The China Syndrome: revisited

The Effects of the Import Competition on United States Local Labor Markets in the extended timeline

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Abstract

This thesis analyzes the effects of the Chinese import competition on the US local labor market from 1991 to 2018, and aims to capture the trend shifts in trade and employment rates post-2009.While international trade's benefits are widely acknowledged, the debate persists regarding its effects on local employment and income inequality. The paper examines the relationship between increased Chinese imports and local manufacturing employment, analyzing data through descriptive, statistical, and instrumental variable methodologies. Descriptive analyses indicate a slowdown in import and employment growth post-2009. Statistical inference via OLS models reveals a persistent albeit slightly moderated negative correlation between import exposure and manufacturing employment. However, instrumental variable (IV) analysis challenges the reliability of earlier causal inferences, indicating a diminished suitability of the instrument for the updated time frame.

The China Syndrome: revisited

I. Introduction

International trade's impact on local employment and income inequality remains a contentious topic in economic discourse. This thesis analyzes the effects of the Chinese import competition on the US local labor market from 1991 to 2018, and aims to capture the trend shifts in trade and employment rates post-2009.

Despite the commonly accepted benefits of international trade on the economy overall, there remains a debate on the effects of trade on local employment and income inequality. According to Krugman (2008), there is a possibility of a negative outcome outlined in the trade theory: low-income imports affect the labor market of high-income countries, as low-cost imports put a downward pressure on demand for domestic outputs, resulting in decrease in wages and employment.

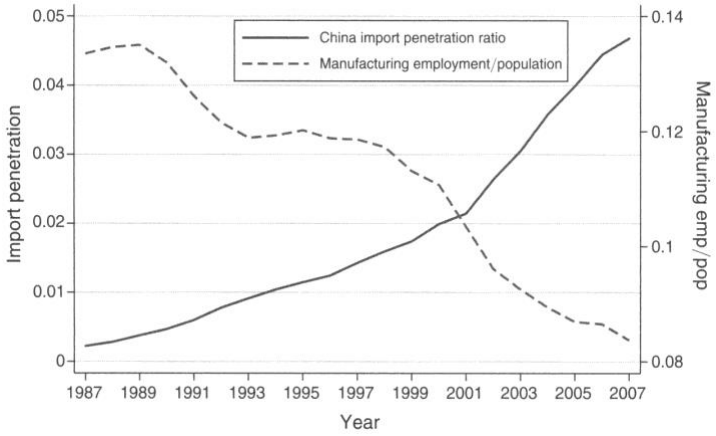

Figure 1: Autor et al. (2013). Import Penetration Ratio for US Imports China (left), and Share of US-working population employed in Manufacturing (right)

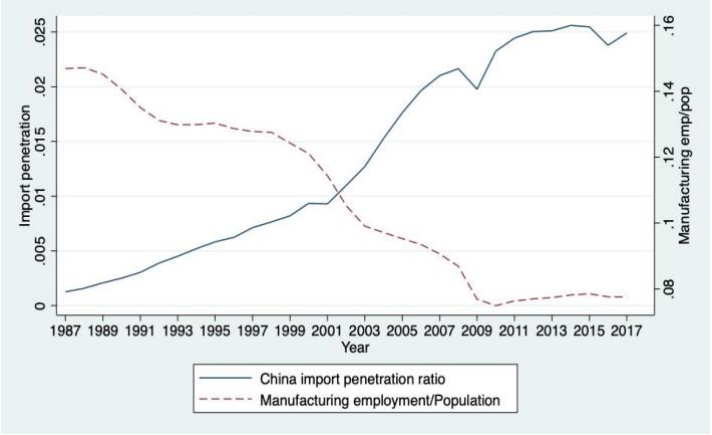

Figure 2: Import Penetration Ratio for US Imports China (left), and Share of US-working population employed in Manufacturing (right)

According to Autor et al. (2013), the impact of trade on US employment was limited throughout the history of US trade, low-income countries' imports were minimal, making disruptions relatively insignificant until China's rapid economic growth. Imports from low-income countries increased from 9% in 1991 to 28% in 2007, with China accounting for almost 90% of this increase, accompanied by a one-third reduction in manufacturing. (Autor et al., 2013).

