aversion parameter σ. For simplicity, I assume that the student makes a binary schooling choice of either dropping out of school at time t ($s = 0$) or completing high school at time $t + 1$ ($s = 1$):

$$s = \mathbf{I}\left[\max_{i\in I}(\varepsilon_{i0}(l_{it})^{1-\sigma}\sum_{\tau=t}^{\infty}\frac{y_{i0,\tau-t}^{1-\sigma}}{(1+\rho)^{\tau-t}}) < \overline{y}_t^{1-\sigma} + E_t[\max_{i\in I}(\varepsilon_{i1}(l_{it+1})^{1-\sigma}\sum_{\tau=t+1}^{\infty}\frac{y_{i1,\tau-t-1}^{1-\sigma}}{(1+\rho)^{\tau-t}})]\right]. \quad (1)$$

The student stays in school if the net present value of the best job available today across industries (the "opportunity cost of schooling") is inferior to the expected net present value of the best future job plus the utility during the year of school attendance (the "returns to schooling").[25] The opportunity cost of schooling is not only the foregone earnings if the student stays at school, but also includes the potential loss from turning down a job at a firm that pays high wage premia and may not be hiring the following year.

[20] Frias, Kaplan, and Verhoogen (2009) document firm-specific wage differentials in Mexico, presumably only possible if firms ration the number of jobs they offer. Duval Hernandez (2006) presents evidence of more general formal sector job rationing in Mexico. However, Maloney (2004) suggests that the least skilled may prefer self-employment to the worst formal sector jobs, although this does not seem to be the case higher up the skill distribution (Gong and van Soest 2002).

[21] These firm-specific premia may derive from efficiency wage models (Shapiro and Stiglitz 1984), fair wage considerations (Akerlof and Yellen 1990), search models where high productivity firms find vacancies more costly (Burdett and Mortensen 1998), insider bargaining (Abowd and Lemieux 1993) or external pressures from foreign consumers (Harrison and Scorse forthcoming).

[22] Oreopoulos, Von Wachter, and Heisz (2006) present evidence for year-of-entry wage premia in Canada.

[23] Even for a given firm, there may be wage premia that depend on the labor demand conditions during the year of entry into that firm. Beaudry and DiNardo (1991) show that, within firms, a persistant cohort-specific wage premium emerges endogenously from optimal lifetime contracts for risk-averse credit-constrained workers.Baker, Gibbs, and Holmstrom (1994) provide evidence for such "handshake" models.

[24] The at-school income equivalent depends on family support, the disutility or cost of school attendance and part-time employment opportunities.

[25] A high discount rate or low at-school income will generally reduce the desire for additional schooling as the net benefits of schooling are smaller and are discounted more heavily. Meanwhile, high risk aversion increases the probability of dropout in response to new job opportunities because the student values uncertain future vacancies relatively less than certain vacancies today.

I now explore how new job arrivals in industry i affect the schooling decision. In the simplest case, new jobs arrivals, l_{it}, weakly reduce schooling by weakly raising the best wage on offer if the student drops-out today.[26] However, the realization of net new jobs today may change the expected industry year-of-entry wage premium in the future, $E_t\varepsilon_{i1}(l_{i,t+1})$. For example, a new factory-opening brings many immediate vacancies, but students may expect the factory to hire additional workers next year or more firms to arrive in the future due to the forces of agglomeration or industry growth. If l_{it} is positively correlated with $E_t\varepsilon_{i1}(l_{i,t+1})$, both the best job available today and the expected best future job may change and the net impact on schooling will be ambiguous. The next two sections of the paper use a reduced form empirical approach to determine the sign of the net effect of new job arrivals on schooling for each industry.

The perceived serial correlation of new jobs provides an additional empirical prediction that differentiates an education decision framework in a neoclassical labor market setting from one in which vacancies are stochastic. In neoclassical labor market settings, new job arrivals in a high skill industry should raise the returns to schooling by increasing the demand for skill and making skill acquisition more attractive. Correspondingly, job losses in this industry should reduce the demand for skill and increase the incentive to dropout. However, in a framework with stochastic vacancies, the perceived serial correlation may be a function of net new jobs. In Mexico, most years between 1986 and 2000 saw substantial formal sector employment growth. Consequently, l_{it} and $l_{i,t+1}$ were uncorrelated if $l_{it} < 0$ but positively correlated if $l_{it} > 0$. If students had expectations consistent with this pattern, both job arrivals and job losses in a high skill industry will encourage students to stay in school. In the latter case, jobs in the sector are unavailable today so the opportunity cost of schooling falls, but students still expect them to be available in the future. I test this conjecture in section 4.1, and find evidence in favor of an education decision framework that incorporates stochastic vacancies.

2.1 Industry Characteristics and School Dropout

There are three observable industry characteristics that determine whether new jobs at time t in industry i encourage or discourage school dropout in a framework with stochastic vacancies.

First, the lower the perceived serial correlation between new jobs arriving today, l_{it}, and new jobs arriving in future, $l_{i,t+1}$, the more likely it is that new jobs in industry i will encourage school dropout. The expected net present value of the best job in future in that industry will improve by only a small amount

[26] Adding a cost to job searching makes dropout more tempting when new jobs arrive since the search costs will be lower that year.

if students perceive a low positive serial correlation and will deteriorate for a negative serial correlation.

For the next two industry characteristics that I will describe, I assume that students expect a positive correlation between new jobs today and new jobs in future.

Second, the higher the wages for school dropouts in industry i compared to other industries, the more likely it is that one of the new jobs in industry i is the best job available to the student today, raising the opportunity cost of schooling. Conversely, the higher the wages for school graduates in industry i compared to other industries, the larger the increase in the expected best future job and the perceived returns to schooling. Therefore, the higher the ratio between these two relative wage terms, the more likely it is that new jobs in industry i encourage school dropout.[27]

Third, the higher the proportion of employees that are school dropouts in industry i compared to other industries, the more likely it is that the vacant positions do not require high school education. Therefore, a job opening in industry i is more likely to be the best job available to the student today, raise the opportunity cost of schooling and encourage school dropout. By a similar logic, the higher the proportion of vacancies that are filled by young and inexperienced workers in industry i, the more likely job openings in industry i are to encourage school dropout.

In summary, whether a new job arrival in a particular industry does discourage education acquisition will depend in part on the three industry characteristics: the serial correlation of new job openings, the relative wage premia paid to different skill levels and the availability of jobs at different skill levels. Only the last of these characteristics matters in a standard neoclassical labor market setting. In section 6, I evaluate the importance of these three characteristics in explaining the heterogenous educational effect of new jobs that I find across industries.

3 Empirical Implementation

3.1 Data

I use two sources of data in this paper to examine how the education of different age cohorts in a municipality varies with new job opportunities in different industries. The education data are from a 10.6 percent subsample of the 2000 Mexican decennial census collected by the National Institute of Statistics, Geography, and Informatics (INEGI).[28] The 10.1 million person records cover all 2,443

[27] E.g. New jobs in industry i are more likely to encourage dropout when the wage for school dropouts relative to other industries divided by the wage for school graduates relative to other industries is large.

[28] The census, XIII Censo General de Poblacion y Vivienda 2000, is publicly available from IPUMSI Minnesota Population Center (2007). I obtain the annual working-age municipality population by linearly interpolating INEGI

municipalities in Mexico. Data from the 1990 census are also used to investigate various industry characteristics. I cannot, unfortunately, use family background data for the individuals, as many of the older cohorts I study have left their parental homes by the time of the census.

The employment data originate from the Mexican Social Security Institute (IMSS), and cover the complete universe of formal private-sector establishments, including Maquiladoras. IMSS provides health insurance and pension coverage and all employees must enroll. I construct the main employment variable, net new jobs, from annual changes in employment by industry within each municipality.[29] The data cover 2.2 million firms between 1985 and 2000, with annual employment recorded on December 31st of each year. Sample means for both data sources are shown in table 1.

As this paper focuses on the impact of export-oriented manufacturing, I break the manufacturing sector into export and non export industries. The IMSS data assigns each firm to an industry category, but does not indicate whether it exports or not. Therefore, I define a firm as an exporter if it belongs to a 3-digit ISIC classification (Rev. 2) industry where more than 50 percent of output was exported for at least half the years in the sample.[30] The conceptual framework suggests that new jobs in high-skill and low-skill industries may produce quite different educational outcomes. Therefore, I split the very heterogenous export manufacturing and service sectors by the average education of the 3-digit industry's employees in the 2000 census.

The composition and sizes of the five industry groupings are as follows:[31] Non Export Manufacturing (1,087,457 jobs in Metals, Minerals, Glass, Plastics, Chemicals, Paper, Publishing, Food, Beverage and Tobacco), Low-Tech Export Manufacturing (898,592 jobs in Textiles, Apparel, Shoes, Leather, Wood and Furniture), High-Tech Export Manufacturing (1,396,645 jobs in Electrical, Electronic, Transport and Scientific Equipment; Toys, Clocks and Ceramics), Commerce and Personal Services (3,066,358 jobs in Communications, Rental, Food, Lodging, Domestic, Recreational and Transport Services) and Professional Services (1,733,037 jobs in Professional, Technical, Medical, Educational, Administrative and Financial Services). The skill distribution of workers in these industries in 2000 is shown in

population data for ages 15-49 from 1990, 1995 and 2000.

[29]The aggregations from the firm to municipality level were carried out at ITAM, where the data is held securely. Kaplan, Gonzalez, and Robertson (2007) contains further details on the IMSS data.

[30]The industry categories used by IMSS, the 2000 census and the 3-digit ISIC classification (Rev. 2) were matched by hand. The export and output data come from the Trade, Production and Protection 1976-2004 database (Nicita and Olarreaga 2007). Results are robust to using other export industry groupings.

[31]The size is the total employment in the year 2000 from the IMSS database, excluding the Mexico City metropolitan area.

figure 3.[32] The low-tech export manufacturing sector is substantially less skilled than the two other manufacturing sectors, which in turn are less skilled than the service sectors.

While not all of the jobs in the industries that I classify as high and low-tech export manufacturing are in firms that export, the overwhelming majority are. Of the approximately 2.3 million jobs in these two industries in 2000, about 1.2 million are in Maquiladoras. Maquiladoras can import intermediates duty free, and are required to export most of their production. This type of firm accounted for more than half the employment growth over the period. A large number of the remaining 1.1 million jobs are also in exporting firms. In the 1990 Encuesta Industrial Anual, which only covers large non-Maquiladora firms, half of the 417,000 jobs in these two industries were in firms that exported. This proportion is likely to have increased further as Mexican manufacturing became more export oriented over the 1990's. Figure 1 and 2 provide more details about the manufacturing firm groupings. Firms in the two export manufacturing sectors export a much larger fraction of their total output and are more likely to be Maquiladoras or foreign owned.[33] A substantial fraction of the year on year growth in employment in the export industries is driven by Maquiladoras, particualrly in the middle of 1990's. In section 6, I explore whether new Maquiladora jobs affect education choices differently than other new jobs. To do this, I approximately identify the Maquiladora firms in my sample by matching firm level employment data to INEGI aggregate statistics on Maquiladoras by industry, state-industry and municipality.[34]

I combine the education and employment data using the 1985 municipal boundaries. In order for each location to represent a single labor market, I merge any municipalities classified by INEGI as metropolitan zones or where more than 10 percent of the working population commute to a nearby municipality.[35] These adjustments result in a panel of 13 cohorts across 1,809 municipalities.[36]

[32] The education distribution is calculated using IMSS insured workers in the year 2000 census.

[33] These data cover the whole of Mexico and originate from Banco de Mexico, Nicita and Olarreaga (2007) and Ibarraran (2004). The measure of output used by Nicita and Olarreaga (2007) does not properly account for all the imported intermediate components that typify the Mexican export production, hence the major export assembly industries show export ratios of over 100 percent.

[34] These data come from http://dgcnesyp.inegi.gob.mx/cgi-win/bdieintsi.exe. I am able to roughly identify Maquiladoras by classifying a firm as a Maquiladora when the number of firms or employees in a given aggregate cell is equal in the INEGI data to the number of firms or employees in the IMSS dataset. The fact that each of these firms appear in several overlapping aggregates allows me to iterate this process until convergence. Due to the highly clustered nature of Maquiladora production in Mexico, I am able to classify all the potential Maquiladoras in 4 iterations.

[35] I make this correction as if workers commute to nearby municipalities, the error terms will be spatially correlated. When a municipality sends workers to two different municipalities that do not send workers to each other, two synthetic municipalities are created, with both containing the sending municipality (but with its relative weighting halved).

[36] To calculate changes in employment, I lose the first year of data, 1985. Since the census was collected in February 2000, only firm data through 1999 is relevant. This leaves 14 years of data, but the two-year exposure window reduces the length of the panel to 13 cohorts.

Finally, I restrict the sample to non-migrants, defined from the census as those people born in the same state they are currently living in who also lived in their current municipality in 1995. Including in-migrants confounds the impact of local job opportunities on education, since the census does not ask where they lived at ages 15 and 16. Therefore, my estimates are only representative of the non-migrants who comprise 80 percent of the full census sample. In section 5.1, I provide econometric evidence that any potential selection biases related to migration are likely to bias my results against finding that new employment opportunities induce dropout.

3.2 Empirical Specification

The school dropout equation 1 suggests that the impact of new job opportunities on educational attainment is ambiguous. Accordingly, I first estimate a reduced form equation. I then use the conceptual framework to explore why new job opportunities encourage education in some industries and discourage it in others. I regress school attainment on net new jobs by industry as follows:

$$S_{mc} = \sum_i \beta_i l_{mci} + \delta_m + \delta_{rc} + \varepsilon_{mc}. \tag{2}$$

S_{mc} is the average total years of schooling obtained by February 2000 for the cohort born in year c in municipality m.[37] The labor demand measure, l_{mci}, is the net new formal jobs per worker in one of my five industries, i, in municipality m (Δemployment$_{mi}$\working-age population$_m$), in the years that the cohort turned age 15 and 16.

The β_i coefficients for the two export sectors estimate the change in the school attainment of workers that results from new export-oriented manufacturing jobs arriving during the key school-leaving years. I include municipality fixed effects, δ_m, and a full set of state-time dummies, δ_{rc}, where r indexes the state. These state-time dummies, which subsume national time dummies, are identical to state-cohort dummies as each cohort is exposed at a different year. As a robustness check, I also include municipality linear time trends. The state-time dummies control for the fact that education trended upwards during the period, but at different rates across Mexico.[38] Therefore, I am comparing a cohort

[37] I do not use data from 1990 census in calculating S_{mc} as these data would only cover 3 cohorts, and the meausure would be error prone as many members of the cohort would not yet have completed their education by 1990. Additionally, it is not clear how to weight these observations as the sampling methodology changed between 1990 and 2000.

[38] The state-time dummies also remove trends that arise because younger cohorts have had less time than older cohorts to complete their education, and the degree of measurement error for younger cohorts will vary with the education level of the state.

within a municipality who was heavily exposed to new factory openings at their key school leaving age to other cohorts in the same municipality who did not have such a shock to their employment opportunities at these ages, flexibly controlling for time effects using the cohorts of key school-leaving age in nearby municipalities where factories did not open. In section 3.3, I discuss potential reverse causation and omitted variable bias in detail, and present a novel instrumentation strategy.

The addition of state-time dummies means that the Valle de México metropolitan zone (that includes Mexico City) is essentially omitted from my sample as it constitutes two states on its own. As a robustness check, in section 5, I include region-time dummies for six regions of Mexico instead of state-time dummies.

The main specification focuses on new jobs arriving at ages 15 and 16, although I will also examine other exposure ages. Compulsory schooling in Mexico ends with Secundaria (grade 9), and most children complete this grade at either 15 or 16 depending on their birth date. The compulsory schooling law only dates from 1992 and enforcement is rare (Behrman, Sengupta, and Todd 2005). However, ages 15 and 16 are still the two most common school leaving ages and the age at which the decision to attend high school is made. Additionally, formal sector jobs first become a direct alternative to school at this age, as the minimum formal sector working age is 16.[39][40]

3.3 Empirical Methodology and Threats to Identification

With a conceptual framework in place and the basic specification introduced, I now address the three main econometric concerns: omitted variables, measurement error and reverse causality. Omitted variables will bias coefficients if a third factor affects both a municipality's education level and its attractiveness as a location for a firm.[41] Using the panel dimension of my data, I am able to sweep out time-invariant features of the municipality using municipality fixed effects. Similarly, the flexible state-time dummies control for any omitted variable that changes over time within the 32 states of Mexico. These dummy variables will be insufficient if there are omitted variables correlated with

[39] The specification accommodates grade slippage, since job arrivals at ages 15 or 16 affect all students as formal sector work is now possible. In the sample of students currently at school who had completed 9 years of school in February 2000, 32 percent were older than 16.

[40] The actual minimum working age is 14, however children under 16 require parental consent and medical documentation. Additionally they cannot work overtime, in certain hazardous industries, beyond 10pm or more than 6 hours a day (Bureau of Economic and Business Affairs 2001). Accordingly, the minimum working age in the formal sector is usually taken as 16. While there is much child labor in Mexico, most of this is in the informal sector.

[41] For example, the neoclassical growth model predicts that poorer municipalities will converge with richer municipalities, with both education and the number of firms increasing due to high returns to low human and physical capital. A cross-section analysis will incorrectly attribute the schooling increases to the arrival of these firms.

employment changes over time within municipalities. Unfortunately, there are almost no annual data available at the level of Mexican municipalities that could serve as time-varying controls.

The most obvious confounding factors are complementary investments at the time of a new factory opening. For example, a factory may agree to build a school when it opens. However, such complementary investments will affect all cohorts, with younger cohorts exposed for more years and likely to see larger effects. However, I find disproportionate effects on the cohorts of school leaving age (see figure 6). Additionally, Helper, Levine, and Woodruff (2006) look at school building decisions in Mexico and find that these decisions were made at the national level prior to 1992 and at the state level afterwards, with little municipality say in either time period.

