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Economic Policy Analysis

The impact of import competition and export opportunities on the Dutch labour market

Increased trade flows from China and Central and Eastern European Countries between 2001 and 2016 have hardly affected net local employment, wages and inequality in manufacturing in The Netherlands. This can be explained by the fact that the manufacturing employment was relatively low in industries that faced high competition from China's rising exports and vice versa.

Although the net impact of increased trade with China and the CEE countries may be limited, it may involve temporary unemployment and moving costs for workers.

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The impact of import competition and export opportunities on the Dutch labour market[1]

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Abstract

We study the impact of rising Chinese and Eastern European import competition and export opportunities between 2001 and 2016 on the Dutch labour market. Both the participation of China in the WTO and the extension of the European Union provide an opportunity to investigate the impact of an unanticipated increase in trade on 40 Dutch COROP regions. We do not find a robust impact of the increase in trade on local employment, wages and inequality. The results do not imply that trade does not have an impact on Dutch regions, but the effects might play out in a more complicated way. Results for the Netherlands as well as other countries can be explained by the initial composition of the employment share across industries and the labour institutions.

Keywords: trade, employment, wages
JEL Classifications: F16, J31, R11

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Dutch summary

De effecten van importconcurrentie en exportmogelijkheden op de Nederlandse arbeidsmarkt

We bestuderen de effecten van toenemende Chinese en Oost-Europese importconcurrentie en exportmogelijkheden tussen 2001 en 2016 op de Nederlandse arbeidsmarkt. Zowel de deelname van China aan de WTO als de uitbreiding van de Europese Unie biedt de mogelijkheid om de effecten van een onverwachte toename van de handel op de veertig Nederlandse COROP-regio's te onderzoeken. We vinden geen robuust effect van de toename van de handel op de lokale werkgelegenheid, lonen en ongelijkheid. De resultaten impliceren niet dat handel geen invloed heeft op Nederlandse regio's omdat de effecten op een meer gecompliceerder manier kunnen spelen. Resultaten voor zowel Nederland als andere landen kunnen worden verklaard door de initiële samenstelling van het werkgelegenheid en arbeidsmarktinstituties.

Contents

1. Introduction

The impact of rising competition from low-wage countries on manufacturing employment and labour market inequality is a topic of much discussion. Earlier work of Feenstra and Hanson (1999, 2003) sought to understand the factors that explained rising US wage inequality. Increasing trade with low wage countries may affect domestic wages and employment, in addition to technical change (Krugman, 2008). In the early years of the 1990s and 2000s, trade is thought to have played a minor role, because trade flows with low-wage countries were still limited (Feenstra and Sasahara, 2017). This changed after China became a member of the WTO and its exports increased rapidly. The seminal study by Autor et al. (2013: p. 2125), hereafter ADH, finds that China's rising competitiveness resulted in not just lower wages in the US, but also in increased unemployment, decreased labour force participation, and increased the use of disability and other benefits.

After the ADH study, more empirical evidence appeared to show for several countries that manufacturing employment and wages have come under pressure after a strong increase of Chinese imports (Autor et al., 2013; Dauth et al., 2014; Balsvik et al., 2015; Donoso et al., 2015; Foliano and Riley, 2017; Malgouyres, 2017; Blanco, Borland, Coelli, and Maccarone, 2020) as well as an increase in imports from Central and Eastern European countries that recently joined the EU (Dauth et al., 2014). Several studies find a negative effect on the labour market of what has been termed the "China shock" in the literature.

In this study, we follow the regional variation approach introduced by ADH and investigate the impact of the China and Central and Eastern European (hereafter CEE) trade shocks on 40 Dutch regions at the Nuts-3 (or COROP) level for the period 2001 – 2016. There is substantial variation in industrial employment patterns at the regional level. Given this variation, regions are differently exposed to the recent rise in import competition. Like Dauth et al., (2014), we include the potential positive effect of new export opportunities. In addition, we explore the structure of the Dutch manufacturing industry and labour institutions to help explain the impact, or lack thereof, of the Chinese and CEE trade shocks.

In contrast to studies for countries like the US, Germany, Norway, Spain, UK, France and Australia, we do not find a robust impact of the increase in trade on local employment, wages and inequality. When there is an impact, it is small, with positive effects of increased exports countering the negative effects of increased imports: the net effect varies over regions between a –1 and +1 %-point shift in manufacturing labour between 2001 and 2016. One

reason why we find different results for the Netherlands is the fact that the Dutch manufacturing industry experienced changes well before the rise of China and the CEE countries and became less susceptible to import competition from China or the CEE countries. In addition, the Netherlands has collective wage bargaining, which may help explain the fact that we find no effects on wages.

The remainder of the paper is structured as follows. Section 2 provides an overview of the increase in trade from China and the CEE countries, and a literature review detailing the effect on the manufacturing industry in different countries. We also provide a brief historical analysis of the Dutch manufacturing industry. Section 3 presents our empirical approach. We describe our data sources in section 4, together with descriptive statistics for regional exposure to competition from China. In Section 5 we show the regional differences for exposure to import and export opportunities. Section 6 presents our estimation results. Section 7 provides a discussion and concludes.

2. Setting the stage

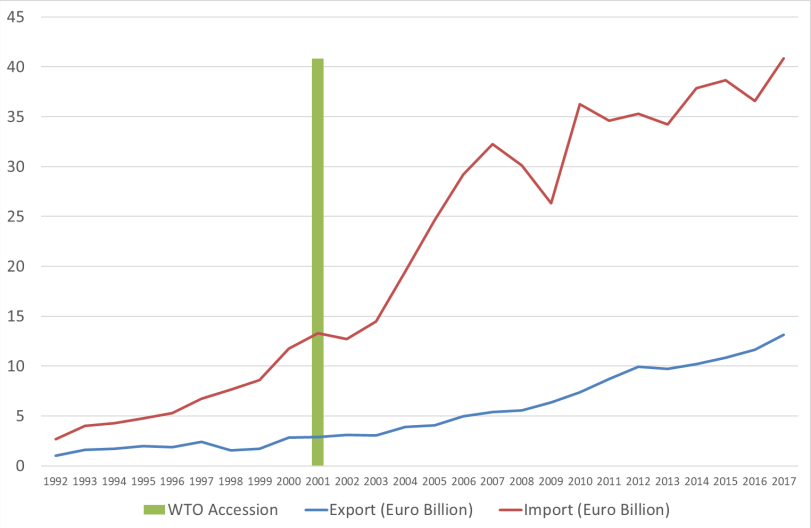
2.1 Trade shocks: China and the EU enlargement

The accession of China to the WTO in 2001 and the enlargement of the EU with ten Central and Eastern European (CEE) countries[2] in 2005 and 2007 provide a unique opportunity to measure the causal impact of globalisation. ADH explain that investigations into the effects of trade on labour markets are plagued by a "degrees of-freedom problem", as it requires mapping of many industry-specific shocks into a small number of aggregate outcomes. When national labour markets are analysed at annual frequencies, there are only few observations and many confounding factors. ADH devise a creative solution to this "degrees of-freedom problem" by taking regional economies as the unit of analysis. The increase of imports from China as well as the CEE countries can be seen as an exogenous shock, thus enabling the identification of the causal effect of rising Chinese import exports on manufacturing employment.

[2] Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia

Figure 2.1 shows the increase in total Dutch imports from and exports to China after China's accession to the WTO in 2001.[3] After 2001, China especially increased its machinery and electrical equipment exports. The Netherlands started exporting more to China as well, but the range of products varies much more and the value of exports is much lower than imports. It is noteworthy that in recent years, the rise of China's exports seems to have lost momentum.

Figure 2.1: Dutch imports from and exports to China (billion Euro, deflated, 2016)



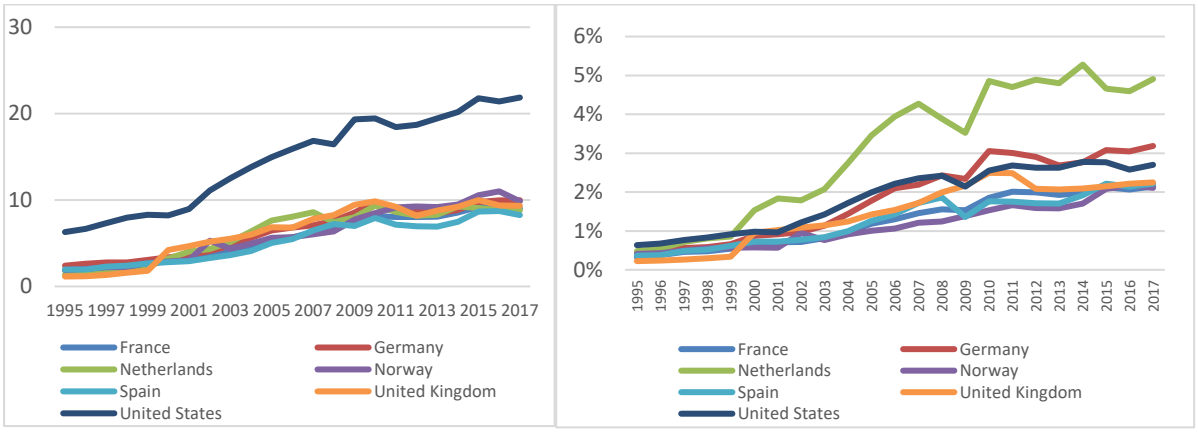
Source: WorldBank, WITS database (based on Comtrade)

Note: Figures on China include Hong Kong and Macau (see footnote)

To put this in perspective, Figure 2.2 (left) shows the share of Chinese imports in total imports and Figure 2.2 (right) shows the share of Chinese imports in GDP for the Netherlands, compared to the US, France, Germany, Norway, Spain and the UK, which are all countries for which the impact of the Chinese shock have been analysed.

[3] Throughout this paper, the figures on China include Hong Kong and Macau as part of Chinese trade goes through these city-states.