The share of total US spending on Chinese goods rose from 0.3 percent in 1991 to almost 2.5 percent in 2016 (Figure 2), with an inflection point in 2001 where China joined WTO. During the same period, the ratio of manufacturing employment over the working age population fell by a half, from 16% in 1991 to 8% in 2016 (Figure 2). It is important to note that the employment level in the manufacturing industry has been stable at around 8% after 2009.

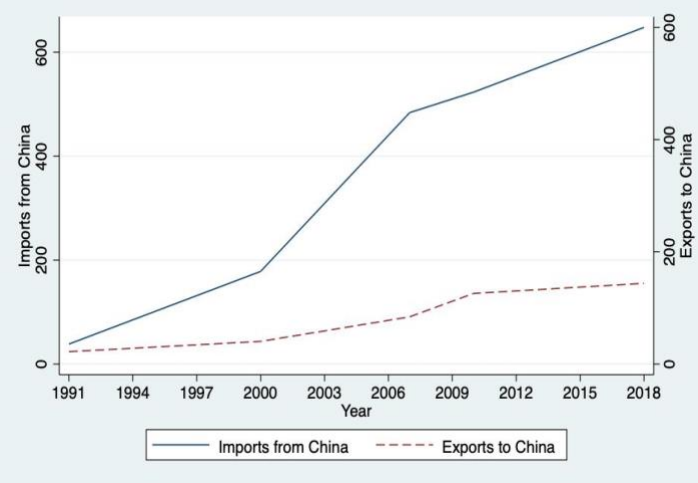

Figure 3: Value of Trade with China for the US (in billions 2022 US$)

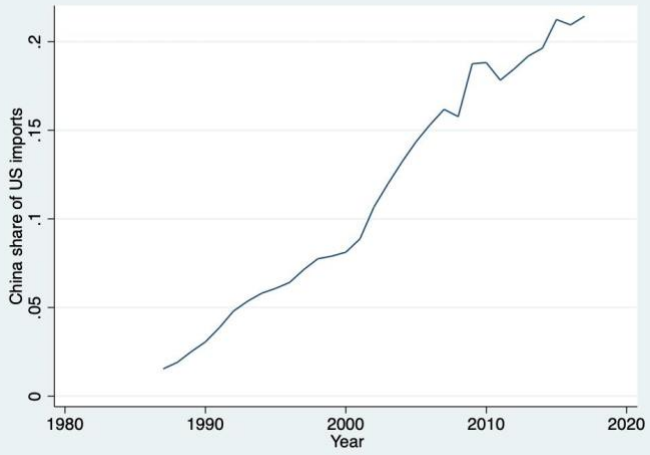

Figure 4: Share of imports from China of total US imports

According to Autor et al. (2013), the expansion of China's exports is being driven by the Chinese economy's transition to a market-oriented economy, which has resulted in "rural-to-urban migration of over 150 million employees." Furthermore, this transition is accompanied by expanded access to technology, intermediary goods, and the establishment (permission to operate)

of multiple multinational enterprises (Autor et al. 2013). These major internal policy adjustments, along with external shifts - China's WTO accession - are the major determinants of export growth.

The effect of China's export expansion can be observed in Figures 3 and 4, where the values of imports from China increased from 38 billion USD in 1991 to 647 billion USD in 2018. The graph visualizes the trends of growth, suggesting that after 2009 there has been a much slower rate of growth compared to the previous period. Additionally, the share of Chinese imports in total US imports rose exponentially and continuously over the same period, from 4% in 1991 to 21% in 2018.

Autor, Dorn, and Hanson (2013) examined this effect of change in imports from China on the local labor market in the manufacturing industries by comparing the areas more and less exposed to import realizations over the years of 1990 and 2007. The authors' major findings were that local markets exposed to increased Chinese imports faced lower labor force participation and wage reductions.

