Summary: The effect of China import competition in the Italian local labor markets

César Urquizo Ubillús
Rome Masters in Economics

Supervisor: Prof. Pietro Reichlinn

June 28, 2019

Abstract

This document analyzes the effect of growing import competition from China in manufacture employment in the Italian local labor markets over the period 2004-2017. We analyze both the changes over the full period as well as the changes over 3 subperiods: 2004-2008, 2008-2013, and 2013-2017. In the sub period 2004-2008 we find that import competition had a negative effect on manufacture employment, whereas export exposure had a positive effect. When accounting for both effects, we find the total effect of the "China Shock" to be negative in 2004-2008. Additionally, we find a negative effect of import competition on manufacture employment in the sub period 2013-2017. When analyzing the full sample and the 2008-2013 sub period we find no statistically significant effects, which we attribute to the decline in Italian imports from China during the 2008 Global Financial Crisis.

1 Introduction

Since the decade of 1990, economists have debated the impact of trade on the labor market, noting the growing difference in wages of low-skilled workers relative to high skill workers (see Feenstra, 2010). In this line of research Krugman (2008), using a theoretical model, identifies low-wage countries as a possible source of disruption to high-wage labor markets. This opened the way for empirical studies that tried to identify the impact in high income countries' labor markets of liberalizing trade with low income countries.

One of the most important sources of exogenous variation in international trade in the recent years was the set of internal reforms in China, which turned it into a market economy; and its accession to the World Trade Organization (WTO) in 2001, which granted it a most-favored nation among its members (Branstetter and Lardy, 2006). The internal reforms in China involved the migration of over 150 million workers from rural to urban areas (Chen, Jin, and Yue., 2010); led Chinese industries to gain access to foreign technologies, capital goods, and intermediate inputs (Hsieh and Klenow, 2009); and led to multinational enterprises being allowed to operate inside the country (Naughton, 2007). As a result of this changes, China experienced a large productivity growth and a reduction in its trade costs starting in the early 2000s, which is what some authors refer to as the "China Shock".

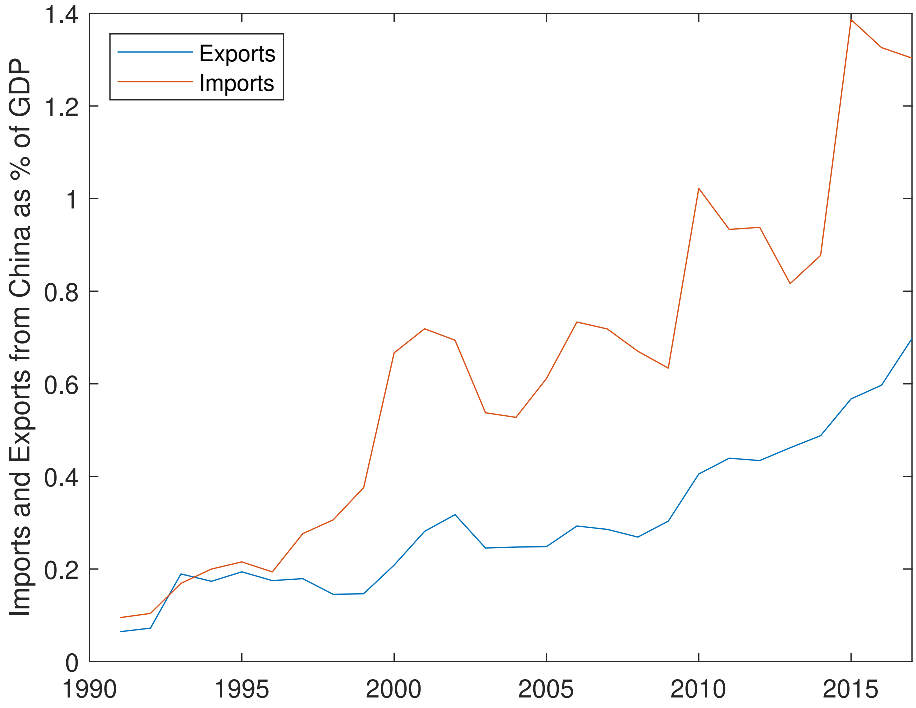
Given that different regions within a country can be specialized in industries that are more or less affected by imports competition with China, the "China Shock" has been used by may authors to identify the effect of import competition in local labor markets. One of the most important works to tackle this question is Autor, Dorn, and Hanson (2013), which studies the effect of rising import competition from China in a series of outcomes in the United States local labor markets. Using a simple model of trade based on monopolistic competition (Helpman and Krugman, 1987), they establish a measure of how such shocks affect the labor market of US region i. Using this measure they estimate the effect of import competition in the United States Commuting Zones using an instrumental variable framework. They find a negative effect of exposure to China on manufacture employment, labor force participation, and wages in local labor markets that house import competing manufacturing industries.

Following a similar methodology to measure exposure to import competition and to exports from China, many authors have tried to further analyze the effects of the "China Shock" in the United States local labor markets. Acemoglu, Autor, Dorn, Hanson, and Price (2016) estimate that rising import competition was a major force behind both recent reductions in US manufacturing employment and weak overall US job growth, while Kemeny, Rigby, and Cooke (2015) find it increases the likelihood of job loss among manufacturing workers with less than a high school degree. Regarding the effect of exports, Feenstra and Sasahara (2018) find that the growth in U.S. exports led to increased demand for 2 million jobs in manufacturing.

Similar studies have also been carried out for Europe. Auer, Degen, and Fischer (2013) study the impact on producer prices of labor-intensive exports from Asia and other global regions in Germany, France, Italy, Sweden, and the United Kingdom. They find that low wage country import competition is associated with strong price effects. Colantone and Crino (2014) find that new imported inputs have a strong positive effect on product creation in Europe, allowing countries to benefit from both wider and better sets of intermediate products. Dauth and Suedekum (2016), Malgouyres (2014), Balsvik, Jensen, and Salvanes (2015) perform country specific studies in Germany, France, and Norway, respectively; and find negative effects from import competition on manufacture employment. Federico (2014) analyzes the effect of competition from low-wage countries on domestic activity in Italy between 1995 and 2007, finding that low-wage import penetration is negatively related to employment and other measures of activity.

The "China Shock" has also been used to study the effect of trade in developing countries. Some noteworthy examples of such studies in Mexico include Chiquiar, Covarrubias, and Salcedo (2017), who find a negative effect of China imports on employment, and Iacovone, Rauch, and Winters (2013) who find that the shock causes selection and reallocation at both firm and product levels and has a highly heterogeneous impact at the intensive and extensive margins.

Figure 1. *Imports and Exports from China as % of GDP*



Italy was not exempt of the disruption in global trade caused by China's internal reforms and its accession to the WTO. This is evidenced by the rapid growth of imports from this country as well as the sustained growth in exports, which we report in Figure 1. We can see that Italian imports from China went from representing just around 0.1% of the Italian GDP in 1990 to representing close to 1.4 % in 2017 (a 14-fold increase). Although exports did not grow as fast as imports in the same time period, they still experienced a significant and sustained growth going from around 0.1 % of the GDP to around 0.7 % (a 7-fold increase).

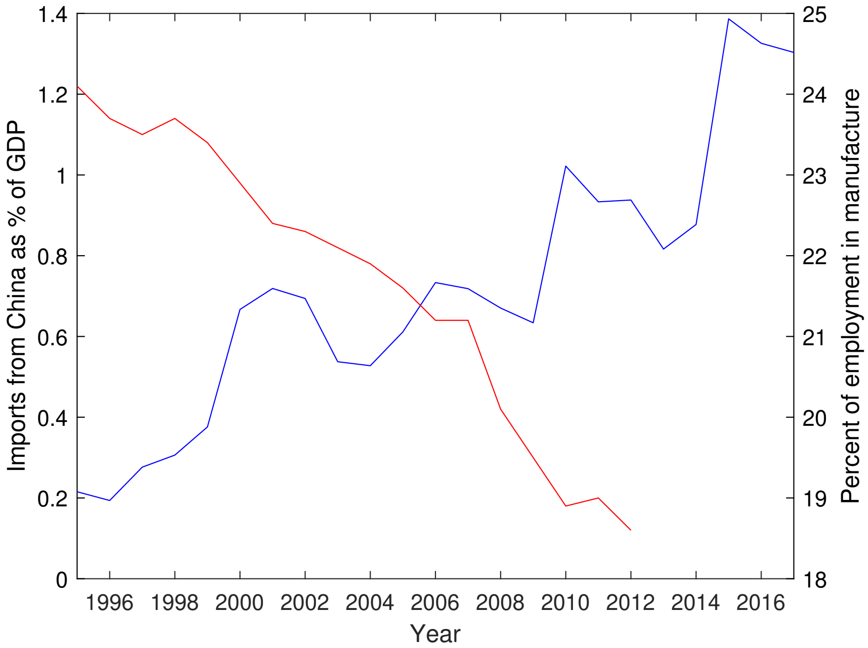
Furthermore, in this same time period Italy experienced a sustained decline in the percentage of workers employed in manufacturing industries (see Figure 2). This raises the question of whether there is a causal mechanism linking the growing import competition from China and the observed decline in manufacture employment in this time period. Using provincial heterogeneity in the percentage of employment in each industry j, in this document we will test whether the evidence suggests there is a link between import exposure to China and manufacture employment at the provincial level.

