Trade, Growth and Inequality: Evidence from China

(Preliminary)

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Abstract

This paper studies the impact of trade on growth and income inequality using disaggregated data for Chinese urban areas. To complement the cross-country analyses typically conducted in the macroeconomic literature, we explore the effects of trade for about 162 Chinese cities and 60,000 urban households over the period 2002-2009. Our analysis shows that in the period since China joined the WTO in 2001, Chinese urban areas that experienced greater degree of openness in trade also experienced greater increases in both output and income inequality. Using the household-level data we also document how these effects differ by income group, education, and gender.

JEL Classification Numbers: F16, F43, J16, O40.
Keywords: Trade openness, growth, inequality, gender gaps.

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1. INTRODUCTION

Economists have a deep belief that trade raises average incomes. But, as Frankel and Romer (1999) note, "despite the great effort that has been devoted to studying the issue, there is little persuasive evidence concerning the effect of trade on income." Trade and average incomes are positively correlated but establishing causation has proven to be difficult. Frankel and Romer construct an instrumental variable based on the geographic component of countries' trade and use that to obtain estimates of the effect of trade on income. They conclude that "that trade has a quantitatively large and robust, though only moderately statistically significant, positive effect on income." Though there are some skeptical views of their evidence (e.g. Rodriguez and Rodrik, 2000), Frankel and Romer has emerged as perhaps the most influential study in the past two decades of the impact of trade on income.[2]

In addition to its impact on average incomes, trade has an impact on the distribution of incomes. This has long been recognized in trade theory, for instance in the Stolper-Samuelson theorem. The theory generally predicts that, given the prevailing pattern of factor endowments, trade will lead to higher inequality in developed countries by depressing the wages of their unskilled workers while lowering inequality in developing countries by raising the wages of their unskilled workers. However, as Barro (2000) notes, the "standard theory seems to conflict with the concerns expressed in the ongoing popular debate about globalization" where the view is "rich groups will be most able to take advantage of the opportunities offered by global commerce." Hence, even in developing countries, "increased openness would be most likely to raise inequality," the opposite of the prediction from the standard trade analysis. Barro's comprehensive investigation of the sources of inequality for a panel of countries shows that "in line with the popular view, greater openness to trade goes along with more inequality" and that "the positive relation between openness and inequality is most pronounced in poor countries." An extensive review by Goldberg and Pavcnik (2007) of the experience of developing economies in the 1980s and 1990s concludes that "while globalization was expected to help the less skilled [in developing countries], there is overwhelming evidence that these are not generally better off, at least not relative to workers with higher skill or education levels."

[2] One metric of influence is that the paper has over 5000 citations on Google Scholar.

A newer literature explores the impact of trade on gender inequality. This is of course an important issue for equity. Juhn, Ujhelyi and Villegas-Sanchez (2013) note that it may also have long-run efficiency effects given "growing evidence" that empowering women promotes their education and also leads to better economic outcomes for children. Their study uses Mexican establishment-level data to show that, after NAFTA, women's outcomes improved in blue-collar jobs but not in white-collar jobs, consistent with the view that the use newer technology made possible by trade liberalization reduced the "need for physically demanding skills," thus helping women with obtaining blue-collar jobs.

Our paper studies the impact of trade on growth and inequality—including gender outcomes—using disaggregated data for Chinese cities and urban households for the 2002-2009 period, following China's accession to the WTO in December 2001. There are many reasons why this analysis can be of interest. Given China's population size, its experience has important implications for human welfare; many Chinese cities rival countries in population size. A limitation of cross-country studies is that it is difficult to control for differences in institutions and other characteristics that can be difficult to measure but can influence growth. Data from within a country controls for many of these sources of heterogeneity. At the same time, while China's overall trade expanded sharply after it joined the WTO, there is enough variation across cities in their exposure to trade to carry out an investigation of the relationship between trade and incomes. By using both city-level and household data we are also able to see how the impact of trade on incomes differs by income class, education levels and gender.

Our results suggest that trade and incomes are positively associated. Using an instrumental-variable approach similar to that of Frankel and Romer (1999), we suggest that the results support a causal interpretation: cities more exposed to trade enjoyed a faster increase in incomes. Using the household level data, we also show that income and consumption Gini coefficients increased more in cities with higher exposure to trade. Our results by income class and education levels are still very preliminary but seem to suggest that income matters more than education in determining who benefits the most from trade. Consistent with the findings of the literature surveyed earlier, it appears that the richer income classes benefit more than the others. Another finding is that women consistently earn 20-30% less than men and trade appears to have done little to erode this gender gap.

Section 2 discusses the two main sources of data used in the paper. Section 3 presents the city-level analysis using approaches very similar to those used by Frankel and Romer (1999) and Barro (2000). Section 4 contains the household-level analysis using the standard specification for income determination (Mincer, 1974), and Section 5 concludes.

2. DATA

There are two main sources of the data used in this paper. The Urban Households Survey (UHS), a representative survey, is conducted annually by China's National Bureau of Statistics. It records a wide range of demographic and socioeconomic information on urban households, including detailed information on income sources, wages and consumption. Each year, about a third of the sample is reshuffled; that is, most households stay in the survey for three years at most. This gives us broader cross-sectional coverage in terms of number of households but limits the ability to conduct inter-temporal analysis using a true panel. The data available to us are for the years 2002 to 2009.[3] Table 1 presents the data summary.

We matched this individual data for over 200,000 Chinese urban individuals (60,000 urban households) to city-level macroeconomic and trade data for 162 Chinese cities spread across 16 provinces. The city-level data, which is from the CEIC China Database, includes GDP, population, exports and imports. Price level data is only available at the provincial level; we use this to convert the nominal wage data from the household survey into real terms. The city-level trade series mostly start from year 2004 with very few observations in 2002 and 2003. So our analysis focuses on the years of 2004—2009 matching the UHS individual data with the macroeconomic series.

In Figure 1, we compare the combined trade of these 162 cities in our sample with aggregate national trade data. This shows that we are capturing a large part of the total trade and the time series pattern is similar to that in the aggregate data. The sharp increase in trade has been

[3] Prior to 2002, the survey does not provide a panel structure.

accompanied by a large fall in poverty rates and an increase in income inequality (Figure 1). The overall Gini coefficient has risen from 0.28 in 1981 to over 0.50 in 2010.

City trade openness (defined as the ratio of international trade to GDP by cities, or the ratio of total imports and exports to GDP by cities) varies markedly across provinces in China (Figure 2, panel a). As the map indicates, coastal regions tend to have higher trade openness on average than inland regions, but there is also variation within these regions. Figure 2 (panel b) also presents the coverage of the UHS dataset across 16 provinces. We calculated the city-level Gini coefficients for our further analysis.

As we show in the next section, both the degree of openness and the increase in average incomes and inequality vary considerably across cities. This heterogeneity reflects the underlying philosophy—summarized by Deng Xiaoping's adage of "*(let) some people get richer first"*—that guided China's opening-up.

3. EVIDENCE FROM CITY-LEVEL DATA

We begin with a simple scatter plots of the relationship between a city's trade share, measured by the sum of imports and exports as a share of city GDP, with its average income, its income and consumption Gini coefficients and its gender gap. The relationship between trade and average incomes is shown in Figure 2 and the relationship with the distributional outcomes is shown in Figure 3. These provide suggestive evidence that trade raises average incomes, the Gini coefficients and the gender gap. These plots are based on *average* values for the 2004-09 period. We get similar results if we plot the data for the full sample or *all* the individual years instead of average values; these plots are given in the Appendix (Figure A1, Figure A2).

Next, following the empirical strategy of Frankel and Romer (1999), we estimate the following equation for each year in our sample:

$$\ln(Y_i) = \alpha + \beta Trade\ Openness_i + \gamma x_{i*} + \epsilon_i \quad (1)$$

where $\ln(Y_i)$ is log of real GDP per capita in city i; $Trade\ Openness_{it}$ is the trade share of GDP and x_{i*} is a set of control variables, specifically the investment share of GDP and log of population. The results of the estimation are presented in Table 2 (Panel A) for the years 2003 to 2007. They suggest that a 1 percentage point increase in trade share to GDP is associated with an increase of 0.7 percent in income per capita. The estimated coefficients are statistically significant and their magnitude is similar to that in Frankel and Romer's study.

To deal with the possible endogeneity of the trade-to-GDP ratio, we follow the idea in Frankel and Romer—and other authors such as Irwin and Tervio (2000) and Wei (2000)—that a country's volume of trade is related to its geography (e.g. proximity to other major trading nations in the world), but its geography is less likely to be influenced by its income. To adapt to idea for our case, we take advantage of the special geographic features of the Chinese territory to construct an instrumental variable for a city's openness, which is the degree of access to major seaports. Specifically, we used (the log of) each city's average distance to the 3 closest major ports in China as an instrument for the trade share. The coefficients obtained from the two-stage least squares (2SLS) regression are also shown in Table 2 (Panel B). We find that impact of trade on incomes is now larger, consistent with the findings of Frankel and Romer. An increase in trade share of one percentage point increases per capita income by about 1 percent.

We also estimated a panel version of equation (1), namely:

$$\ln(Y_{i,t}) = \alpha + \beta Trade\ Openness_{it} + \gamma x_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (2)$$

where μ_i is a province fixed effect and μ_t is the time fixed effects. The control variables are similar to those in equation (1). The results are presented in Panel A of Table 3. Controlling for province and time fixed effects, the estimated coefficient suggests that a 1 percentage point increase in trade share increases income per capita by 0.25 percent. To take advantage of the panel data feature, we use a different instrumental variable here, which is a city's road coverage (the total length of road mileage inside a city). This variable varies by year and captures the ease of carrying freight traffic. The results of the IV regression (Table 3, Panel B) show that an increase in trade share of 1 percentage point is associated an increase of 1.8 percent in income per person.

