Analysis of Impact of Immigration on Labor-market Outcomes

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1. Question

This report focuses on the impact of immigration shock on the labor-market outcomes (including native wage, native unemployment rate, native labor participation rate, and share of native labor in manufacture) in the United States from 1980 to 2007.

2. Motivation

Immigrants has become a large proportion of the United States population. Statistics show that the citizens born outside of the United States raised from 5% in 1980 to nearly 13% in 2010, about 40 million in total [1]. Recently, there is an increasing trend of immigrants from Asia, and immigrants from Mexico have declined [2]. Moreover, in labor market, immigrants also play an important part, it is reported by the US Bureau of Statistics that The amount of immigrants participating in the labor force is about 17.4% of the total labor force in 2018 [3]. There is no doubt that the large amount of immigrants labors would affect the native, therefore, this study aims to investigate the effect of immigrants on the labor-market outcomes for the US domestic citizen.

3. Data

3.1 Commuting Zones

Our sample is composed of 5% Census samples in 1980 and 2007 ACS sample [4]. To study the economic effects on the labor market nationwide, we restrict the samples to individuals between 16 and 64 years old and involve all commuting zones as labor market areas. The commuting zones are identified by analyzing county to county flows of commuters with a hierarchical cluster algorithm, which is generated from the open source of David.Dorn [5].

3.2 Variables Arrangement

As for dependent variables, ACS and Census data has top coding on extremely high income, assigning a certain number to individuals with income over the threshold. According to instructions, we multiply 1.5 to each threshold number to adjust the top-level income, to depict a preciser income distribution. Labor wage and income are deflated by GDP afterwards.

To evaluate immigration shock, we use four labor outcome variables, which might be misleading owing to change of composition. Thus, the dependent variable needs to be composition adjusted. We use hours worked as a weight for native average wage and native labor participation rate, and this weight needs to be time invariant. The weight is a ratio between hours worked in a particular bin divided by the total hours worked in all the bins in this commuting zone:

$$\bar{\pi}_{l,cz} = \left(\frac{\#Hours_{l,cz}}{\#Hours_{cz}}\right)^{1980+2007} \tag{1}$$

What's more, we use working age population as a weight for native unemployment rate and share of native workers in manufacture. The weight is a ratio between population worked in a particular bin divided by the total population worked in all the bins in this commuting zone:

$$\bar{\pi}_{l,cz} = \left(\frac{\#Population_{l,cz}}{\#Population_{cz}}\right)^{1980+2007} \tag{2}$$

where we restrict the population to workers in manufacture for the outcome of share of native workers in manufacture.

4. Approach

4.1 Basic model

To analyze the shock of immigration between 1980 and 2007, we established the following regression with the dependent variable being the logarithm of ratio of labor outcome in 2007 relative to 1980. The regression is:

$$ln(\frac{outcomes_{2007}^{Native}}{outcomes_{1980}^{Native}})_{cz} = \alpha + \beta X_{cz} + \gamma X_c + \varepsilon_c \tag{3}$$

For independent variables, we have representing the immigration inflow. We use people who are not native in this commuting zone in 2007 subtract by people who are not native in 1980 to get the change of immigrants in this commuting zone. Then we divide this by the total population in this commuting zone in 1980. The equation is: $\mathrm{X}_{cz} = \frac{1}{N_{cz,1980}}(I_{cz,2007} - I_{cz,1980})$

4.2 Instrument variable

In the above base model, we assume that immigration inflows are exogenous in the economic system. However, actually there are many unobserved shocks(like local demand shocks) that will affect both labor outcomes and attractiveness to immigrants, so here we use the so-called "Card Instrument", which is first used by David Card [6]:

$$f_{cs} = \frac{I_{cz,s}}{I_{cz}}|_{1980} Z_{cz} = \frac{1}{N_{c,1980}^{-cz}} \sum_s f_{cs}(I_{s,2007}^{-cz} - I_{s,1980}^{-cz}) \tag{4}$$

To develop the card instrument, we need to identify the source region of the immigrants, which is conducted from the census data. Then we calculate the share of immigrants from each particular region s in the commuting zone out of all the immigrants in this particular commuting zone, which is called $f_{c,s}$ in the above equations.

