2. Global value chains and the value added of trade

Author
Oscar Lemmers

Fragmentation of production processes created global value chains for products: from conception to end use. These value chains become better visible when one considers flows of value added instead of gross value. For every country they show the true importance of its trade and its interconnectedness and dependencies with other countries. For example, the share of value added created due to exports was higher in the Netherlands than in other countries. The share of value added due to exports to the BRIC countries was also higher in the Netherlands. We also find that imports fulfil a relatively high share of Dutch final demand.

2.1 Introduction

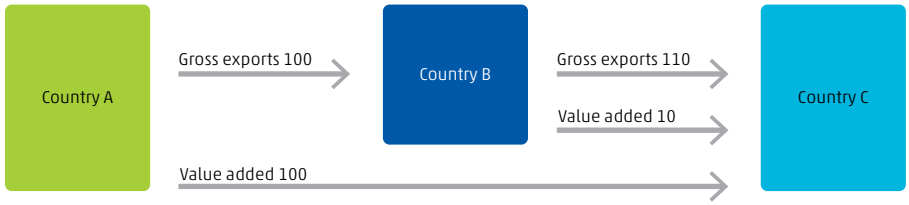
"Global value chains are binding us together"
Pascal Lamy, Director-General WTO, 2012

Several studies (e.g. Hummels et al. (2001), OECD (2013a), UN (2013)) show that the strong growth of international trade is mainly driven by a growing share of intermediate goods and services. Complete production chains are split up over countries. Countries used to produce their own exports in full, but now these are only partially produced in their own country. The value added of exports for the local economy is therefore not equal to total exports.

Gross exports show the direct flows between countries, but not the interdependencies along the value chain between the countries that supply or demand. They attribute the full value of exports to the last link in the production chain, even when that final link only made a minimal contribution. This implies that traditional trade statistics, that only show gross exports of a country, are no longer sufficient. Looking solely at these figures it is impossible to determine the real contribution of exports to a country's GDP, nor do they show the countries that are really responsible for supply and demand. This is clearly illustrated by figure 2.1.1. Traditionally, country B is seen as the source of imports for country C, and there is no obvious connection between country C and country A. However, it is clear that they have a strong connection in reality. Country A produces the intermediate goods and services for country B that are used to produce the exports of country B to country C. Thus, country C is dependent on country A for supply, and country A is dependent on country C for demand. This becomes clear when one does not consider gross exports from A to C, but rather how much value added in country A is created thanks to final demand in country C. These so-called exports

of value added from A to C equals 100 in this example. Country B creates 10 of value added due to final demand in country C, so exports of value added of B to C equal 10 although gross exports from B tot C equal 110.

2.1.1. Concepts of gross exports and exports of value added



Source: OECD (2013a).

This concept of trade in value added adds a valuable dimension to the existing statistics because it shows interdependencies between countries which at first sight are not doing business together. And it avoids confusion with respect to the size of trade: in Figure 2.1.1 total value added is 110, whereas total gross exports equals 210. Measuring trade in value added provides a better picture of the supply side because it shows where the value is really created. This helps to determine in which industries a country is competitive thanks to production, and where it only seemingly looks competitive thanks to its position at the end of the value chain. Of course the traditional statistics remain fully relevant, as they give detailed information about the demand side of the economy: how much consumers, firms and administrations have spent on goods and services from abroad.

In this chapter we will shed some light on the involvement of the Netherlands in global value chains by showing new information about trade in value added. We will compare it to other countries for indicators such as the share of value added that is created thanks to foreign demand for products and services and the share of final domestic demand that is fulfilled by foreign countries. This shows the relative dependency from abroad. Throughout the chapter there is special attention for the BRIC countries.

The structure of this chapter is as follows. First, we provide some background and point out several policy issues. Next we explain the methods and data. Then we present the results. The chapter ends with conclusions and suggestions for further research.

2.2 Background

Grossman and Rossi-Hansberg wrote (2006) "The rise of offshoring: it's not wine for cloth anymore", expressing that a lot had changed since the 19th century. Back then, the full value of exported goods was seen as output of the national economy, and trade was in final products: Portuguese wine for English cloth. However, business practices have changed, and companies now import raw materials and intermediates from other countries. Sometimes they even move part of the production abroad (chapter 5 in this publication). So, a product is no longer made from start to finish in the same country, but it consists of parts that are being produced in different countries all over the world.

This fragmentation of the production process created global value chains (GVCs) that link firms, workers and consumers around the world. The value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use. This includes activities such as design, production, marketing, distribution and support to the final consumer. Sturgeon (2013) gives a good overview of ideas and literature.