We estimated similar panel regressions to assess the impact of trade on inequality:

$$Inequality_{i,t} = \alpha + \beta Trade\ Openness_{it} + \gamma x_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (3)$$

The measures of inequality are the income Gini, the consumption Gini and the gender wage gap. Results are shown in Table 4 for OLS and in Table 5 for the IV estimation, again using a city's road coverage as the instrument for trade share. We find that increases in the trade share are associated with a statistically significant increase in both income and consumption Gini coefficients. The impact on the gender gap is also positive and significant in all specifications except one.

To test whether the Kuznets curve exists on the city level, we estimated equation (4) across cities, similar to Barro (2000):

$$Gini_i = \alpha + \beta \log(GDP\ per\ capita)_i + \gamma \log(GDP\ per\ capita)^2{}_i + education\ participation_i + \theta Trade\ Openness_i + \varphi Trade\ Openness_i + \rho \ln(population)_i + \epsilon_i \quad (4)$$

The dependent variable is the average city-level Gini coefficients across years. The control variables are logarithm of per capita GDP, its squared term, and other city-level education participation, trade openness, and population. To keep it similar to Barro (2000), we all use the average terms across years (2002-2009 or 2004-2009). We also use city's distance to the closest ports as IVs. Both OLS and IV results are presented in Table 6. Both OLS and IV regression results demonstrate an inverted-U shape of the correlation between income Gini coefficients and per capital GDP (log-term), which suggested the Kuznets curves (based on the IV regression results shown in Figure 4).

4. EVIDENCE FROM HOUSEHOLD DATA

In this section, we investigate how much of the rise in individual income can be attributed to increased trade openness after controlling for various individual characteristics and also how

the impact of trade on income depends on some of these characteristics, such as initial incomes, education and gender. Our baseline model is similar to the Mincer regression (Redding and Venables, 2004):

$$\text{Ln}(y_{it}) = \mu_1 Trade\ Openness_{ct} + X_{it} + \mu_c + \mu_t + \epsilon_{ict}, \quad (5)$$

where y_{it} is individual i's annual wage income in year t, $Trade\ Openness_{ct}$ is international trade (exports and imports) as share of GDP in the city c where household lives in year t; X_{it} are other control variables, including gender, education, age, industry, marital status and so on. We also include the provincial (μ_c) and time fixed effects (μ_t) in the regression.

Technology externality in regions of high trade openness could lead to substantial spillovers to all industries from the demand channel and benefit different skilled workers based on their individual education and skill premium. Table 7 summarizes our results for equation (5) for both OLS and IV tests. We start with the OLS estimation, and the results suggest a positive and significant impact of trade openness on average income. To deal with the possible endogeneity of the trade-to-GDP ratio, we use the city-level road coverage as instruments for city trade openness, which differs from the standard fixed geographic distance from the city to the closest ports for our cross-sectional analysis. Our main finding shows a positive impact of trade share on individual incomes, consistent with our previous city-level findings. Our IV results are stronger than those from the OLS estimation. A 1 percentage point increase in trade shares in the region raises average resident's income by about 0.5—0.6 percent from the IV regression results[4]. The estimated regression coefficient of gender is about -0.3, suggesting a statistically significant (at 1% level or better) negative gender gap---on average women's wage is about 30% lower than men's.

To test the robustness, we repeat the above analysis year-by-year from 2004 to 2009, as the observations of city trade series are limited for earlier years. The results are summarized in Table 8 (OLS estimation) and Table 9 (IV estimation), broadly in line with the panel results shown in Table 7. Both OLS and IV results indicate significance at the 99% level. The IV results suggest

[4] Discriminatory immigration policies in different regions raises the threshold and cost of labor migration.

a larger economic impact of city trade openness on resident's wage income than the OLS results. On the magnitude, the impacts are similar to what we find using the panel regression. However, the coefficients measured using the year 2006—2008 sample are smaller than other years, suggesting a slight decline of trade impacts on income before the Great Recession. Among all the regressions, the gender income gaps remain significant at about 20%—30% levels, implying that the women's income could be about ¼- 1/3 lower than men's even after controlling for education, age, and industry factors.

Heterogeneity

Individual characteristics vary in different dimensions such as income level and education level. Such heterogeneity could determine the impact of the trade openness on its income. Besides the average trade impact, we are also interested in if the interaction of micro factors and city-level trade differ in different types of individuals.

To test the heterogeneity, we modify our regression (5) by introducing the interaction terms of its income group and its city-level trade openness and by introducing the interaction terms of its education level and its city-level trade openness, respectively.

First, we look into the income group. We use the year 2003's individual income distribution to classify the income groups by lower-income, median-income, and higher-income group. We first present the results by looking at the income changes by groups in different regions. Figure 6 shows the average income change of the three income groups for higher/median/lower trade regions and suggests that the income increases the most for higher trade regions except for median-income and higher-income groups. Interesting, the income does not always increase. For the lower-income group, the income decreases in the higher trade region. Although it may subject to the endogeneity of the sample change, the facts still suggest the trade may widen the inequality.

The modified Mincer regressions are below:

$$\mathrm{Ln}(y_{it}) = \alpha Trade\ Openness_{ct} + \beta Income\ Group_i + \mu_1 Income\ Group_i * Trade\ Openness_{ct} + X_{it} + \mu_c + \mu_t + \epsilon_{ict}, \quad (6)$$

Table 10 presents the results with different controls. To eliminate the endogeneity of the income group for each year, we use the first-year city-level income data to define the income groups (low/middle/high). And our results are not much different if we use the current year income to define three income groups. Although the average income is growing over time, which suggests that the median income for high-income group is rising over time, our results still suggest that lower-income group may not benefit much from the trade openness.

As robustness, we also use the instrumental variable approach on each individual level analysis. In the first stage, we still use a city's road coverage as the instrument for trade share. And we show the second-stage least square results (IV results) in Table 10, Columns (4)—(6), following the OLS regression results. We also add different fixed effects into each regression. And the results are very consistent.

Figure 7 presents the marginal impacts of city trade openness over different income group. For low-income group, the increase of 1 percentage point of trade share in the city indeed tend to lower the individual wage income, but the marginal effects using IV are not significant. However, for the median-income and higher-income groups, the marginal effects of city trade openness are positive and significant at the 99% significance level. For the higher-income group, an increase of 1 percentage point of trade share in the city will increase the resident's individual wage income by about 0.4—0.5 percent. The contrast is that the higher-income and lower-income groups are affected by the trade openness quite opposite, which increases the inequality in the economy, which confirms our city-level results on inequality.

Second, we also look into the impact of trade openness for different education groups. Figure 8 shows the average income change of the three education groups for higher/median/lower trade regions and suggests that the income increases the most for higher trade regions. The modified Mincer regressions are modified using the three education groups--primary, secondary, college and above:

$$\text{Ln}(y_{it}) = \alpha Trade\ Openness_{ct} + \beta Education\ Group_i + \mu_1 Eduation\ Group_i * Trade\ Openness_{ct} + X_{it} + \mu_c + \mu_t + \epsilon_{ict}, \quad (7)$$

Table 11 summarizes the results for Model (7) for three different education groups, which are primary education, high school, college and graduate school. Consistent with the existing literature in analyzing the education premium, our results also suggest a positive and significant (at 1% level or better) impact of education onto individual's income. Wage income for higher educated group increase more than other groups from the trade openness. In theory, although the labor abundant country could export more labor-intensified goods, the trade openness could push up the technology frontier in the economy and results in a higher education premium. Our results confirm this.

Similar to what we had before, as robustness, we use the instrumental variable approach on each individual level analysis. The city's road coverage is used as the instrument for trade share. And we present the OLS and IV results in the same table. In Table 11, Columns (1)—(3) present the OLS regression results, and columns (4)—(6) are the IV results. Different sets of fixed effects have been considered as robustness checks. And the results are very consistent.

Figure 9 presents the marginal effects of city trade openness over different education group. Higher education groups enjoy more technological spillovers from trade openness, and it is reflected into higher marginal effects on individual wage income. An increase of 1 percentage point of trade share in the city have marginal effects of 0.7 percent of income increase for the higher education group. However, the marginal effects are 0.6 percent and 0.5 percent for secondary and primary education groups, respectively. The results are all significant at the 99% significance level. As comparison, an increase of 1 percentage point of trade share in the city will increase the resident's individual wage income disproportionally, suggesting that trade openness could increase the income inequality in the economy if education ratios are kept at a constant level for cities and for economies. The results are consistent with what we find from the other analysis of trade openness on inequality.

Although we discuss the marginal impacts of trade openness on individual wage income, it is worth mentioning that the results are marginal on top of the annual growth of the economy. We show the year fixed effects in Figure 10 for our previous regressions—Equations (5)—(7), for the panel regression with other province and industry fixed effects. The year fixed effects suggest an about 10 percent annual income growth, moving along with the real GDP growth of China over that period. And our above analysis is done on marginal impacts of trade openness controlling for year fixed effects.

5. CONCLUSIONS

In the past two decades, China among many other emerging countries has observed large growth from the international trade. The impacts of trade on growth across countries have been discussed in a large existing macroeconomic literature. We extend the literature by further exploring more micro-level individual data in China.

