Endogenous
Skill Acquisition and Export Manufacturing in Mexico

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Online Appendix

Appendix A Robustness Results

I present a variety of robustness checks on my key finding, that cohort schooling declines with net new export-manufacturing jobs at age 16. Tables A.1 to A.4 rerun the preferred reduced form specification, repeated in column 1 of each table, with several modifications.

Table A.1 explores how sensitive results are to the removal of the various fixed effects and trends. Columns 2 to 4 sequentially remove the commuting-zone linear trends, the state-specific time dummies and finally the basic time-dummies. Column 5 removes both the commuting-zone fixed effects and linear trends. The coefficient remains negative and becomes about twice as large in magnitude with the removal of the commuting-zone linear trends. One potential explanation is that, with only 14 years of data, the inclusion of a linear trend terms risks over-fitting and causing attenuation due to the inclusion of an excessive number of controls in the regression. Removing the other time fixed effects in columns 3 and 4 results in even larger coefficients. Meanwhile, the removal of the commuting-zone fixed effects and linear trends flips the sign of the relationship. Therefore, the effects I find are primarily coming from variation within commuting zones across time as opposed to variation across commuting zones within time.

Tables A.2 and A.3 investigate how results vary across different geographic samples. In column 2 of Table A.2, I exclude the 781 commuting zones that had no formal sector employment during the period. As these commuting zones are generally very small, they have little impact on my weighted regression results. Column 3 controls for the fact that the Progresa conditional cash transfer program was rolled out at the end of the sample period. 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 include a Progresa dummy takes the value 1 in the 1998 and 1999 if more than 10 percent of the commuting-zone population reported receiving Progresa or Procampo payments in the 2000 census (no specific Progresa indicator is available in the census). Column 4 excludes the two large cities in the sample, Monterrey and Guadalajara, which may have been driving my population weighted results. In both columns 3 and 4, results are unchanged. Finally, column 5 reproduces the main specification but without the cohort population weights that are used in all other specifications. The coefficient is slightly smaller, but still highly significant.

In Table A.3, I explore additional geographic subsamples. Columns 1-3 focus on the Northern region, the Central region and the Southern region of Mexico respectively. Results are similar in the North and Center of the country. In the South of the country I find a larger negative coefficient. Since there was very little export job creation in the South, it is perhaps not unsurprising that when these jobs arrived, the impacts were particaulry large. In the remaining columns, I replace the state-time fixed effects with region-time fixed effects using three regions of Mexico (North, Center and South). The region-time fixed effects allow me to include Mexico City (which is its own State). Additionally, region-time fixed effects allow me to separately run regressions on various sub-samples for which there is limited variation in the presence of 31×14 state-time dummies. Column 5 reproduces the standard specification but with region-time fixed effects. The coefficient is similar but slightly smaller than the state-time fixed effects specification. The coefficient changes little in column 6 where I includes the Valle de México metropolitan zone that contains Mexico City. Column 7 restricts the sample to the 54 metropolitan zones in Mexico. Column 8 restricts the sample to the 1754 non-metropolitan commuting zones in my data set. Results are similar except for the case when I focus only on metropolitan zones where I find no negative schooling effect. These results suggest that the dropout effects I find are coming primarily from smaller towns and cities.

Finally, Table A.4 examines various alternative specifications. One concern is that schooling is mismeasured as I only observe completed schooling in the year 2000 and youths may go on to obtain additional schooling at a later date. In column 2, 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 commuting zone. I also note that adult education was uncommmon in Mexico over this period.[1] In column 3, 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.

Column 4 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 in a

[1]The 2003 World Bank report "Status of Education for Out of School Adults in Mexico" (downloaded from http://siteresources.worldbank.org/EDUCATION/Resources/278200-1126210664195/1636971-1126210694253/Status_Out_School_Mexico.pdf) contains figures on adult education in Mexico. In 1983, just prior to the start of my sample, 13,279 grade school certificates and 13,021 lower secondary school certificates were awarded to adults out of a population of approximately 25 million adults without completed lower secondary schooling. By the end of the sample, the year 2000, 188,800 grade school certificates and 305,500 lower secondary school certificates were awarded to adults out of a population of 32.5 million adults without completed lower secondary schooling. In terms of returning to high school during my sample period, the World Bank report states: "There has been minimal effort in Mexico to reduce the out-of-school adult population that has not completed their upper secondary education. In fact it is only recently in 2001-02, that educational authorities have become aware of the magnitude of the problem."

single year. One potential worry with my identification strategy is that my variation may be driven by large expansions and contractions at firms that almost always expand (or contract) by more than 50 employees each year. For these firms, the firm-level year-to-year variation may be small and potentially driven by changes in the educational decisions of the cohort aged 16. Columns 5 and 6 show that this is not the case by restricting attention to large expansions and contractions that are unusually large for the firm in question. Column 5 restricts attention to shocks where the absolute change in firm-level employment is both above 50 and more than 1 standard deviation above the mean employment change at that firm. Column 6 restricts attention to large shocks at firms that do not experience absolute changes in employment of more than 50 in more than half of the periods in which the firm appears in the data. In both cases, I find similar or larger effect sizes.

Columns 7-8 of Table A.4 separate new export job arrivals into the jobs created (firm expansions or openings) and the jobs destroyed (firm contractions or closures) in each commuting-zone year cell. Column 7 includes only new job creation, labeled hires, and I find similar magnitudes. Column 8 includes both job creation (hires) and job destruction (fires) with the latter coded as negative numbers. The coefficient is of a similar magnitude for both; job expansions lower education, and job contractions raise education. Column 9 interacts new export job arrivals with a positive and a negative indicator dummy. Therefore, I allow for years of net new job losses (negative values of l_{zc}) to have potentially different effects from years of net new job gains (positive values of l_{zc}). I find similar coefficients on both.

Finally, column 10 investigates the possibility that there are geographic spillovers. For example, a student may decide to drop out of school due to new export job opportunities in the State capital. I calculate the net new export job arrivals at age 16 in all other commuting zones in the state and divide this number by the working age population of those other commuting zones. I include this state-level job measure as an additional independent variable (and replace state-time dummies with region-time dummies to avoid collinearity). The coefficient on state-level net new export jobs per worker is positive but insignificant, providing limited evidence for this hypothesis.

In summary, there is a robust negative impact of new export-manufacturing jobs at age 16 on cohort schooling.

Table A.1: Robustness: Fewer Fixed Effects

	(1)	(2)	(3)	(4)	(5)
	Baseline	*Fewer Fixed Effects*			
	Cohort Average Completed Years of Schooling (All RF, Large Δs)				
Net New Export Manufacturing	-3.306***	-7.016***	-8.490***	-12.31***	8.095**
Jobs/Worker at Age 16	(0.690)	(1.073)	(1.665)	(3.062)	(4.118)
Commuting-Zone Fixed Effects	Yes	Yes	Yes	Yes	No
Commuting-Zone Linear Trends	Yes	No	No	No	No
State-Time Dummies	Yes	Yes	No	No	Yes
Time Dummies	Yes	Yes	Yes	No	Yes
Observations	25,289	25,289	25,289	25,289	25,289
R^2	0.942	0.904	0.892	0.876	0.327
Commuting Zones	1808	1808	1808	1808	1808

Notes: Dependent variable is cohort average years of schooling in the year 2000. Independent variable is net new export-manufacturing jobs per worker arriving in cohort's commuting zone at age 16 attributable to firms that expand or contract their employment by 50 or more employees in a single year. Column 1 repeats the baseline specification with state-time dummies, commuting-zone dummies and commuting-zone linear trends. Columns 2-4 sequentially remove commuting-zone linear trends, state-time dummies and time-dummies. Column 5 removes commuting-zone fixed effects and linear trends. Regressions weighted by cell population, exclude Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table A.2: Robustness: Different Geographical Samples

	(1)	(2)	(3)	(4)	(5)
	Baseline	*No Informal commuting zones*	*Progresa Dummy*	*No Monterrey or Guadalajara*	*Regression Unweighted*
	Cohort Average Completed Years of Schooling (All RF, Large Δs)				
Net New Export Manuf.	-3.306***	-3.234***	-3.268***	-3.154***	-2.741***
Jobs/Worker at Age 16	(0.690)	(0.691)	(0.693)	(0.690)	(0.880)
Observations	25,289	14,376	25,289	25,261	25,289
R^2	0.942	0.939	0.943	0.935	0.806
Commuting Zones	1808	1027	1808	1806	1808

Notes: Dependent variable is cohort average years of schooling in the year 2000. Independent variable is net new export-manufacturing jobs per worker arriving in cohort's commuting zone at age 16 attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time dummies, commuting-zone dummies and commuting-zone linear trends included. Geographic coverage documented in column headings. Progresa dummy included in column 3 takes the value 1 in the 1998 and 1999 if more than 10 percent of the commuting-zone population reported receiving Progresa or Procampo payments in the 2000 census. Regressions weighted by cell population (except column 5 which is unweighted), exclude Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table A.3: Robustness: Different Geographical Samples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline	*Northern Region*	*Central Region*	*Southern Region*	*Baseline With Region-Time FE*	*Includes Mexico City*	*Metropolitan Zones*	*Non-Metropolitan Commuting Zones*
	Cohort Average Completed Years of Schooling (All RF, Large Δs)							
Net New Export Manuf.	-3.306***	-3.287***	-2.184**	-16.19***	-2.373***	-2.437***	0.892	-2.474***
Jobs/Worker at Age 16	(0.690)	(1.001)	(0.937)	(4.625)	(0.777)	(0.806)	(1.737)	(0.664)
State-Time Dummies	Yes	Yes	Yes	Yes	No	No	No	No
Region-Time Dummies	No	No	No	No	Yes	Yes	Yes	Yes
Observations	25,289	4,633	10,542	10,114	25,289	25,303	756	24,533
R^2	0.942	0.935	0.928	0.931	0.939	0.955	0.964	0.905
Commuting Zones	1808	331	753	724	1808	1809	54	1754