Figure 2.2 share of Chinese imports in total imports (left panel) and share of Chinese imports in GDP (right panel)



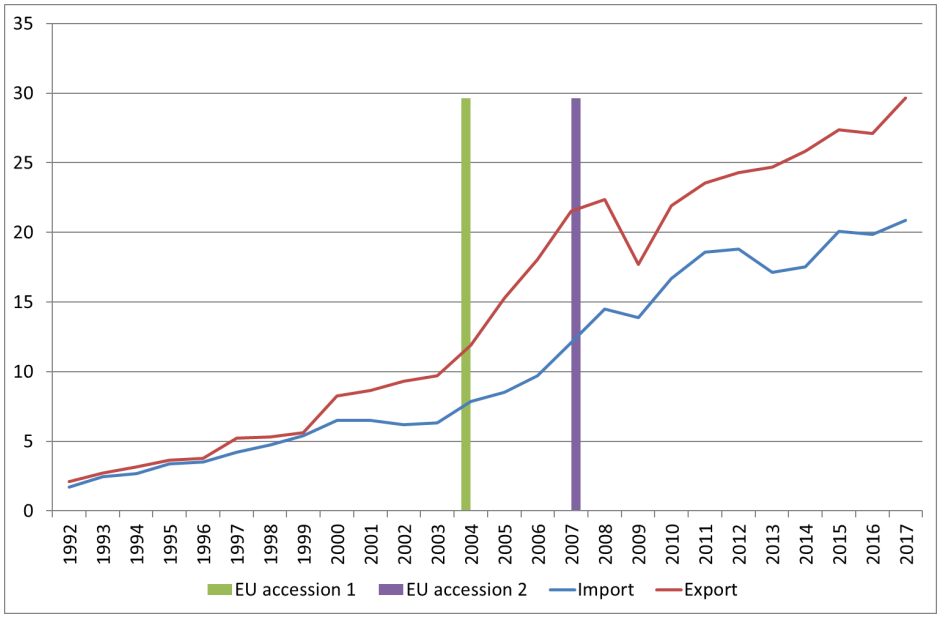
Source: WITS Database

Figure 2.2 (left) shows that in terms of share of Chinese imports in total imports, the US clearly stands out: these have risen about twice as much as those for other European countries. In this sense, the US experienced more of a "shock" than other European countries. In terms of share of Chinese imports in GDP (Figure 2.2 right), the Netherlands stands out. As an open economy with a large international harbour (Rotterdam), trade has grown more compared to GDP than other countries.[4]

In 2004, the EU was enlarged with eight Central and Eastern European countries. In 2007, two additional countries joined the EU. Figure 2.3 shows that trade with the Netherlands increased from around 2 billion Euro in 2000 to over almost 30 billion Euro for exports and over 20 billion Euro for imports.

[4] In sections 3 and 4 we discuss the role of re-exports for our analysis in more detail.

Figure 2.3: Imports from and exports to new Central and Eastern European EU member states (billion Euro, deflated, 2016)



Note: For EU accession 1 we include Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia and for EU accession 2 we include Bulgaria and Romania.
Source: WorldBank, WITS database.

2.2 Literature overview

The findings of ADH led to the application of their methodology in many other countries, see Table 2.1 to Table 2.3. For six countries (US, Germany, Norway, Spain, UK, France and Australia) significant effects have been found for the trade shock on manufacturing employment, and for Germany also for the rise of the CEE countries. For several countries there is also evidence of an impact of import competition on wages, but not on the wages of the manufacturing industries itself.

The overview of literature shows that the industrial composition at the start of the period of rising imports as well as the institutional setting of the labour market of a country are important factors. Several papers explain the lack of impact on manufacturing wages by wage rigidity and union wage bargaining for Europe. The importance of institutions is also supported by Aghelmaleki et al., (2019) who find that stricter dismissal regulations, associated with higher employment protection legislation (EPL), are linked to a lower transition probability from employment to unemployment.

Table 2.1: Effect of import competition on manufacturing employment

Authors Import competition	Country	Period	China	CEE
Autor et al (2013)	USA	1990-2007	-0.596*** (Dollar) (-0.786 in Euro) Explains 44% of the decline -0.68% (1990-2001) -1.10% (2001-2007)	n.a.
Dauth et al. (2014)	Germany	1988-2008	-0.149* Explains together 30% of decline -1.17% (1988-2008)	-0.973**
Balsvik et al. (2015)	Norway	1996-2007	-0.139*** (Krone) (-0.124 in Euro) Explains 10% of the decline -0.16% (1996-2007)	n.a.
Donoso et al (2015)	Spain	1999-2007	-2.0545*** Explains more than 100% of the decline -0.41% (1999-2003) -1.66% (2003-2007)	0.2726 Does not explain the decline
Foliano and Riley (2017)	United Kingdom	2000-2015	-0.0158*** (pounds) (-0,0216 Euro) Explains 20-30% of the decline -1,11% (2000-2015)	-0.0116 (pounds) (-0.016 Euro) Explains 10% of the decline
Malgouyres (2017)	France	1995-2007	-6.224*** (Dollar) (-8.208 in Euro) Explains 13% of the decline for 2001-2007 -0.31% (1995-2001) -1.77% (2001-2007)	n.a.
Badinger and Reuter (2017)	Europe	1991-2011	-0.137*** Explains 8% of the decline -0.26% (1991-2011)	n.a.
Blanco et al (2020)	Australia	1991-2006	-0.96** (Australian dollar) (-0.58 in Euro) Explains more than 100% of the decline -8.5% (1996-2006)	n.a.

Note: only the 2SLS results are shown that are comparable to those of ADH. The parameter estimate for France is not directly comparable as due to data limitations; Malgouyres (2017) reports the impact on growth rates (instead of employment over population).

Table 2.2: Effect of export opportunities on manufacturing employment

Authors	Country	Period	China	CEE
Export opportunities				
Dauth et al. (2014)	Germany	1988-2008	0.536	0.900***
			Exports to CEE counteract decline by 70%	
			+2,82% (1988-2008)	
Badinger and Reuter (2017)		1991-2011	-0.008	
			Does not counteract the decline	

Note: only the 2SLS results are shown that are comparable to those of ADH.

Table 2.3: Effects on wages

Authors	Country	Period	China	CEE
Import competition				
Autor et al (2013)	USA	1990-2007	-0,759*** (Dollar)	n.a.
Dauth et al. (2014)	Germany	1988-2007	-0,016	
Balsvik et al. (2015)	Norway	1996-2007	-0.005*** (Krone)	n.a.
Donoso et al (2015)	Spain	1999-2007	-0,0123	n.a.
Malgouyres (2017)	France	1995-2007	Negative impact over almost entire wage distribution	n.a.
Export opportunities				
Dauth et al. (2014)	Germany		0.108***	

Note: impact of import competition on manufacturing wages is insignificant for all countries, except for France. The result for France is based on overall employment earnings (hours worked times hourly wage) and suggests a mild decline in average hourly wages as the impact on employment earnings is larger than that on hours worked.

For Germany, Dauth et al. (2014) expand the approach of ADH by including exports, which results in a creation of 42,000 full-time equivalent jobs in Germany over the period 1988–2008 that would otherwise not have existed.[5] The increase in trade exposure from China, affected industries that tended to import labour-intensive goods already in the 1980s, and

[5] In a later study, Feenstra and Sasahara (2017) also include exports in a study that investigates the China shock, using the World Input-Ouput Database. They find that the expansion in U.S. merchandise exports to the world relative to imports from China over 1995-2011 created net demand for about 1.7 million jobs

displaced German import flows from other countries (such as Italy or Greece). They find that German labour markets have responded to an increase in imports at the employment margin, but induced wage responses are found to be small. So there is some evidence for downward nominal wage rigidity, which is in line with the institutional setting with union wage bargaining in the German labour market. Note that export opportunities, in particular to the CEE countries, do lead to higher wages.

The Norwegian case, analysed by Balsvik et al. (2015) finds negative employment effects, but the effects are only half of those found by ADH. They find no evidence of wage effects. The 'Nordic model' includes centralized wage bargaining, which leaves little flexibility for wages. The authors explain the limited impact on the labour market by the fact that the Chinese imports compete to Norwegian products to a lesser extent than to US products.

Donoso et al (2015) find for Spain that the China trade shock is also associated with an increase of employment in other, non-manufacturing industries, resulting in no significant association between exposure to imports from China, either with unemployment or with participation in the labour market. The impact of import competition on manufacturing employment is relatively large because the Spanish labour market is characterised by high rigidities, and has a more labour-intensive productive specialisation.

For the UK, the rise in Chinese imports explain 20 to 30% of the decline in manufacturing employment (Foliano and Riley 2017), which aligns closely to the decline in the US. Although the authors do not elaborate on this, it is clear that the institutions of the UK labour market are similar to those of the US.

For France, Malgouyres (2017) finds a clear significant negative effect. Malgouyres (2017: p. 414) explains this by the fact that France and the US run a large overall trade deficit, in particular with respect to China. The study finds also that wages are rather uniformly and negatively affected in the manufacturing industry with no polarisation effects.

Badinger and Reuter (2017) apply the methodology of ADH to 1146 NUTS3 regions in 17 European countries[6] and include both import and export exposure for China and CEE

[6] Austria, Belgium, Demark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

countries. For China and for the 17 European countries combined, they find a small negative but significant effect. On average, the decline in the share of manufacturing employment of 0.26 percentage points between 1991 and 2011 is due to imports from China. Given that the overall average decline in manufacturing employment was 3.4 percentage points,[7] the effect is relatively small compared to the estimates for the US. The effect of the export opportunities are found to be not significant. In general, the effects are close to zero, with heterogenous underlying country-specific effects. The effects include labour and product market spillovers arising from spatial interdependencies. The effects for the Netherlands, combined with those for Belgium and Luxembourg, are negative but small.