To complement the cross-country analyses in the macroeconomic literature, we use both the city-level and individual-level datasets to assess the effects of trade openness for about 162 Chinese cities and 60,000 urban households over the period 2002—2009 following China's entry of WTO. We show that Chinese urban areas that experienced greater degree of trade openness also experienced greater increases in both output and income inequality. Further household-level data confirms the city-level results and documents the heterogeneous effects by income group, education, and gender.

Our findings are consistent with some theoretical work which suggests, although labor-intensive exporting countries benefit from the trade openness, the skilled-workers could benefit more from the technological spillovers and market agglomeration from trade-related sectors. Our city-level results show that trade increases growth but also increases inequality. The household results provide a more detailed anatomy into the issue. We show that higher income and higher educated group are benefited more from the same trade openness, suggesting a heterogeneous impact on individuals as well as a continuous rise in inequality in the urban cities in China.

Figure 1: Trade and Inequality in China

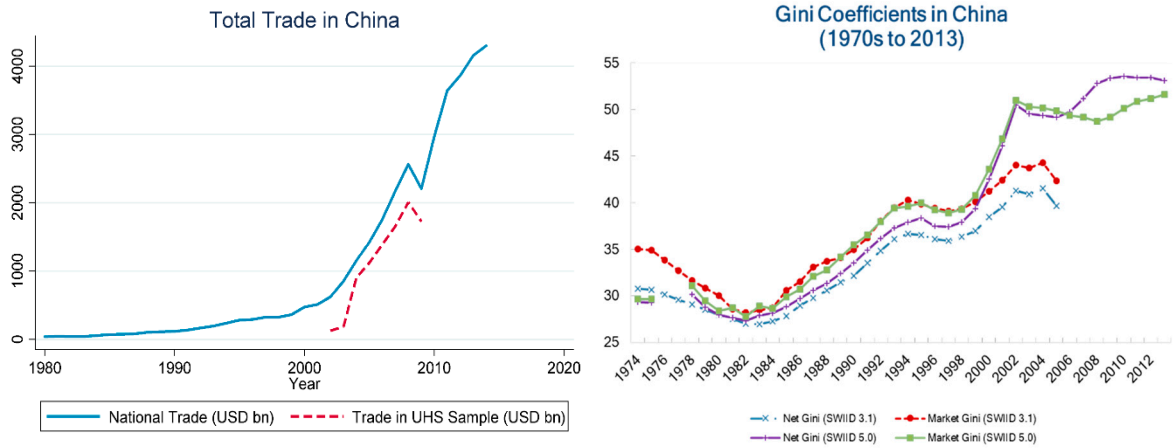
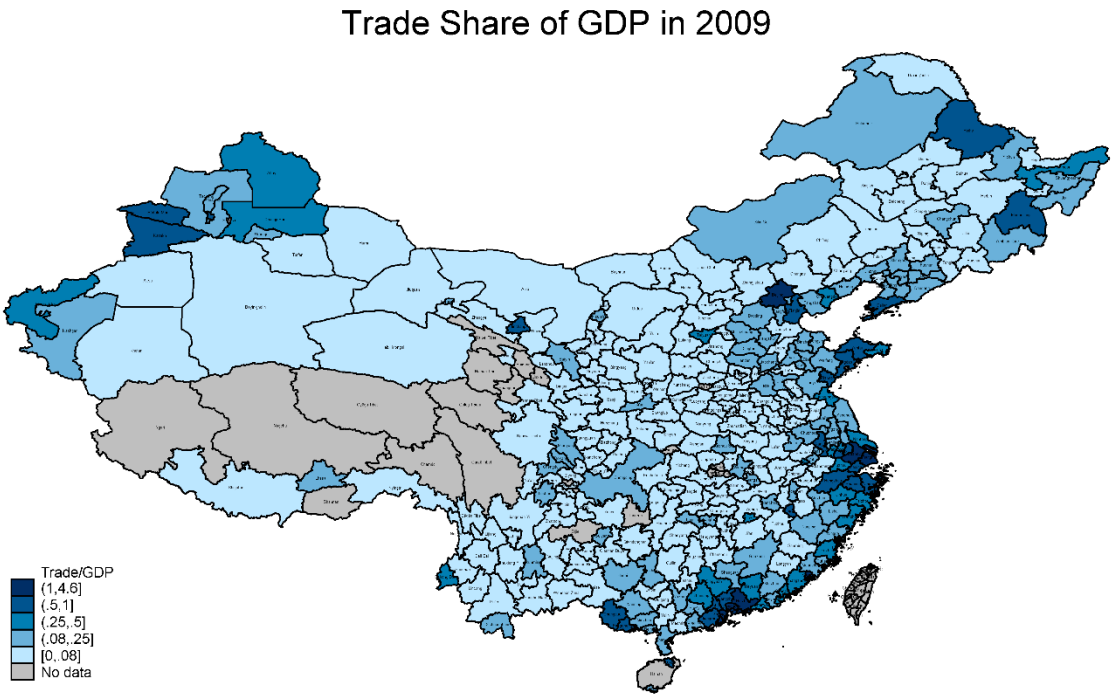