We use this $f_{c,s}$ as a weight for immigration inflow. Next we multiply the constructed $f_{c,s}$ by the difference of immigrants between the year 2007 and 1980 from source region s to all the commuting zone except commuting zone c. This way we can eliminate all the possible local demand factors that are associated with this commuting zone, since changing the immigrants from s to all other commuting zones should have no relationship with commuting zone c. Finally we add them up and

divide by the total population except conmmuting zone c in 1980 in this commuting zone to get the inflow ratio. Below we will apply this process for all four labor outcomes.

5. Results

5.1 First-stage results

Table 1: First Stage

	Dependent variable:
	Immigration Inflow Ratio
Card IV	3.998***
	(0.290)
Col Share	0.281***
	(0.057)
Manu Share	-0.045
	(0.045)
Female Share	1.241***
	(0.151)
Constant	-0.564***
	(0.053)
Observations	741
R^2	0.312
Adjusted R^2	0.308
Note:	*p<0.1; **p<0.05; ***p<0.01

Firstly we just take a glimpse of the first-stage regression result, it is shown that the correlation between the Card Instrument and independent variable is very strong, so it is a very good instrument variable at least in term of correlation.

5.2 Outcome 1: Effect of immigration shock on Native Average Wage

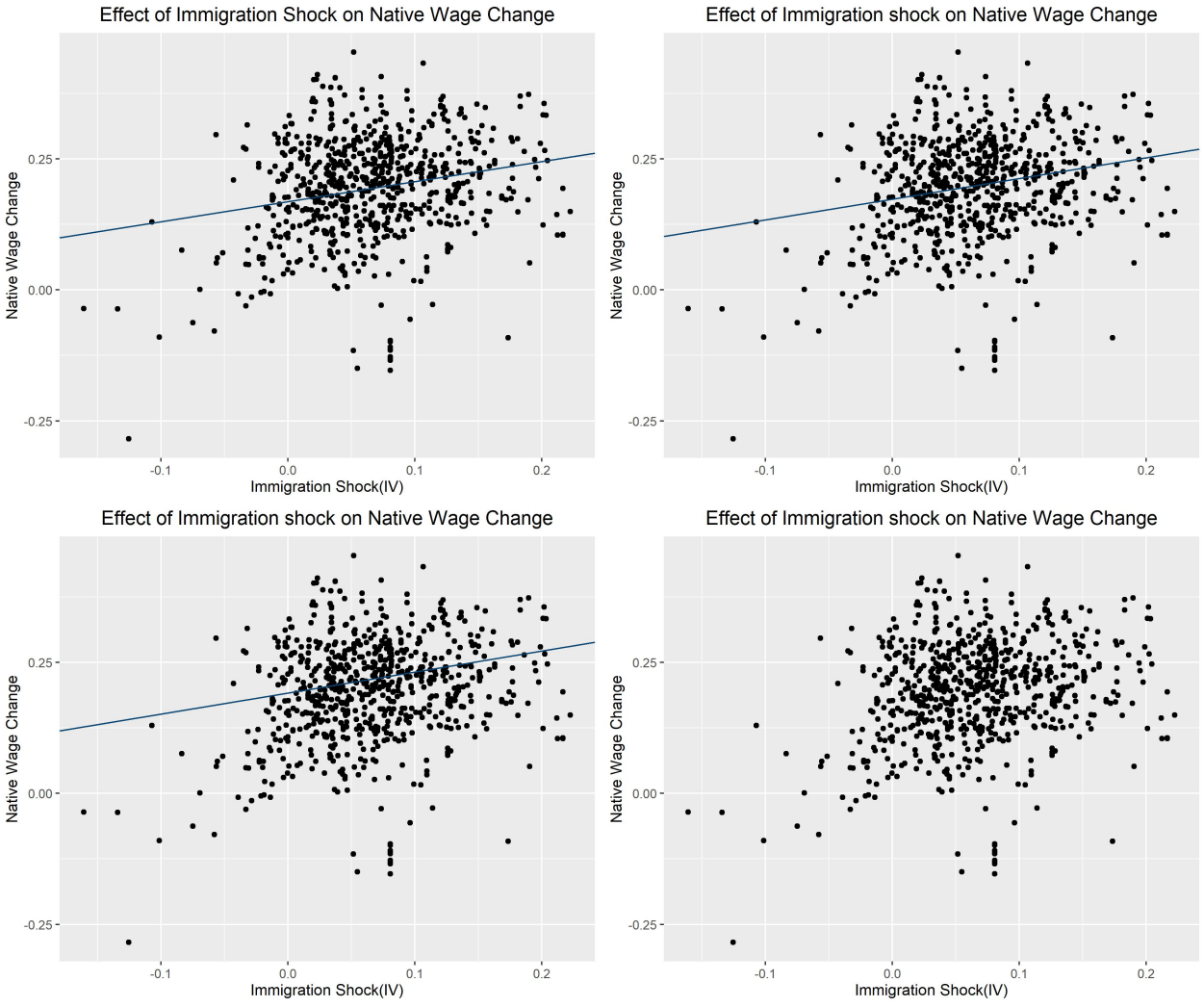

Figure 1: Effect of Immigration on Native Average Wage(IV)

Over the period that we examine, Figure 1 illustrates a weak positive relationship between immigrants flow and native average wage. One possible reason may be immigrants, lower competitively in general, mainly enter labor-intensive industries like manufacturing industries, thus,

native workers in these industries are crowded out and might be forced to leave the labor market, raising up the share of workers in skill-intensive or capital-intensive industries, where they earned much higher salaries. In this way, the immigration shock exerted a small positive impact on average native income due to sample selection.

