When Opportunity Knocks: China's Open Door Policy and Declining Educational Attainment

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Abstract

At the end of 1978, China opened the door to trade with the outside world. This study investigates how the Open Door Policy affected the educational choices and wage and employment differentials of workers born 1960-1970. Using measures of local labor markets' export exposure, we find that the mean level of export exposure caused youths born in 1966 to be 3.4 percentage points less likely to complete high school than those born in 1960. Linking this to mid-career outcomes in 2010, we show large skill premia high-export provinces, suggesting the choice to leave school early in response to export growth resulted in substantial reductions in permanent lifetime income. Our findings suggest China's early economic growth was likely dampened and its income inequality widened during the industrialization of the 1980s and 1990s, as the Open Door Policy reduced the availability of skilled labor and increased the skill premium for young workers.

JEL Classification: I20, J20, F16

Keywords: Open Door Policy, educational attainment, high school completion, skill premium

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1 Introduction

The relationship between labor markets and educational attainment is widely studied, in part due to the difficulties in disentangling causal estimates from selection bias. In his seminal model of human capital, Becker (1962) notes that individuals invest in schooling to increase their marginal product of labor, which in turn increases their expected future wages. The effects of schooling on future wages are well-documented, though not yet entirely settled.[1] Far less studied is the effect of local labor market conditions on educational attainment – how a student's opportunity cost of continuing her education affects her decision to drop out or stay in school. In this paper, we study a massive, largely exogenous shock to local labor market conditions in China – the implementation of the Open Door Policy in late 1978 – as an extreme example of how rapidly changing local labor markets affect the opportunity costs of remaining in school.

From 1975 to 1982, the total value of Chinese exports increased from 6.2 billion to 20.4 billion US dollars, and export's share of total Chinese GDP grew from 3.79% to 9.95% over the same time period.[2] This tripling of export value was one of the major driving factors behind a rapid growth in manufacturing employment, a 39 percent increase from 53 million manufacturing workers in 1978 to 74 million in 1985 (Banister, 2005). The large increase in labor demand brought relatively high-paying jobs to Chinese workers, but it also increased the opportunity cost of remaining in school. Figure 1 suggests that students in China responded to these new jobs by dropping out of school; students born between 1961 and 1964 would

[1] See Heckman et al. (2018), Angrist and Krueger (1991), and many others

[2] Sources: UN Commodity Trade database (export values) and The World Bank Open Data (GDP). Export values are in 2018 US dollars.

be in high school when the Open Door Policy was enacted, and the national high school completion rate decreased by 16.7 percentage points between cohorts born in the early 1960s and the late 1960s. Similarly, students born between 1965 and 1968 would be in middle school when the Open Door Policy was enacted, and the national middle school completion rate decreased by 10.2 percentage points between cohorts born in the early 1960s and the late 1960s. These cohorts completed their education after the end of China's Cultural Revolution (1966-1976), during a time when education quality and access was improving (Giles et al., forthcoming); that educational attainment declined so substantially during this period suggests trade and manufacturing growth were the major driving forces.

We aim to causally identify the relationship between local labor market export exposure and the educational attainment of teens living in those labor markets. We construct Bartik-style measures of local labor market export exposure at the prefecture level, analogous to the import penetration measures used in Autor et al. (2013) and many following works. At the mean of export exposure, we find that export exposure caused people born in 1966 to be 3.4 percentage points less likely to complete high school than people born in 1960. At the 90th percentile of export exposure, people born in the late 1960s were 2.9 to 5.6 percentage points less likely to complete high school than people born in 1960. Even with this coarse measure of export exposure, only varying at the prefecture level, we are able to explain 20.7 percent of the overall decline in high school completion across the 1960s birth cohorts. Our analysis of export exposure's effects on middle school completion shows precisely estimated null effects, particularly for non-farmers. This suggests a skill-bias to the relationship between export growth and educational attainment in China, which we investigate in a descriptive analysis at these worker's mid-career in 2010.

In this time period, high school graduates were the primary source of high-skilled labor in China, so our results demonstrate a decline in high-skilled labor and a corresponding increase in low-skilled labor occurred in the most highly export exposed prefectures in China in the late 1970s and early 1980s. We use the Chinese Family Panel Studies (CFPS) 2010 baseline survey data to investigate patterns between export exposure in youth, educational attainment, and wages and employment at mid-career. With a series of Mincer regressions, we show that the wage differential between a high school graduate and a middle school graduate is more than twice as large in the top third of export exposed provinces than in the middle and lowest thirds of export exposed provinces.[3] Furthermore, a high school graduate is 15.6 percentage points more likely to be employed than a middle school completer in the top third of export exposed provinces, compared to a 10.3 percentage point increase in employment probability in the middle third and a 6.4 percentage point increase in the lowest third. While these estimates are descriptive and not causally identified, they do suggest that the decline in educational attainment caused by export growth in the 1970s and 1980s created a shortage of skilled labor in the most highly export exposed locations. This is especially important from a national growth and development perspective, as China's rapid initial growth created incentives for its population to reduce their educational attainment, which in turn may have slowed future growth by reducing the skilled labor pool in the high-export areas which need skilled labor the most.

The Open Door Policy increased the short-term opportunity cost of education

[3] The high school-middle school wage differential in the top third of export exposed provinces is 2037.33 USD, is 945.79 USD in the middle third, and is 919.52 USD in the lowest third.

for Chinese youth, and caused a large decrease in educational attainment. Few other studies look at local labor market growth and demand for education in developing countries, but our findings generally align the broader literatures on education and development, and on local labor markets and demand for education. García and Saavedra (2017) survey the literature on Conditional Cash Transfer (CCT) programs in developing countries. More than 50 countries worldwide use some form of educational CCT program, which pay families for investing in the human capital of their children. CCTs have large, positive effects on educational attainment, with substantial heterogeneity, by decreasing the opportunity cost of education (or increasing the cost of dropping out of school). In the developed world, there is a growing literature on the relationship between local labor market tightness and education demand. Black et al. (2005) look at boom/bust cycles in coal-producing labor markets in the US, and Cascio and Narayan (2019) look at fracking booms in the US; both studies find that improved labor market opportunities caused by booms in low-skill industries decrease educational attainment and increase dropout rates substantially. Emery et al. (2012) study the long-term effects of oil booms on educational attainment in Canada, finding only temporary decreases in post-secondary educational attainment, consistent with high school graduates delaying entry to college until after the oil boom ended. The Open Door Policy, however, did not follow a boom/bust cycle; China's demand for low-skill labor permanently increased after 1978 and, if anything, further increased over the following decades as China became a major global economic power.

Most closely related to our study are two papers examining local labor market effects of trade liberalization on educational attainment. Atkin (2016) studies the education choices of Mexican teenagers after Mexican trade liberalization from 1986 to 2000, finding that the expansion of job opportunities in the manufacturing sector leads to students dropping out at grade 9 instead of continuing through grade 12. The main mechanism we investigate and our findings are similar to Atkin's, although the methods we use differ. Atkin's main specification is an instrumental variables regression, with a large single-firm expansion (e.g. a plant opening) as an instrument for new export-related jobs, and his independent variable is local cohort-average schooling. Our specification is useful for studies of countries and periods where firm-level microdata are not available and provides a measure for export-induced local job openings without relying on the counts of new openings.

? studies the effects of export growth on educational attainment in China from 1990 to 2005 and finds that high-skill export shocks increase high school and college enrollment while low-skill export shocks depress both. We look at an older generation than Li because we aim to explain the puzzling decline in educational attainment in the 1960s, while Li examines a period of greater trade growth and better educational quality and accessibility in China. Li's study provides a strong basis for comparison to our work, with increased low-skill labor demand causing educational attainment to decline. Unlike Li, however, we are able to describe how low- and high-skill labor market tightness appear to have evolved over our cohorts' life cycles.

The paper proceeds as follows. Section 2 provides a historical background of China's Open Door Policy reforms in 1978, as well as an overview of major educational policy changes in the 1970s. Section 3 describes the data, and Section 4 explains the estimation strategies used. Section 5 presents the empirical results of the Open Door Policy's effects on educational attainment and Section 6 presents the results of analysis on relationship of export exposure and mid-career outcomes of the 1960s cohort. Section 7 concludes.

2 Historical Background

2.1 The Open-Door Policy

Before 1978, China had a rigid, centrally planned economy. Individuals and private corporations were not allowed to trade without approval from National Foreign Trade Corporations (NFTCs) – state-owned intermediaries under the supervision of the Ministry of Foreign Trade (Song and Sung, 1991). Domestic commodity prices were not linked to international prices, and foreign currency exchanges were highly restricted. These policy barriers resulted in almost no trade. From the data reported by all trade partners of China in the UN Commodity Trade database, the total value of Chinese exports in 1975 was 6.2 billion USD, only 3.79% of the national GDP. By 1982, China's total export value rose to 20.4 billion USD, 9.95% of the national GDP[4].

In December 1978, China enacted a series of reforms to loosen its trade restrictions. The government granted local governments and NFTCs the power to make decisions regarding exports and imports. Provinces were allowed to set up provincial import-export corporations and by 1980, several hundred corporations obtained the right to export (Song and Sung, 1991). Additionally, the government replaced the administrative restrictions on exports and imports with tariffs, quotas, and licensing. It also loosened control over foreign-owned firms and began encouraging

[4]GDP data for China comes from The World Bank Open Data. In 1975, Chinese GDP was 163.4 billion USD and total Chinese export was around 6.2 billion US dollars. By 1982, Chinese GDP grew to 205.1 billion USD. Both Chinese GDP reported by The World Bank Open Data and the trade values reported by UN ComTrade database are in current US dollars.

foreign direct investment.

The reform to trade policy and foreign investment had a profound impact on the Chinese labor market. The Chinese government recognized the abundance of land and labor in China and tried to accumulate capital and technological expertise by attracting foreign investors. The new factories set up after the Open Door Policy mostly engaged in export processing, assembly, or compensation trade (known as "san lai yi bu").[5] Export processing and assembly are labor-intensive, so these new factories created many well-paid occupations for Chinese workers.

The open door policy rolled out gradually over the country, so the policy had considerable geographic heterogeneity. The government first designated four special economic zones (SEZ) in 1980, where foreign and domestic investment decisions could be made without authorization from the central government in Beijing.[6] In 1984, 14 additional cities spread along the Pacific coast were designated "open coastal cities" for a similar purpose to the original four SEZ (Wei, 1995).[7]

During the same period, China restructured the administration of the agriculture sector. Under the new household responsibility system, local rural households were held responsible for the profits and losses of the land assigned to them. This agriculture system was first adopted in 1979, and expanded nationwide in 1981. Unlike the former agricultural system, this household responsibility system stimulated farmers' enthusiasm and substantially increased agricultural productivity (Lin, 1987, 1988).

[5]Compensation trade is a form of trade where China imports machinery from foreign countries on credit, and pays back with products or services in the future.

[6]The 4 SEZ were Shenzhen, Zhuhai, Shantou, and Xiamen.

[7]The "open coastal cities" differed from the SEZ by their well-established industry facilities and educated labor force.

2.2 Educational History

We aim to examine the impact of the Open Door Policy on declining educational attainment as illustrated in Figure 1. However, this was a tumultuous time period in China with many reforms and shocks that affected education, requiring further explanation. Perhaps the most well-known of these is the Cultural Revolution from 1966-1976. During the decade long movement, all colleges were closed and the national university entrance exam was not reinstated until 1977. However, the Cultural Revolution is unlikely to be the cause of declining education for cohorts born in late 1960s because it occurred before the younger cohorts with the lowest educational attainment entered middle school. The cohort born in 1960, however, were enrolled in primary and middle school during the Cultural Revolution. Why did these cohorts achieve higher educational attainment than their younger counterparts?

Middle and high school education were affected by the Cultural Revolution, albeit to a lesser degree than college education. One policy that directly affected middle and high school education was the "Down to the Countryside Movement". In December 1968, urban youths were sent to "undergo re-education by poor peasants".All middle school and high school graduates in classes 1966-1968 were sent to remote villages and border regions. Beginning in 1970, problems with the movement caused the program to be scaled down, and some sent-down youth even returned home (Unger, 1979; Zhou, 2013). The program officially ended in October 1980, but by 1977, as the merit-based college entrance examination resumed and enforcement of the sent-down policy was relaxed, most sent-down youth had already returned home. Many scholars consider the movement effectively ended by 1978 (Zhou and Hou, 1999). Considering all of this, the main group of "sent-down youth" were birth cohorts 1948-1953 (aged 13-18 in 1966). The "sent-down movement" did not reduce incentives to obtain middle and high school education for birth cohorts after 1965 relative to the 1960 birth cohort, since the 1965-1970 birth cohorts were only 8-12 years old when the program effectively ended.