Research Question:

The main question that is being addressed in this thesis is how do the changes in Chinese import competition impact the US labor market? Specifically, it aims to determine if the earlier findings, which highlighted that regions exposed to heightened Chinese imports experienced decreased labor force participation and wage reductions, persist within an extended timeframe up to 2018.The main reason for the extension is that both trade and employment rates have leveled off after 2009, implying that the impact established by Autor et al, (2013) may no longer be present after the time frame has been extended

My main results can be summarized as follows. According to the descriptive analysis of the Import Penetration Ratio and Manufacturing Employment in the United States (Figure 2), the

trend for both ratios remains the same - increase for import penetration and decrease for manufacturing employment - with manufacturing employment leveling off after 2009 (Figures 1 & 2). During the same time period, the growth rate in Chinese imports and exports has slowed down substantially (Figure 3), implying that the new results can be less prominent than the original results. However, the Chinese share of all US imports has been rising (Figure 4), indicating that, while overall US imports are leveling off, the relative share of Chinese imports in the US remains high. As a result, US markets continue to observe an increased import competition from China in the domestic market.

Following the initial consideration gained from the descriptive analysis, the statistical inference of OLS model reveals that an increase in worker import exposure on CZ is associated with a statistically significant decrease in manufacturing employment in that CZ, even in the extended time frame, suggesting that the local economies face employment hardships even when the growth rate of imports decrease. These findings support the findings of Autor et al. (2013); however, the effects are slightly less pronounced in the extended time frame, which is consistent with the notion that observed deceleration of trends observed in Figures 1 and 2, impact the overall results.

However, the findings of the IV method reveals a significant divergence from the initial causal inferences established in Autor et al. (2013). A more in-depth analysis suggests that while the instrumental variable was strong in the timeframe of Autor et al. (2013), its reliability diminishes significantly when applied to the newer period. This observation questions the reliability and suitability of the instrumental variable for the updated time frame.

To motivate the empirical findings, Section II will review Autor et al.'s (2013) research and related literature, followed by a brief overview of trade data in Section III. Methodology,

including OLS regressions and variable constructions, will be detailed in Section IV. Section V will analyze the results of these regression models. Sections VI and VII will focus on the 2SLS model and its findings. The Discussion in Section VIII will interpret these results, exploring their implications. The Conclusion will summarize the study's key insights.

II. Literature Review

The thesis mainly focuses on the research done by Autor, Dorn and Hanson (2013). The paper establishes that local labor markets exposed to rising low-income-country imports as a result of China's rising competitiveness face more unemployment, lower labor-force participation, increased usage of disability and other transfer benefits, and lower wages.

According to Autor et al. (2013), because trade shocks occur in general equilibrium, empirical mapping of several “industry-specific shocks into a small number of aggregate outcomes” is required, thus they exploit the regional economies as units of analysis. More specifically, the use of Commuting Zones.

The use of CZs as a local labor market is justified by the fact that these zones differ in their exposure to import changes as a result of regional heterogeneity in the manufacturing industry. Variation in exposure is observed since manufacturing industries face varied degrees of import competition. There is a distinction, for example, that is attributable to the local market's reliance on labor-intensive industries, where China has a significant comparative advantage. By 2007, China accounted for more than 40% of US imports in four-digit SIC industries that were more labor intensive.

Notably, Liang (2021) in his study adds to the trade and labor discourse by offering fresh insights into how exports influence employment in U.S. manufacturing sectors. The research yields

estimates indicating that U.S. exports to several emerging markets led to the creation of over 1.6 million manufacturing jobs from 1991 to 2007. Remarkably, this figure aligns closely with the estimated job losses attributed to import competition from China, highlighting a nuanced balance between job creation through U.S. exports and job displacement due to import competition.