Until recently there were no statistics available to reflect this and researchers and policy makers had to rely on gross export statistics. But because of re-exports and the inflation of gross statistics due to the trade in intermediates as mentioned in the introduction, this can lead to overestimation of the importance of trade. A good example in which gross export statistics do not tell the complete story is Singapore. It has a ratio of trade to GDP of more than 100 percent, so obviously value added of exports must be smaller than gross exports. Besides gross exports, the trade surplus (or deficit) also gives insufficient information. It only gives a net value and does not discern between a country that heavily relies on imports for local consumption and on exports of domestic products and a country that has only limited international trade.

Lamy (2012) stated that if we want to understand the true nature of trade relationships, "We need to know what each country along a global value chain contributes to the value of a final product. We also need to know how that contribution is linked to those of other suppliers in other countries coming before and after along the chain." He also noted that "The high level of import intensity in export production has created an unprecedented level of inter-dependency among countries in supply chains."

New insights due to statistics about trade in value added

Statistics about trade in value added show the interdependencies mentioned above: on which countries is one really dependent, for imports, for exports, for welfare and for jobs? United Nations (2013b) gives the example of the 2011 tsunami in Japan, which transmitted specific shocks to those countries that are related to Japan in the value chain of certain industries. Escaith et al. (2010) identify the risk of a "bullwhip effect" in global value chains: when there is a sudden drop in demand, firms will run down their inventories instead of making new orders. Then this fall of demand is amplified along the value chain and might cause a standstill for firms that are upstream in the chain. So, besides resilience this growing interconnectedness also brings the risk of contagion (OECD 2013a).

Traditional statistics attribute the full commercial value of imports to the last link in the production chain, even where the contribution made by that final link has been minimal. This might suggest macro-economic imbalances that do not exist in reality. Dedrick et al. (2010) give the example of an iPod, assembled in China and exported to the United States. The exports from China to the United States would be about $150, and the trade surplus of China with respect to the United States would be $150. But only $4 of value added is created in China. The rest of value added is partly created by Apple because of design, marketing and R&D, and partly by suppliers of the parts of the iPod in Japan and the United States. The surplus of China with respect to the United States in terms of value added is only $4 for this iPod. So, the trade surplus of China with respect to the United States is much smaller in terms of value added than in gross trade statistics. Similarly, the Netherlands has a great trade deficit with China and a large trade surplus with the European Union, because of sizeable imports from China that are subsequently re-exported to the European Union. Measured in value added, the deficit and surplus shrink. However, note that the total trade deficit (or surplus) of a country is the same in value added as in gross statistics. Only the distribution among its trade partners may be different.

Policy issues

What the new statistics also teach us, is that one needs to take a holistic view of international production processes. Traditionally, policies were aimed at promoting exports and attracting foreign investments. But now more attention is paid to obtaining and maintaining a good position in a production or value chain. Is this position related to low or high value activities, to labour intensive production or to design and R&D? Policies arise to integrate in value chains, to use them to be

more competitive thanks to specialisation and get spill overs for the local economy through transfer of technology and knowledge (OECD (2013b)). That implies focus on imports as well because they are necessary for exports, and on outward FDI because a subsidiary abroad may help getting high quality inputs against a reasonable price.

Policies concerning developing/emerging countries

Also, there is focus on designing policies that enable emerging and developing countries to reap the benefits of global value chains. How can these countries tap into GVCs and how can other countries help them? Gurriá (2013) states that "To overcome existing constraints and integrate into GVCs, developing countries can open up to foreign trade and investment, improve infrastructure, strengthen trade facilitating measures, and improve the business environment. They can provide access to networks, global markets, capital, knowledge and technology. With such key actions, integration in an existing GVC can provide a first step to the economic development of developing countries that is often easier than building a complete value chain." And he notes that "aid for trade initiatives enable least developing countries to build their supply-side capacity and trade-related infrastructure so they can too further reap the benefits of trade".

