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Publication date
2017
Document Version
Final published version

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Amsterdam, 16 January 2017
Commissioned by the Ministry of Foreign Affairs, the Netherlands

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SEO report nr. 2017-03

ISBN 978-90-6733-850-9

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1 Introduction

The Netherlands is a small open economy, with exports constituting around one third of GDP (CBS 2015). Yet only a small fraction of those exports go to Asia. This is surprising, given that emerging markets like China and India have grown very rapidly in the past 15 years. China's economy grew 9-fold during 2000-2015 while India's GDP quadrupled during the same period. Southeast Asian countries have also grown rapidly, with the Philippines growing its economy 3.6 times, Thailand more than 3 times and Indonesia 5 times between 2000 and 2015 (World Bank 2015). Together, China, India and South Asia have more than 3 billion consumers – constituting an enormous market.

The Dutch Ministry of Foreign Affairs has noted that Dutch exports to Asia lag behind those of other European countries. While Dutch exports to Asia have increased, the Asian exports of neighbouring countries such as Belgium and Germany have risen faster. While the Netherlands keeps up with its peers in terms of the export of services to Asia, it particularly lags behind with regard to the export of goods to Asia. One possible reason is that Dutch companies still focus too much on traditional export routes for goods and are too focused on Western Europe (Accountant 2015). Another possible reason is that the Netherlands simply does not have a comparative advantage in the goods that are demanded by Asian countries.

At the request of the Ministry, SEO investigates to what extent Dutch companies have already taken advantage of export opportunities to Asia, and to what extent potential opportunities might still exist, particularly for the export of goods. To make this assessment, we first analyse existing trade flows by sector between the Netherlands and Asia. We compare these to the trade flows of four benchmark countries in Western Europe that are similar to the Netherlands in many respects. To identify opportunities, we make an assessment of the comparative advantages of Dutch exports by sector. A potential opportunity in Asia is then defined as an export sector in which the Netherlands does have a comparative advantage and is doing well in terms of worldwide exports, whereas for some reason this sector does not (yet) export much to Asia.

It is important to point out the limitations of this study in advance. First, we limit ourselves to identifying potential opportunities in a 'statistical' sense and do not pretend to claim that all of these are real business opportunities. In many cases, there may be very good reasons why an apparent opportunity is not yet being exploited. To assess whether or not this is the case, further research will be needed into each specific (sub)sector, which is beyond the scope of this study.

Second, we use sector classifications based on international standards in trade statistics, which are not always comparable to the names of 'top sectors' more commonly known in the Netherlands, such as 'logistics', 'water', or 'life sciences and health'. It might therefore appear that this study does not say anything about such 'top sectors' but in fact these sectors are covered under different headings such as 'transportation and storage', 'construction', or 'machinery and equipment'.

Finally, to keep the study to a manageable size, we focus only on seven specific Asian countries as requested by the Ministry. To this list we have added Hong Kong, which tends to serve as a hub

for exports to China. As a benchmark, we compare Dutch exports to Asia with the exports of four other countries in Western Europe. An overview of these countries is given in Table 1.1.

Table 1.1 Benchmark and Asian countries considered in this study

Asian countries	Benchmark countries
China (and Hong Kong)	Germany
India	Belgium
Indonesia	Denmark
Malaysia	United Kingdom
Philippines	
Thailand	
Vietnam	

The remainder of this report is organised as follows. First, we explain the important difference between gross exports and value added exports, and describe our data sources (Chapter 2). We then analyse existing Dutch export patterns and compare these with Dutch export flows to Asia (Chapter 3). Subsequently, we explain the theory of comparative advantage and compute the comparative advantages for all Dutch sectors, comparing them to those of the benchmark countries (Chapter 4). This puts us in a position to properly identify success stories and opportunities in exports to Asia (Chapter 5), which we further explore through two case studies on opportunities in the food sector (Chapter 6) and successes in high-tech exports to Asia (Chapter 7). Chapter 8 presents the conclusions and suggestions for further research.

2 Trade Data

In this report we use three different data sources. The two most important sources are the value added export data of the TiVA dataset and the gross export data of Comtrade.

2.1 Gross exports and value added exports

Before we start our analysis, it is important to distinguish between 'gross exports' (the total *value* of exports) and 'value added exports' (gross exports minus the value of imported components used in the production of these exports). Traditionally, economists tend to focus on gross exports, regardless of which part of the product (or which *value added*) is actually produced in the Netherlands. These gross trade data exist at a very detailed level and are consistently reported for nearly all countries in the world. Moreover, they are updated regularly.

Gross export values can be misleading, however, because modern trade is no longer characterised by simply trading finished products between countries. Nowadays, parts of products and semi-products frequently cross borders to be further produced in a second, third or fourth country. In that case, a significant part of the value of the end product derives from the value of imported components, implying that there can be large differences between gross and value added export data (Brakman et al., 2015).

Using value added export data has the advantage of focusing only on the value added created by the exporting country, thus subtracting the value of imported components. Another advantage of value added export data is that they exist for both goods and services, while consistent gross export data exist only for goods. However, there is a significant lag in data availability and they are currently available only through 2011. In an attempt to obtain the best of both worlds, we use a combination of gross and value added export data for the analysis in this report.

2.2 Data sources

In this report we use three different trade data sources, all of which have their advantages and disadvantages. Each of the three data sources is described briefly below in table Table 2.1.

Table 2.1 Three different datasets, each with their own (dis)advantages

	TiVA	Comtrade	EBOPS
Source	OECD/WTO	UN	UN
Period	1995-2011	1995-2015	2014
Gross/added value	Value added	Gross	Gross
Import/Export	Export	Import + Export	Import + Export
Goods/Services	Goods + services	Goods	Services
Level of detail	34 sectors	Highly detailed	Detailed but plagued by missing data

Source: SEO Amsterdam Economics based on UN (2016), OECD/UN (2016), OECD (2016)

2.2.1 Data on Trade in Value Added (TiVA)

TiVA is a joint OECD-WTO initiative and is aimed at solving the shortcomings of gross export data. Gross exports and imports are measured by customs officials as they cross national borders. However, global value chains and international fragmentation of production mean that goods that are exported by a specific country are not necessarily also produced there. The country exporting the final product (which carries the most value) may have simply assembled the components, provided quality control or packaged the product. Registering the finished product as an export of this country would mean overestimating the actual contribution of this country to global value chains. Dutch exports of petroleum products, for example, would appear to be very large based on gross export data, but may be less significant when correcting for the fact that the key component – oil – is imported.[1]

The TiVA database provides a remedy by only measuring the amount of domestic value added content in exports. For example, an exported car contains thousands of parts made in many different countries. Rather than attributing all of this value to the single country exporting the final product, TiVA only counts each country's share of value added to the finished product.

Using TiVA has both advantages and disadvantages. An advantage of TiVA is that it contains both goods and services data. The three disadvantages of TiVA are that (1) it contains only data on exports (no imports), (2) the data is only available up to 2011, and (3) TiVA only distinguishes 34 sectors, with no possibility to 'zoom in' on more detailed subsectors.

2.2.2 Data on gross exports of goods (Comtrade)

For more detailed trade data we use the Comtrade database on gross exports of goods. Comtrade is a United Nations (UN) database which contains very detailed gross import and export data for all countries in the world. Commodity groups can be as detailed as 5 digits, which means up to a basic heading of a subgroup of a group of a division of a section. To give an example of the level of detail available, we show the location of flower bulbs in the Comtrade classification:

- Section: 2 - Crude materials, inedible, except fuels
    - Division: 29 - Crude animal and vegetable materials, not elsewhere specified
        - Group: 292 - Crude vegetable materials, not elsewhere specified
            - Subgroup: 292.6 - Bulbs, tubers and rhizomes of flowering or of foliage plants; cuttings, slips, live trees and other plants
                - Basic heading: 292.61 - Bulbs, tubers, tuberous roots, corms, crowns and rhizomes, dormant, in growth or in flower; chicory plants and roots (other than roots of subgroup 054.8)

[1] As Brakman and van Marrewijk (2015) explain: "International fragmentation of the production process has become a salient characteristic of the world economy and international trade flows no longer, or to a lesser extent than it used to be, reflect what a country is producing and exporting (see Brakman et al. 2015b for some recent references). The export of a computer, for example, is in a fragmented world no longer reflecting the production of that computer from start to finish. The country involved might only contribute a (small) fragment of the production process, or in other words, add only a part of the total value added of the final product (Johnson 2014). Analysing the characteristics of international trade flows thus becomes more challenging."

The Comtrade dataset is surprisingly complete, with data that consistently adds up even for smaller and less developed countries. We use the Comtrade data therefore to map trade flows between countries, including the imports of the Asian countries of interest. One of the major disadvantages of Comtrade is that the dataset only relates to goods and not to services. Also, the fact that Comtrade contains gross data could give a distorted view of exports and imports.

2.2.3 Data on gross exports of services (EBOPS)

The third dataset that we use is the Extended Balance of Payments Services (EBOPS) dataset, a combined initiative of the United Nations and the OECD. This dataset complements the Comtrade dataset as it contains data on the export and import of services. It is fairly detailed in coding and is available up to 2014. However, only (most) EU countries report imports and exports of services by destination country and by sector. Countries outside the EU only report total imports and exports of services, which is not very informative for the purpose of this study. Also, the Netherlands does not report services up to a very detailed level. Moreover, the data seems to be inconsistent to the extent that reported exports and imports from individual partner countries do not add up to the figures given for 'total' imports and exports, and more detailed subgroups do not correctly add up to their corresponding main group exports.

3 Key Dutch Export Sectors and Destinations

Given the highly competitive nature of global trade, it is likely that export opportunities in Asia will mostly occur in those sectors in which the Netherlands is already an established exporter. This chapter identifies those sectors.

Section 3.1 first identifies the key Dutch export sectors and shows that it makes a big difference whether one uses gross export data or value added data. Section 3.2 then takes a look at current Dutch export destinations. Finally, section 3.3 analyses current Dutch exports to Asia and compares these with the exports of 'benchmark countries' in Europe.

3.1 Key Dutch Export Sectors

The most important Dutch export sectors are services. Table 3.1 shows the top 10 sectors for Dutch exports. On the left we see exports in value added, for services and goods. Services take up positions 1 to 4. Transport and trade are the number 1 and 2 export sectors. This is not surprising, since Europe's largest port is in Rotterdam and the Dutch are known as specialists in trade, transportation and logistics for the European mainland. The Dutch government identified logistics as a top sector (Topsector Logistiek, 2016). Finance and insurance and 'other business activities' rank as numbers 3 and 4. These are the Netherlands' large banking sector, the financial companies at Amsterdam's 'southern axis' and the many consulting and advisory activities that are partly related to the special tax status of the Netherlands. With regard to the export of goods, chemicals is a large export sector. The Dutch government identified the chemicals sector as another 'top sector', reflected by the fact that 19 out of the 25 largest chemicals companies in the world have a production location in the Netherlands (Topsector Chemie, 2016).

When looking at gross exports of goods, the largest Dutch export sectors are machinery and transport equipment, chemicals and mineral fuels. As can be seen in Table 3.1 on the right side, these three heavy industries account for nearly 60% of goods exports. The next biggest sector is the agricultural category 'food and live animals' (13%), followed by some minor categories that each account for less than 10%.

The top export sector in terms of gross export values is 'machinery and transport equipment'. Note that it is only number 10 when looking at value added exports. This difference suggests that a significant part of the machinery exported is produced using imported components.

The second largest export sector in terms of gross export values is chemicals, which was also in the top 5 for value added exports. The third largest export sector is mineral fuels, which is again related to the large oil refining and gas production business in the Netherlands. In fourth place is a well-known Dutch export sector: food and live animals. This is consistent with the fact that the Netherlands is the second largest food exporter in the world. Traditionally, the Netherlands has been a major exporter of meat, dairy, fruit and vegetables.

The export of 'miscellaneous manufactured articles' in fifth position mainly reflects the Dutch export of specialised high-tech products, for example medical apparatus. We will discuss this sector in more detail in chapter 7.

Table 3.1 Based on value added export data, the top Dutch export sectors are transport, trade and finance. Based on gross export data, the top sectors are machinery, chemicals, minerals and food.

Goods & services (value added)	mln. US$	% of total exports	Goods (gross exports)	mln. US$	% of total exports
Transport and storage	36,289	16%	Machinery, transport equipment	132,193	28%
Wholesale and retail trade; repairs	23,370	10%	Chemicals	84,131	18%
Finance and insurance	22,013	10%	Mineral fuels	62,477	13%
R&D and other Business Activities	21,297	9%	Food and live animals	62,369	13%
Chemicals and chemical products	18,279	8%	Miscellaneous manufactured articles	50,957	11%
Food products, beverages and tobacco	17,569	8%	Basic manufactures	40,586	9%
Coke, refined petroleum products and nuclear fuel	13,077	6%	Crude materials	21,754	5%
Other community, social and personal services	8,548	4%	Beverages and tobacco	6,769	1%
Agriculture, hunting, forestry and fishing	8,508	4%	Other goods	6,591	1%
Other machinery and equipment	8,137	4%	Animal and vegetable oils and fats	4,131	1%

Sources: TiVA (2011), Comtrade (2015), EBOPS (2014)

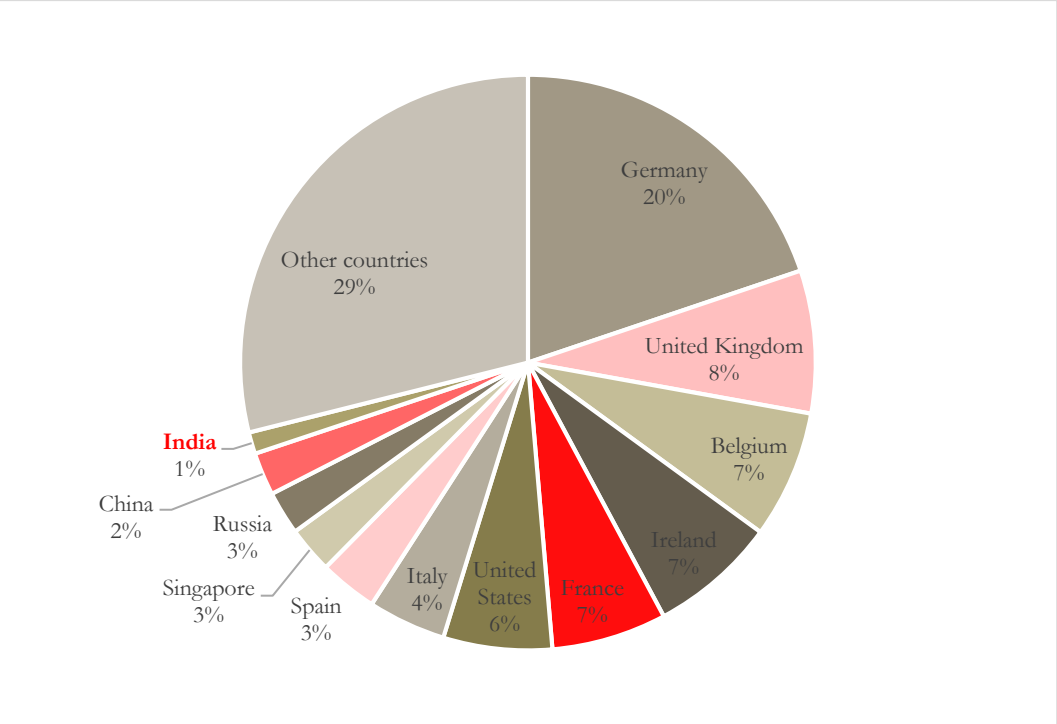
Our gross value export data on goods allows us to look at specific goods exports at a more detailed level of aggregation. Table 3.1 showed that the largest export sector among the main groups is 'machinery and transport equipment'. This also shows in sectors at a more detailed level: office machines, telecom, and electric machinery (together 43%) all stem from this group. Furthermore, the 'mineral fuels' exports mainly consist of petroleum. The main chemicals exports consist of pharmaceutical products. Thus, it appears that the Netherlands exports a diverse and high-tech assortment of goods.

3.2 Key Dutch Export Destinations

To gain a good overview of Dutch exports, it is not only important to consider *what* the Netherlands exports, but also *to where* it exports. Figure 3. 1 shows that Europe, especially Germany, and the US are the key Dutch export destinations. Germany and the UK are important for both goods and services exports. Belgium is mainly a destination for goods exports, while Ireland is almost exclusively a destination for exports of services, particularly financial services.

Note that there are no Asian countries amongst the top 5 Dutch export destinations. Singapore ranks 9th with 3% of Dutch exports, mainly due to services exports, and China is 11th accounting for only 2% of Dutch exports. India accounts for only 1%.