Aligned with the prior studies of Autor et al (2013), Dix-Carneiro and Kovak (2017) explore the post-trade liberalization labor market dynamics in Brazil's regions, drawing on 25 years of administrative employment data. The research uncovers substantial and escalating impacts of trade liberalization on regional formal earnings and employment. Contrary to expectations of labor adjustment equalizing wages across regions, the effects of liberalization persistently grew for over a decade before stabilizing, unaffected by post-liberalization economic shifts and robust across varied models.

These extended effects don't solely stem from economic shifts post-liberalization. After eliminating potential mechanisms, the study finds evidence supporting imperfect interregional labor mobility and dynamic labor demand due to sluggish capital adjustment and agglomeration economies.

These findings challenge prior assumptions about trade liberalization's labor market impacts. While short-term effects vary across regions, traditional thinking assumed these effects would diminish over time. Yet, this research highlights the contrary: short-term impacts notably underestimate long-term repercussions, indicating persistent uneven consequences even two decades after policy initiation.

III. Data Sources

The datasets used in this research will be based on those used in the original research (Autor et al., 2013). The information on international imports into the United States on a six-digit

Harmonized System product level will be acquired from the UN Comtrade Database for the years 1991-2018. These six-digit HS data will be converted into the four-digit SIC industries, using the combination of 1) crosswalk for 10-digit HS products to four-digit SIC industries (Pierce and Schott, 2009) and 2) six-digit HS Comrade data on imports for the United States to four-digit SIC industries outlined in Autor et al. (2013).

The CZs (more specifically local industry employment data) will be derived using US Census data collected at the county and industry level between 1991 and 2016. The mapping of county-level data to commuting zones will be accomplished following the aggregation methodology outlined in the original research.

Similar to the Autor et al. (2013), the observational units are the regional economies of the United States, which comprise the Commuting Zones (CZs), which are exposed to varying trade shocks in a specific industry specialization. The commuting zone analysis would adhere to the roadmap established by Autor et al. (2013) in order to preserve consistency throughout time and make the comparisons feasible. 722 CZs from across the United States were included (both metropolitan and rural areas)

Data from County Business Patterns (CBP) were extracted on a decadal basis to measure CZs' potential exposure to import competition - 1980, 1990, 2000, 2010, and 2016 (replacing the 2020 data). The CBP data contains employment, firm size, and payroll information segmented by county and industry. As the CBP data is disclosed at the six-digit NAICS codes or at the disaggregate level, the data needs to be aggregated up to four-digit SIC industry level. The procedure is 5 steps of classification up to 2-digit, then to 3-digit to 4-digit level industries combined with conversion from NAICS to SIC codes using the Census “Bridge” file.

Year	Imports From China	Exports to China
1991	38.56	22.14
2000	178.31	40.44
2007	483.89	84.17
2010	523.25	125.89
2018	647.89	143.87
2020	525.99	143.8
Growth 1991-2007	**1155%**	**280%**
Growth 2007-2018	**34%**	**71%**
Growth 1991-2018	**1580%**	**550%**

2019-2020* Excluding from the analysis to avoid the impact of Covid-19

Table 1: Value of Trade with China (in billions 2022 USD)

This section will provide a summary of the data constructs. The US import data categorized by 6-digit HS product level is gathered from 1991 to 2018. The first column of Table 1 summarizes the annual value of US imports from China in 1991, 2000, and 2007 (the original time frame used by Autor et al. (2013)) and 2010, 2018 (extended time frame) valued in US dollars in 2022 using the Personal Consumption Expenditure deflator. As was highlighted in the original research, the volume of imports in the initial time frame rose substantially, experiencing a growth rate of 1,155% (Table 1), from 38.56 billion US$ to 483.89 billion US$. However, the amount of imports increased at a significantly slower rate in the following years, with just a 34% growth in import values from 2007 to 2018. The leveling off of the imports might yield a different result than the Autor et al. (2013) observed in their research. The volume of exports to China was significantly lower compared to imports throughout the entire period, signifying that the drastic growth of US-China trade is largely driven by increase of imports from China.