To answer our main research question, we follow a similar methodology to Autor et al. (2013), using a slightly modified version of their index of import exposure that takes into account both direct change in imports from China as well as the indirect effect generated by input-output interactions. We also construct a similar index using exports to see which provinces are most affected by the increase in demand from China. To account for the possibility of endogeneity in our model, we instrument both import and export exposure to China. The former is instrumented using an index constructed with the changes in imports from other developed countries (to capture China's supply shock), and the latter with an index constructed using changes in exports from other developed countries (to capture China's demand shock).

To test the robustness of our results, we repeat all our empirical exercise using an index that only takes into account the direct effect of imports, but we find no statistically significant results. This leads us to believe that an important part of the effect of the "China Shock" in the Italian local labor markets comes from input-output interactions. For this reason, we favor the specification in which we measure total import and export exposure (using the modified index constructed with the input-output matrix).

We begin our empirical exercise by analyzing the "China Shock" in the full sample period, that goes from

Figure 2. *Imports from China as % of GDP and % of workers in manufacture*



2004 to 2017[1]. We observe that both of our indexes (imports and export exposure) are highly correlated, to the extent that when not controlling for export exposure we find a positive effect of import competition in manufacture employment. After controlling in our regression for export exposure, we find both effects to be statistically non significant.

In order to improve the precission of our estimator, we then break down the shock into three five-year periods[2], and we find a statistically significant and negative effect of import competition on the change in the rate of employment in manufacture in the periods 2004-2008 and 2013-2017, although the effect we find in the former period is around 8 times higher than the one we find on the latter. The period 2008-2013, in which we find no statistically significant effect coincides with the global financial crisis and a big fall in imports from China in absolute terms, which probably introduces a lot of noise to our estimation using 2004-2017 variations. Additionally, we find a positive effect of export exposure in the 2004-2008 period.

We focus on the elasticities that we find in the 2004-2008 period, as we believe this is when most of the effects of the "China Shock" took place. To measure the total effect of this shock (considering that import exposure has a negative effect and export exposure has a positive one) we construct a weighted average of the estimated elasticities for each index, where the weight is proportional to the standard deviation of each index, in an attempt to capture the size of each shock. The result of such computation is a negative total effect of the "China Shock". Additionally, we perform a counter factual exercise to compute the change in manufacture employment of a province that goes simultaneously from being in the bottom 25 % of provinces ranked by import and export exposure to being in the top 25 % and find that such province would experience a decrease in the rate of employment in manufacture of -0.77 percentage points.

2 Conclusions

From the previous empirical exercise we have learned a few facts about the way import competition from China affected manufacture employment in Italy. In the first place, we noticed that there is a very high

[1] Although the "China Shock" is usually defined as starting in 2001, due to data availability we cannot go further to the past than 2004. However, this should not be a big concern, as we can see in Figure 1 that most of the growth in imports from China happened after 2004 and not in the period 2001-2003.

[2] Variables constructed using changes between 2004-2008 and 2013-2017 are adjusted proportionally to denote five year changes.

correlation between import exposure and export exposure to China, regardless of which index we use to measure them. This means that when talking about the effect of China in Italian local labor markets, we cannot only consider the increase in import competition, but we also have to take into account the increase in the demand of Italian products in China. Otherwise we would suffer from omitted variable bias.

The second important result of this study is that the effect of the "China Shock" in Italian rate of employment in manufacture has not been homogenous throughout the period 2004-2017. In fact, in our favored specification, most of the effect of the increase in import competition in manufacture employment happened before the 2008 crisis, during the 2004-2008 period (and possibly even before, although we do not have the data to test this claim). During the crisis we observed no statistically significant difference among provinces that were more or less exposed to China. On the other hand, in the 2013-2017 period we observed a negative, statistically significant effect of import competition, but just about one eighth in magnitude of the one we found for 2004-2008.

After computing a weighted average of the elasticities, where the weights are given by the standard deviation of our measures of imports and exports exposure to account for the different size of each shock, we find that the total effect of the "China Shock" (taking into account imports and exports) is negative in the period 2004-2008. We also perform a counter factual exercise by using the elasticities obtained from the regression in the 2004-2008 period to predict the change in manufacture employment in a province that moves from a tail of the distribution of both import and export exposure to the opposite tail. With this exercise we also find a negative effect, which means that the fall in manufacture employment due to higher import competition from China overshadows the increase due to rising demand for exports.

It is also worth noting that we only find a statistically significant effect when we use the index that takes into account input-output interactions among industries. This might suggest that a large portion of the effect of the "China Shock" comes from the indirect exposure, that is from the industries that supply other industries that are affected by the increase in import competition.

However, a caveat is in order when interpreting this results as the effect of the "China Shock" in the aggregate labor market. It has been documented that local responses in employment and wages can differ from the aggregate ones. This is because when estimating only regional elasticities, we could be omitting economic channels and shocks that are important at the aggregate level but not at the regional level (Beraja, Hurst, and Ospina, 2016). To find an adequate estimate of the aggregate effect of the "China Shock" in the Italian labor market, we should use a framework that utilizes both local and aggregate level data.

This provides an avenue for future research, which could consist on using a modified version of the model proposed by Beraja et al. (2016) to estimate an aggregate effect of the "China Shock" on labor markets. Other possible extensions of this work could include estimations with a more detailed classification of industries that allows us to identify different effects on industries that are mainly intermediate or final goods producers; measuring the effect of import and export exposure in different labor outcome variables; and finding differentiated effects on individuals of different characteristics, such as the effect on wages of workers with a college degree vs those without one.

References

Acemoglu, D., D. Autor, D. Dorn, G. Hanson, and B. Price (2016). Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics 34*(S1), 141–198.

Auer, R., K. Degen, and A. Fischer (2013). Low-wage import competition, inflationary pressure, and industry dynamics in europe. *European Economic Review, Elsevier 59*(C), 141–166.

Autor, D., D. Dorn, and G. Hanson (2013). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review 103*(6).

Balsvik, R., S. Jensen, and K. Salvanes (2015). Made in china, sold in norway: Local labor market effects of an import shock. *Journal of Public Economics 127*(C), 137–144.

Beraja, M., E. Hurst, and J. Ospina (2016, February). The aggregate implications of regional business cycles. Working Paper 21956, National Bureau of Economic Research.

Branstetter, L. and N. Lardy (2006). China's embrace of globalization. Technical report, National Bureau of Economic Research Working Paper 12373.

Chen, Y., G. Jin, and Y. Yue. (2010). Peer migration in china. Technical report, National Bureau of Economic Research Working Paper 15671.

Chiquiar, D., E. Covarrubias, and A. Salcedo (2017). Labor market consequences of trade openness and competition in foreign markets. Technical report, Banco de Mexico.

Colantone, I. and R. Crino (2014). New imported inputs, new domestic products. *Journal of International Economics 92*(1), 147–165.

Dauth, W. and J. Suedekum (2016). Globalization and local profiles of economic growth and industrial change. *Journal of Economic Geography 16*(5).

Federico, S. (2014). Industry dynamics and competition from low-wage countries: Evidence on italy. *Oxford Bulletin of Economics and Statistics 76*(3), 389–410.

Feenstra, R. (2010). *Offshoring in the Global Economy: Microeconomic Structure and Macroeconomic Implications.* MIT Press.

Feenstra, R. and A. Sasahara (2018). The china shock, exports and u.s. employment: A global input-output analysis. *Review of International Economics 26*(5), 1053–1083.

Helpman, E. and P. Krugman (1987). *Market Structure and Foreign Trade*. MIT Press.

Hsieh, C. and P. Klenow (2009). Misallocation and manufacturing tfp in china and india. *Quarterly Journal of Economics 124*(4), 1403–1448.

Iacovone, L., F. Rauch, and L. Winters (2013). Trade as an engine of creative destruction: Mexican experience with chinese competition. *Journal of International Economics 89*(2), 379–392.

Kemeny, T., D. Rigby, and A. Cooke (2015). Cheap imports and the loss of us manufacturing jobs. *The World Economy 38*(10), 1555–1573.

Krugman, P. (2008). Trade and wages, reconsidered. *Brookings Papers on Economic Activity* (1), 103–138.

Malgouyres, C. (2014). Chinese imports competition's impact on employment and the wage distribution: evidence from french local labor markets. Technical report, Economics Working Papers ECO2014/12, European University Institute.

Naughton, B. (2007). *The Chinese Economy: Transitions and Growth*. MIT Press.

The effect of China import competition in the Italian local labor markets

César Urquizo Ubillús

Rome Masters in Economics

Supervisor: Prof. Pietro Reichlin

June 27, 2019

Abstract

This document analyzes the effect of growing import competition from China in manufacture employment in the Italian local labor markets over the period 2004-2017. We analyze both the changes over the full period as well as the changes over 3 subperiods: 2004-2008, 2008-2013, and 2013-2017. In the sub period 2004-2008 we find that import competition had a negative effect on manufacture employment, whereas export exposure had a positive effect. When accounting for both effects, we find the total effect of the "China Shock" to be negative in 2004-2008. Additionally, we find a negative effect of import competition on manufacture employment in the sub period 2013-2017. When analyzing the full sample and the 2008-2013 sub period we find no statistically significant effects, which we attribute to the decline in Italian imports from China during the 2008 Global Financial Crisis.