Table 2: Outcome 1 - Native average wage change

	Dependent variable:			
	Native Wage Change			
	(1)	(2)	(3)	(4)
Immigration Shock	0.383***	0.395***	0.401***	0.080
	(0.065)	(0.079)	(0.079)	(0.081)
Col Share		-0.017	-0.050	-0.182***
		(0.061)	(0.071)	(0.069)
Manu Share			-0.040	-0.343***
			(0.043)	(0.051)
Female Share				1.788***
				(0.182)
Constant	0.168***	0.173***	0.191***	-0.397***
	(0.006)	(0.018)	(0.027)	(0.065)
Observations	741	741	741	741
R^2	0.045	0.045	0.046	0.156
Adjusted R^2	0.043	0.042	0.042	0.152
Note:				*p<0.1; **p<0.05; ***p<0.01

Then we add the control variable, share of college educated in each commuting zone in 1980 to control the education effect and labor share of manufacturing industries in commuting zones in 1980 one after the other. Both results of regressions shown in table 2 suggest a statistically significant relationship between immigration flow and native average wage. However, when adding the share of females in commuting zone, the significance of immigration effect disappears immediately,

while the positive coefficient between female share dummy and the dependent variable stands out. We think that it is probably because more immigrants multiplied supply in the labor market thus lessening the wage of native workers, combined with the sample selection, the immigration made no difference to the native average wage in total. As for the significance of the female dummy estimated coefficient, a possible explanation is that with the economic development post Vietnam War and the springing up of feminism, more and more women entered the job market to pursue personal success. Hence, they may enlarge the labor force and demand in the local market at the same time, contributing to the development of local economy, thus increasing the demand of high-skilled people with local working experience, reflected on native average wage.