IV. Methodology

According to the original paper's underlying theoretical reasoning, China's productivity growth, along with the reduction of trade barriers for China, resulted in an increase in the country's exports. As a result, commuting zones now face increased competition from China in the US market, resulting in lower demand for local output, which prompts wages to decline. It should be emphasized that the authors have assumed that no migration between CZs occurs in the short run. In other words, focusing on the direct effect of increased Chinese imports on the employment situation in a commuting zone.

$$\Delta L_{it}^{m} = \beta_1 * \Delta IPW_{uit} + X_{it}\beta_2 + e_{it} \quad (1)$$

$$\Delta L_{it}^{m} = \gamma_t + \beta_1 * \Delta IPW_{uit} + X_{it}\beta_2 + e_{it} \quad (2)$$

Where, ΔL_{it}^{m} – is decade change in manufacturing *(m)* employment share of working-age population in a CZ *i*,

ΔIPW_{uit} –the change in import exposure in the US (*u*), (see below)

γ_t - time dummy for each decade,

X_{it} –is the control vector for CZs.

The main coefficient of interest is β_1, which is interpreted in the following way: an exogenous decadal increase of $1,000 in import exposure of the CZ per worker will predict a percentage point change (decline if $\beta_1 < 0$) in manufacturing employment per working age population.

The change in import exposure to import competition is measured empirically, following the roadmap set by Autor et al. (2013):

$$\Delta IPW_{uit} = \sum_{j} \frac{L_{ijt}}{L_{ujt}} \frac{\Delta M_{ucjt}}{L_{it}}$$

Where, L_{it} is the initial employment in the year *t* in CZ *i*

L_{ijt} is the initial employment in the year *t* in CZ *i* in industry *j*

L_{ujt} - is the initial employment in the year *t* in industry *j*

ΔM_{ucjt} is the change in the US (*u*) imports from China (*c*) in industry *j*, during the period *t*

Construction of the variable: The decadal import changes of the industry j in CZ i are scaled by total CZ i labor force (L_{it}**)** and weighted by the share of CZ i in the employment in industry j ($\frac{L_{ijt}}{L_{ujt}}$).

V. Results - OLS

The results in the columns estimate the equations (1) and (2), respectively, for the period of 1991 to 2018. The coefficient for the first model is -0.255, statistically significant at 1% level, which indicates that a 1,000$ exogenous decadal increase in CZ's import exposure per worker would be associated with 0.255 percentage points decrease in manufacturing employment. The coefficient in the second regression model (2) with decadal dummy variables is not statistically different from zero, but the sign of the results might suggest an inverse relation.

Comparing the results from the initial model (equation 1) to the findings in Autor et al.'s (2013) research within the original time frame, there is similarity in both magnitude and direction. Specifically, the OLS coefficient in the original study stood at -0.273 (significant at the 1% level), indicating a 0.273 percentage point decline in manufacturing employment with a $1,000 increase

in import exposure. However, within the extended timeframe (1991 to 2018), the coefficient slightly diminishes to -0.255. This slight reduction in magnitude supports the hypothesis of a slightly moderated effect of import competition on manufacturing employment over the extended period.

Table 2: OLS Results

VARIABLES	(1) OLS regression
US Import Exposure Change	-0.255***
	(0.0127)
Constant	-1.561***
	(0.155)
Observations	2,887
R-squared	0.124

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

A focused analysis on the years 2010 to 2018, utilizing the same regression model (1), further isolates the effects of import exposure on manufacturing employment. Table 3 shows a coefficient of -0.165, significant at the 1% level. This finding underscores the persistent impact of import exposure within the updated timeline, indicating a 0.165 percentage point decrease in manufacturing employment for every $1,000 increase in import exposure. Notably, this effect demonstrates a weakening trend (-0.165 in the extended timeline versus -0.255 in the full timeline), suggesting the potential influence of external factors during the 2008-2018 period, contributing to this observed change.