Figure 3.1 Europe is by far the most important export destination for the Netherlands, while China and India account for only 2% and 1% of total exports.



Source: TiVA (2011)

3.3 Dutch Exports to Asia

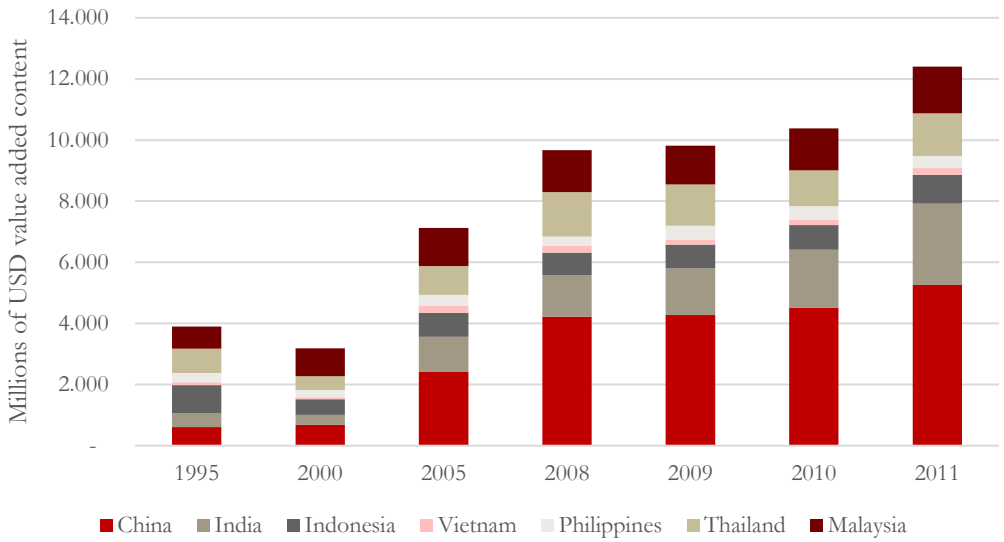
3.3.1 Exports to Asia: developments over time

Figure 3. 2 shows that since the year 2000, Dutch exports to Asian countries have been on the rise. Whereas only 2.5 billion US$ was exported in 2000, exports to these countries were worth more than 12 billion US$ in value added in 2011. This number has likely increased since then.

Among the countries considered in this study, China is the chief export destination by far,[2] and India comes second. Thailand and Malaysia are medium-sized export partners. Exports to Vietnam and the Philippines are very small, even compared to their Asian counterparts.

[2] Singapore is the largest Asian export destination, but is not considered in this study.

Figure 3.2 Dutch exports to Asia are small but have been on the rise



Source: SEO Amsterdam Economics, based on TiVA-database

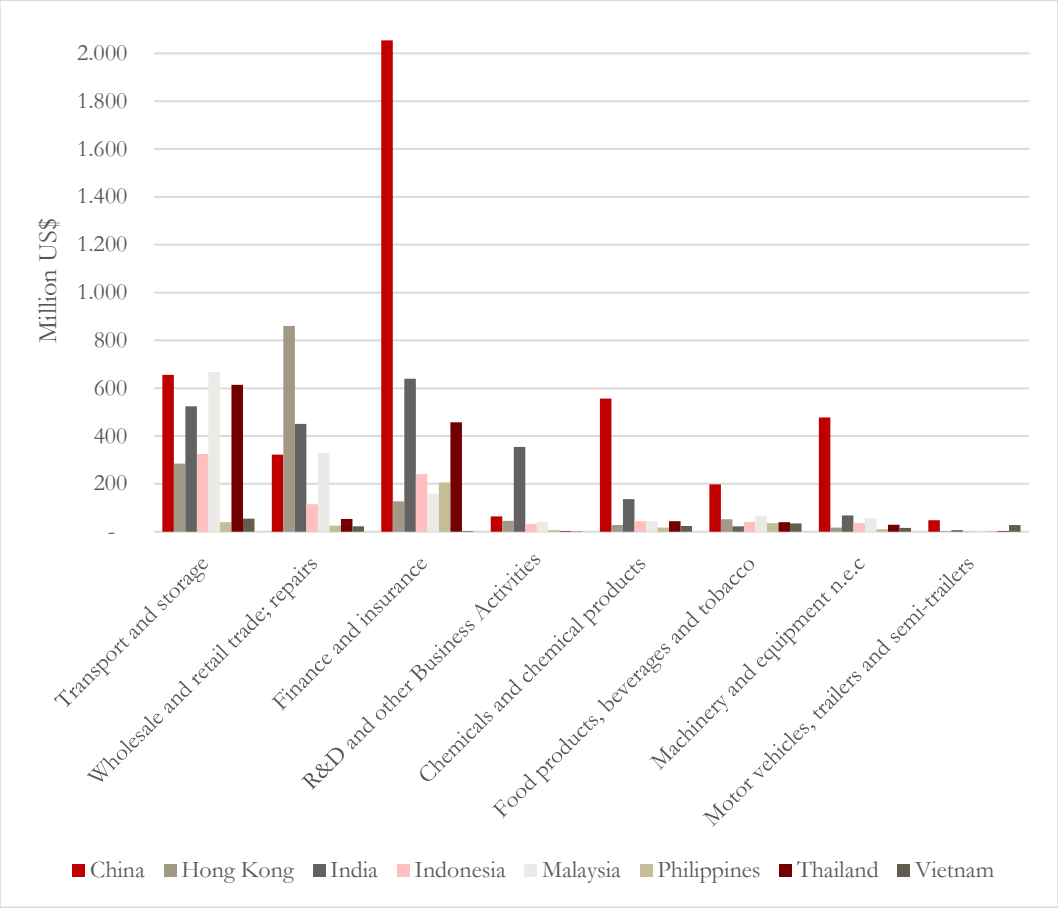
3.3.2 Exports to Asia: sectors

In line with the largest Dutch export sectors in general, exports to Asia are largely services. With respect to the export of goods, the largest export flows to Asia occur in sectors such as chemicals, food, and machinery and equipment.

As noted above, the main exports for the Netherlands to the rest of the world are transport, trade, finance, business activities and chemicals. This top 5 is clearly visible in exports to Asia as well. Services sectors prevail in Dutch export to Asia, with transport, trade, finance and other business activities being large in China, India and Hong Kong. Finance exports to China are remarkably high in particular. Chemicals, food and machinery are also large categories for Dutch exports to China.

China, Hong Kong and India are the main export destinations for Dutch companies, as we can see in Figure 3. 3. Indonesia, Malaysia, and Thailand are much smaller, although they are destinations for transport, trade and finance. The Philippines and Vietnam are not large consumers of Dutch exports.

Figure 3.3 Services in transport, trade and finance are the largest exports to Asian partner countries

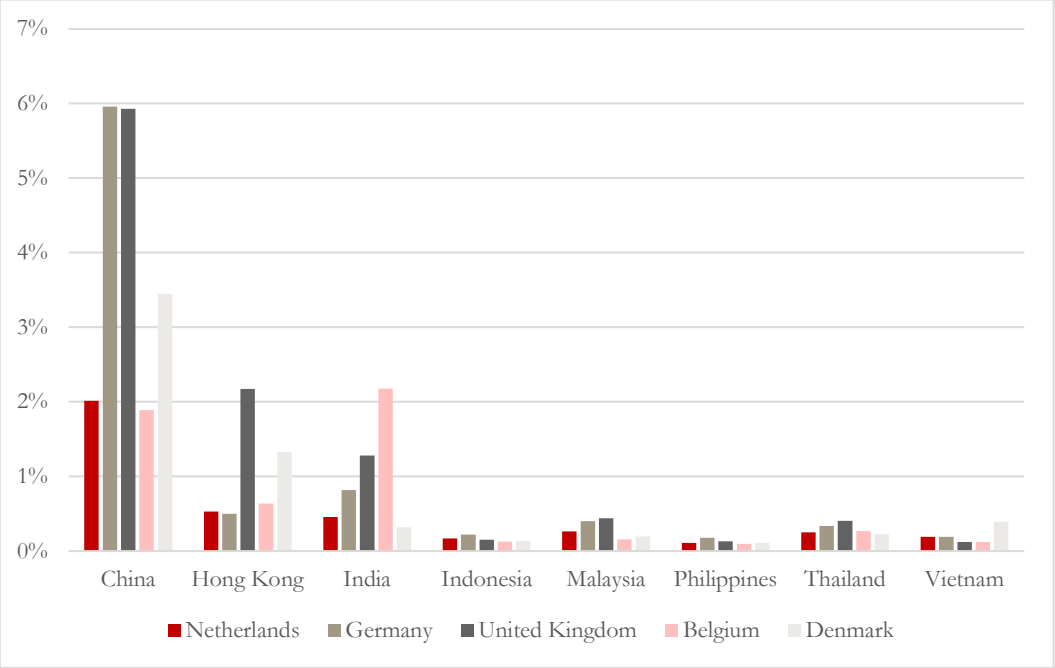


Source: TiVA (2011)

3.3.3 Exports to Asia: the Netherlands lags behind benchmark countries

Dutch exports to Asia clearly lag behind those of its peers, even when taking into account the smaller size of the Dutch economy, as Figure 3. 4 shows. In 2015, only 2% of Dutch total gross exports went to China, compared with around 6% for Germany or the UK. Similarly, Dutch gross exports to India in 2015 constituted only 0.5% of total Dutch gross exports, compared with 2.2% for Belgium, which is similar to the Netherlands in many respects. And countries such as Germany and the UK generally export more to Southeast Asia, even as a percentage of total exports.

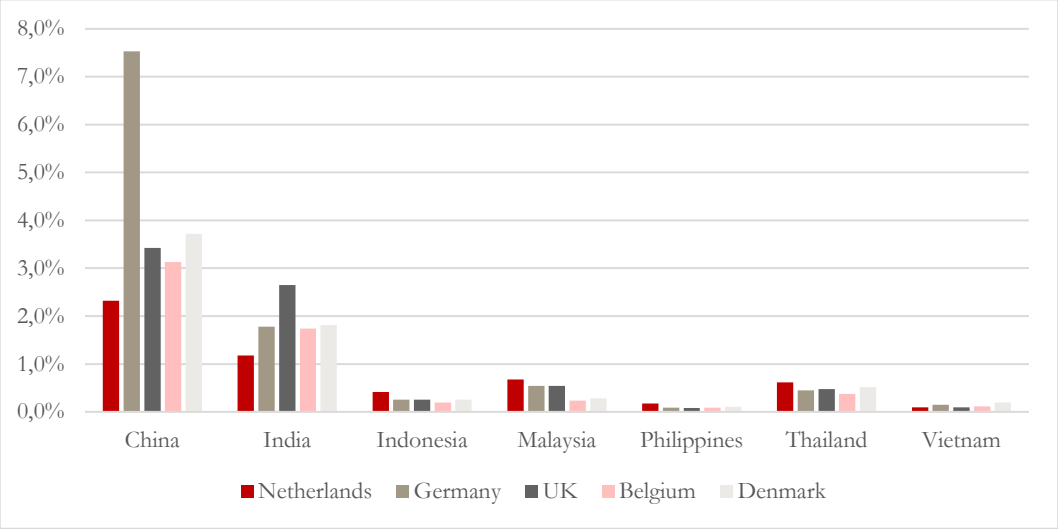
Figure 3.4 The Netherlands lags behind its peers in gross exports to Asia (2015)



Source: SEO Amsterdam Economics; Comtrade (2015)

The Netherlands also lags behind on the basis of value added export data. Figure 3. 5 shows that in 2011, the last year for which TiVA data are available, around 7.5% of German exports were going to China, whereas for the Netherlands this was only 2%. All benchmark countries had larger shares of exports going to China and India than the Netherlands. For Germany, more than half of all value added exports are in machinery and transport equipment, which is likely related to the export of German cars and (parts of) heavy machinery. For the UK, a large share of exports to Asia are in the services sector, particularly finance and insurance, but also R&D and 'other business services'.

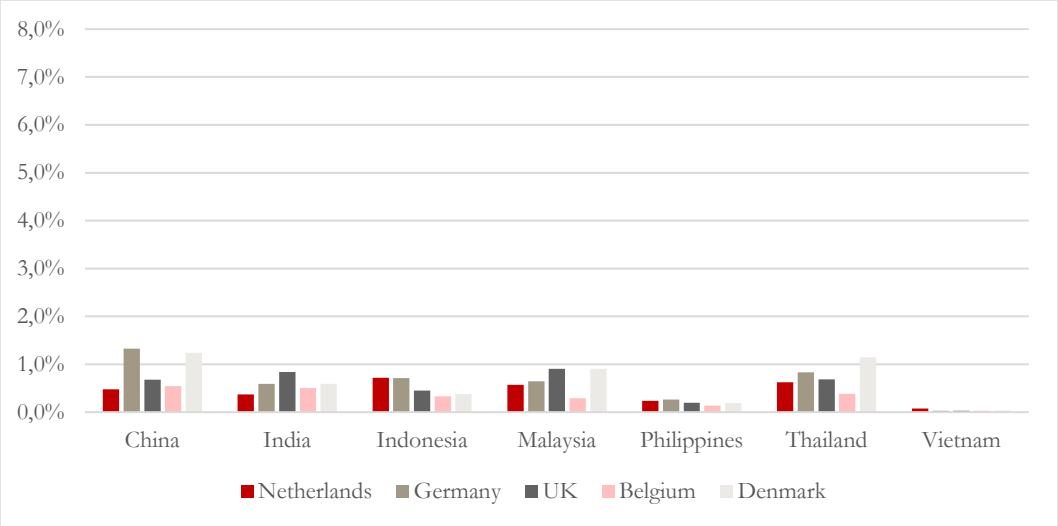
Figure 3.5 The Netherlands also lags behind its peers in terms of value added exports to Asia



Source: SEO Amsterdam Economics; TiVA (2011)

Comparing this to the situation in 1995, as shown in Figure 3. 6, we see that exports to Asia have risen considerably. Both Dutch and benchmark exports to Asia were very small in 1995, with a maximum of 1.3% for Germany in China. Exports from Europe have mainly increased to China and India, with regard to the other countries not much has changed.

Figure 3.6 In 1995, exports to Asia were limited for both the Netherlands and its neighbouring peers

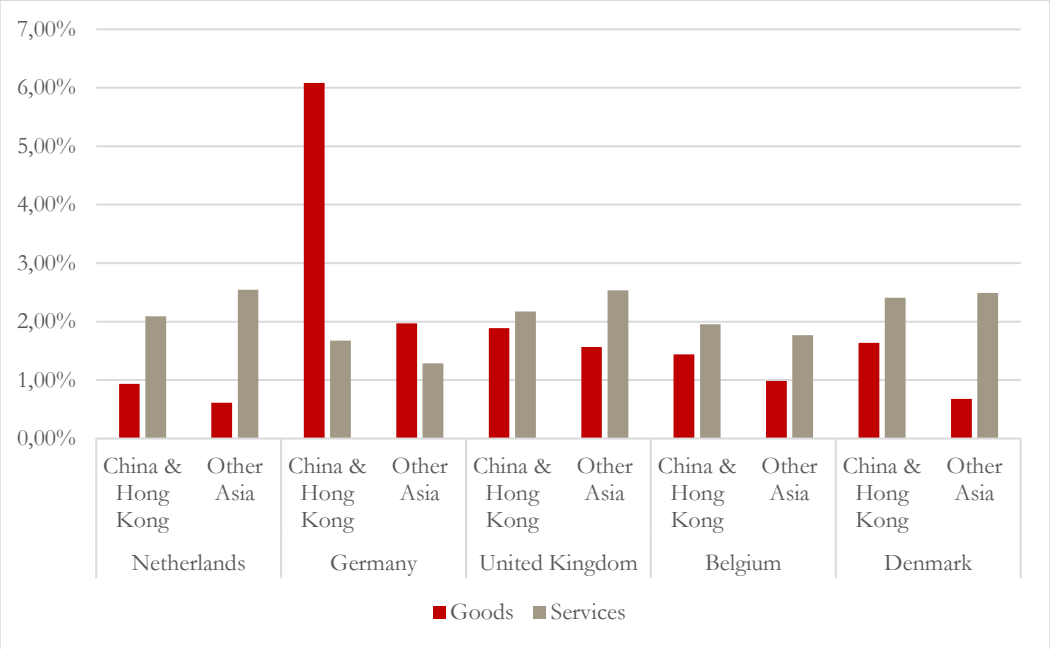


Source: SEO Amsterdam Economics; TiVA (1995).