1 Introduction

Since the decade of 1990, economists have debated the impact of trade on the labor market, noting the growing difference in wages of low-skilled workers relative to high skill workers (see Feenstra, 2010). In this line of research Krugman (2008), using a theoretical model, identifies low-wage countries as a possible source of disruption to high-wage labor markets. This opened the way for empirical studies that tried to identify the impact in high income countries' labor markets of liberalizing trade with low income countries.

One of the most important sources of exogenous variation in international trade in the recent years was the set of internal reforms in China, which turned it into a market economy; and its accession to the World Trade Organization (WTO) in 2001, which granted it a most-favored nation among its members (Branstetter and Lardy, 2006). The internal reforms in China involved the migration of over 150 million workers from rural to urban areas (Chen, Jin, and Yue., 2010); led Chinese industries to gain access to foreign technologies, capital goods, and intermediate inputs (Hsieh and Klenow, 2009); and led to multinational enterprises being allowed to operate inside the country (Naughton, 2007). As a result of this changes, China experienced a large productivity growth and a reduction in its trade costs starting in the early 2000s, which is what some authors refer to as the "China Shock".

Given that different regions within a country can be specialized in industries that are more or less affected by imports competition with China, the "China Shock" has been used by may authors to identify the effect of import competition in local labor markets. One of the most important works to tackle this question is Autor, Dorn, and Hanson (2013), which studies the effect of rising import competition from China in a series of outcomes in the United States local labor markets. Using a simple model of trade based on monopolistic competition (Helpman and Krugman, 1987), they establish a measure of how such shocks affect the labor market of US region i. Using this measure they estimate the effect of import competition in the United States Commuting Zones using an instrumental variable framework. They find a negative effect of exposure to China on manufacture employment, labor force participation, and wages in local labor markets that house import competing manufacturing industries.

Following a similar methodology to measure exposure to import competition and to exports from China, many authors have tried to further analyze the effects of the "China Shock" in the United States local labor markets. Acemoglu, Autor, Dorn, Hanson, and Price (2016) estimate that rising import competition was a major force behind both recent reductions in US manufacturing employment and weak overall US job growth, while Kemeny, Rigby, and Cooke (2015) find it increases the likelihood of job loss among manufacturing workers with less than a high school degree. Regarding the effect of exports, Feenstra and Sasahara (2018) find that the growth in U.S. exports led to increased demand for 2 million jobs in manufacturing.

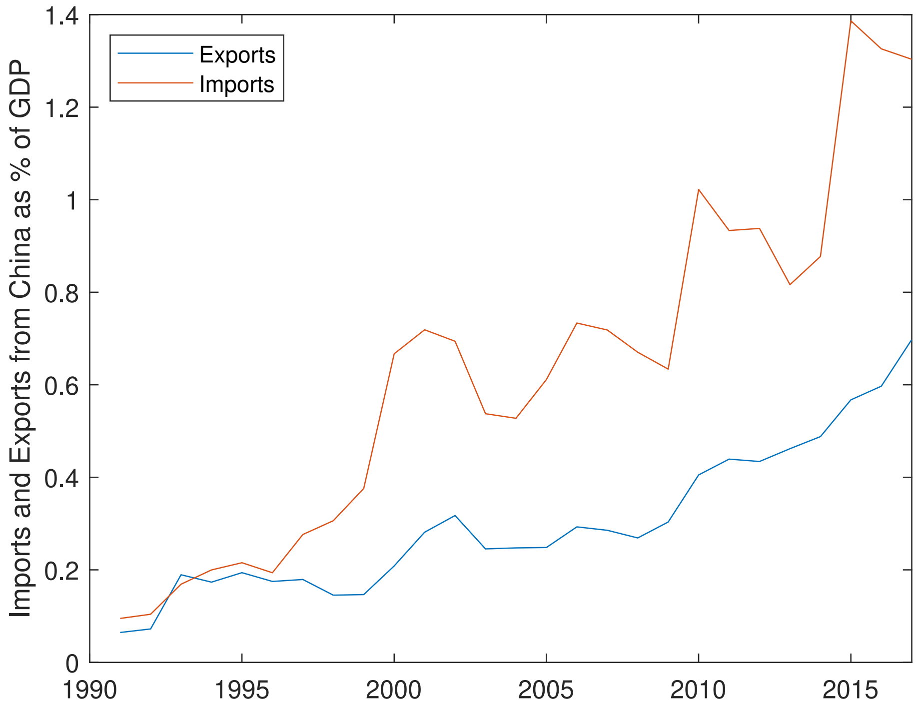
Similar studies have also been carried out for Europe. Auer, Degen, and Fischer (2013) study the impact on producer prices of labor-intensive exports from Asia and other global regions in Germany, France, Italy, Sweden, and the United Kingdom. They find that low wage country import competition is associated with strong price effects. Colantone and Crino (2014) find that new imported inputs have a strong positive effect on product creation in Europe, allowing countries to benefit from both wider and better sets of intermediate products. Dauth and Suedekum (2016), Malgouyres (2014), Balsvik, Jensen, and Salvanes (2015) perform country specific studies in Germany, France, and Norway, respectively; and find negative effects from import competition on manufacture employment. Federico (2014) analyzes the effect of competition from low-wage countries on domestic activity in Italy between 1995 and 2007, finding that low-wage import penetration is negatively related to employment and other measures of activity.

The "China Shock" has also been used to study the effect of trade in developing countries. Some noteworthy examples of such studies in Mexico include Chiquiar, Covarrubias, and Salcedo (2017), who find a negative effect of China imports on employment, and Iacovone, Rauch, and Winters (2013) who find that the shock causes selection and reallocation at both firm and product levels and has a highly heterogeneous impact at the intensive and extensive margins.

Italy was not exempt of the disruption in global trade caused by China's internal reforms and its accession to the WTO. This is evidenced by the rapid growth of imports from this country as well as the sustained growth in exports, which we report in Figure 1. We can see that Italian imports from China went from representing just around 0.1% of the Italian GDP in 1990 to representing close to 1.4 % in 2017 (a 14-fold increase). Although exports did not grow as fast as imports in the same time period, they still experienced a significant and sustained growth going from around 0.1 % of the GDP to around 0.7 % (a 7-fold increase).

Furthermore, in this same time period Italy experienced a sustained decline in the percentage of workers employed in manufacturing industries (see Figure 2). This raises the question of whether there is a causal mechanism linking the growing import competition from China and the observed decline in manufacture employment in this time period. Using provincial heterogeneity in the percentage of employment in each industry j, in this document we will test whether the evidence suggests there is a link between import exposure

Figure 1. *Imports and Exports from China as % of GDP*



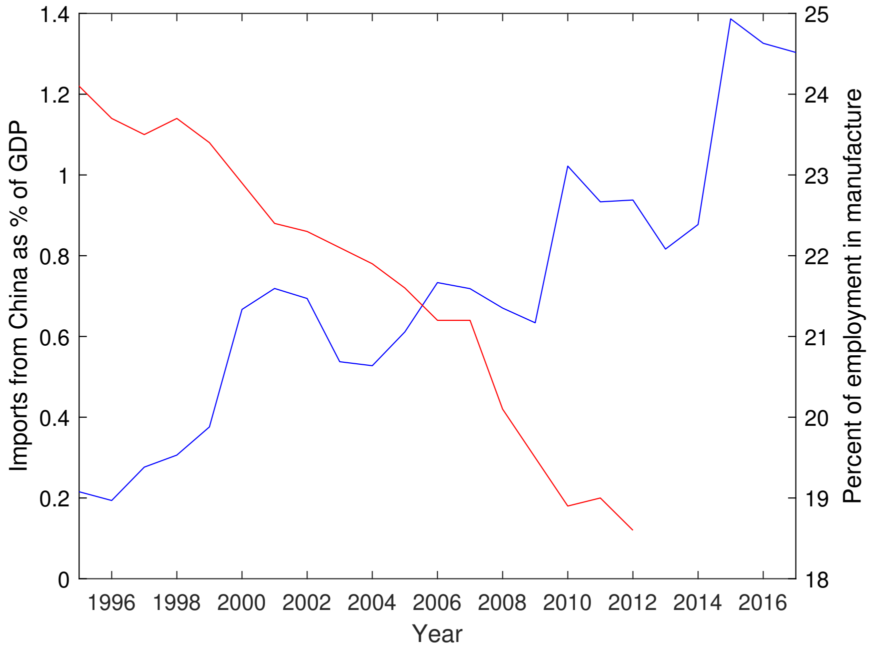
to China and manufacture employment at the provincial level.

To answer our main research question, we follow a similar methodology to Autor et al. (2013), using a slightly modified version of their index of import exposure that takes into account both direct change in imports from China as well as the indirect effect generated by input-output interactions. We also construct a similar index using exports to see which provinces are most affected by the increase in demand from China. To account for the possibility of endogeneity in our model, we instrument both import and export exposure to China. The former is instrumented using an index constructed with the changes in imports from other developed countries (to capture China's supply shock), and the latter with an index constructed using changes in exports from other developed countries (to capture China's demand shock).

To test the robustness of our results, we repeat all our empirical exercise using an index that only takes into account the direct effect of imports, but we find no statistically significant results. This leads us to believe that an important part of the effect of the "China Shock" in the Italian local labor markets comes from input-output interactions. For this reason, we favor the specification in which we measure total import and export exposure (using the modified index constructed with the input-output matrix).

We begin our empirical exercise by analyzing the "China Shock" in the full sample period, that goes from

Figure 2. *Imports from China as % of GDP and % of workers in manufacture*



2004 to 2017[1]. We observe that both of our indexes (imports and export exposure) are highly correlated, to the extent that when not controlling for export exposure we find a positive effect of import competition in manufacture employment. After controlling in our regression for export exposure, we find both effects to be statistically non significant.