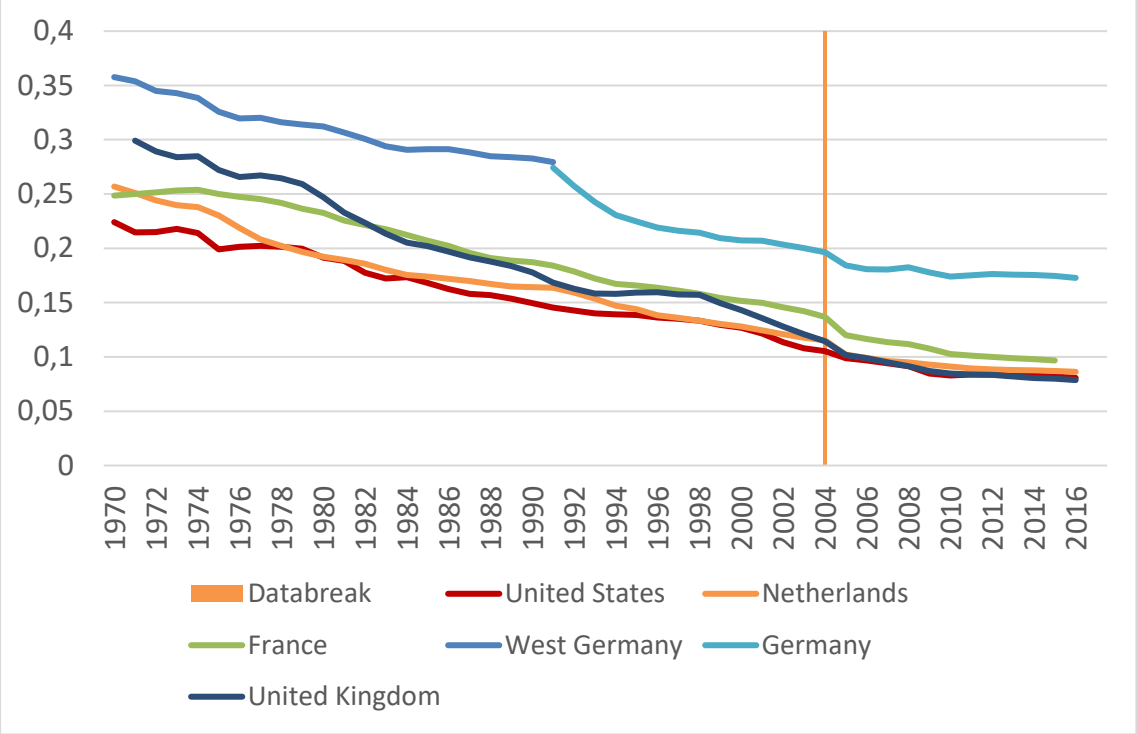
Finally, a recent study by Blanco et al., (2020) for Australia shows that growth in imports from China caused a loss in total manufacturing employment of between 90 and 210 thousand workers. This decline is more than the total decline in manufacturing jobs. The authors find the largest impacts from growth in Chinese imports for the period from 2001 to 2006. They also include small indirect spill-over effects from input-output linkages.

2.3 The Netherlands in an international context

Building on the existing empirical evidence, our research question is what impact the surge in imports from and exports to China and new EU member states (CEE countries) had on the Dutch local labour market. A relevant question is to what extent the Dutch labour market is different from other countries, in particular with respect to industrial development and composition at the start of the period of increasing Chinese imports. In this section, we delve deeper into the decline of manufacturing in some key countries, which industries needed to compete with Chinese imports and the recent history of industrial development in the Netherlands.

[7] with the largest declines in Denmark, Austria, Luxembourg and Portugal and the smallest in Germany, Greece and Spain, with large regional differences.

Figure 2.4: Share of manufacturing in total labour (1970-2016)



Source: OECD (Stan database, 2020)

Most OECD countries, including the Netherlands, have experienced a secular decline in the manufacturing labour share in the past decades (see Figure 2.4). Germany stands out with a high share of manufacturing in total labour, but also showed a substantial decline. The Netherlands and the US show a similar decrease in manufacturing employment. In general, manufacturing is first an engine of growth, but with increasing GDP per capita, the service industry becomes relatively more important and the manufacturing share tends to gradually decrease. The literature cites two main drivers: (i) international trade, which moves labour intensive, low labour productivity industries to low wage countries; (ii) technology, which increases output per worker through innovations in production techniques, such as automation (see Fort et al., 2018 for an extensive discussion).

Figure 2.5: Relation between the composition of manufacturing employment in 1996 and the change in Chinese world exports between 2007 and 1996 for different industries.

Source: OECD (Stan database)

We use the most disaggregated data available because this will be the most accurate, but with the note that even more disaggregated product data may lead to different results. From left to right: C20 Wood and products of wood and cork; C21T22 Pulp, paper, paper products, printing and publishing; C15T16 Food products, beverages and tobacco; C26 Other non-metallic mineral products; C23 Coke, refined petroleum products and nuclear fuel; C25 Rubber and plastics products; C34 Motor vehicles, trailers and semi-trailers; C28 Fabricated metal products, except machinery and equipment; C353 Aircraft and spacecraft; C33 Medical, precision and optical instruments; C27 Basic metals; C31 Electrical machinery and apparatus, n.e.c.; C29 Machinery and equipment, n.e.c.; C17T19 Textiles, textile products, leather and footwear; C30 Office, accounting and computing machinery; C352A9 Railroad equipment and transport equipment n.e.c.; C351 Building and repairing of ships and boats; C32 Radio, television and communication equipment; C24 Chemicals and chemical products.

Although the decline in manufacturing employment occurred in all the countries discussed, we expect the effect of trade shocks to be greater for countries with an initial composition of manufacturing employment that is similar to the industrial composition of the influx of imports. Figure 2.5 shows for a set of countries the relation between the increase in Chinese

imports from 1996 onwards and the share of employment in 1996 by type of industry.[8] In particular, the textiles, manufacturing and equipment industries were confronted with substantial competition from Chinese imports. Several countries had a large employment share in these industries (marked in the figure); for these countries we expect the increase in Chinese trade to have experienced a stronger and more negative impact. From our literature review we know this to be true for the US, UK, Spain, Germany and Belgium, which correspond with the countries marked in the figure.[9]

For the Netherlands, Figure 2.5 shows that Dutch industries that experienced a relatively high level of Chinese imports, employed a relatively modest share of workers (e.g. machinery and equipment, n.e.c. and electrical and optical equipment). Vice versa, Dutch industries that had relatively high employment shares in 1996 experienced only a relatively modest increase in Chinese imports (e.g. manufacturing n.e.c. and recycling; pulp, paper, paper products, printing and publishing; and food products, beverages and tobacco).

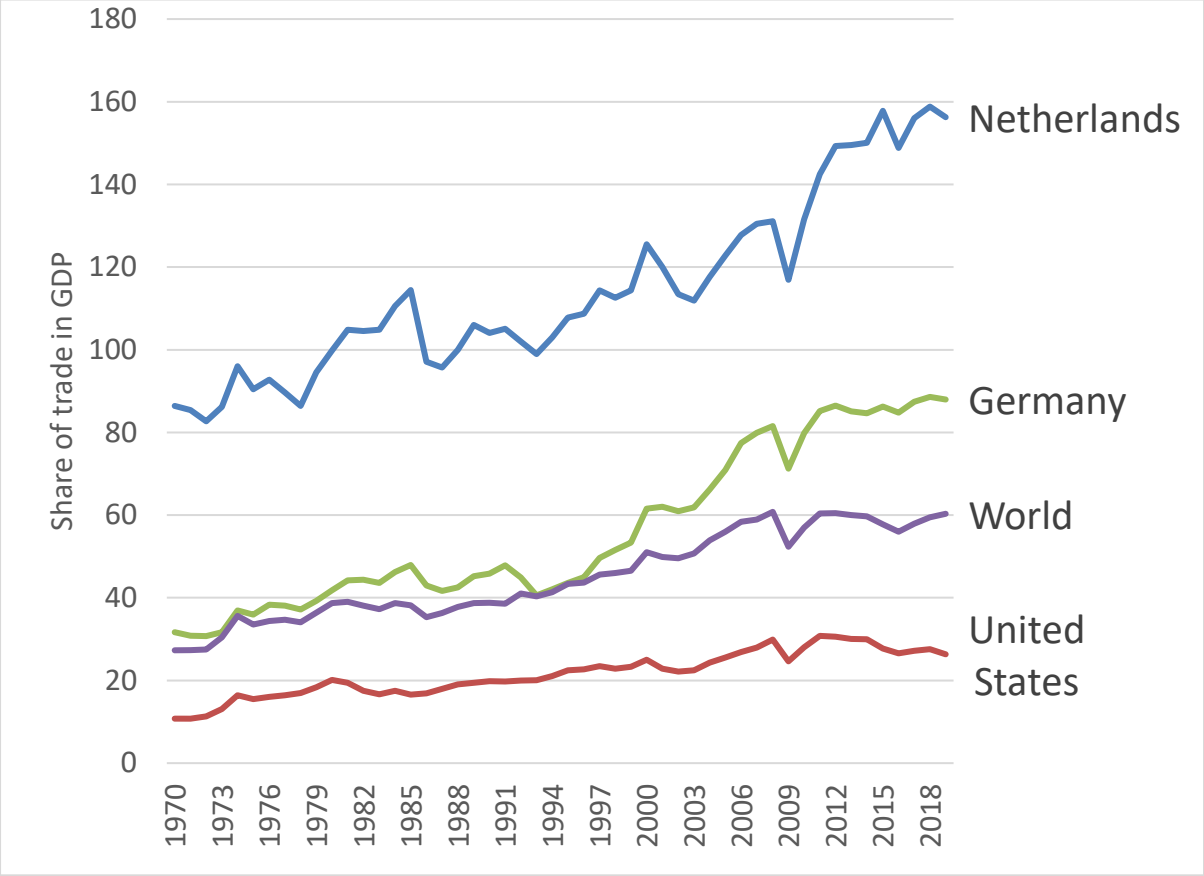
What may explain the fact that the Dutch manufacturing industry has been less affected by Chinese competition? The short answer is that as an open trading country, the Dutch manufacturing industry has been constantly in flux during the 21st century and has adapted relatively well to changes in the international environment.

The manufacturing industry of the Netherlands has historically always had to contend with competition from foreign market, as the Netherlands is an open economy (van Bergeijk, 2019). Its trade openness, measured by the share of trade in GDP is much higher than other countries, especially compared to the US, but also to its neighbour Germany (see Figure 2.6).

[8] Our analysis is inspired by Figure 2 of Balsvik et al. (2015). We choose a descriptive and disaggregated figure, as correlations for different countries turn out to be highly sensitive to the choice of industry categories.

[9] Belgium would explain the positive and significant results found for BeNeLux countries by Badinger and Reuter (2017)

Figure 2.6 Trade openness of the Netherlands compared to the world, US and Germany



Source: The World Bank (online database).

The openness of the Netherlands has impacted the development of industrialisation early on. Manufacturing industries could only be successful if they could withstand foreign competition. Industrialisation came relatively late in the Netherlands (only in the first half of the 20st century, an active industrialisation policy was instigated), starting with metal industry (ship building and machines), textile industry and chemical industry. After the second world war, a "guided wage policy" helped the growth of small and labour intensive firms (Böhl et al., 1945; cited in Nijhof and Davids, 2003; Van Zanden, 2005). These were mostly located in the Western provinces, Noord Brabant and Twente, where traditionally the agricultural industry had been dominant.

The 1960s were a turning point. Labour was scarce and wages rose. This led to more investment in labour saving capital goods and a downturn in labour intensive industries, such as textiles, clothing and footwear, as well as ship building. Many of the small firms disappeared. Competition from Japan and South Korea hastened the process. Energy and

capital intensive industries expanded (large volume chemical industry, oil refining, base metals, paper production), of which many were export oriented and located near harbours (Nijhof and Davids, 2003).