During the 1970s, the government expanded primary schools and middle schools, especially in rural areas. As a result, according to the Chinese National Statistics Yearbook 1980, enrollment in primary and middle school increased throughout the 1970s nationwide. Overall, we argue that the education policies and reforms of the 1960s and 1970s should have had no negative impact on middle school or high school completion of the cohorts born between 1960 and 1970. If anything, the end of the Cultural Revolution, reopening of universities, and expansion of primary and middle schools should have increased educational attainment, making the decline in Figure 1 all the more surprising.

3 Data

We construct our data set from three data sources. Our primary data source is the 1990 Chinese Population Census 1% sub-sample[8], providing educational attainment, prefecture and province of residence, migration status and other individual characteristics. Table 4 presents the summary statistics of main variables used by comparing the 1960 and 1970 cohorts. We link the Census with industry-level export value changes from 1975 to 1982 using the UN ComTrade database and use prefecture-level industry composition to construct export exposure factors. Lastly, we link our main data set to the Chinese Family Panel Studies 2010 to obtain mid-career labor market outcomes for the cohorts of interest.

[8]Data source: IPUMS International

3.1 Export Changes from UN Commodity Trade Database

The commodity export values come from the United Nations Commodity Trade (UN ComTrade) database, measured in US dollars. We aggregate the import flows from China reported by all countries and use that as the total value of exports from China. There are two reasons for using import flows instead of export flows. First, China did not report its export flows to the United Nations until 1984, although China had exported goods for decades before that. We need trade flows from the 1970s to observe changes in exports from the late 1970s to the 1980s, thus it is not feasible to use export flows reported by China. Second, import flows are generally more reliable than export flows because countries have incentives to track import shipments carefully for tariff purposes (Hummels and Lugovskyy, 2006).

It is commonly believed that export growth in China primarily occurred during the 1990s and 2000s, especially after China joined the World Trade Organization in 2001. In the 1990s and the 2000s, China became a large exporter relative to the rest of the world. However, if we focus on export growth within the country, as industrialization spread and China's productivity increased after a series of political reforms, exports grew exponentially starting in the mid-1970s. According to the World Bank, the total value of Chinese exports grew five-fold from 1970 to 1980, quintupling again from 1980 to 1990. Figure 2 shows the changes in export value for the four highest export value industries from 1960-1990 in China. Before 1990, China mainly exported natural resources (petroleum products) and unskilled labor-intensive products (textile and clothing, small manufactured articles). The export value growth in each of these pillar industries mirrors the aggregate growth in exports, except for petroleum products.[9]

[9]Export value in petroleum products decreased in the late 1980s as China steadily became a net importer of petroleum.

We link Chinese export value changes to local employment data by industry. An industry in trade flow data is defined as a two-digit Standard International Trade Classification (SITC-2) category. Appendix A describes how we create a crosswalk between SITC-2 and Chinese Census industry codes.

3.2 Local Labor Market Composition from Chinese Population Census

In order to calculate the local impacts of export expansion, we need information on the local labor market conditions that Chinese teens faced in the 1970s. However, poor employment statistics in China at that time make direct measurement of local labor market conditions impossible to obtain in a reliable form. We instead use the 1982 Chinese Population Census to infer employment by industry and prefecture in the mid-1970s. We expect some of the changes in job opportunities brought by exports have started to appear in the labor market by this time, particularly for younger workers. To circumvent this issue, we instead used older cohorts, aged 40-50 in the 1982 census (born 1932-1942), to estimate the employment shares in 1975.

There are concerns that some workers may have switched industries between 1975 and 1982. However, given that most workers worked in state-owned enterprises at the time and that the labor market was rigid, moving between occupations was not common.In addition, we choose cohorts that are at mid- to late-career to calculate industry shares; they are less likely to move than their younger, less experienced counterparts. Another potential concern is workers migrating across regions, so we restrict our sample to individuals who have not migrated between prefectures in the last five years. We lose less than 5% of the sample from this restriction.

As shown in table 1, prefecture-level export exposure per worker from 1975 to 1982 increased in the median prefecture by $12,268. The bottom 10% of the prefectures experience only a quarter of the median export exposure . The bottom 10% are exclusively rural inland prefectures, mostly in Tibet. In our main specification, we exclude prefectures above the 99th percentile in export exposure to avoid identifying on prefectures with a small population and one dominant industry.[10] All excluded prefectures are natural resource-producing prefectures. The province-level export exposure per worker has less variation than the prefecture-level export exposure. Table 2 presents the province-level export exposure per worker by quintile. The top quintile includes three municipalities, Beijing, Shanghai and Tianjin, and two oil producing provinces, Heilongjiang and Liaoning.

3.3 Mid-career Outcomes from China Family Panel Studies

We use the China Family Panel Studies (CFPS) 2010 baseline survey to obtain income and employment outcomes for the cohorts born from 1960 to 1970. The CFPS is a nationally representative, annual longitudinal survey of Chinese communities, families, and individuals. It provides national standard province codes, but county and district codes are restricted and unavailable to us.

The variables we use from the CFPS 2010 are years of schooling, number of siblings, marital status, mother's education, father's educaton, mother's party membership, father's party membership, gender, province of residence, and prefecture of birth. Table 7 shows summary statistics of the main variables we use in the mid-career outcome analysis. The mean annual income is 12173 yuan, and the median is about half of the mean. The employment rate of 1960s cohorts in 2010 is 67.4%.

[10]The cut off value for export exposure is 200. Three prefectures are excluded: Karamay city of Xinjiang province, Fushun city of Liaoning Province, and Jiuquan prefecture of Gansu province. Karamay city was built after a rich oil field was discovered in 1955. Jiuquan prefecture has the Yumen oil field and Fushun city is nicknamed "the city of coal".

We use province-level export exposure to assign individuals to three strata in the mid-career outcome analysis.

4 Methods

We aim to estimate the effect of trade on the educational choices of Chinese students in the 1970s and 1980s, around the implementation of China's Open Door Policy in late 1978. To begin, we modify the local labor market exposure measure used by Autor et al. (2013) to be applicable to the rise in exports in China, rather than in import competition from a single trading partner:

$$\Delta XPW_k = \sum_j \frac{L_{jk}}{L_k} \frac{\Delta X_j}{L_j} \tag{1}$$

In equation (1), L_{jk} is the total employment in prefecture k and industry j in China in 1975, ΔX_j is the change in Chinese exports to the world in industry j from 1975 to 1982 (in \$1000s). The term ΔXPW_k, then, is the average export change per worker in prefecture k, weighted by the prefecture's pre-Open Door Policy share of total employment nationwide in industry j, L_j.

Ideally, we would observe employment by industry and by prefecture in China in 1975, and use this to construct our local export exposure variable. However, these data are not available, likely due to the political turmoil in China in the mid-1970s. Instead, we observe employment using China's 1982 National Population Census, and restrict our sample to older workers who are unlikely to change industries between 1975 and 1982. Our sample for constructing these labor share variables includes only workers ages 40 to 50 in 1982 (33 to 43 in 1975), and requires the assumption that any movement of these older workers between industries or between prefectures from 1975 to 1982 is not endogenous with the education decisions of teenagers in this time period. Constructing ΔXPW_k provides us with a single export exposure measure per prefecture, used as the primary variable of interest in our regressions.

We wish to observe the final education decisions of teens who are in school when China implements its Open Door Policy in 1978; to do this, we use China's 1990 National Population Census. Treatment is assigned based on prefecture of residence in 1990, restricting our sample to only individuals who have not moved across prefectures in the past 5 years ($> 95\%$ of the sample). Additionally, we exploit heterogeneity across different age groups, as older teens when the Open Door Policy begins are likely to respond to the trade shock differently than younger teens. Our primary regression model is:

$$Ed_{iky} = \alpha + \sum_{y} \beta_y \Delta XPW_k \times \delta_y + \gamma X_{ik} + \varepsilon_{iky} \tag{2}$$

In (2), our coefficients of interest are β_y, the different effects of the export exposure ΔXPW_k on each birth cohort y born between 1960 and 1970, aged 8 to 18 when the Open Door policy begins in 1978. Importantly, the export exposure does not change between cohorts, it only varies across prefectures. We also include fixed effects for birth cohort, province, sex, ethnicity, and prefecture-level controls in X_{ik}. The coefficients β_y identify between-prefecture, within-province, within-birth cohort differences in the educational response to a prefecture's export exposure change. Our outcome variable, Ed_{iky}, is a middle school completion dummy variable or a high school completion dummy variable. In our regressions in Section 5, we set birth cohort 1960 as our baseline, as 18 year olds in 1978 would have already completed middle school and high school by the time China implemented its Open Door policy. This allows us to make direct comparisons between an unaffected cohort (1960), partially affected cohorts (1961-66)[11], and fully affected cohorts (1967-70).

In our main specification, we relate changes in educational attainment with prefecture-level measures of export value changes. Export value changes can be caused by changes in global demand for Chinese goods or by domestic supply and productivity shocks. An identification challenge we face is that domestic supply shocks are also correlated with uncontrolled factors such as the land reforms of the late 1970s, which potentially affect educational choices by Chinese teenagers. To address this problem, we instrument Chinese export changes with changes in World Import Demand (WID) following Hummels et al. (2014).[12] World import demand is constructed from the UN Comtrade database as the value of product j imported by all countries in year t from all exporting countries and regions except China.[13] The instrument reflects a change in world demand for good k caused by shifts in consumer preferences or industrial use of good j.

We implement the instrumental variable regression using a method similar to (Li, 2018). The first stage regresses Chinese exports from industry j in year t on world import demand and industry and time fixed effects:

$$\mathrm{X}_{jt} = \mathrm{WID}_{jt} + \gamma_t + \phi_j + \epsilon_{jt} \tag{3}$$

Since world import demand and Chinese export values vary only at the industry-time level, it is not appropriate to keep individual person-level control variables in 1 in 3 as is typical in 2SLS estimation. Instead, we use time and industry fixed effects so that first stage identification only comes from industry-level deviation from the

[11]The cohort born in 1966 would be in middle school when the Open Door policy began.

[12]In (Hummels et al., 2014), WID is importing country-product-time specific. In our analysis, we only care about the total export volume, so we aggregate all import flows and construct an industry-time specific variable.

[13]We also exclude exports from Macau and Hong Kong because their exports are likely highly correlated with exports from China due to their investment in mainland China and re-exporting.

aggregate time trend in world imports. The predicted export flows $\widehat{X_{jt}}$ are then used to construct the IV local export exposure:

$$\Delta XPW_k^{IV} = \sum_j \frac{L_{jk}}{L_k} \frac{\Delta \widehat{X_j}}{L_j} \tag{4}$$

One potential concern with world import demand is that it will not satisfy the exclusion restrictions if Chinese domestic supply shocks can alter world demand. In the early 1980s, Chinese economy is likely not large enough relative to the overall world economy to have an impact on world demand. To support our argument of instrument exogeneity, we correlate Chinese industrial outputs with world demand. We obtain output data for 9 "major industrial products" from the China Compendium of Statistics 1949-2008 published by the National Bureau of Statistics. The nine products examined are cement, cigarettes, cloth, coal, crude oil, fertilizer, glass, paper, and steel. The correlation of Chinese output growth in these products from 1975 to 1982 with the world import demand change in the corresponding products is -0.0237, small, and in fact, negative, causing us to believe that world import demand is unlikely to be driven by Chinese domestic supply shocks. Figure E1 in Appendix E plots year-to-year growth of output over annual change in world import demand from 1975 to 1985. We can see that there is no correlation pattern in any of the nine industries and world import demand changes seem uncorrelated with Chinese domestic supply changes.

5 Results

5.1 High School Completion

To begin, we estimate the average effect of prefecture-level export exposure changes on the likelihood of completing high school for birth cohorts 1960-1970. Table 5 presents the OLS and IV point estimates of the effect of export exposure changes on high school completion. Column (1) shows the OLS estimates from a regression including export exposure, gender, ethnicity dummies, province fixed effects and birth year fixed effects. It shows a positive relationship between export growth and high school completion overall. Specifically, a $10000 increase in export exposure increases high school completion by 1.38 percentage points. More interesting, however, is how younger and older students differ in their response to export exposure.

Column (2) includes export exposure interacted with birth cohort fixed effects, in addition to the covariates in column (1). This specification identifies how the effects of export growth differ across birth cohorts. With the 1960 birth cohort set as the baseline, cohorts born in 1961, 1962, and 1963 experienced increased high school completion, while the cohorts born in and after 1964 decreased their high school completion, albeit not significantly, relative to the 1960 cohort. Column (3) is our preferred OLS specification. Column (3) adds two sets of controls – interaction terms of province fixed effects and birth cohort fixed effects, and prefecture-level controls including total population, proportion of ethnic minorities, primary school completion rate, middle school completion rate, and college completion rate. These controls capture all potential province-year specific omitted variables, as well as additional effects varying at the prefecture level – the smallest level of geography available in our dataset.