2.3 Data and methodology

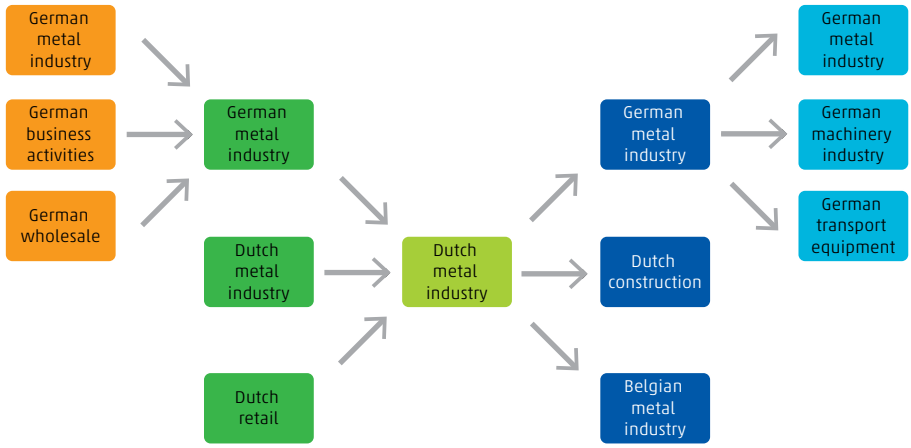
The data that was used in this chapter follows from the World Input Output Database (WIOD) project (Timmer et al. (2013)). The core of the database is a set of harmonised supply and use tables, alongside with data on international trade in goods and services. These two sets of data have been integrated into sets of inter country (world) input-output tables. Others also created multi-regional input-output (MRIO) databases, for example the Global Trade Analysis Project (GTAP), the University of Sydney (EORA database) or the OECD. For an overview, see Wiedmann et al. (2011).

The WIOD contains, among others, input-output tables with 40 countries, a Rest of World category and 35 industries for the period 1995–2009. For 2010 and 2011 we used WIOD projections with possible larger margins of error. An MRIO table shows the relation between production, foreign trade (imports and exports of intermediates and final products) and final demand, not only within countries but

also between countries. A row in this table shows how the output of an industry is distributed among other industries and final demand (consumption, investments and exports). The necessary inputs for the output can be derived from the columns of an input output table. They show how much input from which industry is needed. The difference between output and costs of the inputs used is the added value of an industry.

This enables us to picture a value chain around an industry, because the origin of the inputs and the origin of these inputs and so on are known. Similarly, one knows the destination of the outputs and the destination of these outputs again. Figure 2.3.1 shows an example of part of such a value chain. The main inputs for the Dutch metal industry come from the German metal industry, the Dutch metal industry itself and the Dutch retail industry. One step downstream the value chain the inputs for the German metal industry come from the German metal industry itself, from several business activities in Germany, and the German wholesale industry. Similarly, the products of the Dutch metal industry go to the German metal industry, the Dutch construction industry and the Belgian metal industry.

2.3.1 Part of the value chain for the Dutch metal industry, 2011



Source: WIOD, calculated by Statistics Netherlands.

Traditionally, value added of exports of commodities and services is attributed to the exporting industry. For example, the value added of exports by the manufacturing industry is attributed completely to this industry. However, the manufacturing industry uses inputs from other industries as well. These can be foreign inputs or inputs from other Dutch industries. The industries that produce

these intermediate inputs contribute to the value added of exports. The method to calculate these contributions is described by Kranendonk and Verbruggen (2011), who used national input-output tables. Groot and Möhlmann (2008) showed that, compared to the traditional way described above, the distribution of value added of exports is completely different among the industries when taking the supplying industries into account. Especially the services sector contributes far more to the value added of exports than in the traditional registration. The same phenomena can be observed in other countries.

2.4 Results on exports

Table 2.4.1 shows the share of value added that is created through the production for exports. This share slowly grew for the Netherlands during the period 1995–2011 and was 38[1)] percent in 2011. It grew for most of the countries listed, which shows that they integrated more in the world economy and were less dependent on their home markets. Germany had a very large rise; Notten et al. (2013) extensively studied the causes and found that a major cause for this growth was the flourishing transport equipment industry. The share for all countries dropped from 2008 to 2009, when world exports took a sharp downfall. This drop took a large toll on China, but it should not be forgotten that this was one of the few boom countries in 2009. When other economies shrunk, exports shrunk, the Chinese economy grew and took a larger share in total value added while the foreign share dropped.

The Netherlands is more dependent on exports for economic growth than the average EU-14 country, which relies more on consumption and investments in its own economy for economic growth. This has advantages and disadvantages. It makes the Dutch economy more resilient and fragile at the same time. If the Dutch economy fares less well than foreign economies, exports may soar compared to other categories of final demand such as consumption and investments. And due to the large share of exports in total value added, this will have a visible effect on the Dutch economy, which is less dependent on domestic economic growth. On the other hand, large exports imply greater vulnerability to foreign macro-economic shocks.

1) Kuypers et al. (2013) calculated that the share of value added due to exports in Dutch GDP was 29 percent in 2009. Here we calculated a different number, namely the share of value added due to exports in total Dutch value added (also called GDP at basic prices). Thus, in the two ratios the denominator is the same, but the numerators are different. GDP is equal to total value added plus taxes less subsidies on products plus VAT.