Notes: Dependent variable is cohort average years of schooling in the year 2000. Independent variable is net new export-manufacturing jobs per worker arriving in cohort's commuting zone at age 16 attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time dummies, commuting-zone dummies and commuting-zone linear trends included in columns 1-4. Columns 5-8 replace state-time dummies with region-time dummies. Geographic coverage documented in column headings. Regressions weighted by cell population, exclude Mexico City (except column 6) and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table A.4: Robustness: Alternate Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Baseline Cohort Schooling	*Alternate* Schooling Cap at 12	*School Measures* Schooling (Not at School)	$\lvert\Delta l_{mc}\rvert \geq 100$ Cohort Schooling	*Outlier* $\lvert\Delta l_{mc}\rvert \geq 50$ Cohort Schooling	*Rare* $\lvert\Delta l_{mc}\rvert \geq 50$ Cohort Schooling	*Hires* Cohort Schooling	*Hires/Fires* Cohort Schooling	*Pos/Neg* Cohort Schooling	*State Spillover* Cohort Schooling
Net New Export Manufacturing Jobs/Worker at Age 16 (NNEM)	-3.306*** (0.690)	-2.642*** (0.561)	-3.149*** (0.673)	-3.389*** (0.737)	-3.628*** (0.884)	-5.226** (2.129)				-2.933*** (0.891)
New Hires in Export Manuf. Jobs/Worker at Age 16							-3.479*** (0.884)	-3.414*** (0.912)		
New Fires in Export Manuf. Jobs/Worker at Age 16								-3.111** (1.310)		
Positive NNEM Jobs/Worker at Age 16									-3.413*** (0.846)	
Negative NNEM Jobs/Worker at Age 16									-2.992* (1.759)	
State-Level NNEM Jobs/Worker at Age 16										3.556 (2.370)
Observations	25,289	25,289	25,282	25,289	25,289	25,289	25,289	25,289	25,289	25,289
R^2	0.942	0.939	0.932	0.942	0.942	0.942	0.942	0.942	0.942	0.938
Commuting Zones	1808	1808	1808	1808	1808	1808	1808	1808	1808	1808

Notes: Dependent variable is cohort average years of schooling in the year 2000, other than columns 2 and 3. Dependent variable in column 2 is cohort average schooling with schooling capped at 12 years. Dependent variable in column 3 is cohort average schooling for subset of students not currently attending school. Independent variable is net new export-manufacturing jobs per worker arriving in cohort's commuting zone at age 16 attributable to firms that expand or contract their employment by 50 or more employees in a single year. Column 4 raises the threshold to firms that expand or contract their employment by 100 or more employees in a single year. Columns 5 and 6 restrict attention to expansions or contractions of 50 or more employees that are unusual for that firm (either 1 standard deviation above the firm mean in column 5 or at firms that do not experience absolute changes in employment of more than 50 in more than half of the periods in which the firm appears in the data in column 6). Columns 7-8 break up export job arrivals into net new job arrivals at firms expanding or contracting employment (column 7 includes hires alone, column 8 includes both hires and fires separately). Column 9 separates years of positive and negative net new job arrivals. Column 10 includes an additional independent variable, the net new export job arrivals in other commuting zones in the State. State-time dummies, commuting-zone dummies and commuting-zone linear trends not shown. Column 10 replaces state-time dummies with region-time dummies. Regressions weighted by cell population, exclude Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Appendix B Migration

As discussed in Section 4.5.2, migration could bias my results if local labor market conditions alter the composition of out-migrants. If new export jobs prevent low-education individuals from migrating, the average education of the cohort declines with export job arrivals despite no student altering their schooling decision. I perform two empirical tests in order to dismiss this possible explanation for my findings.

The first test explores the size of different cohorts of non-migrants. If these composition effects are important, and if the less educated 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, $\ln N_{zc}$, in specification 1:[2]

$$\ln N_{zc} = \beta l_{zc} + \delta_z + \delta_z c + \delta_{rc} + \varepsilon_{zc}. \tag{11}$$

Column 1 of Table B.1 show the results from this regression. There is no evidence that cohort size responds positively to net new export-manufacturing job arrivals at age 16. In fact, the basic specification finds a small decline in cohort size. I draw similar conclusions in column 2 where I use an alternate cohort population measure instead of log cohort size: the cohort size divided by the working population at the time of the census.[3]

The second test directly examines the hypothesis that relatively uneducated youths were disproportionately deterred from migrating due to a new factory opening. If this hypothesis is correct, I should find that the education of out-migrants rises relative to the education of non-migrants in a commuting zone when new export-manufacturing jobs arrive.

The 2000 census records where each individual was living in 1995. Therefore, for every commuting-zone cohort pair, I calculate the average education of individuals who lived in the commuting zone in 1995 but not in 2000, $S_{leave,zc}$, divided by the average education of individuals who lived in the commuting zone in both 1995 and 2000, $S_{stay,zc}$. My dependent variable is the mean value of this ratio for the five cohorts who turned 16 between 1995 and 1999, $\frac{1}{5}\sum_{c=1995}^{1999}\frac{S_{leave,zc}}{S_{stay,zc}}$. This variable is then regressed on the sum of the changes in export-manufacturing employment per worker between January 1995 and December 1999. I also include a full set of state dummy variables:

$$\frac{1}{5}\sum_{c=1995}^{1999}\frac{S_{leave,zc}}{S_{stay,zc}} = \beta\sum_{t=1995}^{1999} l_{zt} + \delta_r + \varepsilon_m. \tag{12}$$

If my finding that new export jobs reduce schooling is driven by the less educated remaining

[2] I use log cohort size as commuting-zone populations vary greatly. Therefore, I am considering proportional changes in cohort size. Net new jobs are already scaled, as they are divided by the number of workers in the commuting zone.

[3] If cohorts aged 16 at the time of large export shocks have differential migration patterns compared to less heavily exposed cohorts, these cohorts should have differential sizes compared to older and younger cohorts within the same commuting zone.

in the commuting zone, the ratio of leavers to stayers education will increase with net new export job arrivals between 1995 and 1999 ($\beta > 0$).

Results are reported in column 3 of Table B.1. β is significantly negative, not positive. New export-manufacturing jobs keep the more educated youth in the commuting zone. This is strong evidence, at least for the later years in the sample, that when new export jobs arrive, out-migration effects tend to raise cohort education through composition effects. This result only applies to internal migrants, but Chiquiar and Hanson (2005) find that emigrants to the United States are also drawn from relatively educated portions of the population. Taken together, the magnitude of my finding that new export-manufacturing jobs reduce schooling is likely to be attenuated by out-migration.

In-migration may generate heterogeneity in the impact of new export-manufacturing jobs. In the extreme, if only migrants are employed in export manufacturing in a particular commuting zone and labor markets are segmented, then new job arrivals should have no impact on the education decisions of local youth. In this scenario, these export jobs do not enter into a local youth's choice set. In less extreme cases, large numbers of migrants are likely to reduce the local manufacturing wage and hence make new export-manufacturing jobs less attractive alternatives to schooling.

I test this hypothesis using the in-migrants I identify in the 2000 census. I interact new export job arrivals at age 16 (potentially broken down by skill) by ϑ_z, the proportion of formal export manufacturing jobs held by migrants in the year 2000 in each commuting zone:

$$S_{zc} = \beta l_{zc} + \gamma \vartheta_z l_{zc} + \delta_z + \delta_z c + \delta_{rc} + \varepsilon_{zc}. \tag{13}$$

If the presence of a large number of migrants reduces the impact of new job arrivals on the local population, I expect β to be negative, and γ to be positive.

I report results in columns 4 of Table B.1. Column 5 reports a similar specification but using the proportion of migrants in employment more generally. I find the expected sign patterns, and the negative coefficient on the migrant interaction is the same size as the positive coefficient on the main effect implying that if all the employees are migrants there is no effect at all (although the standard error is equally large so the interaction is not significant). Hence, in the absence of internal migration in Mexico, local education would decline even more with the arrival of new export-manufacturing opportunities at age 16.