The estimates in column (3) show that export exposure has a significant, negative effect on cohorts born in and after 1965. Compared to the cohort born in 1960, a $10000 increase in exports per worker leads to a 0.911 percentage point decrease in the high school completion rate for those born in 1965. Moreover, this effect is greater for younger cohorts. Those born in 1970 have a 1.15 percentage point lower probability of completing high school compared to the 1960 cohort, when experiencing the same $10,000 trade shock. We also estimate a 2SLS model using the same second-stage specification as in column (3), where we use contemporaneous industry-specific world import demand to instrument industry-specific Chinese exports. This estimation enables us to disentangle demand-driven export growth from the overall productivity growth of China in the 1970s and 1980s. Column (4) shows the IV estimates. They show a consistently similar pattern to the OLS estimates in Column (3) with somewhat larger magnitudes, but also large standard errors.

The effects shown in Table 5 mask substantial between-prefecture heterogeneity in export growth from 1975 to 1982. The average prefecture-level export exposure was $31,510, but the 25th percentile prefecture experienced only $5917 of export exposure, while the 90th percentile experienced over $49,131. Figure 3 plots the point estimates from column (3) of Table 5, evaluated at the mean export exposure per worker for each birth cohort, with the 1960 birth cohort as the baseline. A student born in 1966 with a mean export exposure of $31,510 has a 3.4 percentage point lower probability of finishing high school compared to one born in 1960 with the same exposure. Overall, our coarsely measured export exposure explains 20.7% of the high school completion decline among cohorts born in the 1960s.[14]

Figure 4 includes three curves showing the estimated effects at the 25th, 50th,

[14]The high school completion rate decreased from 30.02% in the 1960 birth cohort to 13.67% in the 1966 birth cohort; our export exposure measure explains 3.4 percentage points of the 16.35 percentage point overall decline in high school completion.

and 90th percentile of export exposure per worker. The high school completion rate for cohorts born between 1964-1970 with the 90th percentile export exposure is reduced by 2.9 to 5.6 percentage points compared to the 1960 birth cohort.[15] Overall, our results indicate that China's Open Door Policy had a negative, significant, and large effect on the high school completion rates of the 1964-1970 birth cohorts, compared to the cohort born in 1960.

5.2 Middle School Completion

The previous results suggest that high schoolers dropped out of school due to job opportunities brought by the Open Door Policy. It is important to also investigate if this trade shock had a similar effect on middle school completion. In Figure 1, both middle school and high school completion rates declined for the 1960s birth cohorts, although the reduction in high school completion rate was larger and affected older cohorts than the decrease in middle school completion.

Table 6 presents OLS and IV estimates of the effects of export exposure on middle school completion. Unlike with high school completion, column (2) shows that export exposure has a positive effect on the middle school completion rate of the birth cohorts born after 1966, compared to the baseline cohort in 1960. The effects are stronger for younger cohorts. After controlling for province by birth interactions and prefecture-level characteristics, column (3) still shows that export exposure has a positive effect on the 1968 and 1970 cohorts. Column (4) shows the IV estimates. The export exposure has an insignificant and negative effect on cohorts born in and after 1962 and its positive effect on cohort 1968 and 1970 is

[15]Prefectures include Jiayuguan city, Ningbo city, Taiyuan city, Anshan city, Dandong city, Tongling city, Shanghai municipality, Beijing municipality, Tianjin municipality, Dalian city, Huainan city, Qiqihar city, Suihua city, Daqing city, Baicheng city, Songyuan city, Liaoyang city, Urumuqi city, Baicheng city, Songyuan city, Yingkou city, Panjin city, Lanzhou city, Benxi city, Wuhai city, Jiuquan prefecture, Fushun city and Karamay city.

greatly diminished in the IV estimation. Although the positive effect is not large in magnitude in column (3), it is puzzling. Why would export growth decrease high school completion, yet increase middle school completion for cohorts born in the 1960s?

Simultaneous reforms in the agricultural system affected farmers' educational attainment differently than non-farmers'. If we estimate our main regression separately for farmers and non-farmers, we find that export exposure has negative effects on both high school and middle school completion of the youngest cohorts in our sample, although the results are no longer significant. We discuss this finding in further details in Appendix B.

6 Mid-Career Outcomes

The analysis in the previous section shows that the Open Door Policy decreased the educational attainment of birth cohorts 1965-1970. This explains a substantial amount of the overall decline in high school completion for people born in the mid-1960s compared to those born in 1960. In this section, we investigate the mid-career outcomes of adults who were exposed to this trade shock when they were of schooling ages, to link the changes in education shown in Section 5 to local skill premiuma.

The channels through which the trade shock impacts mid-career outcomes for the generation born between 1960-1970 are complex, but here we only focus on education. We use the Chinese Family Panel Studies 2010 baseline survey (henceforth CFPS), which is the best publicly available dataset providing detailed demographic, education, and employment information for the 1960s birth cohorts. The individuals in the 1960-1970 birth cohorts are 40 to 50 years old in 2010, reaching their peak earnings potential in our sample. To test if there are differential skill premia for individuals born in provinces with different levels of trade exposure, we assign export exposure by the province at birth in the CFPS.[16] The final education decisions for these cohorts were made in response to the job opportunities available when they were teenagers attending middle school or high school; the province-level shocks at that time should reflect the labor market environment faced bythose teens in school. We split the distribution of province-level export exposure into three subgroups: high, middle, and low trade exposures (see Figure 5 for the distribution).[17] The CFPS includes deidentified indicators for birth prefecture, which cannot be linked to our export exposure measures; instead, we link at the birth province level. Note that not all provinces in the high exposure level are high-income provinces today. By level of export exposure, we regress labor market outcomes on educational attainment, controlling for number of siblings, parental education, parental Communist party membership, birth prefecture fixed effects, year of birth fixed effects and current province of residence fixed effects.

Table 8 presents the skill premia by group of province-level export exposure. We are showing only descriptive evidence of the patterns between education and wages, rather than causal relationships between education, career outcomes and export exposure. Results in the previous sections demonstrate that in high trade exposure areas, people attained lower education. If high trade exposure regions have lower wage and employment differentials than low exposure regions, the dropout decisions made in the 1970s and 1980s are easily justifiable. However, if these differentials are flat or even increasing in export exposure, then the trade-induced high school

[16] CFPS 2010 has the question "Where did you live when you were 12?", which is a more direct proxy for location of school. The response rate to that question is too low, however, for it to be useful to our analysis. Given how hard it was to migrate back in the 1970s, it is reasonable to believe that for most people the province they are born in will be the one they went to school in.

[17] Table 3 lists provinces and summary statistics of export exposure of each group

dropouts likely are worse off at mid-career than in the counterfactual scenario where they chose to complete high school instead.

The top two panels of Table 8 show that the skill premium of high school graduates is generally non-decreasing across levels of trade exposure. High school graduates earn at least 55% more in annual income than those who did not graduate from high school. The percentage increases in income are not statistically different across these three subgroups, although the most export exposed areas have significantly greater differences in total annual income compared to the less export exposed provinces. Panel three shows that high school graduates are more likely to be employed than their less educated peers. Moreover, a high school graduate in the highly exposed provinces is significantly more likely to be employed than a high school graduate in the less exposed areas. Overall, these results suggest that skill premia are, at minimum, non-decreasing, and often increasing in export exposure.

Since the highest exposed areas generally have the highest skill premia, we should more closely examine this subgroup. There are four provincial-level administrative regions in the highest subgroup: Beijing, Shanghai, Tianjin, and Liaoning. In the late 1970s, Liaoning was a largely rural, oil-producing province while Beijing, Shanghai and Tianjin were the only three municipalities designated as provincial-level administrative regions. Liaoning's high trade exposure is driven by a large increase in oil exports and the dominance of oil extraction in the provincial economy. In contrast, Beijing, Shanghai and Tianjin's trade exposure was driven primarily by growth in textile, clothing, and small manufactured article exports. We break the most trade-exposed subgroup into "cities" and "non-cities" to explore if exports affect the skill premium differently between municipalities and rural oil-producing provinces.

Table 9 reveals that the higher income premium in the highest exposed areas is mainly driven by cities. High school graduates born in Liaoning have similar income differentials to the rest of the country. High school graduates born in the large cities, however, earn CNY 25302 more per year than non-graduates, which is equivalent to 3737 U.S. dollars.[18] This is 31.8% of average urban household income according to the China Household Finance Survey in 2011. This result is quite large, but not surprising, as skill-intensive jobs concentrate in big cities. A teenager who quit high school to work in a factory will likely be unqualified for managerial jobs in his forties. Interestingly, the gap between employment differentials comparing cities to non-cities is extremely large: 9.96% versus 24.6%. Given that most people have not moved out of the province they were born in[19], trade shocks opened jobs that remained in the long run, but those jobs don't necessarily pay more.

Given that the skill premium is higher for those born in a city between 1960-1970, did high schoolers in big cities dropout in response to export growth in a similar manner to the rest of the country? We create an indicator for the 9 most populated cities in 1990 based on China Statistical Yearbook.[20] We divide birth cohorts into young (born in or after 1965) and old (born before 1965) and interact the large city indicator with this young/old indicator and our export exposure measure. Table 10 shows that the younger cohort are more responsive to export growth if they were born in a big city than in other regions with similar trade exposure. This is an intuitive result; when China was opening its doors for trade, the earliest expansion of production was concentrated in big cities where existing infrastructure was already well-suited for industry.

In summary, our mid-career outcome analysis indicates that education has a high long run return across the country, which is much larger for individuals born

[18]Converted using 2010 exchange rate. 1 USD=6.77 CNY in July 12 2010.

[19]Only 4.88% of cohorts born between 1960–1970 moved out of their province at birth based on CFPS 2010.

[20]Shanghai, Beijing, Tianjin, Wuhan, Shenyang, Guangzhou, Chongqing, Xi'an, and Nanjing.

in big cities. However, when making drop-out decisions, it seems that teenagers chose to forego long run career benefits, which they may not have anticipated, to earn immediate income. This decision was especially costly for teenagers born in Beijing, Shanghai and Tianjin, as the returns to education at mid-career are much higher than in the rest of country. Because they are more likely to drop out before completing high school, in the long run, they appear to have made a costly decision leaving school early.

7 Conclusion

We investigate how China's Open Door Policy affected the educational attainment of China's 1960s birth cohorts. There are clear declines in both high school and middle school completion for nearly a decade, and we are the first to examine the underlying causes of these nationwide trends. We find that export growth driven by the Open Door Policy explains 20.7 percent of the overall decline in high school completion across the 1960s birth cohorts. This suggests that the wave of new, unskilled jobs created by the Open Door Policy were filled by teenagers choosing lower educational attainment than they otherwise would.

At mid-career for the 1960s cohorts, we provide descriptive evidence that the wage and employment differentials for high school graduates are non-decreasing in export exposure. This is despite the fact that export exposure causes substantial decreases in high school completion. This implies that any temporary gains in income and employment from an early dropout decision were eventually surpassed by the widening of the skill premium over the following decades. Likely, these individuals should have attained more education in response to export shocks in their teenage years, not less. The potential reasons for dropping out could be that these teenagers did not properly anticipate the long run benefits of education. Alternatively, they could be excessively risk averse or impatient in waiting for the resolution of the uncertainty of mid-career returns to education, or they simply desired an immediate boost to their income due to familial survival constraints.

Future studies on rapid growth in developing countries should certainly consider the tradeoffs our study indicates. Our findings provide empirical evidence that the tradeoffs between rapid economic growth and educational attainment cause a reduction in the long-term availability of skilled labor. We are the first to link this reduction in educational attainment to long-term wage and employment returns to education. Our descriptive results suggest that early economic growth causes short-sighted reductions in educational attainment, which may impede the long-term growth of developing economies. Future work on the causes of economic growth should carefully consider the complicated relationships our findings suggest between short-term growth, human capital accumulation, and long-term growth.

References

Angrist, J. D. and Krueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings? *The Quarterly Journal of Economics*, 106(4):979–1014.

Atkin, D. (2016). Endogenous skill acquisition and export manufacturing in mexico. *The American Economic Review*, 106(8):2046–2085.

Autor, D. H., Dorn, D., and Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*.

Banister, J. (2005). Manufacturing employment in china. *Monthly Lab. Rev.*, 128:11.

Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of Political Economy*, 70(5, Part 2):9–49.

Black, D. A., McKinnish, T. G., and Sanders, S. G. (2005). Tight labor markets and the demand for education: Evidence from the coal boom and bust. *ILR Review*, 59(1):3–16.

Cascio, E. U. and Narayan, A. (2019). Who needs a fracking education? the educational response to low-skill biased technological change.

Emery, J. H., Ferrer, A., and Green, D. (2012). Long-term consequences of natural resource booms for human capital accumulation. *ILR Review*, 65(3):708–734.

García, S. and Saavedra, J. E. (2017). Educational impacts and cost-effectiveness of conditional cash transfer programs in developing countries: A meta-analysis. *Review of Educational Research*, 87(5):921–965.