In order to improve the precision of our estimator, we then break down the shock into three five-year periods[2], and we find a statistically significant and negative effect of import competition on the change in the rate of employment in manufacture in the periods 2004-2008 and 2013-2017, although the effect we find in the former period is around 8 times higher than the one we find on the latter. The period 2008-2013, in which we find no statistically significant effect coincides with the global financial crisis and a big fall in imports from China in absolute terms (see figure 7 in the Appendix), which probably introduces a lot of noise to our estimation using 2004-2017 variations. Additionally, we find a positive effect of export exposure in the 2004-2008 period.

We focus on the elasticities that we find in the 2004-2008 period, as we believe this is when most of the effects of the "China Shock" took place. To measure the total effect of this shock (considering that import exposure has a negative effect and export exposure has a positive one) we construct a weighted average of the

[1] Although the "China Shock" is usually defined as starting in 2001, due to data availability we cannot go further to the past than 2004. However, this should not be a big concern, as we can see in Figure 1 that most of the growth in imports from China happened after 2004 and not in the period 2001-2003.

[2] Variables constructed using changes between 2004-2008 and 2013-2017 are adjusted proportionally to denote five year changes.

estimated elasticities for each index, where the weight is proportional to the standard deviation of each index, in an attempt to capture the size of each shock. The result of such computation is a negative total effect of the "China Shock". Additionally, we perform a counter factual exercise to compute the change in manufacture employment of a province that goes simultaneously from being in the bottom 25 % of provinces ranked by import and export exposure to being in the top 25 % and find that such province would experience a decrease in the rate of employment in manufacture of -0.77 percentage points.

The remaining of this document are divided as follows. In Section 2 we explain in detail how we construct our measure of import and export exposure and the identification strategy of our model to estimate an effect of import competition on manufacture employment. Section 3 contains the data sources, descriptive statistics of our main variables, and the explanation of how we built the final data set used to run the regressions presented in Section 2. Section 4 presents the discussion of the main results of our favored specification. Finally, in Section 5 we present the conclusions of our analysis and provide recommendations for future research.

2 Methodology

2.1 Measuring direct effects

In order to measure the effect of import competition in the local labor markets, it is necessary to start by defining a measure of how exposed is a province to rising competition from Chinese imports. This measure also needs to be as exogenous as possible with respect to the shock whose effect we are trying to identify. In their seminal work, Autor et al. (2013) measure exposure to China as the change in Chinese imports of each industry, with imports apportioned to the region according to its share of national industry employment. This is then divided by the number of workers in each province to have an indicator that is not influenced by province size:

$$\Delta IPW_{it} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta M_{jt}}{L_{i0}} \tag{1}$$

where L_{it} is the start of period t employment in region i, and ΔM_{jt} is the observed change in Italian imports from China in industry j between the start and end of the period. To make sure this measure is exogenous, and not affected by changes in the industry composition of provincial economies due to the "China Shock", we use the provincial share of employment of each industry at the national level from the earliest year that we have data. In this case, this would be 2004, denoted as period 0.

Differences in ΔIPW_{it} across local labor markets come from changes in local industry employment structure at the start of period 0, which in our case will be 2004. We use the earliest observation available for this variables in order to reduce endogeneity concerns, as local industry composition could be modified in response to rising import competition. The heterogeneity the distribution of employment in industries across regions before the "China shock" means that some local labor markets will be more exposed to increases in imports than others.

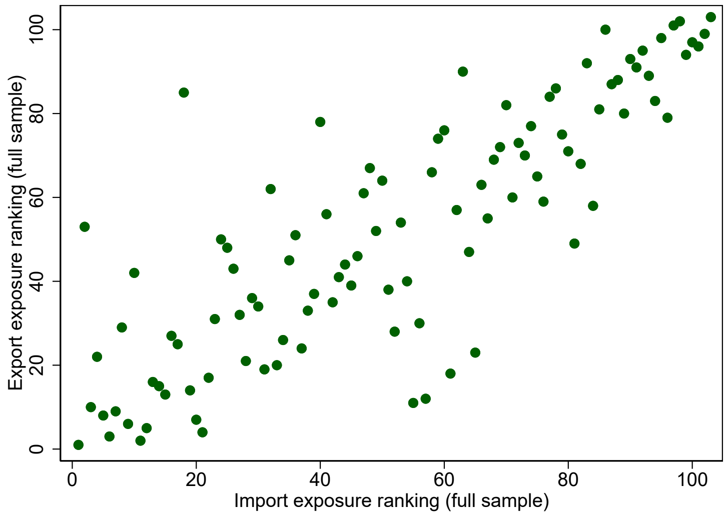
However, it is important to consider that China's accession to the World Trade Organization not only increased import competition for local labor markets, but also meant that Italian firms had access to a new market in which to sell their products. In other words, the "China Shock" does not only affect local employment throuhg imports, but also through the increase demand of exports. In order to see whether this could threaten our strategy to identify the effect of import competition, it is necessary to construct a similar index to measure exposure to changes in export demand.

Then, in a similar fashion to what we did for imports we construct the following index

$$\Delta EPW_{it} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta X_{jt}}{L_{i0}} \tag{2}$$

Figure 3 shows the relation between the indexes IPW and EPW. From this figure we can see that provinces that are more exposed to import competition are also the most benefited by the increase in export demand. In fact, the correlation between these two indexes is approximately 0.8. This threatens the identification of the model as import effects can be confounded with exports, which is why it is necessary to control for export exposure when looking for the effect of import competition, to avoid possible omitted variable bias.

Figure 3. *Import vs Export exposure over the full sample 2004-2017*

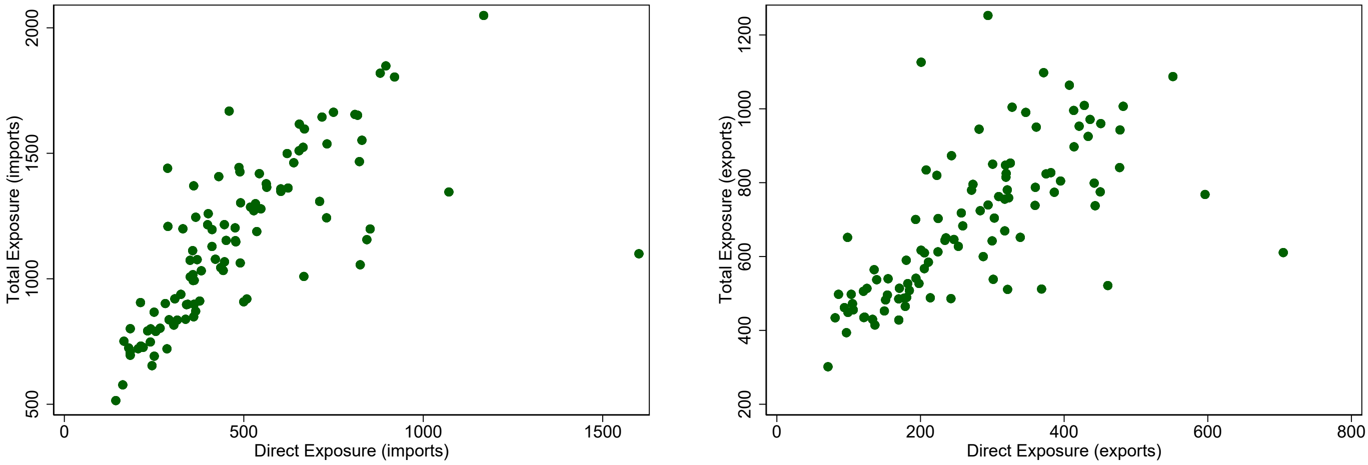


2.2 Measuring Total Effects

It is important to consider that provinces that produce goods that serve as inputs to industries affected by imports could be indirectly affected by China trade shocks. If this indirect effect is big, then the indexes defined in Equations 1 and 2 would not be an adequate measure of the total effect in the local labor markets.

To account for this interactions between industries, we construct a new index, using an input-output model, in which total output of goods in each industry, contained in the vector Y, is given by

Figure 4. *Total vs Direct Import and Export exposure (full sample)*



$$Y = AY + C + I + G + X - M$$

Where A is a matrix whose a_{ij} coefficient denotes the value of good j used in the production of good i, as a fraction of total production of good i. C is consumption, I is investment, G is government expenditure, X is exports, and M is imports. In other words, C, I, G, X, M are the components of the final demand.

Given this model, the total effect of a change in imports (ΔM) and exports (ΔX) on production will be

$$\Delta Y^M = (I - A)^{-1} \Delta M \quad \text{and} \quad \Delta Y^X = (I - A)^{-1} \Delta X \tag{3}$$

And then we can construct the new index, that takes into account input-output interactions as

$$\Delta IPW^*_{it} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta Y^M_{jt}}{L_{i0}} \quad \text{and} \quad \Delta EPW^*_{it} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta Y^X_{jt}}{L_{i0}} \tag{4}$$

We call IPW^*_{it} and EPW^*_{it} the total import and export exposure of province i at time t, respectively. Figure 4 shows the relation between IPW_{it} and IPW^*_{it}, and EPW_{it} and EPW^*_{it}. The former pair have a correlation of 0.72, while the latter have a correlation of 0.67.