Figure 2: Map

Panel A



Panel B

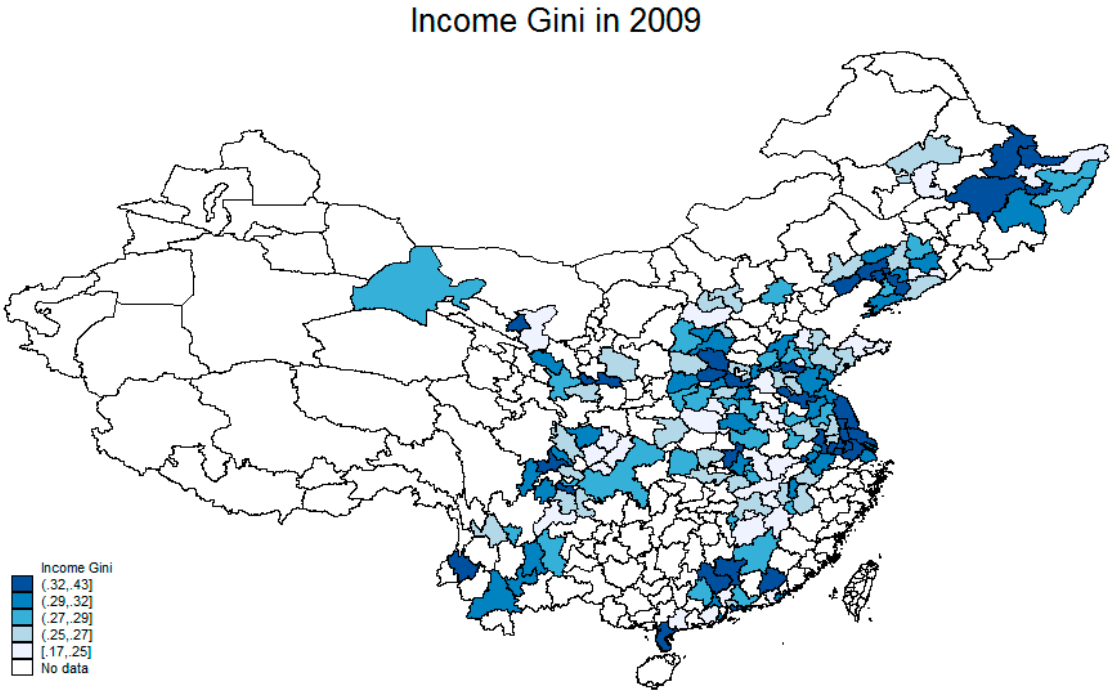


Figure 3: Trade Shares and Average Incomes Across Cities

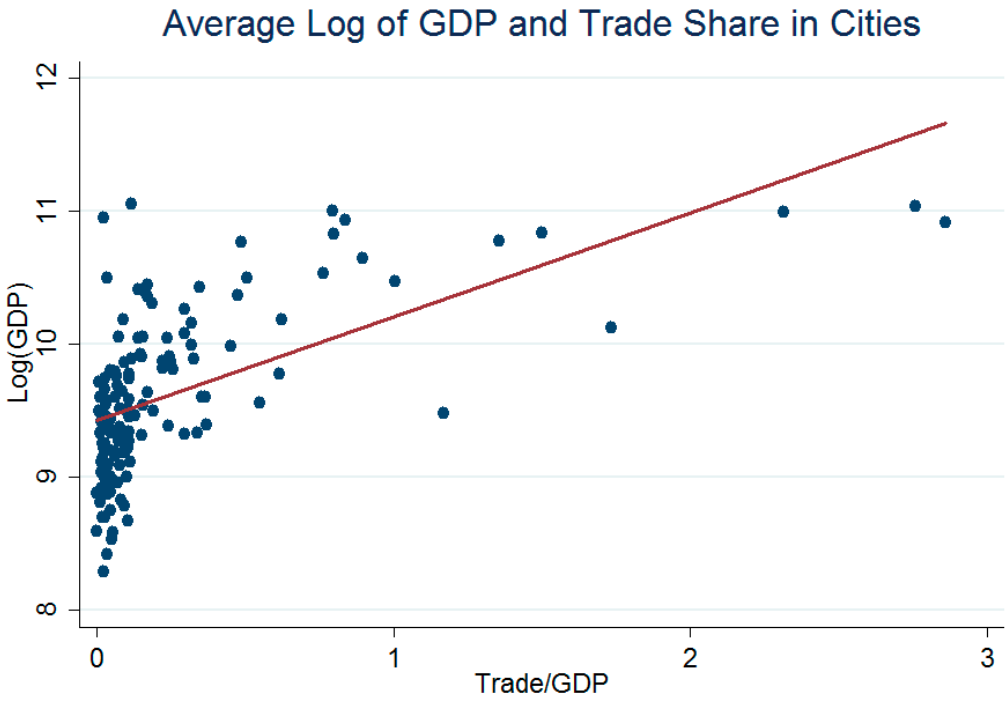


Figure 4: Kuznets Curve

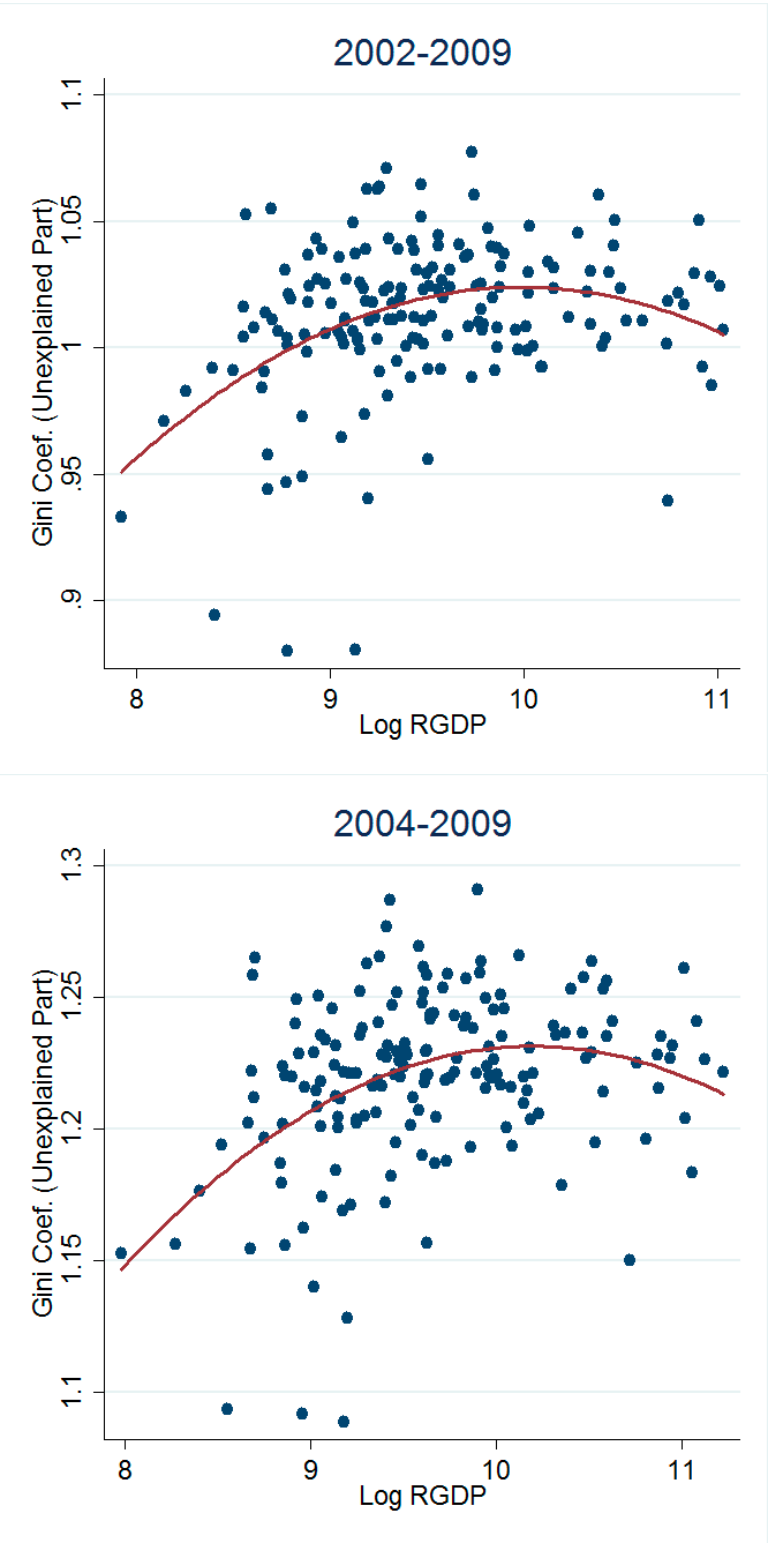
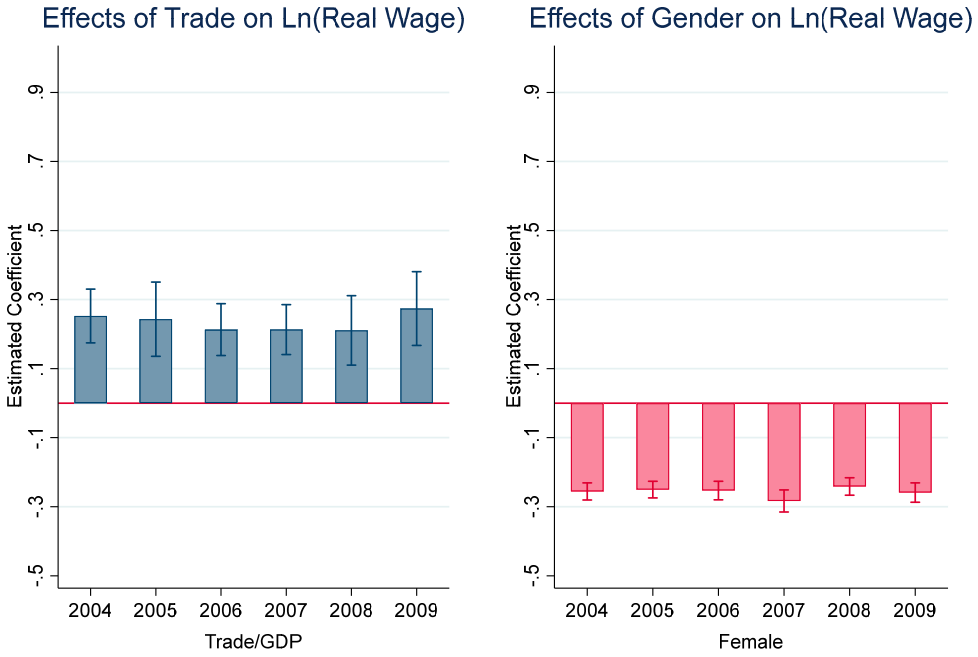