2.4.1 Share of exports of value added in total value added

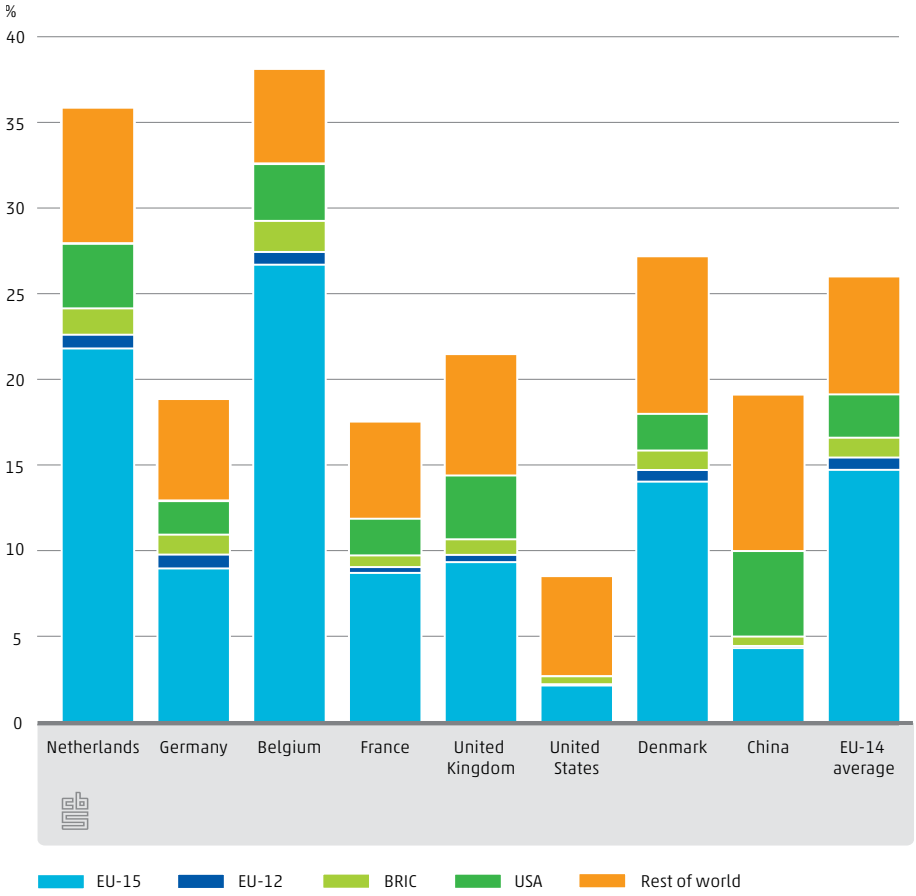
	1995	2000	2005	2008	2009	2010*	2011*
	%						
Netherlands	35.8	36.5	35.6	37.6	35.3	37.0	38.0
EU-14	25.9	29.0	28.6	30.0	28.1	29.2	29.7
Belgium	38.1	40.5	38.5	39.0	37.3	38.3	38.2
Denmark	27.1	31.1	30.8	31.5	28.1	30.2	31.0
France	17.5	19.7	18.0	17.5	15.8	16.8	17.2
Germany	18.8	24.7	29.1	32.3	28.4	30.2	31.0
United Kingdom	21.4	21.0	19.8	22.1	21.4	21.9	22.8
United States	8.5	7.7	7.3	8.8	8.1	8.9	9.5
China	19.1	18.8	26.2	25.8	20.7	21.9	21.2

Source: WIOD, calculated by Statistics Netherlands.

Figure 2.4.2 and 2.4.3 are extensions of table 2.4.1: they split the value added of exports by country group. They show that the share of Dutch value added due to exports to BRIC countries in total Dutch value added rose from 1.5 percent in 1995 to 3.8 percent in 2011. So, for every 1,000 euros of value added created in the Netherlands, 38 euros was thanks to production for the BRIC countries. That can be direct production, for example exported cheese, but also indirect, for example Dutch steel that is used in German cars that are exported to China.

For the European countries shown in Figure 2.4.3, a large part of value added is created in the process of exports for other countries in the European Union. And by far the largest part is thanks to countries that joined the European Union before 2004. Both facts are not surprising. It is a stylised fact that size of an economy and distance are important determinants for trade (e.g. Linders (2006)). And the countries in the EU-15 are closer to the Netherlands, Germany, Belgium, France, the United Kingdom and Denmark than the countries in the EU-12, and their economies together are also much larger.