When breaking down value added exports into goods and services, we see that the Netherlands clearly lags behind in terms of exports of goods to Asia, but it does not lag behind in terms of exports of services. As Figure 3. 7 shows, services exports to China constituted around 2 percent of total Dutch exports, which is similar to the share of services exports by our European benchmark countries, and even larger than Germany's share. As noted in section 3.3.2, the services exports by the Netherlands mostly fall within the categories of finance and insurance, transport and storage, and wholesale and retail trade. Germany's key exports to China, on the other hand,

mostly consist of goods, notably transport equipment (mainly motor vehicles), electrical equipment, and machinery and equipment, which reflects the industrial ties between China and Germany. The UK, Belgium and Denmark all have larger services exports than goods exports to Asia, like the Netherlands. For the UK it mostly concerns finance, for Belgium the export composition is similar to that of the Netherlands (finance, transport, trade), while for Denmark a substantial part of exports to Asia consist of transport and storage services.

Figure 3.7 The Netherlands particularly lags behind in terms of value added exports of goods to Asia[3]



Source: SEO Amsterdam Economics; TiVA (2011)

[3] Other Asia comprises total exports to India, Indonesia, Malaysia, the Philippines, Thailand and Vietnam

4 Revealed comparative advantages for the Netherlands

This chapter identifies the comparative advantages of the Dutch economy. The highest comparative advantages for the Netherlands are found in services sectors (transport, finance, and business activities), but also in the agro-food sector, mineral fuels and chemicals the Netherlands has strong comparative advantages.

Chapter 4.2 explains economic theory on comparative advantages. Chapter 4.3 explains the method of Revealed Comparative Advantages used in this report. Chapter 4.4 shows the export categories in which the Netherlands is most specialised and in which it has the greatest comparative advantages. Chapter 4.5 assesses the key Dutch comparative advantages in goods, and chapter 4.6 the key Dutch comparative advantages in services.

4.1 Introduction

When aiming to identify 'opportunities' for Dutch exports to Asia, it is important to take into account the comparative advantages of other countries with which the Netherlands may compete. We do this by using the concept of Revealed Comparative Advantage (RCA). As we will explain, the RCA concept offers a way to objectively assess the *relative* strengths and weaknesses of the Dutch economy. When doing so, it is also important to correct for differences in country size and sector size. We do this by using the normalised version of the RCA concept, which we refer to as 'NRCA' or 'normalised revealed comparative advantage'. The NRCAs that we calculate for Dutch sectors and subsectors are fully 'neutral' in that they can be objectively compared to those of our competitors when it comes to trade with Asia. The country with the highest NRCA in a sector can therefore be seen as being more competitive in that sector.

In order to assess the comparative advantages of the Netherlands, it is best to use export data based on value added. However, as explained above, data on trade in value added are available only at a relatively high level of aggregation, such as 'food'. In order to determine in which specific subsectors comparative advantages occur, we therefore also compute NRCAs for gross export data. The more specifically these subsectors are defined (i.e., the lower the level of aggregation), the smaller the difference between gross and value added exports. Therefore, using gross export data is less of a problem when we look at a detailed subsector level.

4.2 The rationale behind trade

For those less familiar with the concept of comparative advantage, we start with a brief recap of basic international trade theory. In order for trade between two countries to be beneficial for both parties, it is not strictly necessary that country A can produce something that country B desires but cannot produce itself. Trade can also be beneficial when country A is more efficient in producing the product that country B desires, even if country B can also produce this product itself. In this

case, country A has an absolute advantage over country B in the production of a product. Country B can benefit from importing the product because it is cheaper than making it domestically.

While this is part of the reason trade occurs, David Ricardo (1817) pointed out that it is not the *absolute* advantage in production that matters for trade, but the *relative* or "comparative" advantage. To explain this concept, he provided an example in which Portugal was more efficient in producing both cloth and wine, compared to England. It would seem then that England would be best off by simply importing both of these products from Portugal without producing any of them itself. However, Ricardo explained that specialisation would still pay off in this example.

Ricardo's insight was that the relative costs of producing those two goods differ between the countries. Suppose, for example, that in England, producing cloth takes 100 hours of work, while for the production of wine 120 hours is needed, as shown in Table 4.1. In Portugal respectively 90 and 80 hours are necessary. Put differently, in England producing one unit of cloth is equally costly as producing 0.8 units of wine. In Portugal however, producing one unit of cloth carries the same costs as producing 1.1 unit of wine. This means that even though Portugal is more efficient in producing both goods, England is more efficient in producing cloth compared to wine.[4] Ricardo thus concluded that England has a comparative advantage in the production of cloth, and Portugal in wine.

Table 4.1 England has a comparative advantage in cloth, Portugal in wine

	Hours on cloth	Hours on wine	'Price' of cloth	'Price' of wine	Comparative advantage
England	100	120	0.8 wine	1.2 cloth	Cloth
Portugal	90	80	1.1 wine	0.9 cloth	Wine

Source: SEO Amsterdam Economics

Due to these comparative advantages, trade between England and Portugal occurs. Without trading, England needs 220 hours of work to produce one unit of cloth and one unit of wine. Portugal needs 170 hours , as shown in Table 4.2. In this scenario, after 220 and 170 hours of work they both have 1 unit of wine and 1 unit of cloth. If both countries do trade and fully specialize in the product in which they are best comparatively speaking, the total production increases, as shown in Table 4.3. In that case England would be able to produce 2.2 units of cloth (in 220 hours) and Portugal would produce 2.125 units of wine (in 170 hours). Total production thus increases by 0.2 units of cloth and 0.125 units of wine. Meanwhile, the total number of hours worked has remained the same. By specialising and trading both countries profit.

Table 4.2 With no trade, 220 hours of work result in 4 'units' of cloth and wine

No trade	Hours on cloth	Units of cloth	Hours on wine	Litres of wine	Total hours
Portugal	90	1	80	1	170
England	100	1	120	1	220
Total cloth/wine		**2**		**2**	**4**

Source: SEO Amsterdam Economics

[4] England can produce cloth for the costs of 'only' 0.8 units of wine whereas Portugal needs the effort of 1.1 units of wine to produce that same unit of cloth. Producing cloth is thus relatively cheaper in England than in Portugal.

Table 4.3 With trade, 220 hours of work result in 4.325 'units' of cloth and wine

	Trade	Hours on cloth	Units of cloth	Hours on wine	Litres of wine	Total hours
Portugal				170	2.125	170
England		220	2.2			220
Total cloth/wine			**2.2**		**2.125**	**4.325**

Source: SEO Amsterdam Economics

Hence, specialising in what one is relatively best at and trading with countries that have a relative advantage in other commodities is beneficial for both trading partners. Ricardo's comparative advantage remains a well-known concept in economics up to this day.

4.3 Measuring Comparative Advantages

4.3.1 Revealed Comparative Advantage (RCA)

To measure the comparative advantage of one country or another, an economist needs to know the relative prices of production factors of these countries. Comparative advantages arise due to so-called 'factor endowments', such as the availability of land, labour and capital (Jackman et al. 2011). The differences in factor endowments across countries make that one factor (say: capital and labour) is cheaper in one country than in the other. That specific country then produces something that requires this 'cheaper' factor and trades it for something for which its factor endowment is less favourable (say: sunshine and land), just as England trades clothes for wine with Portugal.

However, the relative prices of factors are a rather theoretical concept and not observable. This makes measuring a comparative advantage based on the level of technology or available factor endowment difficult.

Balassa (1965) therefore developed a method to measure comparative advantage based on the existing export flows of countries. In this manner it is not necessary to search for the causes of a comparative advantage (differences in technologies or factor endowments). Put differently, this method looks at the resulting export flows rather than the underlying causes to find comparative advantages of countries. Balassa's method is currently the most widely used approach to analysing comparative advantages and is known as the Balassa Index or Revealed Comparative Advantage (RCA) (Jackman et al. 2011). The revealed comparative (dis)advantage of a country i in commodity j is calculated as:

$$RCA = \frac{\frac{export\ of\ country\ i\ in\ commodity\ j}{total\ exports\ of\ country\ i}}{\frac{exports\ of\ country\ peer\ group\ in\ commodity\ j}{total\ exports\ of\ country\ peer\ group}}$$

A country has a comparative advantage if the relative share of exports in commodity j compared to its total exports is larger than that same share for the peer group countries. If 10% of Dutch exports are flowers whereas only 5% of the total exports of peer group countries are flowers, an RCA of 2 is computed. An RCA of over 1 signifies a comparative advantage. An RCA of between

0 and 1 means that a country has a comparative disadvantage in the production of that specific commodity.

The main advantage of RCA is that it is a relative straightforward way to calculate comparative advantages. It is not necessary to know or estimate the background of a certain advantage (the differences in production factors). It only requires trade data of the country of interest and trade data of a peer group of countries for comparison. A possible disadvantage is that a country may actually export products in which it has no real comparative advantage. This is because trade flows are determined not only by efficiency but also by trade barriers, historical trade patterns, political preferences and supply and demand stocks. All of these factors are unintentionally measured in the RCA. The fact, for example, that India trades a lot with the United Kingdom could be an expression of the historical and political relationship between the former colony and former coloniser rather than an expression of comparative advantages of the two countries (Leromain en Orefice, 2014).

Due to the relative simplicity of the method, the Balassa RCA remains a very popular measurement for comparative advantages up to this day. However, researchers have found several (econometrical) shortcomings of the Balassa RCA. First of all, the outcomes of the Balassa index are not symmetrical. Values in the Balassa index fall between 0 and 1 if a country does not have a comparative advantage, which means that they will lie closely together, with little room to differ from each other. Values are larger than 1 if the country does have an advantage. There is no maximum. This means that values that signify a comparative advantage differ between 1 and infinity. This makes it hard to compare values with each other. Second, Balassa RCAs are not easily comparable over countries, commodities or time. This means that we cannot readily compare the Netherlands' RCA in machinery with Germany's RCA in machinery (because of the different economy sizes). Neither can the Netherlands' RCA in chemicals be compared to the machinery RCA. This is true in particular when the world trade in chemicals is much larger than the world trade in machinery. Comparing RCA's from different years can be difficult when both economy size and commodity size have changed over time. Third, the Balassa RCA tends to be disproportionally large for small countries with an advantage in a certain commodity or for countries with an advantage in a commodity that has relatively little trade around the world (Yu 2009).

4.3.2 Normalised Revealed Comparative Advantage (NRCA)

A number of researchers have proposed alternative NRCA indices, which all improve certain aspects of Balassa NRCA (among others Vollrath 1991, Laursen 1998, Proudman and Redding 1998, Hoen and Oosterhaven 2006). We have chosen to use the alternative index proposed by Yu (2009), who developed the Normalised NRCA.

The Normalised NRCA is calculated as follows:

$$NRCA = \frac{export\ of\ country\ i\ in\ commodity\ j}{total\ world\ exports} - \left(\frac{total\ exports\ of\ country\ i}{total\ world\ exports} \cdot \frac{total\ world\ exports\ in\ commodity\ j}{total\ world\ exports}\right)$$

The export from a certain country of a certain commodity (say: the Netherlands' export in machinery) is compared to the total world export in all commodities and corrected for the relative

size of the country's total exports (the Netherlands' export of all commodities) and the size of the trade in the particular commodity (the size of machinery exports all over the world).

The values of the NRCA are symmetrical around 0. This means that a negative NRCA indicates a disadvantage and a positive NRCA indicates an advantage. There are as many negative NRCAs as there are positive ones, and they always add up to 0. Yu's NRCA has a maximum value of 0.25 and a minimum value of -0,25. For ease of reading we multiply each by four throughout this report to get a scale of -1 to 1.

NRCAs are comparable over time, commodity and country. It is thus possible to compare the Netherlands' NRCA in machinery exports in 2015 to Germany's NRCA in machinery exports. Similarly one can compare the Netherlands' NRCA in food exports to the Netherlands' machinery exports of calculate the NRCA over several years and analyse its development. The NRCA thus corrects for countries' total exports and the size of world trade in that commodity, making them comparable. If both Germany and the Netherlands have a low export share in textiles, this results in a larger negative NRCA for Germany because Germany has larger total exports. Also, a low export share for the Netherlands in textiles will result in a lower NRCA than a low export share in space freight, because textiles is a much larger trade sector worldwide.

4.4 Comparative Advantages of the Netherlands

When applying the NRCA concept outlined above to value added trade data, it appears that the strongest comparative advantages for the Netherlands occur in services sectors. Table 4.4 shows the Dutch sectors with the highest NRCAs, based on value added export data for 34 sectors. This suggests that the Netherlands is most competitive in transport and storage; finance and insurance; and R&D and 'other business activities'. Other services in which the Netherlands has relatively high NRCAs are 'other community, social and personal services', post and telecommunications, and construction.

Unfortunately, there is little additional information available on the export of services. Services data are not as accurate as goods data, tend to be inconsistent and incomplete for many countries, and are not available at a detailed subsector level. Hence, it is not possible to obtain a further breakdown of 'financial services' or 'other community, social and personal services'.

Table 4.4 Based on value added export data, the Netherlands has the strongest comparative advantages in Transport, Finance, R&D, Food, and Petroleum Products.

Rank sector	Export sector	NRCA	Development NRCA 1995-2011	% exports	Type[5]
1	Transport and storage	0.51	Stable	16%	Services
2	Finance and insurance	0.40	Increasing	10%	Services
3	R&D and other Business Activities	0.31	Stable	9%	Services
4	Food products, beverages and tobacco	0.24	Decreasing	8%	Goods
5	Coke, refined petroleum products and nuclear fuel	0.16	Stable	6%	Goods
6	Other community, social and personal services	0.14	Stable	4%	Services
7	Chemicals and chemical products	0.10	Decreasing	8%	Goods
8	Agriculture, hunting, forestry and fishing	0.09	Decreasing	4%	Goods
9	Post and telecommunications	0.08	Stable	2%	Services
10	Construction	0.05	Stable	1%	Goods

Source: SEO Amsterdam Economics, based on Trade in Value Added (TiVA) data for 2011 (latest available). NRCA stands for Normalized Revealed Comparative Advantage.

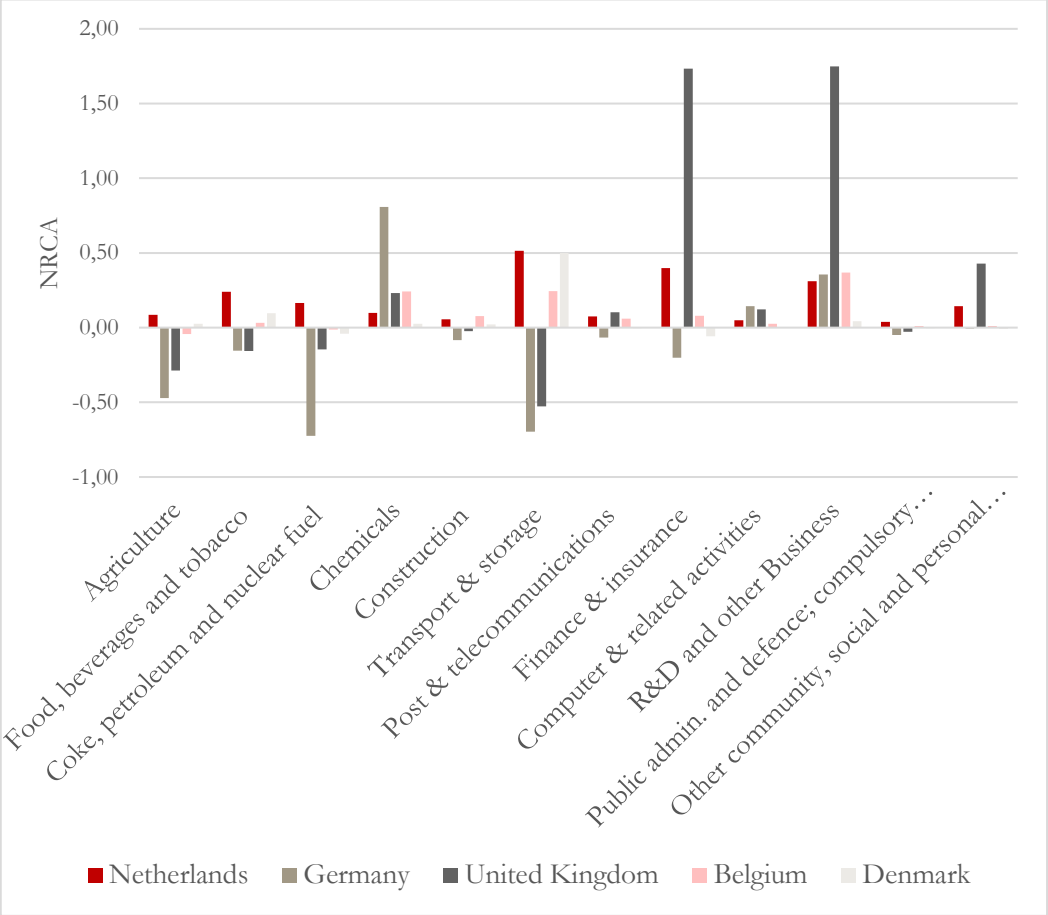
The strongest Dutch export sectors for goods (as opposed to services) are food, agriculture, petroleum, and chemicals. The international competitiveness of the Dutch agro-food sector is well-known and is consistent with its designation by the Dutch government as a 'top sector'. We devote more attention to this sector in Chapter 6. The identified strength of the Netherlands in the export of petroleum products is also natural given the significant refinery activities in Rotterdam.