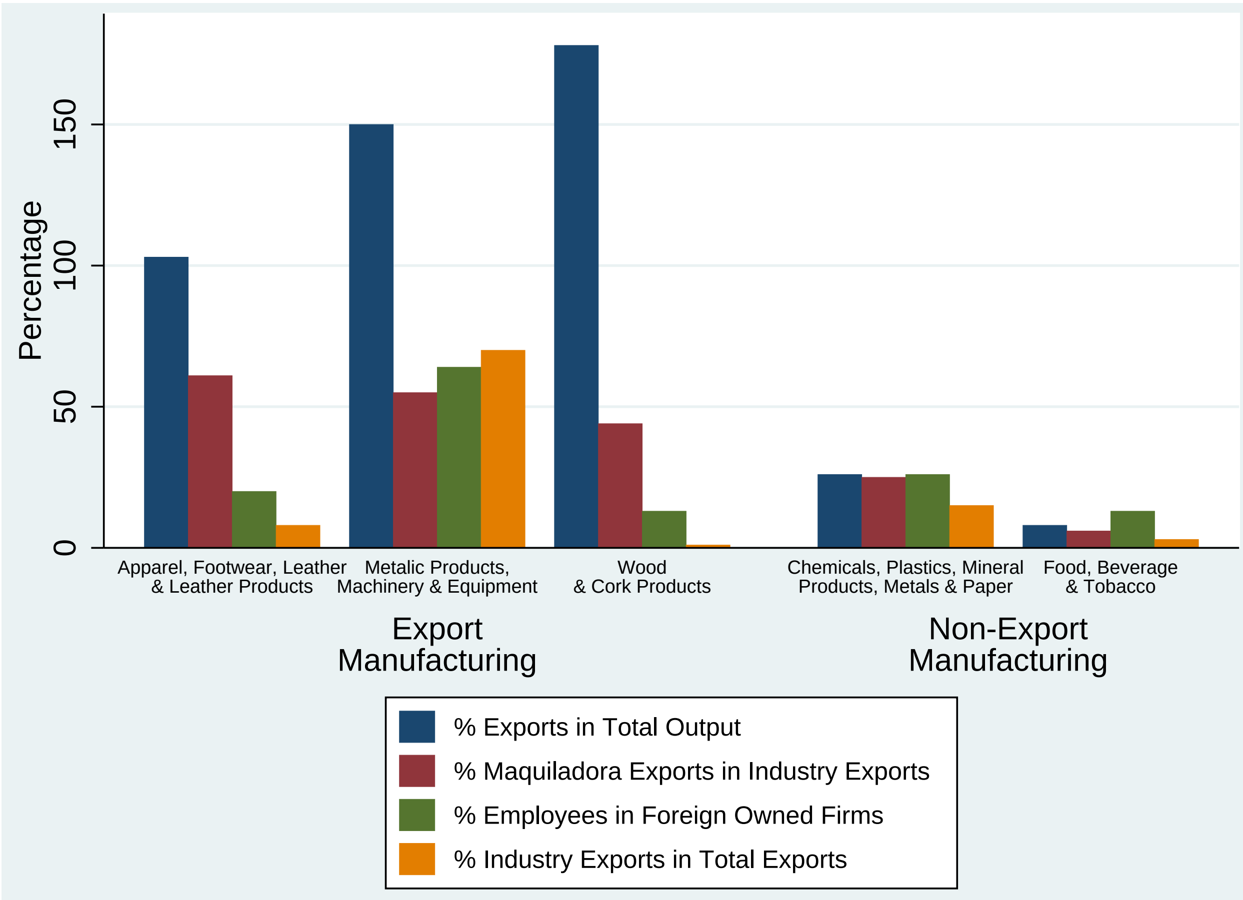
Table B.1: Net New Export Jobs and Migration

	(1)	(2)	(3)	(4)	(5)
	Migration	*Migration*	*Skill-Biased Migration*	*Migrant Interaction*	
	All Reduced Form Specifications (Large Δs)				
	Log Cohort Size	Cohort Size/ Working Population	Ratio of Leavers School to Stayers School	Cohort Schooling	
Net New Export Manufacturing (NNEM) Jobs/Worker at Age 16	-0.0599	-0.00615	-0.847***	-4.854***	-4.454**
	(0.239)	(0.00899)	(0.255)	(1.663)	(1.765)
Migrant Prop. in Formal Export Manuf.				5.085	
$\times$NNEM Jobs/Worker at Age 16				(4.126)	
Migrant Prop. in All Jobs					3.996
$\times$NNEM Jobs/Worker at Age 16					(4.745)
Observations	25,289	25,289	1,663	25,289	25,289
R^2	0.996	0.783	0.049	0.942	0.942
Commuting Zones	1808	1808	1663	1808	1808

Notes: Dependent variable in column 1 is log cohort size for non-migrants in the year 2000 and column 2 is cohort size divided by commuting-zone working population in the year 2000. Dependent variable in column 3 is the schooling of individuals who lived in the commuting zone in 1995 but not in 2000 divided by the schooling of individuals who lived in the commuting zone in both 1995 and 2000 (for cohorts who turned 16 between 1995 and 1999). Dependent variable in columns 4 and 5 is cohort average schooling. Independent variable in Columns 1-2 and 4-5 is net new export jobs per worker arriving in cohort's commuting zone at age 16 attributable to firms that expand or contract their employment by 50 or more employees in a single year. Columns 4-5 also include an interaction with the proportion of migrants in formal export jobs in that commuting zone from the 2000 census, or in employment more generally. Columns 3 uses the total net new export jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year that arrived between January 1995 and December 1999. Columns 1, 2, 4 and 5 include State-time dummies, commuting-zone dummies and commuting-zone linear trends. Column 3 includes State dummies. Regressions weighted by cell population and exclude Mexico City. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Appendix C Additional Figures and Tables

Figure C.1: Manufacturing Industry Features

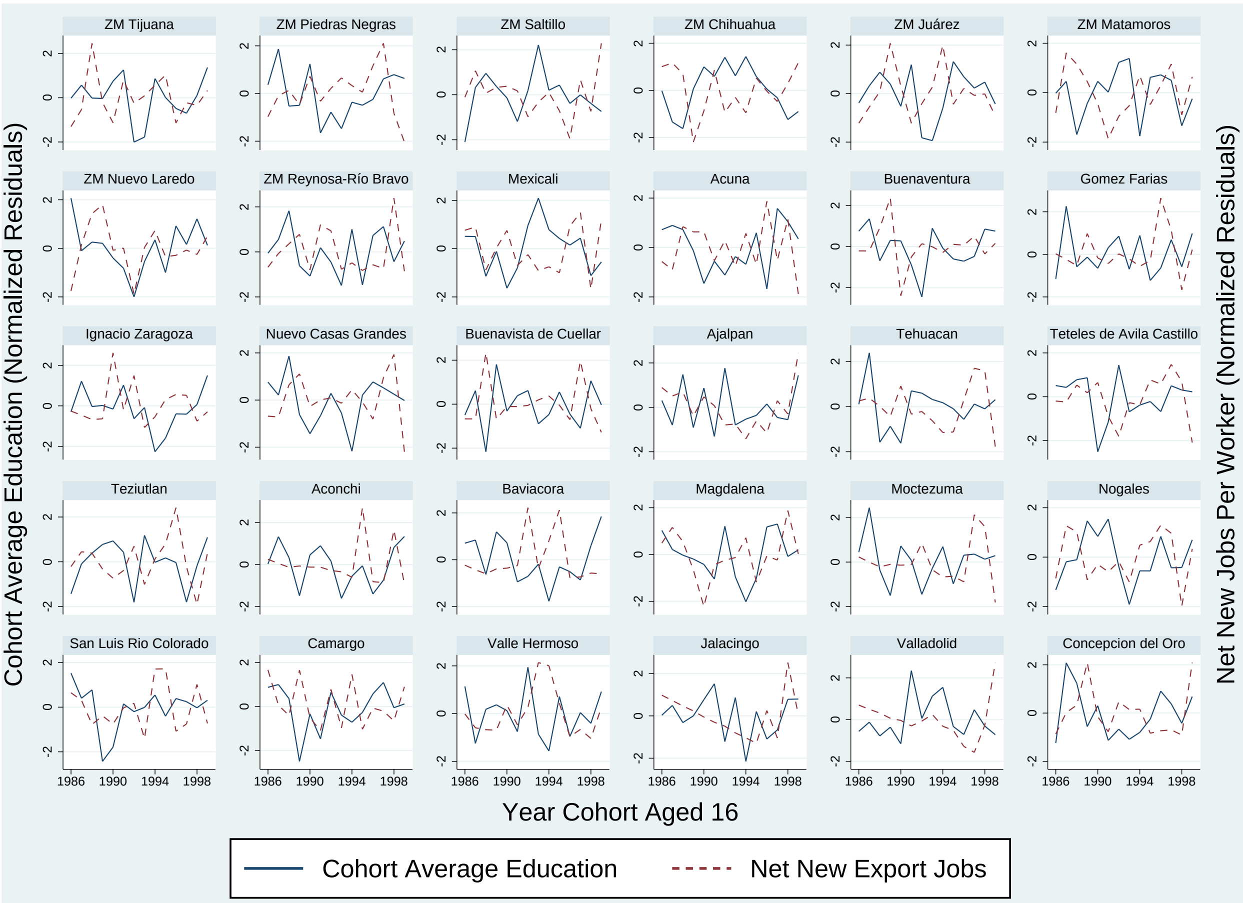


Notes: These data cover the whole of Mexico and originate from Nicita and Olarreaga (2007) (exports in total output), Banco de Mexico (Maquiladora and industry shares of exports) and Ibarraran (2004) (employees in foreign owned firms). The measure of output used by Nicita and Olarreaga (2007) does not 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. As these various sources report at different levels of aggregation, textiles are included in the apparel et al. category despite being classified as a non-export industry using the export threshold described in Section 2.1. Similarly, petroleum refinement is included in the chemicals et al. category despite being classified as an export industry. The metal products et al. category includes: metal products; electronic and mechanical machinery; electrical machinery; transport equipment; and scientific and optical equipment.