5.2 Outcome 2: Native unemployment rate change

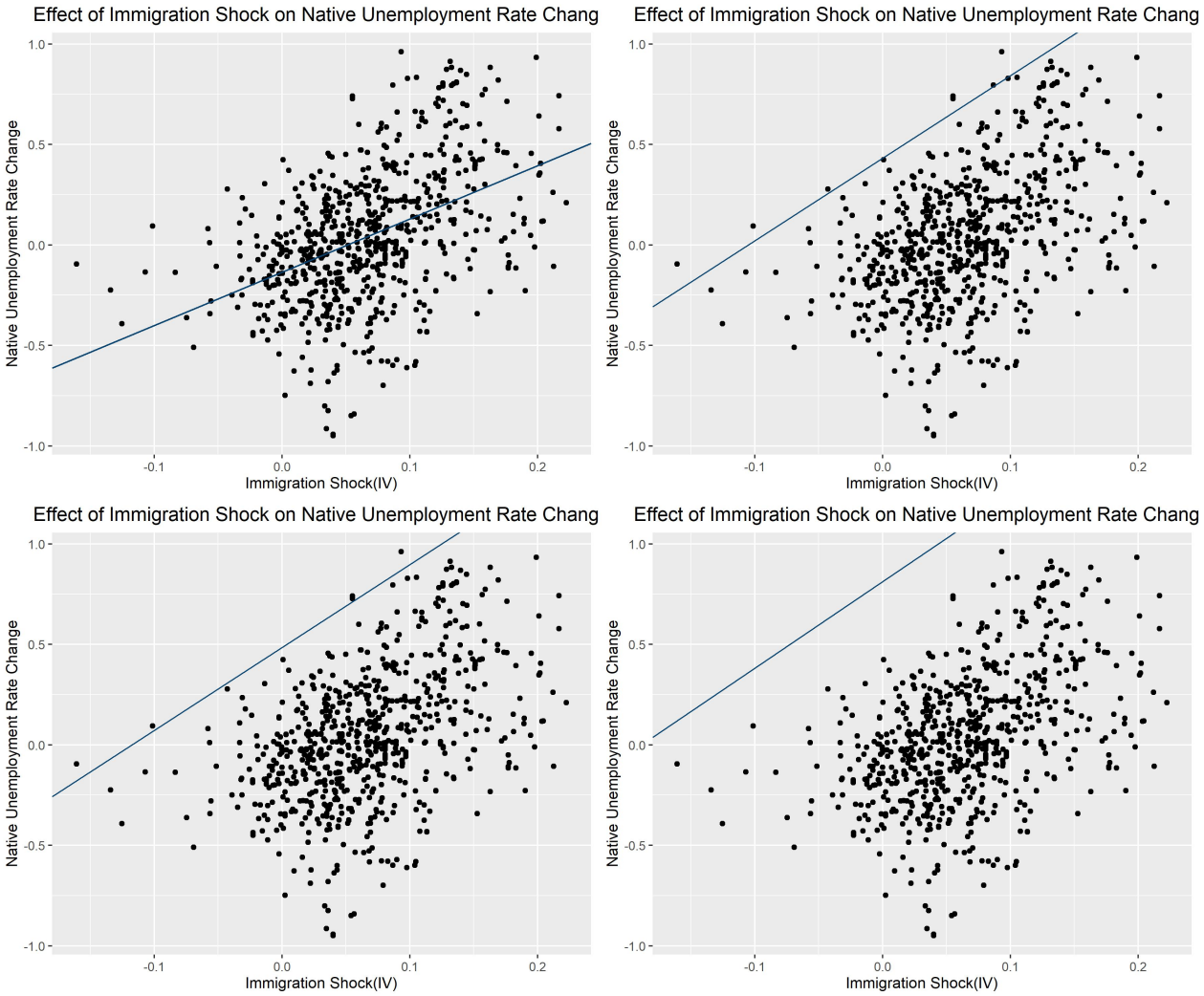

Figure 2: Effect of Immigration on Native Unemployment Rate(IV)

Table 3: Outcome 2 - Native Unemployment Rate Change

	Dependent variable:			
	Native Unemployment Rate Change			
	(1)	(2)	(3)	(4)
Immigration Shock	2.649***	4.111***	4.127***	4.306***
	(0.192)	(0.212)	(0.213)	(0.232)
Col share		-2.026***	-2.122***	-2.049***
		(0.165)	(0.192)	(0.196)
Manu share			-0.113	0.056
			(0.115)	(0.145)
Female share				-0.996*
				(0.521)
Constant	-0.136***	0.433***	0.485***	0.813***
	(0.017)	(0.049)	(0.072)	(0.186)
Observations	741	741	741	741
R^2	0.205	0.339	0.340	0.343
Adjusted R^2	0.204	0.337	0.337	0.340
Note:				*p<0.1; **p<0.05; ***p<0.01

