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Tides of Change: Assessing the Consequences of Rising Import Competition on the Swedish Manufacturing Sector

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Abstract

This paper investigates the impact of import competition on labor market outcomes in Sweden, focusing on wages, employment, and labor productivity. We analyze a panel dataset spanning from 1992 to 2020 and employ various econometric methods, including long difference, fixed effects, and instrumental variables approaches, to examine the relationship between import competition and labor market outcome variables. Our main findings are that import competition from China is responsible for 1.74% of the decrease in Swedish manufacturing employment, 3.07% of the increase in value added and 3.86% of the industry-level average wages between 1992 and 2008. This indicate that Sweden's manufacturing market was not in a competitive state, and China's trade liberalization exposed the market to more competition, leading firms to downsize significantly and focus on increasing productivity to remain competitive.

Keywords: *Import Competition, China's WTO Accession, Swedish Manufacturing, Labor Market Outcomes, Trade Shocks, Long Difference Regression, Panel Regression, IV*

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Contents

Chapter 1

Introduction

1.1 Background and Motivation

In the region of Skaraborg surrounding my hometown of Skövde, there once thrived a humble manufacturing industry. However, during my upbringing, whenever conversations touched upon these cities, they often carried a negative undertone, reflecting the stagnation of the once-prosperous rural cities. While some cities experienced stagnation, others, like Skövde, managed to adapt and innovate. In particular, Volvo, Skövde's largest manufacturing employer, has remained relevant in the sector for a long time, even in the face of increasing import competition. In the meantime, China as a country, has grown to become a major global trade player over the years, particularly after its accession to the World Trade Organization (WTO) in 2001. This development has had far-reaching implications on the world economy, making it crucial to investigate the impact of rising import competition from China fueled by trade liberalization and cheap labor. Therefore my thesis aim to answer the question of what labor market impact has China had upon its WTO accession 2001 on the manufacturing industry in Sweden.

The impact of China's accession to the WTO is a topic that has intrigued researchers and policymakers alike, as the rise of China as a global economic powerhouse has had far-reaching implications on the entire world economy. Understanding the consequences of this development for Sweden is essential

for formulating effective policies and strategies to navigate the changing global landscape. Prior research has shed light on various aspects of this impact, including the influence of increased competition from China on innovation [1], local labor market in the US [2], the local structure of employment in the manufacturing sector in France [3], Norway [4], UK [5], Germany [6] and the effects of Chinese import competition on European firms' productivity [7].

We combine several datasets to analyze industry-level data on the ISIC 2-digit level between the years 1992-2020. Our primary sources of data are the UN Comtrade where we got the bilateral trade data and Unido INDSTAT 2 2020 Rev.3 dataset where we got our dependent variables from. Our methodology is built upon the existing literature from the paper "The China Syndrome" (2013) [2] and Trade Adjustment: Worker-level Evidence (2014) [8] which is from where we got the theory and the idea of instrumenting import penetration with imports from other high income countries. Our analysis extends this to the context of Sweden, allowing us to assess the generalizability of their findings and provide new insights into the impact of Chinese import competition on several labor market outcome variables.

Our main findings are that import competition from China is responsible for 1.74% of the decrease in Swedish manufacturing employment, 3.07% of the increase in value added and 3.86% of the increase in industry-level average wages between 1992 and 2008. Comparatively, the decrease in manufacturing employment was recorded at 21% in the US [2], 10% in Norway [4] and 13% in France [3] over a similar period. Other main findings show that import competition is responsible for increases in output and decreases in average firm size. Previous research were mostly consistent with our results and trade theory however multiple studies such as [5],[6] and [2] all find that increased import competition leads to a decline in wages with the exception of the Norway study [4] that attribute it to the Nordic model. Overall, the results indicate that Sweden's manufacturing market was not in a competitive state, and China's trade liberalization exposed the market to more competition, leading firms to downsize significantly and focus on increasing productivity to remain competitive.

The thesis is organized as follows: The second chapter reviews the existing literature on the big picture by showcasing the changing landscape of trade

on a global and local level. The third chapter presents the data sources and methodology employed in our analysis, outlining the strategy for replicating and extending the work of Autor, Dorn, and Hanson in the Swedish context. The fourth chapter discusses the findings and sheds light on the effect of import competition on labor market outcomes. Finally, in the fifth chapter, we conclude the paper with some final remarks on our findings and its significance.

Chapter 2

Literature Review

2.1 The Big Picture

Over the past few decades, the global economy has experienced significant transformations, driven by the rapid expansion of international trade and the emergence of new economic powerhouses like China. This evolution has led to a remarkable shift in the composition of trade across countries, with low-income nations increasingly dominating the manufacturing sector while advanced economies, such as Sweden, move towards knowledge-intensive service industries. This narrative is supported by the growing body of literature and data that underscores the changing landscape of global trade and the pivotal role of services in advanced economies [9].

The wave of trade liberalization in the 1990s and 2000s led to many low-income countries opening their markets and embracing global trade. This movement facilitated the growth and expansion of their manufacturing sectors, which have been able to capitalize on low labor costs and a favorable global trade environment [10]. As a consequence, low-income countries have effectively leveraged their comparative advantage in labor-intensive industries, taking on a larger share of global manufacturing output [2]. This shift in production has had a profound impact on the structure of advanced economies, as their manufacturing activities have been displaced by the rise of low-income countries in the global market.

Concurrently, as the global economy has become more interconnected and knowledge-intensive, advanced economies such as Sweden have increasingly focused on the service sector, which now accounts for a substantial portion of their exports. According to the World Bank, the share of services in Sweden's total exports grew from 23% in 1990 to 34% in 2020, reflecting the country's transition towards higher-value-added industries. This shift has been well documented in the literature, with studies by Gereffi [11] and the International Monetary Fund [9] highlighting the growing importance of services trade in advanced economies.

Moreover, the changing composition of trade has also had implications for the labor force in advanced economies. As manufacturing jobs have been increasingly outsourced to countries like China, the demand for higher-skilled workers in the service sector has grown in countries such as Sweden [12]. This development has further reinforced the trend towards more knowledge-intensive industries in advanced economies, as they strive to maintain their competitiveness in an increasingly globalized world.