Giles, J., Park, A., and Wang, M. (forthcoming). The great proletarian cultural revolution, disruptions to education, and the returns to schooling in urban china. *Economic Development and Cultural Change*.

Heckman, J. J., Humphries, J. E., and Veramendi, G. (2018). Returns to education: The causal effects of education on earnings, health, and smoking. *Journal of Political Economy*, 126(S1):S197–S246.

Hummels, D., Jørgensen, R., Munch, J., and Xiang, C. (2014). The wage effects of offshoring: Evidence from danish matched worker-firm data. *American Economic Review*, 104(6):1597–1629.

Hummels, D. and Lugovskyy, V. (2006). Are matched partner trade statistics a usable measure of transportation costs? *Review of International Economics*, 14(1):69–86.

Li, B. (2018). Export expansion, skill acquisition and industry specialization: evidence from china. *Journal of International Economics*, 114:346–361.

Lin, J. Y. (1987). The household responsibility system reform in china: a peasant's institutional choice. *American Journal of Agricultural Economics*, 69(2):410–415.

Lin, J. Y. (1988). The household responsibility system in china's agricultural reform: a theoretical and empirical study. *Economic Development and Cultural Change*, 36(S3):S199–S224.

Song, E. and Sung, Y. W. (1991). *The China-Hong Kong connection: The key to China's open door policy*. Cambridge University Press.

Unger, J. (1979). China's troubled down-to-the-countryside campaign. *Contemporary China*, 3(2):79–92.

Wei, S.-J. (1995). The open door policy and china's rapid growth: evidence from city-level data. In *Growth Theories in Light of the East Asian Experience, NBER-EASE Volume 4*, pages 73–104. University of Chicago Press.

Zhou, W. (2013). How does a traumatic experience during youth affect life later? the long-term impact of the send-down program during the chinese cultural revolution. Technical report, Working Paper.

Zhou, X. and Hou, L. (1999). Children of the cultural revolution: The state and the life course in the people's republic of china. *American Sociological Review*, pages 12–36.

Table 1: Summary Statistics of Export Exposure per prefecture, in 10,000 USD

Percentile	Export Exposure	Statistics	
	Panel One: Unweighted by prefecture population		
10%	0.3033	Mean	3.151
25%	0.5917	Std Dev	15.0498
75%	2.2562	Minimum	0.0486
90%	4.9131	Maximum	209.5255
Obs	198	Median	1.2268
	Panel Two:Weighted by prefecture population		
10%	0.4663	Mean	2.0377
25%	0.8546	Std Dev	3.4339
75%	2.2077	Minimum	0.0486
90%	4.4438	Maximum	209.5255
Obs	2,643,546	Median	1.3719

This table shows the summary statistics of prefecutre-level export exposure (in $10,000) between 1975–1982. Panel 1 shows the unweighted export exposure and Panel 2 shows the export exposure weighted by prefecture population.

Table 2: Summary Statistics of Export Exposure per province, in 10,000 USD

Quintiles	Provinces	Mean	SD	Min	Max
20%	Yunnan, Tibet, Guangxi, Guizhou, Henan, Sichuan	0.692	0.22	0.47	1.003
40%	Anhui, Hunan, Jiangxi, Shaanxi, Fujian, Hebei	1.246	0.177	1.021	1.498
60%	Shanxi, Hubei, Guangdong, Ningxia, Shandong, Qinghai	1.639	0.064	1.54	1.718
80%	Inner Mongolia, Jiangsu, Gansu, Zhejiang, Xinjiang, Jilin	2.913	0.939	2.0003	4.211
100%	Beijing, Shanghai, Tianjin, Liaoning, Heilongjiang	6.393	1.111	4.407	6.928

This table shows the summary statistics of province-level export exposure (in $10,000) between 1975–1982 by quintiles.

Table 3: Summary Statistics of Export Exposure by Low, Middle, and High Levels

Level	Provinces	Mean	SD	Min	Max
Low	Zhejiang, Hunan, Guangxi, Guizhou, Yunnan, Tibet Inner Mongolia, Anhui, Fujian, Jiangxi, Henan Sichuan, Hebei, Jiangsu, Jiangxi, Hubei, Guangdong Shaanxi, Shanxi, Qinghai, Ningxia, Gansu	14.006	6.0947	4.701	28.396
Middle	Jilin, Heilongjiang, Xinjiang	41.789	2.452	39.194	44.067
High	Beijing, Shanghai, Tianjin, Liaoning	68.897	0.550	68.098	69.283

This table shows the summary statistics of province-level export exposure (in $10,000) between 1975–1982 by low, middle, and high level. The province-level export exposure distribution is shown in Figure 5. .

Table 4: Summary Statistics on Education and Demographics, 1990 Census

	1960		**1970**	
1990 Census	**Mean**	**SD**	**Mean**	**SD**
Education				
Complete primary school	0.847	0.36	0.863	0.344
Complete middle school	0.631	0.483	0.524	0.499
Complete high school	0.281	0.449	0.096	0.294
Some high school	0.289	0.454	0.142	0.349
Some College	0.024	0.154	0.028	0.164
Demographic Characteristics				
Female	0.486	0.5	0.489	0.5
Ethnic Minority	0.078	0.268	0.08	0.272
Agriculture	0.574	0.494	0.627	0.484
N	142270		277357	

Source: IPUMS 1990 China Population Census. This table shows the summary statistics on educational attainment and key demographic information for the 1960 cohort and the 1970 cohort.

Table 5: High School Completion

	OLS			IV
	(1)	(2)	(3)	(4)
ΔXPW	0.0138**	0.0160*	0.0110*	0.0177*
	(0.00649)	(0.00862)	(0.00550)	(0.0103485)
1961.birthyr×ΔXPW		0.00593**	0.000500	0.0000499
		(0.00243)	(0.00248)	(0.0056993
1962.birthyr×ΔXPW		0.00297	-0.00191	-0.00439
		(0.00186)	(0.00223)	(0.0058464)
1963.birthyr×ΔXPW		0.00124	-0.00294	-0.00584
		(0.00194)	(0.00335)	(0.0075166)
1964.birthyr×ΔXPW		-0.0000960	-0.00589	-0.0102
		(0.00286)	(0.00439)	(0.0087994)
1965.birthyr×ΔXPW		-0.00414	-0.00911*	-0.0137
		(0.00424)	(0.00487)	(0.0095123)
1966.birthyr×ΔXPW		-0.00532	-0.0108**	-0.0155
		(0.00494)	(0.00490)	(0.0097662)
1967.birthyr×ΔXPW		-0.00611	-0.0107*	-0.0160
		(0.00518)	(0.00544)	(0.0101343)
1968.birthyr×ΔXPW		-0.00398	-0.0114**	-0.0158
		(0.00547)	(0.00530)	(0.010412)
1969.birthyr×ΔXPW		-0.00441	-0.0105*	-0.0152
		(0.00557)	(0.00594)	(0.0117285)
1970.birthyr×ΔXPW		-0.00742	-0.0115*	-0.0171
		(0.00613)	(0.00628)	(0.0117693)
Province FE	Y	Y	Y	Y
Birth FE	Y	Y	Y	Y
Province × Birth FE			Y	Y
Prefecture Controls			Y	Y
F-Statistic				5.34
Observations	2443360	2443360	2399394	2399394

This table presents the OLS and IV point estimates of the $10,000 prefecture-level export exposure's effect on high school completion. All regressions include demographic characteristics as sex and ethnicity, province fixed effects, and birth year fixed effects. Column 2 adds in interaction terms of birth year and the export exposure. Column 3 is our preferred OLS specification, which controls for prefecture-level population, ethnic minority fraction, primary school completion rate, secondary school completion rate, and university completion rate. Column 4 shows the IV estimates from the same specification of Column 3.

All standard errors in parentheses are clustered at province level. *$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Middle School Completion

	OLS			IV
	(1)	(2)	(3)	(4)
ΔXPW	0.0200*	0.0149	-0.00391	0.00293
	(0.0117)	(0.0124)	(0.00556)	(0.0130563)
1961.birthyr×ΔXPW		0.00261*	0.00259	0.00115
		(0.00135)	(0.00170)	(0.0044927)
1962.birthyr×ΔXPW		0.000395	0.000803	-0.00396
		(0.00230)	(0.00227)	(0.0060218)
1963.birthyr×ΔXPW		-0.000790	0.00252	-0.000863
		(0.00261)	(0.00248)	(0.0058412)
1964.birthyr×ΔXPW		0.00195	0.00292	-0.00104
		(0.00272)	(0.00281)	(0.0070215)
1965.birthyr×ΔXPW		0.00326	0.00280	-0.00214
		(0.00292)	(0.00276)	(0.0061265)
1966.birthyr×ΔXPW		0.00554*	0.00293	-0.00296
		(0.00289)	(0.00290)	(0.0073495)
1967.birthyr×ΔXPW		0.00737**	0.00469	-0.00177
		(0.00287)	(0.00288)	(0.0083815)
1968.birthyr×ΔXPW		0.0107***	0.00611**	0.00124
		(0.00316)	(0.00260)	(0.0058545)
1969.birthyr×ΔXPW		0.0108***	0.00460	-0.0000789
		(0.00328)	(0.00291)	(0.0064149)
1970.birthyr×ΔXPW		0.0131***	0.00728**	0.00334
		(0.00372)	(0.00309)	(0.0076127)
Province FE	Y	Y	Y	Y
Birth FE	Y	Y	Y	Y
Province × Birth FE			Y	Y
Prefecture Controls			Y	Y
F-Statistic				5.34
Observations	2443360	2443360	2399394	2399394

This table presents the OLS and IV point estimates of the $10,000 prefecture-level export exposure's effect on middle school completion. All regressions include demographic characteristics as sex and ethnicity, province fixed effects, and birth year fixed effects. Column 2 adds in interaction terms of birth year and the export exposure. Column 3 is our preferred OLS specification, which controls for prefecture-level population, ethnic minority fraction, primary school completion rate, secondary school completion rate, and university completion rate. Column 4 shows the IV estimates from the same specification of Column 3.

All standard errors in parentheses are clustered at province level. $*p < 0.10$, $** \ p < 0.5$, $*** \ p < 0.1$

Table 8: Skill Premium, by Levels of Birth Province Exposure to Trade Exposure

	Low	Middle	High
	Panel One: Annual Income (CNY)		
High School Completion	6224.7***	6402.5**	13791.7***
	(752.4)	(2352.0)	(3448.2)
	Panel Two: Log Annual Income		
High School Completion	0.565***	0.769**	0.550***
	(0.0595)	(0.264)	(0.127)
	Panel Three: Current Employment Status		
High School Completion	0.0640**	0.103	0.156**
	(0.0212)	(0.0965)	(0.0476)
N	3793	282	726

This table presents the correlation of high school completion and mid-career outcomes of adults who have been exposed to 3 different levels ("low", "middle", and "high") of the trade shock when they were at schooling ages. The outcome variables in Panel One, Two and Three are annual income, log annual income, and current employment status. All regressions include individual controls, current province of residence fixed effects, year of birth fixed effects and birth prefecture fixed effects. Individual controls include gender, number of siblings, mother's highest level of education, father's highest level of education, mother's party membership and father's party membership.

Table 7: Summary Statistics on Career Outcomes and Demographics, CFPS 2010

Variable	**Mean**	**Median**	**Std. Dev.**
Annual Income	12173.313	6000	23282.61
Years of Schooling	7.689	9	4.087
Employment Status	0.674	-	0.469
# Siblings	3.507	3	1.703
Female	48.26%		
Marriage Status			
Never Married	1.03		
Married	95.21		
Cohabitation	0.27		
Divorced	1.94		
Widowed	1.55		
N	5781		

Variables	**Percent**		**Percent**
Father's Edu		**Mother's Edu**	
Illiterate/Semi-illiterate	51.49		74.42
Primary School	30.55		18.24
Junior High School	10.72		4.47
Senior High School	5.36		2.11
2- or 3-year College	0.84		0.28
4-year College/Bachelor's Degree	1.01		0.35
Master's Degree	0.00		0.03
Doctoral Degree	0.03		0.09
Father's Part		**Mother's Party**	
Member of Communist	18.79		2.42
Member of Democratic	0.15		0.01
Member of Communist Youth League	1.06		0.95
General Public	80.00		96.63

This table shows the summary statistics of China Family Panel Studies (CFPS) 2010. The upper panel shows individual characteristics and career outcomes and the lower panel shows the parental characteristics we controlled for.