2.3 Estimation

Different composition of local labor markets will allow us to identify the total effect of import competition in local labor indicators by running the following regression in a cross section of provinces

$$\Delta L_{it} = \gamma_t + \beta_1 \Delta IPW^*_{it} + \beta_2 \Delta EPW^*_{it} + X'_{it}\beta_2 + \varepsilon_{it} \tag{5}$$

Where ΔL_{it} is the percentage change in manufacture employment in province i, period t, γ_t is a period fixed effect, X_{it} is a vector of beginning of period t controls for each region i, and ε_{it} is the error term.

However, it is worth noting that Italian employment, imports, and exports could be positively correlated with shocks to Italian product demand. To account for this we will instrument both imports and exports with the contemporaneous composition and growth of Chinese imports and exports, respectively, in eight other developing countries measured with the variables IPW^*_{oit} and EPW^*_{oit}:

$$\Delta IPW^*_{oit} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta Y^M_{ojt}}{L_{i0}} \quad \text{and} \quad \Delta EPW^*_{oit} = \sum_j \frac{L_{ij0}}{L_{j0}} \frac{\Delta Y^X_{ojt}}{L_{i0}} \tag{6}$$

where Y^M_{ojt} and Y^X_{ojt} are defined as in Equation 3, but constructed using tha change in imports and exports to and from China in 8 other developed economies [3]. The identification assumption of the model is that the common within-industry component of rising Chinese imports to Italy and other high-income countries stems from China's rising comparative advantage/falling trade costs in these sectors, whereas that of export stems from China's rising demand.

[3] Following Autor et al. (2013), we use imports and exports of Australia, Denmark, Germany, Finland, Japan, New Zealand, Spain and Switzerland

3 Data

3.1 Data Sources

The data for the empirical exercise described in Section 2 is obtained from four different sources. First, the data of employment at the province level, as well as the province characteristics used as controls is obtained from ISTAT Labor force survey (2019). This is a yearly survey that contains information at the individual level and is designed to be representative at the province level. Among the data of employment included, there is a variable clasifying the industry of each worker following ATECO 2007 2-digit classification. This survey is available since 1993, however the industry classification variable only appears in 2004 and onwards, which is why we must begin our analysis in this period.

The second data source is Coeweb - Statistiche del commercio estero (2019) from which we obtain data of imports and exports by industry, following ATECO 2007 3-digit classification. This data set contains information on imports and exports by industry of each of the Italian provinces, starting in 1991.

The third data source is UN Comtrade Data Base (2019), which contains bilateral trade data from all the countries in the United Nations, from 1962 onwards. In this data set industries are classified following the six-digit Harmonized System (HS6). Following Autor et al. (2013) we obtained from this data set the imports and exports from and to China of Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland that are used to construct the instruments described in Equation 6.

The final data source, from which the Input-Output matrix for Italy is obtained is ISTAT (2019). This input-output matrix uses ATECO 2007 2-digit classification for industries, and we use it to construct the total change in imports and exports defined in Equation 3.

Industry classification across data sets is homogenized to follow Ateco 2007 2-digit format, using the guidelines provided by ISTAT. To construct the independent variables IPW^*_{it} and EPW^*_{it}, we first obtained the change in imports and exports by industry in the 2004-2017 period, and then calculated the variables L_{ij0}, L_{i0}, and L_{j0} with the ISTAT Labor force survey (2019) of 2004. Then, we obtained ΔY^X_{jt} and ΔY^M_{jt} using the ISTAT (2019) input-output matrix and constructed the indexes following Equation 4. We then constructed the instruments IPW^*_{oit}, and EPW^*_{oit} following a similar procedure, but with the data of imports from the chosen developed countries, using the formulas of Equations 4 and 6.

To construct our dependent variable, we use ISTAT Labor force survey (2019) to obtain the number of workers in manufacture at the beginning and end of the period (2004 and 2007). Then, we calculate the difference and divide it by the beginning of period working age population, obtaining the change in manufacture employment. Also using ISTAT Labor force survey (2019), we constructed the variables Rate of employment in manufacture, by dividing the beginning of period employment in manufacture by the working age population; Percentage of College educated by dividing the number of people with college education by the population of each province; and percentage of women employed, by dividing the number of women that work by the female working age population of each province. All the rate and percentage variables are multiplied by 100 to avoid working with too many decimals. We then merged the dependent variable, independent variables, instruments, and control variables into a single file to obtain a cross section data set with 103 provinces.

We also constructed a second data set by defining our dependent variable, independent variables, and instruments over 3 sub periods: 2004-2008, 2008-2013, and 2013-2017. To build our dependent variables and instruments, we fixed the population and share of the region in each national industry employment to 2004, as we want this share to be independent from the shock, and defined ΔY_{jt}^{X} and ΔY_{jt}^{M} as differences between the beginning and end of each sub period. The dependent variable, independent variables, and instruments were adjusted proportionally in 2004-2008 and 2013-2017 to denote 5-year changes. The control variables which were constructed using the data for 2004 in the cross section are constructed using beginning of period data in each of the periods (that is 2004 for 2004-2008, 2008 for 2008-2013, and 2013 for 2013-2017). The result was a panel data set with 103, observations in the first and third sub periods and 101 in the second.

3.2 Descriptive Statistics

Table 1 shows the percentiles as well as the mean and standard deviation of total import and export exposure (IPW_{it}^{*} and EPW_{it}^{*}) in the full sample. This table shows that not only IPW_{it}^{*} has a higher mean than EPW_{it}^{*}, but also a greater variance. This shows that not only the import shock was bigger in magnitude than the export one, but also that the former affected regions in a more heterogeneous way than the latter. These differences between our dependent variables will be important when interpreting the elasticities we obtain by running the regression in Equation 5.

When analyzing the measure of import exposure by macro region, we find that the Northeast is the most exposed, followed by the Northwest, Center, South and the Islands. When analyzing export exposure, the same is true, except that the Islands macro region ranks above the South. To illustrate which provinces are the most and least affected by the import and export shocks, in Table 8 in the Appendix we show a list of the top and bottom 5 provinces ranked by import and export exposure.

The descriptive statistics of direct import and export exposure (IPW_{it} and EPW_{it}) are presented in Table 6 of the Appendix. Also in the Appendix we show the descriptive statistics of our dependent variable (Δ% Employment in Manufacture) and variables used as controls (Table 6).

Table 1. *Total Import and Export exposure in the full sample 2004-2017 (euros per worker)*

Percentiles	Import Exposure	Export Exposure
1 %	577.30	393.90
5 %	706.70	434.12
10 %	732.11	455.59
25 %	897.03	510.99
50 %	1128.80	651.94
75 %	1364.72	825.01
90 %	1596.92	971.20
95 %	1663.60	1009.12
99 %	1848.27	1126.24
Mean	1143.78	688.87
Std. Dev	319.80	200.06

To see the industries which mostly drive the import and export exposure indexes, we also built industry rankings based on the change in imports and exports during the analyzed period. The top ten industries of these rankings are presented in Table 7 of the Appendix.

4 Results

4.1 Full Sample (2004-2017)

Table 2 contains the results of estimating the coefficients of Equation 5 over the full sample with Ordinary Least Squares (OLS), whereas Table 3 shows the results of estimating the equation by Two-stage Least Squares (2SLS)[4]. We can see that instrumenting import and export exposure leads to a reduction in the coefficient of import exposure in specifications (2) and (3).

If we focus on the 2SLS results, we can see that when we do not control in the regression for export exposure, import exposure has a positive coefficient, which is due to the fact that provinces that import the most are also the ones that export the most. This correlation makes it so that the import exposure effect is confused with that of export exposure when we do not control for the latter variable. This is fixed in specification (3), as we can see that in Table 3 the coefficient goes from being positive to negative.

The results from this regression also indicate that provinces with higher rates of employment in manufacture are the ones with a lower (or negative) growth rate in manufacture employment, even when controlling for import and export exposure, which seems to point to a general tendency for the rate of employment in manufacture to converge among provinces.

However, in the third specification, in which we control for export exposure, both the coefficients for IPW_{it}^{*} and EPW_{it}^{*} are not statistically significant. Despite the coefficients being relatively large in absolute value, the high standard errors make it difficult to detect a statistically significant effect. We also ran the same regressions using the indexes of direct exposure to imports and exports IPW_{it} and EPW_{it}, but found no statistically significant effects. This results are reported in Tables 11 and 12 in the Appendix

4.2 Decomposing the shock by periods

In order to test whether it would be possible to increase the precision of our 2SLS estimator we subdivided our 2004-2017 sample into three sub periods, and once again constructed the indexes of total import and export exposure for each region.

Figure 5 shows a plot of the ranking of each province in import exposure over the full sample in the vertical axis, while the horizontal axis is the ranking in import exposure over each of the 5 year periods [5].

[4] It is worth mentioning that both instruments IPW_{oit}^{*} and EPW_{oit}^{*} pass the weak instrument tests.

[5] The change over 2004-2008 and 2013-2017 are proportionally adjusted to measure exposure over a 5 year period.