One important export sector that is not included in the top 10 in Table 4.4 is 'wholesale and retail trade'. In the previous chapter, we showed that this was the second largest export sector of the Netherlands. The reason why this sector does not appear in the top 10 of most competitive sectors is that the Netherlands has a negative (and even decreasing) NRCA in this sector. Even though 10% of Dutch value added exports are related to the wholesale or retail trade, other countries are apparently even more specialised in wholesale and retail trade exports. However, some of these international trade flows may well be captured under 'transport and storage', the strongest export sector of the Netherlands.

When comparing the Dutch positive comparative advantages to the advantages of our peer countries in Figure 4.1 we see that the Netherlands has some strong competitors in several sectors. The Netherlands is best of its peer group in agriculture, food, petroleum and transport, and the Dutch do not have to worry much about competition from the peer group in these sectors. For other sectors, however, this is different. While the Netherlands is strong in chemicals, Germany, the UK and Belgium are even stronger in this sector. Germany stands out in particular as highly specialised in chemicals. Similarly, the Netherlands is strong in construction, but Denmark is even stronger. And while the Netherlands appears to have high NRCAs in finance and 'R&D and other business services', these scores are dwarfed by the UK's scores in these areas, undoubtedly driven by the City of London. The UK also outperforms the Netherlands in the telecom sector, although marginally.

5 The TiVA database uses the 'ISIC Rev 3' sector classification, which has loosely defined certain sectors as predominantly 'goods' or 'services' orientated.

Figure 4.1 The Netherlands is stronger than its peers in agriculture, food, fuel and transport

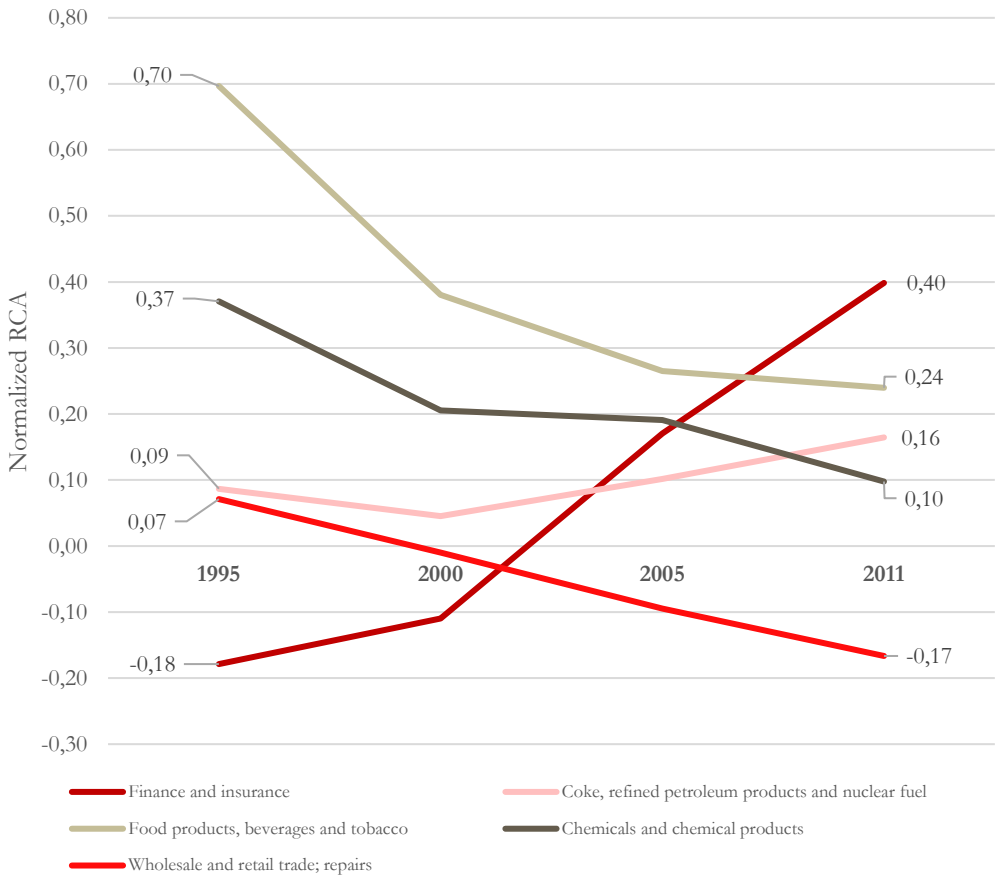


Source: SEO Amsterdam Economics, based on TiVA (2011). Normalized NRCAs calculated based on trade in value added content by sector.

When identifying opportunities for Dutch exporters, it is also important to look at changes in comparative advantages over time. As Figure 4.2 shows, the strong comparative advantages of traditional export sectors (food, trade, chemicals) have declined since 2000, as indicated by decreasing NRCAs. Other sectors are on the rise: there is relatively more focus on fossil fuels and there has been a relatively fast growth in the competitiveness of the Dutch finance sector: its NRCA has increased rapidly from -0.10 in 2000 to a high 0.4 in 2011.

The decreasing NRCAs of certain exports do not necessarily indicate a decline in such exports. For example, the decline in the NRCA for food products could simply mean that the percentage of food exports has dropped because of the rise of finance services exports. Or other countries in the world could have been increasing their food exports relative to the Netherlands.

Figure 4.2 Traditional comparative advantages are declining, while finance is on the rise



Source: SEO Amsterdam Economics, based on TiVA (2011). NRCA stands for Normalised Revealed Comparative Advantage.

4.5 Comparative advantages in subsectors of goods

In order to deepen our understanding of Dutch comparative advantages in the export of goods, we can use the UN Comtrade gross export database to compute the NRCAs for each of the 260 sub-subsectors in this database. As explained above, the data on gross goods exports can be broken down into very detailed subsectors. For example, an export sector such as '0 Food and live animals' can be broken down into subsectors such as '01 Meat and meat preparations', which in turn consist of sub-subsectors like '011 Bovine meat, fresh, chilled or frozen'. In total, there are 10 aggregate sectors, 66 subsectors and 260 sub-subsectors. While these still have further sub-sub-subsectors, the level of detail is most informative at the subsector and sub-subsector level.

As already mentioned, one of the best features of the NRCA concept is that NRCAs are additive. This also holds for sectors: the NRCA of 'food and live animals' (0.86) is the total sum of all of the (positive as well as negative) NRCAs of the subsectors, which in turn are also the sum of the NRCAs of their sub-subsectors, etc.

The gross exports data shows that the Netherlands has strong comparative advantages in a wide range of goods, particularly in food, mineral fuels, machinery and transport equipment, and chemicals. This is fairly consistent with the comparative advantages identified based on value added data as described in the previous section (transport, petroleum, food, chemicals).

As Table 4.5 shows, the Netherlands strong comparative advantage in mineral fuels is mostly related to refined petroleum and gas exports. This is probably because most of all European petroleum arrives at the port of Rotterdam, where it is refined and then re-exported to other European countries. Gas exports to Europe are transported by pipeline. Since there is a strong regional component associated with fuel exports, this sector may be strong on a global scale, but may not be that relevant for export opportunities in Asia.

The detailed gross exports data also reveals in which sub-subsectors the comparative advantages in the agro-food business sector lie. One such sub-subsector is the crude vegetable materials sector (which is mostly flowers and flower bulbs, for which the Dutch are considered to be the most specialised country in the world). Another such sub-subsector is 'miscellaneous edible products', which turns out to be mostly food preparations for infant use (baby milk formula) and other food preparations.

The sub-subsectors in the chemicals sector are also interesting. They include medicaments, a high-tech product from the pharmaceutical industry, and hydrocarbons, a residual product of the petroleum industry.

Finally, there is a surprisingly high comparative advantage in some of the manufacturing subsectors. The Dutch have a positive comparative advantage in some specialised, high-tech manufacturing products, such as parts of office machines, machinery for special industries and medical instruments. This is discussed in more detail in Chapter 7.

Table 4.5 Based on detailed gross export data, the Netherlands has comparative advantages in Petroleum products, agro-food products and machinery

Rank	Sub-subsector	NRCA
1	Petroleum products, refined	0.67
2	Crude vegetable materials, other (esp. flowers and flower bulbs)	0.26
3	Parts and accessories of office and adp machinery	0.19
4	Medicaments, incl. veterinary medicaments	0.15
5	Vegetables etc., fresh or simply preserved	0.14
6	Natural gas	0.12
7	Edible products and preparations, other (esp. baby milk formula)	0.12
8	Other machinery for special industries	0.11
9	Medical instruments, other	0.10
10	Hydrocarbons, other, derivatives	0.10

Source: SEO Amsterdam Economics, based on Comtrade 2015

4.6 Comparative advantages in services

Given the inconsistent and incomplete data on services, it is unfortunately not possible to compute comparative advantages for detailed subsectors within larger services categories. This occurs for four reasons. First, data on imports and exports of services are broken down into sectors only for EU countries. For example, a country like China reports only exports of 'total services' without any breakdown by sector. Second, these subsectors are not very informative. For example, it is possible to break down 'transport and storage' into 'sea transport', 'air transport' and 'other transport', but it is impossible to see whether it concerns freight transport, passenger transport, etc. Third, there are sectors, such as finance, that have no subsectors at all. Finally, the data seems to be inconsistent to such an extent that reported exports and imports from individual partner countries do not add up to 'total' imports and exports, and more detailed subsector exports do not always correctly add up to their corresponding main sector exports.

5 Exports to Asia: Successes and Opportunities

This chapter provides an overview of Dutch export successes and potential Dutch export opportunities in Asia. Most successes in export to Asia are found in services (transport, finance, trade) and in chemicals and machinery. Possible opportunities are found in agro-food products and, again, services. At a more detailed level, food products (baby milk formula, milk, meat) and machinery parts stand out as successes in Asia, while other agro-food products (vegetables, fruit, flower bulbs) and high-tech machine parts (automatic data processing equipment, parts of office machinery, machinery for special industries) are defined as opportunities.

Chapter 5.2 explains how this report defines export successes and opportunities. Chapter 5.3 gives an overview of successes and possible opportunities in the broader value added categories. Chapter 5.45.3 shows successes and possible opportunities for the more detailed goods categories. Chapter 0 explains which export categories will be further specified in the case studies and why.

5.1 Introduction

In chapter 3 we noted that Dutch exports are concentrated in logistics and trade, financial services, chemicals and agro-food. Chapter 4 showed that the strongest comparative advantages of the Netherlands are in transport and storage, finance and other business activities, chemicals and petroleum products, and in food and agriculture.

These strong Dutch export sectors are partly reflected in exports to Asia. Services sectors prevail in Dutch export to Asia, with transport, trade, finance and other business activities being large in China, India and Hong Kong. By far the largest Asian export sector is the export of finance and insurance to China. Chemicals, food and machinery are also large sectors in China. China, Hong Kong and India are larger export destinations. Indonesia, Malaysia and Thailand are much smaller, although they are destinations for transport, trade and finance. The Philippines and Vietnam are not major destinations for Dutch exports.

This chapter will show that generally, the most competitive Dutch export sectors have been successful in Asia as well. However, there are also Dutch export sectors that can be considered globally competitive, but which have not been very successful in Asia thus far. We will identify these sectors and denote them as possible 'opportunities' for future exports to Asia.

Note that the opportunities identified in this chapter are potential opportunities in a 'statistical' sense only, because there may be very good reasons why an apparent opportunity is not being pursued. To determine the real business opportunities in each specific (sub)-sector is beyond the scope of this study. However, the following two chapters provide a first exploration of specific opportunities within the agro-food sector and the high tech machinery sector.

5.2 Measuring 'successes' and 'opportunities'

For the purpose of identifying 'export successes' and 'export opportunities' we will first provide some definitions. In this chapter, 'successes' are identified and defined as follows:

1. **We first compute the total export share of Dutch exports for each (sub)sector** (e.g. 'edible products and preparations, other' comprises 1.4% of Dutch exports)
2. **We compare each sector's export share to each of the 7 Asian countries with its total export share** (e.g. 'edible products and preparations, other' comprises 7.4% of Dutch exports to China)
3. **If the difference is more than 2 percentage points (1 percentage point for detailed goods data), we define the respective export sector as a 'success'.** We do this separately for each of Asian export destination.

Similarly, we define a potential 'export opportunity' as follows:

1. **We start with the total export share of Dutch exports for each (sub)sector** (e.g. 'vegetables and fruits' comprise 1.5% of Dutch exports)
2. **We compare each sector's export share to Asia with its total export share** (e.g. 'vegetables and fruits' comprise 0.0% of Dutch exports to China)
3. **If the difference is more than 2 percentage points (1 percentage point for detailed goods data) and the NRCA is positive, we define the sector as a 'possible opportunity'.**

Note that the NRCA does not matter when defining 'successes' but is relevant when it comes to defining (potential) 'opportunities'. This is because having a positive NRCA could be considered as a condition for being able to compete internationally, while even sectors with an overall negative NRCA can still constitute an unexpected success in a particular country.

The next section will give a quick overview of the 'successes' and 'opportunities' in the broad goods and services sectors. Subsequently, we give an overview of 'successes' and 'opportunities' in the more detailed goods sectors.

Appendix A, B and C give a complete overview of all goods and services sectors (based on value added trade data), exports and export shares, the NRCAs, and successes and opportunities per country.

5.3 Broad export successes and opportunities

Table 5.1 shows, on the basis of value added trade data for 2011, that Dutch exports to Asia are most successful in services, even more so in Asia than in the world in general. This table shows the sectors in which Dutch exports are 'successful' in more than one of the 8 Asian countries considered (including Hong Kong).

Transport and finance are sectors in which the Netherlands is highly specialised (as indicated by positive NRCAs) and their shares in exports to Asia are even higher than to the world in general.

Trade comprises large shares of exports to four Asian countries, although NRCAs are negative. The two successful good sectors are machinery and chemicals in China and Vietnam. NRCAs for 'machinery and equipment' are negative, but the sector is successful in China and Vietnam. We will elaborate on this in the case study 'High-Tech' in Chapter 7

Table 5.1 Export successes in Asia are mainly found in services and machinery & equipment

Successes in value added	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Transport and storage	6		✓	✓	✓	✓		✓	✓	0.51
Finance and insurance	5	✓		✓	✓		✓	✓		0.40
Wholesale and retail trade; repairs	4		✓	✓	✓	✓				-0.17
Chemicals and chemical products	2	✓							✓	0.10
Machinery and equipment, other	2	✓							✓	-0.11

Source: SEO Amsterdam Economics, based on TiVA (2011)

Possible opportunities for exports to Asian countries can roughly be divided into three categories: agro-food products, petrochemical products and services, as shown in Table 5.2.

Dutch agro-food exports are less than expected for most Asian countries. The Netherlands mainly exports its food products to European countries, as we have seen in Chapter 3. China imports most of its food products from the USA, New Zealand, Thailand and Australia, major food exporting countries that have lower transport costs to China than the Netherlands. India imports its food from Canada, the USA, Myanmar and Brazil. There are no EU countries among the top 10 countries that India imports from.

We also see relatively few exports in the petrol and chemical sector going to Asia. Chemicals exports stay behind in most Asian countries, except for China and Vietnam, where they are relatively successful. Petrol exports stay behind in all Asian countries. Dutch petrol exports enter the country in Rotterdam and are exported mainly to Germany and Belgium, and to a lesser extent to the USA, France, the UK, Nigeria and Mexico. The Netherlands has a sizeable petrol industry around Rotterdam, which makes the country a regional distribution centre for petrol. The only Asian country in the top 10 of petrol export destinations is Singapore, which again is a distribution centre for oil in its own region. China mainly imports its petrol products directly from major oil sourcing countries like Saudi Arabia, Angola, Russia, Oman, Iran, Iraq, Venezuela, the UAE, Korea and Kuwait.