2.4.2 Share of destination of value added, 1995

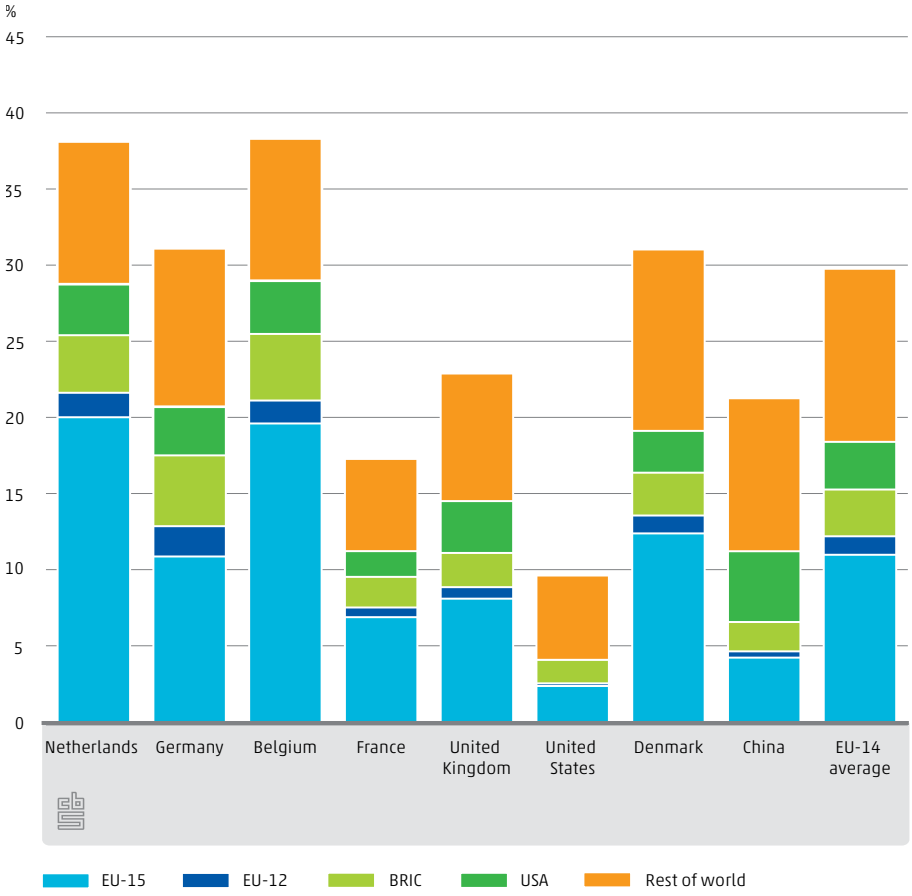


Source: WIOD, calculated by Statistics Netherlands.

Compared to other countries, the exports of the Netherlands are relatively less focused on emerging markets and more on the EU instead. For example, the share of the BRIC countries[2)] in total exports of the Netherlands is small compared to that share in exports of other countries. Several sources (OECD 2012, Groot et al. 2011) voiced the opinion that the Netherlands does not optimally use the possibilities offered by globalisation. But, as was already pointed out in the Miljoenennota (2012), this ignores the fact that the Netherlands has a very open economy and exports more than other countries (in absolute terms). So, due to the size of total Dutch trade, the low share of the BRIC countries in Dutch exports still amounts to a large absolute value, even compared to GDP.

[2)] WIOD allows to consider other emerging markets, such as Indonesia, Mexico or Turkey, as well.