A second issue is measurement error in employment changes. IMSS registration defines firm formality. However, some firms existed informally prior to registering with IMSS, thus, they appear as new firms when they register. Measurement error will attenuate the coefficients, although in this context it could also bias the coefficients in a particular direction if an omitted variable both encouraged firms to register and affected cohort education choices.

The final threat to identification is reverse causality. Differences in wages across skill groups drive firm location and employment decisions, and depend on the local distribution of educational attainment.[42] If new factories do lower education and low schooling levels attract factories, $\hat{\beta}_i$ will be biased in an ambiguous direction.[43] My methodology compares cohorts over-time within a municipality, and allows me to relax the restriction that municipality education levels do not affect current firm employment decisions—a restriction that would be required in a cross-section. Instead, reverse causality will not bias the coefficients in a panel setting if a single cohort deviation in (state) de-trended education does not affect firm employment decisions in the past, present or future. Therefore, while a firm may wish to locate in a highly skilled location, or in a state where skills are increasing rapidly over time, the firm's decision to open in a particular locality must not be influenced by the fact that the youths of age 15 and 16 in the locality have an unusually strong desire for education.

In order to deal with these last two identification concerns, I use an instrumental variable approach.

[42]In the extreme, if there is no informal sector, no unemployment and no migration, one additional school dropout will lead to one new formal sector employee in the municipality. With only one third of working-age adults in Mexico in formal private sector employment, this mechanical relationship will not exist. However, changes in the local labor pool are still likely to affect the number of formal sector employees.

[43]Bernard, Robertson, and Schott (2004) show that factor prices are not equalized across Mexico, resulting in an inverse relationship between relative wages and relative skill levels.

I instrument for net new jobs per worker, l_{mci}, with the net new jobs per worker generated by large single-firm expansions and contractions (positive or negative changes of 50 or more employees in a single year at a single firm). The instrument is highly correlated with net new jobs per worker, as large single firm changes comprise a substantial component of the total change in employment. For the instrument to be exogenous to the error term in equation 2, I require that firms respond to changes in the education decisions of the local youths only through the small expansions and contractions that are excluded from my instrument.

The exogeneity assumption seems reasonable. There are very large fixed costs associated with large single-firm expansions, and large contractions are extremely costly to reverse. An unusually high dropout rate for a particular cohort of youths is unlikely to drive these large firm investment decisions for two reasons. First, a single cohort is a very small component of the local skill distribution and so will have only a minor influence on the labor pool from which the firm can hire. This assumption is especially plausible for Mexico, which has a large number of both informal and migrant workers. As many of these workers are also seeking formal sector employment in the municipality, they ensure that the total labor supply is unresponsive to small annual changes in local dropout rates.[44] Second, entrepreneurs must obtain cohort-varying information about the skill level in a municipality, which is not readily available. Instead these large expansions are most likely driven by external demand factors interacted with stable municipality characteristics (distance to US border, size of local market etc.). Therefore, these firm employment changes are unlikely to be the result of the schooling decisions of the current cohort aged 15 and 16.

For the assumption of strict exogeneity to be valid, I require that these large firm expansions and contractions are also not influenced by future or past cohort schooling deviations. Future deviations in cohort education are unknown at the time of the firm decision and so presumably will not affect firm decisions. However past schooling deviations may affect firm decisions, since the skill level of all these workers, having already entered the job market, are observable. If, for example, a particularly bad teacher joins a local school and many students start to drop out, this may have a non-negligible effect on the local unskilled wage after multiple cohorts have been exposed. Two factors limit the size of the bias that such a situation will cause. First, any correlation between past schooling deviations and firm location decisions will be divided by the number of cohorts in my panel (thirteen). Second,

[44] There is generally perceived to be a shortage of formal sector employment opportunities in Mexico. See footnote 20 for references.

older cohorts have progressively smaller impacts on the pool of local labor a firm can hire as many will no longer be looking for new employment. Additionally, I include a municipality linear time trend as a robustness check in section 5 in order to pick up persistent trends in schooling deviations.[45] Therefore, my instrumental variable strategy plausibly deals with the issue of reverse causation.

The instrumental variable strategy also mitigates the problem of measurement error due to the registration of previously informal firms. My instrument focuses only on large single-firm employment changes. These large changes can only occur in larger firms, which could not have avoided registration with IMSS

I provide a second instrumental variable strategy to mitigate a particular concern. My state-time dummies will not adequately control for schooling trends if firms decide to locate in a particular state for statewide factors (geography, state level governance etc.) and then choose the precise municipality based on local education trends. Therefore, I follow the widely used methodology of Bartik (1991) to isolate labor demand shocks. I instrument for net new jobs per worker in a particular industry and municipality by the growth rate of that industry in the whole state, interacted with the total number of jobs per worker in the previous year in that municipality.[46] This instrumental variable strategy will produce coefficients that are not biased by firm employment decisions that take this particular form.[47]

Finally, I cluster all standard errors at the municipality level to prevent misleading inference due to serial correlation in the error term across years within a municipality (Bertrand, Duflo, and Mullainathan 2004). The large number of groups (1808 municipalities) mitigates concerns regarding spurious correlation (Baltagi and Kao 2000). All the regressions use the survey weights from the 2000 census to make them representative of Mexico, excluding the capital city metropolitan area.[48] I now present the results.

[45] I require substantially weaker conditions for identification if I am able to interpret my instrumentation strategy as a variant of the fuzzy regression discontinuity design. The lumpy changes in the industry job environment that come from large expansions and contractions are discontinuous. Therefore, whatever the origin of these firm employment changes, I can compare cohorts who were at key schooling leaving ages when these changes occur with those in adjacent age cohorts. For this approach to be valid, I only require that adjacent cohorts have identical distributions of pre-determined characteristics and that my time dummies and trend terms are able to characterize the evolution of schooling in the absence of new factory shocks.

[46] This variable will serve as a valid instrument for net new jobs per worker as long as state-industry growth rates are not correlated with labor supply shocks in the municipality. This is equivalent to including national time trends and identifying off the interaction of the state level industry mix and national industry growth rates, as is common in the US literature, for example Bartik (2006). There are an average of 58 municipalities in each state in my sample.

[47] However, as the instrument is rather weak and for some states there is a worry that growth rates are driven by a single large urban area, I use this second instrument only as a robustness check.

[48] Specifically, I weight each cohort in each municipality by the number of individuals that the cell represents.

4 Basic Results

Figure 5 shows the basic identification strategy for the 20 municipalities that received the largest total number of net new jobs per worker in high-tech export manufacturing. The figure plots the residuals over time after regressing both schooling and net new jobs per worker in high-tech export manufacturing on the remaining terms in equation 2. As one example, in Matamoros, which lies at the US border, cohorts who were exposed to a particularly substantial number of new factory openings in high-tech export manufacturing attained fewer years of schooling than the adjacent cohorts. The panel regression, equation 2, essentially aggregates these effects over all 1808 municipalities.

Table 3 shows the results from the basic specification, regression 2. Column 1 contains the OLS results. Column 2 contains the results of instrumenting for net new jobs per worker with the net new jobs per worker attributable to changes of 50 or more employees in a single firm in a single year. Column 3 contains the reduced form results from regressing schooling on my instrument. The arrival of new formal sector jobs in both export manufacturing sectors significantly increases school dropout ($\beta_i < 0$). In contrast, employment growth in professional services significantly increases education acquisition. Skill acquisition depends on the local availability of jobs at ages 15 and 16, and only employment growth in export manufacturing industries reduces educational attainment.

The results across the three columns are very similar except in commerce and personal services where the positive coefficient falls considerably in the IV specification.[49] The first stage of the IV is extremely significant, as expected. The second instrumentation strategy, instrumenting for net new jobs with the predicted value of net new jobs if the municipality grew at the state-industry growth rate, is shown in column 4 of table 3. The results are similar although larger in magnitude for several sectors, suggesting that reverse causation is not biasing my results downwards and leading to spurious negative coefficients. However, the second instrument is much weaker than the first and so the estimates are more imprecise.[50] Accordingly, for the remainder of the paper, I focus on the first instrumentation strategy.

The magnitude of these coefficients in table 3 imply large effects on educational attainment. As a concrete example, a 90th percentile positive shock to high-tech export manufacturing (0.01 net new jobs per worker over the two year exposure period) results in the cohort who were 16 at some

[49] This result is perhaps unsurprising. Firms in this sector are generally small, and therefore this industry is particularly likely to make small employment adjustments in response to changes in the supply of school leavers.

[50] The first stage F-stat is just over 10 compared to an F-stat of 558 for the first IV strategy.

point that year obtaining 0.07 years less school on average. Alternatively, such a coefficient would be obtained if for every ten high-tech export manufacturing job arrivals, one student changed their education decision and dropped out at grade 9 rather than continuing on to grade 12.[51]

4.1 Are Years of Hiring and Firing Symmetric

I now explore whether job arrivals and job losses have symmetric effects on school dropout. The conceptual framework suggested that such an asymmetry was likely if students expect a year of job growth to be followed by further growth, but a year of job loss to be just as likely to reverse as to continue. Table 2 provides evidence for why expectations of this type would be rational. The table shows the transition matrix for negative, positive and zero values of net new jobs by industry. Negative employment shocks persist roughly 50 percent of the time, while positive shocks persist 70 to 80 percent of the time. If students have such expectations, years of job losses weakly encourage school drop out as the opportunity cost of schooling declines but the expected best job available in future is unchanged. Therefore, in the industries where new job arrivals encourage school acquisition, both job growth and job losses will increase schooling. This prediction is inconsistent with a neoclassical labor market setting, in which job gains and losses in a high skill industry will have opposite effects on education acquisition.[52]

In order to test the hypothesis that years of job losses encourage schooling in all industries, I interact the measure of net new jobs, l_{mci}, with indicator dummies so that β_i can differ between years of industry job creation and job destruction. $\boldsymbol{I}^+$ takes the value 1 if $l_{mci} > 0$, and $\boldsymbol{I}^-$ takes the value 1 if $l_{mci} < 0$:

$$S_{mc} = \sum_i \beta_{1i} l_{mci} \boldsymbol{I}^+ + \sum_i \beta_{2i} l_{mci} \boldsymbol{I}^- + \delta_m + \delta_{rc} + \varepsilon_{mc}. \tag{3}$$

If students expect new job arrivals to be serially uncorrelated in a year of job losses then I should find $\beta_{2i} \leq 0$ in all industries. As $l_{mci} < 0$ in a year of job losses, $\beta_{2i} < 0$ implies that cohort schooling increases with job losses.

[51] To calculate this number, I assume that a new factory only affects the educational choices of youths who drop out to work in the factory and that a single cohort comprises 5 percent of the Mexican population aged 15-49. If each student who dropped out of school to take a factory job obtained 3 years less education, and enough new jobs arrived to employ the entire cohort, the cohort would obtain 3 years less schooling on average. If only one in ten of the new factory jobs were offered to youths in that cohort, the average cohort schooling decline falls to 3/10. If enough new jobs arrived for each worker in the municipality, then the effects would be 20 times larger and β_i would approximately equal 6 ($3/10 * 20$) as I find. Of course, if some students leave school to work in these new export manufacturing jobs, but would have dropped out anyway, the cohort can obtain a higher percentage of the new jobs. These proportions seem reasonable: in the census sample, 9.6 percent of high-tech and 13.3 percent of the low-tech export manufacturing workers are age 18 or younger.

[52] Job losses will raise the relative demand for unskilled labor and vice versa.

Table 4 shows the results of regression 3. The positive net new jobs per worker coefficients are very similar to the coefficients on net new jobs per worker in table 3. Now, however, the positive coefficient on new job arrivals in non export manufacturing is significant. The hypothesis of asymmetric expectations is supported. While years of job growth have mixed effects on education across industries, years of job decline increase schooling in all industries. In the two industries where I find significant positive schooling effects for positive net new jobs, the impacts of positive and negative job arrivals are significantly different at the 1 percent significance level ($\beta_{2i} < \beta_{1i}$).

Therefore, the assymetric educational impacts of years of job growth and decline provides evidence in support of a conceptual framework that incorporates stochastic vacancies. In subsequent sections of the paper, I will focus on the positive net new job effects that describe the educational impacts of a successful export-oriented industrialization policy.

4.2 Direct and Indirect Employment Channels

I now explore the mechanisms through which new job arrivals are affecting educational decisions. Most obviously, a youth may change his or her schooling decision in anticipation of employment at one of the formal sector firms in my sample. First, I will investigate the effects of new job arrivals at additional ages of exposure and over specific time periods, before addressing the possibility that more indirect mechanisms are at play.

Up until this point, I have included only a single age of exposure in my specification, and looked at new job arrivals at ages 15 and 16. This age was chosen as it is both the modal school leaving age in Mexico and the age of first legal employment in formal manufacturing. However, jobs arriving at other ages may also affect educational choices. Accordingly, I modify equation 3 to include the new job arrivals, l_{mci}, for cohort c at every age between 13/14 and 17/18.[53] Of course including even 4 additional lags comes at a substantial cost, as the panel length contracts from 13 to 9 years and estimates are less precise. The resulting IV regression coefficients are shown in table 5. The estimates for positive net new job arrivals are plotted in figure 6 for years of schooling, as well as an alternative dependent variable, the average grade 9 dropout rate for the cohort.[54]

[53] The specification is $S_{mc} = \sum_i \beta_{1i} l_{mi13/14} \boldsymbol{I}^+ + ... + \sum_i \beta_{1i} l_{mi17/18} \boldsymbol{I}^+ + ... + \delta_m + \delta_{rc} + \varepsilon_{mc}$.

[54] The grade 9 dropout rate is calculated as the number of students who obtain only 9 years of school divided by the number of students who obtain 9 or more years of school. In figure 6 the coefficients are inverted in order to mirror the total years of schooling panel.

The multiple year of exposure estimates in the upper panel provide supportive evidence that my estimates are the result of students evaluating the opportunity cost of and return to school, and not trends or third factors. There are generally negative, or less positive, schooling impacts when new job arrivals occur at common school leaving ages (13/14 after primary school, 15/16 at the end of secondary school and 17/18 at the end of high school). In contrast, in the in between school level ages of 14/15 and 16/17, there are positive schooling impacts of new jobs in all industries. At these school stages, the return to one additional year of education is relatively high, since the student may be able to graduate from secondary or high school and benefit from the sheepskin effect. The dip in years of schooling is largest at ages 15/16, when formal sector employment is first possible in most workplaces and the opportunity cost of schooling is particularly high. The effects of new export job arrivals at ages 13/14 on total schooling may in part be coming from youths dropping out of school at grade 7 as they expect to obtain a factory job in the future without the need for additional education. The lower panel showing grade 9 dropout corroborates these results, with the only significant increase in grade 9 dropout in coming with new high-tech export manufacturing job at ages 15/16, and not at older or younger ages.[55]

The estimates from the multiple exposure age regression can be used to verify that my results produce reasonable estimates of the total educational impact of new job arrivals. I multiply the coefficients in table 5 by the actual employment shocks that occurred in Mexico when the cohorts aged 18-26 in the year 2000 were growing up. The estimates suggest that had no new jobs arrived in either export industry over the period, these cohorts would have acquired 0.048 years less education on average. This reduction in schooling would be the result of 165,000 students forgoing exactly three year education—secondary or high school for example—in order to take a new export job. In the year 2000 census, 532,000 members of my sample aged 18-26 were employed in the export sectors. The estimates seem reasonable, and would match the census data if 367,000 students chose to work in the export sector without altering their education decision.[56]

Looking at later exposure ages can serve as a placebo test. If my results are driven, as I claim, by students altering education decisions when new job opportunities arrive in their municipality, then new job arrivals should not affect education levels if they arrive after all education decisions are complete.

[55] There are significant reductions in school dropout when new jobs arrive in professional services at ages 14/15 and 16/17, as well as high-tech export manufacturing at ages 14/15. Note that new job arrivals that induce students to stay on at school will reduce school dropout at later ages if students decide to complete more than one additional year of school.

[56] Of course, some students may forgo more or less than three years of school, and some workers may have changed sectors between leaving school and the year 2000.

Net new job arrivals are highly correlated over time, and so separately estimating equation 3 for multiple exposure ages will not provide an accurate representation of coefficient on nearby ages of exposure. However it does allow many more ages of exposure than simultaneously including multiple exposure ages. The lower panel of figure 6 presents the IV coefficients on positive net new jobs per worker arriving at every age of exposure between 7-8 and 23-24. The placebo test is satisfied, as there are no educational impacts from new manufacturing jobs by ages 22-23, the age at which students graduate college and education decisions are complete.[57]

Finally, as one further check, I look at the decision to partake in technical versus general education. In Mexico, the technical track in secondary and high school offers less academically able students the opportunity to obtain technical training. These students are most likely to go into professional and technical services, with 37.5 percent of high school educated students in this sector in possesion of a technical education.[58] Column 4 of table 6 shows that when new export jobs arrive, the proportion of students taking the technical track shrinks, presumably as these less academically minded students are the most likely to want to work in a factory. In contrast, when new professional and technical service jobs arrive, the proportion of students choosing the technical education track rises. Table 6 also shows school dropout regressions at grade 7, 10 and 12, with the estimates suggesting that commerce and low-tech export manufacturing affect low education types, and non export manufacturing affects higher education types, with professional services and non-export manufacturing in between.[59]

A substantial literature, cited extensively in the introduction, has shown that the returns to education in Mexico changed over the sample period. The lower panel of figure 7 shows this evolution using the National Urban Employment Survey. The returns to high school rose through 1993 and then by 2000 had fallen back to their 1988 level.[60] By breaking my 1986-1999 sample into five-year rolling subsamples, I can loosely evaluate the evolution of the schooling impacts over time. The coefficients for each of these subsamples are plotted in the upper panel of figure 7. Reassuringly, the schooling

[57]The only impacts at ages 22-23 come from the two service industries. In table **??**, I show that these effects are driven by the least educated groups. There is evidence of adult education in the 2000 census. Over 600,000 people older than 20 report currently attending school, yet have not completed grade 12. Therefore, the least skilled may continue to acquire skills in response to new service sector jobs at older ages.