Also exports of certain services lag behind in several or more Asian countries. Finance and insurance exports are a success in China, India, Indonesia, the Philippines and Thailand but lag behind in Hong Kong and Vietnam. The same is true for transport and storage: the sector is a success in most countries except for China and the Philippines, where it comprises a smaller than average part of exports.

Table 5.2 Exports to Asia lag behind in the agro-food sector, chemicals and several services: opportunities for Dutch exports?

Possible opportunities in services and goods	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Agriculture, hunting, forestry and fishing	8	✓	✓	✓	✓	✓	✓	✓	✓	0.09
Food products, beverages and tobacco	6	✓	✓	✓	✓	✓		✓		0.24
Coke, refined petroleum products and nuclear fuel	8	✓	✓	✓	✓	✓	✓	✓	✓	0.14
Chemicals and chemical products	6		✓	✓	✓	✓	✓	✓		0.31
Other community, social and personal services	8	✓	✓	✓	✓	✓	✓	✓	✓	0.16
R&D and other Business Activities	7	✓	✓		✓	✓	✓	✓	✓	0.10
Post and telecommunications	5	✓			✓	✓		✓	✓	0.08
Computer and related activities	3						✓	✓	✓	0.05
Finance and insurance	2		✓						✓	0.40
Transport and storage	2	✓					✓			0.51

Source: SEO Amsterdam Economics, based on TiVA (2011)

After presenting an overview of 'successes' and possible 'opportunities' in the 34 broad goods and services sectors, we calculate successes and opportunities at a more detailed level. Unfortunately, as explained earlier in this report, it is not possible to look at services exports in more detail because of a lack of data, but for the goods sector we identify 260 goods categories and their exports to the Asian countries.

5.4 Detailed export successes and opportunities

Successes in the detailed goods categories can be roughly divided into two groups: food and high-tech machinery.

Table 5.1 showed that the Dutch agriculture and food sectors in a broad sense export less to Asian countries than to the world in general. However, certain types of food exports are certainly a success in Asia, as we can see in Table 5.3. The most outstanding is 'edible products and preparations', which is a success in 7 out of 8 countries and even comprises 32% of exports to Hong Kong. Upon closer inspection this can be attributed to baby milk formula, of which the export to Asia has recently boomed. More generally, the export successes in the 'milk and cream' category in five Asian countries are likely due to Dutch dairy company Friesland Campina, which has subsidiaries in China, Indonesia, Thailand, Vietnam, the Philippines and Malaysia and Hong Kong. From there, Friesland Campina sells a lot of imported Dutch dairy products (Friesland Campina 2016).

Meat exports to Asia mainly consist of parts of animals that are not popular in Europe, whereas there is a demand for this meat in Asia, as will be further specified in the case study on meat in Chapter 6. Feeding stuff exports to the Philippines, Thailand and Malaysia include the activities of

animal feed producer De Heus (De Heus 2016, Fenedex 2016), which has production locations in Vietnam, while the Philippines has a major pig breeding industry (Van Boekel 2009).

The other major successful groups of exports to Asian countries are equipment and accessories of aircraft, machinery, telecom and electrical machinery. These are mainly exports in the high-tech sector, and we will elaborate further on this in the case study on high-tech in Chapter 7.

Table 5.3 Export successes to Asia are found in food products and machinery parts

Successes in goods	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Edible products and preparations, other *(=baby milk formula)*	7	✓	✓		✓	✓	✓	✓	✓	0.12
Milk and cream	5	✓	✓		✓		✓	✓		0.04
Other meat, fresh, chilled or frozen	3		✓			✓	✓			0.04
Feeding stuff for animals	3						✓	✓	✓	0.08
Aircraft equipment	5			✓	✓	✓		✓	✓	-0.13
Other machinery for special industries	4	✓				✓		✓	✓	0.11
Cathode tubes, diodes, transistors etc.	4	✓	✓			✓		✓		-0.33
Food machinery, non-domestic	3				✓		✓	✓		0.03
Telecommunications equipment, parts and accessories, other	3		✓			✓		✓		0.00

Source: SEO Amsterdam Economics, based on Comtrade 2015

The previous section showed that exports to Asia are relatively small in agro-food, petroleum products and chemicals. These categories also clearly show in the detailed goods data in Table 5.4, along with a new category: high-tech parts and equipment.

Table 5.4 shows that fresh vegetables are exported on a relatively small scale to Asia, as is the case with cut flowers and flower bulbs in the category 'crude vegetable materials'. However, in China, India and Vietnam there is a market for flower bulbs[6].

'Other meat', a success in Hong Kong, Malaysia and the Philippines, lags behind in India and Indonesia. This might be because 'other meat' mainly contains pig offal products, which might not be that popular among the Muslim population of Indonesia and the Muslim/Hindu population of India.

Petroleum products, natural gas and hydrocarbons (a chemical product derived from the petrol industry) are major export products for the Netherlands, but not to Asia. Oil is not exported to Asia because of the architecture of the global oil trade, as explained above. Gas is only going to nearby countries because of geographical constraints: gas is transported via pipes, which makes it currently impossible to transport gas to faraway destinations in Asia.

6 Interview Neele Exports, 2016

Although half of the successes in exports to Asia concern high-tech machinery parts, there are some parts that the Netherlands exports a lot but not to (certain) Asian countries. Automatic data processing equipment and parts of office machines are exported to European neighbours, but not much to Asia, although Hong Kong and Malaysia are an exception. The export of machinery for special industries to Thailand and Vietnam reportedly concerns machines for the chicken and pig meat industry, while for China and Malaysia they are probably machinery parts for the semiconductor industry, as will be described in Chapter 6. The export of other road motor vehicles might originate from the Dutch companies DAF (trucks[7]) and VDL group (buses, coaches, car assembly[8]).

Table 5.4 Exports in agro-food products, microchips and machinery parts lag behind in certain countries (but not in others): opportunities for Dutch exports?

Possible opportunities in goods	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Vegetables etc. fresh or simply preserved	5	✓	✓	✓				✓	✓	0.14
Crude vegetable materials, other *(=flowers and bulbs)*	5		✓		✓	✓	✓	✓		0.26
Other meat, fresh, chilled or frozen	2			✓	✓					0.08
Petroleum products, refined	8	✓	✓	✓	✓	✓	✓	✓	✓	0.67
Natural gas	7	✓	✓	✓	✓	✓	✓		✓	0.12
Hydrocarbons other, derivatives	4					✓	✓	✓	✓	0.10
Automatic data processing equipment	6	✓		✓	✓		✓	✓	✓	0.05
Parts and accessories of office and adp machinery	6	✓		✓	✓		✓	✓	✓	0.19
Other machinery for special industries	3		✓		✓		✓			0.11
Road motor vehicles, other	2	✓							✓	0.09
Medicaments, incl. veterinary medicaments	2		✓	✓						0.15

Source: SEO Amsterdam Economics, based on Comtrade 2015

5.5 Case study selection

To further assess the successes and opportunities of the Dutch export industry, the next two chapters will discuss two case studies into further detail: one opportunity (food) and one success story (high-tech).

When looking at the 'successes' in Table 5.3, we see two product groups that stand out: the agro-food group and the machinery group. Upon further exploration of the parts and accessories for machines going to Asia, it became clear that the Netherlands has a thriving high-tech sector, mainly in the Eindhoven area (likely related to the location of Philips), which is very active in countries like Malaysia. We therefore chose to focus on the Dutch high-tech sector in Malaysia as a success story.

7 DAF 2016
8 VDL (2016)

When considering the potential 'opportunities' identified in Table 5.4, petroleum, natural gas and hydrocarbons statistically came out as opportunities. However, because of the regional character and high transportation costs of these products, as explained above, we do not consider them as a realistic opportunity for exports to Asia. Motor vehicles and medicaments are two other product groups that lag behind, but they only do so in two Asian countries. Two other product groups that are then left are the group of agro-food products and manufactured parts and accessories.

Agro-food products are therefore partly a success and partly a 'possible opportunity'. For this reason we take food exports to Asia as our first case study. We will focus on vegetables and meat because the Netherlands has such a strong competitive position in this area, and because the demand for these products is assumed to be high in these countries.

6 Case Study 1: Food Exports

Meat and fruit & vegetables are Dutch top sectors, with high comparative advantages and large exports. However, both types of products are mainly exported to other EU countries and not to Asian countries. This chapter identifies a possible opportunity for pork and residual pork and poultry products in Asia, and discusses whether there is a possible opportunity for high-quality fruit and vegetable exports to China.

Chapter 6.1 shows that the agro-food industry is a top sector in the Netherlands. Chapter 6.2 discusses meat exports to Asia in more detail. Chapter 6.3 discusses whether there is an opportunity for Dutch meat exports to Asian countries. Chapter 6.4 focuses on fruit and vegetable exports to Asia and discusses whether they offer an opportunity in Asia. Chapter 6.5 discusses the position of the Dutch government on agro-food exports to Asia.

6.1 Agro-food: a Dutch top sector

Despite its small size, the Netherlands is the second food exporter worldwide. To feed a densely populated urban delta, Dutch fruit and vegetable producers have always been forced to squeeze as much production as possible out of relatively small plots of land. Because of its high productivity and its strong international competitive position, the Dutch government has designated the agro-food sector as a 'top sector'. To maintain this top position, further develop the sector and find solutions for social challenges regarding food, the sector aims to support innovation in agro-food, thereby connecting companies, researchers, public authorities and civil society organisations (Topsectoren, 2016; Topsector Agri & Food, 2016).

Dutch food exports mainly comprise vegetables, meat, dairy and processed food products, as we can see in Table 6.1. Vegetables and fruit are by far the largest subsector among food exports, almost twice as large as the second sector, with a very strong NRCA of 0.26. Meat, dairy and other food products follow closely with strong NRCAs as well. In all but one food sector the Netherlands has a positive NRCA, together amounting to an NRCA of 0.86, which shows the relatively high specialization of the Netherlands in food products.

Table 6.1 Vegetables and fruit are by far the largest food export subsector

Sector	Export in Mln. US$	NRCA
Vegetables and fruit	16,392	0.26
Meat and meat preparations	9,312	0.14
Dairy products and birds' eggs	8,288	0.16
Miscellaneous edible products and preparations	7,078	0.13
Coffee, tea, cocoa, spices	6,551	0.10
Feeding stuff for animals	5,218	0.08
Fish and fish preparations	3,320	0.00
Cereals and cereal preparations	2,619	-0.06
Live animals	2,138	0.04
Sugars, sugar preparations and honey	1,452	0.01
Total: Food and live animals	**62,369**	**0.86**

Source: SEO Amsterdam Economics, based on Comtrade 2015

6.2 Meat exports

The Netherlands has a large export oriented meat sector. Only one quarter of Dutch meat is consumed in the Netherlands, the rest is exported. More than 100 million people inside and outside the Dutch borders consume meat of Dutch origin (COV 2016). Dutch abattoirs are big players on the European market and have many specialized companies, often with an international orientation. In 2015, the Netherlands exported pork worth €2.4 billion and beef and veal worth €2.5 million (COV 2016).

Around three quarters of pork is exported, mainly to European countries but also for a small part outside the EU, for example to Southeast Asia (COV 2016). Despite the strong Dutch dairy sector the Netherlands are a net importer of beef, but thanks to the dairy sector the Netherlands has a prosperous veal sector. Most of the veal by far is exported, mainly to Central and Southern Europe and increasingly to non-European countries (COV 2016).

The export data in Table 6.2 show the strength of the Dutch meat sector. The Netherlands exported meat worth more than $9 billion in 2015, which is 2% of all Dutch goods exported. The combined Dutch meat sector has a positive NRCA of 0.14, mainly due the 'other meat' sector, which contains both pork and chicken meat and has an NRCA of 0.08.

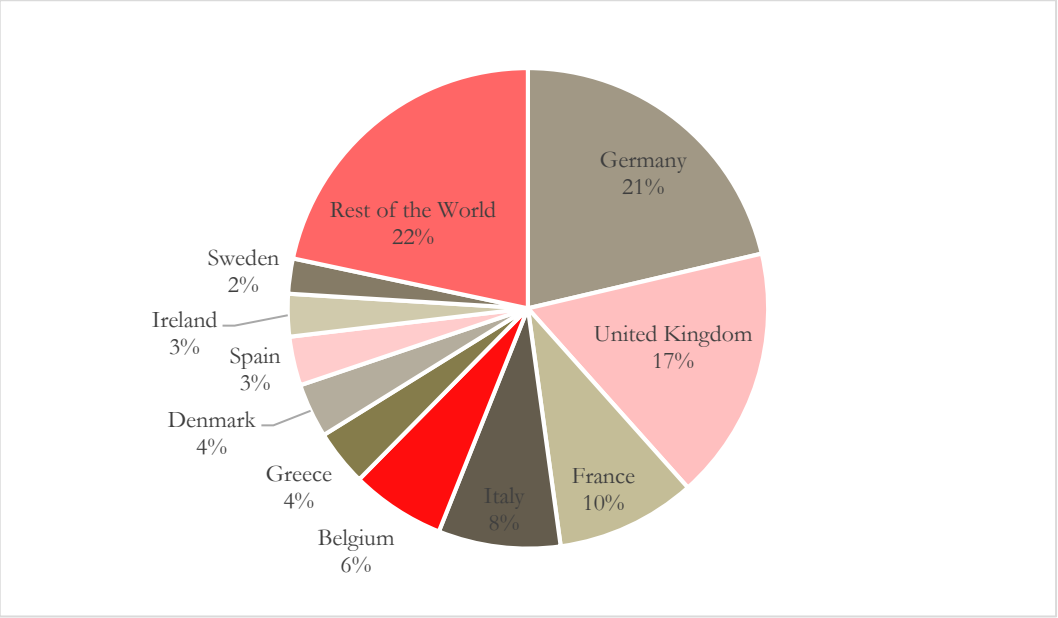
Table 6.2 Dutch exports in the beef (bovine) and chicken and pork sector (other meat) are substantial

Sector	export in million US$	NRCA	#1 of benchmark countries
Other meat, fresh, chilled or frozen	5,065	0.08	Netherlands
Bovine meat, fresh, chilled or frozen	2,469	0.03	Netherlands
Meat, dried, salted or smoked	843	0.02	Netherlands
Meat, prepared or preserved, other	935	0.01	Denmark (0.01)
Meat and meat preparations in total:	**9,312**	**0.14**	**Netherlands**

Source: SEO Amsterdam Economics, based on Comtrade 2015

Looking at meat export destinations in more detail, Figure 6. 1 shows that most meat exports go to western and southern European countries. Asian countries are not in the top 10, although Hong Kong ranked 11th in 2015 with 1.9% of all Dutch meat exports going there, slightly more than to Sweden. China ranked 19th with 0.7% and the Philippines 25th with 0.4%. Together, the Asian countries under study (including Hong Kong) account for only 3.4% of Dutch meat exports.

Figure 6.1 Dutch meat exports mainly go to the European Union

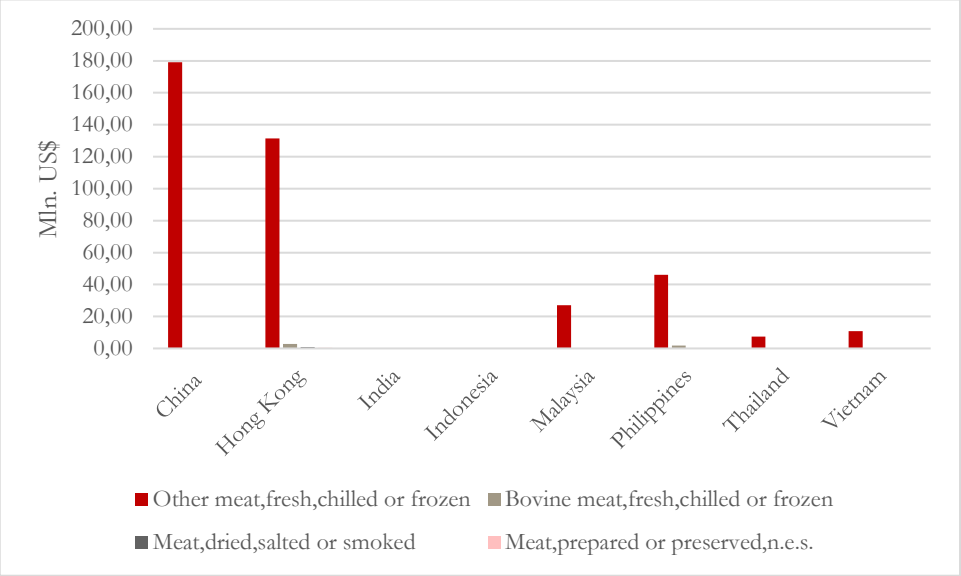


Source: SEO Amsterdam Economics based on Comtrade (2015)

6.2.1 Meat exports to Asia

Meat exports to Asian countries are overwhelmingly in the 'other meat' sector, as we can see in Figure 6. 2. Zooming in on this meat sector, China (including Hong Kong) is by far the most important export destination for Dutch pork of the Asian countries studied in this report. At great distance, Malaysia and the Philippines follow as third and fourth destination countries. Other meat categories such as beef or prepared meat are hardly exported to the Asian countries.