The global economic downturn in the 1970s and 1980s had an overall negative impact on the manufacturing industry in the Netherlands, but the effect differed per industry. It mostly wiped away what remained of the textile industry, and many firms in the metal industry, ship building and machine production disappeared after a wave of bankruptcies. However, the electrotechnical industry grew, not in terms of employment but production. Successful multinationals spread their activities abroad, and Philips grew even larger with the shift to the upcoming information industry (Nijhof and Davids, 2003).

As an open economy, the Netherlands uses much of its imports in manufacturing. In 2018, only around a third of total Dutch imports were for domestic consumption (20% for consumption and 11% for investments). Most of the imports (69%), however, were used for the export of goods and services, either in the form of re-exports or in the production of goods and services that are exported. In 2018, almost 40 percent of these imports consisted of so-called intermediate goods. These are intermediates or semi-finished products that are used or consumed by companies in the production of 'final' goods, or the end product. Around 185 billion in imported goods and services is needed for the production of Dutch exports of goods and services (CBS, 2020). Thus, only a relatively small share of imports competes with Dutch manufacturing.

2.4 Conclusions on basis of the literature

On the basis of the literature inspired by the work of Autor et al. (2013), as well as the descriptive analyses on industry composition of countries, the size of the competition of Chinese imports and the literature on industrial development in the Netherlands, we expect that the impact of Chinese imports on the Dutch labour market may be smaller than for other industrial countries. The decline of the major Dutch industries occurred well before the integration of China and the CEE countries into the world economy. The manufacturing industry has become more capital intensive and a large share of the Dutch labour force has moved into the service industry, which has grown rapidly in importance. Similar developments occurred in other European countries. According to Cheptea et al (2014), the EU-27 withstood the competition from emerging countries better than the United States since

1995 because the EU specialised more in high-technology products as well as products in the upper price range of the market.[10]

It is important to note that the manufacturing industry still plays an important economic role in the Netherlands: almost a fifth of the economy (in GDP) is related to manufacturing activity. This not only concerns the added value of the industry itself, but also that of other industries in supplying to the manufacturing industry. For the final sale by the manufacturing industry, other industries create nearly 40 billion in added value (Hitzert et al., 2017).

3. Data

For the analysis at the regional level, we combine trade data from UN Comtrade with Dutch administrative dataset on all inhabitants. The administrative data are used for two purposes. First, information on employees is used to translate the manufacturing trade data into regionally disaggregated information (see next section). Secondly, the dataset is used to construct regional outcome variables like the share of manufacturing employment, wages, unemployment benefit dependence, wage inequality and control variables like regional variation in gender, educational attainment and the share of migrants.

We use the UN Comtrade data for the period 2001–2016, using the trade flows reported by the Netherlands or by the countries we use to construct our instruments. Trade is reported in several versions of the Harmonised System (HS) on the 6-digit level and includes re-exports.[11] We first convert these data to the 1992 version of the HS classification, using conversion tables from the UN. Next, we convert this classification of products to a classification of industries (4-digit, ISIC revision 3), using a conversion table from the World Integrated Trade Solution (WITS)[12]. This conversion table allocates products to the industry that produces them. The ISIC industries are then converted to the industry classification used in the Netherlands (3-digit NACE, revision 1)[13] using a conversion table of tat. In ambiguous cases, where one ISIC industry is associated with multiple NACE industries, we assign the trade proportionally based on size of the NACE industries in the Netherlands. Trade in

[10] However, after the financial crisis, the market share of the EU-27 proved less resilient.

[11] Trade data excluding re-exports are not available.

[12] See https://wits.worldbank.org/

[13] Nace Rev 1 includes 17 sections, 31 subsections, 60 divisions (2-digit codes) and 222 groups (3 digit codes)

products that could not be allocated to any industry is assigned to the regions proportionally to their shares in national employment. All trade values are converted from current year US dollars to 2016 .

We construct the variables manufacturing employment, unemployment benefit dependency, wages and wage inequality for the 40 COROP regions on the basis of Dutch administrative data, administered by Statistics Netherlands. The Dutch administrative data (the so-called GBA) include municipality data on residency of all inhabitants of the Netherlands for the period 2001–2016. On the basis of this population information, we construct regional variables on gender, migration background and educational attainment. Next, all inhabitants are linked to their individual employment histories, which are constructed on the basis of information from the mandatory insurances for dependent employees in the Netherlands. On the basis of the merged demographic and employment information, we construct variables on wages, unemployment benefit dependency and sector of industry. Note that we use residency location information and not work location to construct the regional variables, as the latter information contains measurement error in case a firm has more than one geographical location.

4. Empirical approach

Our goal is to estimate the impact of trade exposure on a set of economic outcomes including employment, wages and inequality in the Netherlands. Following the ADH approach, we adopt the local labour-market approach that uses the regional differences in trade exposure to identify its effects.

We consider different geographical units at the Nuts-3 (COROP) level that face different trade shocks. The intensity of the import competition (measured as import exposure) varies over time and varies for different geographical units. The methodology is similar to a difference-in-difference (DD) approach with a continuous treatment variable (the import and export exposure), of the following form:

$$\Delta Y_{ct} = \alpha_1 + \alpha_2 \Delta \mathrm{I}PW_{ct} + \alpha_3 \Delta \mathrm{E}PW_{ct} + \alpha_4 X_{ct} + \varepsilon_{ct} \qquad \textbf{(1)}$$

With *c* the region at the COROP level, *t* the time and *X* a vector of control variables. ΔY is the change in a local market outcome.[14] Variables $\Delta \mathrm{I}PW_{ct}$ and $\Delta \mathrm{E}PW_{ct}$ respectively measure the change in import and export exposure for region *c* between t and t+1 and are expressed in Euro per worker. Parameters α_2 and α_3 are the DD coefficients capturing the direct effect of trade exposure. The set of control variables includes a time dummy as we will consider two different time periods. Industry fixed effects will not be considered due to the limited number of time periods.[15] Instead, the set of control variables will include the initial share of manufacturing employment to take differences between industries into account. For example, regions with low initial shares of manufacturing employment will experience a relatively small decline in manufacturing employment.

The identifying assumption of a causal effect is the same as in a classic DD framework: absent the trade shock, the change in *Y* would have been the same in the different local units. This is a rather strong assumption in the general case, as many factors may be correlated to both local import and export exposure and employment outcomes, such as a local demand shock.[16] We specifically use the import shocks created by the opening of the markets with China and the EU10, as the large change in trade exposure of these countries approximates exogenous variation in trade exposure, making the identifying assumption more plausible. The measure of import competition is an index of import exposure to China and/or the CEE countries, the value of imports in euro's per worker *IPW* defined as:

$$\Delta IPW_{ct} = \frac{1}{L_{ct}} \sum_{j} \frac{L_{cjt}}{L_{jt}} \Delta M_{jt} \tag{2}$$

[14] The share of manufacturing employment and the share of the working age population receiving unemployment benefits are expressed by the %-point change. The average in the manufacturing industry wage is expressed by the difference in the natural logarithm of the average wage. Inequality is expressed by the difference of the ratio of the wage in the 90th percentile and the 10th percentile.

[15] Note that industry fixed effects in the level of the outcome variable are canceled anyway as we consider changes over time.

[16] As manufacturing output produced in the region will be sold mostly outside this region, this is not so likely for Dutch regions, which strengthens the confidence in the OLS results.

With *j* representing the industry, L_{ct} the total number of workers (including both manufacturing and non-manufacturing) in region *c* at time *t*, L_{jt} the number of workers in industry *j* in the whole country at time *t* and L_{cjt} this same number for workers in region *c*. Variable M_{jt} is the total value of import from China (in nominal terms, deflated by CPI in 2016) to the country considered that competes with output of industry *j*. The variable ΔEPW_{ct} is calculated in the same way for the value of export to China. The variation in ΔIPW_{ct} and ΔEPW_{ct} across different regions *c* hence only comes from the pre-shock manufacturing employment structure at the start of the period (at time *t*), determining how strongly they will be hit by the trade shock.

As in Autor et al. (2013) and followers, we apply an instrumental variables (IV) approach with the bilateral trade flows between China and the new EU members and other advanced economies as instrument. Without IV, our identification strategy may be subject to omitted variable bias, as changes in imports or exports from China and the new EU members and employment outcomes may be impacted by unobservable factors, through nationwide industry-specific demand or supply shocks. For example, a positive local demand shock for goods on a given local market would increase both imports and employment, generating an upward bias in the OLS estimation of the effect of ΔIPW on outcome variable *Y*. For IV we use for example for imports exposure:

$$\Delta IPW_{it}^{O} = \frac{1}{L_{it}} \sum_{j} \frac{L_{ijt}}{L_{jt}} \Delta M_{jt}^{O} \qquad (2)$$

With the subscript O referring to a set of countries (Australia, Canada, Japan, New Zealand, Norway, Singapore and Sweden) that are (i) similar to the considered country in terms of global trends and (ii) weakly related in terms of economic cycle. We use the same countries that Dauth et al (2014) use for Germany and Badinger and Reuter (2017) for Europe, but remove the UK as this is a neighbouring country of the Netherlands. Dauth et al (2014) find that this mix worked well for their IV approach. We note that Singapore may be problematic given its function as entrepot for China, this is why we use several, different mixes of countries as a robustness check.

The assumption behind the IV approach in Autor et al. (2013) is that the trade development in the selected other countries are correlated with that in the US, and that these developments are exogenous with respect to US labour market demand or supply shocks.

We distinguish two periods: 2001 – 2008 and 2008 – 2016. This divides the sample period in two approximately equal periods.[17] Table 4.1 shows the descriptive statistics for the dependent and independent variables. The dependent variables are: the change of the share of manufacturing employment, the change of the share that received unemployment benefits, the change of the average wage and the change of wage inequality ($90^{th}/10^{th}$ percentile ratio). The share of manufacturing employed is defined as the number of people that are employed in manufacturing divided by the working age population. The share of people receiving unemployment benefits is also relative to the working age population. The descriptive statistics for these changes are shown in the last two columns of Table 4.1.

The main explanatory variables are the change in import and export exposures to China, the new Eastern-European EU countries and the sum of these two. The allocation of trade to COROP regions is based on the industry composition at the start of the period. For example, the average exposure to Chinese imports in 2008 was 5,530 per worker if allocation of trade to regions is based on the industry composition in 2001 and it is 5,460 if it is based on the industry composition in 2008. In the regression analysis we base the change between 2001 and 2008 on the industry composition of 2001 and the change between 2008 and 2016 on the composition in 2008.[18]

[17] These two periods have very different trends in global trade and the second period contains a large reduction in trade between 2007 and 2009. We choose to include the drop from 2008 to 2009 in the second period to divide the crisis over the two periods. In the estimations we include a dummy for the second period. We do not estimate the model for the two periods separately since we do not have sufficient observations.