[58]This falls to just under 30 percent in all four other sectors.

[59]While all export manufacturing and service sectors have effects at grade 7, only professional services and high-tech export manufacturing continue to have effects at grade 10. The coefficient on non export manufacturing is at its largest for grade 12 dropout, although the standrad errors are also large as the sample of students reaching this level is small.

[60]The returns to college also rose until 1994, before flattening out, while the returns to lower levels of education remained essentially flat over the period.

effects of new jobs in all industries approximately follow this inverted U pattern as well, with school dropout largest at the tail end of the sample period, when returns to high school were actually falling.[61] Therefore, looking across subperiods provides further evidence that new job arrivals alter educational choices by changing the trade off between the opportunity cost of, and the returns to, school.

There are two other possible mechanisms through which new job arrivals are affecting educational decisions. New formal sector jobs may create additional informal sector jobs which youths are attracted to, for example informal piece-work contracts for a formal manufacturing firm. My methodology will not be able to discriminate between direct and indirect employment of this type, as no data is available on annual informal sector employment. However, this mechanism has very similar policy implications to the direct employment channel and so this may not be a major worry.

Conversely, new export manufacturing plants may create additional formal sector jobs that provide services to these plants. By including new job creation in services as a separate variable, any spillovers of this sort will be attributed to service job creation and not export manufacturing. Column 5 of table 6 includes only new job creation in the three manufacturing sectors. The coefficients on new manufacturing jobs change little, suggesting that any spillovers to service sector employment have a minimal impact on educational choices.

The second alternative mechanism is that new job arrivals may impact another family member and thereby change household income or necessitate youths looking after younger siblings. As education is a normal good, job arrivals should increase household income and raise educational attainment.[62] Therefore, household income seems an unlikely explanation for the school dropout effects on new export opportunities. However, if a youth's mother or sister enters the workforce with the arrival of new job opportunities, the youth may be required to drop out of school to look after other family members. In order to test this hypothesis, in column 6 of table 6 I include both net new jobs per worker and net new female jobs per female worker. If this channel is behind my results, the schooling effects should be driven by new female job opportunities rather than total new job opportunities. The results suggest that the positive schooling impacts of new service jobs are being driven by female job opportunities, perhaps through the income channel, but the negative schooling coefficients are driven by general, not female specific, job creation.[63]

[61] Additionally, credit constraints raise the cost of funding additional schooling, and were more likely to bind after the banking collapse with the peso crisis in 1995.

[62] For evidence on positive schooling effects of trade liberalization through the income channel, see Edmonds and Pavcnik (2005) and Edmonds, Pavcnik, and Topalova (2008).

[63] There is strong evidence that female earned income is more likely to be spent on human capital investments than

In conclusion, I find that new export manufacturing opportunities induce students to drop out of school, while new opportunities in other industries generally encourage skill acquisition. These differences are at first glance suprising. In particular, both high-tech export and non export manufacturing employ workforces with similar education levels, yet new job arrivals in the two sectors have opposite impacts on education. In the conceptual framework, I highlighted the additional industry characteristics beyond the skill level of the workforce that, in a world of stochastic vacancies, can drive such heterogenous responses. In section **6**, I show that the variation in these characteristics across the different industries can explain my findings. However, first, I explore the robustness of these results.

5 Robustness Checks

I perform a variety of robustness checks to ensure that my findings are not spurious. Tables 7 and 8 rerun the preferred IV specification, shown in column 1, with several modifications. Column 2 includes a municipality-level linear time trend. This trend controls for omitted variables that trend up or down relative to other municipalities in the state. As the peso crisis occurred in the middle of the sample, a linear trend may be misleading. Additionally, with only 13 years of data, even including a linear trend terms risks over-fitting and causing attenuation due to the inclusion of an excessive number of controls in the regression. However, the coefficient on high-tech export manufacturing remains significantly negative, although smaller than in the basic specification.[64] In column 3, I cap education at 12 years and recalculate cohort schooling. By capping education at 12 years, most of the sample will have reached their final level of schooling by the year 2000, mitigating concerns that the amount of misreporting varies with the skill level of the municipality. In column 4, I further restrict attention only to individuals not at school at the time of the census. Results are very similar in both cases, therefore, I can be confident that my results are driven by students making school dropout decisions before the end of high school. Columns 5 and 6 split the sample into men and women.[65] I find similar results for both sexes. Column 7 shows that my results are robust to extending the cutoff threshold of my instrument from changes of 50 employees to changes of 100 employees in a single firm. Column 8 excludes the 781 small

male earned income, e.g. Duflo (2003).

[64]The other two manufacturing coefficients retain their signs and fall slightly but are no longer significant. The two coefficients on services actually reverse sign. The service sector is the most likely sector to suffer from reverse causation as fixed costs of expansion are smallest in this sector where less capital equipment is needed.

[65]The new jobs variables are net new (fe)male jobs per (fe)male worker and I instrument with net new (fe)male jobs per (fe)male worker for firms experiencing large expansions or contractions in total employment.

municipalities that saw no formal sector job growth over the period.[66] The coefficient on low-tech export manufacturing is no longer significant when these comparison municipalities are removed. Column 9 includes controls that account for the fact that rural municipalities may have seen differential trends over time and that the Progresa conditional cash transfer program was rolled out at the end of the period.[67]

Further robustness tests are shown in table 8. Column 10 excludes the two large cities in the sample, Monterrey and Guadalajara, which may have been driving my population weighted results. In both cases, results are unchanged. Columns 11 includes the Valle de México metropolitan zone contains Mexico City. As this city forms its own state, I remove the state-time dummies and replace then with region-time dummies for six broad regions. Columns 12 and 13 look at differences between metropolitan and non-metropolitan municipalities. Again, I use region-time dummies for both these regressions as there are only 54 metropolitan zones in my data set and so including state-time dummies for each of the 31 states would remove any interesting variation across cities. The results suggest that the low tech export manufacturing and commerce effects found in the main specification are coming primarily from non-metropolitan municipalities.

I also explore how the results vary over different regions of Mexico. In columns 14 through 16, I divide the municipalities into three regions. In columns 17 through 20, I split the municipalities by both average education and average income in the year 2000. There is a positive effect on education from new high-tech export manufacturing jobs in the south, and the least educated areas of the country, where very few such jobs were created. These results suggests that the initial skill distribution of the municipality matters, as high-tech export manufacturing jobs demand relatively high skills compared to average schooling levels in these areas. Poorer and less educated municipalities experience relatively larger negative education effects from low-tech export manufacturing.[68] In summary, there is a robust negative impact of new job arrivals in export manufacturing on educational attainment.

[66] For 67 percent of periods in my sample there was no change in formal sector employment. However, as these zeroes generally occur in small municipalities, they have little impact on my weighted regression results.

[67] To control for rural trends, I include a full set of state dummies interacted with a time trend multiplied by the percentage of the municipality population that is classified as rural. Progresa could potentially be a cause of omitted variable bias as the program encouraged children to stay in school at the tail end of my sample period by offering cash incentives. Therefore, I also include a Progresa dummy takes the value 1 in the 1998 and 1999 if more than 10 percent of the population reported receiving Progresa or Procampo payments in the 2000 census (no specific Progresa indicator is available in the census)

[68] A possible explanation for this finding is that families in poorer municipalities are less able to financially support youths still at school (low $\overline{y}_t$), and so dropout is relatively more tempting when very low skill jobs arrive in these municipalities

5.1 Migrants, Non-Migrants and Selective Migration

My results only pertain to the population of non-migrants. As the census does not record where migrants were living at ages 15 and 16, I cannot match these individuals to new local job opportunities at these ages and so I exclude them from my sample. Many export manufacturing workers migrate from poorer, often rural areas. McKenzie and Rapoport (2006) find that the option to migrate to the United States lowers educational attainment in Mexico.[69] Therefore, a plausible hypothesis is that my results understate the true educational decline as some potential migrants drop out of school in the belief that the benefits of migration have risen with the arrival of export manufacturing jobs in other municipalities. Unfortunately, I cannot examine this hypothesis using my empirical strategy.

However, migration effects could still bias my results if local labor market conditions differentially affect out-migration by skill group. For example, a new factory may stop a low skill worker from migrating, but have no impact on the migration decision of a high skill worker. The cohort average education, measured in the year 2000, could then fall, but the cause is the reduced out-migration of low skill workers. In appendix A, I address the concern that the negative schooling coefficients I find originate from such compositional effects. First, I show that new export manufacturing jobs do not affect the sample cohort size. Second, I use census data on the municipality of residence in 1995 to show that when new jobs arrive, it is the more skilled who are less likely to migrate. This finding only applies to internal migrants, but Chiquiar and Hanson (2005) find similar effects for emigrants to the United States.[70] Therefore, the negative impacts of export manufacturing that I find are likely even larger in magnitude, because compositional effects bias the coefficient upwards and attenuate my estimated coefficient.

Migration may also bias results in other ways. If rural youth are more likely than urban youth to migrate in search of jobs or to attend secondary school, then rural youths will be underrepresented in my sample. As three quarters of Mexicans live and most formal sector jobs are found in urban areas, this underrepresentation is likely to only have a small impact on my population-weighted estimates, however there is still reason to be cautious. Alternatively, large exogenous flows of migrants into a municipality may alter both education and factory location decisions. However, omitting migrant flows from my specification would likely exert an upward bias on my estimates. An increase in low-skill migrant labor should lower the local unskilled wage, attracting factories and encouraging local students

[69]Similarly, de Brauw and Giles (2008) show that, for rural China, reduced migration costs increase school dropout.

[70]However, in a recent paper, Moraga (2008) disputes this finding for international migrants.

to acquire more education.

In-migration also plays an important role by reducing the responsiveness of education to local employment shocks. I find in table 13 that the presence of a large number of migrants working in a particular industry in a municipality significantly attenuates the educational impacts of new job arrivals. In the absence of the substantial in-migration present in Mexico, the negative schooling effects I document for the local population would be even larger.

6 Investigating the Role of Industry Characteristics

My empirical approach has focused on five broad industry groupings, for which I have found heterogenous educational impacts of new job arrivals. In an alternative approach, I regress cohort education on the total quantity of new formal sector job arrivals in the municipality, and also interact these job arrivals with various firm or industry characteristics. The conceptual framework suggests three industry characteristics that make school drop out more likely when new jobs arrive: a low serial correlation of labor demand shocks, a large employment share for unskilled workers and a relatively attractive wage profile for unskilled workers. This section reveals that such industry characteristics seem to describe the export manufacturing industries of Mexico, and, once these characteristics are controlled for, new jobs in export-intensive industries actually encourage students to stay in school relative to industries with similar characteristics.

Before exploring the three industry characteristics, I investigate whether new jobs at exporting firms do indeed discourage education compared to non-exporting firms, consistent with my results using five broad industry categories. In the absence of firm level exporting data, I have two measures of export participation at a finer level than the broad industry group used previously. At the firm level, Maq_j is an approximate indicator of whether or not firm j is a Maquiladora, as described in data section 3.1. Therefore, I interact Maquiladora status with new job creation at the firm level and sum these interactions over all the firms in the municipality.[71] Similarly, at the 3-digit industry i' level, I have a measure of export intensity, namely the share of that industry's output that is exported over the sample period for the whole of Mexico, $Export_{i'}\text{mex}/Output_{i'}\text{mex}$.[72] I also interact $Export_{i'}\text{mex}/Output_{i'}\text{mex}$with

[71]As in section 4.1, I interact all these new variables with positive and negative indicator variables in order to separate years of job arrivals from years of job losses.

[72]There are 41 3-digit industry i' categories in the manufacturing and services sectors that can be matched between the 2000 census and the IMSS database. See section 3.1 for a description of these data.

new job arrivals, but here by 3-digit industry, and sum these terms over all industries i':

$$S_{mc} = \beta_1 \boldsymbol{I}^+ \sum_{j \in m} l_{mcj} + \beta_2 \boldsymbol{I}^+ \sum_{j \in m} l_{mcj} Maq_j + \beta_3 \boldsymbol{I}^+ \sum_{i'} l_{mci'} \frac{Export_{i'}\text{mex}}{Output_{i'}\text{mex}} + ... + \delta_m + \delta_{rc} + \varepsilon_{mc}. \quad (4)$$

My previous findings suggest that new job arrivals at Maquiladora firms or in sectors with high export intensities will discourage education compared to other jobs; $\beta_2 < 0$, $\beta_3 < 0$.

Table 9 reports the results of this regression. Columns 1 and 2 include only one of the two exporter interactions and column 3 contains both terms. As expected, the coefficients β_2 and β_3 are negative. New job arrivals within Maquiladora or within industries with a high export intensity significantly reduce educational attainment, while new job arrivals alone encourage schooling.[73]

In the next three subsections, I interact new job arrivals with measures of the three industry characteristics described in the conceptual framework, and add these terms to equation 4. The results of this regression are shown in column 4 of table 9.

6.1 Serial Correlation of Job Creation

The conceptual framework predicts that if hiring is only weakly serially correlated within an industry, new jobs would be more likely to encourage drop out since such opportunities are less likely to also be available the next year. The transition matrix for positive, zero and negative net new jobs in table 2 shows that the two export manufacturing sectors have the lowest probability of a positive shock being followed by another positive shock.[74] Consequently, I interact new job arrivals with the transition probability that a year of municipality job growth in a 3-digit industry is followed by another year of job growth.[75] The predicted positive sign is found is only found once controls for industry growth and firm size are included and is not significant. Therefore, there is no strong supportive evidence that new export jobs induce dropout in part because the relative volatility of job growth in these industries encourages students to grab jobs when they become available.

[73]When both are included, the Maquiladora term remains negative but becomes insignificant. Maquiladoras are highly concentrated in export-intensive industries, and so the fact that one of these two exporting interaction terms becomes insignificant is not surprising.

[74]I also estimate an Arellano-Bond linear dynamic panel estimator and find a negative coefficient on past job growth only for high-tech export manufacturing. However, the panel is too short to differentiate the autoregressive processes across the different industries.

[75]These probabilities are calculated from the IMSS dataset. For the negative net new jobs terms, I interact the transition probability that a year of losses is followed by another year of losses. Ideally, I would estimate an ARMA model for each industry. However, the brevity of my panel precludes this.

6.2 Skill Level and Age of Employees

The conceptual framework suggests that new job arrivals in an industry where almost all jobs require high education levels will not induce dropout for students with low skills, since the opportunity cost of schooling does not change. Similarly, if an industry only employs more experienced older workers, immediate employment is not possible for a student and the opportunity cost of school will not rise with new job arrivals.

Figure 3 uses the 2000 census to show histograms of years of schooling and age for my five broad industry categories, as well as for the residual informal sector.[76] Low-tech export manufacturing demands the least skilled workers of the formal sector industries, with 40 percent the workforce having less than 9 years of schooling. Non export manufacturing and high-tech export manufacturing have almost identical skill distributions.[77] The service sectors are more skilled and the informal sector is, unsurprisingly, the least skilled.[78] The 1990 census shows similar patterns, although with workers in all sectors having relatively less education. In terms of the age distribution of employees, shown in figure 4, both export manufacturing sectors have significantly younger workforces. The younger age distribution may be a result of faster growing firms in these industries. I therefore exclude this variable, or add an additional control explicitly for firm growth in the regression specification. In summary, the export sectors have a comparatively young and unskilled workforce compared to other formal industries.

Guided by these descriptive statistics, I include two interaction terms calculated at the 3-digit industry from the 2000 census in equation 4. The results are shown in columns 4 and 5 of table 9, while column 6 shows the same interaction terms but using the 1990 census.[79] To measure the abundance of jobs available for unskilled workers, I interact new job arrivals with the national share of workers in industry i' with less than a high school diploma, $S < 12$. To measure the abundance of jobs available for young workers straight out of school, I interact new job arrivals with the national

[76] I define private formal sector workers in the census as full-time workers with IMSS health insurance and non-zero income. Wives, children and unemployed husbands of IMSS workers are also eligible for IMSS insurance, and may impart some error. To match the sample of my main specification, the skill level sample comprises non-migrants aged 16 to 28. The age sample comprises non-migrants aged 15-50.

[77] Therefore, the skill level of the industry is not able to explain my finding that new jobs arrivals in these two industries had opposite effects on schooling. In a neoclassical labor market framework, this characteristic would determine whether or not new jobs in an industry encouraged school dropout.

[78] There are some excluded formal sector workers in this group: public sector employees insured by ISSSTE, employees of PEMEX and a relatively small number of agriculture, construction, mining and utilities workers insured by IMSS.

[79] For 1990, as the census does not ask about IMSS status, I use the full sample of workers.

share of employees in industry i' who are likely to have been in the workforce for 3 years or less.[80] The higher the proportion of new jobs that are available to the young and unskilled, the more likely it is that new job arrivals will encourage school dropout. Therefore, the coefficients on these interaction terms should be negative. I find support for these conjectures, with significant negative coefficients on the skill level interaction terms in all specifications and the age term when using the 1990 census data.