Figure 2 and Table 3 demonstrates the immigration shock always exert a negative influence on native employment rate and the argument is strengthened as we append the control the variables, education, manufacture labor share and female share gradually. Then we turn to the degree of impact, and find that controlling education reared up the slope of immigration shock in Figure 2, meanwhile the estimated coefficient of education term is significantly below zero in Table 3. The mechanism behind may be that the immigrants flowing in compete with local native labor force, squeezing out less competitive native workers from the labor market, thus being part of picking up unemployment rate. In contrast, the native more competitive, closely associated with well-educated, are not likely to lose jobs owing to immigrants, implying the negative relationship between education level and unemployment rate, consistent with our sense of the relationship under

most circumstances. Therefore, in terms of employment rate, the area with higher share of college educated have more resistance from immigration shock.

Outcome 3: Native Labor Participation Rate

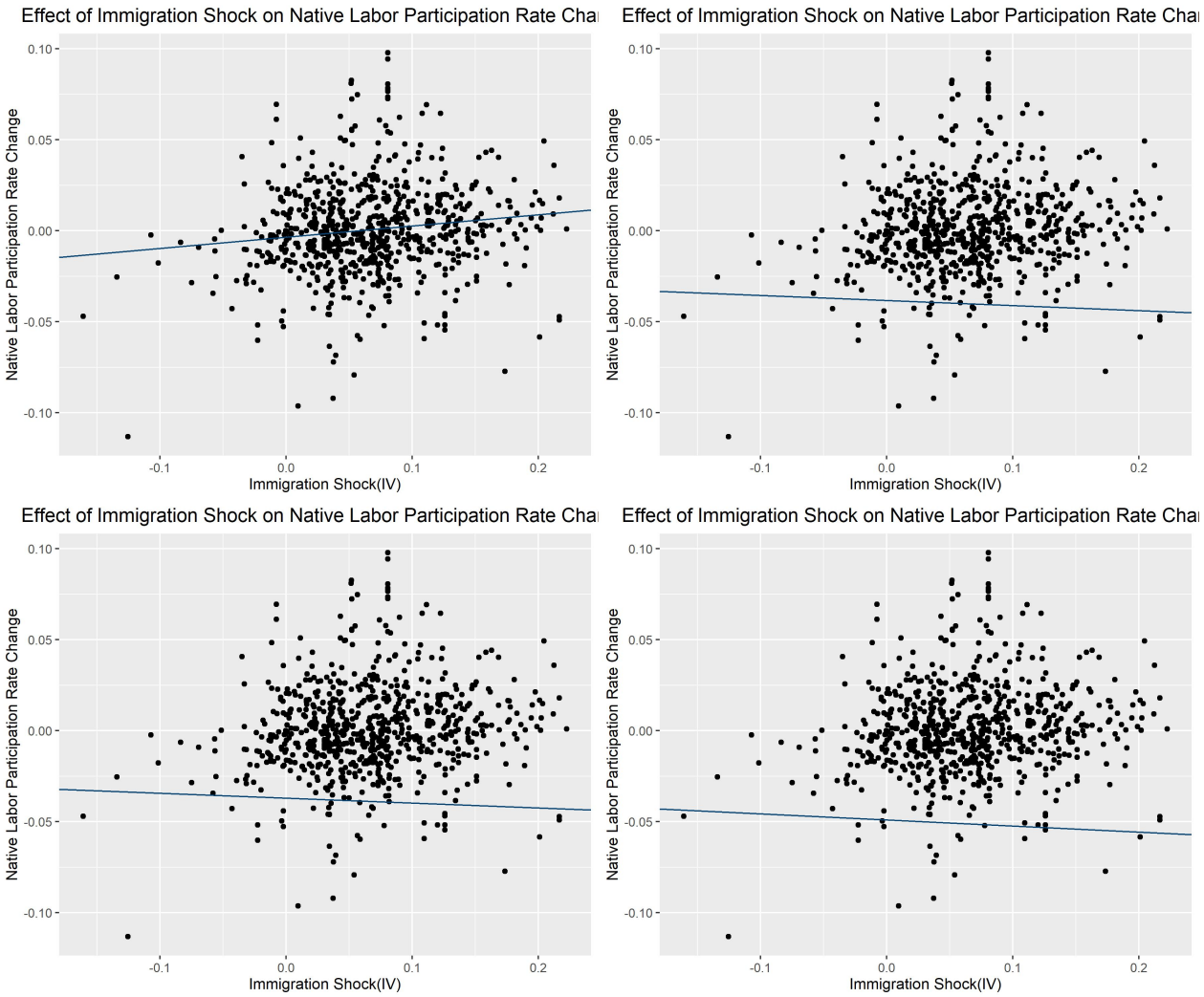

Figure 3: Effect of Immigration on Native Labor Participation Rate(IV)

Table 4: Outcome 3 - Native Labor Participation Rate Change

	Dependent variable:			
	Native Labor Participation Rate Change			
	(1)	(2)	(3)	(4)
Immigration Shock	0.062***	-0.027	-0.027	-0.034