Figure C.2: Histogram of Age by Industry Grouping (Age 16-28 in 2000, Insured by IMSS)

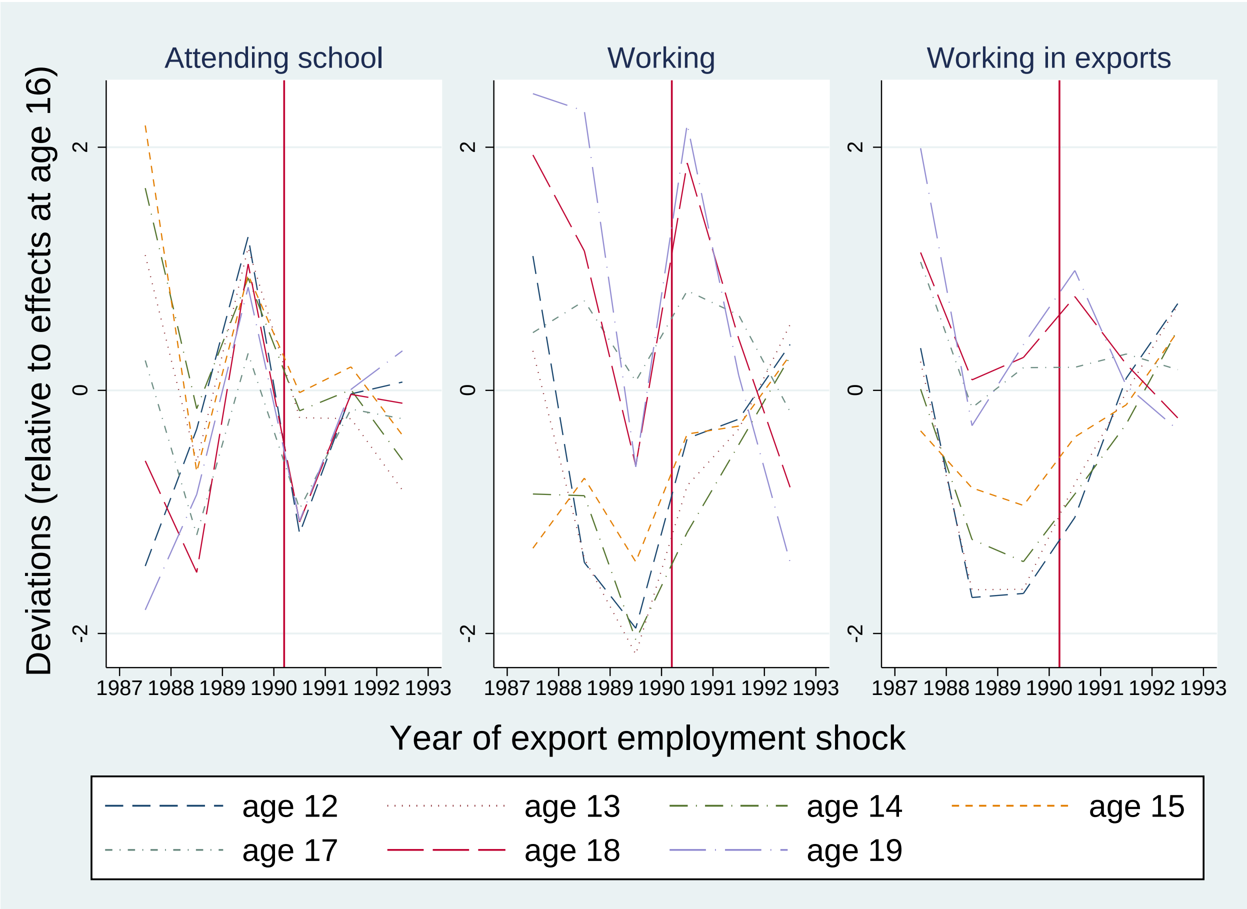
Note: The age distribution is calculated using the year 2000 census for formal sector workers age 16 to 28 (my sample cohort). A formal worker is defined as a worker insured by IMSS or equivalent insurance scheme.

Figure C.3: Visual Identification for 30 Commuting Zones with Largest Export Job Shocks



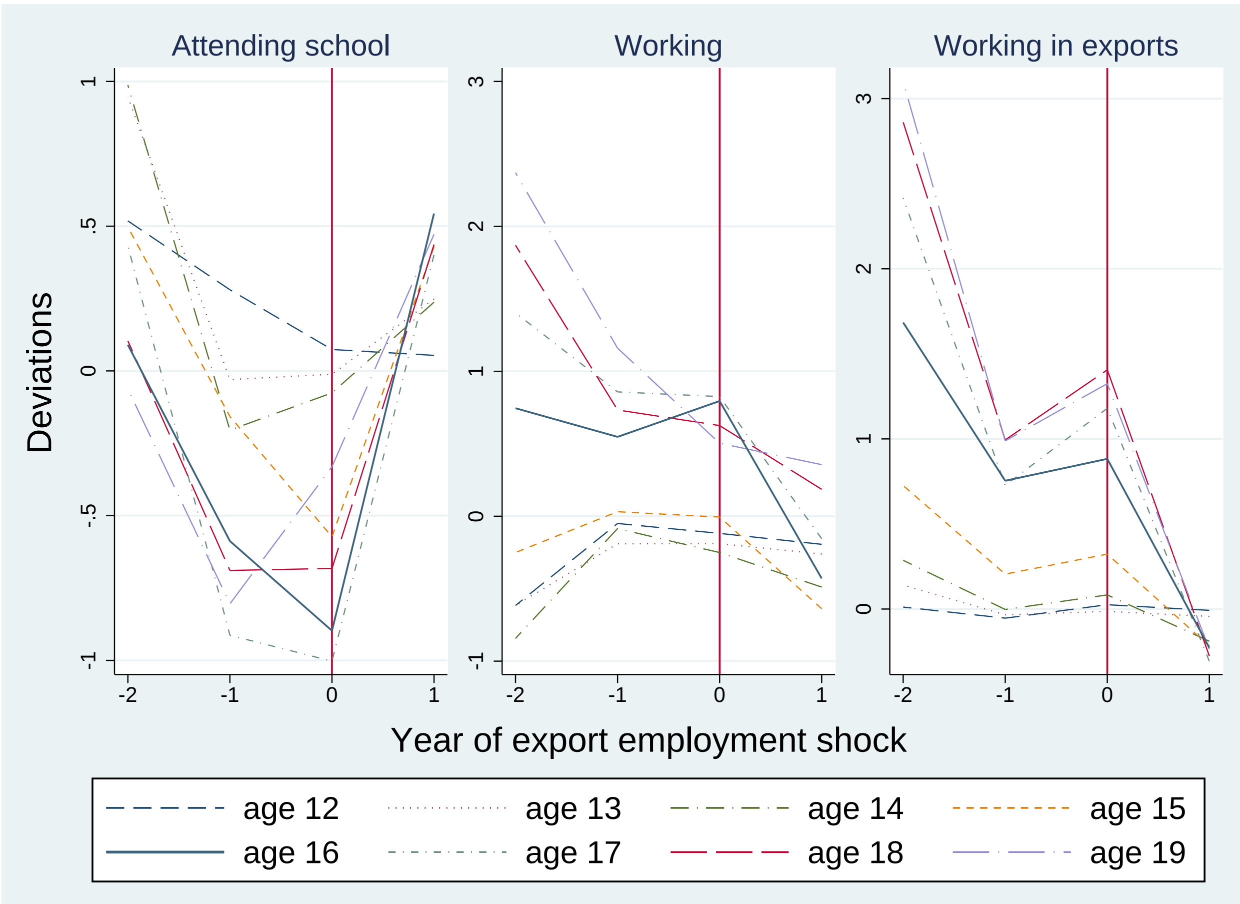
Note: Residuals from regressions of cohort schooling and net new export jobs at age 16 on state-time dummies, commuting-zone dummies and commuting-zone linear trends (i.e. the remaining terms in equation 1). Residuals are plotted against the year the cohort turned 16 for the 30 commuting zones with largest cumulative export job arrivals per worker.