6.3 Wages Paid at Different Skill Levels

The conceptual framework suggests that the attractiveness of industry wages at different skill levels affects the dropout decision. New jobs in the industry are more likely to induce drop out if the wages for unskilled workers, relative to other industries, are high in comparison to the wages for skilled workers, again relative to other industries.[81]

The relative wages paid by different broad industry categories can be seen most clearly in figure 8. This figure shows plots of the wage differences between each industry and the local informal sector by skill level from the 2000 census for new workers in their first years of employment.[82] These premia should be treated with some caution as they do not take account of workers sorting on unobservables. However, they still provide useful evidence on wage differences by skill and industry. For workers with only 6 years of school, low-tech export manufacturing offers high premia of over 17 percent and this premia declines rapidly at higher levels of education. For intermediate years of schooling, high-tech export manufacturing offers high premia of about 15. However, with 12 years of schooling, non export manufacturing offers the best premia of about 14 percent over the informal wage for that level of schooling, while the export sectors offer significantly smaller premia of between 5 and 9 percent.[83] The within industry returns to education and the wage profiles in figure 9 show similar patterns in the 6-12

[80] I assume workers graduated in the expected year based on their age, and calculate likely experience as age minus schooling minus 6. If a worker has less than 9 years of education, I count the number of years since they turned 16, the legal factory employment age.

[81] If this ratio is high, a new job opportunity is more likely to affect the best job today than it is to affect the expected best future job.

[82] I focus on 6 to 12 years of schooling, the relevant education margin for most manufacturing workers in Mexico. These are wages for workers with five or less years of experience (age minus schooling minus six) post age 16. To estimate these wage premia, I run a Mincer-like wage regression of log income for individual j on a set of industry-school level dummies, $d_i d_s$. I also include a full set of municipality-school level fixed effects, γ_{ms}: $\ln Y_{jmis} = \sum_{i \neq \text{informal}} \sum_s \psi_{is} d_i d_s + \sum_m \sum_s \gamma_{ms} d_m d_s + X_j + \varepsilon_{jmis}$. By omitting the schooling dummies for the informal sector, the coefficients ψ_{is} on the other industry dummies measure the premium that each industry i pays over the informal sector wage at that skill level s. Controls, X_j, include sex, experience and a rural dummy. To obtain estimates of wage premia that are representative of the non-migrant population of Mexico excluding Mexico City, I weight wages in each municipality by the regression municipality weights.

[83] The wage premia for high-tech export manufacturing and non export manufacturing are significantly different at both 9 and 12 years of schooling.

years of schooling range, with a significantly lower return to high school in the export industries.[84]

These descriptive statistics are consistent with the very different schooling impacts of new jobs across the three manufacturing industries detailed in section 4. The premia in the two export sectors are most generous at lower skill levels, while the premia in non export manufacturing remain generous for high school graduates. Accordingly, we would expect new low-tech export manufacturing jobs to have the largest effects on youths with less than secondary school, high tech export manufacturing to induce students to leave school after grade 9, and non export manufacturing jobs to potentially entice students to stay and complete high school.

These high premia in the export sectors support the ample evidence that exporters and foreign firms in Mexico pay high wages for a given skill level (e.g. Bernard 1995). For the relatively low skilled workers they employ (75 percent of employees with 9 years of education or less), export manufacturing jobs are highly remunerated compared to jobs in other sectors.

The insights that come from the census wage figures can be tested more rigorously by including an interaction term suggested by the conceptual framework : the ratio of the wage differences over the informal sector at 9 and 12 years of schooling in industry i', again from either the 2000 or 1990 census.[85] I should find a negative coefficient on this interaction term if new job arrivals are more likely to induce drop out when they offer relatively more attractive wages to low skill rather than high skill workers, compared to other local opportunities at those skill levels. The conjecture is supported by significant negative coefficients on the interaction term in columns 4, 5 and 6 in table 9.

6.4 Exporting, Industry Characteristics and Dropout

Finally, I include two additional firm-level controls to equation 4 in columns 5 and 6. First, I interact firm size (in terms of employees) with firm-level changes in employment. Firm size is a standard firm characteristic in the trade literature, but it is only weakly significant in this context. Second, I interact national industry average growth rates. The interaction terms suggested by the conceptual framework are likely to be correlated with industry growth rates (for example, the age of the workforce). I

[84] For the returns to education, I run Mincer-like regressions again for new workers, but now including municipality-industry fixed effects instead of municipality-school level ones. I omit all the industry-school level dummies for workers with 9 years of education, and obtain the returns relative to 9 years of schooling in that industry for non-migrants in Mexico excluding Mexico City. For wage profiles, I plot locally weighted regressions of the wage relative to the local informal sector with 9 years of school to allow comparability across education levels and industries. I restrict the sample to men since many women in Mexico drop out of the labor market and return in later life, breaking the link between age and experience.

[85] As the 1990 census does not record IMSS membership, I use the wage differences over the local domestic service industry.

therefore include this term in order to avoid spurious correlation. New job arrivals at fast growing industries significantly encourage school dropout compared to slow growing industries.

Once the full set of interactions are included, there is no longer a negative effect from either being a Maquiladora or being in an export intensive industry. In fact, these coefficients become positive and significant. Therefore, new exporting jobs actually encourage students to stay in school relative to non-exporting industries with identical characteristics.

In the conceptual framework, I highlighted three industry characteristics that encourage school dropout in the context of a labor market with stochastic vacancies, namely a large number of jobs available to young unskilled workers, relatively high wages for very low skill workers and a low serial correlation of new job opportunities. I find strong support for the relevance of at least the first two of these characteristics.

These industry characteristics are typical of export manufacturing firms in Mexico. The fact that exporting sectors possess the industry characteristics that induce dropout is not a coincidence. Mexico, like many other developing countries with large export manufacturing sectors, has an abundance of low skill labor. Therefore, the Heckscher-Ohlin theorem would predict that Mexico has a comparative advantage in industries intensive in that factor. Firms hoping to manufacture in Mexico for export therefore use technologies and produce products that are intensive in unskilled labor. For a variety of reasons listed previously, exporting firms also pay wages that are relatively high for the age and skill level of workers they employ. Similarly, the volatility of employment in the export manufacturing sector is not coincidental. Bergin, Feenstra, and Hanson (2007) provide evidence that the Maquiladora sector is exceptionally volatile because shocks to US demand are amplified in the employment decisions of firms that outsource to Mexico. The net result is that the new export manufacturing opportunities generated by Mexico's trade liberalization discouraged skill acquisition between 1986 and 2000.

7 Income Effects

I now turn to analyzing the income effects that arise from the arrival of new jobs. The 2000 census records the earned monthly income for everyone employed in the last month. I run the same reduced form as my main specification for schooling, except that I replace schooling with the cohort mean of log earned income, $\ln Y_{mc}$ for employed workers:[86]

$$\ln Y_{mc} = \sum_i \beta_{1i} l_{mci} \boldsymbol{I}^{+} + \sum_i \beta_{2i} l_{mci} \boldsymbol{I}^{-} + \delta_m + \delta_{rc} + \varepsilon_{mc}. \tag{5}$$

The identification argument and the IV strategy are identical to those detailed for the schooling regression in section 3.3. However, reverse causality is less of an issue than in the schooling case as it is unlikely that cohort income deviations in the year 2000 influenced labor demand in previous years.

The income effects of net new job arrivals generally mirror the educational impacts and are shown in table 10. Those industries where new jobs encourage more schooling see positive income gains, as would be expected. However, for high-tech export manufacturing, where new jobs discourage education acquisition, I find the opposite effects. Despite the high wages on offer in the industry, by the year 2000 the average log income of cohorts heavily exposed to the arrival of high-tech export manufacturing jobs in earlier years actually declines compared to less exposed cohorts.[87] The arrival of low-tech export manufacturing jobs brings no such income losses in later years.[88]

The results above pertain only to employed workers. Column 4 of table 11 shows the results of replacing $\ln Y_{mc}$ in equation 5 with the cohort labor force participation rate for individuals not reporting still being at school. The negative income effects of high-tech export manufacturing described above would have a different interpretation if labor force participation rose. However, labor force participation in the year 2000 actually fell with new job opportunities at ages 15 and 16 in this industry, consistent with the high rates of volatility and churn in this industry.

Additionally these estimates, along with the income estimates above, are broken down by gender in the other columns of table 11. There are no gender differences in the impacts of high-tech export jobs. However, female labor force participation does rise significantly when new low-tech export and professional service jobs arrive for females, effects not found in the male sample.

The magnitude of the income loss from high-tech export manufacturing conforms with the estimates

[86] This measure excludes everyone who reports no earned income, and so I am evaluating the wage margin not the labor market participation margin. I use log income as is standard in the labor literature, both to reduce problems related to outliers and because income is typically log normal. I drop all workers who report working for less than 20 hours per week, and winsorize the log wage at the 1 percent tails. Results are essentially unchanged without this cleaning procedure.

[87] There is no evidence that new jobs in export manufacturing alter the variance of earned income, perhaps compensating for the lower income. A similar specification to equation 5, but with log income replaced by the variance of log income, produces insignificant coefficients.

[88] One possible explanation for the lack of a negative income effect, despite lower schooling, is that new jobs at these firms induce the very lowest skill groups to drop out. For this group, the returns to education are particularly flat, and these firms pay a very high premium over the informal sector (shown in figures 9 and 8).

of the returns to schooling in Mexico. For my preferred IV specification, I find a negative coefficient of -0.580 on log income. This corresponds to a "return to schooling" of 7.9 percent per year.[89] This return to an additional year of schooling is in the range of between 7.5 percent and 16.1 percent suggested by Patrinos (1995) and Psacharopoulos, Velez, Panagides, and Yang (1996) for Mexico. An estimate of the returns to schooling in the lower end of this range is not surprising, given that these are hypothetical returns to schooling. I am comparing the income of a student for whom new export manufacturing plants open at her key school leaving age to the income of an otherwise identical student in the alternative scenario, where no factory opened. Because these new export jobs pay high wages, the estimated returns to schooling will be lower than the genuine returns to schooling for the student in the alternative scenario, who did not have a new high-paying export manufacturing job on offer.

I can also calculate a back of the envelope discount rate using my conceptual framework and the coefficients on new high-tech export jobs. With a constant wage throughout the workers lifetime and at-school income at half of work income, the value of the implied discount rate is 11 percent with log utility (where coefficient of risk aversion, σ, equals 1).[90]

It is valuable to note that these coefficients are not representative of the population as a whole. My estimates derive from comparing the subset of the population whose educational choices and incomes were altered by the arrival of new factories in their municipality to similar subgroups who were not exposed to the arrival of new factories at key school leaving ages. This subgroup likely contains youths who have unusually high returns from, or a particular disposition for, factory work. The impact of new factory jobs on the subgroup of non-migrants whose decisions are altered by large firm expansions or contractions is particularly relevant. For an industrial policymaker considering how the education of the local population is affected by the placement of a new factory, this is a subgroup that is of primary interest.

7.1 Individual Welfare Implications

The large positive externalities associated with education make government intervention justifiable. However, before addressing such policy considerations in the conclusion, I will focus on the welfare implications of my findings for the individuals making the education decisions.

In light of my findings, it is important to note that incomes losses do not imply welfare losses. Some

[89] The returns to schooling is the exponential of the income coefficient divided by the coefficient on schooling.

[90] For σ=0.5 the discount rate rises to 13.3 percent, and falls to 7.3 percent for σ=2. If at-school income is a quarter of work income, the discount rates are 2.4 percent, 5.5 percent and 7.6 percent in order of descending risk aversion.

impatient, risk averse or credit-constrained students will quite rationally forgo schooling for immediate income gains, knowing that in a few years their salaries may be lower than if they had stayed at school.

Policymakers could still have paternalistic concerns for their citizens if they believe that adolescents are particularly predisposed to discount the future heavily when faced with delayed and uncertain gains.[91] Similarly, peer effects at this stage of life are particularly strong, and may cause excessive dropout rates.[92]

Credit constraints can also result in youths dropping out of school when new jobs arrive if there are high-return investment opportunities, such as starting a small business, that become feasible with the income from an export manufacturing job. Atkin (2008) provides evidence for a related story, as women induced to work in a factory at young ages make larger health investments in their children. In order for credit constraints to explain my income findings, the returns on the investment must not show up in earned income by the year 2000. Additionally, these credit constraints will also bind when non-export jobs arrive for example, and so new jobs arriving in this sector would have to be impacting educational choices of a different subpopulation that was not credit constrained. As an empirical check on the validity of the credit constraints hypothesis, columns 4 and 5 of table 10 show that the negative schooling coefficients are actually smaller in poorer municipalities where credit constraints are presumably more binding.[93,94] Therefore, the credit constraints story is an unlikely explanation for the negative income effects of new jobs in high-tech export manufacturing.

In a similar vein, high-tech export firms may offer on-the-job training which is more useful to workers than additional years of schooling. Again, the benefits to firm training must be delayed, or else earned income would not be lower in the year 2000. While plausible, the evidence from Mincerian wage regressions using the 2000 census suggests that the return to experience are significantly smaller than the returns to education in both of the two export industries.[95]

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[91] There is a growing body of evidence in cognitive neuroscience, discussed by Oreopoulos (2007), that adolescents are particularly predisposed to such behavior as the frontal lobes associated with planning and decision making only fully develop in adulthood. For example see Sowell, Thompson, Holmes, Jernigan, and Toga (1999) or Galvan, Hare, Parra, Penn, Voss, Glover, and Casey (2006).

[92] In support of such hypotheses, 74 percent of American school dropouts surveyed by Bridgeland, DiIulio, and Morison (2006) would want to stay in school if they could relive that decision.

[93] High-tech export manufacturing increases incomes in poorer municipalities, although students still drop out of school early (table 8). In these areas, the high wages on offer may compensate for the lower level of education, given the paucity of well-paying local alternatives.

[94] If there are also higher returns to investment in richer municipalities, credit constraints could drive larger negative income effects in richer municipalities.

[95] I run the Mincer regression described in footnote 84 but allowing returns to experience to vary by industry. The coefficients on experience are 3 percent per year for both export industries, while the returns to the three years required to complete high school are 19 percent in both industries. Three years of export experience increases income significantly less than attending high school.

There are several situations where the income losses I find would imply clear welfare losses. Students may drop out early in anticipation of obtaining a high-tech export manufacturing job in the future, but they are unable to obtain a job at that firm when they apply. Alternatively, students may actually be misestimating the industry wage profile and did not expect their incomes to be lower by the year 2000.[96] If students incorrectly forecast future incomes, as in these two situations, a specific policy remedy may be appropriate if the policymaker possesses better information than the students. [97]

8 Conclusions

This paper finds that for Mexico during the period 1986 to 2000, the changing industry composition brought about by trade liberalization altered the skill distribution. In particular, new export manufacturing jobs induced students to drop out of school at younger ages. The magnitudes I find suggest that for every ten new jobs created in high-tech export manufacturing, one student dropped out at grade 9 rather than continuing on through grade 12. Despite high-tech export manufacturing paying high wages for a given skill level, new jobs in this industry eventually reduced incomes for those cohorts in school at the time these jobs arrived, since these workers acquired less education than they would have otherwise. The specific characteristics of export manufacturing in Mexico can explain these negative schooling impacts. Export manufacturing firms offer an abundance of jobs to unskilled workers, these jobs are particularly volatile, and the formal-sector wages that these firms pay are particularly remunerative at lower skill levels, all of which raised the opportunity cost of schooling.

My findings are relevant for designing industrial policies that will allow developing countries to gain fully from the increasing globalization of production. Individual educational decisions have positive externalities, which justify governments all over the world subsidizing school attendance.[98] Accordingly, many developing countries, including Mexico, have prioritized raising the skill level of the workforce. These policies are often based on the explicit assumption that a more educated workforce will attract firms that produce high value-added exports, rather than simple Maquiladora-type assembly operations. It is crucial for the success of such policies to know which types of formal sector employment

[96] In an earlier version of this paper, Atkin (2009) provides empirical evidence that students may not have fully anticipated the decline in the returns to experience that new assembly line technologies brought to this industry.

[97] Jensen (2010) and Nguyen (2007) carry out successful information interventions that provide students with more accurate estimates of the returns to education. In a similar vein, emerging low-cost export manufacturing locations could inform the local population of the volatile nature of these jobs and their likely wage profiles.

[98] The most prominent of these spillovers comes from educated workers making those around them more productive. Lucas (1988) suggests that such human capital externalities may be large enough to explain income differences across the world, and recently Moretti (2004) provides evidence using plant-level data.

opportunities pull students out of school and in what context. For example, the increase in education that accompanied new service sector opportunities in Mexico mirrors the similarly positive impacts that the rise of information technology outsourcing has had on India. Meanwhile, the positive educational impact of high-tech export jobs in the less-skilled south of Mexico echoes the rise in education that accompanied Indonesia's export driven industrialization.

Feedback loops can magnify the initial educational effects of new job arrivals. For example, if export manufacturing lowers skill levels in a municipality, the resulting low-skill population will put downward pressure on unskilled wages and attract even more export-assembly operations. These forces can quickly polarize a country's geographic distribution of schooling attainment, with skilled and unskilled regions forming. Policymakers should also be wary that when footloose export-assembly jobs move to lower-wage countries, as has already started happening to Mexico, the prospects for the areas that encouraged export manufacturing could be bleak, left without jobs or skills.

Fortunately, there are several potential policy remedies. A system of payments conditional upon school attendance would neutralize the negative educational impact of export manufacturing jobs.[99] Alternatively, the age of earliest employment in export manufacturing could be raised above 16 to ensure that most Mexican workers will have already chosen their final education levels before being allowed to work in an export manufacturing plant. Engineering a steadier flow of new firm arrivals could reduce dropout by putting less pressure on students to grab formal sector jobs as soon as they appear.[100] Reducing the psychic cost of returning to school in later life would allow adults to obtain the foregone education should the export manufacturing jobs dry up or if the adult comes to regret their decision to drop out of school. Finally, policymakers may wish to more vigorously promote the type of exporting firms which offer jobs that demand relatively high levels of education, and thereby encourage, rather than discourage, skill acquisition.

[99] The much-studied Progresa program in Mexico does just that, providing cash transfers to parents who keep their children in school up to grade 9 (Schultz 2004). The roll out was too late to have an impact on my sample.

[100] I find some support for this hypothesis as municipalities which experienced more variable job growth had lower average educational attainment, conditional upon the mean job growth in the municipality. Results available on request.