As depicted in Figure 2.1, the import penetration ratio for Swedish imports from China shows a similar pattern to the one observed in the "China Syndrome" study by Autor et al. [2]. The Chinese import competition in Sweden experienced a gradual increase in the 1990s, followed by a more rapid surge after the year 2000 with the mean of import competition six folding since the bottom of 1995. During the same period, the manufacturing jobs have trended negatively since the 2000s and it exemplifies China's potential impact on the Swedish labor market where manufacturing jobs has gone from the top of around 8.5% of working-age population working a manufacturing job to roughly 5% in 2020.

Figure 2.2 illustrates the evolution of Swedish exports and imports to and from China, with a focus on the 15 manufacturing industries in our dataset. The red line represents the trade deficit, expressed in thousands of USD. From the plot, it is evident that Sweden had a relatively small positive trade balance with China during the early years, which gradually shifted towards a negative trend in the early 2000s. The deficit has continued to increase since then, indicating a rising imbalance in the trade relationship between the two countries.

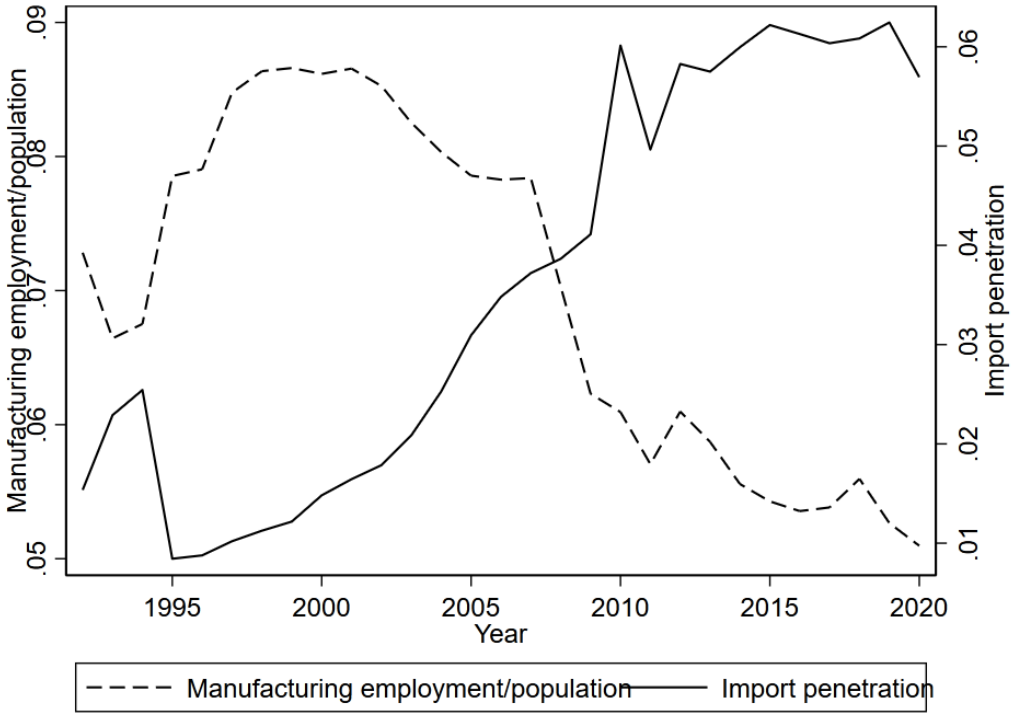

Figure 2.1: Import Penetration Ratio for Swedish Imports from China and Share of Swedish Working-Age Population Employed in manufacturing

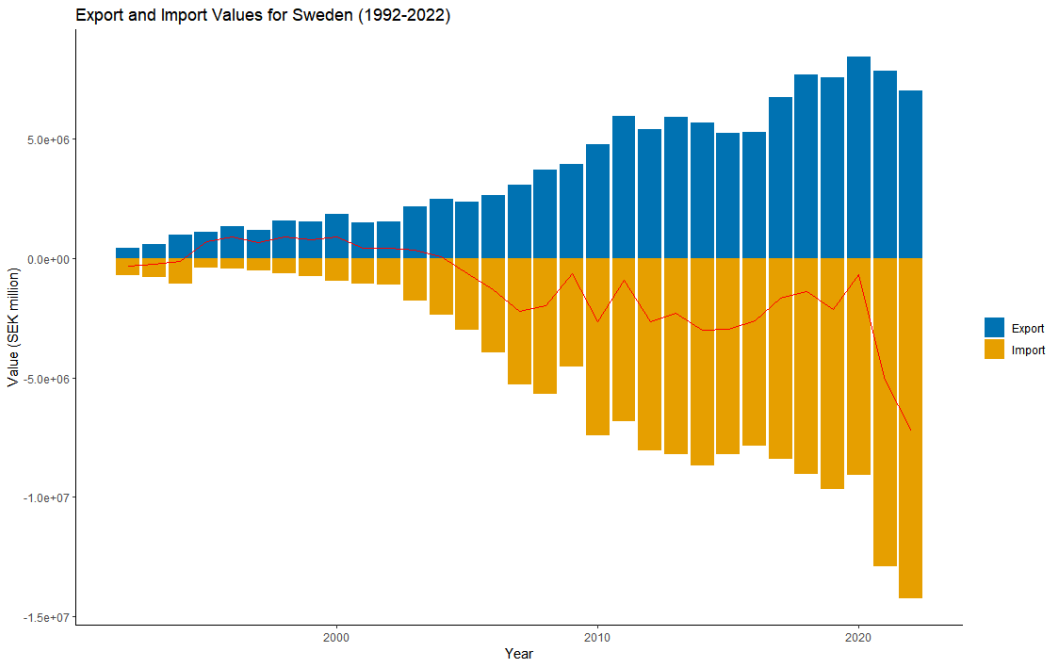

Figure 2.2: Swedish Export/Imports to/from China summed over 15 manufacturing industries. Red line is Deficit, values are in thousand USD.