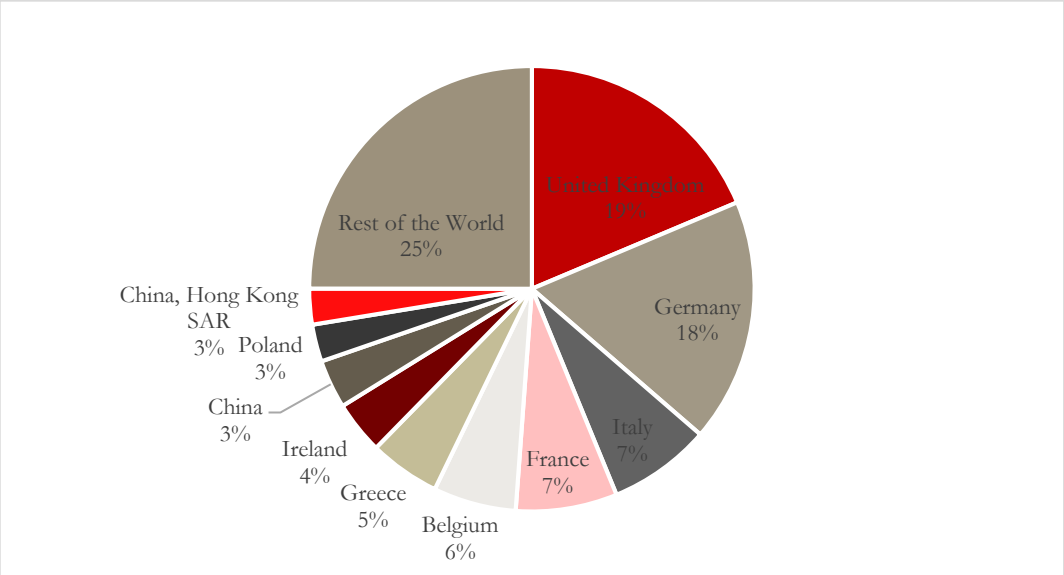
Figure 6.2 Dutch exports to Asia almost exclusively consist of 'other meat', and go mainly to China



Source: SEO Amsterdam Economics, based on Comtrade (2015)

'Other meat' is therefore the main category of meat that is exported to Asia, and this is reflected in the data. Figure 6.3 shows that for 'other meat', China and Hong Kong are in the top 10 destination countries.

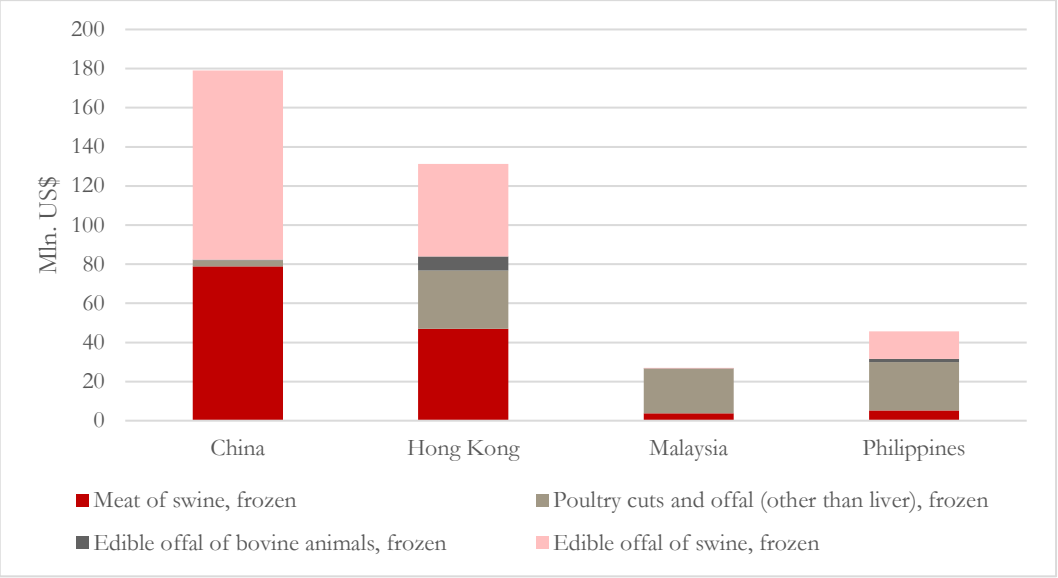
Figure 6.3 China and Hong Kong are ranked 8th and 10th as export destination for 'other meat'



Source: SEO Amsterdam Economics, based on Comtrade (2015)

Delving further into the details of the 'other meat' category, Figure 6. 4 shows that exports to China and Hong Kong mainly consist of pork offal (products considered 'residual products' in Europe, such as such as pig's organs, trotters, ears and noses) and frozen pork, whereas exports to Malaysia and the Philippines are mainly poultry 'residual products' such as organs and feet.

Figure 6.4 'Other meat' exports to Asia mainly consist of pork meat, pork residual products and poultry residual products



Source: SEO Amsterdam Economics, based on Comtrade (2015)

6.2.2 Pork exports to Asia

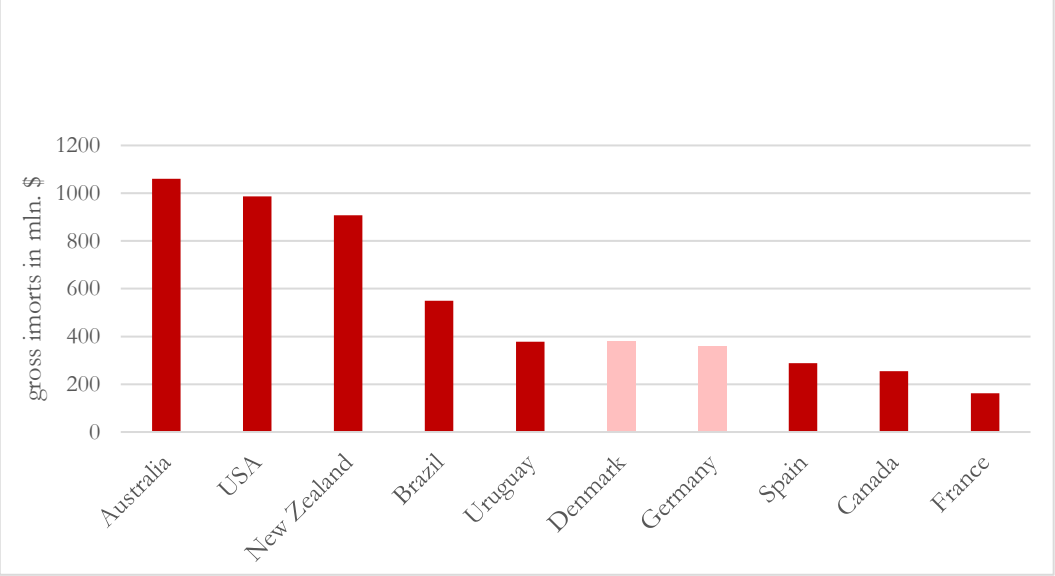
Because the Chinese consumption of pork has seen strong growth in the last decade, China has become the largest market for pork in the world (COV 2016). Consequently China has become an important export market for EU countries. The Chinese market is especially interesting for meat products that are not popular in Europe, such as organ meat and pig ears or noses (Agroberichten 2016). The good prices that meat producers can obtain for these goods in China help to maximize carcass utilization, which is critical to the success of the meat industry and export in the Netherlands.

China (and many more countries) have long had trade barriers for European meat, as an effect of the outbreak of diseases such as swine fever in the late 1990s (Vlees.nl 2016) and foot-and-mouth disease (*mond- en klauwzeer*) at the beginning of the 2000s (Wikipedia 2016b). Until recently, these trade barriers meant that meat exporters had to go through a burdensome application process to get approval from the Chinese authorities to export their products to China (ECTrade 2016). In recent years, the Dutch government and the Dutch meat sector have focused on obtaining market access for pork in China by removing trade barriers. Thanks to these efforts, the number of companies that are allowed by the Chinese government to export to China and the number of products that these companies can export have risen sharply. In the first eight months of 2016, Dutch pork exports to China grew threefold compared to the same period in the year before. During this period, the Netherlands exported 187.000 tons of pork. By comparison, for the whole year 2014 this was only 54,000 ton (COV 2016).

The expectation is that the demand in China will keep growing, although projections differ. The EU supplies two thirds of Chinese pork imports and is thus leading in this area, although more competition from Canada but also from the US and Brazil can be expected (Ordelman 2016).

Figure 6.5 shows Chinese imports of all meat types in 2014. We see that China mostly imports from large meat exporting countries like Australia, the USA, New Zealand, Brazil and Uruguay. The leading European exporter of meat is Denmark. This country has a large pork industry, with around 5000 farms producing 28 million pigs annually. In comparison: the Netherlands has 3725 pig farms and produces 15,5 million pigs annually (COV 2016). 90% Of Danish pork is exported, and pork exports account for almost half of all Danish agricultural exports (Danish Agriculture and Food Council, 2016). China is the 4th most important export country for the Danish. Danish pork exports to China are so successful because of two reasons. First, Denmark has never had to deal with the disease outbreaks that the Netherlands had. Therefore, meat from Denmark has always remained available for export. Second, the Danish have promoted their meat in Japan and China for decades, having a permanent office on location and a complete market channel to promote the brand of 'Danish pork' (Danish Agricultural Council Japan 2016)[9]. This promotion has paid off, as the data show. The Netherlands has not used this strategy for the Dutch pig sector in Asia, reportedly because the sector considered the market in Asia as not very interesting. Also, more Danish meat going to China would mean less meat going to Germany, a gap that could be filled by the Dutch[10].

Figure 6.5 China imports European meat mostly from Denmark and Germany



Source: SEO Amsterdam Economics, based on Comtrade (2015)

6.3 Potential opportunities for meat exports to Asia

The category of 'other meat' can be defined as a success in some of the Asian countries and as a possible opportunity in others, as Table 6.3 shows. We compare the export shares of the 'other meat' subcategories to the Asian countries to the export shares of the 'other meat' sector for the Netherlands in general. Like before, if the export share in an Asian country is substantially (more than 1%) higher than the export share in general, we identify this subcategory as a success in that particular Asian country. Because of the positive NRCA of the 'other meat' sector, the sector is

9 Interview Ministry of Economic Affairs, Directorate-General Agriculture & Nature
10 Interview Ministry of Economic Affairs, Directorate-General Agriculture & Nature

defined as a possible opportunity if 'other meat' exports to Asia 'lag behind' 1% or more compared to general Dutch exports.

Based on this method, the 'other meat' sector can be defined as a success in Hong Kong, Malaysia and the Philippines and as a possible opportunity in India and Indonesia. The fact that pork exports to India and Indonesia are not that large is understandable, considering that pork might not be that popular due to sizeable Muslim populations (especially in Indonesia) and negative cultural perceptions of pork, also among Hindu populations (Quora 2014). However, in the other Asian countries covered in this report meat exports are at or above the average percentages and can thus be considered a success.

Table 6.3 'Other meat' is a success in Hong Kong, Malaysia and the Philippines and a possible opportunity in India and Indonesia

country	NRCA	Million US$	% to country	% to world	difference	succ/opp
China	0.08	179	1.9%	1.1%	0.8%	-
Hong Kong	0.08	132	5.2%	1.1%	4.2%	Success
India	0.08	0	0.0%	1.1%	-1.1%	Opportunity?
Indonesia	0.08	0	0.0%	1.1%	-1.1%	Opportunity?
Malaysia	0.08	27	2.2%	1.1%	1.1%	Success
Philippines	0.08	46	9.1%	1.1%	8.0%	Success
Thailand	0.08	7	0.6%	1.1%	-0.5%	-
Vietnam	0.08	11	1.2%	1.1%	0.1%	-

Source: SEO Amsterdam Economics, based on Comtrade (2015)

Based on the growing demand for pork in China, the removal of trade barriers and the strong global position of the Dutch pork sector, there could very well be an opportunity for the Dutch pork sector in Asia.

Potential growth opportunities for Dutch meat exports to Asia depend on three factors. First, is there (possibly) a demand for Dutch products in the destination countries? Second, is there supply capacity in the Netherlands? And third, how much competition is there from other suppliers of the product?

China is the largest pork importer in the world, and many sources see a growing demand for pork in China (varkens.nl 2016). The Chinese pig herd has shrank substantively while consumer demand for pork keeps rising, forecasting a large import demand for pork in China (Agroberichten 2015). Rabobank, a banker with a focus on the agricultural sector, is positive about the opportunities for the Dutch pork sector in Asia. Since 2014, Russia bans European food imports in response to the European import sanctions that were imposed after Russia's Crimea annexation. These Russian countersanctions have had a negative impact on the Dutch pork sector (Bolle 2016). However, Asian countries have completely made up for the Russian ban on pork. Rabobank signals a growing demand for pork in Asian countries, and sees great opportunities for the Dutch pork sector there (Rabobank 2016).

However, there are supply constraints in the Netherlands. The number of pig farms has shrunk over the last two decades (Boerderij.nl 2015), although the number of pigs has remained the same. This means that pig farms are getting larger and larger, meeting more and more resistance of civil society because of health, environment, waste and animal welfare considerations (Rabobank 2016, ABN AMRO 2010, Interview Ministry of Economic Affairs). The question arises whether it is wise to export (pork) meat to Asian countries on a large scale because the growth of the Dutch meat sector has boundaries due to environmental, animal welfare and spatial planning restrictions (Rabobank 2016, ABN AMRO 2010).

Competition in the pork sector is growing. Countries like Brazil, the US and Canada are the largest pork exporters in the world (Rabobank 2016, Boerderij.nl 2015, ABN AMRO 2010), and in Europe Germany, Spain and Denmark all doubled or tripled their exports to China in 2016 (Agroberichten 2016). It is hard to compete with these countries on cost price. Therefore, it will be crucial for the Dutch pork sector to compete with a unique product that distinguishes itself with regard to features such as health safety, sustainability or animal welfare (ABN AMRO 2010).

Also, the Dutch pork sector should be aware of the risks of being dependent on imports and exports (Rabobank 2016). Exports can be volatile, as the examples of Russia and China in this chapter show. A political sanction as it is currently in place for food exports to Russia can be a blow for the sector. Also, an outbreak of diseases will be a disaster for the Dutch pork sector because Dutch exports would be banned in many countries. China is an unpredictable country when it comes to its foreign policy and could implement or lift import bans at any time. The export dependence of the Dutch pork sector is therefore a risk. Also, because of the global growth of meat and biofuel production, the demand for natural resources such as corn, wheat and soybeans grows and, as a result, so do their transport costs. The Netherlands depends on the import of these products as inputs for the pork sector, which carries a risk as well (Rabobank 2016).

6.3.1 Meat - conclusions

In this chapter we have seen that there is large demand for pork in China, and that this demand is growing (Agroberichten 2016). Dutch companies are increasingly getting access to the Chinese market and meat export to China will be very high in 2016. However, there are supply constraints in a small country such as the Netherlands, global competition is harsh and the sector should beware not to become too dependent on resource imports and pork exports.

In this chapter we have mostly focused on pork exports to China. We should, however, not forget the other countries in this study. There is a demand for pork or poultry in the Philippines, Thailand and Vietnam (Agroberichten 2015b). Exports to these countries are still at a low level, but might have potential to grow. The Philippines have a considerable pork sector (Van Boekel 2009), which not only implies a possibility for meat exports for consumers but also of knowledge and technologies exports from the high-tech Dutch pig breeding sector. Also, we can think of other export opportunities for the Dutch meat sector than the physical export of meat. The Dutch meat sector has cutting-edge technologies for efficiency, energy use and large scale production. This knowledge and these technologies could be exported to less productive countries, as the Dutch Ministry of Economic Affairs intends to do in its internationalization policy (Janssen 2016).