Appendix A Migration Composition Effects

The negative educational effects of new export manufacturing jobs that I find may be spurious if new jobs prevent low skilled individuals from migrating, and thereby lower the average education of my sample without changing schooling decisions. I carry out two empirical tests to explore the relevance of such out-migration composition effects.

The first test looks at the size of different cohorts of non-migrants. If these composition effects are important, and if the less skilled are deciding not to migrate, the size of the sample cohort should rise with new jobs in export manufacturing. To test this hypothesis, I replace cohort years of schooling with log cohort size $\ln N_{mc}$ in equation 2, the main specification:[101]

$$\ln N_{mc} = \sum_i \beta_{1i} l_{mci} \boldsymbol{I}^{+} + \sum_i \beta_{2i} l_{mci} \boldsymbol{I}^{-} + \delta_m + \delta_{rc} + \varepsilon_{mc}.$$

Table 12 shows the results from this regression. The cohort size responds positively to new service jobs, but there seems to be no impact from new jobs arrivals in the three manufacturing sectors.

The second test examines whether skill differences between migrants and non-migrants can explain the negative coefficients on new export manufacturing jobs. If so, I should find that the education of out-migrants rises relative to the education of non-migrants in a municipality when new export manufacturing jobs arrive. As the census only records where people lived in 1995, I cannot exploit the panel dimension of my data. Instead, I take the average education of people who lived in the municipality in 1995 but not in 2000, $S_{leave,mt}$, divided by the education of people who lived in the municipality in both 1995 and 2000, $S_{stay,mt}$, as my dependent variable.[102] The ratio is then regressed on the sum of the changes in employment over these years by industry, interacted with positive and negative indicator dummies. I also include a full set of state dummy variables:

$$\frac{1}{5} \sum_{t=95}^{99} \frac{S_{leave,mt}}{S_{stay,mt}} = \sum_i \beta_{1i} [\sum_{t=95}^{99} l_{mit}] \boldsymbol{I}^{+} + \sum_i \beta_{2i} [\sum_{t=95}^{99} l_{mit}] \boldsymbol{I}^{-} + \delta_r + \varepsilon_m.$$

If my finding of negative schooling impacts from new export jobs is driven by the less educated remaining in the municipality when new jobs arrive, the ratio of leavers to stayers education will

[101] I use log cohort size as municipality populations vary greatly. By using logs I am looking at proportional changes. Net new jobs are already scaled, as they are divided by the number of workers in the municipality.

[102] Accordingly, I restrict my sample to cohorts who turned 15 or 16 between 1995 and 1999.

increase with positive changes in employment between 1995 and 2000 (β_{1i}>0).

The results are reported in table 12. For all sectors the β_{1i} coefficients are negative. New formal jobs keep the more educated youth in the municipality.[103] This is strong evidence, at least for the later years in the sample, that when new jobs arrive, out-migration effects would tend to increase cohort education averages through composition effects. Therefore, the magnitude of my finding that new export manufacturing jobs reduce schooling is likely attenuated by out-migration. The fact that new jobs in other sectors increased education, however, may purely or partly be coming from composition effects.

Migration may have other effects on my estmates. For example, if a particular industry only employs migrants, then new jobs in that industry should have no impact on the education decisions of local youth. I test this hypothesis using the in-migrants I identify in the 2000 census. I calculate ϑ_{mi}, the proportion of migrants in each industry in each municipality and then interact ϑ_{mi} with positive and negative net new jobs per worker:

$$S_{mc} = \sum_i \beta_{1i} l_{mci} \boldsymbol{I}^+ + \sum_i \beta_{3i} l_{mci} \vartheta_{mi} \boldsymbol{I}^+ + ... + \delta_m + \delta_{rc} + \varepsilon_{mc}.$$

If the presence of migrants reduces the impact of new job arrivals on the local population, I expect β_{3i} to be significant and of the opposite sign to β_{1i}. These results are detailed in table 13. For high-tech export manufacturing, commerce and non export manufacturing, I find the expected pattern.[104] The magnitudes of β_{3i} and β_{1i} are similar, implying that there is essentially no effect on non-migrant education when new jobs arrive in an industry that employs only migrants. The implication of this finding is that, in the absence of internal migration in Mexico, local education choices will be even more affected by the arrival of new employment opportunities than my results suggest.

[103] For job losses, the effects are also negative or highly insignificant, implying that the more educated leave the municipality when there are no formal sector jobs.

[104] Although in the latter case, the β_{3i} term is not significant.

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Figure 1: Manufacturing Industry Features

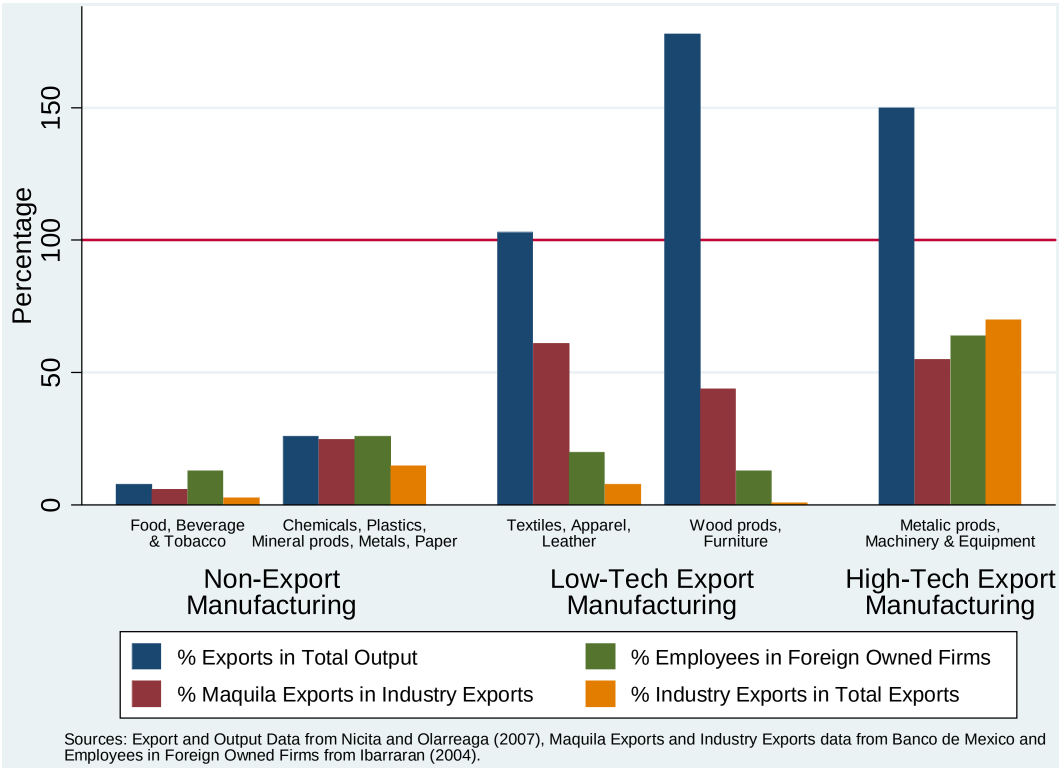


Figure 2: Manufacturing Employment Changes

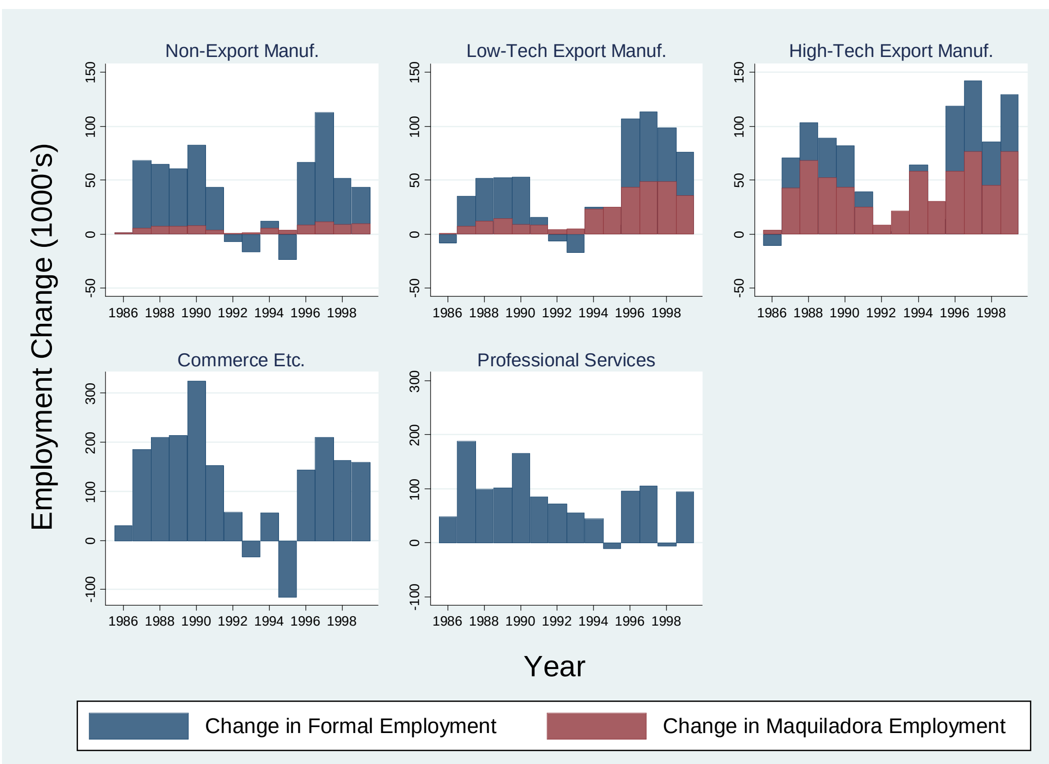
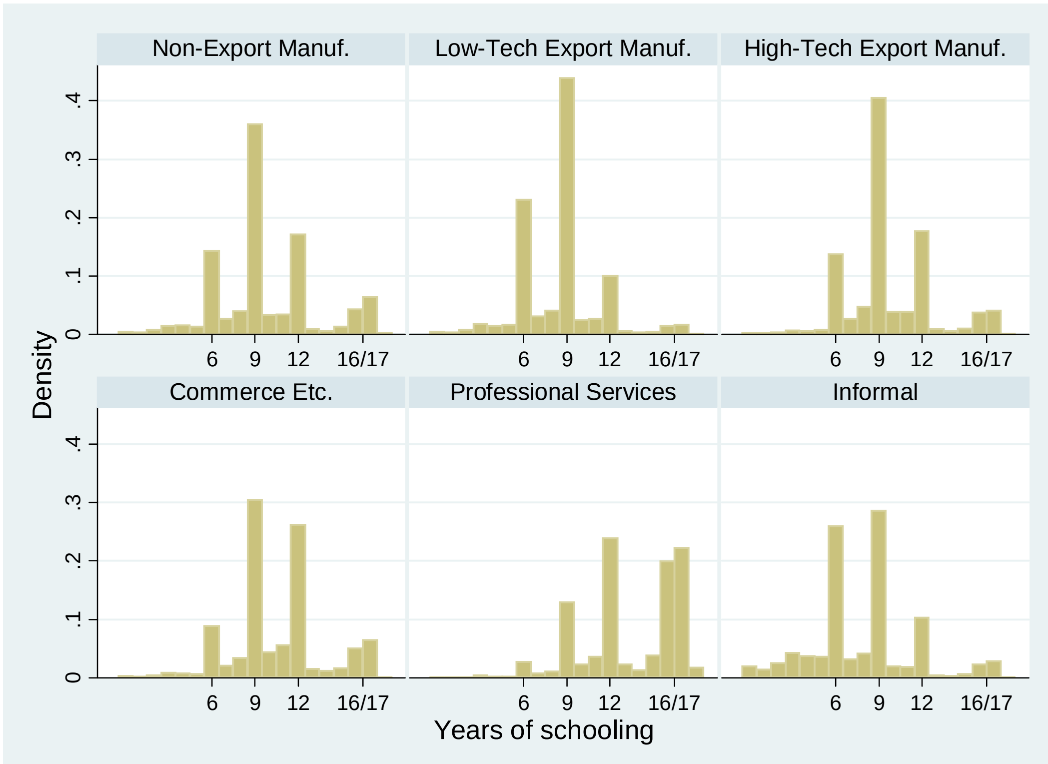


Figure 3: Histogram of Education by Industry (2000, Insured by IMSS)



Histogram of Education by Industry (1990 and change 1990-2000, All Workers)

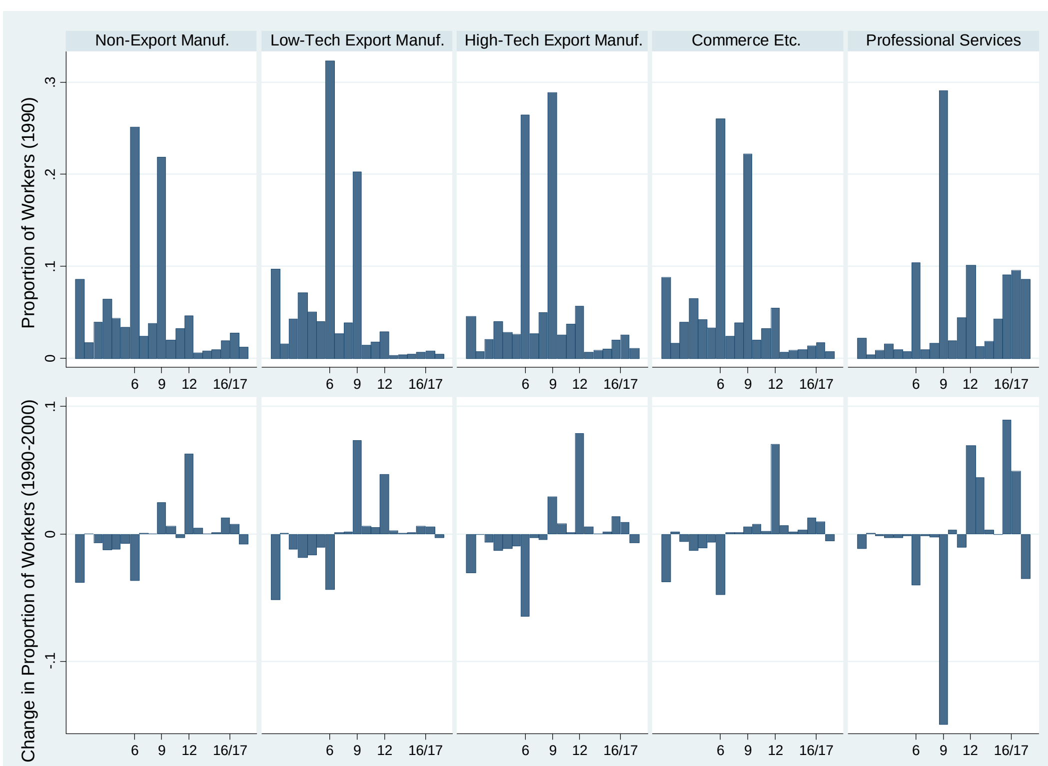
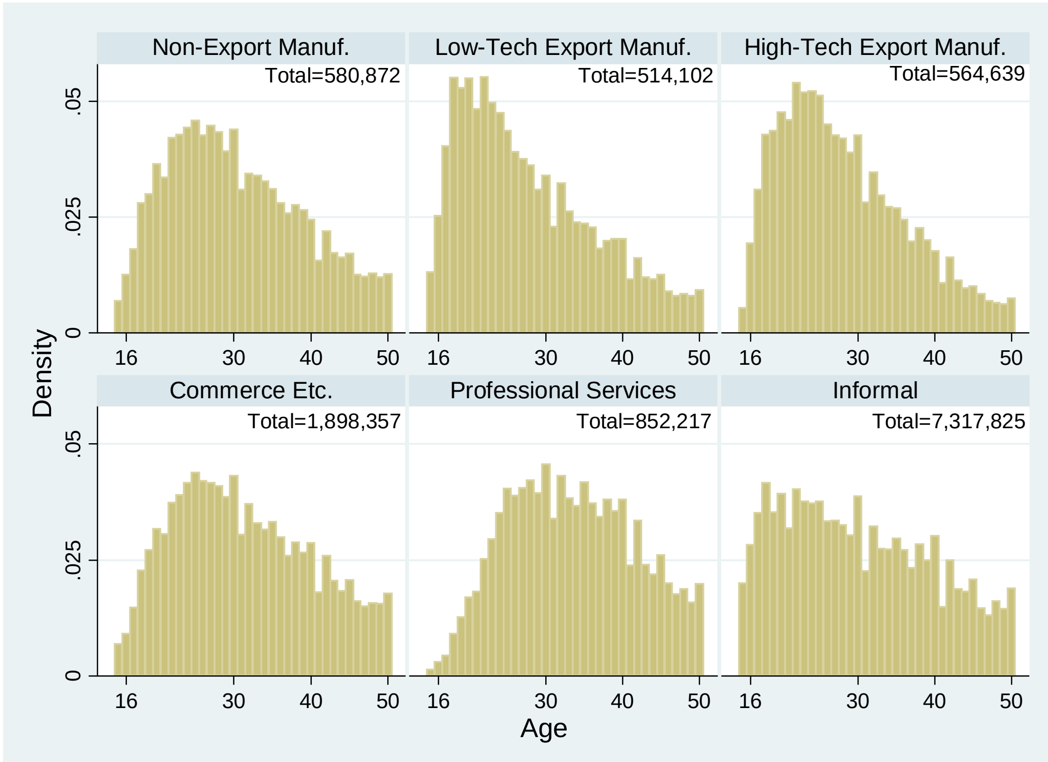


Figure 4: Histogram of Employee Age by Industry (2000, Insured by IMSS)



Histogram of Employee Age by Industry (1990 and change 1990-2000, All Workers)