Table 9: Skill Premium in the Highest Trade Exposure Areas, Cities v.s. non-Cities

	Cities (Beijing Shanghai Tianjin)	Non-cities (Liaoning)
	Panel One: Annual Income (CNY)	
High School Completion	25301.6***	4314.6**
	(6978.3)	(1952.2)
	Panel Two: Log Annual Income	
High School Completion	0.616***	0.492**
	(0.170)	(0.217)
	Panel Three: Current Employment Status	
High School Completion	0.0996*	0.246**
	(0.0597)	(0.0790)
N	301	425

This table presents the correlation of high school completion and mid-career outcomes of adults who have grown up in the most trade-exposed areas, cities (Beijing, Shanghai, and Tianjin) versus non-cities (Liaoning). The outcome variables in Panel One, Two and Three are annual income, log annual income, and current employment status. All regressions include individual controls, current province of residence fixed effects, year of birth fixed effects and birth prefecture fixed effects. Individual controls include gender, number of siblings, mother's highest level of education, father's highest level of education, mother's party membership and father's party membership.

Table 10: High School Completion by Generation by Birth Location

	High School Completion Rate
Young cohort×Big city×ΔXPW	-0.772**
	(0.305)
Young Cohort	-1.62***
	(0.286)
Young cohort×ΔXPW	-0.360**
	(0.110)
Big city	0.187
	(0.130)
Big city×ΔXPW	1.49***
	(0.281)
ΔXPW	0.667***
	(0.180)
Observations	2450185

This table presents OLS estimates of export exposure's differential effects on young cohorts in the most populated cities. We define young cohort as 1 if the individual is born after 1965, and 0 otherwise. Big city is 1 if the individual is born in one of these 9 cities: Shanghai, Beijing, Tianjin, Wuhan, Shenyang, Guangzhou, Chongqing, Xi'an, and Nanjing, 0 otherwise. ΔXPW is the province level trade exposure. Each of these cities is a prefecture. Harbin was one of the top 10 cities, but it is not a prefecture on its own so we leave it out. Standard errors are clustered at the province level.

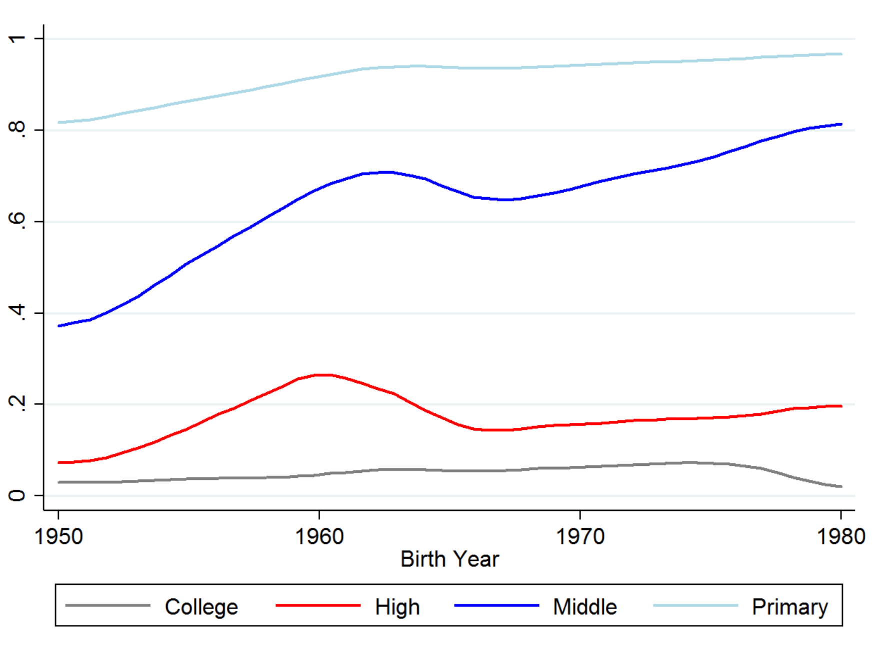


Figure 1: School Completion Rates across Cohorts
Notes: Data is from China's 2000 Census. Sample includes birth cohorts 1950–1980.

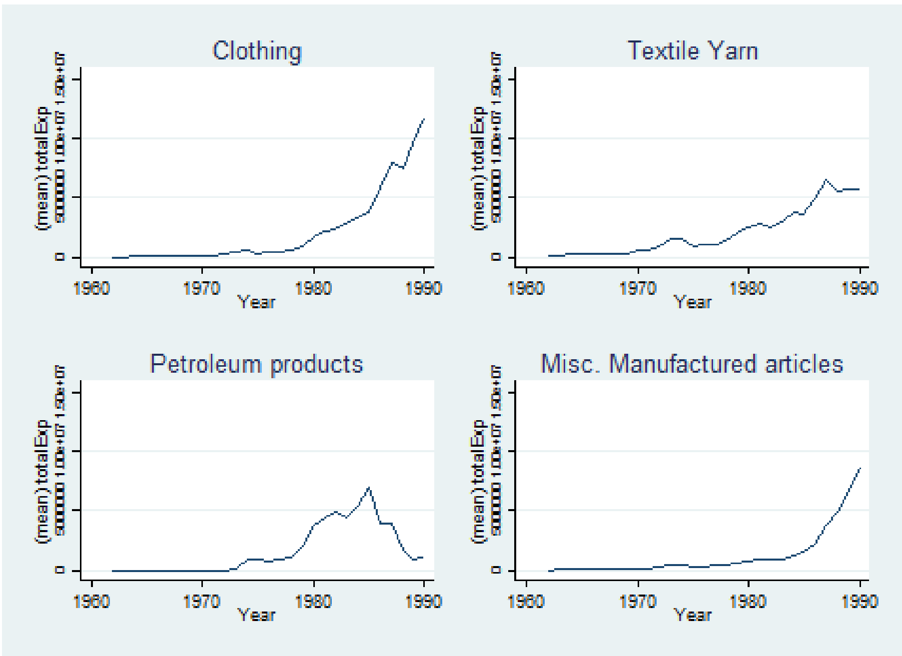


Figure 2: Highest Export Value Industries, 1960-1990
Notes: Data is UN Commodity Trade database. It shows China's yearly export values from the top four export industries in 1960–1990.

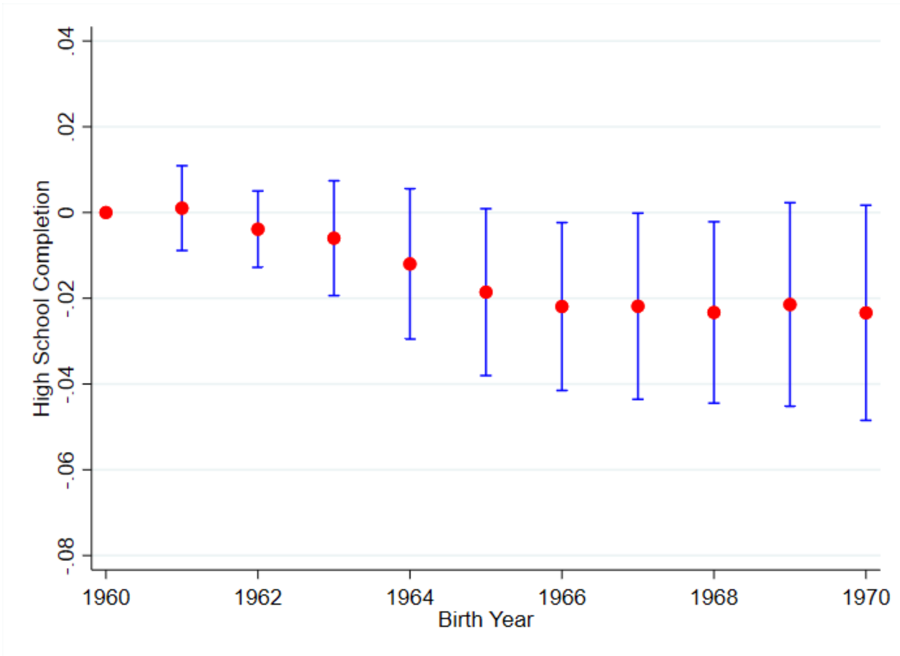


Figure 3: Population-level-mean Effect of Export Exposure on High School Completion

Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-level export exposure on high school completion of the 1961–1970 cohorts, relative to the 1960 cohort.

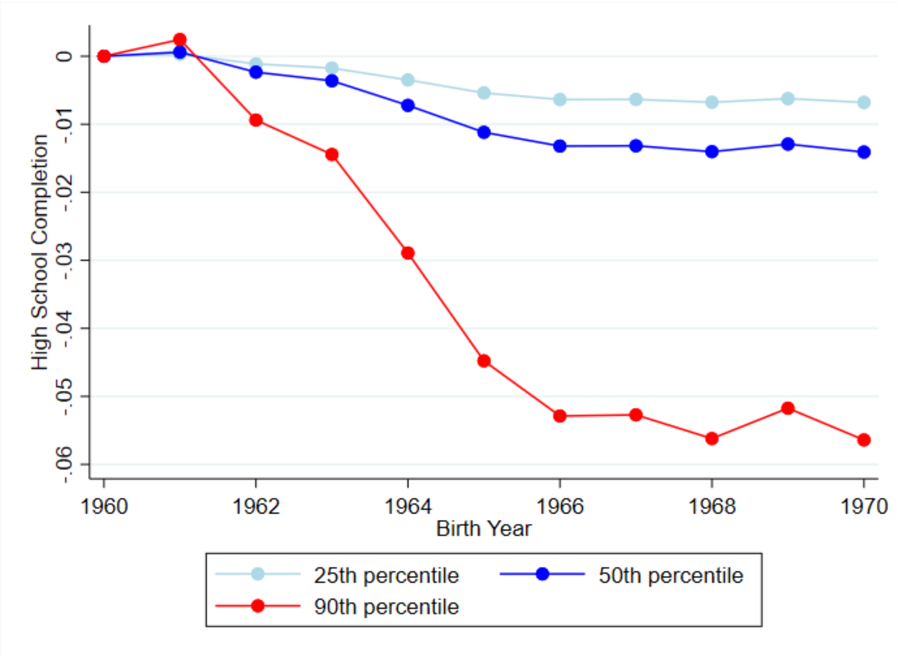


Figure 4: 90/50/25 Percentile Effects on High School Completion
Notes: This Figure includes three curves showing the 25th, 50th, and 90th percentile of prefecture-level export exposure on high school completion.

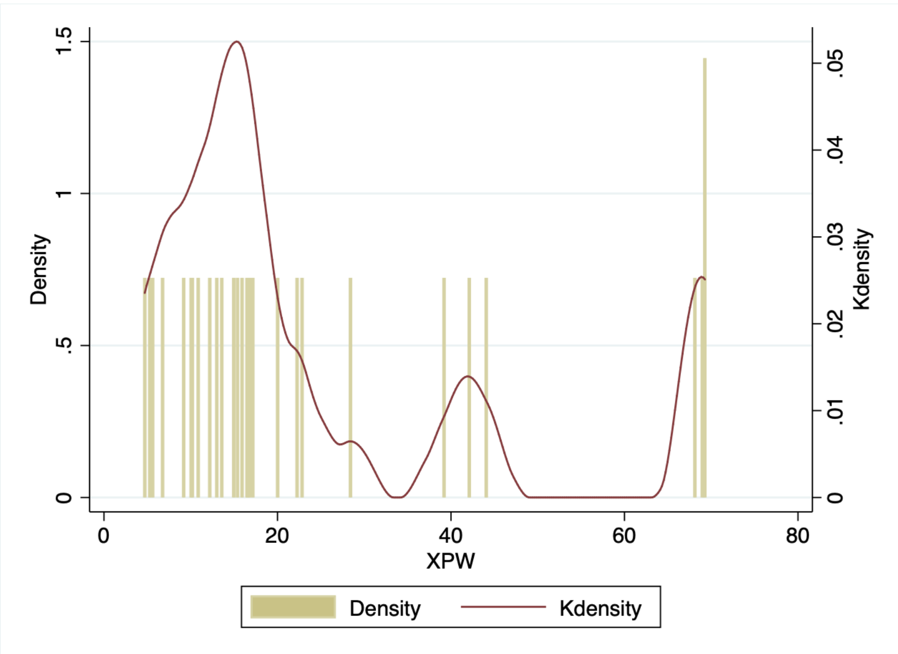


Figure 5: Province-level Export Exposure Distribution
Notes: This Figure includes density and kernel density of the province-level export exposures.

Appendix A Data Appendix

A.1 Mapping Census industry code to Standard International Trade Classification

IPUMS International provided the Chinese Census 1982 data, in which we learn about the industries the subjects worked in. Industry codes are reported on IPUMS website as "CN1982A_INDUSTRY", but the codes do not belong to any standardized classification systems commonly used to record trade data. We created a mapping between CN1982 industry codes and two-digits Standard International Trade Classification (henceforth SITC-2) codes to link changes in trade flows reported by UN ComTrade to the industry compositions calculated from Chinese Census data. Note that two-digits SITC industries are more aggregated than most CN1982 industry categories, so it is common to have multiple CN1982 industry codes mapping into one SITC-2 category.