Figure 5: Trade Effects

OLS



IV

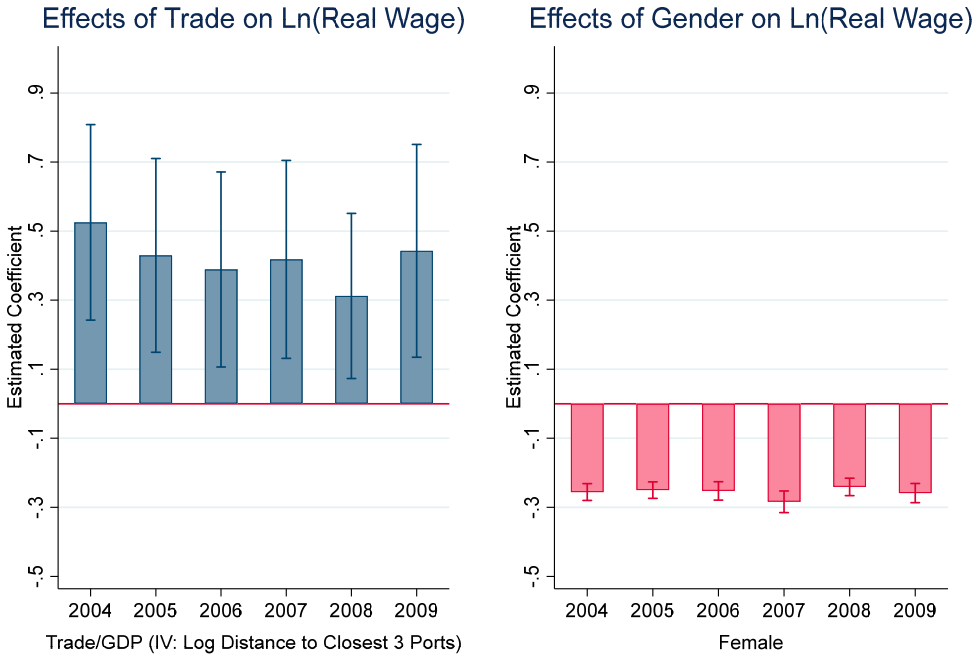


Figure 6: Effects of Trade Openness across Income Groups in Different Regions

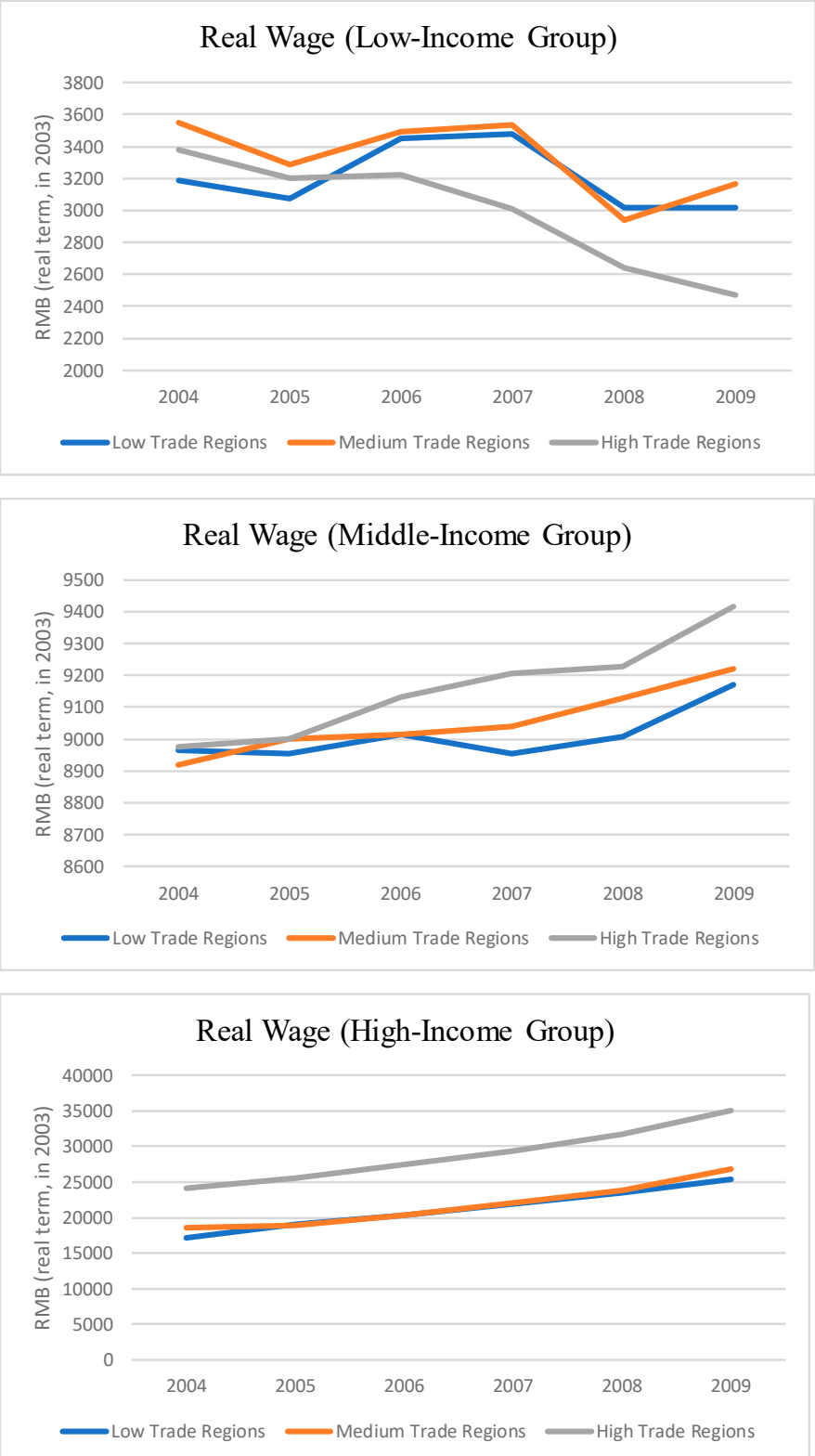


Figure 7: Effects of Trade Openness across Income Groups

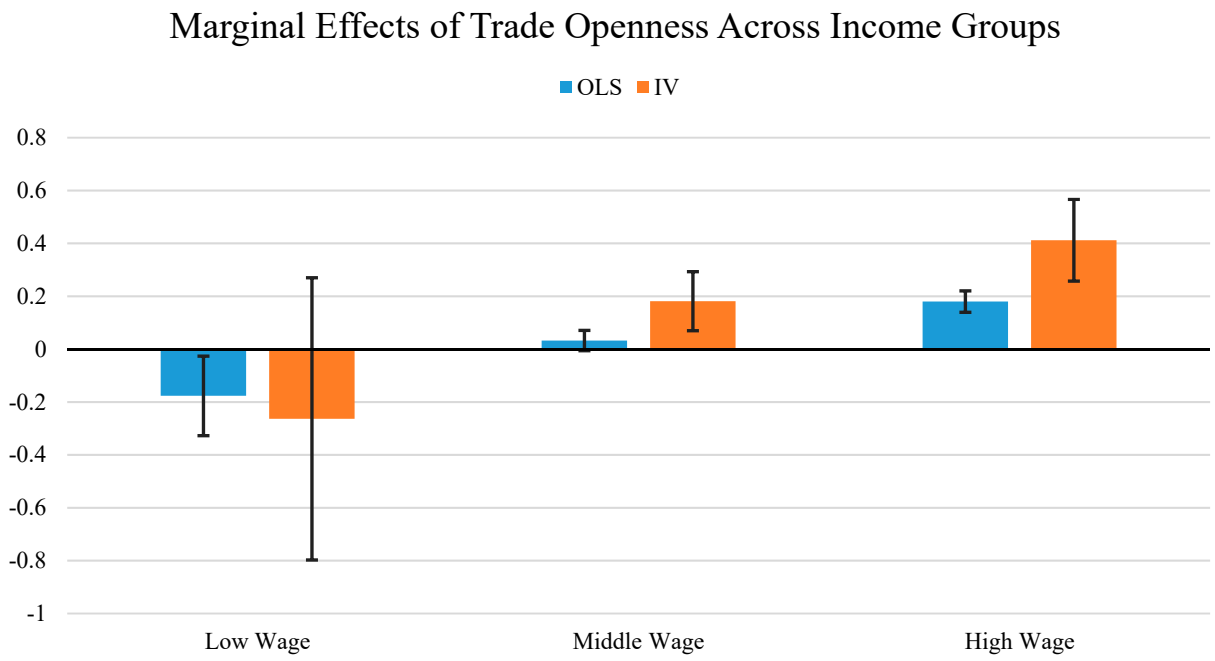
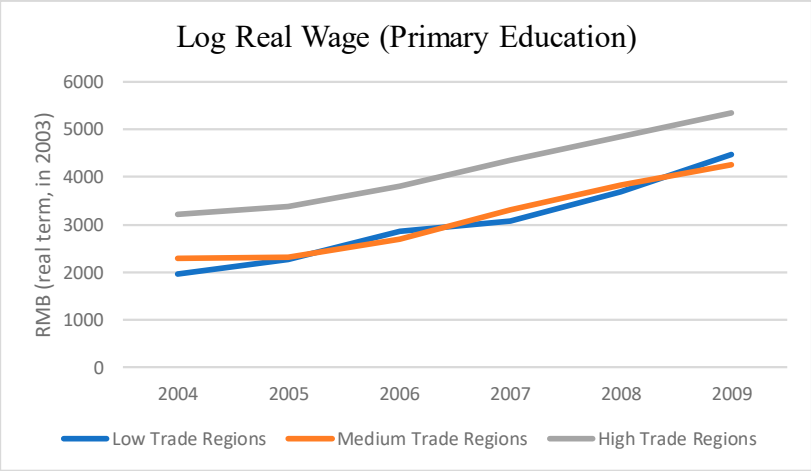
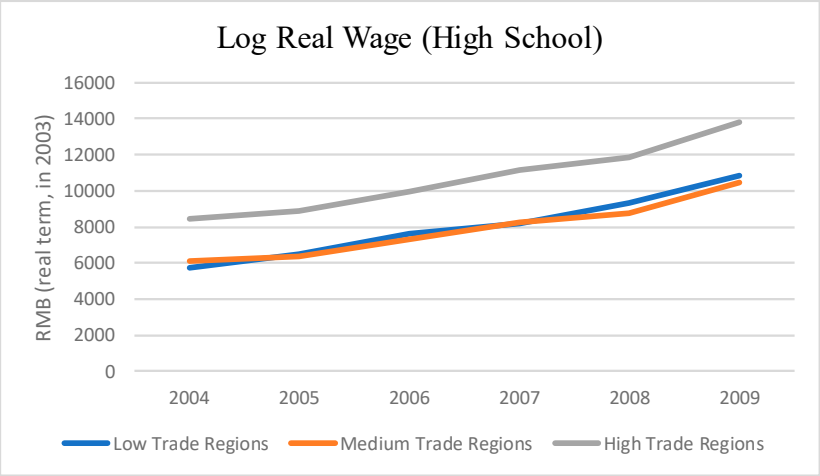