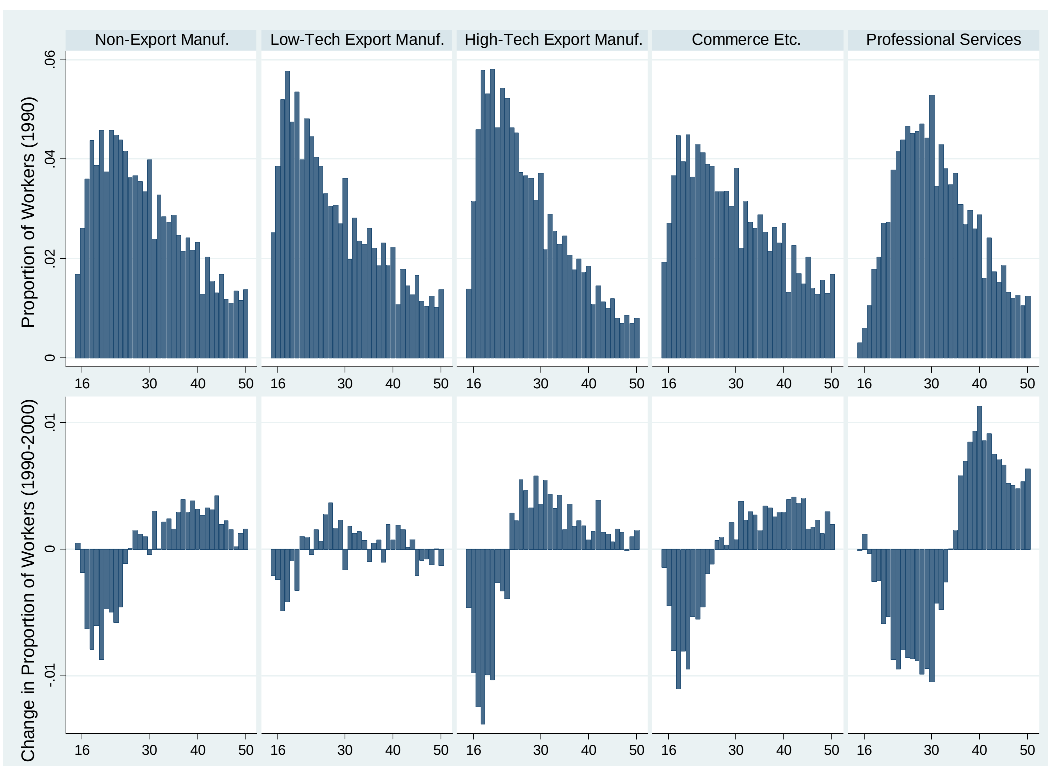
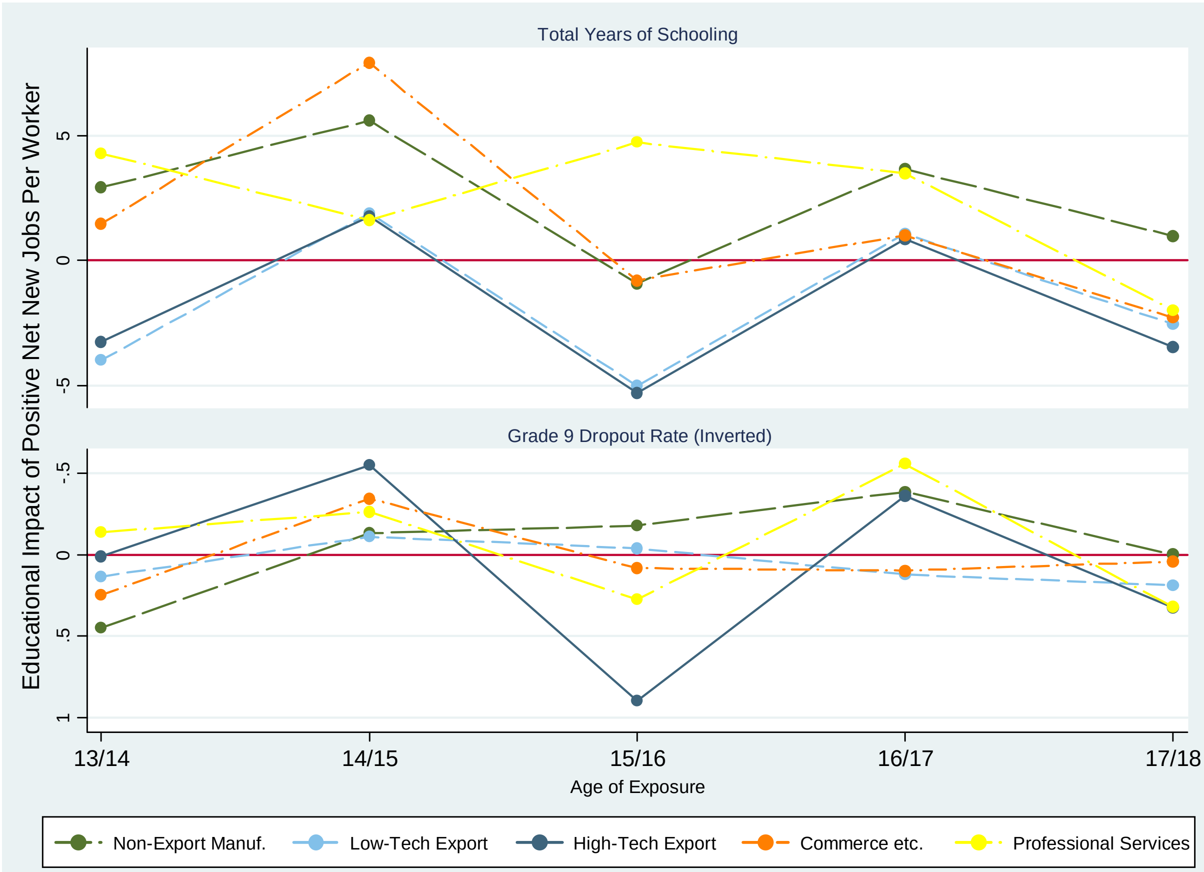


Figure 5: Visual Identification for 20 Municipalities with Biggest High-Tech Export Manufacturing Inflows

Figure 6: Effect of Positive Net New Jobs per Worker Including Multiple Exposure Ages (IV)



Effect of Positive Net New Jobs per Worker, Separate Regressions at Multiple Exposure Ages

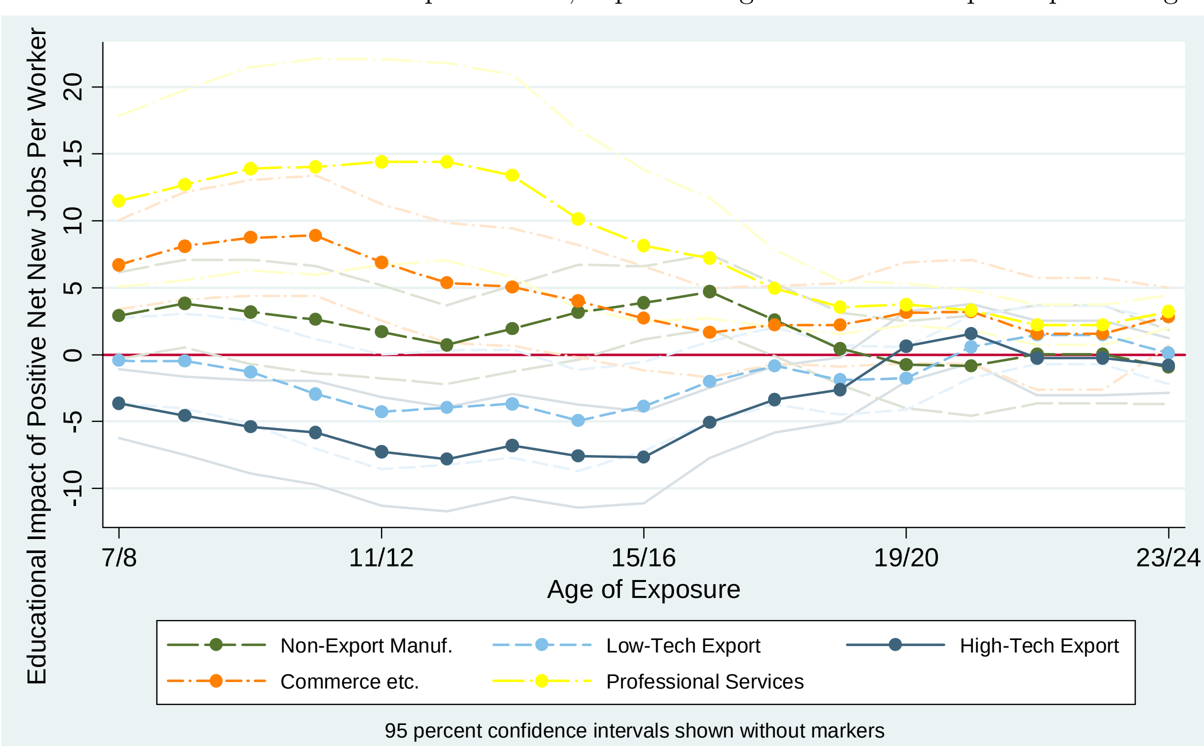
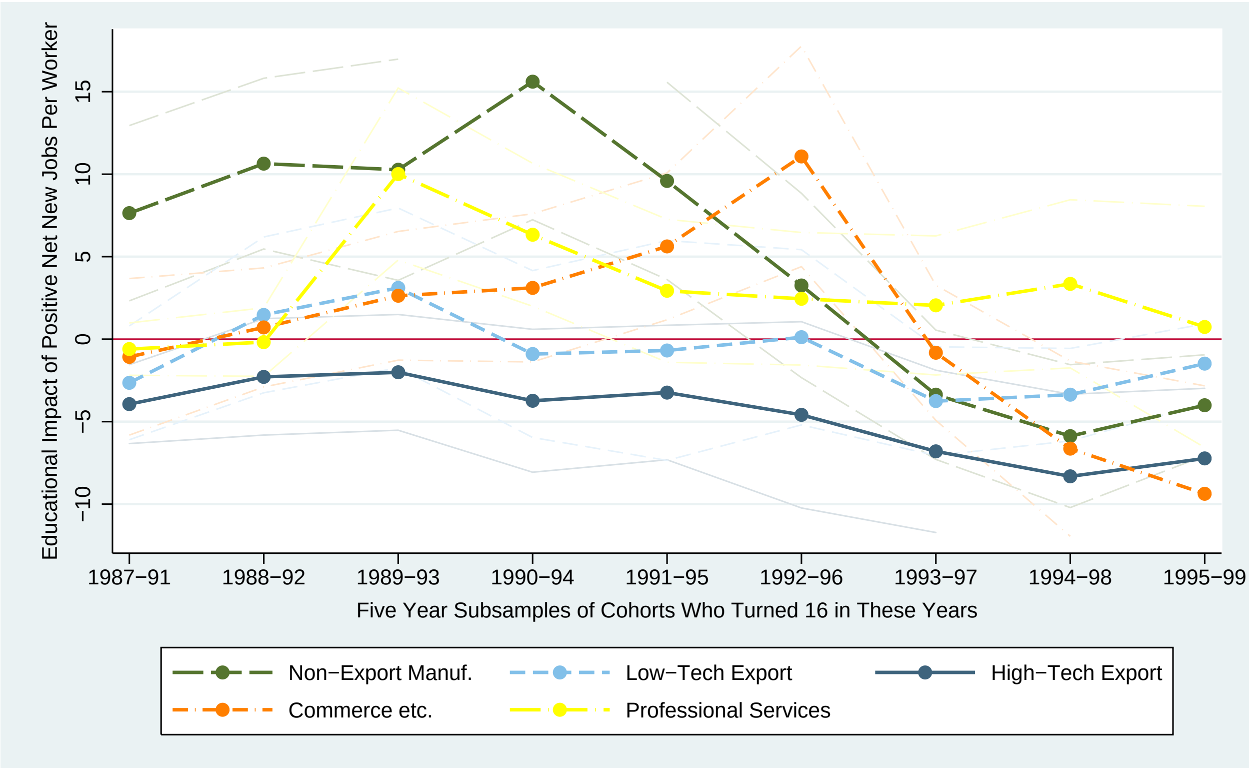
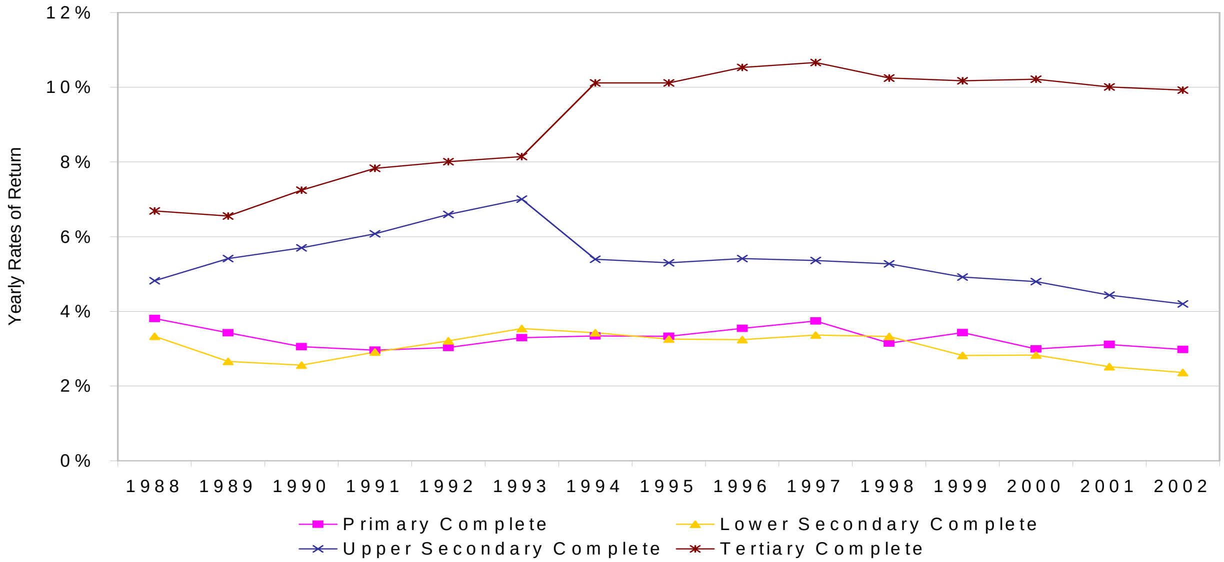


Figure 7: Effect of Positive Net New Jobs per Worker at Different Sample Periods (IV)



Yearly Rates of Return to Education Level, Mexico Urban Areas, 1988-2002



Note: Lower panel from Lopez-Acevedo (2006), "Mexico: Two Decades of the Evolution of Education and Inequality", calculated using data from the National Urban Employment Survey.

Figure 8: Formal Sector Wage Premia for New Workers (2000, Insured by IMSS)

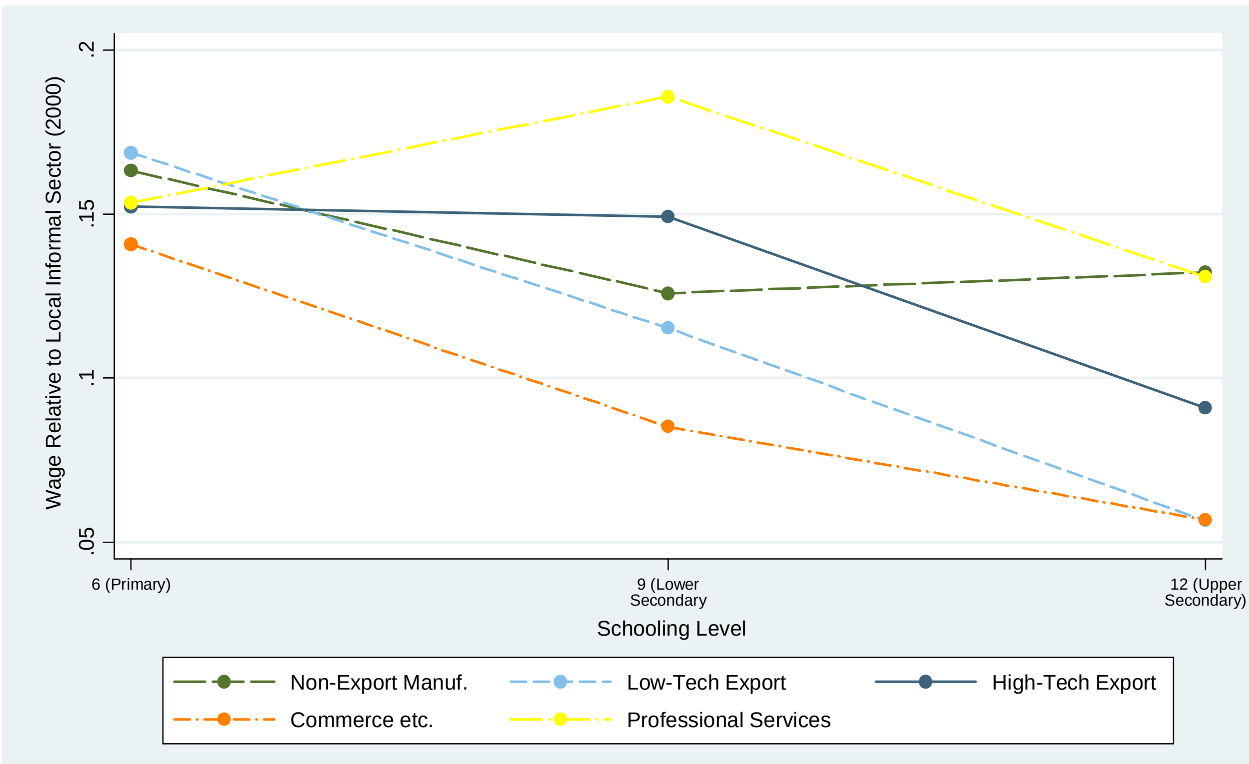
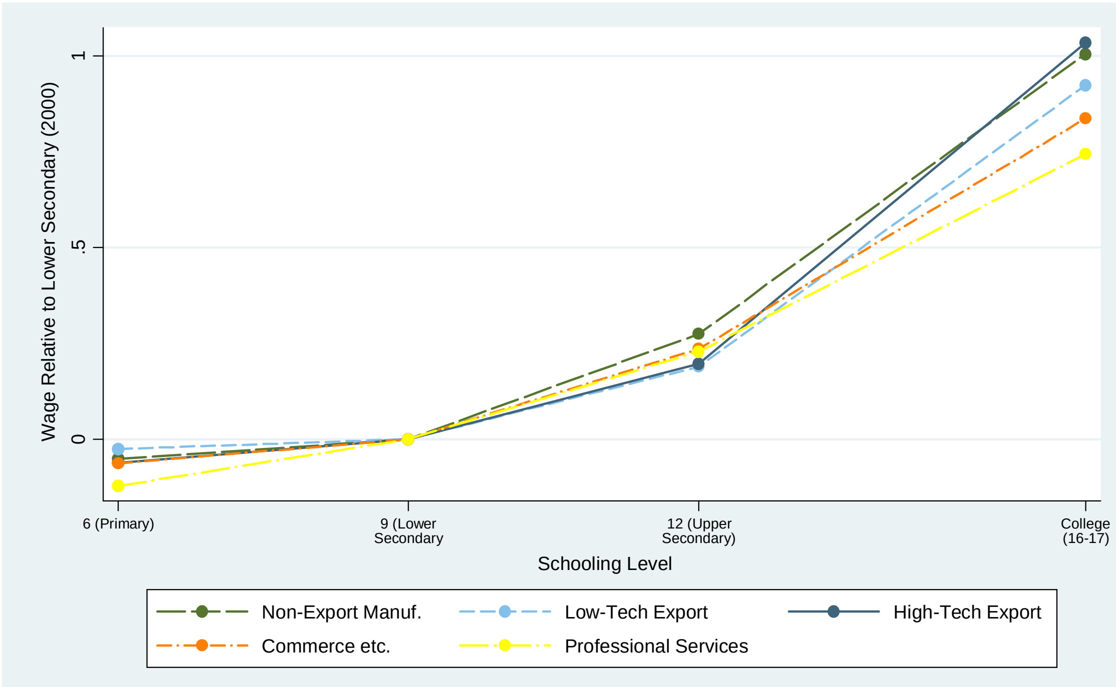