[18] This split does not make much difference for the results, but we maintain the split to follow the Autor et al method. Note that in the second period, imports and exports have increased equally.

Table 4.1 Descriptive statistics

	2001 (2001 weights)	**2008** (2001 weights)	**2008** (2008 weights)	**2016** (2008 weights)	**2008 – 2001 (Δ)**	**2016 – 2008 (Δ)**
Dependent variables						
Percentage of working age population	10.11	8.57		7.73	-1.53	-0.85
employed in manufacturing	(2.89)	(2.45)		(2.26)	(0.61)	(0.41)
Percentage of working age population	1.05	1.18		2.04	0.13	0.86
that receives unemployment benefits	(0.27)	(0.28)		(0.86)	(0.12)	(0.19)
Ln(mean wage manufacturing	10.30	10.42		10.49	0.11	0.08
industry)	(0.09)	(0.11)		(0.11)	(0.04)	(0.04)
90^{th} wage percentile / 10^{th} wage	3.32	3.21		3.35	-0.11	0.14
percentile	(0.25)	(0.29)		(0.32)	(0.09)	(0.07)
Trade exposure variables (in 1000 euro)						
Imports from China to NL per worker	2.46	5.53	5.46	6.56	3.07	1.09
	(2.94)	(5.13)	(5.23)	(6.61)	(2.31)	(1.54)
Imports from new EU to NL per	1.18	2.55	2.52	3.25	1.37	0.73
worker	(0.83)	(1.52)	(1.50)	(1.47)	(0.84)	(0.43)
Imports from China and new EU to	3.64	8.08	7.98	9.81	4.43	1.83
NL per worker	(3.74)	(6.55)	(6.63)	(7.96)	(3.03)	(1.61)
Exports to China from NL per worker	0.52	0.97	0.95	1.94	0.45	1.00
	(0.22)	(0.42)	(0.41)	(0.87)	(0.21)	(0.49)
Exports to new EU from NL per	1.54	3.80	3.75	4.58	2.27	0.82
worker	(1.05)	(2.35)	(2.40)	(3.60)	(1.32)	(1.26)
Exports to China and new EU from	2.06	4.78	4.70	6.52	2.72	1.82
NL per worker	(1.21)	(2.66)	(2.68)	(4.11)	(1.47)	(1.53)
Control variables						
Percentage of working age population	10.11	8.57				
employed in manufacturing	(2.89)	(2.45)				
Share of highly educated in total	13.81	16.70				
population	(3.61)	(4.13)				
Share of foreign-born in total	8.67	9.00				
population	(3.97)	(4.40)				
Employment share females among	40.98	43.62				
total female population	(3.02)	(2.87)				
Routine task index	0.60	0.39				
	(0.36)	(0.35)				

Note: all averages are based on 40 COROP regions. Standard deviations are shown in brackets.

One of the control variables is the initial share of the working age population employed in manufacturing. The dependent variable is the change of the working age population employed in manufacturing. The shares of highly educated (tertiary education) and foreign-born are calculated as a share in the total population in the region. The employment share among women is calculated as the number of women that are employed divided by the number of women in the working age population. For the control variables working age, share of educated, foreign-born and female workers the rationale is that different groups may be affected differently by the trade shock. For instance, AHD find that within manufacturing, women are disproportionately likely to hold low-wage jobs and therefore may be more adversely affected by the trade shock than men; however, women also more often opt for jobs in services, which insulates them from the trade shock. To control for the rate of technical change or automation, which has similar effects on labour markets as globalisation, we use a "routine task index" as a proxy, using data from Spitz-Oener (2006), following the Autor and Dorn (2013) methodology. These control variables are all based on the first year of the period.

In our empirical analysis, the variable ΔIPW_{ct} (change in the value of imports per worker) includes re-exports, but not transit goods. The available data source simply does not allow us to exclude re-exports from imports (see below). We argue that imports that are re-exported also compete with domestically produced Dutch products. Note that the studies discussed in section 2 use the same data and therefore apply the same argument.

The variable ΔEPW_{ct} (change in the value of exports per worker) includes re-exports as well (which holds for Figure 2.1 and Figure 2.3 as well). This leads to double counting of re-exports in our two variables for trade exposure. As the manufacturing industry hardly adds value added to these exports, the export opportunities are exaggerated. This means the estimation strategy has two issues. First, the parameter estimate for the export opportunities has to be interpreted with care. In the next section, we will show that re-exports of Chinese imports are indeed substantial. This leads toa measurement error in the export opportunities

variable, which leads to a bias in the parameter estimate towards zero (the so-called attenuation bias). In a statistical sense, the impact of the variable will be underestimated.[19]

Second, a simultaneous analysis of the impact of Chinese imports including re-exports to the CEE countries and the impact of exports to CEE countries may lead to a correlation between the two variables. Exports to the CEE countries consist for about half out of re-exports (Statistics Netherlands, 2020), so a rather substantial amount of the re-exports to CEE countries could actually be imports from China. To check this, we use the Comtrade data to correlate the change in imports from China with the change in exports to the CEE countries (1995-2016). At the COROP level, the correlation is high (0.92), at a more aggregated product level (3 digit) it is still rather high (0.71), but at a more disaggregated level (4, 5 or 6 digit level) the correlation drops to 0.20. This means that the Dutch exports to CEE countries (including re-exports) differ from the imports from China.

5. Descriptive results on regional trade exposure

This section shows the regional distribution of import and export exposures. Regions with high import exposure of goods from China and Eastern Europe are in the north, east and south of the Netherlands. In other words, the densely populated west, with large cities like Amsterdam, Rotterdam, The Hague and Utrecht, experiences less competition from imports from these countries. This pattern is explained by the fact that a relatively large part of manufacturing employment is located in the north, east and south, while the western part of the country is more specialised in services and public administration. Note that the north, east and south also profit from export opportunities of goods to, in particular, Eastern Europe.

The impact of import competition (i.e. import exposure) from China in 2016 varies from 3 to 37 thousand euro per worker (Figure 5.1). In particular the regions around Eindhoven in the south and the region Heerenveen-Drachten in the north have experienced a substantial increase in competition; specifically from Chinese imports of electronic, computer and optical equipment. The region Venlo-Venray, which is east of Eindhoven, also scores high as

[19] This only holds in case the noise is uncorrelated with the outcome variable. We maintain the hypothesis that the re-exports, which run through the harbour of Rotterdam, should at best have a positive impact on the wages in this region (an aspect which is ignored in the analysis), and not a positive effect on the Dutch regions which produce these products.

a relatively large part of Dutch workers in this region are involved in the production of a particular type of electronic office equipment. The regions around Tilburg (which is west of Eindhoven) and Twente in the east experienced an increase in import competition of textiles.

The large increase in import competition of the region east of Eindhoven seems an outlier, but Germany seems to have incurred such increases as well.[20] For the US, the largest increase in import competition for a region was slightly more than 7 thousand dollars for the period 2000 – 2007 (Autor et al., 2013), while for Germany the largest increase was about 15 thousand euro during the period 1998 – 2008 (Dauth et al., 2014). The figure for Germany matches reasonably well with the increase for the region east of Eindhoven of about 15 thousand euro during the period 2001 – 2008.

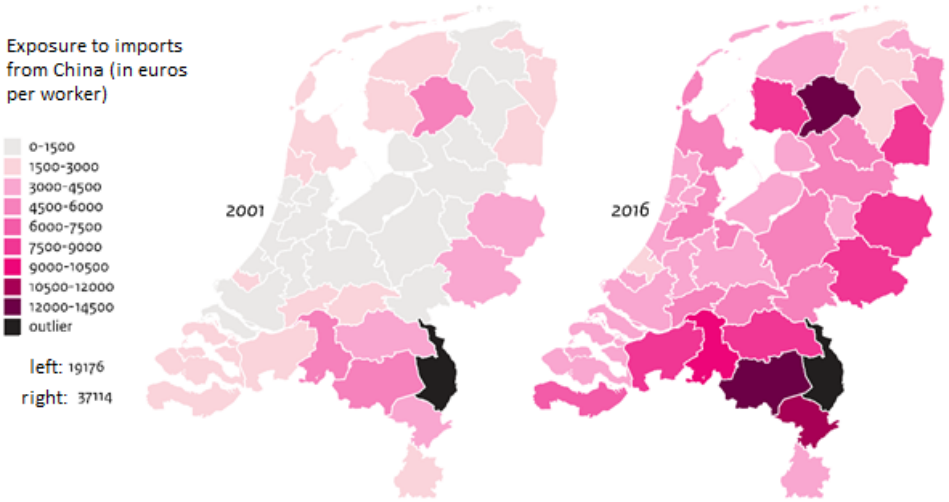
The import competition from new EU countries is less intense than from China, and the new EU countries seem to offer an increase in export opportunities. The import competition from these countries in 2016 varies from 2 to 10 thousand euro. In particular the south-west and the north-east of the Netherlands profit from increased export opportunities: both regions have a large harbour and specific chemical industry.[21] Again, the regions in the north, east and south are affected most. The same regions, however, also profit from export opportunities offered by the new EU countries. The reason for this is that the regions are involved in production of tradable goods, which leads to both import competition and export opportunities. It is likely that the goods produced in the Dutch regions differ slightly in type and quality from the imported Chinese goods, nonetheless they are classified in the same product group.

[20] Using the same definition for impact of import competition

[21] Note that also the south-east has chemical industry, but there is no harbour and they probably trade with Germany, Belgium and France.