Table 2. *Change in manufacture employment over the full sample 2004-2017 (OLS)*

VARIABLES	(1) Δ% M.E.	(2) Δ% M.E.	(3) Δ% M.E.
Total Exposure (imports)	3.653***	3.632***	0.686
	(1.389)	(1.377)	(2.258)
Total Exposure (exports)			5.852
			(3.572)
Rate of Employment in Manufacture		-6,181***	-6,651***
		(1,036)	(1,066)
Percentage of College educated		-48.82	-77.64
		(196.3)	(195.4)
Percentage of women employed		275.6**	259.9**
		(121.5)	(120.8)
Constant	-624.3	-468.6	-46.65
	(1,649)	(5,129)	(5,092)
Observations	103	103	103
R-squared	0.064	0.366	0.383

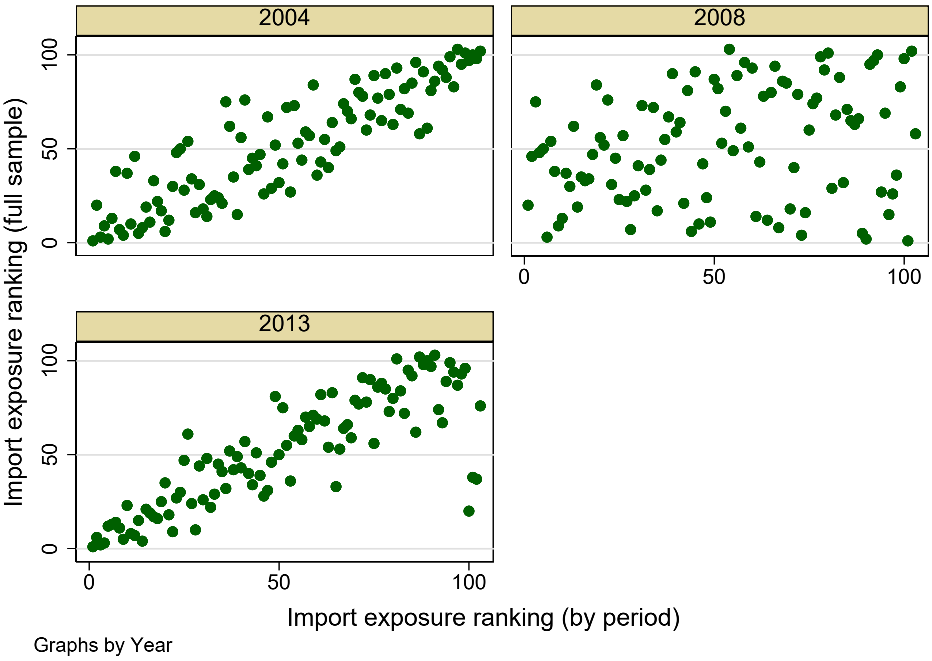
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. *Change in manufacture employment over the full sample 2004-2017 (2SLS)*

VARIABLES	(1) Δ% M.E.	(2) Δ% M.E.	(3) Δ% M.E.
Total Exposure (imports)	3.095*	4.933***	-1.773
	(1.637)	(1.692)	(5.044)
Total Exposure (exports)			10.94
			(9.074)
Rate of Employment in Manufacture		-6,413***	-7,079***
		(1,031)	(1,224)
Percentage of College educated		-23.61	-100.7
		(193.4)	(197.6)
Percentage of women employed		226.1*	242.4**
		(125.2)	(121.9)
Constant	13.58	-1,593	229.9
	(1,923)	(5,103)	(5,096)
Observations	103	103	103
R-squared	0.063	0.360	0.370

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 5. *Ranking of Import exposure - Full Sample vs 5-year period*



We can see that in the 2004-2008 and 2013-2017 periods the rankings are very correlated. However, in the 2008-2013 period there would seem to be a lot of noise.

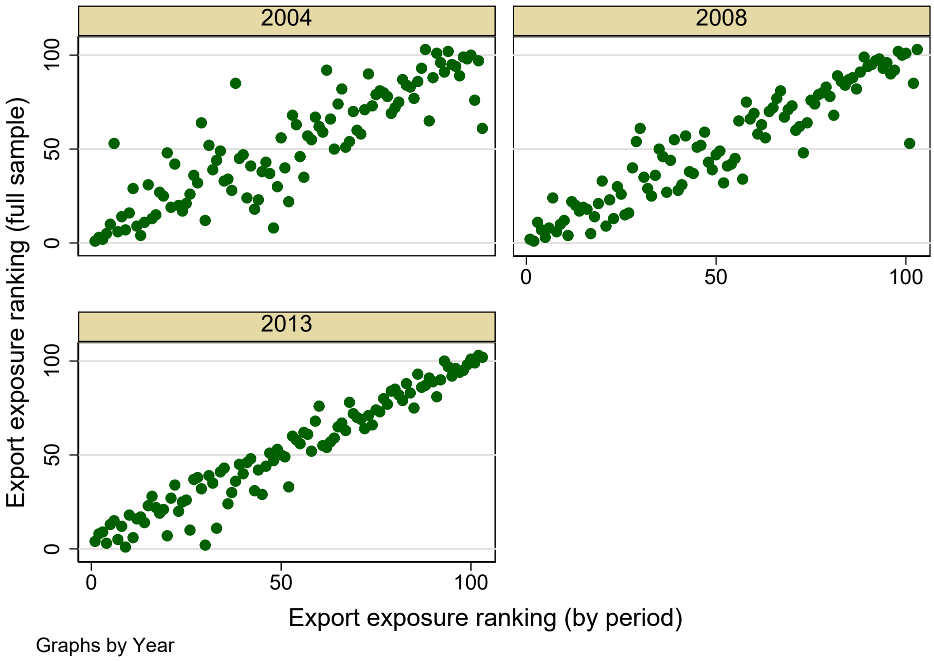
During this time, due to the global financial crisis there was a big decline in Italian imports from China (see Table 7, in the Appendix), which introduces a lot of noise into our analysis when we study the full period 2004-2017. In Figure 6 we can see a similar graph but for the ranking of export exposure over the full sample vs. 5-year periods. Unlike imports from China, Italy's exports to China did not experience a decline during the global financial crisis (see Table 7, in the Appendix), which is why the noise present for imports is not present when we do the same analysis for exports.

The evidence in Figures 5 and 6 would seem to suggest that analyzing the "China Shock" by sub periods might be a good way to get rid of some of the noise in our analysis for the whole period, and improve the precision of our 2SLS estimator.

Table 4 show the results of estimation Equation 5, but dividing the sample into three sub periods: 2004-2008, 2008-2013, and 2013-2017 [6]. We also estimate a regression using the full sample as a panel with 3 five year periods, including two year dummies [7]. We can see in Table 4 that in the period 2004-2008 there is a statistically significant effect of both imports and exports on the percentage change in manufacture

[6] Variables calculated over 2004-2008 and 2013-2017 are adjusted proportionally to represent 5-year variation.
[7] As in the previous exercise, both instruments IPW^{*}_{oit} and EPW^{*}_{oit} pass the weak instrument tests.

Figure 6. *Ranking of Export exposure - Full Sample vs 5-year period*



employment. In fact, an increase in import exposure of 1 euro per worker reduces manufacture employment by 0.0826 percentage points, whereas an increase in export exposure of 1 euro per worker increases manufacture employment by 0.17 percentage points.

When we look at the period of 2008-2013, during the global financial crisis we find more evidence that there is a lot of noise during this period. In fact the standard errors from both the coefficients for import and export exposure are considerably higher than in the other two periods. In this part of the sample we find no statistically significant effect of either imports nor exports.

In the period 2013-2017, we see again a negative effect of import exposure over the change in manufacture employment, although it is of a smaller magnitude than that of the 2004-2008 period (around one eighth). The effect of exports is also smaller, and in fact it becomes statistically insignificant in this period. This would seem to indicate that even when removing the noise from 2008-2013 most of the effect from the greater imports from China on manufacture employment rate took place in the initial sub period, before the 2008 crisis.

The final column of Table 4 shows the results of the 3-period panel data estimation. As in the estimation with the full sample, the coefficients for import and export exposure are not statistically significant, probably due to the noise introduced by the 2008-2013 sub period. The results of this same regressions estimated with

Table 4. *5 year Change in manufacture employment (2SLS)*

VARIABLES	(2004-2008) Δ% M.E.	(2008-2013) Δ% M.E.	(2013-2017) Δ% M.E.	(Panel) Δ% M.E.
Total Exposure (imports)	-0.0826**	0.815	-0.0112**	0.216
	(0.0342)	(1.185)	(0.00453)	(0.339)
Total Exposure (exports)	0.179**	7.038	0.0212	-0.247
	(0.0848)	(7.536)	(0.0445)	(0.738)
Rate of Employment in Manufacture	-103.7***	-6,908***	-0.0921	-112.5***
	(29.42)	(1,603)	(0.417)	(38.48)
Percentage of College educated	-3.700	-38.34	1.686	40.88
	(4.555)	(202.6)	(1.240)	(95.43)
Percentage of women employed	-7.189	347.3*	0.0727	211.5***
	(4.976)	(207.8)	(1.158)	(71.83)
Period 1 Dummy				-3,409***
				(349.2)
Period 3 Dummy				-2,295***
				(303.8)
Constant	232.5*	217.2	-43.44*	-603.1
	(126.1)	(6,481)	(23.96)	(2,925)
Observations	103	101	103	307
R-squared	0.249	0.426	0.145	0.333

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

OLS are shown in Table 10 in the Appendix. We also ran the same regressions using the indexes of direct exposure to imports and exports IPW_{it} and EPW_{it}, but found no statistically significant effects. This results are reported in Tables 13 and 14 in the Appendix

Since we only find a statistically significant effect of import and export exposure in the 2004-2008 period, we will focus on it when discussing the total effect of the "China Shock" in local labor markets. Although the coefficient for export exposure for this period is bigger than that of import exposure, this does not mean that the effect of the former is larger than that of the latter. In fact, this elasticities means that the response to a similar sized shock of exports would be higher than that that of imports. However in our sample, as discussed in Subsection 3.2, import shocks have been larger than export shocks (see Table 9 in the Appendix for the descriptive statistics of IPW^*_{it} and EPW^*_{it} in the 2004-2008 sub period). Then, in order to see which has a larger effect it is necessary to weight this elasticities by the standard deviation of each of the shocks. When weighing the elasticities by the standard deviation of each shock (and then dividing by the sum of the standard deviations) we find that the total effect of the exposure to China in the 2004-2008 period is -0.008, which means that in average the total effect of being more exposed to China (considering both imports and exports) is negative.