Table 3: OLS Results only in 2010-2018

VARIABLES	(1) OLS regression
US Import Exposure Change	-0.165***
	(0.0189)
Constant	-4.636***
	(0.321)
Observations	1,443
R-squared	0.050

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

It is crucial to acknowledge that while Ordinary Least Squares (OLS) estimation provides valuable insights, it may fall short in establishing causality, as evident in Autor et al.'s (2013) utilization of the 2SLS model to infer causality. In their study, the results from a 2SLS regression, instrumenting the imports from China to other high-income countries, yielded a coefficient of -0.596. This discrepancy suggests potential biases in the OLS model indicating a potentially larger true effect.

VI. The Instrumental Variable

OLS might not be sufficient enough to establish a causal effect because of the endogeneity concerns, as the CZ employment might be correlated with US industry demand shocks.

Endogeneity concerns pose a challenge for OLS in determining causal effects, especially when CZ employment could be correlated with US industry demand shocks. Notably, the OLS regression might underestimate the impact of increased imports from China on US manufacturing employment, as highlighted in Autor et al. (2013). This correlation between increased imports and industry demand shocks underscores the need for alternative methodologies to disentangle these

effects. To address this, the authors introduced an instrumental variable, where ΔIPW_{uit} is being instrumentalized by ΔIPW_{oit}.

The instrumental variable that is being used is the empirically measured exposure to the changes of Chinese imports (on industry level) in eight high-income countries other than the US, which were outlined by Autor et al. (2013) as Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland.

$$\Delta IPW_{oit} = \sum_{j} \frac{L_{ijt-1}}{L_{ujt-1}} \frac{\Delta M_{ocjt}}{L_{it-1}}$$

Where, L_{it} is the initial employment in the year *t-1* in region *i*

ΔM_{ocjt} is the change in other high-income markets (*o*) imports from China (*c*) in industry *j*, during the period *t-1* (To eliminate simultaneity bias, the employment level data are from a decade earlier; the bias stems from the fact that an anticipation of China trade may have an effect on employment change).

The major caveat of the use of this instrument is to ensure that the Chinese export booms are supply sided (within China), rather than demand driven - demand shocks for the imports from China within the high-income countries.

VII. Results - IV

The primary coefficient in the 2SLS regression model, which instruments the imports from China to other high-income countries, stands at 0.262, indicating significance at a 10% level (Table 4). This outcome contrasts with expectations, notably diverging from the coefficient of -0.596 reported in Autor et al. (2013) where it held significance at the 1% level. This divergence not only suggests a weakening trend in the effects originally identified but also a surprising shift in the direction of these effects.

Table 4: IV results in the full time frame 1991-2018

VARIABLES	(1) IV regression
US Import Exposure Change	0.262*
	(0.123)
Constant	-1.912*
	(0.754)
Observations	2,887
F-statistic	5.76806

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

Upon closer examination of the regression results, it is apparent that F-Statistic for the 2SLS model stands at 5.76806, suggesting that the instrument is no longer relevant.

Further scrutiny of the 2SLS Model involved running the regression on two distinct datasets corresponding to different timeframes: 1991-2010 and 2010-2018, mirroring the approach taken in the analysis of the OLS Regression Model. The analysis revealed a striking contrast in the F-statistics between the two timelines: 49.6791 for the 1991-2010 period, primarily aligning with the original study's timeline, and 2.06312 for the new timeframe. These findings suggest that while the instrumental variable—imports from China to other high-income countries—demonstrates strength within the original time frame used in Autor et al. (2013), its validity diminishes notably in the newer timeframe.

Therefore, based on these observations, an essential assumption emerges: within the timeframe utilized in Autor et al. (2013), the instrumental variable—imports from China to other high-income countries—holds substantial strength. However, its applicability and strength wane considerably when applied to the newer timeframe, prompting questions regarding its reliability and suitability for the updated period.