Although the growing import competition from China has been a significant driver of the decline in manufacturing employment in Sweden, as shown in Figure 2.1, it is important to note that the trade balance with China is not as clearly one-sided as it has been in the case of the US. This suggests that, while the Swedish manufacturing sector has been affected by the increasing presence of low-cost imports from China, it has also managed to maintain a certain level of exports to the Chinese market.

2.2 The China Syndrome

In this section, we will discuss the methodology employed in [2] and [8]. We will address the endogeneity problems associated with a simple regression between import competition and labor market outcome variables, the instrument used to overcome these issues, and the rationale behind employing long differences instead of panel regression.

The late 1970s saw China's transition from a centrally planned to a market-oriented economy, leading to trade liberalization and integration with the global economy [13]. This shift, along with internal and external factors, allowed China to become a major exporter. However, measuring the effects of trade on labor market outcomes is complex, as it plays out in a general equilibrium with numerous confounding variables, reverse causality, and measurement error. Autor [2] identified these issues in their paper and sought to overcome them using an instrumental variable approach and long differences.

To address the endogeneity problem between import competition and labor market outcomes, they [2] instrumented U.S. import growth from China using import growth from other high-income countries. This instrument captures the variation in Chinese export growth common across all high-income countries, stemming from an internal growth shock and facilitated by trade liberalization due to China's entry into the WTO.

The instrumental variable approach used by [2] hinges on the assumption that import growth from China is primarily driven by internal supply shocks and liberalization, rather than demand shocks in high-income countries. This is to ensure that the variation used in the IV analysis is not driven by demand-side factors in high-income countries, which could potentially confound the relationship between import competition and labor market outcomes. If the import growth were driven by demand shocks in high-income countries, it would be harder to disentangle the causal effect of Chinese import competition on the labor markets in these countries.

This assumption is supported by evidence of massive rural-to-urban migration in China, which provided a vast labor supply and substantially lowered labor costs, making Chinese products more competitive in the global market [14]. The scale of this movement was also unprecedented, exceeding 140 million workers by 2008. Additionally, China gained access to foreign intermediate input, capital, and technology [15], and foreign multinational enterprises were allowed to operate in the country [13], which many studies have shown are related to significantly positive effects on total factor productivity, labor productivity, and other measures of innovation [16]. In [2] they tested the validity of their instrument formally through a series of robustness checks, one

of which tested for pre-trends in their Appendix Table 3, among other things, to conclude that it was robust to many specifications.

Studies conducted in Norway [4] and the US [2] found that Chinese import growth influenced low-skill employment in these countries. Their research highlights that the local labor market was affected by the increasing import competition from China, particularly in industries with a higher share of low-skilled workers.

[2] employed long differences, using ten-year employment levels because, to the degree that contemporaneous employment is affected by anticipated China trade, the use of lagged employment apportion predicted Chinese imports to regions will mitigate this simultaneity bias. This approach helps isolate the effects of import competition on labor market outcomes over longer periods, reducing the impact of short-term fluctuations and confounding factors. Ever since the instrument was first used in [2] it has become an established and reliable instrument used in other highly cited papers such as [8], [4], [6], and others. However, it is not perfect and the endogeneity problem related to this paper will be discussed further in the methods section, as the instrument's validity and relevance depend on which outcome variable is of interest.

Chapter 3

Data and Methodology

3.1 Theoretical Motivation

In this study, we adapt the theoretical framework from Autor, Dorn, and Hanson (2014) and Autor, Dorn, and Hanson (2013). Consider an economy with two sectors: one impacted by international trade and the other not affected. In the long-run an equilibrium is reached where workers with similar productivity have equalized wages across sectors.

The trade shock arises from productivity growth in a foreign country, which affects the domestic market's trade-exposed sector in two ways which is shown in the models below. The variables of interest in this case is change in wage ($\hat{W}_i$), change in employment in traded goods ($\hat{L}_{Ti}$) and change in employment in non-traded goods($\hat{L}_{Ni}$) where the hat denote that the variable is in log changes.

The two channels through which China affects region i, which is Sweden in our case is: (i) increased competition in all markets k in which Sweden sells its output that come from China's internal productivity growth in each industry j ($\hat{A}_{Cj}$) which is assumed exogenous in this model and (ii) the positive effect which come from an increased demand for goods in China captured by the change in expenditure ($\hat{E}_{Cj}$) where C stands for China.

$$\hat{W}_i = \sum_j c_{ij} \frac{L_{ij}}{L_{iN}} \left(\theta_{ijC} \hat{E}_{Cj} - \sum_k \theta_{ijk} \phi_{Cjk} \hat{A}_{Cj} \right), \tag{3.1}$$

$$\hat{L}_{Ti} = \rho_i \sum_j c_{ij} \frac{L_{ij}}{L_{iT}} \left(\theta_{ijC} \hat{E}_{Cj} - \sum_k \theta_{ijk} \phi_{Cjk} \hat{A}_{Cj} \right), \tag{3.2}$$

$$\hat{L}_{Ni} = \rho_i \sum_j c_{ij} \frac{L_{ij}}{L_{iN}} \left(-\theta_{ijC} \hat{E}_{Cj} + \sum_k \theta_{ijk} \phi_{Cjk} \hat{A}_{Cj} \right). \tag{3.3}$$

The terms $\frac{L_{ij}}{L_{iN}}$ and $\frac{L_{ij}}{L_{iT}}$ represent the share of employment for non-traded and traded goods sectors, respectively. The parameter θ_{ijC} reflects the initial share of Swedish output that are destined for China, while θ_{ijk} denotes the initial share of Sweden's output sold to market k. The variable ϕ_{Cjk} signifies the initial share of imports from China in market k's total imports for industry j. Lastly, ρ_i captures the response of non-traded goods employment to changes in traded goods. The increased competition and increased demand shocks are summed over all industries and weighted by initial ratio of employment in industry j to total employment in both traded and non-traded industries $\frac{L_{ij}}{L_{iM}}, M = N, T$ and a general-equilibrium scaling factor $c_{ij} > 0$.

The first equation describes the change in wages in region i as a result of the trade shock, while the second and third equations represent the changes in employment for the traded and non-traded goods sectors, respectively. The important thing in these models are the two channels that trade shock influences wages and employment through increased competition in all markets where Sweden sells its output due to China's productivity growth ($\hat{A}_{Cj}$) and the increased demand for goods in China ($\hat{E}Cj$).