When matching the trade flows to the industries individuals in the census works in, we need to create a concordance between the product classification system used to document trade flows and the industry code provided by the census. There are several commonly used classification codes for trade flows: the United Nation database used harmonized system codes (HS codes), standard international trade classification (SITC codes) and classification by Broad Economic Categories (BEC codes). We choose SITC because we need data from the sixties, and HS codes are not introduced until 1989. Most countries report trade flows under SITC codes in the earlier years. BEC is less commonly used in the international trade literature since it does not have categories as fine as HS and SITC codes.

We manually created the concordance between unrecoded industry codes (variable name "ind") in the census and two digits SITC industry codes. Given that there are 231 categories of unrecoded industries and only 20 for the recoded, we used the unrecoded industries instead of the general recoded industries to create a more detailed mapping. The mapping is from Chinese 1982 industries codes to two-digits SITC codes. We restrict the mapping to two-digits SITC to minimize measurement error due to the manual mapping.

SITC is a five-digit system to code products, and the trade literature usually regard two-digit SITC as the industry. For example, industry 05 is "Fruit and vegetables", 051 is "Fruit, fresh, and nuts excl. Oil nuts", 0511 is "Oranges, tangerines and clementines", and 05111 is "Oranges". The corresponding industry in the census is 013 "Vegetables, gourd and melons". For most industries, there is a natural and unambiguous mapping between a census industry and a two-digit SITC industry. Occasionally, it is possible to match a census industry code to higher digit SITC products, but for consistency, we keep all the matching to the two-digit level. There are two-digit SITC codes, thus multiple industries in the census may map into one SITC industry. When we calculate the impact on a province or prefecture, we aggregate the unrecoded industries to SITC industries and calculate the export impact using the SITC industries.

There are occasions that we need to merge two SITC-2 industries into one industry. Here is a list of industries we merged: we simply summed the export flows into one industry classification.

- 41(Animal oils and fats) and 29 (crude animal or vegetable materials) were added to to category 09, miscellaneous edible products and preparations.

- 52 (inorganic chemicals) and 53 (dyeing tanning and colouring materials) were added to 51, chemical elements and compounds.

- 95 (Armoured fighting vehicles, war firearms, ammunition, parts, nes), 96(coin (other than gold coin), not being legal tender), 91(Postal packages not classified according to kind), 83(Travel goods, handbags and similar containers), 81(Sanitary, plumbing, heating and lighting fixture) are added into 89, miscellaneous manufactured articles, nes.

- 7(Coffee, tea, cocoa, spices & manufacs. Thereof), 22(Oil seeds, oil nuts and oil kernels) is added to 23 (rubber) , and it maps into CN1982A_INDUSTRY code 012, cash crops.

- 57(Explosives and pyrotechnic products) and 58(Artificial resins and plastic materials, and cellulose esters etc) are added into 59(Chemical materials and products, nes)

- 94(Animals, live, nes, (including zoo animals, pets, insects, etc)) is added to 01(livestock) is is mapping to CN1982A_INDUSTRY code 029 small animal raising, hunting and others.

- 42(Fixed vegetable oils and fats) is added to 43(Animal and vegetable oils and fats, processed), mapping to CN1982A_INDUSTRY code 182, vegetable oil processing.

A.2 Trade Flows

We are only interested in commodity trade flows because service trade data is not available in the period we are interested. In the case of China's service export, the data is available year 2000 onward on UN Trade Statistics database. In addition, service trade value is relatively small compared to goods trade. In year 2001 for example, service trade only takes 14% of the total export value of China.

All data are downloaded under the option "SITC revision 1" to make sure we have minimum missing value. UN Trade Statistics database provides consistently coded data that is converted from the trade flow reported under various original categorizations. In the seventies and the eighties, trade flows are documented under SITC revision 1 and revision 2. United Nation introduces the SITC revision 2 in 1981; and some countries report using SITC rev 2 immediately. On two-digit industries level, only revision 1 and 2 are very similar. We chose SITC codes over harmonized system codes to minimize the potential measurement error introduced by the concordance across different versions of product coding systems.

A.3 Individual farmer dummy: a substitute of rural dummy

One of the individual controls that we think is important is an indicator of whether the person lives in the rural area. In that period, job opportunities in manufacturing pulled labor away from the agriculture sector and likely affect rural and urban workforce differently. However, in the Chinese Census from IPUMS, we do not have an indicator for rural/urban residence (*hukou*). To create a proxy for that, we generate a dummy for everyone in the related cohorts (born 1960-1970) who are working in crops, vegetable and fruit production, animal husbandry, forestry and fishery (occupation codes 011-042). As shown in the following graph (produce graph), for most cohorts, the percentage of population in working in agriculture sector exceeds 60%, and that is close to our guess of the rural population fraction.

Appendix B Impact on Farmer v.s. non-Farmer

During the same period as the Open-Door Policy, China experienced a series of fundamental changes to the agricultural sector. In 1979, a few villages conducted a secret experiment that later on developed into the "household responsibility system". Each household in those villages was responsible for a piece of land and they were allowed to sell their harvest beyond the quota assigned to them on a free market. That experiment was a great success and Deng Xiaoping, the leader of communist party at the time, openly praised their attempt in 1980. The system was adopted nationwide in 1981. Unlike the previous agricultural system under Mao Zedong, this more privatized system stimulated farmers' enthusiasm and increased agricultural productivity. As a result, labor demand in the agricultural sector increased under this new system. Our export exposure measure is larger in highly industrialized, non-agrarian prefectures. Given that export exposure is positively associated with the middle school completion rate in Table 6, it is likely that this effect can be explained by a reduction in middle school completion in rural provinces, rather than by a positive causal effect of export growth on middle school completion. To investigate this, we construct a farmer dummy variable and a series of interaction terms of this variable and birth cohort and include them in the primary regression model[21].

Column 1 in Table B shows the estimates of export exposure's effect on middle school completion, accounting for the differential effects on farmers and non-farmers. The coefficients shown are only for non-farmers; coefficients for farmers are shown in Table B2. We can see that after accounting for farmer differences, the coefficients

[21] We use the occupation reported in the 1990 Census to identify farmers, as we do not have their *hukou* information for their official urban/rural designation. Occupation codes we consider farmers are detailed in the data appendix.

of interest for non-farmers become small and insignificant. Figure B1 also plots the point estimates with confidence intervals from this regression, and Figure B2 shows the effects at different percentiles of export exposure per worker on middle school completion. These results show that the Open Door Policy had no effect on the middle school completion rates of the 1960s cohorts, and suggest that agricultural reform is the cause of the decline in primary and middle school completion among these cohorts.

As a robustness check, we add the same set of farmer dummies to the high school completion regression and show the results in Column 2 of Table B. Our results are no longer significant and magnitudes are much smaller than those in Table 5. In Figure B3 we can still see obvious negative effects, although the effects are not statistically significant for several birth cohorts. Compared to Figure 4, Figure B4 shows that the trade shock's effect on high school completion is weaker at all levels of export exposure per worker after accounting for farmer heterogeneity.

Table B1: Export Exposure Effects on Non-Farmers' Education

	(1) Middle School	(2) High School
ΔXPW	-0.0128***	0.00161
	(0.00376)	(0.00587)
1961.birthyr×ΔXPW	-0.000146	-0.00222
	(0.00174)	(0.00251)
1962.birthyr×ΔXPW	-0.000895	-0.00250
	(0.00219)	(0.00327)
1963.birthyr×ΔXPW	-0.0000283	-0.00338
	(0.00249)	(0.00361)
1964.birthyr×ΔXPW	-0.00145	-0.00534
	(0.00270)	(0.00478)
1965.birthyr×ΔXPW	-0.00126	-0.00704
	(0.00285)	(0.00500)
1966.birthyr×ΔXPW	-0.000762	-0.00628
	(0.00340)	(0.00525)
1967.birthyr×ΔXPW	-0.000794	-0.00740
	(0.00344)	(0.00608)
1968.birthyr×ΔXPW	-0.00000137	-0.00574
	(0.00357)	(0.00588)
1969.birthyr×ΔXPW	-0.00424	-0.00598
	(0.00363)	(0.00698)
1970.birthyr×ΔXPW	0.00138	-0.00280
	(0.00409)	(0.00650)
N	2238465	2238465

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.5$, *** $p < 0.1$. This Table shows the $1000 export exposure per worker's effect on middle school completion (column (1)) and high school completion (column (2)) of non-farmers.

Table B2: Export Exposure Effects on Farmers' Education

	(1) Middle School	(2) High School
Farmer	-3.79***	-3.38***
	(0.225)	(0.197)
Farmer×1961.birthyr×ΔXPW	0.00100	-0.00148
	(0.00269)	(0.00245)
Farmer×1962.birthyr×ΔXPW	0.00193	-0.00176
	(0.00244)	(0.00387)
Farmer×1963.birthyr×ΔXPW	0.00247	-0.00129
	(0.00341)	(0.00365)
Farmer×1964.birthyr×ΔXPW	0.00556	-0.00135
	(0.00359)	(0.00438)
Farmer×1965.birthyr×ΔXPW	0.00373	-0.000562
	(0.00362)	(0.00438)
Farmer×1966.birthyr×ΔXPW	0.00365	-0.00201
	(0.00401)	(0.00506)
Farmer×1967.birthyr×ΔXPW	0.00544	-0.0000466
	(0.00416)	(0.00532)
Farmer×1968.birthyr×ΔXPW	0.00626	-0.00246
	(0.00474)	(0.00573)
Farmer×1969.birthyr×ΔXPW	0.00838*	-0.00260
	(0.00489)	(0.00661)
Farmer×1970.birthyr×ΔXPW	0.00585	-0.00537
	(0.00547)	(0.00664)
N	2238465	2238465

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This Table shows the $1000 export exposure per worker's effect on middle school completion (column (1)) and high school completion (column (2)) of farmers.

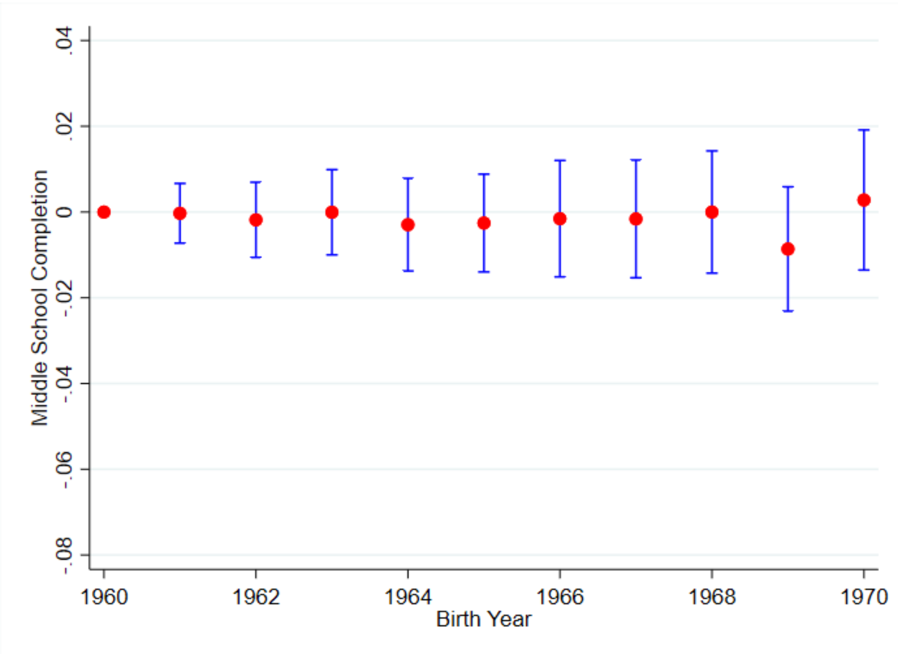


Figure B1: Population-level-mean Effect of Export Exposure on Middle School Completion of Non-Farmers

Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-level export exposure on middle school completion of the 1961–1970 born non-farmers, relative to the 1960 born non-farmers.