Figure 8: Effects of Trade Openness across Education Groups in Different Regions





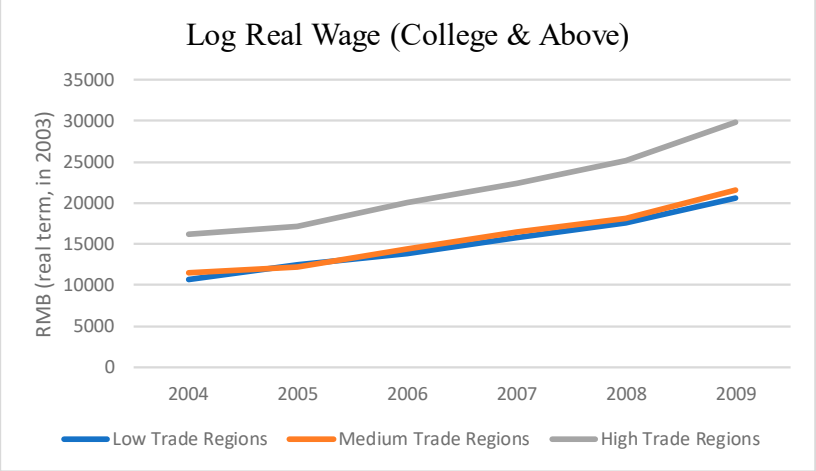


Figure 9 Effects of Trade Openness across Education Groups

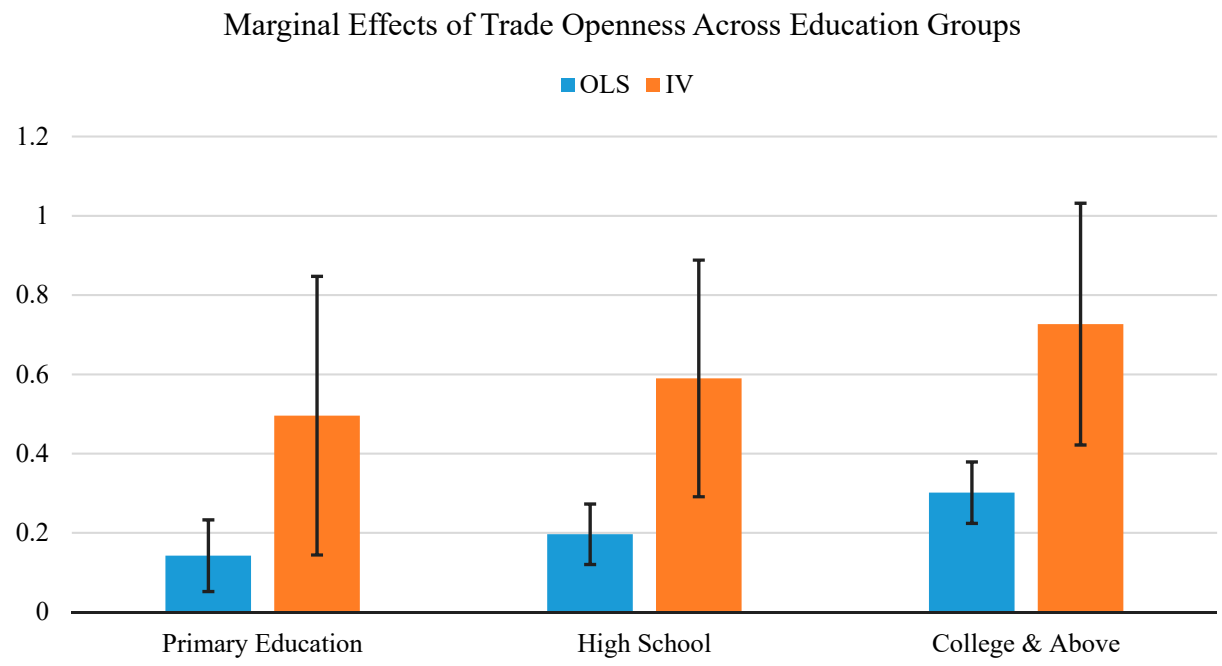
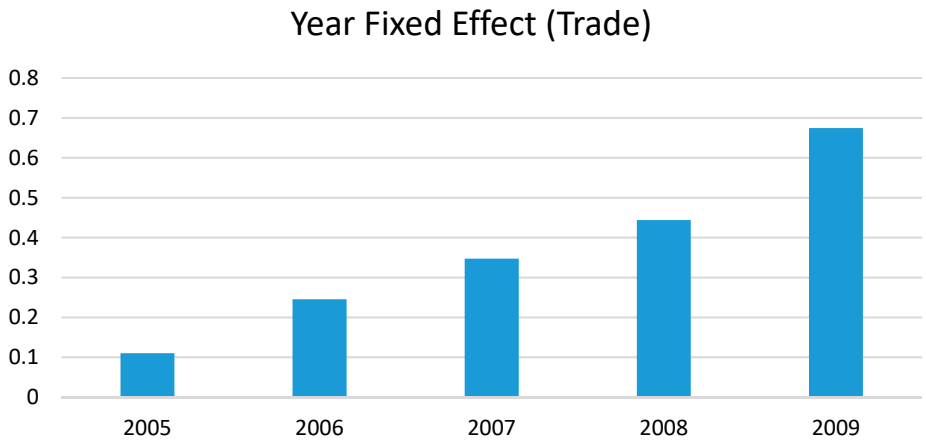
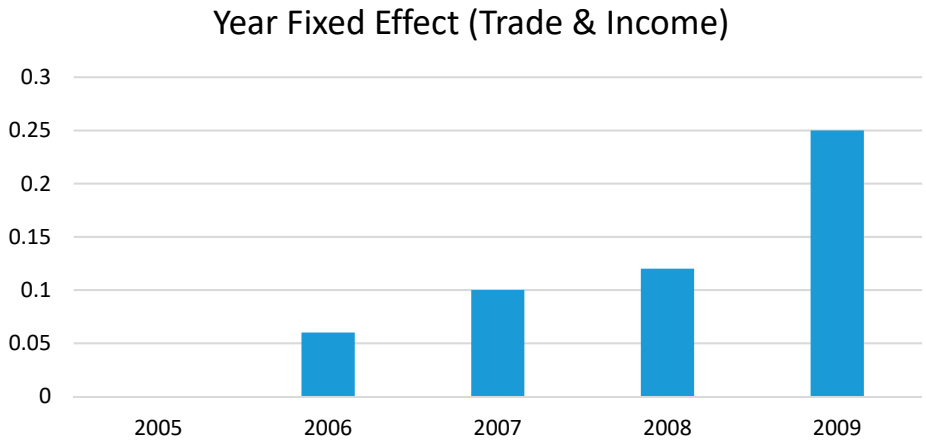


Figure 10: Year fixed effects





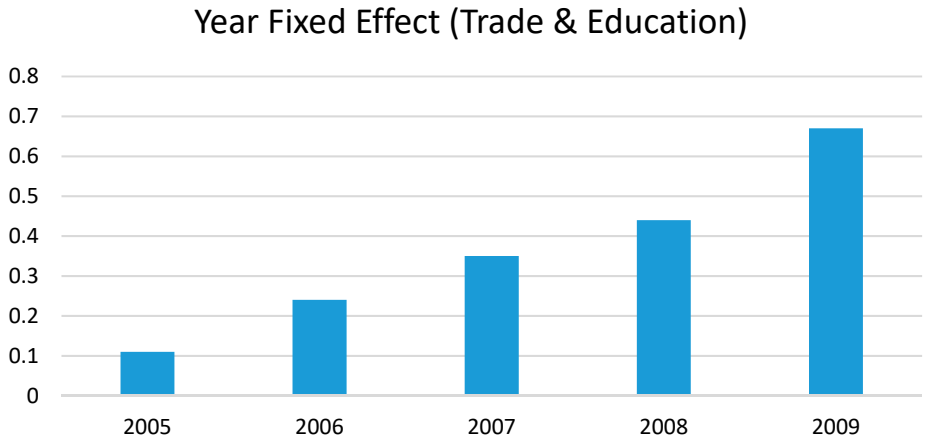


Table 1: Percentile Distribution of Income								
Real Wage Income (RMB)								
Percentile	2002	2003	2004	2005	2006	2007	2008	2009
10	2,132	2,058	2,851	2,809	3,909	4,707	4,425	5,935
25	4,814	4,804	5,716	6,214	7,414	8,657	9,218	11,199
50	8,586	8,833	10,226	11,383	13,142	14,899	16,621	19,584
75	13,428	14,073	16,163	18,015	20,941	23,800	27,163	31,747
90	19,000	20,059	23,978	26,873	31,661	35,652	40,940	46,857

Table 2

Dependent Variable: Ln (GDP per capita)						
Panel A: OLS	2004	2005	2006	2007	2008	2009
	(1)	(2)	(3)	(4)	(5)	(6)
Trade share	0.60***	0.55***	0.56***	0.54***	0.57***	0.72***
	(0.10)	(0.11)	(0.09)	(0.10)	(0.11)	(0.13)
Investment share	0.36	0.32	0.00	-0.06	-0.10	-0.25
	(0.58)	(0.54)	(0.51)	(0.41)	(0.36)	(0.28)
Ln Population	-0.21**	-0.19**	-0.23**	-0.23**	-0.24**	-0.24**
	(0.10)	(0.10)	(0.10)	(0.09)	(0.10)	(0.09)
Observations	127	133	129	128	129	130
R-squared	0.51	0.48	0.50	0.51	0.50	0.50
Province Effect	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: IV	2004	2005	2006	2007	2008	2009
	(1)	(2)	(3)	(4)	(5)	(6)
Trade share	1.35***	1.16***	1.00***	0.99***	0.98***	1.13**
	(0.46)	(0.40)	(0.37)	(0.36)	(0.37)	(0.47)
Investment share	0.17	0.36	0.17	0.11	0.03	-0.15
	(0.59)	(0.49)	(0.47)	(0.40)	(0.36)	(0.29)
Ln Population	-0.11	-0.10	-0.19**	-0.18*	-0.19**	-0.21**
	(0.12)	(0.12)	(0.10)	(0.09)	(0.10)	(0.09)
Observations	127	133	129	128	129	130
Province Effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