My paper is going to study the relationship between China's internal productivity growth and trade liberalization that culminated 2001. The variable of interest for me will be the ($\hat{A}_{Cj}$) , which measures the effect of increased competition in china across all industries j that come from a change in domestic productivity growth. Equation (3.1)-(3.3) show that productivity shocks

in china decrease wage and employment in traded industries and increase employment in non-traded industries. In (3.2) and (3.3) the degree of the shock depends on the labor mobility from traded to non traded sector ρ_i and on the trade imbalance. If $\theta_{ijC}\hat{E}_{Cj} = \sum_k \theta_{ijk}\phi_{Cjk}\hat{A}_{Cj}$ and trade is balanced then the increase in demand will equal the loss from increased competition which will not change wage and employment. But it might heterogeneously within the trade exposed sectors reallocate from industries that are getting taken over by China's expansion to other industry sectors that Sweden is expanding instead. These might be labor heavy sectors that China has a comparative advantage in.

3.1.1 Industry trade shock

We continue from the theoretical part to the empirical through modelling import competition within industries. As a measure of import competition I will use import penetration (IP_{jt}) a measure created in Autor, Dorn, and Hanson (2014). Let IM^C_{jt} denote imports from China in ISIC industry j at year t, IM^W_{jt} denote imports from the world, EXP^W_{jt} denote exports to the world and O_{jt} denote the output in Swedish ISIC industries.

$$IP_{jt} = \frac{IM^C_{jt}}{IM^W_{jt} + O_{jt} - EXP^W_{jt}} \tag{3.4}$$

$IM^W_{jt} + O_{jt} - EXP^W_{jt}$ represent the total domestic demand in each sector for every year and IM^C_{jt} represent the import from China. The higher import penetration a sector has the larger the import competition come from china, $IP_{jt} \leq 1$ since the share can not be larger then 100 percent. And we cannot get negative values since O_{jt} is the total output of each industry and EXP^W_{jt} exports to the world is a fraction of what we produce meaning that $EXP^W_{jt} \leq O_{jt}$ and therefore $IM^W_{jt} + O_{jt} - EXP^W_{jt} \geq 0$ where we only get 0 results if we export everything we produce and import nothing, or if we do not produce or import anything from a specific industry.

An endogeniety issue with (3.4) as a measure of import competition is that it could be endogenous with domestic demand shocks to Swedish industries,

it could be the case that the increase in Chinese import may not be due to Chinese productivity growth but domestic demand shocks which means that we measure the wrong effect. And even if China is experiencing a huge productivity growth it might be hard to capture in our models with the demand shocks. We solve this issue by instrumenting with $IM_{jt}^{HighInc}$ which is the imports from China in other high-income countries. When we instrument we only take variation of growth in Chinese export that is same for all these high income countries.

$$IPO_{jt} = \frac{IM_{jt}^{HighInc}}{IM_{jt}^{W} + O_{jt} - EXP_{jt}^{W}} \tag{3.5}$$

The motivation for using this specific instrument is because high-income countries are effected in a similar way by the productivity growth in china. Therefore our identifying assumption becomes that industry import demand shocks are weakly correlated across high-income countries. This means that it would pose a problem if the demand shock from all high income countries were related in some ways. A potential scenario could be that these high-income countries might have a boom cycle increasing their demand and in turn also increasing imports as a result. Or the barriers to trade between these high income countries and China for some reason get lower, for example better infrastructure or institutions that incentivize trade. These scenarios would result in an increase in trade that has not come from the productivity shock which would bias the result upwards. The opposite could be that in response to the productivity growth, high income countries coordinate to reduce trade from china for any reason, this would negatively bias our estimate.

In our analysis, we employed the methodology used in Autor and Dorn papers to assess the strength and validity of our instrumental variable (impiv) for the endogenous variable (imppen). We regress eq (3.5) on eq (3.4) which is equivalent to a first stage regression. In the first stage regression, we estimated the endogenous import penetration variable using the instrument. The coefficient for impiv is 0.0082437, with a standard error of 0.0001458, and the

t-statistic is 56.55. This results in a p-value close to zero, indicating strong evidence against the null hypothesis of no relationship between impiv and imppen. The R-squared value of 0.8830 shows that approximately 88 percent of the variation in the endogenous variable imppen is explained by the instrumental variable impiv. This suggests that impiv is a relevant and strong instrument for imppen. In conclusion, the results of the first stage regression support the use of impiv as a relevant and significant instrument for the endogenous variable imppen.

3.2 Data sources and sample period

We combine several datasets to analyze industry-level data on the ISIC 2-digit rev 3 classification between the years 1992-2020. Our primary sources of data are the UN Comtrade, Unido INDSTAT 2 2020 Rev.3, and the World Bank Group. The UN Comtrade database provides six-digit product level information on bilateral imports and exports for 2-digit ISIC level. Unido INDSTAT 2 2020 Rev.3 contains data for the manufacturing sector, which comprises 23 industries at the ISIC 2-digit level, and includes variables such as employees, establishments, gross fixed capital formation, output, value added, average industry wages, and salaries. The World Bank Group dataset offers annual labor and population data for Sweden, including population figures, unemployment rate, total labor force, and labor force participation rate for individuals aged 15 and above, sourced from various census reports, Eurostat, official data collection agencies, and estimates from the International labor Organization. All sources use the US dollar as the common currency. Despite the availability of more detailed data in some sources, our analysis is limited to the aggregated 2-digit ISIC level due to restrictions imposed by the UN Comtrade database.

We started with 23 industries, but ended up with 15 due to two reasons. Firstly, ISIC industry 37 (recycling) was not updated after 2010 and had incomplete information, so we decided to drop it. Secondly, the labeling of the data from the UNIDO dataset caused some confusion. For certain years, the data contained mixed results from multiple industries, such as the same value

added for ISIC industry 33 and 32 in 2003-2005, and for ISIC industry 32 and 29 in 2011-2013. To address this, we combined the ISIC industries to the biggest common denominator and removed duplicate results to avoid double counting.