2.4.3 Share of destination of value added, 2011*



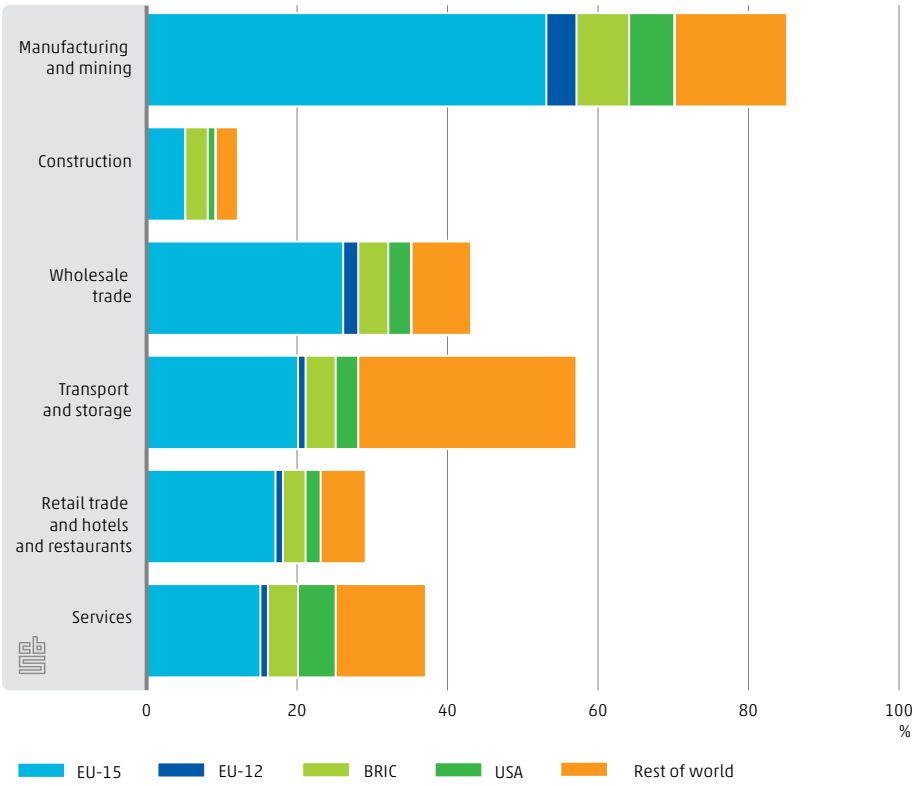
Source: WIOD, calculated by Statistics Netherlands.

And indeed, although Germany has relatively more value added thanks to the BRIC countries (4.7 percent of total value added), the Netherlands managed to tap into these markets more successfully than the average EU-14 country or the United States.

As expected, there is a lot of heterogeneity between industries in terms of value added created thanks to exports. In general, services are more often provided at arm's length (for example, by a hairdresser), whereas commodities can be traded more easily. In 2011, the manufacturing and mining industry exported 84 percent of their created value added, whereas this was only 29 percent for retail trade and restaurants and hotels. The distribution of exported value added by an industry among the several country groups is in general the same as this distribution for all industries together. However, note that the BRIC countries are responsible for

almost a quarter of exported value added by the construction industry. And the countries in the group "Rest of the World" generate half of exported value added by the transport industry.

2.4.4 Share of destination of value added, by sector, 2011*



Source: WIOD, calculated by Statistics Netherlands.

Almost 4% of Dutch value added due to exports to BRIC countries

2.5 Results on imports

A large part of final domestic demand (i.e. final demand excluding exports) in the Netherlands is fulfilled with imports. This share is higher than for most countries. We also observed that a larger part of Dutch value added was exported. Together this shows that the Netherlands is vastly integrated in global value chains. Conversely, the United States has a small share. This is common for large economies, as they can be more self-sufficient than smaller countries that may lack raw materials, or may be specialised in certain industries. In all countries, the share of final demand met by imports from abroad grew during the period 1995–2011. Also, in all countries this share dropped from 2008 to 2009 due to the economic crisis that was especially hard on international trade. But it recovered quickly and in 2011 the levels were comparable to those of 2008 again.

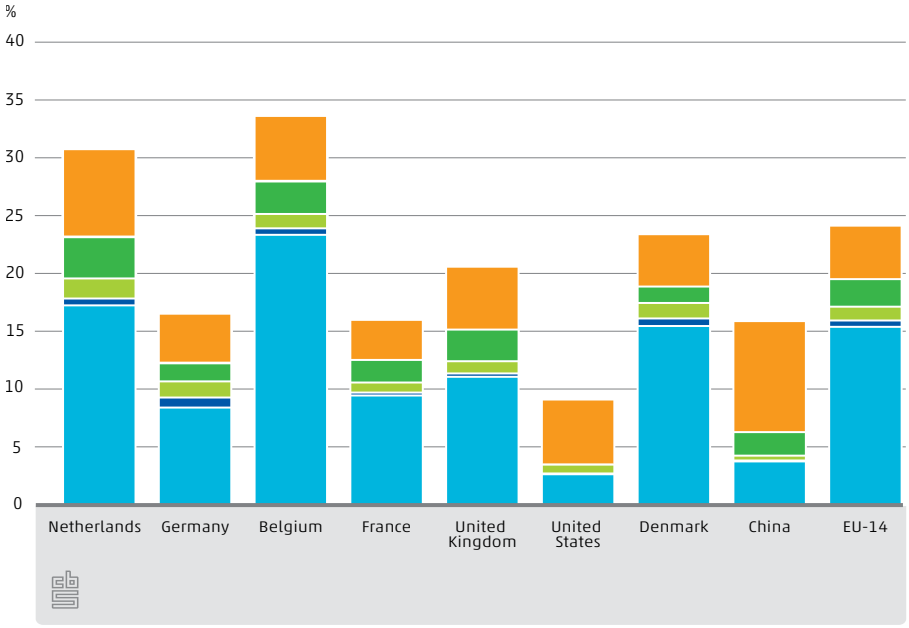
2.5.1 Share of final domestic demand fulfilled by imports, 2011