Figure 5.1 Evolution of Import and export exposure: China

(a) Import exposure



(b) Export exposure

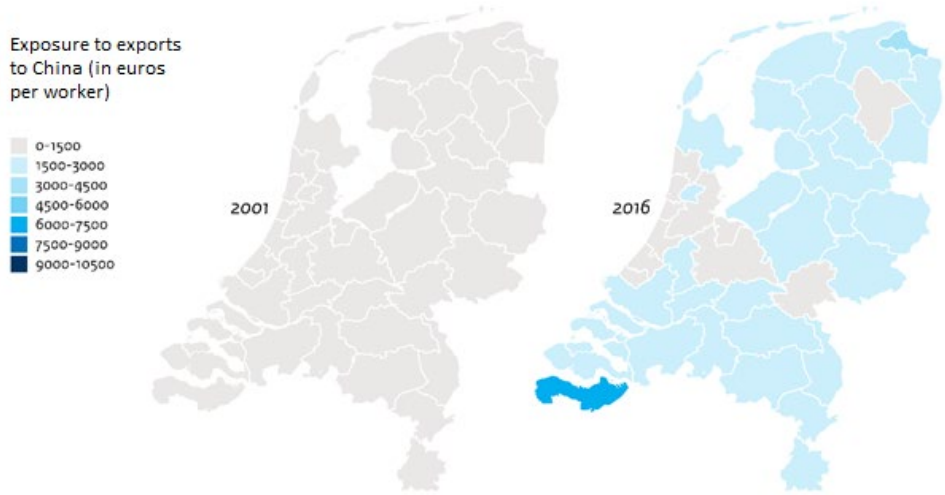
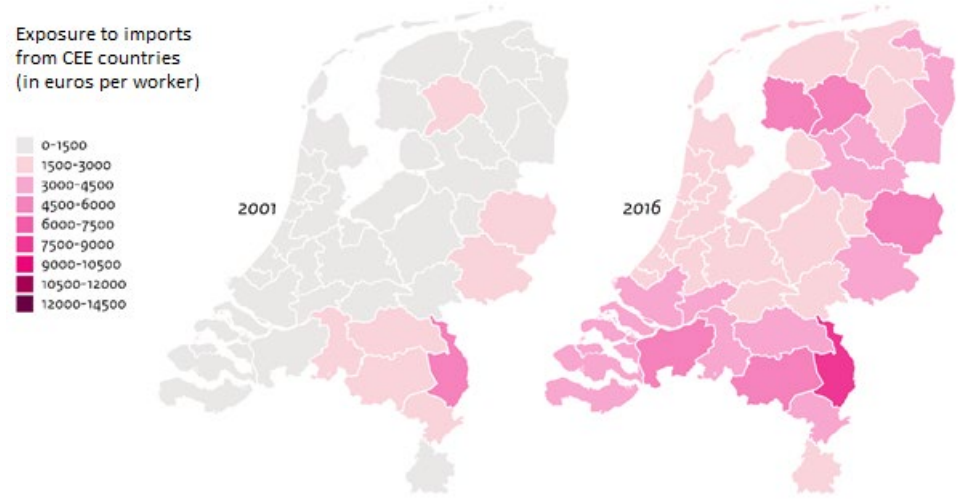
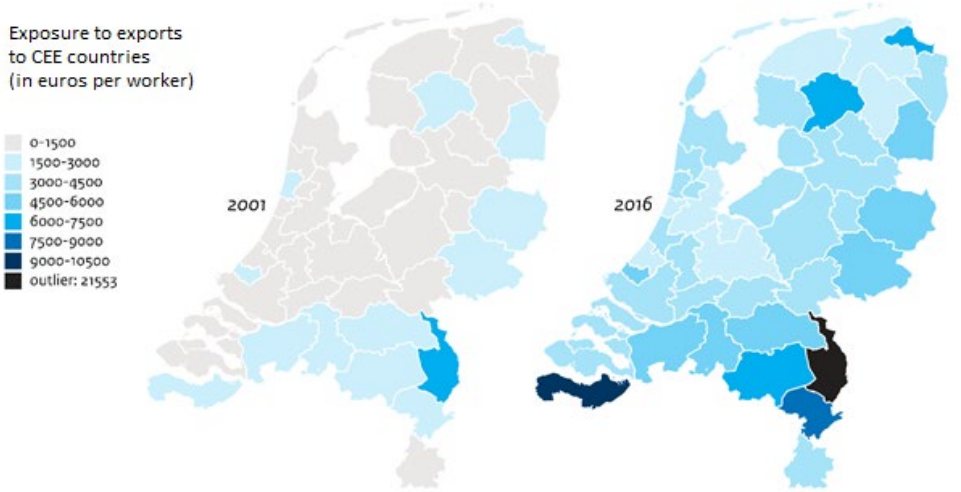


Figure 5.2 Evolution of Import and export exposure: EU 10

(a) Import exposure



(b) Export exposure



6. Results

6.1 Trade exposure and manufacturing employment

In this section we estimate the effect of changes in regional import and export exposure on the share of the working age population in a region that is employed in manufacturing. There is a strong negative correlation between the change in this share and the change in import and export exposure from and to China and the new EU members. This negative correlation with import exposure (Figure 5.1 top) is consistent with the hypothesis that competition from imports reduces local manufacturing employment. However, we also find a negative

correlation for export exposure (Figure 5.1 bottom), which is inconsistent with the hypothesis that export opportunities increase local manufacturing employment.

Changes in import and export exposure are strongly correlated with the initial share of manufacturing employment because the measures for import and export exposure are scaled by the total workers (including manufacturing and non-manufacturing workers) in a region, consistent with Autor et al. (2013). This explains why regions with a strong increase in import exposure generally also experienced a strong increase in export exposure. It is therefore important to correct for the initial share of manufacturing and to include import and export exposure in a joint analysis.

Table 6.1 shows the estimation results for the change of the share of the labour population employed in manufacturing. For each region, two observations are included, one for 2001 – 2008 and one for 2008 – 2016. A dummy is included for the latter period. The first three columns contain the OLS results. These results also show the importance of including the share of manufacturing employment at the start of the period. When this variable is included in specification 2, the R^2 increases from 45% to 71%. The control variables in specification 3 are all statistically insignificant and do not strongly affect the estimations for import and export exposure. In specification 3, which includes the control variables, import and export exposure are statistically significant and have the expected signs.

Table 6.1 Estimation results for share of manufacturing employment

Change in share of manufacturing employment	**OLS 1**	**OLS 2**	**OLS 3**	**OLS 4**	**IV 3**	**IV 4**
Change in import exposure	-0.135***	-0.108***	-0.097***		-0.043	
	(0.038)	(0.024)	(0.029)		(0.079)	
Change in export exposure	0.087	0.203***	0.192***		0.144	
	(0.056)	(0.036)	(0.036)		(0.138)	
Change in net import exposure				-0.086**		0.021
				(0.034)		(0.049)
Dummy for period 2008-2016	0.409***	0.361***	0.392***	0.383***	0.495***	0.584***
	(0.119)	(0.080)	(0.094)	(0.100)	(0.142)	(0.132)
Start of period share of working age population employed in manufacturing employment		-0.146***	-0.176***	-0.143***	-0.191***	-0.183***
		(0.014)	(0.031)	(0.027)	(0.030)	(0.035)
Start of period share of highly educated in population			-0.007	-0.013	-0.021	-0.027
			(0.017)	(0.018)	(0.020)	(0.019)
Start of period share of foreign-born in population			-0.005	0.005	-0.008	0.001
			(0.011)	(0.012)	(0.012)	(0.013)
Start of period employment share among women			0.000	0.006	-0.009	-0.010
			(0.021)	(0.022)	(0.021)	(0.023)
Start of period routine task index routine task index			0.188	0.217		0.185
			(0.180)	(0.191)		(0.190)
Constant	-1.168***	-0.132	0.160	-0.181	0.941	0.957
	(0.132)	(0.120)	(1.024)	(1.037)	(1.091)	(1.148)
Observations	80	80	80	80	80	80
R^2	0.453	0.706	0.716	0.687	0.699	0.634
First step results						
Specification				**IV 3**	**IV 3**	**IV 4**
Dependent variable				Δ Import	Δ Export	Δ Net
Change in import exposure instrument countries				0.221***	0.121***	
				(0.016)	(0.017)	
Change in export exposure instrument countries				-0.062**	0.012	
				(0.024)	(0.013)	
Change in net import exposure instrument countries						0.088***
						(0.016)
Dummy for period 2008-2016				-2.347***	-0.352	-2.006***
				(0.259)	(0.255)	(0.344)
Start of period share of working age population employed in manufacturing employment				0.097	-0.007	0.154
				(0.148)	(0.058)	(0.137)
Start of period share of highly educated in population				0.070	-0.049*	0.117**
				(0.049)	(0.025)	(0.052)
Start of period share of foreign-born in population				0.013	0.028	-0.003
				(0.027)	(0.040)	(0.047)
Start of period employment share among women				0.002	-0.011	0.012
				(0.044)	(0.039)	(0.059)
Start of period routine task index routine task index				0.172	0.083	0.115
				(0.509)	(0.342)	(0.568)
Constant				-0.800	1.392	-2.345
				(2.730)	(1.366)	(2.869)
Observations				80	80	80
R^2				0.879	0.813	0.630

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

The interpretation of these estimates is that an increase in the import exposure by 1,000 euro per full-time employee decreases the share of manufacturing employment by about 0,1%-points; an increase in export exposure of the same amount increases it by about 0,2%-points. Note that in 2001, the COROP average share of manufacturing employment was about 10% (see Table 4.1), so in relative terms this corresponds to a decrease of 1% of manufacturing employment for imports and an increase of 2% of manufacturing employment for exports over a time period of 16 years.[22]

Controlling for endogeneity and statistical significance

The last two columns of Table 6.1 show the estimation results for the IV regressions of specifications 3 and 4. In these estimations we instrument the Dutch import and export exposure by the trade of other countries that are similar to the Netherlands. For both IV regressions, the statistical significance of the trade exposure variables disappears.

The first step of the IV method reveals some remarkable problems with the method for the Netherlands. First of all, import exposure for the instrument countries predicts Dutch import exposure, but the first step estimated coefficient of 0.22 is not particularly large. Autor et al., (2013) estimated a first step coefficient of at least 0.6, depending on the model specification. Nonetheless, it is in line with the German case (Dauth et al., 2014) and the explained variance of about 0.9 is high. Secondly, the first step results for export exposure are not in line with predictions based on economic theory. Export exposure is positively related to import exposure (coefficient: 0.12) from the instrumented countries while it is not related to export exposure from the instrumented countries. The IV method is identified in a statistical sense as we do have two (statistically significant) instruments for two endogenous variables. The results can however not be interpreted in an economically sensible way.

Sensitivity analysis shows that Dutch exports seem to deviate from exports of other countries in terms of products. Focussing on net import exposure (defined as import exposure minus export exposure) gives a sensible result in the first stage, but the estimation result in the second stage remains statistically insignificant. Using different combinations of the set of

[22] We tested for the importance of robotization and migration. Robotization turns out to be highly insignificant in all specifications. Also the results on migration from the new EU countries turn out to be highly insignificant for all specifications .

instrument countries (Australia, Canada, Japan, Singapore, Sweden, Norway and New Zeeland) does not solve the problem either, as the first step results on exports remain counter-intuitive. Another obvious sensitivity analysis would be to remove re-exports or to study the added value of imports and exports (Koopman et al., 2014), but this information is not available in our dataset.