3.3 Empirical Strategy

3.3.1 Specification of Models

Our empirical analysis relies on panel data regressions and long difference regressions. We estimate a variety of models to examine the relationship between the endogenous variable of interest, imppen (*import penetration*), and several dependent variables, such as *lnAvgwages* (log wages/employees), *lnemp* (log employees), *lnvalueadded* (log value added), *LaborProductivity* (Value added/Employees), *lnoutput* (log Output), and *AverageSize* (Employees/Establishments). We use industry fixed effects and cluster our standard errors at the ISIC level to allow for correlation of errors within industries but not across. Moreover, we employ an instrumental variable approach, using import penetration from high-income countries (*impiv*) as an instrument for import penetration. The high income countries we use in the instrument are Australia, Canada, Germany, Denmark, France, United Kingdom, Japan, Netherlands, Norway, New Zealand and United States.

The long difference regressions are conducted in two versions:

1. The first version includes three periods: 1992, 1999, and 2008.
2. The second version includes five periods: 1992, 1999, 2008, 2016, and 2020.

In the 3- and 5 period long difference and the panel regressions, we estimate three types of models:

1. **Model 1 - OLS regression**: Ordinary Least Squares (OLS) regression, clustering standard errors at the ISIC level.

$$Y_{it} = \alpha + \beta_1 imppen_{it} + \epsilon_{it} \tag{3.6}$$

2. **Model 2 - Fixed Effects (FE) regression**: FE regression with industry fixed effects (γ_i), clustering standard errors at the ISIC level.

$$Y_{it} = \alpha + \beta_1 imppen_{it} + \gamma_i + \epsilon_{it} \tag{3.7}$$

3. **Model 3 - Instrumental Variable (IV) regression**: IV regression with industry fixed effects (γ_i), clustering standard errors at the ISIC level, and using *impiv* as an instrument for import penetration.

$$\begin{cases} imppen_{it} = \delta + \phi \cdot impiv_{it} + \gamma_i + \eta_{it} \\ Y_{it} = \alpha + \beta \cdot \hat{imppen}_{it} + \gamma_i + \epsilon_{it} \end{cases} \tag{3.8}$$

Where Y_{it} represents the dependent variable of interest for industry i in period t. $imppen_{it}$ is the import penetration for industry i in period t. $impiv_{it}$ is the instrument for import penetration, i.e., import penetration from high-income countries. γ_i represents the industry fixed effects for industry i.$\hat{imppen}_{it}$ is the predicted value of import penetration, obtained from the first stage of the IV regression.

In this empirical analysis, we use industry clustered standard errors for several reasons with the first one being that, clustering standard errors at the industry level accounts for the potential correlation of errors within industries, as firms within the same industry may be subject to common shocks or face similar market conditions. Second, industry clustered standard errors help control for potential heteroscedasticity within industries, as the variance of errors may differ across industries due to differences in market conditions, regulatory environments, or technological advancements within that industry.

The OLS model provides a simple and intuitive baseline for comparison, but it may not adequately account for omitted variable bias and reverse causality

which affect the relationship between import penetration and the dependent variables. The FE model addresses many of the problems in the OLS model but still have issues related to reverse causality. The IV model further strengthens the analysis by addressing the remaining endogeneity concerns, providing a more accurate estimate of the causal relationship between import penetration and the dependent variables.

Finally, the choice between panel regressions and long difference regressions, as well as the difference in using 3 and 5 periods, stems from the need to test the robustness and consistency of our results across different model specifications. By comparing the results from 3-period and 5-period long difference regressions, we can assess the stability of our findings over different time horizons. This comparison allows us to evaluate whether the results remain consistent even further into the future, providing insights into the persistence of the relationships being studied. On the other hand, contrasting long difference models with panel regressions enables us to identify potential dynamic effects or short-run influences that might be present in the data. Panel regressions can capture both cross-sectional and time-series variation, which may reveal important short-run dynamics that could be masked by the long difference approach. However the panel regression has big issues with simultaneity bias which will make them less reliable and accurate than the long difference estimates.

Chapter 4

Results

4.1 Expectations from other studies

Several studies that use worker level data in the literature have found similar results regarding the effects of import competition on outcome variables such as wages, employment, value added and labor productivity. Although these studies focus on different regions and contexts, they generally suggest that import competition has negative impacts on wages, employment, and value-added in the affected industries. For instance, [5],[6], [17] and [2] all find that increased import competition leads to a decline in wages, particularly for low-wage workers, and reductions in employment and value-added. Moreover, these studies highlight that workers and firms adjust to increased competition through various channels, such as labor mobility, human capital accumulation, adjustments in product mix, and changes in labor composition.

Based on the literature regarding regional differences, the results generally show similar negative impacts of import competition on wages, employment, and value-added in European countries and the United States. However, there are some differences in the magnitude of these effects and the channels through which they manifest, which can be attributed to differences in regional economic structures, labor market institutions, and social policies. For instance, in the United States, as documented in [2], the negative effects of import competition are particularly pronounced for low-skilled workers, who are more

likely to be displaced by increased competition. In contrast, [17] finds that in the United Kingdom, the impact of import competition is more evenly distributed across different skill groups, suggesting that the UK labor market may be more flexible in adjusting to trade shocks. Similarly, [6] highlights that the effects of import competition in Germany are somewhat mitigated by the country's strong social safety nets and vocational training programs, which help workers adjust to structural changes in the economy. In contrast, [3] shows that in France, the negative effects of import competition are particularly strong in regions with a high concentration of low-skilled workers and low levels of human capital. While the overall patterns of negative impacts of import competition on wages, employment, and value-added seem to be similar across European countries and the United States, the specific outcomes and adjustment mechanisms vary across regions, reflecting differences in local economic conditions, labor market institutions, and policy environments.