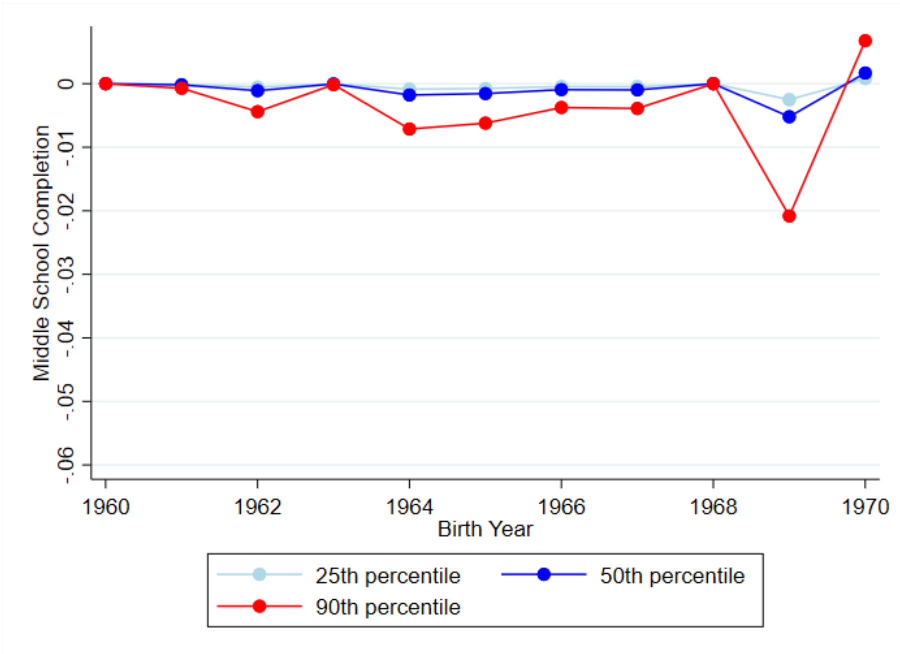


Figure B2: 90/50/25 Percentile Effects on Middle School Completion of Non-Farmers

Notes: This Figure includes three curves showing the 25th, 50th, and 90th percentile of prefecture-level export exposure's effect on middle school completion of non-farmers.

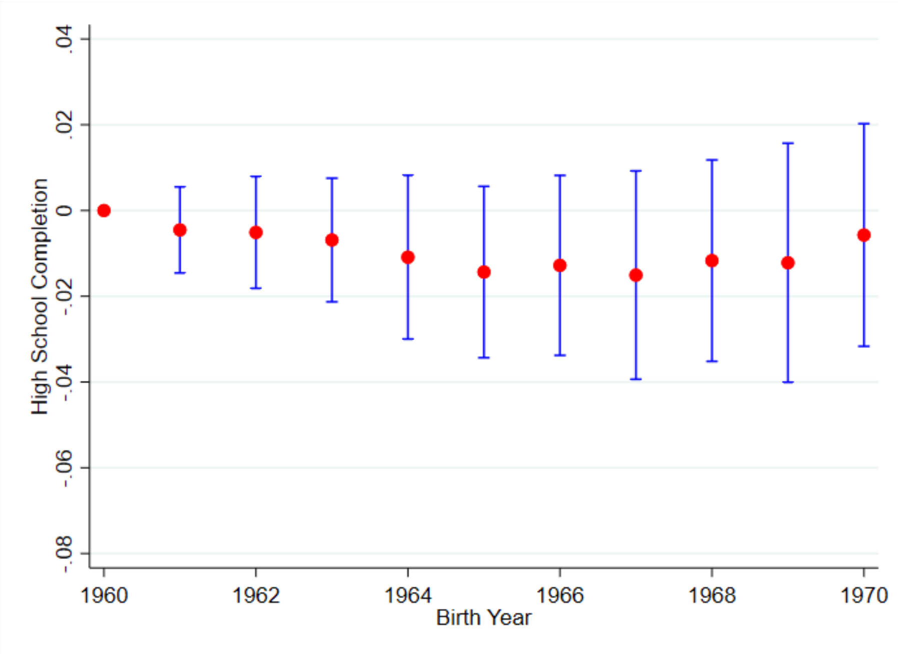


Figure B3: Population-level-mean Effect of Export Exposure on High School Completion of Non-Farmers

This Figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-level export exposure on high school completion of 1961–1970 born non-farmers, relative to the 1960 born non-farmers.

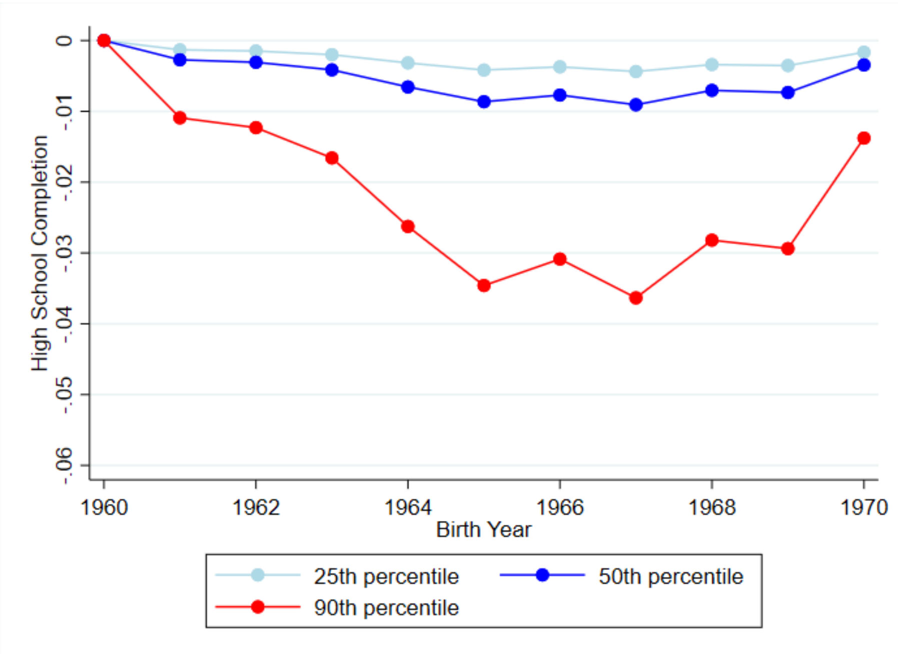


Figure B4: 90/50/25 Percentile Effects on High School Completion of Non-Farmers
Notes: This Figure includes three curves showing the 25th, 50th, and 90th percentile of prefecture-level export exposure's effect on high school completion of non-farmers.

Appendix C Falsification Tests

One potential concern with our identification is that the local export exposure per worker could change in conjunction with human capital accumulation so that this trade shock is not exogenous to education. We test this concern by running the same regression on older cohorts, born from 1940-1960, who had already finished their education when the Open Door Policy started. Figure C1 presents the coefficients of interest of the regression on birth cohorts 1940-1970. Although noisy, the trade shock's effect on earlier cohorts (1940-1960) are not significantly different from zero, and are generally smaller than the primary effects shown from 1964-1970.

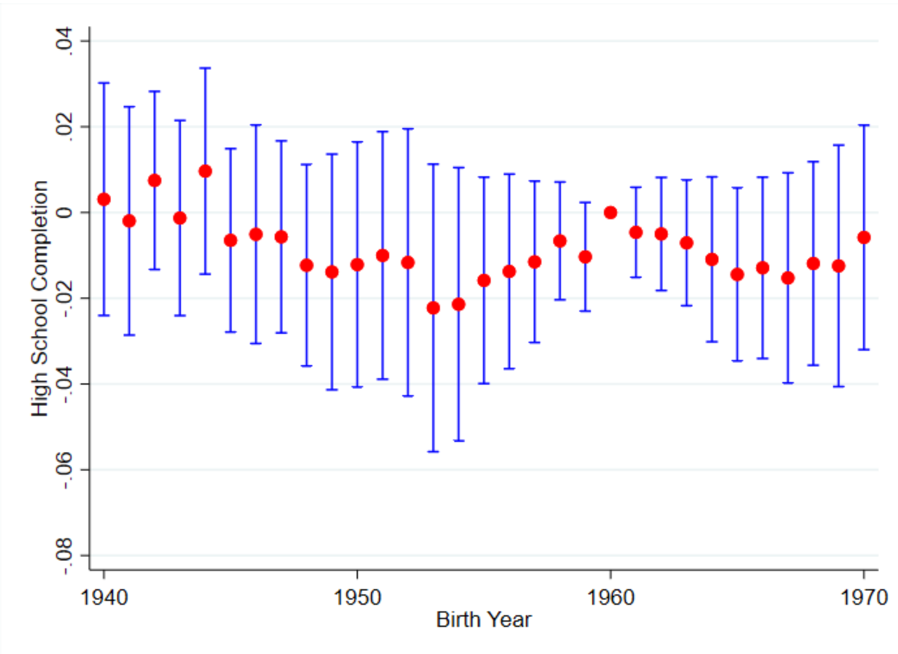


Figure C1: Export Exposure Effects on High School completion for birth cohort 1940-1970 (Non-Farmers)

Notes: Sample includes birth cohorts 1940-1970. This figure shows the trade shock has no effect on the educational attainment of the 1940–1960 cohorts.

Appendix D Cohort-specific Export Exposure

In addition to our main specification, we construct a cohort-specific measure of export exposures that captures trade flow changes between age 6 and 18 for each birth cohort. The export flow changes capture the trade-induced industry expansion/shrinkage when the cohort is going through primary, middle school, and high school education. The "after shock" year for the earliest cohort–the cohort born in 1960–is 1978 which is the beginning of China's open door policy. Arguably, 1978 is too early for the policy to show significant impact, and the 1960 cohort would have made their middle and high school education choices by 1978. The coefficient of export exposure on 1960 cohort should thus be considered as a baseline. We use 1982 Census data to construct prefecture level industry composition as described in section 4. We evaluate equation 2 using cohort-specific exposure effect, but compared to the main specifications, this robustness exercise includes prefecture-level fixed effects instead of province-level fixed effects. Standard errors are also clustered at the prefecture level. Table D1 and table D2 present the results for high school completion rate and middle school completion rate respectively. We found patterns similar to our main results in this exercise. If we measure trade impact using cohort-specific export exposure, cohorts born in the late 1960s still have a lower probability of completing high school. In fact, if we compare column (4) in table D1 and column (3) in table 5, the magnitude of impact using cohort-specific export exposure is roughly three times as big as what we found in main specifications. Figure D1, which is a counterpart for figure 3, illustrate the mean export exposure impacts on high school completion and the 95% confidence intervals. Again, we find not statistically significant impact on middle school completion rate, as shown in table D2, figure D2, and figure D4.

We also run the robustness exercise that include farmer indicator. The results using cohort-specific export exposure are similar to the results detailed in Appendix B. When including farmer dummy, the impact of cohort-specific export exposure on high school completion rates become statistically insignificant, although the negative mean effects persist.

Table D1: High School Completion with Cohort-specific Exposure

	(1)	(2)	(3)	(4)
ΔXPW	0.00554*	-0.00400**	0.00613	0.0288**
	(0.00325)	(0.00191)	(0.00856)	(0.0120)
1961.birthyr×ΔXPW			0.00569	-0.0122**
			(0.00465)	(0.00576)
1962.birthyr×ΔXPW			-0.00206	-0.0221***
			(0.00578)	(0.00831)
1963.birthyr×ΔXPW			-0.00386	-0.0238**
			(0.00647)	(0.00964)
1964.birthyr×ΔXPW			-0.00474	-0.0260**
			(0.00688)	(0.0102)
1965.birthyr×ΔXPW			-0.00807	-0.0290***
			(0.00738)	(0.0107)
1966.birthyr×ΔXPW			-0.00889	-0.0299***
			(0.00786)	(0.0112)
1967.birthyr×ΔXPW			-0.00860	-0.0284**
			(0.00786)	(0.0112)
1968.birthyr×ΔXPW			-0.00624	-0.0308***
			(0.00788)	(0.0113)
1969.birthyr×ΔXPW			-0.00640	-0.0289**
			(0.00775)	(0.0112)
1970.birthyr×ΔXPW			-0.00846	-0.0309***
			(0.00767)	(0.0115)
Prefecture FE		Y	Y	Y
Birth FE		Y	Y	Y
Province × Birth FE				Y
Observations	2398945	2398945	2398945	2398945

This table presents the OLS point estimates of equation 2 using cohort-specific exposure effect. Compared to the main specifications (results are shown in Table **??**), this robustness exercise includes prefecture fixed effects instead of province fixed effects and prefecture-level controls. Standard errors are also clustered at the prefecture level. ΔXPW here is $10,000 prefecture-cohort-level export exposure. All regressions include demographic characteristics as sex and ethnicity. Column 2 controls for prefecture fixed effects and birth year fixed effects. Column 3 adds in a set of interaction terms of birth year and prefecture-cohort-level export exposure. Column 4 further adds in province-specific birth fixed effects.