	(0.017)	(0.019)	(0.019)	(0.021)
Col Share		0.124***	0.122***	0.119***
		(0.015)	(0.018)	(0.018)
Manu Share			-0.003	-0.009
			(0.011)	(0.013)
Female Share				0.036
				(0.048)
Constant	-0.004**	-0.038***	-0.037***	-0.049***
	(0.001)	(0.004)	(0.007)	(0.017)
Observations	741	741	741	741
R^2	0.018	0.100	0.100	0.101
Adjusted R^2	0.017	0.097	0.096	0.096
Note:				*p<0.1; **p<0.05; ***p<0.01

From Figure 3 and Table 4, We only observe insignificant effects from immigration shock towards native labor participation rate. Referring to the figure, we find the estimated coefficient of college educated is always significantly positive, suggesting that higher level education of the commuting zone tends to move up local labor participation from 1980 to 2007. One possible explanation is that better education drives local economic development, thus raising up the labor participation rate by creating more demands in the labor market. An alternative interpretation is that the higher education level results from the more developed economy in the corresponding commuting zones, usually implying higher education budget and higher education demand in households, together with abundant education resources. In the meantime, the better economic condition is positively associated with labor force participation. Since there is potential endogeneity between the education

level and labor participation, we are not able to expound the mechanism rigorously.