Given the strong labor unions and social structure in Sweden, we can expect the impact of import competition on wages to be relatively smaller compared to its impact on employment. The Swedish labor market is characterized by collective bargaining agreements and strong labor unions, which tend to protect the wages of workers and maintain relatively higher wage floors [18] [19]. As a result, wages in Sweden are less likely to be negatively affected by import competition to the same extent as in countries with weaker labor unions and bargaining power. A study in Norway a country that also adopts the Nordic model [4] showed that import competition had no wage effects which strengthens the expectation that we should not see significantly negative wage effects. However, the impact of import competition on employment might be more pronounced in Sweden. As firms face increased competition from imports, they may need to cut costs or adjust their production processes. The relatively high wage floors in Sweden, set by collective bargaining agreements, could further exacerbate this effect by limiting firms' ability to reduce labor costs through wage adjustments. Consequently, firms may be more inclined to reduce their workforce instead of lowering wages to remain competitive in the face of rising import competition.

4.2 Long Difference 3-periods

In the long difference results presented in table 4.1 and 4.2 the estimates show the effects of a 10 percentage point increase in import competition over a time period on various outcome variables. Column 1,4,7 represent the baseline specification 3.6, 2,5,8 represent the fixed effect specification in 3.7 and lastly the 3,6,9 columns show the results for our IV estimation from our IV specification in 3.8.

The results are consistent with expectations from other studies while also showing some unexpected results. In particular, we find significant effects of import competition on all our dependent variable when controlling for industry fixed effects and instrumenting for import competition. A 10 percentage point increase in import competition over a period is associated with a 17.7% increase in wages, a 8.0% decrease in employment, and a 14.1% increase in value-added. The results also indicate significant effects on labor productivity, output, and average firm size, with increases in import competition leading to increases in labor productivity and output, as well as decreases in average firm size.

At first glance, these findings do not entirely align with the existing literature, particularly the positive effect of increased import competition on industry-level wages. As our analysis uses industry-level wages, we do not capture the heterogeneity of wages within the industry. The composition of workers could have changed, as we observe increases in labor productivity and output, coupled with decreases in employment and increases in wages. Potential explanations for this result is that workers have become more productive (technique effect), or the composition of workers in these sectors now includes more productive individuals (composition effect). The low-wage jobs might have been replaced with middle to high-wage jobs that require skills to operate machinery or that are simply more productive. To test this hypothesis, more detailed worker-level data would be necessary, which we currently do not have access to. However the other papers have access to worker level data, table IX from [8] shows that workers with lower initial wages were relatively more affected by import competition compared to initially high-income workers. The results suggested that the adverse effects of trade shocks were greatest

Table 4.1: Longdifferences 3 periods

VARIABLES	OLS lnAvgwage	FE lnAvgwage	IV lnAvgwage	OLS lnemp	FE lnemp	IV lnemp	OLS lnvalueadded	FE lnvalueadded	IV lnvalueadded
dip	0.099***	0.175***	0.177***	-0.075	-0.083**	-0.080**	0.005	0.124***	0.141***
	(0.020)	(0.025)	(0.026)	(0.139)	(0.038)	(0.037)	(0.141)	(0.032)	(0.032)
Observations	30	30	30	30	30	30	30	30	30
R-squared	0.184	0.555	0.555	0.009	0.972	0.972	0.000	0.962	0.962
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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

Table 4.2: Longdifferences 3 periods

VARIABLES	OLS LProd	FE LProd	IV LProd	OLS lnoutput	FE lnoutput	IV lnoutput	OLS AvgSize	FE AvgSize	IV AvgSize
dip	3,845.196	12,729.482***	15,534.797***	-0.010	0.136***	0.151***	-6.597***	-1.015**	-1.400**
	(3,085.432)	(1,668.949)	(3,118.713)	(0.141)	(0.029)	(0.034)	(2.420)	(0.421)	(0.706)
Observations	30	30	30	30	30	30	30	30	30
R-squared	0.018	0.656	0.649	0.000	0.947	0.947	0.084	0.941	0.941
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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

for workers with low earnings capacity and smallest for those with high earning capacity. This observation aligns with the expectation that the average manufacturing worker in China would most likely substitute the low earning capacity worker. Another potential explanation is that Sweden, which is characterized with the Nordic model has strong wage rigidity and as a result wages will remain stagnant or even rise. This wage rigidity in combination with a composition or technique effect will increase wages even during a period with import competition.

Some results in the long difference model may appear counter-intuitive but become more understandable when placed in the Swedish context and considering the aggregated nature of our data. However, the negative effect on the average size of firms is challenging to reconcile. Trade theory, such as Melitz (2003) model [20], suggests two outcomes: first, that the most productive firms earn the largest profit share of the market and expand, and second, as the market grows (e.g., due to China's liberalization), the most productive firms become even more successful by leveraging their higher productivity to compete in a larger market. Trade theory would predict that the average size of firms would increase as competition intensifies since smaller, less productive firms would struggle to compete against their more productive counterparts. The only explanation that comes to mind is that the market in Sweden was not perfect, and larger firms had gained their size through a lack of competition. When the market opened up further, these larger firms may have been forced to downsize significantly and focus on increasing productivity to remain competitive. In this scenario, the average firm size in the industry would decrease, as less productive firms contract or exit the market. This outcome, while not entirely consistent with the predictions of the Melitz model, could be driven by the local context of the Swedish market and the nature of the firms operating within it.

Another more unique explanation of why average size decrease come from the Holmes Stevens paper [21] that suggest that industries are made up of large plants producing standardized goods and smaller plants making custom or specialty goods that could be characterized as niche. Standard theories such as the Melitz model would attribute the difference in size to difference

in productivity which is generally correct but it doesn't consider niche firms specifically as plants differing greatly in size likely perform different functions, even if they are classified under the same industry. This has implications for trade. For instance, in the wood furniture industry, large plants producing standard furniture pieces might be located in specific regions, while smaller facilities producing custom pieces might be scattered in other areas. The authors' theory predicts that when a surge in imports occurs, the larger plants producing standard goods are affected more than the niche/custom goods. They then also produce findings that support their claim that the larger plants produces goods that are closer substitutes to goods imported from China then the custom or niche goods produced by the smaller firms.