6.4 Fruits and vegetable exports

The Dutch fruit and vegetable sector is a major export sector. As Table 6.4 shows, this sector alone accounts for $16 billion in gross exports in 2015, which is 3% of all Dutch exports in that year. The main export products (in volume) are onions, tomatoes, sweet peppers (paprika), cucumbers, apples and pears. The strong position of the Dutch fruit and vegetable exports is clear from the data. The NRCA is positive and substantial: 0.26 for the fruit and vegetables sector, to which the fresh vegetable contributes the most with an NRCA of 0.14. Fresh vegetables are the largest subsector, comprising 1.5% of total Dutch exports.

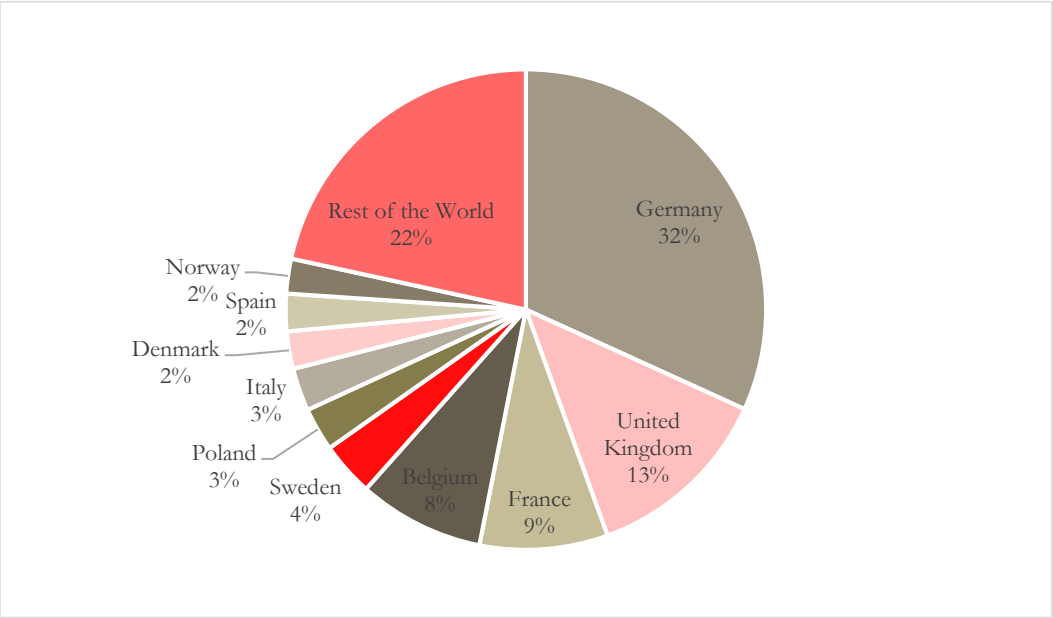
Table 6.4 The Netherlands has a strong comparative advantage in fresh vegetable exports

Sector	Export in Mln. US$	NRCA	#1 of benchmark countries
Vegetables etc. fresh or simply preserved	6,868	0.14	Netherlands
Vegetables etc. preserved or prepared	2,730	0.05	Netherlands
Fruit, nuts, fresh or dried	4,505	0.05	Netherlands
Fruit, preserved or prepared	962	0.01	Netherlands
Fruit or vegetable juice	1,327	0.02	Netherlands
Total vegetables and fruit:	**16,392**	**0.26**	**Netherlands**

Source: SEO Amsterdam Economics, based on Comtrade (2015)

Most Dutch fruit and vegetable exports are destined for EU countries, as we can see in Figure 6. 6. Germany, the UK, France and Belgium are the main destinations, with 62% of Dutch exports going to these countries. No Asian country is represented in this top 10 graph. The Asian countries are not even in the top 25, with maximally 0.1% of Dutch fruit and vegetables going to any of the Asian countries. The Asian countries in this study combined (including Hong Kong) only account for 0.5% of Dutch fruit and vegetable exports.

Figure 6.6 Dutch fruit and vegetable exports mainly go to EU countries

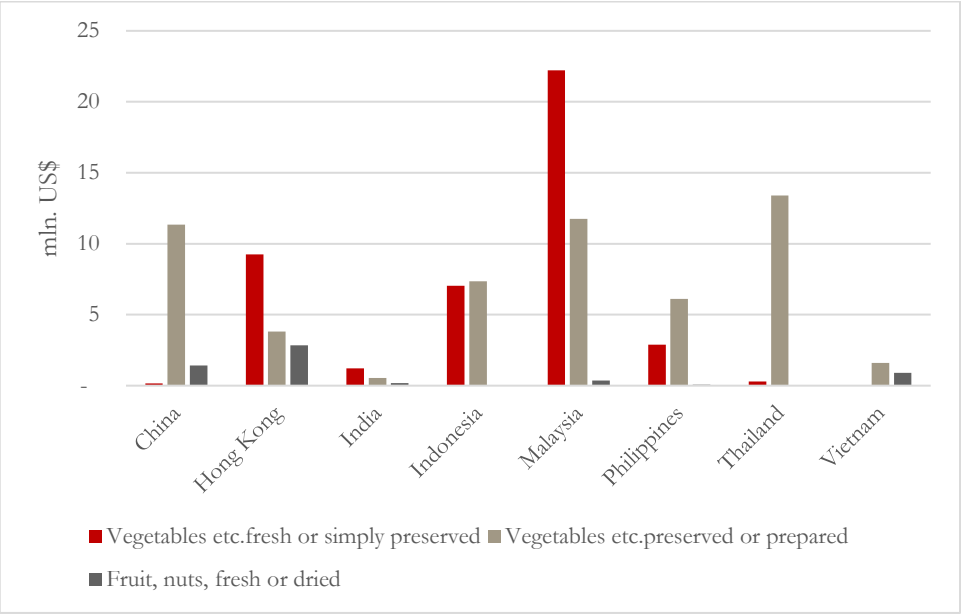


Source: SEO Amsterdam Economics, based on Comtrade (2014)

Dutch fruit is hardly exported to Asian countries. Since the Russian sanctions[11], pear producers have been looking for new markets and partly redirected exports to China and Vietnam. However, this does not show in the data, as we can see in Figure 6.7. Vegetables, either fresh or prepared, are only exported in small numbers. Fresh vegetable exports to Malaysia consist almost exclusively of onions, which are partly transited to Indonesia and Thailand. The prepared vegetable exports to China, Malaysia and Thailand mainly consist of 'preserved potatoes', which are frozen pre-baked French fries (Tuenter 2016, Boerenbusiness 2014).

[11] Since 2014 Russia bans European imports of fruit, vegetables, meat, fish, poultry, nuts and dairy as a counter-sanction to European sanctions imposed after Russia's annexation of the Crimea (Bolle 2017).

Figure 6.7 Fruit and vegetable exports to Asia are very low



Source: SEO Amsterdam Economics, based on Comtrade (2015)

Although very successful in the sector, the Netherlands does not export many vegetables to Asia, as we can see in Table 6.5. If we look at the strongest export sector, fresh vegetables, Malaysia is the largest customer with $22 million worth of vegetables, $19 million of which are onions that partly are also destined for the Indonesian market (Rabobank 2006, Agrio 2015, Heijboer 2014). Fresh vegetables comprise 1.5% of total Dutch exports, but vegetable export percentages to the Asian countries are much lower. In combination with the positive NRCA this makes fresh vegetable exports a possible opportunity in six out of the eight studied countries.

Table 6.5 Fresh vegetable exports to Asia lag behind, except for Malaysia which has $19 million in onion exports

Country	NRCA	Million US$	% to country[12]	% to world[13]	difference	succ/opp
China	0.14	0.1	0.0%	1.5%	-1.5%	Opportunity?
Hong Kong	0.14	9.2	0.4%	1.5%	-1.1%	Opportunity?
India	0.14	1.2	0.1%	1.5%	-1.4%	Opportunity?
Indonesia	0.14	7.0	0.9%	1.5%	-0.6%	-
Malaysia	0.14	22.2	1.8%	1.5%	0.3%	-
Philippines	0.14	2.9	0.6%	1.5%	-0.9%	Opportunity?
Thailand	0.14	0.3	0.0%	1.5%	-1.4%	Opportunity?
Vietnam	0.14	0.05	0.0%	1.5%	-1.4%	Opportunity?

Source: SEO Amsterdam Economics, based on Comtrade (2015)

12 Percentage of fresh vegetable exports as part of total Dutch exports to the Asian country
13 Percentage of fresh vegetable exports as part of total Dutch exports to the world

Thus, the figures show that vegetable exports to Asia, especially of fresh vegetables, lag behind Dutch vegetable exports in general. In combination with the positive NRCAs for vegetables, this brings up the question: is there an opportunity for Dutch fresh fruit and vegetables exports in the Asian countries? The answer to this question is mixed.

Box 6. 1 Potential food export opportunities resulting from new railway connections to China

Zhang (2015) states that there is a demand for high-quality food products among the growing Chinese middle class, who are prepared to pay premium prices. Dutch agricultural products have a strong positive marketing image among Chinese consumers. In China there is a high demand for Dutch agricultural products such as pears, cherry tomatoes, soft fruits such as cherries and blueberries, veal, sweet pepper, flower bulbs and cut flowers (Zhang 2015). Also, there is a strong Chinese preference for Dutch dairy products, as noted earlier in this report.

One reason why food exports to China may be complicated is the perishable character of fruit, vegetables and meat. It takes a ship about one month to reach China from Western Europe, which is a long time for fresh blueberries. A cooled railway line from the Netherlands to China could therefore constitute new export opportunities. According to Zhang (2013), there is strong interest from the Dutch agro-food sector in this railroad.

Zhang (2015) sees opportunities for the Dutch agro-food sector to start transporting Dutch fruit and vegetables via the new 'One Belt One Road' railway running from Chongqing (Western China) to Rotterdam. The railway is operational since March 2011 and is more than 11 thousand km long. Starting in Chongqing, it runs through Kazakhstan, Russia, Belarus, Poland and Germany all the way to Rotterdam. The entire trip takes around 13 days, which is 30 to 40 days less than ocean freight to China. This could be an opportunity for the export of Dutch fruits and vegetables (and other food products).

Many obstacles still need to be overcome before the Dutch agro-food sector can regularly transport its perishable fruits and vegetables to China. First, railway gauges differ between countries, which means that containers need to be transferred from one train to another twice. Second, because of Russian (counter-) sanctions on European food products, European trains with sanctioned products are currently not allowed to cross the Russian border, which makes transport to China impossible (Zhang 2015). Third, the potential transport by train remains limited. One train can carry 200 to 300 containers at most, while one container ship can transport more than 14,000 (Wikipedia 2016a). The volume of transport per train will thus only be one-thousandth of the transport per ship. Fourth, the trains now run up to Western China, whereas the large mass of potential middle class consumers is located in the densely populated east of the country, at least 1500 km further. Fifth, up to now, it is relatively expensive to transport products to China by train. These costs could decrease in the future if trains would start running more frequently and stop returning to China empty. Yet, currently it is unattractive for a single company to start transporting goods via the OBOR railway. To circumvent this problem, there might be a role for the Dutch government in stimulating railway transport to China, according to Zhang (2015).

Source: SEO Amsterdam Economics based on Zhang (2015)

6.5 Dutch government position on agro-food exports

In 2016, the Dutch Ministry of Economic Affairs expressed its viewpoint on the future of agro-food exports. In a the letter to the Parliament (Ministerie van Economische Zaken, 2016) it stated that the international market is a pillar for the fortification of the incomes of Dutch farmers, but also that the international outlook brings with it a certain vulnerability for price fluctuation and sanctions.

Regarding agricultural and food exports, the Ministry expresses three main viewpoints:

- The strength of the current agro-food sector in the Netherlands is very great. The knowledge on agro-food and logistics is cutting edge, which is essential for exports.
- The exports of agro-food products should focus on unique, high-quality and distinctive products that are produced sustainably. The Dutch sector should be competitive on the intrinsic quality of its products, not on the lowest price.
- Exports should focus even more on agrarian knowledge and technology. There is an enormous interest in Dutch knowledge and technology worldwide.

Hence, according to these three viewpoints, physical bulk exports to faraway Asian destinations will not be the future. However, the export of high-end products could be the future, as Zhang (2015) also argues in the report on the OBOR railway. Otherwise, the Netherland really distinguishes itself in terms of agrarian knowledge and technology, which could become a major export asset worldwide.

One way in which the Dutch government attempts to facilitate exports to Asia is through the Partners for International Business (PIB) initiative of RVO[14]. RVO supports clusters of companies in the same sector that are planning to start exporting to a foreign country. The government service aims to help with the promotion of the cluster in the target country, knowledge exchange and economic diplomacy. Since the start of the PIB programme, 70 clusters have started an initiative, among which a Dutch Dairy cluster in India, a horticulture initiative in vegetables and flower plant and seed materials in China, a Dutch potato centre in India and the high-tech sector (mainly semiconductor, solar and display products) in Taiwan and South Korea (RVO 2016). The text box below presents an example of a Dutch fruit tree initiative that has started exporting to India.

[14] Rijksdienst voor Ondernemend Nederland

Box 6. 2 Exports of Flower Bulbs to India

Neele Exports in Sirjansland, Zeeland, has been exporting flower bulbs to India since the late 1980s. The exporter endorses the Minister's view that the future is not in agricultural bulk exports, but in exporting agricultural knowledge and technologies. It points out that the margins in its sector, flower bulbs, have decreased considerably from 20-30% ten years ago to 3-5% now. These margins leave little room to serve clients in the way that Neele Export has done before.

In November 2016 Neele Exports, along with other companies in fruit production such as tree nurseries, walnut, pear and other fruit producers, pear juice makers and an agricultural education institute, signed a cooperation agreement with RVO to start exporting fruit production trees, technologies and knowledge to India as a cluster.

Neele Exports expressed that the Dutch embassy in India is of great help with providing promotion, Indian contacts, and information on the Indian market. It sees a good future for the cluster because of its method: one mutual contact for the Indian customer for all products and questions within the cluster. Interested Indian parties have already visited tree nurseries in the Netherlands.

It took 1.5 years of preparation to get all of the companies together to join the cluster, and the payback of the initiative is unsure. Without the PIB initiative it would never have been attractive for a single company like Neele Exports to start such an export initiative.

Source: SEO Amsterdam Economics; RVO; interview with Neele Exports

7 Case Study 2: High-Tech Exports

This chapter shows that the Dutch high-tech sector is a top sector, especially in exports to Malaysia. Dutch companies have moved their production locations from Europe to Malaysia because of the highly skilled workforce, lower costs and beneficial government policies attracting these industries in Malaysia. The Dutch high-tech exports to Asia therefore do not reflect the demand on the consumer markets, but follow investments of Dutch companies. In considering possible opportunities for the Dutch high-tech sector in other Asian countries the investment climate and business environment are therefore most important.

Chapter 7.1 shows the comparative advantages of the Netherlands in high-tech exports, and 7.2 shows what the Netherlands exports to Asia. Chapter 0 discusses the Dutch high-tech exports to Malaysia in particular, and the Dutch firms that are located in Malaysia. Chapter 7.4 discusses whether the success of the Dutch high-tech exports to Malaysia could be translated to other Asian countries.

7.1 Dutch high-tech exports and comparative advantages

The Dutch government has designated the sector 'High Tech Systems and Materials' (HTSM) as a top sector for the Netherlands. The sector produces end products, semi-finished goods, and components that are used in medical apparatus, semiconductors, cars, logistics systems, aircrafts, satellites and energy systems. Being part of the Dutch top sector policy means that the high-tech industry is considered a sector in which Dutch companies and research centres are of outstanding quality and top of the bill on a global scale. The top sector organization is a cooperation of companies, universities, research centres and the government. Being a top sector, the high-tech industry can expect extra policy support of the Dutch government, such as financial support for innovation and entrepreneurship, the attraction of educated and talented people, and ICT development for the sector (Topsectoren 2016). Priorities are stimulating public-private partnerships, increased investments in research, and increased involvement of small and medium enterprises.

By stimulating cooperation and innovation and promoting the sector's interests, the goal is to enhance the Dutch position globally (Holland High Tech 2016a). With the help of Dutch stations or embassies, the top sector HTSM identifies focus areas. The top sector sees international opportunities in Asia in Taiwan, South-Korea, Japan, India and Singapore,[15] because these countries invest significantly in production facilities, knowledge, innovations and infrastructure. The top sector wants to take advantage of growth opportunities in these countries. Based on the HTSM 'roadmap', a yearly agenda per focus area is then developed (Holland High Tech, 2016b).

[15] Asian countries where the top sector sees opportunities are Taiwan, South-Korea, Japan, India and Singapore.