Figure C.4: Cross-Sectional Evidence from the 1990 Census (Including Commuting-Zone FE)



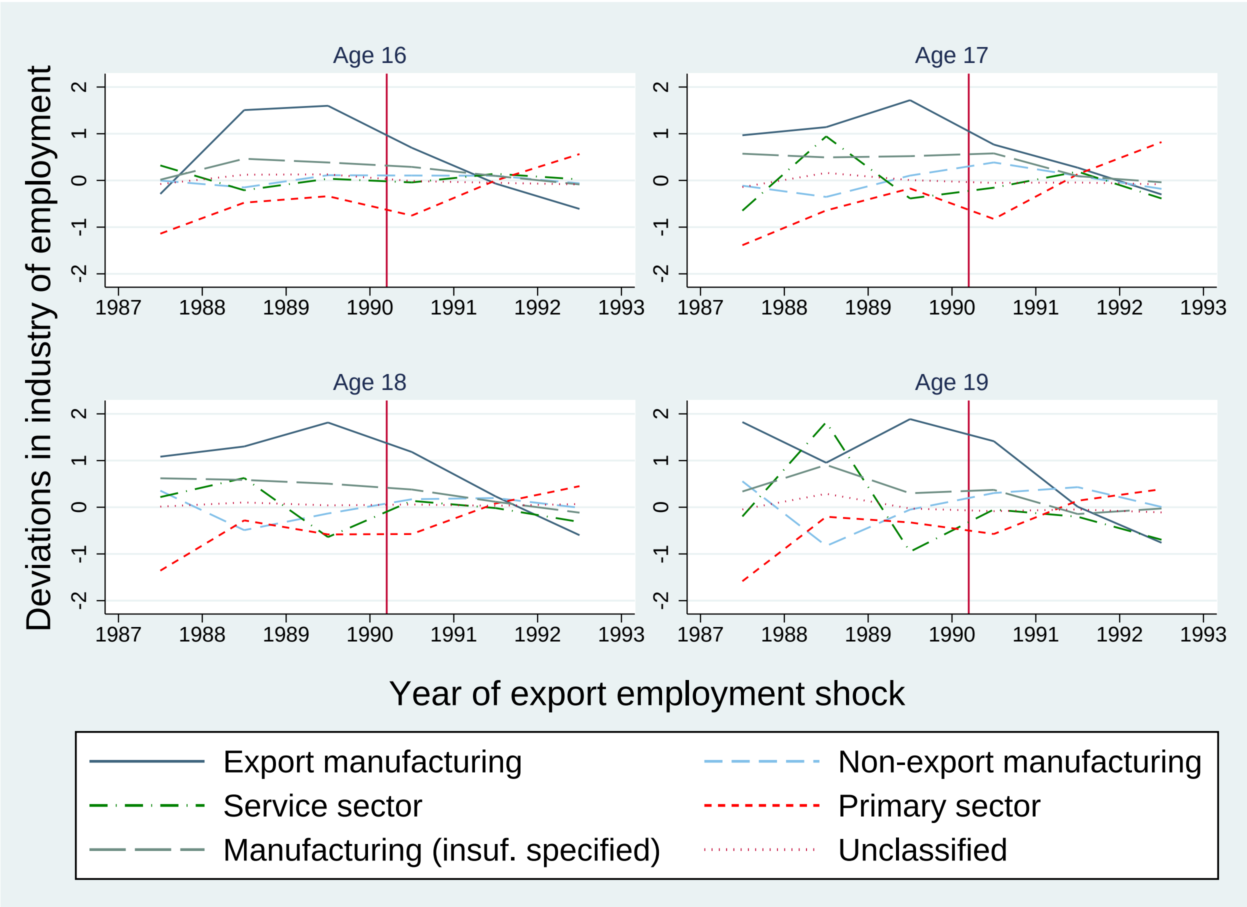
Notes: Each panel plots 48 coefficients obtained from regressing a binary variable from the 1990 census (denoted by panel title) on export employment shocks in each year between 1987-1992. I include cohorts aged 12-19 and age fixed effects, and allow the coefficients on the shocks to differ by age cohort. The full specification is shown in equation 4 of the main text except here I also include commuting-zone fixed effects. The omitted category is shocks at age 16. Sample restricted to commuting zones with at least one year of employment growth in export manufacturing between 1987-1992. Lines connect coefficients of the same age group and x-axis denotes the year of the shock. Vertical lines drawn in March 1990, the month of the 1990 census.

Figure C.5: Cross-Sectional Evidence from Both Censuses



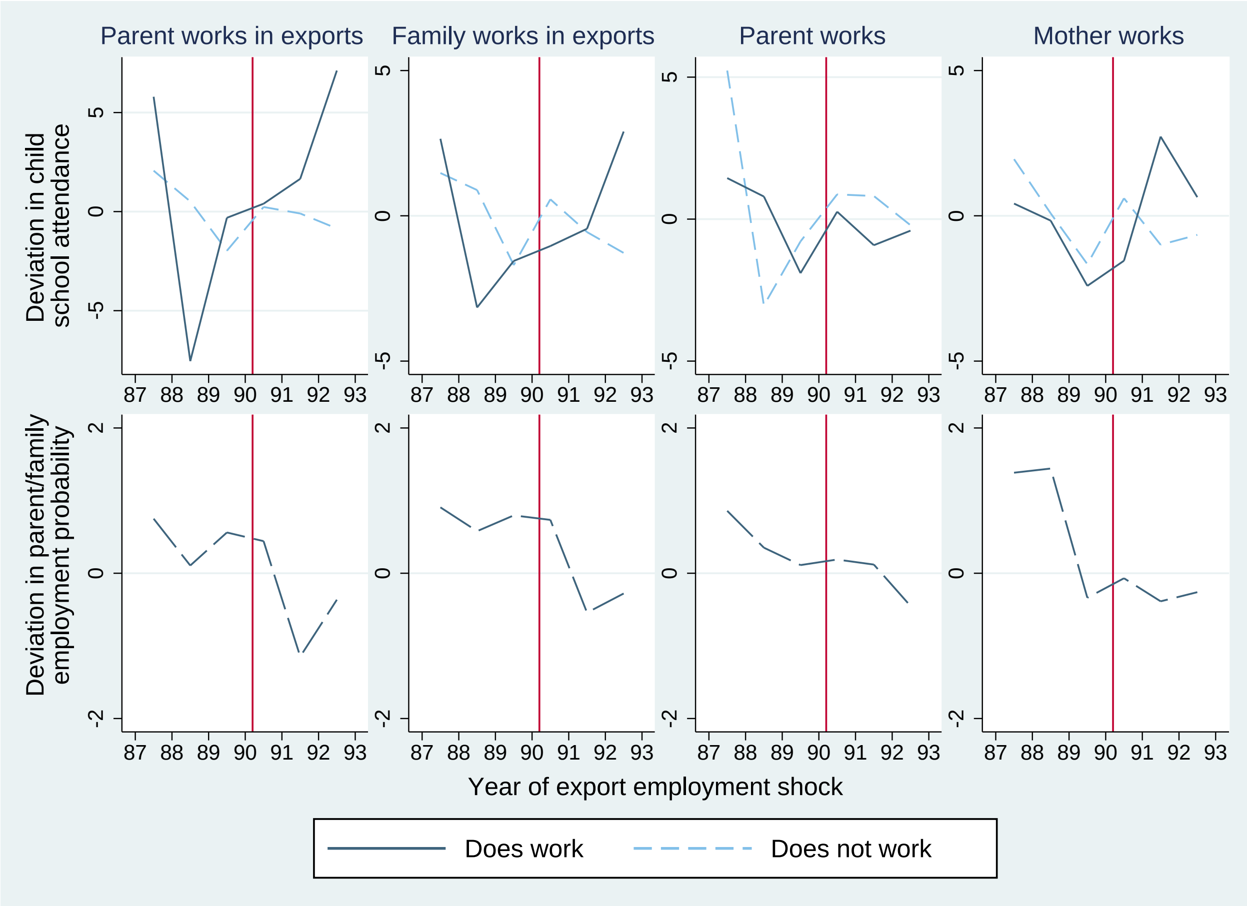
Notes: Each panel plots the 32 coefficients obtained from regressing the dependent variable (denoted by the panel title) on export employment shocks in each year between 1987 and 1990 (for 1990 census data) or between 1997 and 2000 (for 2000 census data). I include cohorts aged 12-19 and age-census fixed effects, and allow the coefficients on the shocks to differ by age cohort. The full specification is shown in equation 4 of the main text. Lines connect coefficients of the same age group and the x-axis denotes the year of the shock with 0 denoting the shock immediately preceding the census (1989 or 1999).