VIII. Discussion

The major theoretical significance that this thesis yields comes from the 2SLS IV regression model which implies that the instrument that was used in the original model is no longer a valid instrument and the use of the model in the extended timeline might result in the biased estimates, undermining its ability to establish robust causal relationships between import exposure and manufacturing employment. In this context, the weakened instrument suggests that the presumed exogeneity of the variable may not hold true, leading to potential biases in estimating the impact of the independent variable on the outcome.

A shift in the validity of the instrument across different time frames raises questions about the generalizability and external validity of the study's findings. If the instrument is no longer valid in a newer timeframe, it brings into question the applicability of the findings to current or future scenarios. This limitation may restrict the broader implications and generalizability of the research, emphasizing the importance of understanding temporal dynamics and their impact on the validity of instruments used.

Economic Significance

Given the limitations encountered with the instrumental variable (IV) results and their inability to substantiate the economic significance due to concerns over validity, the subsequent focus shifts to the Ordinary Least Squares (OLS) results. While the IV findings pose challenges in assessing economic implications, turning attention to the OLS outcomes provides an avenue to delve deeper into understanding the practical and economic relevance of the results.

The economic significance of these results can be demonstrated by comparing the estimated trade-induced decrease in manufacturing employment from 1991 to 2018 with the observed (actual) decline. These comparisons presume that increased exposure to Chinese imports

affects the absolute level of manufacturing employment rather than only the relative level of CZs employment across the US (Autor et al. 2013). Considering the magnitude of US imports from and to China, where the US has a substantial trade deficit and China has a trade surplus, the idea of Chinese import competition having an absolute effect on US manufacturing employment seems reasonable.

From the descriptive statistics of the dataset, Chinese import exposure rose by on average $1,140 per worker during 1990-2000 on a country level and by additional $1,976 in 2000-2010 and by additional $3,907 between 2010-2016. Using the estimates above, the increase in import exposure is associated with a decrease in US manufacturing employment by 0.2907 in the first decade of the sample, 0.5038 and 0.99 in the second and third decade, respectively. In comparison, the US manufacturing employment per population fell by almost 2 percentage points between 1991-2000, and 4.6 percentage points between 2000-2010, and experienced almost 1 percentage point decrease between 2010-2016, due to leveling off of US manufacturing employment per population at around 8%.

Based on the dataset's descriptive statistics, Chinese import exposure increased by an average of $1,140 per worker between 1990 and 2000, an additional $1,976 between 2000 and 2010, and an additional $3,907 between 2010 and 2016. Using the estimates above, an increase in import exposure is associated with a 0.2907 percentage point decrease in US manufacturing employment during the first decade of the sample, a 0.5038 percentage point decrease during the second decade, and a 0.99 percentage point decrease during the third decade. In comparison, US manufacturing employment per population fell by almost 2 percentage points between 1991 and 2000, 4.6 percentage points between 2000 and 2010, and about 1 percentage point between 2010 and 2016, owing to a leveling off of US manufacturing employment per population at roughly 8%.

IX. Conclusion

In conclusion, this extended analysis on the impact of Chinese import competition on the US labor market builds upon the seminal work of Autor, Dorn, and Hanson (2013). The investigation, spanning 1991 to 2018, reveals nuanced dynamics in the relationship between import exposure and manufacturing employment.

While the descriptive analysis portrays a slowdown in the growth of both imports and employment rates post-2009, the statistical inference from OLS models suggests a persistent, albeit slightly moderated, negative association between import exposure and manufacturing employment in local markets (CZs). Notably, the effects observed in the extended timeframe are less pronounced than those identified in the original study, aligning with the deceleration trends witnessed in import penetration and manufacturing employment ratios.

However, the reliability of the instrumental variable used in the 2SLS model for establishing causality diminishes significantly in the extended timeframe. This observation challenges the validity of the instrument and questions the robustness of the causal relationships inferred. Consequently, it highlights limitations in establishing definitive causal links between import exposure and manufacturing employment within this updated period.

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