Outcome 4: Labor Share Change of the Native in Manufacture

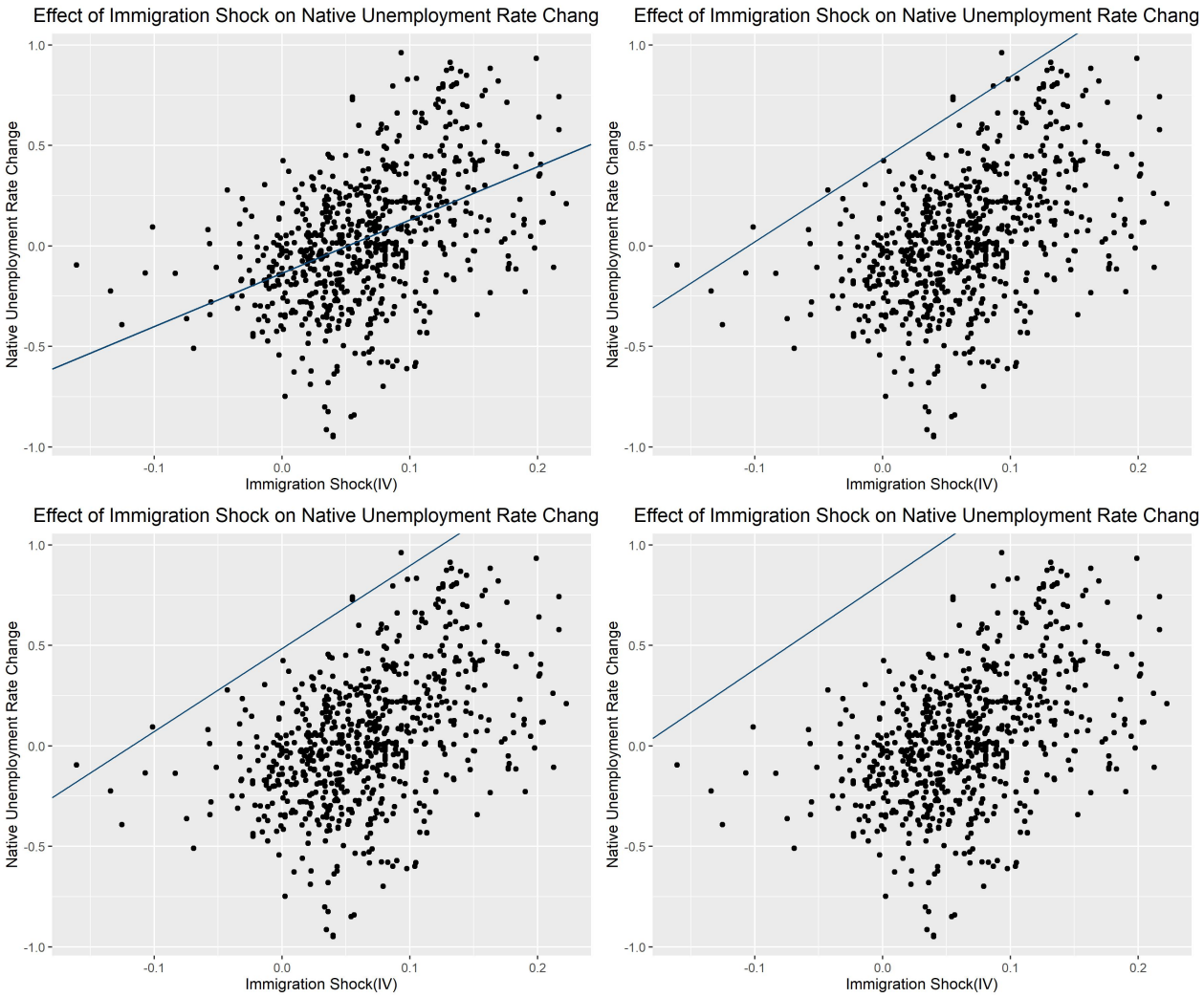

Figure 4: Effect of Immigration on Labor Share Change of the Native in Manufacture(IV)

Table 5: Outcome 4 - Labor Share Change of the Native in Manufacture

	Dependent variable:			
	Labor Share of the Native in Manufacture			
	(1)	(2)	(3)	(4)
Immigration Shock	-1.022***	-1.492***	-1.505***	-1.752***
	(0.146)	(0.174)	(0.174)	(0.189)
Col Share		0.651***	0.726***	0.624***
		(0.135)	(0.157)	(0.160)
Manu_Share			0.087	-0.146
			(0.094)	(0.118)
Female_Share				1.376***
				(0.424)
Constant	-0.147***	-0.330***	-0.371***	-0.823***
	(0.013)	(0.040)	(0.059)	(0.151)
Observations	741	741	741	741
R^2	0.063	0.091	0.092	0.105
Adjusted R^2	0.061	0.089	0.088	0.100
Note:				*p<0.1; **p<0.05; ***p<0.01

In the last part, we focus on the effect of immigration shock on the labor share of the native in the manufacturing industry. As we add the 3 control variables to the regression model gradually, the estimated negative coefficient of immigration shock turns larger in scale, being significant all the time. These specifications further strengthen our belief that a large number of immigrants flowed into the manufacturing industry which requires less skills and working experience, and crowding out the native workers asking for higher salaries. Therefore, the labor share of the native in the manufacturing industry descended partly owing to the immigration shock.

6. Conclusion

References

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