Table D2: Middle School Completion with Cohort-specific Exposure

	(1)	(2)	(3)	(4)
ΔXPW	0.0147***	0.00767***	-0.00436	0.00387
	(0.00398)	(0.00162)	(0.0104)	(0.00920)
1961.birthyr×ΔXPW			0.00306	-0.00313
			(0.00454)	(0.00457)
1962.birthyr×ΔXPW			0.000765	-0.00499
			(0.00641)	(0.00684)
1963.birthyr×ΔXPW			0.000860	-0.00281
			(0.00729)	(0.00718)
1964.birthyr×ΔXPW			0.00311	-0.00215
			(0.00749)	(0.00730)
1965.birthyr×ΔXPW			0.00423	-0.00254
			(0.00750)	(0.00749)
1966.birthyr×ΔXPW			0.00608	-0.00270
			(0.00838)	(0.00822)
1967.birthyr×ΔXPW			0.00741	-0.00187
			(0.00870)	(0.00856)
1968.birthyr×ΔXPW			0.00985	-0.000228
			(0.00851)	(0.00814)
1969.birthyr×ΔXPW			0.0101	-0.000697
			(0.00893)	(0.00872)
1970.birthyr×ΔXPW			0.0112	0.000658
			(0.00935)	(0.00883)
Prefecture FE		Y	Y	Y
Birth FE		Y	Y	Y
Province × Birth FE				Y
Observations	2398945	2398945	2398945	2398945

This table presents the OLS point estimates of equation 2 using cohort-specific exposure effect. Compared to the main specifications (results are shown in Table ??), this robustness exercise includes prefecture fixed effects instead of province fixed effects and prefecture-level controls. Standard errors are also clustered at the prefecture level. ΔXPW here is $10,000 prefecture-cohort-level export exposure. All regressions include demographic characteristics as sex and ethnicity. Column 2 controls for prefecture fixed effects and birth year fixed effects. Column 3 adds in a set of interaction terms of birth year and prefecture-cohort-level export exposure. Column 4 further adds in province-specific birth fixed effects.

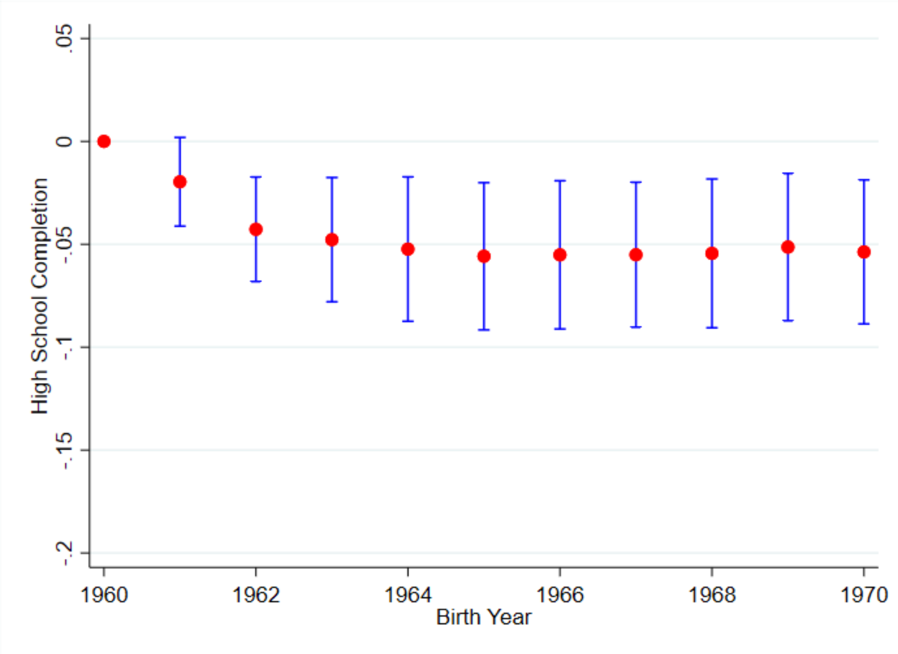


Figure D1: Cohort-Specific Export Exposure Effects on High School Completion
Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-cohort-level export exposure on high school completion of the 1961–1970 cohorts, without controlling for farmer dummy in the specification.

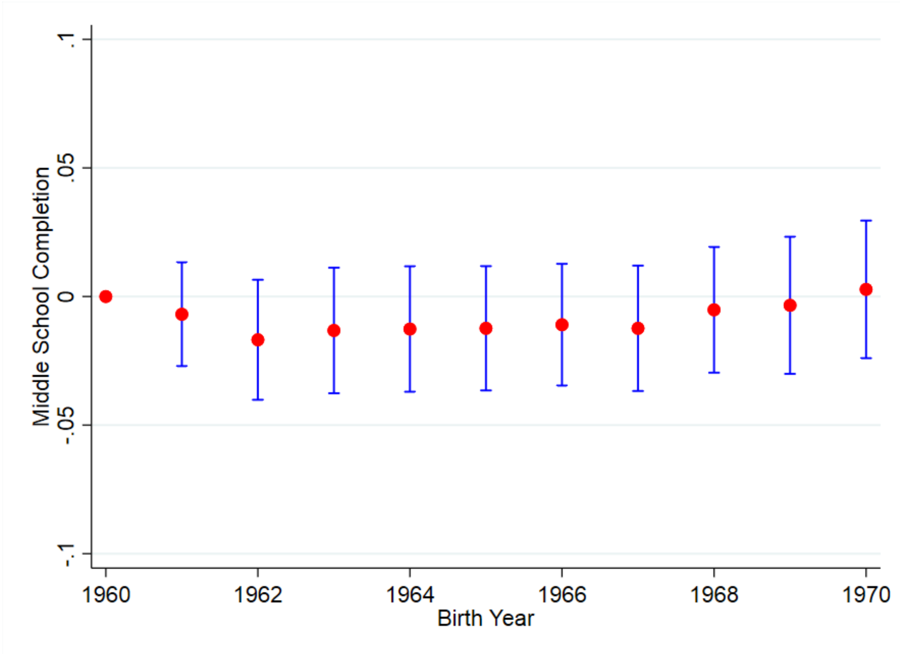


Figure D2: Cohort-Specific Export Exposure Effects on Middle School Completion
Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-cohort-level export exposure on middle school completion of the 1961–1970 cohorts, without controlling for farmer dummy in the specification.

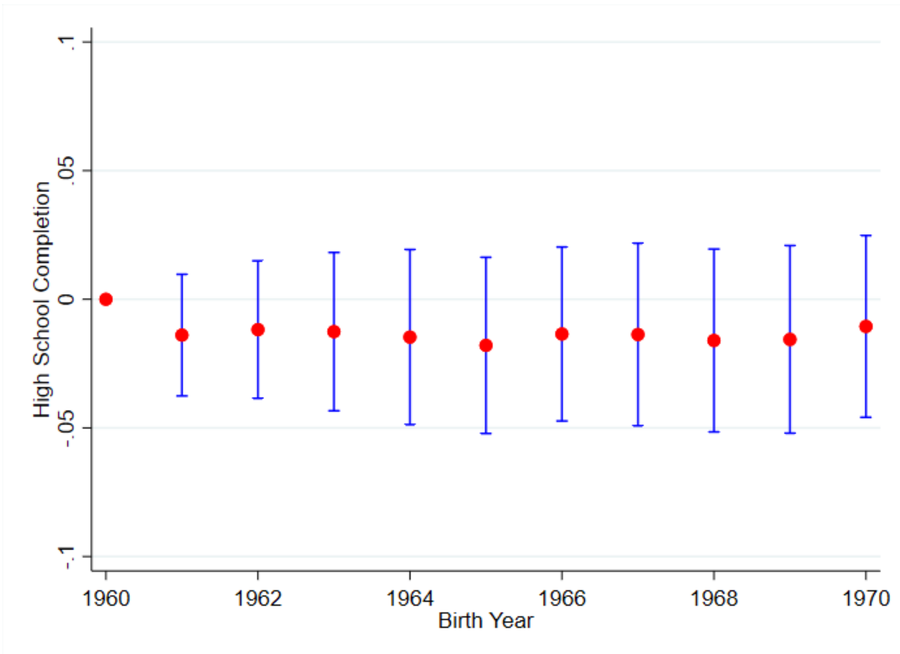


Figure D3: Cohort-Specific Export Exposure Effects on High School Completion
Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-cohort-level export exposure on high school completion of the 1961–1970 cohorts, with farmer control.

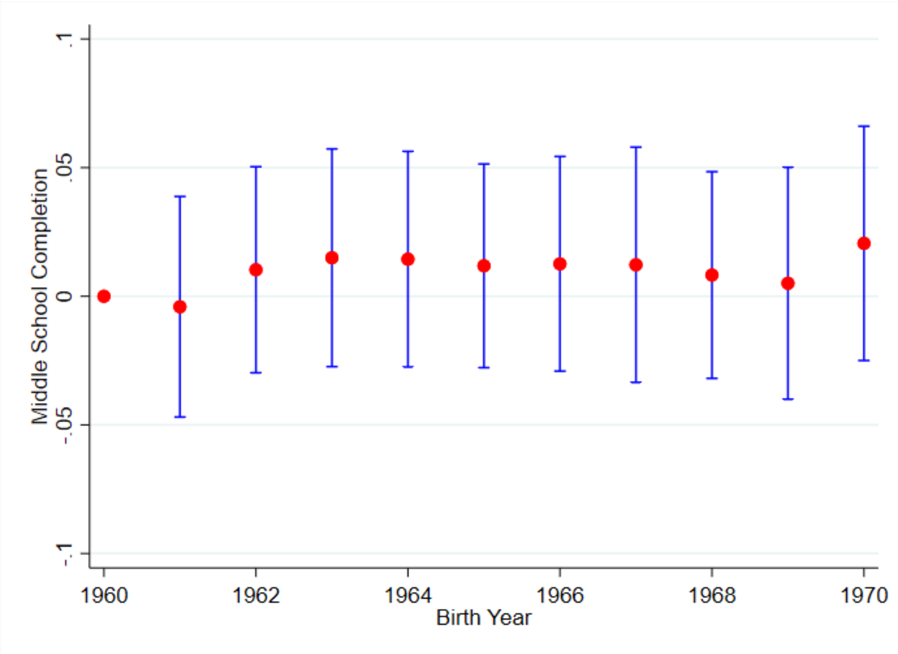
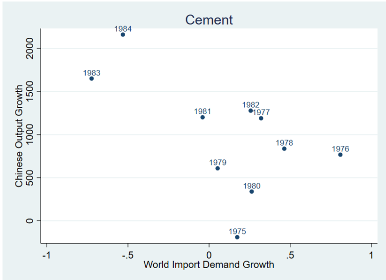
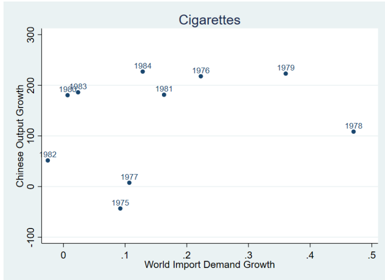


Figure D4: Cohort-Specific Export Exposure Effects on Middle School Completion
Notes: This figure shows the population-level-mean effect (with 95% confidence intervals) of the prefecture-cohort-level export exposure on middle school completion of the 1961–1970 cohorts, with farmer control.

Appendix E Additional Tables and Figures

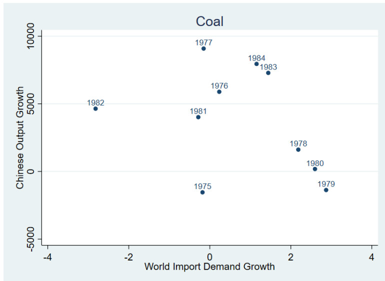


(a) Cement

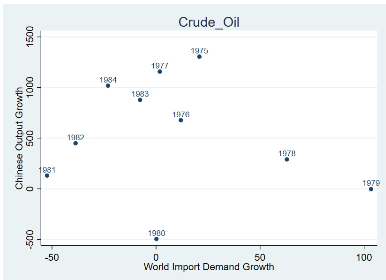


(b) Cigarettes

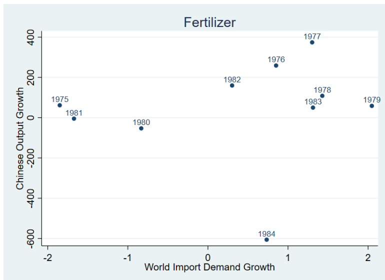
(c) Textiles



(d) Coal

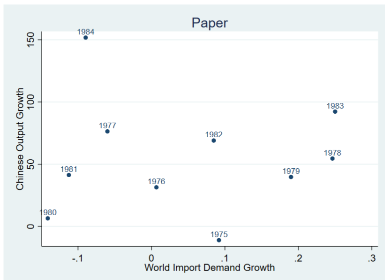


(e) Crude oil

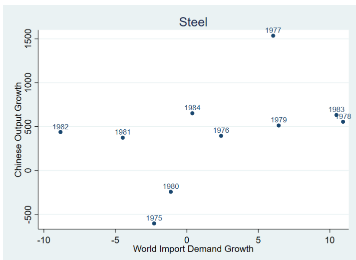


(f) Fertilizer

(g) Glass



(h) Paper



(i)Steel

Figure E1: Annual growth of Chinese industrial output and world import demand (in billions of current USD)

Notes: Output data from National Bureau of Statistics of China and trade flows from UN ComTrade database. Output for each product has different units and they are as following: textiles, 100 million meters; paper, 10,000 tons; cigarettes, 10,000 cases; coal, 10,000 tons; crude oil, 10,000 tons; steel, 10,000 tons; cement, 10,000 tons; glass, 10,000 weight cases; fertilizer, 10,000 tons.