Note: 2004-2009; constant term is not reported

Table 3

Dependent Variable: Ln (GDP per capita)				
Panel A: OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Trade share	0.69***	0.75***	0.73***	0.58***
	(0.09)	(0.10)	(0.11)	(0.09)
Investment share		0.82***	0.14	-0.01
		(0.21)	(0.25)	(0.27)
Ln Population		-0.09	-0.08	-0.22**
		(0.07)	(0.07)	(0.09)
Observations	804	776	776	776
R-squared	0.26	0.31	0.42	0.56
Province Effect				Yes
Year Effect			Yes	Yes
Panel B: IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)
Trade share	1.79***	1.81***	1.73***	2.06***
	(0.37)	(0.42)	(0.40)	(0.51)
Investment share		1.30***	0.63**	0.26
		(0.22)	(0.28)	(0.34)
Ln Population		-0.08	-0.07	-0.05
		(0.13)	(0.12)	(0.13)
Observations	790	763	763	763
Province Effect				Yes
Year Effect			Yes	Yes

Robust standard errors in parentheses

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

Note: 2004-2009; constant term is not reported

Table 4

OLS				
Income Gini	(1)	(2)	(3)	(4)
Trade share	0.02***	0.02***	0.02***	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)
Investment share			0.00	0.02
			(0.01)	(0.02)
Ln Population			0.00	0.01
			(0.00)	(0.00)
Observations	805	777	777	777
R-squared	0.05	0.06	0.07	0.29
Province Effect				Yes
Year Effect			Yes	Yes
Consumption Gini	(5)	(6)	(7)	(8)
Trade share	0.02***	0.03***	0.03***	0.01***
	(0.00)	(0.00)	(0.01)	(0.00)
Investment share			0.00	0.01
			(0.02)	(0.02)
Ln Population			0.00	-0.00
			(0.00)	(0.00)
Observations	805	777	777	777
R-squared	0.07	0.08	0.11	0.30
Province Effect				Yes
Year Effect			Yes	Yes
Gender Wage Gap	(9)	(10)	(11)	(12)
Trade share	0.03***	0.03***	0.03***	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Investment share			0.04	0.01
			(0.03)	(0.03)
Ln Population			-0.03***	-0.02
			(0.01)	(0.01)
Observations	805	777	777	777
R-squared	0.02	0.06	0.06	0.25
Province Effect				Yes
Year Effect			Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: 2004-2009; constant term is not reported

Table 5: IV Estimation of Inequality

IV				
Income Gini	(1)	(2)	(3)	(4)
Trade Share	0.03**	0.03***	0.03**	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Investment Share		0.02	0.01	0.02
		(0.01)	(0.01)	(0.02)
Ln Population		0.00	0.00	0.01
		(0.00)	(0.00)	(0.00)
Observations	791	764	764	764
Province Effect				Yes
Year Effect			Yes	Yes
Consumption Gini	(5)	(6)	(7)	(8)
Trade Share	0.04***	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Investment Share		0.03**	0.01	0.02
		(0.01)	(0.02)	(0.02)
Ln Population		0.00	0.00	0.00
		(0.00)	(0.00)	(0.01)
Observations	791	764	764	764
Province Effect				Yes
Year Effect			Yes	Yes
Gender Wage Gap	(9)	(10)	(11)	(12)
Trade Share	-0.01	0.02	0.03	0.01
	(0.03)	(0.02)	(0.02)	(0.03)
Investment Share		0.02	0.04	0.01
		(0.03)	(0.04)	(0.03)
Ln Population		-0.03***	-0.03***	-0.02
		(0.01)	(0.01)	(0.01)
Observations	791	764	764	764
Province Effect				Yes
Year Effect			Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Barro City-Average (Income Gini)

	(5)	(6)	(7)	(8)
Income Gini	2002-2009	2002-2009	2004-2009	2004-2009
	OLS	IV	OLS	IV
Ln(real GDPPC)	0.21**	0.40**	0.24**	0.34**
	(0.09)	(0.17)	(0.10)	(0.15)
Ln(real GDPPC) squared	-0.01**	-0.02**	-0.01**	-0.02**
	(0.00)	(0.01)	(0.01)	(0.01)
Primary school	-0.08***	-0.07*	-0.09**	-0.08**
	(0.03)	(0.04)	(0.03)	(0.04)
High school	-0.08*	-0.07	-0.04	-0.04
	(0.04)	(0.04)	(0.05)	(0.05)
College	0.01	-0.01	-0.01	-0.02
	(0.04)	(0.05)	(0.04)	(0.04)
Openness	0.01*	0.06	0.01*	0.03
	(0.01)	(0.04)	(0.01)	(0.03)
Ln(population)	0.01**	0.01**	0.01**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	136	134	136	134
R-squared	0.59		0.52	
Province Effect	Yes	Yes	Yes	Yes

Table 7: Household individual regression: Average Trade Impacts (OLS)

Dependent Variable: Ln (Real Wage)	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Trade share	0.37***	0.22***	0.22***	0.53***	0.57***	0.62***
	(0.03)	(0.04)	(0.04)	(0.08)	(0.17)	(0.15)
Female	-0.36***	-0.36***	-0.26***	-0.36***	-0.36***	-0.26***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
High school	0.25***	0.25***	0.19***	0.23***	0.24***	0.18***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
College and above	0.61***	0.61***	0.51***	0.58***	0.59***	0.49***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SOE	0.61***	0.62***	0.26***	0.64***	0.65***	0.29***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
Age	0.16***	0.16***	0.09***	0.16***	0.16***	0.09***
	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Age Squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Marriage	0.08***	0.08***	0.10***	0.11***	0.09***	0.12***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Observations	198,551	198,551	198,551	195,615	195,615	195,615
R-squared	0.37	0.38	0.52	0.34	0.31	0.11
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Effect		Yes	Yes		Yes	Yes
Industry Dummy			Yes			Yes

Robust standard errors in parentheses

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

Table 8: Year-by-year Trade (OLS)						
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(real wage)	2004	2005	2006	2007	2008	2009
Openness	0.25***	0.24***	0.21***	0.21***	0.21***	0.27***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)
Dummy: Female	-0.26***	-0.25***	-0.25***	-0.28***	-0.24***	-0.26***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
High school	0.20***	0.21***	0.20***	0.20***	0.18***	0.18***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
College	0.53***	0.52***	0.52***	0.53***	0.49***	0.50***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Dummy: SOE	0.28***	0.32***	0.28***	0.25***	0.24***	0.22***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Age	0.07***	0.08***	0.08***	0.11***	0.11***	0.12***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Dummy: Marriage	0.13***	0.10***	0.14***	0.05***	0.09***	0.10***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	5.75***	5.67***	5.75***	5.25***	5.19***	5.38***
	(0.11)	(0.17)	(0.29)	(0.33)	(0.26)	(0.24)
Observations	34,365	33,579	38,815	31,833	28,873	31,086
R-squared	0.49	0.50	0.48	0.52	0.51	0.53
Province Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Year-by-year Trade (IV)						
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(real wage)	2004	2005	2006	2007	2008	2009
Openness	0.53***	0.43***	0.39***	0.42***	0.31**	0.44***
	(0.14)	(0.14)	(0.14)	(0.15)	(0.12)	(0.16)
Dummy: Female	-0.26***	-0.25***	-0.25***	-0.28***	-0.24***	-0.26***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
High school	0.20***	0.20***	0.19***	0.20***	0.17***	0.18***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
College	0.52***	0.51***	0.51***	0.52***	0.48***	0.49***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)
Dummy: SOE	0.30***	0.33***	0.29***	0.26***	0.24***	0.23***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Age	0.07***	0.07***	0.08***	0.11***	0.11***	0.12***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Dummy: Marriage	0.14***	0.11***	0.14***	0.06***	0.09***	0.10***
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	34,365	33,579	38,815	31,833	28,873	31,086
R-squared	0.14	0.14	0.14	0.15	0.13	0.16
Province Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Trade and Incomes: Heterogeneity Across Income Groups

	OLS			IV		
Dependent Variable: Ln (Real Wage)						
	(1)	(2)	(3)	(4)	(5)	(6)
Trade share	0.10***	0.02	0.03*	0.14***	0.15**	0.18***
	(0.01)	(0.02)	(0.02)	(0.03)	(0.06)	(0.06)
Female	-0.11***	-0.11***	-0.09***	-0.11***	-0.11***	-0.09***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Dummy(Low Wage)	-1.13***	-1.12***	-0.95***	-1.02***	-1.01***	-0.88***
	(0.03)	(0.03)	(0.02)	(0.07)	(0.07)	(0.06)
Dummy(High Wage)	0.72***	0.72***	0.71***	0.67***	0.67***	0.65***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Dummy(Low Wage)*(Trade Share)	-0.31***	-0.31***	-0.21***	-0.62**	-0.62**	-0.45*
	(0.09)	(0.09)	(0.08)	(0.30)	(0.30)	(0.26)
Dummy (High Wage)*(Trade Share)	0.16***	0.16***	0.15***	0.24***	0.24***	0.23***
	(0.01)	(0.02)	(0.01)	(0.03)	(0.04)	(0.04)
Primary School	-0.05***	-0.05***	-0.05***	-0.05***	-0.06***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
College and above	0.13***	0.13***	0.13***	0.13***	0.13***	0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Dummy(SOE)	0.17***	0.18***	0.06***	0.19***	0.20***	0.07***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Age	0.08***	0.08***	0.06***	0.08***	0.08***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age Squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Marriage	-0.03**	-0.02**	-0.00	-0.02	-0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	198,551	198,551	198,551	195,615	195,615	195,615
R-squared	0.72	0.72	0.75	0.70	0.69	0.55
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Effect		Yes	Yes		Yes	Yes
Industry Dummy			Yes			Yes