Figure C.6: Job Propensities: Cross-Sectional Evidence from the 1990 Census



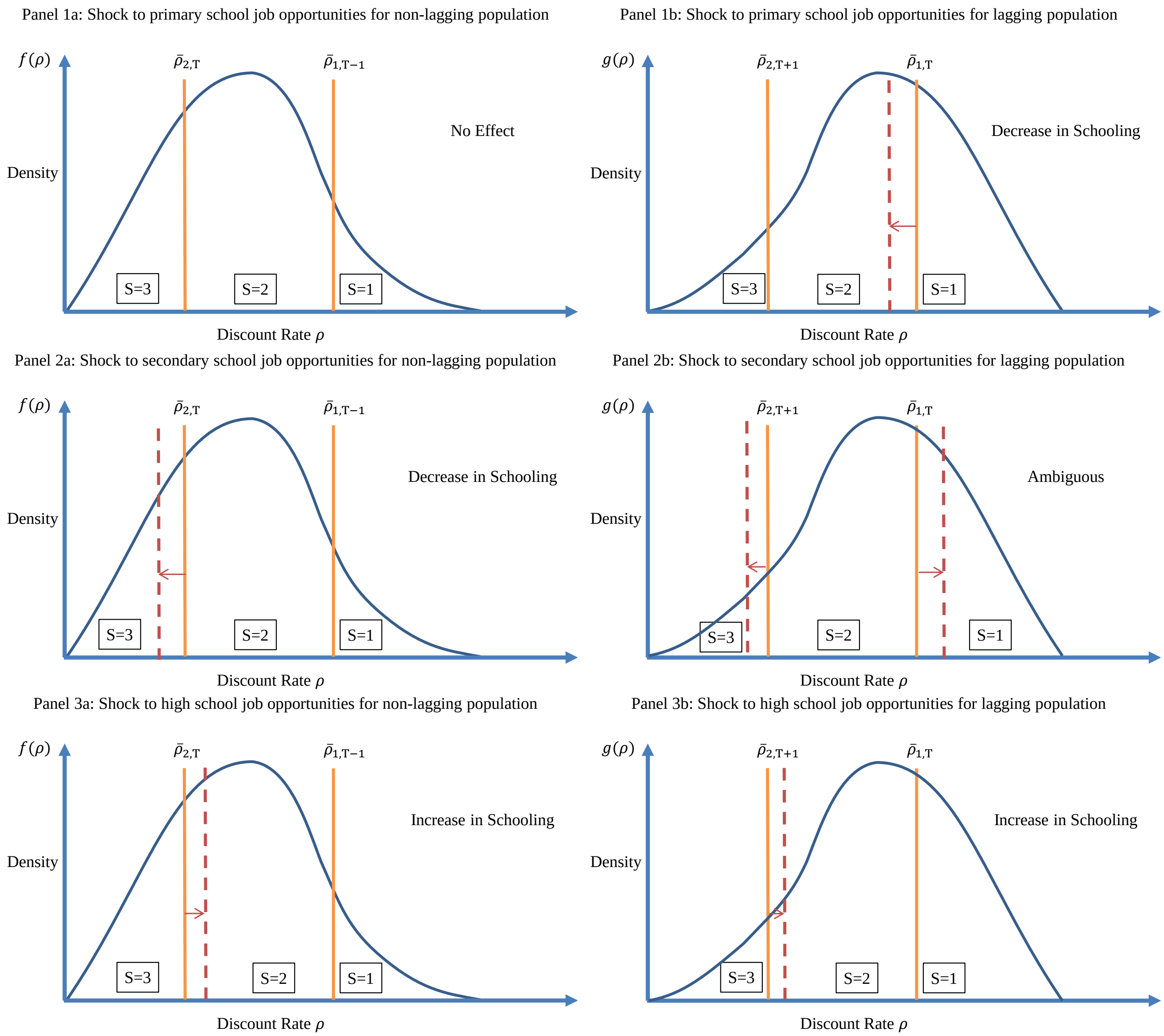
Notes: Panels plots coefficients obtained from regressing the dependent variable from the 1990 census (dummies for employment in the industry denoted by the legend for the relevant line) on export employment shocks in each year between 1987 and 1992. I include cohorts aged 16-19 and age fixed effects, and allow the coefficients on the shocks to differ by age cohort. Sample restricted to commuting zones with at least one year of employment growth in export manufacturing between 1987 and 1992. Each panel plots results for four different industries for a single cohort. The full specification is shown in equation 4 of the main text. Lines connect coefficients of the same industry and the x-axis denotes the year of the shock. Vertical lines drawn in March 1990, the month of the 1990 census.

Figure C.7: Parental/Sibling Channels: Cross-Sectional Evidence from the 1990 Census



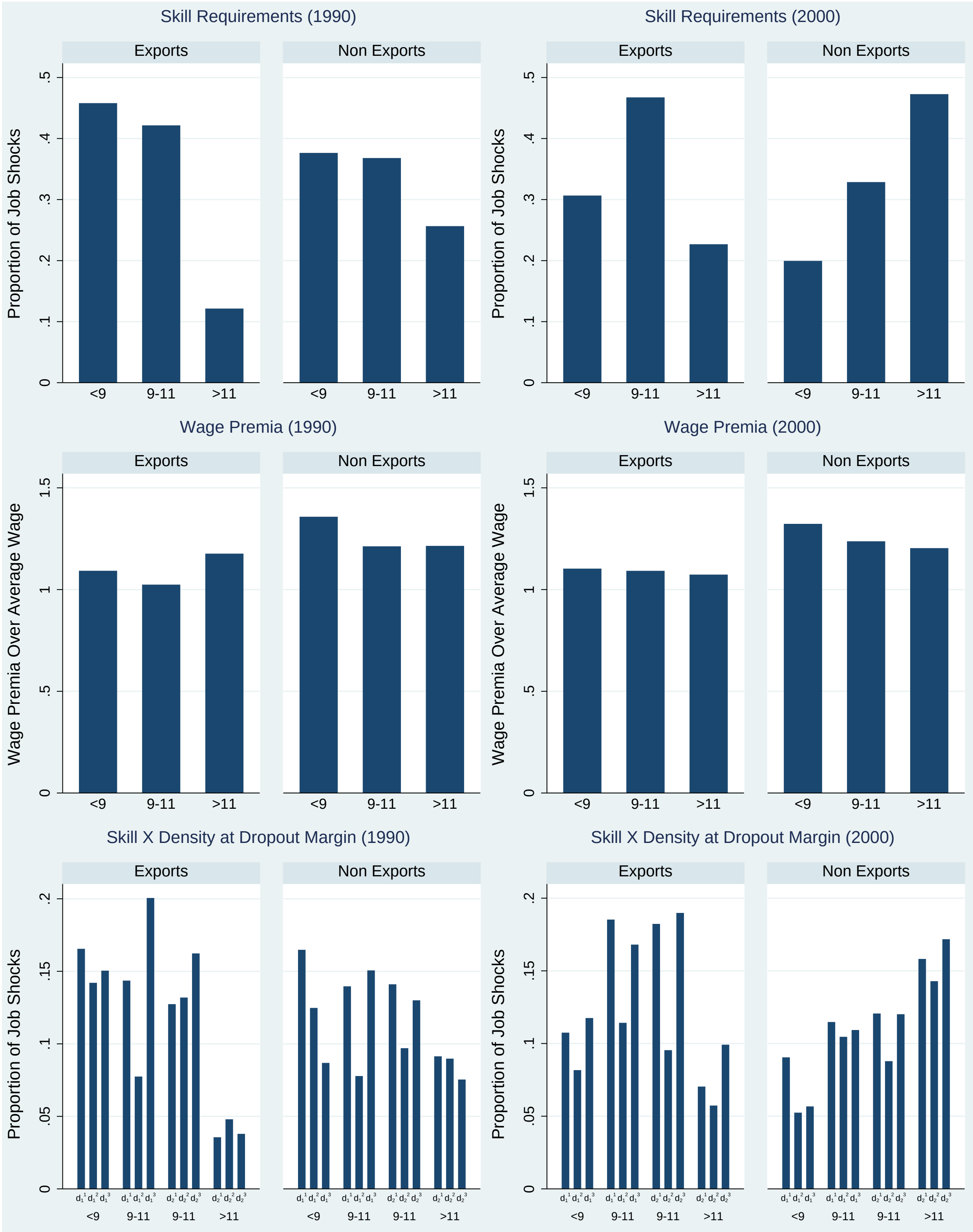
Notes: Each panel plots the coefficients obtained from regressing the dependent variable from the 1990 census (either school attendance in the top panel, or family employment dummies denoted column headings in the lower panel) on export employment shocks in each year between 1987 and 1992. Sample restricted to cohort aged 16 at the time of the 1990 census and to commuting zones with at least one year of employment growth in export manufacturing between 1987 and 1992. For school attainment in the upper panels, the coefficient on each of these shocks is allowed to differ depending on household employment status denoted in the column header. Lines connect coefficients for the same household employment status. The lower panels plots family employment propensities for the categories denoted in the header. The x-axis denotes the year of the shock in all panels. Vertical lines drawn in March 1990, the month of the 1990 census.

Figure C.8: Responses of Discount-Rate Cutoffs and Schooling to Employment Shocks



Notes: Figure shows the various movements of the discount-rate cutoffs for the cohort aged 16 at the time of an unanticipated new factory opening described in Section 5.1.1 of the main text. The left column of panels shows movements in cutoffs for non-lagging youths, those with $S-2$ at the time of the shock. The right column of panels shows movements in cutoffs for lagging youths, those with $S=1$ at the time of the shock. The first row shows the impact of shocks to jobs requiring $S=1$, the second row shocks to jobs requiring $S=2$, and the third row shocks to jobs requiring $S=3$.

Figure C.9: Skill Differences by Sector (All Job Shocks, All Years)



Note: Top row plots skill distribution of net new jobs per worker occurring between 1986 and 1999. Job arrivals categorized into three skill bins based on highest completed educational stage of workers in each state-industry at time of census; primary school (grades < 9), secondary school (grades $9-11$), and high school or above (grades > 11). Second row plots wage premia (over the average commuting zone wage for that skill bin) paid by these same net new job arrivals. Bottom row subdivides the skill bins in top row into terciles (denoted by superscripts) of the relevant density of marginal youths for each skill level detailed in equation 10. Left panels use 1990 census information, right panels use 2000 census (where I focus on formal sector employees only).