	1995	2000	2005	2008	2009	2010*	2011*
	%						
Netherlands	30.7	31.8	29.1	31.5	30.1	31.2	31.7
EU-14	24.0	28.0	27.4	29.1	26.4	27.5	28.1
Belgium	33.5	37.5	35.1	37.7	34.7	36.1	36.7
Denmark	23.3	26.0	27.1	29.2	25.2	26.1	26.8
France	15.9	19.0	18.5	19.3	17.3	18.5	19.5
Germany	16.4	22.2	22.9	25.5	22.7	24.0	25.3
United Kingdom	20.5	20.9	21.0	22.5	21.7	22.9	23.5
United States	9.0	10.3	11.4	12.6	10.2	11.6	12.4
China	15.8	15.3	20.2	18.0	15.6	17.4	17.6

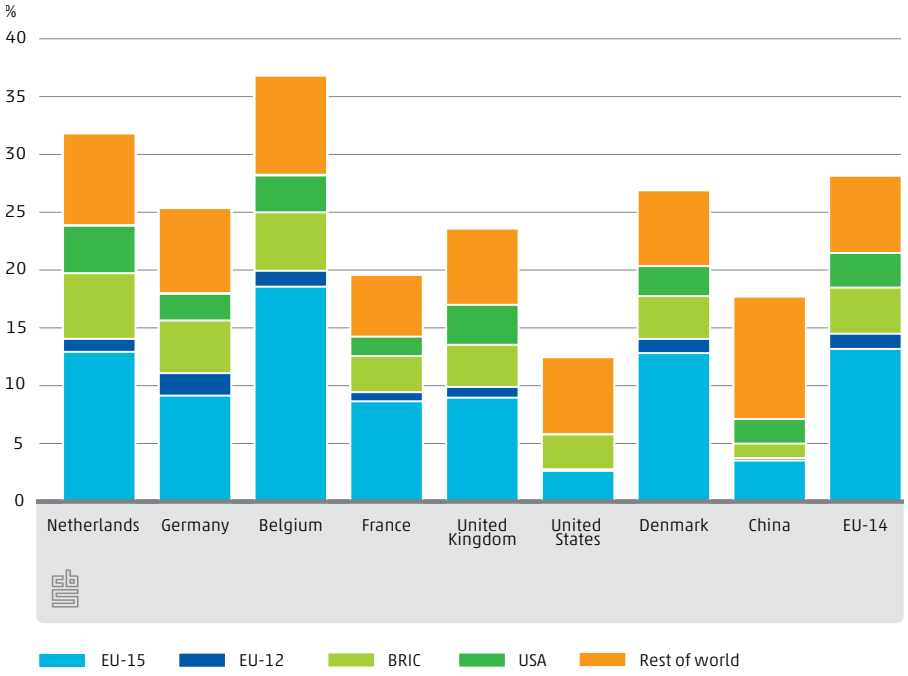
Source: WIOD, calculated by Statistics Netherlands.

Figure 2.5.2 and 2.5.3 reflect, among others, the rise of the BRIC countries during 1995 and 2011. For example, in 1995 imports from BRIC fulfilled 1.7 percent of Dutch final demand, but in 2011 this share had already risen to 5.7 percent. The share of the group "Rest of World" also grew, at the expense of the share of the EU-15. However, this is only a relative drop, and not an absolute one – it does not imply that they "lost" market share. On the contrary, their welfare grew during this period thanks to international trade. Their share diminished only because other countries grew even more.