An alternative way to find a total effect of China exposure, which has a more straightforward interpretation, is by performing a counter factual exercise in which we see what happens when a province goes from being among the least exposed to China imports and exports to being among the most exposed to both. The results of such exercise are shown in Table 5[8]. As with the average weighted by the standard deviations, we get that the total effect from the "China Shock" on manufacture employment is negative.

Table 5. *Effect of moving from one percentile to another of import or export exposure on manufacture employment (in percentage points)*

	Imports	**Exports**	**Total**
Bottom 10% to Top 10%	-43.58	34.35	-9.22
Bottom 25% to Top 25%	-18.21	17.44	-0.77

[8] The values of the percentiles of Import and Export Exposure used for this exercise are presented in Table 9, in the Appendix.

5 Conclusions

From the previous empirical exercise we have learned a few facts about the way import competition from China affected manufacture employment in Italy. In the first place, we noticed that there is a very high correlation between import exposure and export exposure to China, regardless of which index we use to measure them. This means that when talking about the effect of China in Italian local labor markets, we cannot only consider the increase in import competition, but we also have to take into account the increase in the demand of Italian products in China. Otherwise we would suffer from omitted variable bias.

The second important result of this study is that the effect of the "China Shock" in Italian rate of employment in manufacture has not been homogenous throughout the period 2004-2017. In fact, in our favored specification, most of the effect of the increase in import competition in manufacture employment happened before the 2008 crisis, during the 2004-2008 period (and possibly even before, although we do not have the data to test this claim). During the crisis we observed no statistically significant difference among provinces that were more or less exposed to China. On the other hand, in the 2013-2017 period we observed a negative, statistically significant effect of import competition, but just about one eighth in magnitude of the one we found for 2004-2008.

After computing a weighted average of the elasticities, where the weights are given by the standard deviation of our measures of imports and exports exposure to account for the different size of each shock, we find that the total effect of the "China Shock" (taking into account imports and exports) is negative in the period 2004-2008. We also perform a counter factual exercise by using the elasticities obtained from the regression in the 2004-2008 period to predict the change in manufacture employment in a province that moves from a tail of the distribution of both import and export exposure to the opposite tail. With this exercise we also find a negative effect, which means that the fall in manufacture employment due to higher import competition from China overshadows the increase due to rising demand for exports.

It is also worth noting that we only find a statistically significant effect when we use the index that takes into account input-output interactions among industries. This might suggest that a large portion of the effect of the "China Shock" comes from the indirect exposure, that is from the industries that supply other industries that are affected by the increase in import competition.

However, a caveat is in order when interpreting this results as the effect of the "China Shock" in the aggregate labor market. It has been documented that local responses in employment and wages can differ from the aggregate ones. This is because when estimating only regional elasticities, we could be omitting economic channels and shocks that are important at the aggregate level but not at the regional level (Beraja, Hurst, and Ospina, 2016). To find an adequate estimate of the aggregate effect of the "China Shock" in the Italian labor market, we should use a framework that utilizes both local and aggregate level data.

This provides an avenue for future research, which could consist on using a modified version of the model proposed by Beraja et al. (2016) to estimate an aggregate effect of the "China Shock" on labor markets. Other possible extensions of this work could include estimations with a more detailed classification of industries that allows us to identify different effects on industries that are mainly intermediate or final goods producers; measuring the effect of import and export exposure in different labor outcome variables; and finding differentiated effects on individuals of different characteristics, such as the effect on wages of workers with a college degree vs those without one.

References

Acemoglu, D., D. Autor, D. Dorn, G. Hanson, and B. Price (2016). Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics 34*(S1), 141–198.

Auer, R., K. Degen, and A. Fischer (2013). Low-wage import competition, inflationary pressure, and industry dynamics in europe. *European Economic Review, Elsevier 59*(C), 141–166.

Autor, D., D. Dorn, and G. Hanson (2013). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review 103*(6).

Balsvik, R., S. Jensen, and K. Salvanes (2015). Made in china, sold in norway: Local labor market effects of an import shock. *Journal of Public Economics 127*(C), 137–144.

Beraja, M., E. Hurst, and J. Ospina (2016, February). The aggregate implications of regional business cycles. Working Paper 21956, National Bureau of Economic Research.

Branstetter, L. and N. Lardy (2006). China's embrace of globalization. Technical report, National Bureau of Economic Research Working Paper 12373.

Chen, Y., G. Jin, and Y. Yue. (2010). Peer migration in china. Technical report, National Bureau of Economic Research Working Paper 15671.

Chiquiar, D., E. Covarrubias, and A. Salcedo (2017). Labor market consequences of trade openness and competition in foreign markets. Technical report, Banco de Mexico.

Coeweb - Statistiche del commercio estero (2019). Italian National Institute of Statistics (ISTAT).

Colantone, I. and R. Crino (2014). New imported inputs, new domestic products. *Journal of International Economics 92*(1), 147–165.

Dauth, W. and J. Suedekum (2016). Globalization and local profiles of economic growth and industrial change. *Journal of Economic Geography 16*(5).

Federico, S. (2014). Industry dynamics and competition from low-wage countries: Evidence on italy. *Oxford Bulletin of Economics and Statistics 76*(3), 389–410.

Feenstra, R. (2010). *Offshoring in the Global Economy: Microeconomic Structure and Macroeconomic Implications.* MIT Press.

Feenstra, R. and A. Sasahara (2018). The china shock, exports and u.s. employment: A global input-output analysis. *Review of International Economics 26*(5), 1053–1083.

Helpman, E. and P. Krugman (1987). *Market Structure and Foreign Trade*. MIT Press.

Hsieh, C. and P. Klenow (2009). Misallocation and manufacturing tfp in china and india. *Quarterly Journal of Economics 124*(4), 1403–1448.

Iacovone, L., F. Rauch, and L. Winters (2013). Trade as an engine of creative destruction: Mexican experience with chinese competition. *Journal of International Economics 89*(2), 379–392.

ISTAT (2019). Italian National Institute of Statistics (ISTAT).

ISTAT Labor force survey (2019). Italian National Institute of Statistics (ISTAT).

Kemeny, T., D. Rigby, and A. Cooke (2015). Cheap imports and the loss of us manufacturing jobs. *The World Economy 38*(10), 1555–1573.

Krugman, P. (2008). Trade and wages, reconsidered. *Brookings Papers on Economic Activity* (1), 103–138.

Malgouyres, C. (2014). Chinese imports competition's impact on employment and the wage distribution: evidence from french local labor markets. Technical report, Economics Working Papers ECO2014/12, European University Institute.

Naughton, B. (2007). *The Chinese Economy: Transitions and Growth*. MIT Press.

UN Comtrade Data Base (2019). United Nations, Department of Economic and Social Affairs, Statistics Division.