Table C.1: Net New Export Jobs at Different Ages of Exposure

	(1)	(2)	(3)	(4)	(5)	(6)
	Education Metric (All Cohort Averages)					
All RF (Large Δs)	Years of School	Grade-9 Dropout	Pre-Grade-9 Dropout	Years of School	Grade-9 Dropout	Pre-Grade-9 Dropout
Age 11 Net New Export Manuf. Jobs/Worker				-0.372	0.196	0.168
				(1.082)	(0.254)	(0.198)
Age 12 Net New Export Manuf. Jobs/Worker				-1.763	-0.164	0.269
				(1.085)	(0.217)	(0.179)
Age 13 Net New Export Manuf. Jobs/Worker				-2.133*	0.279	0.367**
				(1.118)	(0.215)	(0.169)
Age 14 Net New Export Manuf. Jobs/Worker	-0.605	-0.131	-0.0143	-1.650*	-0.00726	0.134
	(1.287)	(0.239)	(0.153)	(0.897)	(0.232)	(0.137)
Age 15 Net New Export Manuf. Jobs/Worker	-0.955	0.0935	-0.0159	-1.925**	0.0854	0.295**
	(1.340)	(0.210)	(0.159)	(0.828)	(0.216)	(0.136)
Age 16 Net New Export Manuf. Jobs/Worker	-4.090***	0.407*	0.303*			
	(1.149)	(0.231)	(0.161)			
Age 17 Net New Export Manuf. Jobs/Worker	0.753	0.0660	-0.301**			
	(0.932)	(0.189)	(0.138)			
Age 18 Net New Export Manuf. Jobs/Worker	-1.601*	0.329*	0.0233			
	(0.923)	(0.173)	(0.128)			
Observations	18,063	17,206	18,063	18,066	15,739	18,066
R^2	0.952	0.731	0.941	0.953	0.778	0.944
Commuting Zones	1808	1806	1808	1808	1805	1808

Notes: Dependent variable is a cohort education metric, either average completed schooling, grade-9 dropout rates (i.e. the proportion of the set of students with 9 or more years of schooling who obtain no additional years of schooling beyond 9) or pre-grade-9 dropout rates (i.e. the proportion of students that obtain fewer than 9 years of schooling). Independent variables are net new export manufacturing jobs per worker arriving in cohort's commuting zone at various ages between 11 and 18 attributable to firms that expand or contract their employment by 50 or more employees in a single year. State-time dummies, commuting-zone dummies and commuting-zone linear trends not shown. Regressions weighted by cell population, exclude Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table C.2: Cross-Sectional Evidence from the 1990 Census

	(1)	(2)	(3)	(4)	(5)	(6)
	School Attendance in March 1990					
All RF	Export Shock	Export Shock	Export Shock	Export Shock	Export Shock	Export Shock
(Large Δs)	in 1987	in 1988	in 1989	in 1990	in 1991	in 1992
12 year olds	1.106	0.374	0.147	0.582	-0.162	-0.717
	(1.025)	(0.603)	(0.326)	(0.365)	(0.520)	(0.567)
13 year olds	3.380*	-0.291	-0.277	0.850	-0.625	-1.432
	(1.736)	(1.248)	(0.598)	(0.688)	(0.974)	(1.076)
14 year olds	3.871**	-0.224	-0.788	0.273	-0.411	-1.039
	(1.892)	(1.479)	(0.738)	(0.830)	(1.269)	(1.443)
15 year olds	3.613*	-0.617	-1.052	0.110	-0.446	-0.911
	(1.955)	(1.677)	(0.779)	(0.757)	(1.385)	(1.464)
16 year olds	1.278	0.205	-1.904**	0.231	-0.656	-0.538
	(1.913)	(1.792)	(0.880)	(0.910)	(1.449)	(1.436)
17 year olds	1.216	-0.721	-1.574**	-0.488	-0.799	-1.171
	(1.274)	(1.457)	(0.766)	(0.721)	(1.160)	(1.254)
18 year olds	0.741	-1.137	-0.700	-0.419	-0.445	-0.870
	(1.188)	(1.364)	(0.877)	(0.720)	(0.847)	(1.023)
19 year olds	-0.379	-0.389	-0.915	-0.352	-0.390	-0.395
	(1.228)	(1.473)	(0.874)	(0.747)	(0.897)	(1.020)
Observations						675,299
R^2						0.669
Commuting Zones						178

Notes: Dependent variable is a dummy for school attendance at the time of the 1990 census. Independent variables are net new export manufacturing jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year arriving in youth's commuting zone in each year between 1987 and 1992. I include cohorts aged 12-19 and age fixed effects (not shown), and allow the coefficients on the shocks to differ by age cohort. Sample restricted to commuting zones with at least one year of employment growth in export manufacturing between 1987 and 1992. Regression weighted by cell population, excludes Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table C.3: Cross-Sectional Evidence from the 1990 Census (Including Commuting-Zone FE)

	(1)	(2)	(3)	(4)	(5)	
			School Attendance in March 1990			
All RF	Export Shock	Export Shock	Export Shock	Export Shock	Export Shock	Export Shock
(Large Δs)	in 1987	in 1988	in 1989	in 1990	in 1991	in 1992
12 year olds	-1.445	-0.319	1.264	-1.178	-0.0292	0.0683
	(1.397)	(1.544)	(0.928)	(0.894)	(1.190)	(1.177)
13 year olds	1.112	-0.589	1.174**	-0.225	-0.233	-0.821
	(0.787)	(0.895)	(0.587)	(0.564)	(0.697)	(0.689)
14 year olds	1.664*	-0.150	0.924**	-0.168	0.00500	-0.572
	(0.857)	(0.756)	(0.409)	(0.553)	(0.513)	(0.693)
15 year olds	2.179***	-0.670	0.951***	-0.0186	0.193	-0.368
	(0.596)	(0.511)	(0.332)	(0.363)	(0.310)	(0.460)
17 year olds	0.246	-1.189**	0.304	-0.975***	-0.154	-0.233
	(0.798)	(0.567)	(0.261)	(0.314)	(0.455)	(0.450)
18 year olds	-0.580	-1.498*	1.040**	-1.082*	-0.0326	-0.106
	(0.934)	(0.790)	(0.524)	(0.604)	(0.800)	(0.758)
19 year olds	-1.805*	-0.856	0.848	-1.075	0.00812	0.325
	(1.054)	(0.826)	(0.594)	(0.704)	(0.841)	(0.873)
Observations						1,244,386
R^2						0.239
Commuting Zones						1808

Notes: Dependent variable is a dummy for school attendance at the time of the 1990 census. Independent variables are net new export manufacturing jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year arriving in cohort's commuting zone in each year between 1987 and 1992. I include cohorts aged 12-19 and both age and commuting-zone fixed effects (not shown), and allow the coefficients on the shocks to differ by age cohort. Cohort aged 16 is the omitted category. Regression weighted by cell population, excludes Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Table C.4: Counterfactual Job Types from the 1990 Census

	(1)	(2)	(3)	(4)	(5)	(6)
	Cohort Employment Propensities in March 1990					
All RF (Large Δs)	Export Manuf.	Non-export Manuf.	Service Sector	Primary Sector	Manuf. (insuf. specified)	Unclassified
1987 Export Shock: Age 16	-0.288	-0.00268	0.321	-1.140	0.0157	-0.0766
	(0.718)	(0.216)	(0.355)	(0.727)	(0.349)	(0.0886)
1987 Export Shock: Age 17	0.968	-0.112	-0.647	-1.386	0.573*	-0.142
	(0.795)	(0.270)	(0.625)	(0.912)	(0.345)	(0.126)
1987 Export Shock: Age 18	1.083	0.355	0.219	-1.357	0.620	0.0141
	(0.776)	(0.321)	(0.680)	(0.911)	(0.405)	(0.118)
1987 Export Shock: Age 19	1.824***	0.556	-0.197	-1.583*	0.337	-0.0470
	(0.699)	(0.458)	(0.964)	(0.824)	(0.372)	(0.179)
1988 Export Shock: Age 16	1.507***	-0.149	-0.210	-0.475	0.465**	0.123
	(0.497)	(0.172)	(0.326)	(0.724)	(0.199)	(0.0840)
1988 Export Shock: Age 17	1.142**	-0.353	0.944*	-0.642	0.494**	0.162**
	(0.560)	(0.236)	(0.501)	(0.805)	(0.235)	(0.0794)
1988 Export Shock: Age 18	1.302**	-0.490**	0.627	-0.281	0.585**	0.103
	(0.567)	(0.248)	(0.640)	(0.786)	(0.267)	(0.103)
1988 Export Shock: Age 19	0.953*	-0.828**	1.823**	-0.203	0.907***	0.288*
	(0.538)	(0.348)	(0.863)	(0.835)	(0.324)	(0.165)
1989 Export Shock: Age 16	1.599***	0.113	0.0365	-0.338	0.385**	0.131**
	(0.338)	(0.119)	(0.196)	(0.369)	(0.166)	(0.0539)
1989 Export Shock: Age 17	1.719***	0.104	-0.386	-0.171	0.520**	0.00766
	(0.407)	(0.192)	(0.295)	(0.438)	(0.221)	(0.0565)
1989 Export Shock: Age 18	1.815***	-0.133	-0.639*	-0.581	0.505**	0.0416
	(0.404)	(0.168)	(0.333)	(0.419)	(0.219)	(0.0878)
1989 Export Shock: Age 19	1.888***	-0.0502	-0.952**	-0.324	0.300**	-0.0267
	(0.404)	(0.213)	(0.378)	(0.435)	(0.131)	(0.0759)
1990 Export Shock: Age 16	0.699**	0.106	-0.0424	-0.751*	0.289*	-0.0128
	(0.327)	(0.145)	(0.266)	(0.422)	(0.164)	(0.0534)
1990 Export Shock: Age 17	0.768**	0.386**	-0.155	-0.825*	0.579***	-0.0525
	(0.364)	(0.192)	(0.285)	(0.471)	(0.193)	(0.0699)
1990 Export Shock: Age 18	1.184***	0.172	0.137	-0.574	0.380	0.0592
	(0.375)	(0.222)	(0.399)	(0.405)	(0.244)	(0.0885)
1990 Export Shock: Age 19	1.414***	0.305	-0.0474	-0.572	0.373*	-0.0836
	(0.392)	(0.293)	(0.432)	(0.477)	(0.193)	(0.0845)
1991 Export Shock: Age 16	-0.0673	0.100	0.142	0.000953	0.0969	-0.0494
	(0.623)	(0.185)	(0.291)	(0.405)	(0.137)	(0.0675)
1991 Export Shock: Age 17	0.274	0.0980	0.189	0.135	0.0919	-0.0437
	(0.604)	(0.268)	(0.378)	(0.438)	(0.163)	(0.0778)
1991 Export Shock: Age 18	0.233	0.198	-0.0177	0.0821	0.118	0.0324
	(0.624)	(0.276)	(0.427)	(0.413)	(0.140)	(0.0740)
1991 Export Shock: Age 19	0.0117	0.431	-0.203	0.140	-0.144	-0.0469
	(0.680)	(0.347)	(0.445)	(0.394)	(0.153)	(0.0806)
1992 Export Shock: Age 16	-0.609	-0.0618	0.0220	0.566	-0.0849	-0.0858
	(0.656)	(0.198)	(0.293)	(0.532)	(0.137)	(0.0818)
1992 Export Shock: Age 17	-0.299	-0.180	-0.386	0.822	-0.0387	-0.0827
	(0.710)	(0.278)	(0.412)	(0.601)	(0.184)	(0.0674)
1992 Export Shock: Age 18	-0.598	-0.00965	-0.315	0.452	-0.115	0.0682
	(0.709)	(0.307)	(0.458)	(0.579)	(0.180)	(0.147)
1992 Export Shock: Age 19	-0.760	0.00682	-0.695	0.388	-0.0261	-0.109
	(0.796)	(0.455)	(0.557)	(0.651)	(0.212)	(0.140)
Observations	650,454	650,454	650,454	650,454	650,454	650,454
R^2	0.066	0.042	0.144	0.078	0.023	0.012
Commuting Zones	178	178	178	178	178	178