2.5.2 Share of final domestic demand fulfilled by imports, 1995

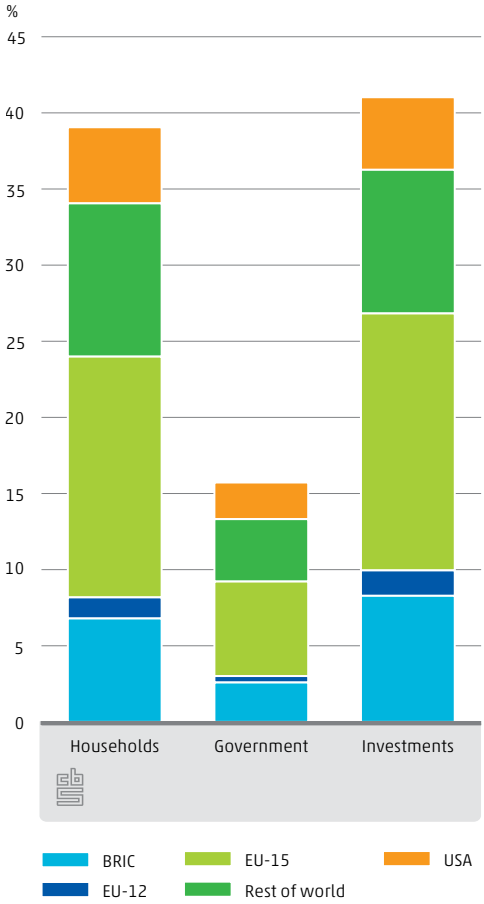


2.5.3 Share of final domestic demand fulfilled by imports, 2011*



Source: WIOD, calculated by Statistics Netherlands.

2.5.4 Foreign countries fulfilling Dutch final domestic demand, 2011*



Source: WIOD, calculated by Statistics Netherlands.

Figure 2.5.4 shows to what extent the individual components of domestic demand (household and government consumption and investment by the government and corporations) were satisfied by imported goods and services from specific country groups. As was to be expected, most of the commodities and services consumed by the government were created in the Netherlands. But about 40 percent of final demand by households and firms was fulfilled by foreign countries. The BRIC countries provided 7 percent of all value added for final demand of households, and 8 percent for that of investments by firms. Examples are apparel and consumer electronics for households and computers and business services for firms. However, the bulk of the value added is still created in the Netherlands.

2.6 Conclusions and suggestions for further research

This chapter showed that for the Netherlands the share of value added thanks to exports remained fairly constant between 1995 and 2011, whereas it increased for other countries such as Germany. Also, the share of foreign value added in Dutch final demand remained constant, whereas this rose for other countries. However, the share that abroad demands from and supplies to the Dutch economy was already high in 1995 and still is above average.

Compared to other countries, the Netherlands uses more commodities and/or services from the BRIC countries to fulfil final demand. Also, the share of value added thanks to the BRIC countries is higher in the Netherlands than in the average EU-14-country. In this way the Netherlands uses the possibilities of emerging markets. The value chains in turn also give emerging countries the possibility to benefit from globalisation.

Industries in the Dutch economy vary in terms of dependency on exports. Manufacturing and mining create over 80 percent of value added due to exports, but retail trade and restaurants and hotels only 29 percent. This is not surprising, because products of the manufacturing and mining industry can be transported easily to be consumed abroad. Whereas services usually have to be consumed close to where they were created.

Further research is necessary to show the consequences of global value chains. Besides statistics on trade in value added, statistics are needed on trade in income, trade in jobs and trade in CO_2 emissions (see chapter 4 in this publication or Hoekstra et al. (2013)) to properly consider their impact. Also, policy makers want to know in which value chains the Netherlands is involved, which types of jobs, which kinds of skills are needed and involved, and how the value chains are distributed among the regions in the Netherlands.

These questions can only be answered by a combination of macro and micro-statistics. The macro-statistics are necessary, because they give an integrated, consistent image of the Dutch economy. The OECD (2013a) pointed out that it is impossible to disentangle every single value chain by hand, and that such a case study approach would typically only show where the intermediate components were produced, but not where the intermediates parts for these components were produced and so on. This problem, albeit on a very aggregate scale, is solved if one

starts from the framework of National Accounts. The micro-statistics are necessary to properly introduce the heterogeneity that is not visible in the National Accounts. For example, using standard input-output techniques yields that for one euro of production by an enterprise in a given industry the same employment is needed, regardless whether this enterprise exports or only produces for the domestic market. But it is a stylised fact that exporters are more productive than non-exporters (Bernard and Jensen (1997), Wagner (2005), Jaarsma and Lemmens-Dirix (2011)).

A successful example of integrating macro-statistics and micro-statistics was the work on environmental footprints (Hoekstra et al. 2013). Traditionally, national accounts do not distinguish between countries of imports. Micro-data on international trade shows from which countries which commodities and services are imported, and production of the same commodities and services in different countries yields different CO2 emissions. Furthermore, the micro-data added information on the share of imports by country of origin destined for the Dutch market. This greatly helped to further improve the already existing estimates and thus reduce margins of error.