Since the standard errors of the IV estimates are large, we are not able to statistically prove that there is an impact of increased trade exposure to China and the CEE countries on regional manufacturing employment in the Netherlands. At the same time, this also does not prove that there is no impact. It only means that the impact cannot be precisely identified, which is likely related to the weak instrument. In this section, we investigate the potential economic impact by taking the OLS results as a baseline. Note that the impact of import and export exposure are in line with economic theory. The size of their marginal impacts in specification OLS 3 is about half the marginal impact for Germany (Dauth et al., 2014) while the marginal impact of import exposure is clearly larger for the US (Autor et al., 2013).[23]

The impact of the simultaneous changes in import and export exposure are well below 1%-point for almost all regions. However, note that the separate impacts of import and export exposure are rather substantial relative to the small initial size of the manufacturing industry in the Netherlands, but that they partially cancel each other out. In the period 2001 – 2008, the smallest increase of import exposure was 1,300 euro and the largest was 17,400 euro per full-time employee. Using the OLS estimate, the decrease of the share of manufacturing employment was 1.4%-points larger in the region with the strongest increase in import exposure than in the region with the smallest increase. For export exposure, the smallest increase in this period was 1,100 euro and the largest increase was 9,700 euro per full-time employee. The OLS estimate suggests that the region with the strongest increase in export exposure increased its share of manufacturing employment by 0.7%-points more than the region with the smallest increase.

Appendix A also shows the estimated effects for each region when we apply the OLS estimate for the net import exposure. For most regions, the impact of increased trade with

[23] The authors use column 2 of Table 3 to illustrate the impact. This implies a point estimate of about 0,6 for 1000 dollar import competition per employee, implying an estimate of about 0,7 for 1000 euro.

China and the CEE countries is slightly negative. The areas with the largest impacts are around Eindhoven (Zuid-Oost Noord-Brabant) and Noord-Limburg over the period 2001 – 2016. Note furthermore that two border-regions with a sea harbour (Delfzijl and Zeeuws-Vlaanderen) actually benefit from the increase in trade as they do not experience much import exposure while they do profit from additional export opportunities for their local chemical industry.

6.2 Trade exposure and other labour market outcomes

This section describes the relation between trade exposure and three other labour market outcomes: (1) unemployment benefits, (2) wages in the manufacturing industry and (3) wage inequality. For these three labour market outcomes we use the same method as for the share of manufacturing employment.

Table 6.2 shows the estimation results for unemployment benefits. The dependent variable is the change in the share of the working age population that receives unemployment benefits. On average, this share increased in both the periods 2001 – 2008 and 2008 – 2016 (see Table 4.1). Based on the OLS results, share of manufacturing employment at the start of the period has no statistically significant effect on the change in the unemployment benefits share (see specification OLS 2). The increase in the share of unemployment benefits was higher in regions with a relatively high increase in import exposure and lower in regions with a relatively high increase in export exposure. An increase in import exposure of 1000 euro per employee is associated with an increase in unemployment benefits of 0.03%-points. For a 1000 euro per employee increase in export exposure this is -0.05 %-points. When these variables are instrumented by the import and exposures, the point estimations become larger, but also become statistically insignificant due to much higher standard errors. The estimation results of the first step of the IV estimations are the same as shown in Table 6.1.

Table 6.2 Estimation results for share of unemployment benefits

Change in share of unemployment benefits	OLS 1	OLS 2	OLS 3	OLS 4	IV 3	IV 4
Change in import exposure	0.036***	0.038***	0.030**		0.042	
	(0.012)	(0.012)	(0.012)		(0.040)	
Change in export exposure	-0.062***	-0.056***	-0.048***		-0.066	
	(0.017)	(0.017)	(0.018)		(0.067)	
Change in net import exposure				0.028**		0.027
				(0.011)		(0.022)
Dummy for period 2008-2016	0.765***	0.762***	0.721***	0.723***	0.743***	0.721***
	(0.037)	(0.037)	(0.048)	(0.047)	(0.075)	(0.057)
Start of period share of working age population employed in manufacturing employment		-0.008	-0.003	-0.010	-0.006	-0.009
		(0.007)	(0.012)	(0.011)	(0.012)	(0.012)
Start of period share of highly educated in population			0.001	0.002	-0.001	0.002
			(0.007)	(0.007)	(0.010)	(0.007)
Start of period share of foreign-born in population			-0.003	-0.005	-0.003	-0.005
			(0.004)	(0.004)	(0.004)	(0.004)
Start of period employment share among women			0.016*	0.015	0.014	0.015
			(0.009)	(0.009)	(0.010)	(0.009)
Start of period routine task index			0.040	0.035	0.038	0.035
			(0.067)	(0.067)	(0.067)	(0.065)
Constant	0.139***	0.193***	-0.486	-0.420	-0.378	-0.430
	(0.036)	(0.059)	(0.422)	(0.415)	(0.487)	(0.446)
Observations	80	80	80	80	80	80
R^2	0.863	0.865	0.874	0.871	0.872	0.871

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

The interpretation of these estimates is that an increase in the import exposure by 1,000 euro per full-time employee increases the share of unemployment benefits by about 0,03%-points; an increase in export exposure of the same amount decreases it by about 0.05%-points. Also here, the impacts of import competition and export opportunities almost cancel each other out. See appendix A for regional results.

Secondly, we analyse the average real wage. The OLS estimation results in

Table 6.3 indicate there is no effect of (net) import or export exposure on the average real wages on the level of COROP regions. The point-estimates of the IV estimation (specification IV 3) are statistically insignificant as well. We report the impact on the average real wage as some studies do find a significant impact (see Table 2.3). The results for manufacturing wages are insignificant as well, and this is in line with the aforementioned studies.

Table 6.3 Estimation results for wages

Change in log of real mean wage in manufacturing	OLS 1	OLS 2	OLS 3	OLS 4	IV 3	IV 4
Change in import exposure	-0.001	0.001	-0.002		-0.000	
	(0.001)	(0.001)	(0.001)		(0.002)	
Change in export exposure	0.002	0.001	0.003		0.003	
	(0.003)	(0.002)	(0.003)		(0.006)	
Change in net import exposure				-0.002		0.001
				(0.001)		(0.002)
Dummy for period 2008-2016	-0.089***	-0.089***	-0.092***	-0.092***	-0.082***	-0.080***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)
Start of period share of working age population employed in manufacturing employment		-0.001	0.003**	0.003	0.001	0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Start of period share of highly educated in population			0.003**	0.003**	0.003***	0.003**
			(0.001)	(0.001)	(0.001)	(0.001)
Start of period share of foreign-born in population			-0.001	0.001	-0.001	-0.001
			(0.001)	(0.000)	(0.001)	(0.001)
Start of period employment share among women			-0.002**	-0.002**	-0.003**	-0.003***
			(0.001)	(0.001)	(0.001)	(0.001)
Start of period routine task index			-0.009	-0.008	-0.008	-0.008
			(0.008)	(0.008)	(0.007)	(0.007)
Constant	0.067***	0.061***	0.093***	0.082**	0.119***	0.124***
	(0.004)	(0.009)	(0.035)	(0.036)	(0.038)	(0.038)
Observations	80	80	80	80	80	80
R^2	0.874	0.875	0.907	0.906	0.907	0.901

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

The third labour market outcome is wage inequality. Our measure for wage inequality is the ratio between the 90th wage percentile and the 10th wage percentile. This is based on all wages in the COROP region, not just manufacturing wages. The reason for this is that a potential shift from manufacturing to other economic activities could have an effect on wage inequality in the region. However, we find no statistically significant effects of the changes in import or export exposure on the change in the 90/10 ratio with OLS or IV, see Table 6.4.

Table 6.4 Estimation results for 90th / 10th wage percentiles

Change in 90th / 10th wage percentiles	OLS 1	OLS 2	OLS 3	OLS 4	IV 3	IV 4
Change in import exposure	0.000	0.002	-0.008		-0.018	
	(0.005)	(0.005)	(0.006)		(0.013)	
Change in export exposure	-0.009	-0.001	0.006		0.037	
	(0.009)	(0.008)	(0.011)		(0.024)	
Change in net import exposure				-0.008		-0.005
				(0.006)		(0.006)
Dummy for period 2008-2016	0.241***	0.237***	0.221***	0.221***	0.208***	0.225***
	(0.022)	(0.021)	(0.017)	(0.017)	(0.032)	(0.020)
Start of period share of working age population employed in manufacturing employment		-0.011**	0.013***	0.013***	0.009*	0.012***
		(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
Start of period share of highly educated in population			0.015***	0.016***	0.018***	0.015***
			(0.003)	(0.003)	(0.004)	(0.003)
Start of period share of foreign-born in population			0.009***	0.009***	0.007**	0.009***
			(0.002)	(0.002)	(0.003)	(0.002)
Start of period employment share among women			-0.006**	-0.006**	-0.006*	-0.007**
			(0.003)	(0.003)	(0.003)	(0.003)
Start of period routine task index			-0.015	-0.016	-0.019	-0.016
			(0.035)	(0.035)	(0.036)	(0.033)
Constant	-0.081***	-0.002	-0.253**	-0.248**	-0.263*	-0.221*
	(0.025)	(0.044)	(0.123)	(0.120)	(0.139)	(0.122)
Observations	80	80	80	80	80	80
R^2	0.707	0.731	0.857	0.856	0.827	0.856

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

7. Discussion and conclusion

The aim of this paper is to investigate whether the trade shock found in ADH holds for the Netherlands. Our result of an insignificant impact deviates from the significant effects found for large economies like the USA (Autor et al., 2013), Germany (Dauth et al., 2014), France (Malgouyres, 2017), Spain (Donoso et al., 2015) and the UK (Foliano and Riley, 2017). It also deviates for another small economy, Norway, for which the estimation results are small but statistically significant (Balsvik et al., 2015). Our findings imply that the rise of China and the integration of new European countries into the EU has not affected Dutch employment in manufacturing in any significant way.

There are two explanations for our findings. The first explanation is related to data and measurement issues. The Netherlands only has a small number of regions (40 COROP regions) because of the small geographical size of the country. Norway has fewer inhabitants, but due to the geographical distances it is easier to identify separate regional labour markets. Due to a high population density in the Netherlands, small geographical distances and a well-functioning infrastructure, it is more difficult to identify independent labour markets,

although of course the COROP (Nuts-3) regions do take this into account as much as possible In addition, it may be more difficult to find instruments for a small open economy that is part of a trade block. Because of value chains linkages, direct trade with China might be less relevant as a measure than indirect trade with China through other countries like Germany. Finally, because of the "Port of Rotterdam effect", much of Dutch imports and exports may be linked. Although our data does not include transit, it does include re-exports. Excluding re-exports as well as imports that are then re-exported from the trade data for China and CEE countries will lower the trade flows, and consequently lower the import exposure and export opportunities. Even if excluding re-exports as well as imports to be re-exported would lead to significant effects, the size of the effects would decrease. As the size of the effects are already small, a significant result would not put much weight in the scale.