Appendix

Figure 7. *Imports and Exports from China (in millions of euros)*

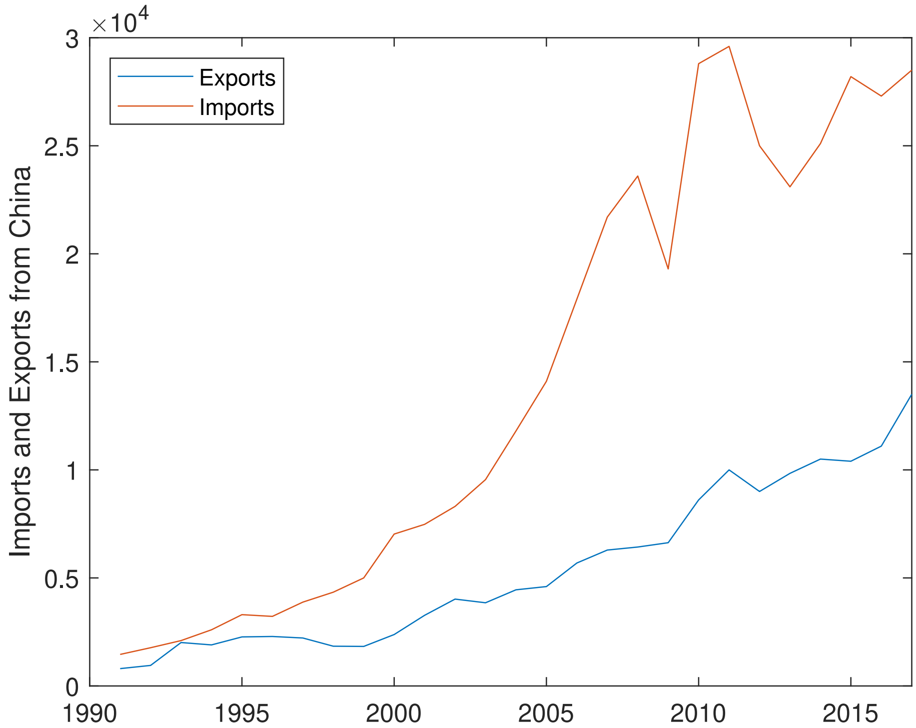


Table 6. *Descriptive statistics of main variables*

Variable	Mean	Standard Deviation
Δ% **Employment in Manufacture (2004 - 2017)**	0.1155	0.0643
Δ% **Employment in Manufacture (2004 - 2008)**	-0.04197	0.2993
Δ% **Employment in Manufacture (2008 - 2013)**	0.10991	0.0621
Δ% **Employment in Manufacture (2013 - 2017)**	0.37478	0.0164
Rate of Employment in Manufacture (2004)	12.17	6.48
Percentage of Women employed (2004)	15.46	3.70
Percentage with college education (2004)	21.95	2.40
Percentage of Women employed (2008)	15.77	3.78
Percentage with college education (2008)	22.00	2.07
Percentage of Women employed (2013)	15.34	3.68
Percentage with college education (2013)	23.35	2.15
IPW_{it} (2004 - 2017)	479.70	242.84
EPW_{it} (2004 - 2017)	272.74	125.96
IPW_{it} (2004 - 2008)	449.03	207.83
EPW_{it} (2004 - 2008)	54.67	32.72
IPW^*_{it} (2004 - 2008)	303.32	332.83
EPW^*_{it} (2004 - 2008)	198.94	133.45
IPW_{it} (2008 - 2013)	-117.97	88.48
EPW_{it} (2008 - 2013)	104.64	49.67
IPW^*_{it} (2008 - 2013)	335.01	296.58
EPW^*_{it} (2008 - 2013)	195.25	87.16
IPW_{it} (2013 - 2017)	185.80	107.41
EPW_{it} (2013 - 2017)	141.78	69.05
IPW^*_{it} (2013 - 2017)	371.38	344.33
EPW^*_{it} (2013 - 2017)	171.95	40.47

Table 7. *Ranking of industries according to import and export exposure*

Ranking	Industries most affected by change in exports
1	Beverage Industry
2	Activities of cinematographic, video, television programs, and music recording productions
3	Confection of clothing and leather articles
4	Fabrication of motor vehicles and trailers
5	Fabrication of furniture
6	Creative, artistic and entertainment activities
7	Fabrication of base pharmaceutical products and pharmaceutical preparations
8	Silviculture and use of forest areas
9	Agricultural cultivation and production of animal products, hunting, and connected services
10	Fabrication of rubber articles and plastic materials

Ranking	Industries most affected by change in exports
1	Other professional, scientific, and technical activities
2	Printing and reproduction of registered supports
3	Fabrication of motor vehicles and trailers
4	Goods declared as ship's stores, returned and rejected domestic goods, various goods
5	Activities of residual management and recycling
6	Other services for people activities
7	Fabrication of paper and paper products
8	Fishing
9	Fabrication of rubber articles and plastic materials
10	Fabrication of base pharmaceutical products and pharmaceutical preparations

Table 8. *Top and Bottom 5 provinces by exposure to imports and exports*

	Imports	Exports
Top 5	Taranto	Cagliari
	Frosinone	Livorno
	Modena	Lecco
	Reggio nell'Emilia	Treviso
	Lecco	Brescia
Bottom 5	Palermo	Catanzaro
	Enna	Savona
	Napoli	Grosseto
	Catanzaro	Cosenza
	Viterbo	Viterbo

Table 9. *Total Import and Export exposure 2004-2008 (euros per worker)*

Percentiles	Import Exposure	Export Exposure
1 %	-374.93	73.75
5 %	-36.52	95.24
10 %	24.83	110.32
25 %	164.11	127.13
50 %	264.21	174.13
75 %	384.52	224.56
90 %	552.37	302.25
95 %	792.65	357.87
99 %	1077.89	669.77

Table 10. *5 year Change in manufacture employment (OLS)*

	(2004-2008)	(2008-2013)	(2013-2017)	(Panel)
VARIABLES	Δ% M.E.	Δ% M.E.	Δ% M.E.	Δ% M.E.
Total Exposure (imports)	-0.0313	2.829**	-0.00795	1.188**
	(0.0325)	(1.363)	(0.00645)	(0.468)
Total Exposure (exports)	0.0545	2.461	0.0444	-1.727
	(0.112)	(4.548)	(0.0540)	(1.824)
Rate of Employment in Manufacture	-94.40***	-6,761***	-0.122	-117.1**
	(25.11)	(1,182)	(0.482)	(46.71)
Percentage of College educated	-7.946	-71.02	1.908*	22.16
	(5.111)	(187.7)	(1.006)	(74.13)
Percentage of women employed	-2.222	488.3***	-0.461	229.5***
	(2.917)	(102.1)	(0.845)	(46.22)
Period 1 Dummy				-3,716***
				(415.7)
Period 3 Dummy				-2,373***
				(655.0)
Constant	265.4**	-466.8	-35.81	-435.6
	(127.8)	(4,504)	(21.68)	(1,792)
Observations	103	101	103	307
R-squared	0.143	0.397	0.074	0.347

Standard errors in parentheses

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

Table 11. *Change in manufacture employment over the full sample 2004-2017 (OLS)*

VARIABLES	(1) Δ% M.E.	(2) Δ% M.E.	(3) Δ% M.E.
Direct Exposure (imports)	3.936**	2.084	-0.516
	(1.849)	(1.719)	(2.597)
Direct Exposure (exports)			7.138
			(5.360)
Rate of Employment in Manufacture		-5,589***	-5,799***
		(1,035)	(1,043)
Percentage of College educated		-87.28	-91.11
		(201.5)	(200.7)
Percentage of women employed		366.6***	308.6**
		(119.1)	(126.4)
Constant	1,666*	1,765	2,142
	(993.9)	(5,179)	(5,166)
Observations	103	103	103
R-squared	0.043	0.331	0.343

Standard errors in parentheses

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

Table 12. *Change in manufacture employment over the full sample 2004-2017 (2SLS)*

	(1)	(2)	(3)
VARIABLES	Δ% M.E.	Δ% M.E.	Δ% M.E.
Direct Exposure (imports)	6.243***	3.828**	-0.0756
	(2.069)	(1.934)	(5.457)
Direct Exposure (exports)			10.45
			(12.94)
Rate of Employment in Manufacture		-5,637***	-5,941***
		(1,015)	(1,073)
Percentage of College educated		-60.60	-67.71
		(198.1)	(197.0)
Percentage of women employed		327.2***	244.6
		(118.8)	(151.9)
Constant	559.1	1,008	1,603
	(1,089)	(5,095)	(5,127)
Observations	103	103	103
R-squared	0.028	0.324	0.334

Standard errors in parentheses

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

Table 13. *5 year Change in manufacture employment (OLS)*

	(2004-2008)	(2008-2013)	(2013-2017)	(Panel)
VARIABLES	Δ% M.E.	Δ% M.E.	Δ% M.E.	Δ% M.E.
Direct Exposure (imports)	0.130*	-0.257	0.0286	-0.311
	(0.0676)	(4.481)	(0.0255)	(0.706)
Direct Exposure (exports)	-0.553*	13.16	-0.0453	6.419
	(0.308)	(8.127)	(0.0562)	(3.988)
Rate of Employment in Manufacture	-101.9***	-7,068***	-0.116	-154.7***
	(30.13)	(1,906)	(0.670)	(53.81)
Percentage of College educated	-7.835	34.14	1.752	47.39
	(5.444)	(253.6)	(1.117)	(102.6)
Percentage of women employed	-1.712	397.4***	-0.187	187.2***
	(3.409)	(131.4)	(0.922)	(63.52)
Period 1 Dummy				-2,984***
				(549.6)
Period 3 Dummy				-2,055***
				(351.2)
Constant	226.7	-1,188	-30.63	-962.9
	(157.9)	(6,794)	(25.10)	(3,030)
Observations	103	101	103	307
R-squared	0.165	0.379	0.052	0.339

Robust standard errors in parentheses

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

Table 14. *5 year Change in manufacture employment (2SLS)*

	(2004-2008)	(2008-2013)	(2013-2017)	(Panel)
VARIABLES	Δ% M.E.	Δ% M.E.	Δ% M.E.	Δ% M.E.
Direct Exposure (imports)	0.143	31.49	0.0853	2.184*
	(0.0935)	(28.11)	(0.162)	(1.198)
Direct Exposure (exports)	-0.845	4.881	-0.124	-12.11
	(0.661)	(16.11)	(0.212)	(7.811)
Rate of Employment in Manufacture	-101.3***	-4,186	-0.0954	-42.70
	(29.51)	(3,116)	(3.701)	(59.84)
Percentage of College educated	-8.456	87.41	1.733	48.90
	(5.593)	(290.2)	(1.704)	(107.4)
Percentage of women employed	-1.212	468.5**	-0.115	235.6***
	(3.340)	(184.1)	(0.952)	(77.05)
Period 1 Dummy				-5,316***
				(1,080)
Period 3 Dummy				-3,373***
				(631.1)
Constant	241.4	-284.1	-30.92	431.0
	(158.4)	(7,542)	(26.27)	(2,830)
Observations	103	101	103	307
R-squared	0.160	0.034	0.003	0.287

Robust standard errors in parentheses

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