Robust standard errors in parentheses

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

Table 11: Trade and Education: Heterogeneity Across Education Groups

Dependent Variable: Ln (Real Wage)	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Trade share	0.28***	0.12**	0.14***	0.42***	0.43**	0.50***
	(0.05)	(0.05)	(0.05)	(0.11)	(0.21)	(0.18)
Female	-0.36***	-0.36***	-0.26***	-0.36***	-0.36***	-0.26***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
High School	0.23***	0.22***	0.17***	0.21***	0.20***	0.15***
	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.03)
College and above	0.53***	0.52***	0.44***	0.49***	0.47***	0.39***
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
(High school)*(Trade Share)	0.07**	0.06**	0.05*	0.07	0.10	0.09
	(0.03)	(0.03)	(0.03)	(0.08)	(0.08)	(0.07)
(College & above)*(Trade Share)	0.18***	0.19***	0.16***	0.22*	0.27***	0.23**
	(0.04)	(0.04)	(0.04)	(0.12)	(0.10)	(0.10)
Dummy(SOE)	0.62***	0.63***	0.26***	0.64***	0.66***	0.29***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)
Age	0.16***	0.16***	0.09***	0.16***	0.16***	0.09***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age Squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Marriage	0.09***	0.08***	0.11***	0.11***	0.10***	0.12***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Observations	198,551	198,551	198,551	195,615	195,615	195,615
R-squared	0.37	0.38	0.52	0.36	0.37	0.50
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Effect		Yes	Yes		Yes	Yes
Industry Dummy			Yes			Yes

Robust standard errors in parentheses

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

Appendix:

Data and Additional Charts

Table A1: List of cities in the sample (2004-2009):		
Province	City	Observations
Anhui	Anqing, Bengbu, Bozhou, Chuzhou, Fuyang, Hefei, Huaibei, Huainan, Huangshan, Maanshan, Tongling, Wuhu, Xuancheng	24,484
Gansu	Dingxi, Jiayuguan, Jinchang, Jiuquan, Lanzhou, Pingliang, Qingyang, Tianshui, Wuwei	9,842
Guangdong	Dongguan, Foshan, Guangzhou, Huizhou, Jiangmen, Jieyang, Maoming, Meizhou, Qingyuan, Shantou, Shaoguan, Shenzhen, Zhanjiang, Zhaoqing, Zhuhai	28,238
Heilongjiang	Daqing, Harbin, Hegang, Jiamusi, Jixi, Mudanjiang, Qiqihar, Qitaihe,, Shuangyashan, Yichun	27,302
Henan	Anyang, Jiaozuo, Kaifeng, Luohe, Luoyang, Nanyang, Pingdingshan, Puyang, Sanmenxia, Xinxiang, Xinyang, Xuchang, Zhengzhou, Zhoukou, Zhumadian	31,326
Hubei	Ezhou, Huanggang, Huangshi, Jingmen, Jingzhou, Shiyan, Wuhan, Xiangyang, Xianning, Xiaogan, Yichang	23,851
Jiangsu	Changzhou, Huaian, Lianyungang, Nanjing, Nantong, Suqian, Suzhou, Taizhou, Wuxi, Xuzhou, Yancheng, Yangzhou, Zhenjiang	53,018
Jiangxi	Fuzhou, Ganzhou, Jian, Jingdezhen, Jiujiang, Nanchang, Pingxiang, Shangrao, Xinyu, Yichun, Yingtan	14,864
Liaoning	Anshan, Benxi, Chaoyang, Dalian, Dandong, Fushun, Fuxin, Huludao, Jinzhou, Liaoyang, Panjin, Shenyang, Tieling, Yingkou	45,255
Shandong	Binzhou, Dezhou, Dongying, Heze, Jinan, Jining, Laiwu, Liaocheng, Linyi, Qingdao, Rizhao, Taian, Weifang, Weihai, Yantai, Zaozhuang, Zibo	36,170
Shanxi	Changzhi, Datong, Jincheng, Jinzhong, Linfen, Luliang, Shuozhou, Taiyuan, Xinzhou, Yangquan, Yuncheng	21,420
Sichuan	Bazhong, Chengdu, Deyang, Guangyuan, Leshan, Luzhou, Mianyang, Nanchong, Neijiang, Panzhihua, Yaan, Yibin, Zigong	29,126
Yunnan	Baoshan, Kunming, Lijiang, Puer, Qujing, Yuxi, Zhaotong	15,671
Direct-Controlled Municipalities	Beijing, Chongqing, Shanghai	52,931

Figure A1: Trade Shares and Incomes Across Cities (all individual years and cities)

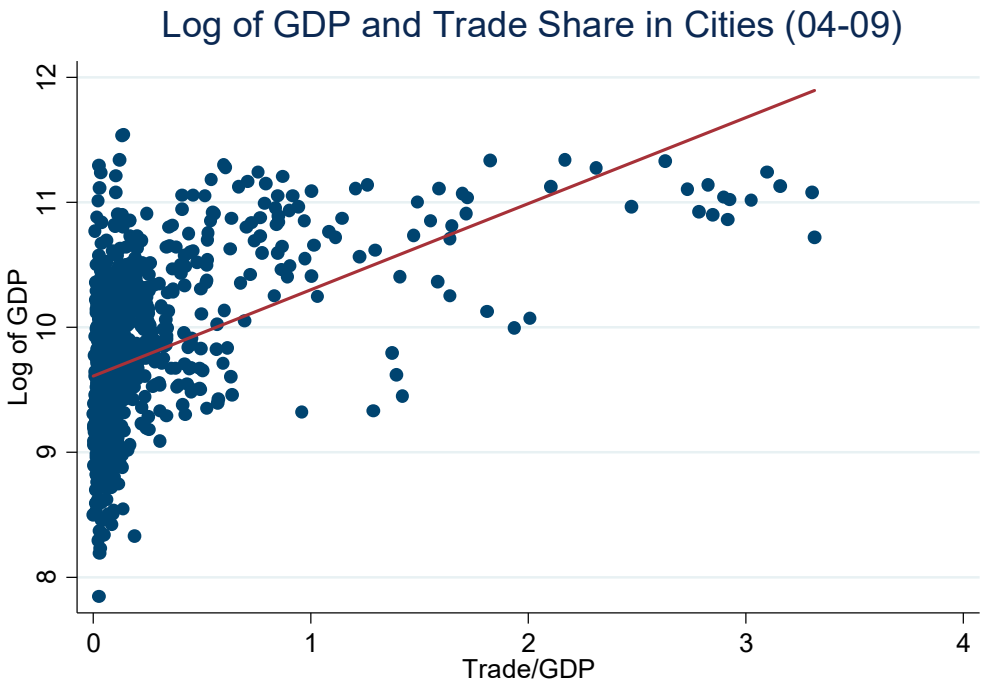
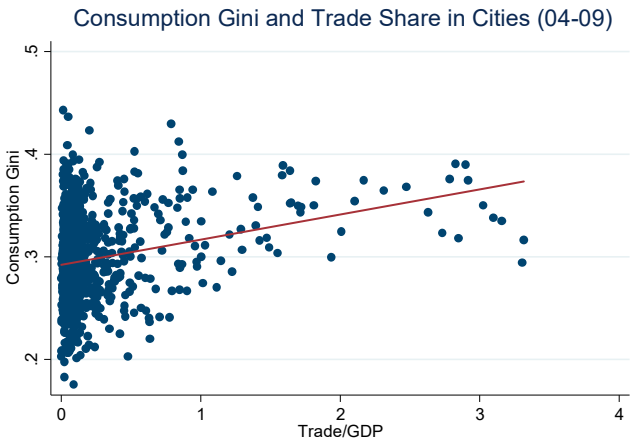
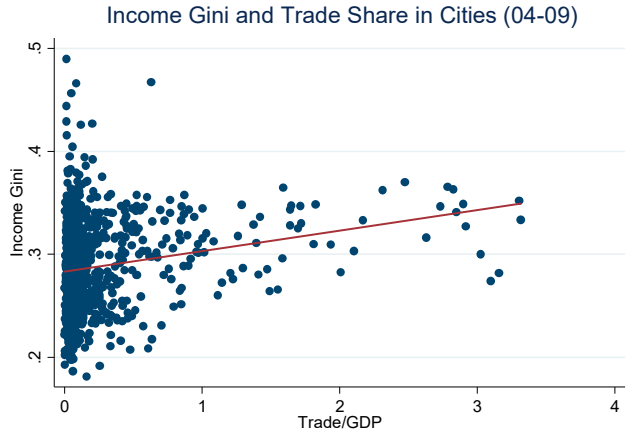
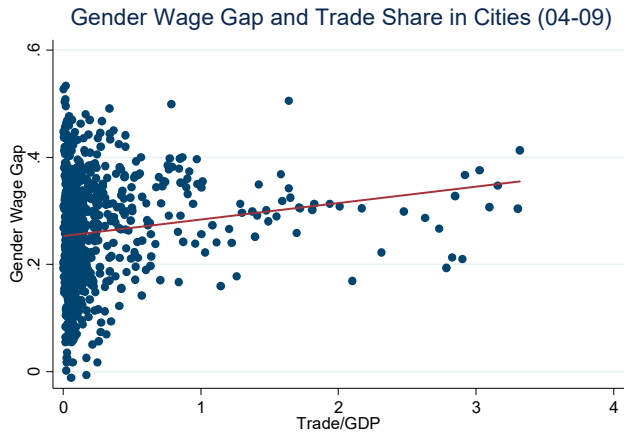


Figure A2: Trade Shares and Distributional Outcomes Across Cities (all individual years and cities)







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