Figure 9: Returns to Schooling for New Workers (2000, Insured by IMSS)



Tenure-Wage Profile for Different Levels of Schooling (2000, Insured by IMSS)

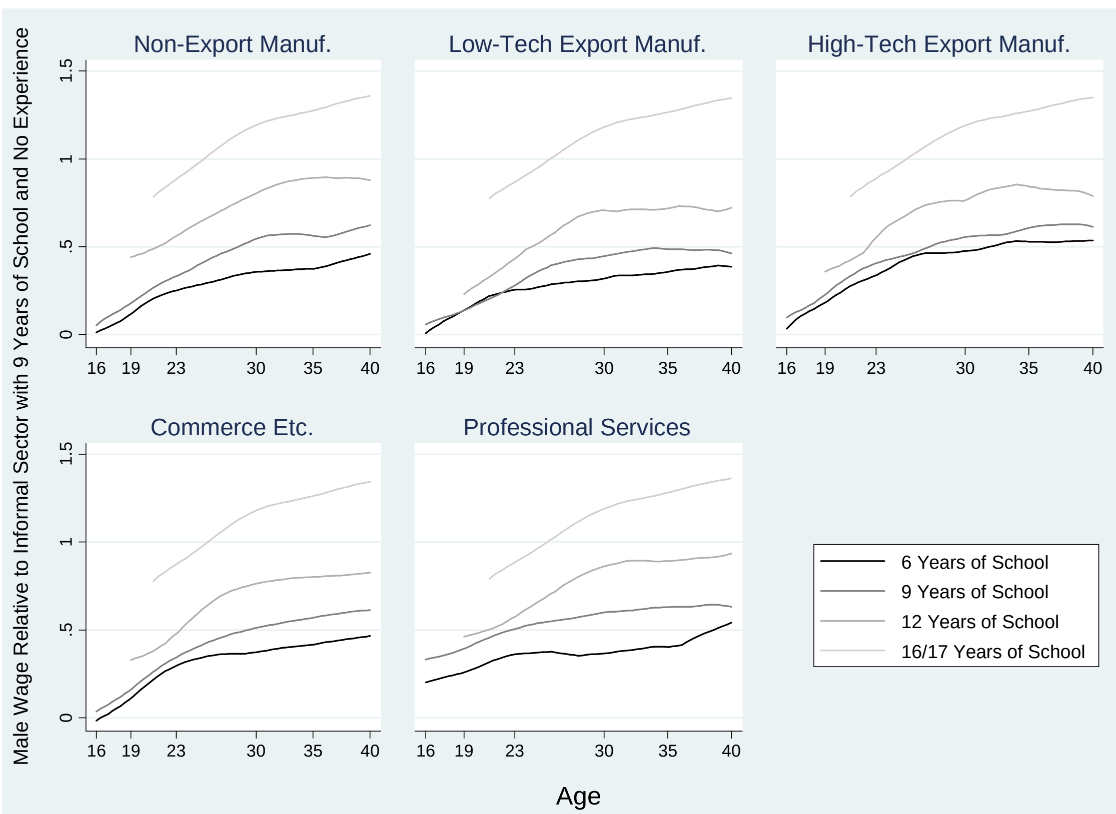


Table 1: Sample Means

Census Schooling Sample (2000, Age 16-28, Non Migrants, Excludes Mexico City)			
	mean	standard deviation	observations
Age	21.54	0.0038	1,706,582
Years of School	8.51	0.0038	1,636,520
Attending School (1=yes, 0=no)	0.21	0.0004	1,696,172
Employed (1=yes, 0=no)	0.52	0.0005	1,706,582
Insured by IMSS (1=yes, 0=no)	0.42	0.0011	1,706,582
Monthly Log Earned Income (Pesos)	7.47	0.0011	667,103
Sex (1=male, 0=female)	0.48	0.0005	1,706,582
Municipality Size	8540.26	816.7	1808
IMSS Annual Firm Sample (1985-2000)			
	mean	standard deviation	observations
Firm Size (Employees)	12.08	0.044	11,365,321
Firm Size (Firms Changing Employment)	16.03	0.065	7,675,094
Firm Size (Firms Hiring/Firing$\geq$ 50 in single year)	416.41	4.140	109,263
Proportion Male Workers	0.68		11,365,321
Unique Firms			2,194,681
Employees (1985)			4,472,491
Firms (1985)			372,520
Employees (2000)			12,509,298
Firms (2000)			912,284

Table 2: Transition Matrix for Net New Jobs Per Worker

	Next Periods Value			Next Periods Value			Next Periods Value		
Initial Value	Negative	Zero	Positive	Negative	Zero	Positive	Negative	Zero	Positive
	Non Export Manuf.			Low-Tech Export Manuf.			High-Tech Export Manuf.		
Negative	53.03	3.10	43.87	53.76	2.87	43.38	51.08	4.13	44.79
Zero	4.94	91.84	3.23	3.94	94.7	1.36	3.79	94.4	1.81
Positive	18.51	6.12	75.37	18.04	8.44	73.52	18.83	10.29	70.88
	Commerce etc.			Professional Services					
Negative	51.65	1.79	46.55	48.85	2.67	48.47			
Zero	5.22	90.72	4.06	2.51	93.98	3.51			
Positive	15.23	3.30	81.47	11.09	6.78	82.13			

Table 3: The Effect of Net New Jobs on Educational Attainment

Net New Jobs/Worker at Age 15-16	(1) OLS	(2) IV (Large Δs)	(3) RF (Large Δs)	(4) IV2 (Bartik)	(5) IV1 & IV2
		Cohort Average Completed Years of Schooling			
Non Export Manufacturing	2.349**	1.454	1.509	-5.190	1.755*
	(1.03)	(1.02)	(1.03)	(4.04)	(1.026)
Low-Tech Export Manufacturing	-3.677***	-4.019***	-4.311***	-10.38***	-3.550**
	(1.17)	(1.39)	(1.48)	(2.94)	(1.386)
High-Tech Export Manufacturing	-6.910***	-6.548***	-6.657***	-10.93**	-6.605***
	(1.51)	(1.41)	(1.46)	(4.36)	(1.440)
Commerce, Personal Services	6.101***	1.422	1.759	10.97***	4.419***
	(1.31)	(1.32)	(1.60)	(3.45)	(1.388)
Professional Services	5.119***	4.942***	4.969***	19.75***	5.171***
	(1.49)	(1.51)	(1.54)	(6.27)	(1.538)
Observations	23484	23484	23484	23466	23466
R^2	0.26	0.26	0.25	0.20	0.26
Municipalities	1808	1808	1808	1808	1808
Kleibergen-Paap F-stat (1^{st} Stage)		558.03		10.08	249.50

Notes: Dependent variable is the cohort average years of schooling in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16. The IV (LargeΔs) column instruments net new jobs per worker by the net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. The RF (LargeΔs) column is the reduced form regression, and regresses schooling on net new jobs per worker attributable to firms that expand or contract employment by 50 or more employees in a single year. The IV (Bartik) column instruments net new jobs per worker with the predicted net new jobs per worker if existing employment in industry i municipality m grew at the state-industry growth rate that year. State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 4: The Assymetric Effect of Net New Jobs on Educational Attainment

LHS: Cohort Average Years of School	(1) OLS	(2) IV (Large Δs)	(3) RF (Large Δs)
Positive Net New Jobs Per Worker at Ages 15-16			
Non Export Manufacturing	5.119***	3.870***	4.175***
	(1.53)	(1.39)	(1.41)
Low-Tech Export Manufacturing	-3.601**	-3.862**	-4.095**
	(1.46)	(1.70)	(1.82)
High-Tech Export Manufacturing	-8.056***	-7.674***	-7.741***
	(1.86)	(1.75)	(1.80)
Commerce, Personal Services	8.405***	2.708	3.775
	(1.82)	(1.97)	(2.50)
Professional Services	9.150***	8.123***	8.378***
	(3.17)	(2.90)	(3.04)
Negative Net New Jobs Per Worker at Ages 15-16			
Non Export Manufacturing	-2.394	-2.510	-2.406
	(1.58)	(1.70)	(1.67)
Low-Tech Export Manufacturing	-4.398*	-4.917	-5.195*
	(2.51)	(3.01)	(2.89)
High-Tech Export Manufacturing	-5.808*	-4.169	-4.259
	(3.13)	(3.15)	(3.21)
Commerce, Personal Services	-4.004**	-2.521	-1.832
	(1.72)	(2.56)	(2.15)
Professional Services	-13.11***	-9.315***	-8.052***
	(2.79)	(2.47)	(2.13)
Observations	23484	23484	23484
R^2	0.27	0.27	0.26
Municipalities	1808	1808	1808
Kleibergen-Paap rk Wald F-stat (1^{st} Stage)		86.50	

Notes: Dependent variable is the cohort average years of schooling in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16 interacted with a dummy variable that takes the value 1 if net new jobs per worker is positive, and another dummy variable that takes the value 1 if net new jobs per worker is negative. The IV (LargeΔs) column instruments (interacted) net new jobs per worker by the (interacted) net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. The RF (LargeΔs) column is the reduced form regression, and regresses schooling on (interacted) net new jobs per worker attributable to firms that expand or contract employment by 50 or more employees in a single year. State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 5: The Effect of Net New Jobs at Multiple Ages on Educational Attainment

LHS: Cohort Average Years of School			(1) IV (Large Δs)		
Positive Net New Jobs Per Worker at:	Ages 13/14	Ages 14/15	Ages 15/16	Ages 16/17	Ages 17/18
Non Export Manufacturing	2.910	5.586**	-0.923	3.646	0.968
	(2.364)	(2.579)	(2.968)	(2.294)	(1.821)
Low-Tech Export Manufacturing	-4.000**	1.880	-5.022**	1.058	-2.550
	(1.845)	(1.996)	(2.161)	(1.692)	(1.658)
High-Tech Export Manufacturing	-3.277	1.762	-5.313***	0.854	-3.468*
	(2.018)	(1.697)	(1.888)	(1.747)	(2.030)
Commerce, Personal Services	1.460	7.909***	-0.808	0.995	-2.294
	(2.487)	(3.062)	(3.012)	(2.404)	(2.647)
Professional Services	4.267***	1.603	4.711**	3.476*	-1.996
	(1.231)	(1.548)	(1.938)	(1.992)	(3.694)
Negative Net New Jobs Per Worker at:	Ages 13/14	Ages 14/15	Ages 15/16	Ages 16/17	Ages 17/18
Non Export Manufacturing	-3.444	1.498	-0.935	-2.576	6.194
	(2.731)	(3.611)	(3.823)	(2.847)	(4.045)
Low-Tech Export Manufacturing	-6.898	3.621	-3.714	3.031	-8.901***
	(4.219)	(3.692)	(4.391)	(3.940)	(3.416)
High-Tech Export Manufacturing	0.886	5.892**	-3.029	-0.000996	-2.024
	(2.641)	(2.499)	(2.628)	(2.032)	(2.146)
Commerce, Personal Services	-4.997	2.811	-2.335	7.044*	-3.729
	(3.237)	(3.831)	(3.689)	(3.870)	(2.727)
Professional Services	8.326	-0.0191	-0.487	-6.091**	2.342
	(6.351)	(2.144)	(3.889)	(2.380)	(3.421)
Observations					16257
R^2					0.2
Municipalities					1808

Notes: Dependent variable is the cohort average years of schooling in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 13/14 through 17/18 interacted with a dummy variable that takes the value 1 if net new jobs per worker is positive, and another dummy variable that takes the value 1 if net new jobs per worker is negative. The IV (LargeΔs) column instruments (interacted) net new jobs per worker by the (interacted) net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 6: Direct and Indirect Channels

	(1)	(2)	(3)	(4)	(5)	(6)
LHS:	Grade 7	Grade 9	Grade 12	Proportion Tech.	Cohort Avg.	Cohort Avg.
(All Large Δs IV)	Dropout Rate	Dropout Rate	Dropout Rate	Ed. Students	Years of School	Years of School
Positive Net New Jobs Per Worker:	at Ages 12-13	at Ages 15-16	at Ages 18-19	at Ages 15-16	at Ages 15-16	at Ages 15-16
Non Export	0.0428	-0.196	-0.424	0.0086	4.484***	4.374**
Manufacturing	(0.166)	(0.199)	(0.332)	(0.17)	(1.387)	(2.07)
Low-Tech Export	0.596***	0.139	-0.253	-0.247**	-3.750**	-2.701
Manufacturing	(0.186)	(0.185)	(0.358)	(0.12)	(1.723)	(4.30)
High-Tech Export	0.526***	0.443**	-0.130	-0.331***	-7.283***	-8.469**
Manufacturing	(0.144)	(0.179)	(0.224)	(0.12)	(1.798)	(4.28)
Commerce,	-0.407***	0.0817	0.258	-0.0135		-0.327
Personal Services	(0.157)	(0.177)	(0.364)	(0.12)		(2.55)
Professional	-0.695***	-0.227*	0.108	0.334*		-2.442
Services	(0.229)	(0.131)	(0.147)	(0.17)		(5.49)
Positive Net New Female Jobs Per Worker:						at Ages 15-16
Non Export						-0.921
Manufacturing						(3.54)
Low-Tech Export						-1.227
Manufacturing						(3.94)
High-Tech Export						0.970
Manufacturing						(3.55)
Commerce,						6.302
Personal Services						(5.22)
Professional						11.62**
Services						(5.55)
Observations	23466	22409	17565	22622	23484	23484
R^2	0.52	0.41	0.25	0.64	0.25	0.27
Municipalities	1808	1806	1696	1807	1808	1808

Notes: Dependent variables are the cohort average years of schooling in the year 2000, the proportion of secondary and high school students who take the technical education rather than general education track and the proportion of a cohort who reaches grades 6, 9 and 12 but goes no further. Independent variables are net new jobs per worker arriving in cohort's municipality at the given exposure ages interacted with a dummy variable that takes the value 1 if net new jobs per worker is positive, and another dummy variable that takes the value 1 if net new jobs per worker is negative. Negative net new job per worker results not shown. All columns instrument (interacted) net new jobs per worker by the (interacted) net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 7: Robustness Checks 1: Other Specifications

LHS: Cohort Average Years of School	(1) Basic IV	(2) Muni. Trend	(3) Cap at 12	(4) Not at School	(5) Men Only	(6) Women Only	(7) $\lvert\Delta l_{mci}\rvert \geq 100$	(8) Formal Muni.	(9) Rural Trend
Positive Net New Jobs Per Worker at Ages 15-16									
Non Export	3.870***	1.409	1.913**	1.778	2.539**	5.747**	4.723***	3.592***	2.806**
Manufacturing	(1.388)	(1.254)	(0.950)	(1.201)	(1.10)	(2.54)	(1.49)	(1.39)	(1.319)
Low-Tech Export	-3.862**	-1.039	-3.408***	-3.934**	-3.975**	-3.440**	-3.866**	-1.685	-2.451*
Manufacturing	(1.699)	(0.960)	(1.204)	(1.596)	(1.78)	(1.74)	(1.97)	(1.88)	(1.410)
High-Tech Export	-7.674***	-3.417***	-4.904***	-5.426***	-5.880***	-6.211***	-7.745***	-7.572***	-5.708***
Manufacturing	(1.752)	(1.149)	(1.162)	(1.320)	(1.92)	(2.11)	(1.78)	(1.65)	(1.343)
Commerce,	2.708	-2.388**	1.568	2.257	0.582	6.533	2.515	3.353*	2.096
Personal Services	(1.975)	(1.178)	(1.425)	(1.606)	(1.32)	(4.08)	(2.12)	(1.96)	(1.499)
Professional	8.123***	-3.874***	4.453**	4.694**	6.376***	8.479**	7.915***	7.573***	4.012***
Services	(2.897)	(1.105)	(1.779)	(1.907)	(2.14)	(3.42)	(2.86)	(2.64)	(1.405)
Negative Net New Jobs Per Worker at Ages 15-16									
Non Export	-2.510	-1.525	-1.655	-2.125*	-0.773	-10.04***	-3.246*	-1.849	-1.572
Manufacturing	(1.696)	(1.469)	(1.162)	(1.191)	(1.34)	(3.72)	(1.79)	(1.73)	(1.707)
Low-Tech Export	-4.917	-0.0679	-1.413	-3.651	-3.195	0.886	-6.187*	-5.869**	-2.601
Manufacturing	(3.010)	(2.647)	(2.347)	(2.802)	(3.34)	(3.89)	(3.43)	(2.93)	(2.680)
High-Tech Export	-4.169	-2.475	-3.348	-1.494	-5.959***	1.016	-3.945	-4.063	-3.069
Manufacturing	(3.146)	(2.298)	(2.376)	(2.319)	(1.87)	(2.01)	(3.28)	(3.16)	(3.085)
Commerce,	-2.521	-0.501	-1.469	-0.533	-0.280	-11.18	-2.178	-3.225	-3.075
Personal Services	(2.555)	(1.864)	(1.712)	(2.105)	(1.47)	(17.3)	(2.74)	(2.53)	(2.222)
Professional	-9.315***	-3.624**	-6.195***	-5.381***	-6.592**	-7.571***	-7.494***	-9.530***	-9.659***
Services	(2.468)	(1.694)	(1.727)	(1.857)	(2.79)	(2.40)	(2.28)	(2.41)	(1.991)
Observations	23484	23484	23484	23477	23328	23375	23484	13350	23484
R^2	0.27	0.56	0.29	0.42	0.20	0.21	0.27	0.31	0.41
Municipalities	1808	1808	1808	1808	1808	1808	1808	1027	1808

Notes: Dependent variable is the cohort average years of schooling in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16. These variables are instrumented by the net new jobs per worker attributable to firms that expand or contract their employment by more than 50 employees in a single year. Specifications described in section 5. State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** 5 percent and *** 1 percent.