The second explanation of the insignificant results is linked to the nature of the Dutch economy. The starting position of the Netherlands (in 1995) was such that the manufacturing employment was relatively low in industries that faced high competition from China's rising exports and vice versa. The Netherlands, as a small and open economy has always had to contend with foreign competitors. Its manufacturing industry has developed in line with that competition, and was therefore in a better position to face the trade shock of China and CEE countries than other, more isolated countries. In addition, total manufacturing employment has not been impacted much because the impact of rising imports and exports partly cancel each other, an argument that Dauth et al. (2014) also make. Incidentally, this argument also applies to the USA; Feenstra and Sasahara (2017) find that for the USA, the negative impact of import competition is partly cancelled by exports opportunities.

Several papers that use the ADH approach make the point that because of collective wage bargaining, there is no effect on wages, and labour markets have responded to an increase in trade exposure at the employment margin. The Netherlands has a collective wage bargaining system, and we also do not find an effect on wages. But, we also do not find that labour markets have responded to an increase in trade exposure at the employment margin.

Although the impact of increased trade with China and the CEE countries on manufacturing employment may be limited, it may still imply uncertainty for workers. For the Netherlands, there is some evidence for an impact on the share of unemployment benefit recipients. The negative impact of import competition and the positive impact of export opportunities on manufacturing employment also suggest adjustments between industries and regions.

Transitions of workers to new types of work may be costly for these workers as they be (temporarily) unemployed and may need to move to other regions. Earlier work finds that in the Netherlands, approximately half of worker turnover and two-thirds of worker reallocation relates to churning (i.e. the rates of separations of workers from jobs, which are not destroyed and therefore are to be filled by other workers) (Bruil et al., 2010).

Several papers have improved the ADH methodology by considering the underlying micro-information on all workers in the regions. Autor et al (2014) find that in particular, low wage workers have lower incomes due to import competition. The same holds for Denmark (Traiberman, 2019). Traiberman (p.4260) argues that "empirical trade economists have focused primarily on industrial or firm reallocation, and largely ignored the impacts of destroyed occupational human capital" when workers change occupations. He finds that import competition from 1995 to 2005 leads to lower lifetime incomes for five percent of Danish workers; 57 percent of the dispersion in worker outcomes is accounted for by occupations, and only 16 percent by industry. Dauth et al (2020) analyse import and export competition and finds that low income workers are also more disadvantaged by export opportunities. These extensions are interesting future work for the Netherlands.

Firms and workers in the Netherlands seem able to cope well with the large influx of trade from China and CEE. However, this ability needs to be maintained to meet future challenges and various policies can support this ability. It is also important to realise that past trends do not necessarily continue in the future. After a rapid increase in global trade since the 1990s, the Chinese economy and trade are slowing down. China is changing from an export led economy to a more a more domestic consumption-led economy. New developments such as reshoring or nearshoring are pertinent for the Netherlands, which is a small open economy highly dependent on trade.

Appendix A: regional effects

Table A.1 Regional effects (in %-points) on manufacturing employment share using OLS 3

	2001-2008			2008-2016		
COROP	**Import**	**Export**	**Total**	**Import**	**Export**	**Total**
Oost-Groningen	-0.3	0.2	-0.1	-0.1	0.1	0.1
Delfzijl	-0.3	0.4	0.1	-0.1	0.3	0.2
Overig Groningen	-0.2	0.1	0.0	-0.1	0.1	0.0
Noord-Friesland	-0.3	0.2	-0.1	-0.1	0.1	0.1
Zuidwest-Friesland	-0.5	0.2	-0.3	0.0	0.1	0.2
Zuidoost-Friesland	-0.5	0.3	-0.3	-0.2	0.2	0.0
Noord-Drenthe	-0.2	0.1	0.0	0.0	0.1	0.0
Zuidoost-Drenthe	-0.3	0.3	0.0	-0.3	0.2	-0.1
Zuidwest-Drenthe	-0.3	0.2	-0.1	-0.2	0.1	-0.1
Noord-Overijssel	-0.2	0.2	-0.1	-0.2	0.1	-0.1
Zuidwest-Overijssel	-0.2	0.2	0.0	-0.2	0.1	0.0
Twente	-0.6	0.3	-0.3	-0.2	0.2	-0.1
Veluwe	-0.3	0.2	-0.1	-0.1	0.1	0.0
Achterhoek	-0.5	0.2	-0.2	-0.1	0.1	0.0
Arnhem/Nijmegen	-0.5	0.2	-0.3	-0.1	0.1	0.0
Zuidwest-Gelderland	-0.3	0.2	-0.2	-0.1	0.1	0.0
Utrecht	-0.2	0.1	-0.1	-0.1	0.0	-0.1
Kop van Noord-Holland	-0.5	0.2	-0.3	0.0	0.1	0.1
Alkmaar	-0.4	0.3	-0.1	-0.1	0.0	-0.1
IJmond	-0.4	0.3	-0.1	0.0	0.0	0.0
Haarlem	-0.2	0.1	-0.1	-0.1	0.1	0.0
Zaanstreek	-0.3	0.2	0.0	-0.3	0.1	-0.2
Groot-Amsterdam	-0.1	0.1	0.0	-0.1	0.0	0.0
Gooi & Vechtstreek	-0.4	0.2	-0.2	-0.2	0.1	-0.1
Leiden & Bollenstreek	-0.1	0.1	0.0	-0.1	0.1	0.0
Den Haag	-0.1	0.1	0.0	-0.1	0.0	-0.1
Delft & Westland	-0.2	0.2	0.0	-0.2	0.2	0.0
Oost-Zuid-Holland	-0.2	0.2	0.0	-0.2	0.1	-0.1
Groot-Rijnmond	-0.2	0.2	0.0	-0.2	0.1	-0.1
Zuidoost-Zuid-Holland	-0.2	0.2	0.0	-0.2	0.1	0.0
Zeeuwsch-Vlaanderen	-0.7	0.5	-0.2	-0.2	0.5	0.3
Overig Zeeland	-0.3	0.2	0.0	-0.1	0.2	0.1
West-Noord-Brabant	-0.5	0.3	-0.2	-0.3	0.2	-0.1
Midden-Noord-Brabant	-0.4	0.3	-0.2	-0.3	0.2	-0.1
Noordoost-Noord-Brabant	-0.6	0.3	-0.2	-0.1	0.2	0.1
Zuidoost-Noord-Brabant	-1.0	0.3	-0.6	-0.1	0.2	0.0
Noord-Limburg	-1.5	0.8	-0.7	-0.8	0.7	-0.1
Midden-Limburg	-0.8	0.4	-0.4	-0.2	0.3	0.1
Zuid-Limburg	-0.3	0.2	-0.1	-0.1	0.2	0.1
Flevoland	-0.3	0.2	-0.1	-0.1	0.1	0.0

Table A.2 Regional effects (in %-points) on share of unemployment benefits using OLS 3

	2001-2008			2008-2016		
COROP	**Import**	**Export**	**Total**	**Import**	**Export**	**Total**
Oost-Groningen	0.1	-0.1	0.0	0.0	0.0	0.0
Delfzijl	0.1	-0.1	0.0	0.0	-0.1	-0.1
Overig Groningen	0.1	0.0	0.0	0.0	0.0	0.0
Noord-Friesland	0.1	-0.1	0.0	0.0	0.0	0.0
Zuidwest-Friesland	0.1	-0.1	0.1	0.0	0.0	-0.1
Zuidoost-Friesland	0.2	-0.1	0.1	0.1	-0.1	0.0
Noord-Drenthe	0.1	0.0	0.0	0.0	0.0	0.0
Zuidoost-Drenthe	0.1	-0.1	0.0	0.1	-0.1	0.0
Zuidwest-Drenthe	0.1	-0.1	0.0	0.1	0.0	0.0
Noord-Overijssel	0.1	-0.1	0.0	0.1	0.0	0.0
Zuidwest-Overijssel	0.1	-0.1	0.0	0.1	0.0	0.0
Twente	0.2	-0.1	0.1	0.1	-0.1	0.0
Veluwe	0.1	-0.1	0.0	0.0	0.0	0.0
Achterhoek	0.1	-0.1	0.1	0.0	0.0	0.0
Arnhem/Nijmegen	0.2	-0.1	0.1	0.0	0.0	0.0
Zuidwest-Gelderland	0.1	-0.1	0.0	0.0	0.0	0.0
Utrecht	0.1	0.0	0.0	0.0	0.0	0.0
Kop van Noord-Holland	0.1	-0.1	0.1	0.0	0.0	0.0
Alkmaar	0.1	-0.1	0.0	0.0	0.0	0.0
IJmond	0.1	-0.1	0.0	0.0	0.0	0.0
Haarlem	0.1	0.0	0.0	0.0	0.0	0.0
Zaanstreek	0.1	-0.1	0.0	0.1	0.0	0.1
Groot-Amsterdam	0.0	0.0	0.0	0.0	0.0	0.0
Gooi & Vechtstreek	0.1	-0.1	0.1	0.1	0.0	0.0
Leiden & Bollenstreek	0.0	0.0	0.0	0.0	0.0	0.0
Den Haag	0.0	0.0	0.0	0.0	0.0	0.0
Delft & Westland	0.1	-0.1	0.0	0.1	-0.1	0.0
Oost-Zuid-Holland	0.1	-0.1	0.0	0.1	0.0	0.0
Groot-Rijnmond	0.1	-0.1	0.0	0.1	0.0	0.0
Zuidoost-Zuid-Holland	0.1	-0.1	0.0	0.1	0.0	0.0
Zeeuwsch-Vlaanderen	0.2	-0.2	0.1	0.1	-0.2	-0.1
Overig Zeeland	0.1	-0.1	0.0	0.0	-0.1	0.0
West-Noord-Brabant	0.2	-0.1	0.1	0.1	-0.1	0.0
Midden-Noord-Brabant	0.1	-0.1	0.1	0.1	-0.1	0.0
Noordoost-Noord-Brabant	0.2	-0.1	0.1	0.0	-0.1	0.0
Zuidoost-Noord-Brabant	0.3	-0.1	0.2	0.0	-0.1	0.0
Noord-Limburg	0.5	-0.3	0.2	0.3	-0.2	0.0
Midden-Limburg	0.3	-0.1	0.1	0.1	-0.1	0.0
Zuid-Limburg	0.1	-0.1	0.0	0.0	-0.1	0.0
Flevoland	0.1	-0.1	0.0	0.0	0.0	0.0

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