Notes: Dependent variables are dummy variables for employment in each of six industries at the time of the 1990 census. Independent variables are net new export manufacturing jobs per worker attributable to firms that expand or contract their employment by 50 or more employees in a single year arriving in cohort's commuting zone in each year between 1987 and 1992. I include cohorts aged 16-19 at the time of the census and age fixed effects (not shown), and allow the coefficients on the shocks to differ by age cohort. Sample restricted to commuting zones with at least one year of employment growth in export manufacturing between 1987 and 1992. Regressions weighted by cell population, exclude Mexico City and migrants. Commuting-zone clustered standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

Appendix D Robustness Using Highly Agglomerated Industries

As noted in Section 2.4, the demand for exports is primarily driven by external demand shifts.[4] However, demand for domestic goods and services may be driven by local demand shocks which correlate with other time-location-varying omitted variables. For example, a positive shock to income may raise local demand and schooling, and upwards bias the job arrivals coefficient. In order to mitigate this concern, I use the IMSS employment data to calculate a Herfindahl index for state-level industrial concentration in the year 2000 at the lowest level of industrial classification in the database (276 industries).

The Herfindahl index for industry j is equal to $\sum_r (s_{jr} - s_r)^2$, where s_{jr} is state r's share of total employment in industry j, and s_r is state r's share of total manufacturing employment. The values for the Herfindahl index range from 0.0017 for "services of repair, washing, lubrication, verification of emission of polluting agents and parking of vehicles" to a value of 0.75 for the "manufacture of pencils, rubbers, pens and ball-point pens" or for "Sulfur extraction". The value of the Herfindahl is above 0.1 for 95 industries (73 of which are in manufacturing) and 181 industries have Herfindahls below that number (53 of which are in manufacturing).

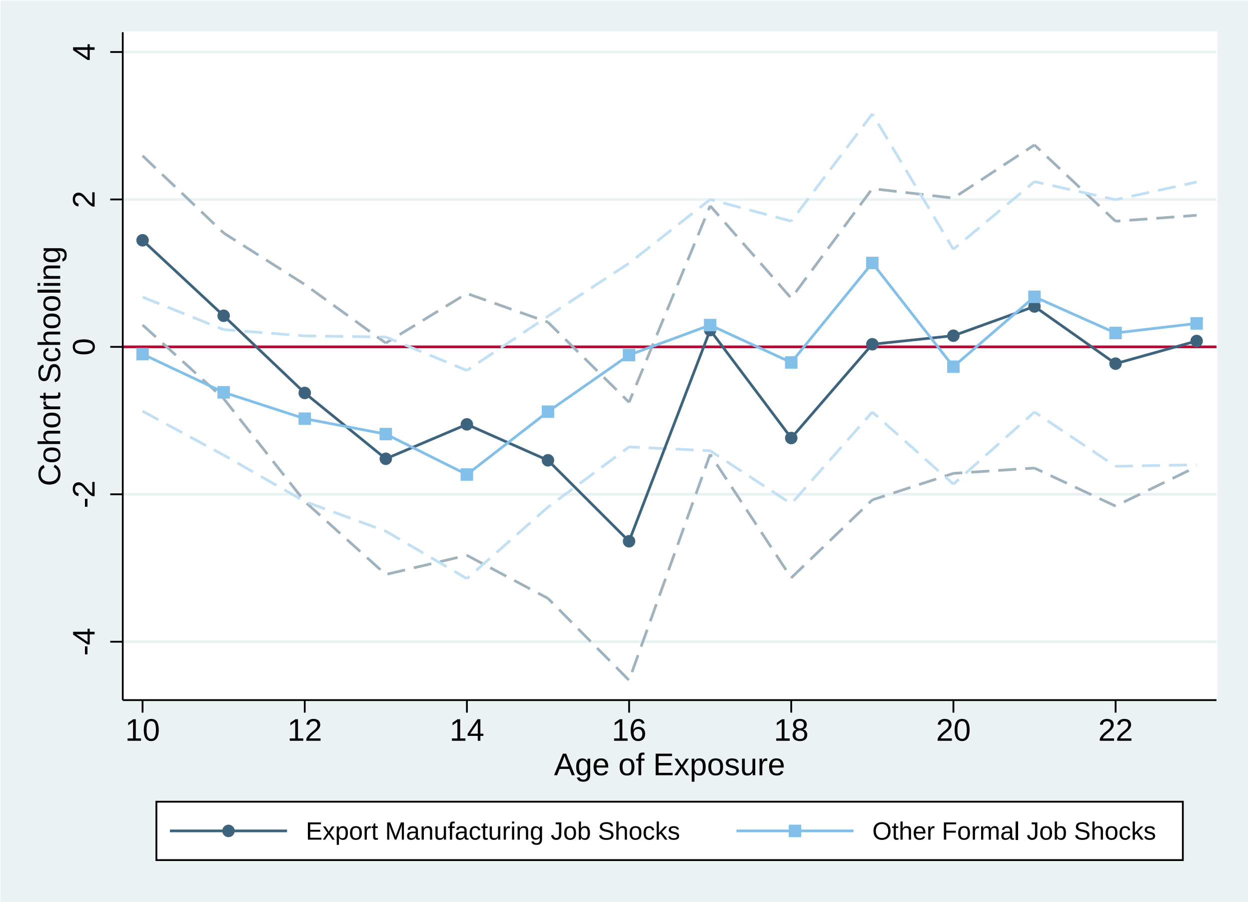
If an industry is highly concentrated in a few states, demand is likely to be driven by national rather than local demand shifters. Therefore, as a robustness check, I repeat the analysis of Section 5 but replace the net new jobs per worker measures with job growth only in the industries which have Herfindahl indexes below 0.1.

These results are reported in Figure D.1 which mimics Figure 7 by plotting the coefficients on both export manufacturing job shocks and other formal job shocks from separate regressions at every age between 10 and 23 (except here only using job shocks in heavily agglomerated industries). As with Figure 7, the impacts of job shocks in export and non-export sectors diverge at age 16 with a significantly more negative coefficient on export shocks at age 16 compared to non-export shocks at that age (an F-stat of 4.96 with a p-value of 0.026). In fact, there is no negative impact of non-export job shocks at age 16 at all (a coefficient of 0.123 with a standard error of 0.619).

As discussed in Section 5.2, Column 15 of Table 7 reproduces the regression for exposure at age 16 for highly-agglomerated industries, but just for job shocks post 1990. Column 16 of Table 7 further includes the four triple interactions to control for job characteristics suggested by equation 10.

[4] Foreign demand shocks, such as a US recession, are swept out in aggregate by the time fixed effects. The variation remaining comes from the fact that export factories are located unevenly across Mexico, coupled with the fact that there are industry-specific export demand shocks.

Figure D.1: Differential Effects of Export and Non-Export Job Shocks (Highly-Agglomerated Industries Only)



Notes: Figure plots the coefficients from 14 regressions that regress cohort average schooling on both net new export job shocks and net new job shocks in all other sectors using the specification in equation 1 but replacing shocks at age 16 with shocks at one of 14 different ages between 10 and 23 and restricting attention to highly agglomerated 4-digit industries in both sectors. Dashed lines show 95 percent confidence intervals. Coefficients on export manufacturing job shocks are significantly different from non-export job shocks at age 16 (an F-stat of 4.96 with a p-value of 0.026).