Table 8: Robustness Checks 2: Regional Effects

LHS: Cohort Average Years of School	(10) No Big City	(11) Mex. City	(12) Only ZM	(13) No ZM	(14) North	(15) Central	(16) South	(17) Low Skill	(18) High Skill	(19) Richer	(20) Poorer
Positive Net New Jobs Per Worker at Ages 15-16											
Non Export Manufacturing	3.334**	6.625***	2.022	0.502	7.286***	1.118	5.068**	0.477	4.811***	3.398*	3.321**
	(1.321)	(1.818)	(2.939)	(1.585)	(2.395)	(2.612)	(2.088)	(1.457)	(1.793)	(1.825)	(1.656)
Low-Tech Export Manufacturing	-5.033***	-0.425	3.299	-4.751***	-3.368	-3.973*	-9.004	-6.084**	-0.749	-3.770**	-10.46***
	(1.717)	(2.448)	(4.429)	(1.795)	(2.434)	(2.395)	(8.483)	(2.944)	(1.703)	(1.687)	(3.035)
High-Tech Export Manufacturing	-4.961***	-6.524**	-3.785*	-3.867***	-5.477***	-27.06***	9.632	1.086	-6.795***	-6.037***	-8.220***
	(1.574)	(2.660)	(2.226)	(1.357)	(1.604)	(7.978)	(24.78)	(2.449)	(1.490)	(1.597)	(2.647)
Commerce, Personal Services	3.449*	4.125*	-10.79***	4.381**	5.788***	-5.220	7.853**	7.014	2.236	-1.317	4.823**
	(1.823)	(2.398)	(3.318)	(1.724)	(2.213)	(3.741)	(3.605)	(4.284)	(1.813)	(2.017)	(2.406)
Professional Services	6.274**	8.350***	2.317*	9.552***	15.97***	8.262***	-1.953	-3.949	7.154***	6.372***	6.507
	(2.502)	(3.150)	(1.244)	(2.955)	(3.719)	(2.824)	(16.20)	(3.714)	(2.380)	(2.391)	(4.180)
Negative Net New Jobs Per Worker at Ages 15-16											
Non Export Manufacturing	-1.715	-2.785	1.480	-0.221	-4.725	-6.170**	2.496	-2.179	-1.603	-2.650	-2.697
	(1.625)	(1.839)	(3.106)	(1.801)	(3.749)	(2.705)	(2.007)	(2.188)	(1.872)	(1.950)	(3.742)
Low-Tech Export Manufacturing	-3.735	-5.939	16.11	2.664	-7.249	-1.940	-22.81	23.25***	-7.976***	-4.855	2.048
	(3.001)	(3.828)	(15.45)	(2.959)	(5.822)	(3.179)	(15.05)	(5.679)	(2.980)	(4.504)	(4.213)
High-Tech Export Manufacturing	-5.504*	-4.009	-6.738	-2.381	-1.549	4.253	-23.65	66.68	-4.033	-4.175	4.297
	(3.213)	(3.545)	(7.616)	(3.208)	(4.570)	(5.574)	(14.98)	(45.47)	(3.138)	(3.543)	(4.669)
Commerce, Personal Services	-3.399	-2.933	-3.657	-1.196	-7.829**	6.296	0.0768	1.021	-2.656	-0.756	2.793
	(2.371)	(2.684)	(13.33)	(1.925)	(3.414)	(5.349)	(6.185)	(2.131)	(2.934)	(4.231)	(2.532)
Professional Services	-6.255***	-7.942***	-9.832**	-6.659***	-13.01***	-11.81**	2.132	18.71***	-9.806***	-8.620***	-9.325
	(2.135)	(2.379)	(4.101)	(2.433)	(2.799)	(4.828)	(25.70)	(7.041)	(2.405)	(2.456)	(8.155)
Observations	23458	23497	702	22782	4302	9789	9393	11739	11745	11748	11736
R^2	0.23	0.37	0.80	0.16	0.49	0.19	0.18	0.32	0.41	0.36	0.32
Municipalities	1806	1809	54	1754	331	753	724	904	904	904	904

Notes: Dependent variable is the cohort average years of schooling in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16. These variables are instrumented by the net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. Specifications described in section 5. State-time and municipality dummies not shown. Columns 14, 15 and 16 include region-time dummies for six regions of Mexico instead of state-time dummies. Cell population weights, excludes Mexico City (except for column 14) and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** 5 percent and *** 1 percent.

Table 9: The Effect of Net New Jobs on Educational Attainment by Industry Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
IV Specification	LHS: Cohort Average Years of School					
Positive Net New Jobs Per Worker	3.285***	4.398***	4.438***	182.7***	27.45	54.52
(All Industries, All Firms)	(1.011)	(1.202)	(1.211)	(43.88)	(56.47)	(61.23)
$\boldsymbol{I}^{+}\sum_{j\in m}$(New Jobs Per Worker$_j$	-7.017***		-0.612	0.861	5.319**	5.383**
$\times$Maquiladora Indicator$_j$)	(1.696)		(1.841)	(2.013)	(2.671)	(2.727)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$		-0.0380***	-0.0365***	0.000716	0.0605**	0.0586*
$\times\frac{\text{Export}_{i'}\text{mex}}{\text{Output}_{i'}\text{mex}}$)		(0.00857)	(0.0101)	(0.0125)	(0.0246)	(0.0336)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$				-241.3***	85.37	87.09
$\times p_{\text{mex}}$(NewJobs$_{i't+1}>0$|NewJobs$_{i't}>0$))				(62.90)	(108.9)	(112.7)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$				-69.58***	-48.11***	-52.42***
$\times$Employee Share with $S<12_{i'\text{mex}}$)				(14.86)	(14.30)	(17.66)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$					-41.87	-113.2*
$\times$Employee Share$\leq$3 yrs out school$_{i'\text{mex}}$)					(124.4)	(68.46)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$				-0.618***	-0.858***	-12.03***
$\times\frac{\text{Wage Premium }(S=9)_{i'\text{mex}}}{\text{Wage Premium }(S=12)_{i'\text{mex}}}$)				(0.181)	(0.186)	(2.778)
$\boldsymbol{I}^{+}\sum_{j\in m}$(New Jobs Per Worker$_j$					-0.000185*	-5.87e-05
$\times$Firm Employees$_j$)					(0.000108)	(0.000126)
$\boldsymbol{I}^{+}\sum_{i'}$(New Jobs Per Worker$_{i'}$					-436.1***	-305.6***
$\times$Industry Mean Growth Rate$_{i'\text{mex}}$)					(156.2)	(115.6)
Census Used For 3-digit Industry Averages	23484	23484	23484	23484	23484	23484
Observations	0.25	0.26	0.26	0.25	0.27	0.27
R^2	1808	1808	1808	1808	1808	1808
Municipalities	1808	1808	1808	1808	1808	1808

Notes: Dependent variable is cohort average years of schooling in year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16 interacted with positive and negative indicator variables. Negative new new jobs coefficients not shown. Interacted net new jobs per worker terms instrumented with interactions of net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. Additional new jobs terms are interactions between firm/3-digit industry job arrivals and firm/3-digit industry characteristics (firm Maquiladora status, proportion of national industry output exported 1986-1999, national industry transition probabilities of two consecutive years of positive new job arrivals 1986-1999, proportion of national industry employees with less than 12 years of schooling in either the year 2000 or 1990, proportion of national industry employees out of school for 3 years or less in 1990 or 2000, national industry "wage premia" for employees with secondary school divided by premia for those with high school in 1990 or 2000, number of firm employees and national industry mean job growth). State-time and municipality dummies not shown. Regression weighted by cell population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 10: The Effect of Net New Jobs on Log Earned Monthly Income

LHS: Cohort Monthly Log Income, Year 2000 (Pesos)	(1) OLS	(2) IV (Large Δs)	(3) RF (Large Δs)	(4) Richer Mun.	(5) Poorer Mun.
Positive Net New Jobs Per Worker at Ages 15-16					
Non Export Manufacturing	1.051***	0.908***	0.978***	0.822*	0.750
	(0.33)	(0.34)	(0.35)	(0.48)	(0.49)
Low-Tech Export Manufacturing	-0.0125	0.0768	0.0936	0.408	-1.277***
	(0.26)	(0.29)	(0.31)	(0.35)	(0.47)
High-Tech Export Manufacturing	-0.685**	-0.580**	-0.555**	-0.473	0.151
	(0.27)	(0.27)	(0.28)	(0.30)	(0.53)
Commerce, Personal Services	1.553***	0.484	0.696*	-0.0341	0.568
	(0.33)	(0.30)	(0.39)	(0.34)	(0.59)
Professional Services	1.068***	0.917***	0.947***	0.667***	0.0172
	(0.25)	(0.24)	(0.25)	(0.21)	(0.87)
Negative Net New Jobs Per Worker at Ages 15-16					
Non Export Manufacturing	-0.794	-0.852	-0.803	-1.435	0.556
	(0.72)	(0.76)	(0.74)	(0.88)	(1.14)
Low-Tech Export Manufacturing	0.510	-0.123	-0.0723	-0.960	0.778
	(0.51)	(0.53)	(0.50)	(0.81)	(0.83)
High-Tech Export Manufacturing	0.600	0.608	0.623	0.169	2.201*
	(0.70)	(0.73)	(0.73)	(0.85)	(1.13)
Commerce, Personal Services	-1.104**	-0.941	-0.687	-0.381	-0.917
	(0.48)	(0.66)	(0.57)	(0.88)	(0.73)
Professional Services	-0.242	0.184	0.277	0.00402	1.761
	(0.31)	(0.32)	(0.29)	(0.29)	(1.40)
Observations	22069	22069	22069	11132	10937
R^2	0.75	0.75	0.75	0.81	0.62
Municipalities	1802	1802	1802	903	899

Notes: Dependent variable is the cohort average monthly log earned income in the year 2000. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16 interacted with positive and negative value dummies. In columns 2, 4 and 5, these variables are instrumented by the net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. In column 3, the reduced form, I replace net new jobs per worker by net new jobs per worker from large expansions or contractions. In columns 4 and 5, I divide the municipalities into the richer and poorer half by year 2000 municipality average income. State-time and municipality dummies omitted. Cell population weights, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 11: The Effect of Net New Jobs on Income and Participation by Gender

	(1)	(2)	(3)	(4)	(5)	(6)
LHS: (All Large Δs IV)	Cohort Log Income, 2000			Cohort Labor Force Participation, 2000		
Gender:	All	Male	Female	All	Male	Female
Positive Net New Jobs Per Worker at Ages 15-16						
Non Export Manufacturing	0.908***	0.351	1.896**	0.246	0.263*	0.167
	(0.337)	(0.226)	(0.799)	(0.164)	(0.157)	(0.414)
Low-Tech Export Manufacturing	0.0768	0.349	-0.628	0.376**	0.0404	0.506**
	(0.290)	(0.286)	(0.476)	(0.169)	(0.185)	(0.229)
High-Tech Export Manufacturing	-0.580**	-0.383	-0.428	-0.274**	-0.229	-0.232*
	(0.272)	(0.240)	(0.346)	(0.133)	(0.143)	(0.120)
Commerce, Personal Services	0.484	0.124	0.922	0.0798	0.0594	0.320
	(0.296)	(0.229)	(0.685)	(0.152)	(0.110)	(0.345)
Professional Services	0.917***	0.753***	1.086***	0.574***	0.222	0.721***
	(0.242)	(0.243)	(0.241)	(0.183)	(0.147)	(0.201)
Negative Net New Jobs Per Worker at Ages 15-16						
Non Export Manufacturing	-0.852	-0.239	-1.361	0.0855	-0.146	1.184*
	(0.760)	(0.494)	(1.719)	(0.306)	(0.180)	(0.710)
Low-Tech Export Manufacturing	-0.123	-0.0542	-1.066	-1.086***	0.0876	-1.877**
	(0.531)	(0.399)	(0.974)	(0.360)	(0.227)	(0.813)
High-Tech Export Manufacturing	0.608	0.145	0.654	-0.180	-0.120	-0.256
	(0.733)	(0.502)	(0.498)	(0.342)	(0.266)	(0.529)
Commerce, Personal Services	-0.941	-0.295	-3.847	-0.304	-0.0969	-2.205
	(0.657)	(0.342)	(4.644)	(0.282)	(0.136)	(1.967)
Professional Services	0.184	0.220	-0.0808	-1.002***	-1.013***	-0.0103
	(0.317)	(0.401)	(0.469)	(0.219)	(0.237)	(0.256)
Observations	22069	21426	18383	23479	23314	23364
R^2	0.75	0.68	0.57	0.26	0.56	0.13
Municipalities	1802	1799	1735	1808	1808	1808

Notes: Dependent variable is the cohort average monthly log earned income in the year 2000 or the cohort average labor force participation for workers not at school, broken down by gender. Independent variables are net new jobs per worker arriving in cohort's municipality at ages 15 and 16 interacted with positive and negative value dummies. These variables are instrumented by the net new jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time and municipality dummies omitted. Cell population weights, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 12: The Effect of Net New Jobs on Cohort Size and Selective Migration

	(1) Log Cohort Size	(2) Ratio of Leavers Schooling to Stayers (1995-1999)
Positive Net New Jobs Per Worker at Ages 15-16		
Non Export Manufacturing	0.353	-0.434
	(0.51)	(0.59)
Low-Tech Export Manufacturing	-0.512	-0.787*
	(0.40)	(0.47)
High-Tech Export Manufacturing	-0.283	-1.061***
	(0.43)	(0.39)
Commerce, Personal Services	1.299***	-0.485
	(0.39)	(0.55)
Professional Services	1.784***	-2.684***
	(0.62)	(0.77)
Negative Net New Jobs Per Worker at Ages 15-16		
Non Export Manufacturing	0.470	0.840
	(0.48)	(2.45)
Low-Tech Export Manufacturing	-1.071	-0.284**
	(0.82)	(0.12)
High-Tech Export Manufacturing	-0.462	0.0986
	(0.57)	(1.16)
Commerce, Personal Services	-0.754	-1.349
	(0.69)	(1.07)
Professional Services	-2.594***	-1.983
	(0.74)	(1.52)
Observations	23484	1663
R^2	1.00	0.07
Municipalities	1808	1663

Notes: In column 1, State-time and municipality dummies not shown. Regression weighted by total municipality population, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. In column 2, State dummies not shown. Regression weighted by total cohort populations, excludes Mexico City. Robust standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table 13: The Interaction of Industry Migrant Proportions and Net New Jobs

	Cohort Average Years of School
Positive Net New Jobs Per Worker at Ages 15-16	
Non Export Manufacturing	6.275***
	(2.33)
Low-Tech Export Manufacturing	-0.0497
	(3.18)
High-Tech Export Manufacturing	-16.06***
	(4.07)
Commerce, Personal Services	13.53***
	(2.64)
Professional Services	0.126
	(5.46)
Positive Net New Jobs Per Worker at Ages 15-16×Proportion Migrants Workers$_{im}$	
Non Export Manufacturing	-8.125
	(9.98)
Low-Tech Export Manufacturing	-16.83
	(11.0)
High-Tech Export Manufacturing	21.84***
	(7.71)
Commerce, Personal Services	-15.74**
	(6.40)
Professional Services	45.75**
	(18.9)
Observations	22127
R^2	0.91
Municipalities	1703

Notes: ϑ_{im} is the proportion of formal workers in the 2000 census in industry i and municipality m that are neither born in that state nor lived in that municipality 5 years ago. Negative net new jobs per worker not shown. State-time and municipality dummies omitted. Cell population weights, excludes Mexico City and migrants. Municipality clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.