The results in the Holmes Stevens paper has implications for the interpretation och explanation of the results we get. Our initial explanation was that the competition level in Sweden's manufacturing industries was low and that China's import competition helped increase the level of competition which in turn lead firms downsizing significantly and increasing productivity. Another reasonable explanation that can be drawn from [21] is that larger plants where proportionally more affected as Chinese import competition increased and thus leading to a composition effect where niche firms became a relatively larger proportion of the industry. This would lead to on average lower number of employees per firm.

in the results presented above the labor productivity measure used, does not account for capital. This oversight could affect the interpretation of the results, as changes in capital intensity might also impact labor productivity. Industry fixed effects are valuable for controlling unobserved industry-specific factors correlated with both import competition in high income countries and labor productivity such as technology growth. However, they do not capture the variation in capital intensity within industries. Consequently, the relationship between import competition and labor productivity observed in the long difference model might be influenced by changes in capital intensity not accounted for by industry fixed effects. To address this issue, we created the same model but included gross fixed capital formation as a control variable, as shown in Table 4.3.

Table 4.3: Long Differences Model with Capital Control

VARIABLES	OLS LaborProductivity	FE LaborProductivity	IV LaborProductivity
dip	4,381.057	11,873.283***	14,781.209***
	(3,157.947)	(1,810.707)	(3,014.534)
Observations	30	30	30
R-squared	0.081	0.668	0.662
Industry FEs		yes	yes
Instrument			yes
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Comparing the results in Table 4.3 to the previous estimates, we observe that labor productivity still increases with import competition, even after controlling for level of capital in the industries. The IV estimate reveals that a 10 percentage point increase in import competition leads to a 14,781.209 increase in labor productivity. This result is statistically significant at the 1% level, indicating a robust positive relationship between import competition and labor productivity.

4.3 Panel regression results

In the panel regression results presented in tables 4.4 and 4.5, the estimates show the effects of a 10 percentage point increase in import competition on various outcome variables over the years 1992-2020 per industry. Column 1,4,7 represent the baseline specification 3.6, 2,5,8 represent the fixed effect specification in 3.7 and lastly the 3,6,9 columns show the results for our IV estimation from our IV specification in 3.8.

The tables show consistency with our 3 period long difference model for the signs but differs in the magnitude of the results. The estimates for output and value added are not significant and other dependent variables: employment, labor productivity and average firm size has much larger estimate than before

Table 4.4: Panelregressions wages, employment and value added

VARIABLES	OLS lnAvgwage	FE lnAvgwage	IV lnAvgwage	OLS lnemp	FE lnemp	IV lnemp	OLS lnvalueadded	FE lnvalueadded	IV lnvalueadded
imppen	0.023	0.495***	0.575***	-1.059***	-0.458***	-0.428***	-1.142***	0.070	0.193
	(0.045)	(0.092)	(0.098)	(0.211)	(0.069)	(0.102)	(0.217)	(0.153)	(0.146)
Observations	425	425	425	425	425	425	425	425	425
R-squared	0.002	0.286	0.279	0.313	0.264	0.263	0.325	0.005	-0.009
Number of ISIC		15	15		15	15		15	15
FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes
First stage F			570.3			570.3			570.3

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

Table 4.5: Panelregressions 2

VARIABLES	OLS LProd	FE LProd	IV LProd	OLS lnoutput	FE lnoutput	IV lnoutput	OLS AvgSize	FE AvgSize	IV AvgSize
imppen	-10,824.909	32,503.590***	42,447.585***	-1.213***	0.087	0.237	-21.331**	-9.697**	-26.671***
	(6,775.590)	(8,029.260)	(10,032.398)	(0.185)	(0.135)	(0.146)	(8.024)	(3.817)	(5.809)
Observations	425	425	425	426	426	426	425	425	425
R-squared	0.020	0.107	0.097	0.345	0.005	-0.010	0.109	0.018	-0.036
Number of ISIC		15	15		15	15		15	15
FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes
First stage F			570.3			570.5			570.3

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

showing that in the panel regression model import competition has larger effect on our dependent variables. A 10 percentage point increase in import competition over a year is associated with a 57.5% increase in wages, a 42.8% decrease in employment, 26.7 fewer employees per establishment on average and a 19.3% increase in value-added.

4.4 Long Difference 5-periods

In the 5 period long difference results presented in table 4.6 4.7 the estimates show the effects of a 10 percentage point increase in import competition on various outcome variables over differences between five periods: 1992, 1999, 2008, 2016, and 2020 per industry. Column 1,4,7 represent the baseline specification 3.6, 2,5,8 represent the fixed effect specification in 3.7 and lastly the 3,6,9 columns show the results for our IV estimation from our IV specification in 3.8.

The tables show consistency with our 3 period long difference model for the signs with the exception of employment but differs in the magnitude of the results. The estimates for wages and average firm size are not significant and most dependent variables has much smaller estimate than before showing that in the 5 period long difference model import competition has smaller effect on our dependent variables. A 10 percentage point increase in import competition over a year is associated with a 2.5% increase in wages, a 7.0% increase in employment, 0.434 fewer employees per establishment on average and a 13.4% increase in value-added.

4.5 Robustness Discussion

While the consistency in the signs of the effects across different models generally supports the overall robustness of our results, there are some concerns regarding the employment and average firm size estimates. For the employment estimate in the 3-period model ending in 2008, the negative effect on employment up until 2008 seems plausible. However, the relationship becomes

Table 4.6: Longdifferences 5 periods

VARIABLES	OLS lnAvgwage	FE lnAvgwage	IV lnAvgwage	OLS lnemp	FE lnemp	IV lnemp	OLS lnvalueadded	FE lnvalueadded	IV lnvalueadded
dip	0.045**	0.074***	0.025	-0.054	0.012	0.070*	-0.019	0.127***	0.134***
	(0.020)	(0.023)	(0.031)	(0.123)	(0.017)	(0.042)	(0.134)	(0.017)	(0.035)
Observations	57	57	57	57	57	57	57	57	57
R-squared	0.030	0.218	0.189	0.003	0.927	0.925	0.000	0.954	0.954
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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

Table 4.7: Longdifferences 5 periods

VARIABLES	OLS LProd	FE LProd	IV LProd	OLS lnoutput	FE lnoutput	IV lnoutput	OLS AvgSize	FE AvgSize	IV AvgSize
dip	238.661	7,179.564***	5,442.695***	-0.032	0.123***	0.128***	-6.539**	0.019	-0.434
	(2,985.616)	(946.567)	(2,064.177)	(0.142)	(0.015)	(0.028)	(2.688)	(0.292)	(0.495)
Observations	57	57	57	58	58	58	57	57	57
R-squared	0.000	0.574	0.572	0.001	0.950	0.950	0.049	0.926	0.926
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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

less clear after 2008, as panel estimates show a negative effect with above 1% significance level, while the 5-period model presents a weaker positive estimate with a 10% significance level. The differences in the magnitudes of the effects on employment and average firm size between the panel regression and long difference regression tables suggest sensitivity to the choice of model. The larger magnitudes in the panel regression tables compared to the long difference regression tables indicate that the panel regression model is affected by simultaneity bias and is therefore less capable of capturing the long-run dynamics of these relationships, overestimating the true impact of import competition on these variables.

Despite these concerns, our results exhibit several strengths. For the remaining outcome variables, the similarity in the magnitudes of the effects across the different models indicates a stable relationship between import competition and these variables, irrespective of the time horizon and the presence of dynamic effects shown through the panel estimates. Even for the wage effect, it seems consistent across models and can be explained by heterogeneous effects that are not visible since we have industry-level wages instead of worker-level wages.

As an additional robustness check, we changed the starting period from 1992 to 1994 to account for the potential influence of the 90s crisis on non-IV estimations. The results, displayed in tables A.1 and A.2, show no large changes in the significance or the magnitude for any of our estimations. Nonetheless, we should interpret the employment and average firm size estimates with caution due to the observed discrepancies.

4.6 External Validity Discussion

Our findings are generally in line with the broader literature, there are however some differences in the magnitude and specific outcomes of these effects, which can be attributed to differences in regional economic structures, labor market institutions, and social policies that affect how import competition affects our labor market. Firms, when faced with increased competition, can adopt one of three strategies: i) Maintain the status quo: If the business con-

tinues to be profitable, this response would imply no changes to our outcome variables. ii) Enhance efficiency: This could involve reducing costs more than profits or increasing profits more than costs. The impact on wages remains uncertain as firms can choose to either offer higher wages for more productive labor or decrease wages for less productive workers. Likewise, for employment, firms could either lessen the number of employees to decrease costs or increase the workforce to increase profits. iii) Exit the market: This could result in a decline in most of our industry-level outcome variables, given that they are aggregated variables. The choice among these responses depends on the structure of the economy. In Sweden's case, its manufacturing sector reacted to increased import competition by enhancing efficiency. Conversely, in the US, the preference was more towards exiting the market, which accounts for the difference in our outcomes.

Our study suggests that heightened import competition leads to increases in labor productivity, wages, and output, along with a decrease in average firm size. These findings hint that Swedish firms adapt to increasing competition by becoming more efficient and increasing their productivity, while potentially downsizing to remain competitive. The external validity of these findings could potentially extend to other advanced economies with similar economic structures, such as Norway, which also employs the Nordic model.

It is important to note that the external validity of our findings may be limited by the aggregated nature of our data and our inability to capture the heterogeneity of wages and employment within industries. To fully assess the external validity of our findings, more detailed worker-level data would be necessary to determine the different impacts of import competition on workers with different skill levels and earnings capacities. Our results are limited by the fact that we use total industry level effects, we can only observe total wage and employment increase or decrease but not which type of work or wage is being employed or fired. Despite these limitations, our findings contribute to the broader understanding of the effects of import competition on various outcome variables in the context of Sweden and provide a valuable comparison to the existing literature on the topic.

Chapter 5

Conclusion

In this paper, we have investigated the impact of import competition on wages, employment, output, average firm size and labor productivity in Sweden. Using a dataset covering the period between 1992 and 2020, we employed various econometric methods such as long difference, fixed effects, and instrumental variables approaches to examine the relationship between import competition and our labor market outcome variables.

Our main findings are that import competition from China is responsible for 2.18% of the decrease in Swedish manufacturing employment, 3.07% of the increase in value added and 3.86% of the industry-level average wages between 1992 and 2008. We also find that import competition is associated with increases in output and decreases in average firm size. These results do not entirely align with the existing literature, the positive effect of increased import competition on industry-level wages. However, we believe that these findings can be attributed to the specific context of the Swedish labor market and its strong labor unions and social structure.

In conclusion, our study contributes to the understanding of the impact of import competition on the Swedish labor market. Further research is needed to explore the heterogeneous effects of import competition on workers within industries and to assess the implications of these findings for policy interventions aimed at mitigating the adverse effects of import competition on employment in Sweden.

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Appendix A

Figures and Tables

Table A.1: Longdifferences 3 periods

VARIABLES	OLS lnAvgwage	FE lnAvgwage	IV lnAvgwage	OLS lnemp	FE lnemp	IV lnemp	OLS lnvalueadded	FE lnvalueadded	IV lnvalueadded
dip	0.105***	0.161***	0.177***	-0.048	-0.080**	-0.077**	0.045	0.113***	0.133***
	(0.019)	(0.023)	(0.029)	(0.117)	(0.034)	(0.032)	(0.115)	(0.032)	(0.034)
Observations	30	30	30	30	30	30	30	30	30
R-squared	0.225	0.560	0.556	0.004	0.972	0.972	0.003	0.962	0.961
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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

Table A.2: Longdifferences 3 periods

VARIABLES	OLS LProd	FE LProd	IV LProd	OLS lnoutput	FE lnoutput	IV lnoutput	OLS AvgSize	FE AvgSize	IV AvgSize
dip	4,775.332*	11,850.688***	14,767.912***	0.034	0.126***	0.155***	-6.070***	-1.007**	-1.537*
	(2,592.964)	(1,656.561)	(3,073.443)	(0.115)	(0.030)	(0.041)	(2.276)	(0.447)	(0.835)
Observations	30	30	30	30	30	30	30	30	30
R-squared	0.029	0.659	0.651	0.002	0.948	0.947	0.077	0.942	0.941
Industry FEs		yes	yes		yes	yes		yes	yes
Instrument			yes			yes			yes

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