Dutch exports in the high-tech sector are significant. As we can see in Table 7.1, the Netherlands exported machinery and equipment worth $132 billion in 2015.[16] For the Asian countries covered by our analysis, total machinery exports were $6.4 billion, or 4% of total Dutch machinery exports. In the Comtrade database, the 'Machinery and Transport equipment' sector contains many types of exports, ranging from heavy industrial machinery like 'metal working machinery' to smaller high-tech equipment like 'telecommunications and sound recording equipment'.

Dutch exports in machinery mainly consist of high-tech products. Table 7.1 gives an overall picture of Dutch exports in 'Machinery and Transport equipment'. All main categories are included, ordered by NRCA, plus the 12 subcategories that had an NRCA of 0.01 or higher. For the main categories as well as the subcategories we see that the more heavy manufacturing industries like metal working and power generating machinery are not exported by the Netherlands on a large scale. The Netherlands does export more sophisticated products like telecom equipment, parts of office machines (printers etc.), automatic data processing equipment (machinery for assembling computer chips) and machinery for specialized industries: the high-tech industry.

NRCAs in the main machinery categories do not necessarily reflect the competition position of the Netherlands in the high-tech sector. In most manufacturing sectors, the Netherlands has a negative NRCA, for the sector as a whole it is even -1.15. Only for the main categories office machines and machinery for specialized industries the Netherlands has a positive NRCA. However, in the subcategories we do see positive NRCAs, even when the main category has a negative one. This is because product categories such as 'telecom equipment' and 'machinery for specialized industries' contain many different products, ranging from simple parts like the plastic case of a cell phone to more high-tech accessories like computer chips (SITC rev 3 category). Despite the fact that other countries are more specialized in 'telecom equipment' than the Netherlands, Dutch companies do have a good competitive position in high-tech parts and accessories on a global scale, as we will see further on in this chapter.

16 To assess the exports in Dutch 'High Tech Systems and Materials' with the help of our export data, we had to make choices regarding which export categories to assess. We chose to use the SITC-7 code called 'Machinery and transport equipment'. This category might also contain exports that are not considered 'high-tech' by the top sector definition, such as 'metal working machinery' or 'road vehicles', but this category is the best fit to reflect the high-tech sector.

Table 7.1 The Netherlands is particularly strong in office machines, machinery for specialised industries and telecom equipment

Sector[17]	Export in mln. US$	Perc. Dutch export	NRCA
Office machines and adp machines	**27,653**	**5.9%**	**0.31**
• Parts and accessories of office and adp machinery	12,032	2.5%	0.19
• Office machines	3,911	0.8%	0.07
• Automatic data processing equipment	11,710	2.5%	0.05
Machinery for specialized industries	**18,013**	**3.8%**	**0.18**
• Other machinery for special industries	9,246	2.0%	0.11
• Food machinery, non-domestic	1,690	0.4%	0.03
• Agricultural machinery, excl. tractors	2,157	0.5%	0.03
• Civil engineering plant etc.	3,679	0.8%	0.03
Telecommunications and sound recording equipm	**21,819**	**4.6%**	**-0.00**
• Record-players, sound and video recorders	2,746	0.6%	0.04
Metal working machinery	**1,045**	**0.2%**	**-0.04**
Other transport equipment	**6,413**	**1.4%**	**-0.13**
• Ships and boats etc.	3,833	0.8%	0.02
General industrial machinery n.e.s.	**13,924**	**3.0%**	**-0.15**
• Mechanical handling equipment	3,056	0.6%	0.01
Power generating machinery and equipment	**5,322**	**1.1%**	**-0.17**
Electric machinery, n.e.s. and parts	**21,031**	**4.5%**	**-0.58**
• Electro-medical, x-ray apparatus	3,099	0.7%	0.05
Road vehicles	**16,973**	**3.6%**	**-0.58**
• Road motor vehicles n.e.s.	4,929	1.0%	0.09
Machinery, transport equipment, total:	**132,193**	**28%**	**-1.15**

Source: SEO Amsterdam Economics, based on Comtrade (2015)

7.2 Dutch high-tech exports to Asia

Strong NRCAs for the Netherlands in general do not necessarily reflect the success of Dutch high-tech exports to Asia. As in Chapter 5, we define relative successes in exports to Asian countries. Again, we take the export shares of machinery subcategories to the Asian countries and compare them to the export shares of this category for the Netherlands in general. If the export share in an Asian country is substantially (more than 1%) higher than the export share in general, we identify this subcategory as a success in that particular Asian country. A success can also have a negative

17 Included in this table: all 9 Comtrade 2-digit categories of S3-7 (71-79) and the 12 3-digit subcategories of S3-7 which have an NRCA of 0.01 or higher.

NRCA, because even if a subcategory has a negative NRCA for the Netherlands in general it can still be an unexpected success in exports to Asia. In Table 7.2 we see the subcategories and their Asian success, ordered by the number of country in which these are considered successes.

Based on this method, Dutch exports in machinery and manufacturing to Asia are generally a success. Although for most of these products Dutch NRCAs are negative, the exports in these categories make up a relatively large share of exports to Asian countries. Aircraft parts for example only comprise 0.5% of total Dutch exports, but comprise 6.7% of the exports to India and 7.5% of the exports to Malaysia. Especially aircraft parts are a success in 5 of the Asian countries in this study, but also exports in 'cathode tubes, diodes and transistors' with a negative NRCA as big as -0.33, other machinery and food machinery are successful sectors in Asian exports, as we can see in Table 7.2.

Table 7.2 The most successful Dutch exports to Asia are in aircraft parts, parts of machinery and medical apparatus

Successes	NRCA	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Aircraft parts	-0.13	**5**			✓	✓	✓		✓	✓
Cathode tubes, diodes, transistors etc.	-0.33	**4**	✓	✓			✓		✓	
Other machinery for special industries	0.11	**4**	✓				✓		✓	✓
Food machinery, non-domestic	0.03	**3**				✓		✓	✓	
Electro-medical, x-ray apparatus	0.05	**2**	✓		✓					
Engines and motors, non-electric, other	-0.03	**2**			✓		✓			
Measuring, controlling and analysing instruments	-0.03	**2**			✓			✓		
Medical instruments other	0.10	**2**			✓			✓		
Telecommunications equipment, parts and accessories n.e.s.	0.00	**2**		✓			✓			
Parts and accessories of motor vehicles	-0.19	**2**					✓			✓
Total			3	2	5	2	6	3	4	3

Source: SEO Amsterdam Economics, based on Comtrade (2015)

We also define the possible opportunities for the high-tech sector. When the export share of a subcategory to an Asian country is substantially less (1% or higher) than the general export share and the NRCA is positive, the subcategory is defined as a possible opportunity. The possible opportunities are found in Table 7.3.

Possible opportunities for exports to Asia are in office machinery parts, automatic data processing equipment, and other machinery for special industries. Automatic data processing equipment is mainly exported to Belgium, Germany and the UK, and not to Asian countries. Note that other machinery for special industries is a major success in China, Malaysia, Thailand and Vietnam (Table 7.2), but that the export to Hong Kong, Indonesia and the Philippines is small compared to Dutch exports in general.

Table 7.3 Dutch exports that "stay behind" in Asia are parts of office machinery, automatic data processing equipment and machinery for special industries

Opportunities?	NRCA	total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Parts and accessories of office and adp machinery	0.19	**6**	✓		✓	✓		✓	✓	✓
Automatic data processing equipment	0.05	**6**	✓		✓	✓		✓	✓	✓
Other machinery for special industries	0.11	**3**		✓		✓		✓		

Source: SEO Amsterdam Economics, based on Comtrade (2015)

7.3 Dutch high-tech exports to Malaysia

This section delves further into the high-tech sector of the Netherlands and its exports to Asia. With six successful categories, the Netherlands has most success in high-tech exports to Malaysia, as we could see in Table 7.4. Therefore, we focus on Malaysia.

Table 7.4 gives an overview of the 8 largest high-tech subsectors in which goods are exported from the Netherlands to Malaysia. Here we see that the first 8 subsectors of machinery exports comprise 37% of all Dutch exports to Malaysia, while the sectors constitute only 13.5% of Dutch world exports. This indicates that high-tech sectors form a large part of the Dutch exports to Malaysia.

Table 7.4 High-tech manufacturing exports to Malaysia are a success

Success stories	Share of Dutch exports to Malaysia	Share of total Dutch export	NRCA
Parts and accessories of office and adp machinery	7.9%	2.5%	0.19
Aircraft (parts)	7.5%	0.5%	-0.13
Telecommunications equipment, parts and accessories n.e.s.	6.6%	3.7%	0.00
Automatic data processing equipment	4.1%	2.5%	0.05
Cathode tubes, diodes, transistors etc.	3.9%	1.2%	-0.33
Other machinery for special industries	3.4%	2.0%	0.11
Parts and accessories of motor vehicles	2.1%	0.7%	-0.19
Engines and motors, non-electric, other	1.5%	0.4%	-0.03
Total of this top 8	**37%**	**13.5%**	

Source: SEO Amsterdam Economics, based on Comtrade (2015)

7.3.1 Dutch high-tech sector in Malaysia

The electronics industry is the leading sector in Malaysia's manufacturing industry, contributing significantly to the country's exports (33%) and employment (24%) (in 2014, MIDA 2016). The focus is on semiconductors, solar and LED technologies, of which the semiconductor sector is Malaysia's top electronics industry (US International Trade Administration 2016). This industry produces semiconductor devices, which are vital parts of today's electronics such as smartphones,

computers and other data processing devices. The semiconductor industry in Malaysia mainly consists of the presence of foreign-owned multinational companies such as Intel, AMD, Freescale Semiconductor, ASE, Infineon, STMicroelectronics, Texas Instruments, Renesas and Malaysian-owned companies such as Silterra, Globetronics, Unisem and Inari. In total, there are more than fifty companies producing semiconductor devices in Malaysia (MIDA 2016).

Dutch companies are present in Malaysia's high-tech manufacturing industry, as we can see in the following text box. The most prominent companies are those in the semiconductor industry: BESI, ASML, NXP and KMWE (BCS 2016). These companies are headquartered in the Netherlands, but have manufacturing locations in Malaysia, where they produce high-tech equipment for the manufacturing of microchips, or high-tech parts of electronic and data processing devices. Dutch semiconductor manufacturers boast that as much as 70% of hardware in the world's most popular smartphones is manufactured by Dutch machines[18].

Box 7. 1 Dutch high-tech companies in Malaysia

BE Semiconductor Industries (Besi 2016)
- Equipment for chip manufacturing
- Equipment for packaging semiconductor devices
- Equipment for plating
- Main costumers: US, European and Asian semiconductor manufacturers

NXP Semiconductors
- Automotive (e.g. car radio tuners)
- High Performance Mixed Signal (e.g. cable TV infrastructure)
- Identification (e.g. public transport IC solutions)
- Standard products (e.g. speakers and receivers for mobile phones)
- NXP Software

ASML
- Equipment for the production of microchips

KMWE (semiconductor market)
- Automated machining of complex, functionally critical components
- High-quality mechatronic modules, such as positioning and handling modules and cooling systems
- Clean room assembly up to ISO class 5
- (Clean room) cleaning and RGA testing of products
- Testing procedures according to customer-specific leak tests
- Gluing of various materials

KLM-ENI
- Services for the region

Philips Lumileds

Teleplan
- Hard drives, located in the NI and Mal

Scherpenzeel
- Rollers for printers

Sources: Besi (2016), NXP (2016), ASML (2016), KMWE (2016), interview Dutch embassy Malaysia, Lumileds (2016), Scherpenzeel (2016).

The semiconductor industry is part of a highly integrated, complex global supply chain. It is difficult to grasp the full complexity of the supply chain in this report, but we will attempt to give a rough overview. In general, the headquarters and main R&D activities of the Dutch companies just

[18] Interview BESI, Interview Embassy of the Netherlands, Malaysia

mentioned are located in the Netherlands (mainly around Eindhoven) or in another European country. The companies have manufacturing locations in multiple countries. The most complex high-tech parts are typically produced in the Netherlands[19], whereas other manufacturing takes place in several Asian locations. NXP, for example, has manufacturing locations in Thailand, the Philippines, China, Hong Kong, Taiwan, Malaysia and Singapore. From there, products are exported to China, Japan, Korea, Germany or Taiwan to use in the manufacturing of electronic devices[20].

Hence, Dutch exports of high-tech equipment do not simply follow (end consumer) demand in Asian countries. The choice of Asian export destinations depends also on the demand from (Dutch) firms in countries like Malaysia. The location of these firms depends on local labour costs and the local investment climate. To see where exports go to and to find out where opportunities for the Dutch high-tech industry exist, we therefore have to consider the investment climate in these countries.

7.3.2 The choice of investment location

The semiconductor industry has moved a growing part of its activities from US and European headquarters to China, Taiwan and Southeast Asian countries in the last decades. Although they are situated in the same region, these countries differ from each other in various aspects. A combination of these differences plus active government policies to attract certain industries determine where countries will locate their activities.

The decision to move production to Malaysia, for example, is made for several reasons. First, the Malaysian population is highly educated and a fair part of the people speak English. The education level is vital in particular to guarantee sufficient quality in a demanding industry such as the semiconductor sector. Second, the Malaysian institutional environment is seen as reliable, with little sudden and unexpected legislation, low corruption levels and a strong currency compared to other Asian countries. Third, since the 1990s the government has aggressively stimulated foreign high-tech companies to invest in Malaysia. This takes the form of attractive tax and subsidy schemes, smooth investment rules and easy ways to funnel money out of the country[21].

Other countries are also attractive, and all have their advantages and disadvantages. China for example, has much lower labour costs than Malaysia. Whereas in Malaysia labour costs are 70% less than in the Netherlands, in China labour costs are again 40% less than in Malaysia[22]. However, in China the education level is lower (although it is catching up) and especially the institutional environment is much more difficult to do business in, with a strong but unpredictable government, some unattractive investment rules and high levels of corruption[23]. This is reflected by the 'Ease of Doing Business' ranking of the World Bank (World Bank 2016). Many (South-)East Asian countries are ranked very high, such as Singapore (2nd easiest country to do business in globally), Hong Kong (4), Korea (5), Taiwan (11) and Malaysia (23). China is ranked 78, which means it is easier to do business in the Kyrgyz Republic, Botswana and Rwanda than in China.

19 Interview Embassy of the Netherlands, Malaysia
20 Interview Embassy of the Netherlands, Malaysia and US International Trade Administration (2016)
21 Interview BESI
22 Interview BESI
23 Interview BESI

7.4 Lessons for other high-tech opportunities in Asia

This chapter has shown that, while Netherlands does not have a comparative advantage in machinery exports *per se*, it is very successful in the export of certain high-tech machinery. The Dutch government has made the high-tech industry a top sector. Exports in telecom equipment, parts of office machinery, automatic data processing equipment and machinery for special industries are some of the sectors in which the Netherlands has high export figures and positive NRCAs.

On top of that, we see that these sectors are quite important in exports to the selected Asian countries. Some sectors have larger export shares in these Asian countries than in total Dutch exports, like exports in aircraft parts, cathode tubes etc. and parts of food machinery. Other sectors are relatively less important for Asia than for other countries, like parts of office machinery and automatic data processing equipment. Machinery for specialised industries is a special case: it is a success in China, Malaysia, Thailand and Vietnam but it plays a smaller than average part in exports to Hong Kong, Indonesia and the Philippines.

Dutch exports in the high-tech industry are particularly successful in Malaysia, where many Dutch high-tech companies have opened a production location, resulting in Dutch exports to this country. Based on our qualitative research, we have learned that local production costs, education levels of the workforce and the investment climate are critical for companies to decide where to locate production.

What are the lessons we can draw for identifying other high-tech opportunities in Asia? One lesson learned is that the Dutch high-tech sector is part of a complex global supply chain. The choice of export destination is therefore closely linked to the choice of FDI destination, which in turn depends on the local investment climate, education and production costs. While production processes are increasingly outsourced to Asia, most R&D activities remain in Europe or the Netherlands because of the higher education levels, higher production quality and lower risks of intellectual property theft. This is what makes the Netherlands competitive in a global market. There may therefore be a role for the Dutch government in investing in high-tech education, R&D for high-tech industries and protecting intellectual property rights in order to keep attracting this industry to the Netherlands.

It would be useful to review whether the export success of the high-tech sector in Southeast Asia and China could be replicated in India. Many Dutch companies in the high-tech sector are already active in India and successful exports to India mainly exist in the subsectors food machinery, electro-medical apparatus, engines and motors, measuring instruments, and other medical instruments. The Indian prime minister Modi is implementing large-scale campaigns such as 'Clean India' and 'Make in India'. The Dutch embassy in India already focuses on the top sector high-tech and could potentially support Dutch high-tech firms in gaining further access to India.

Vietnam is another upcoming country for the high-tech industry. Dutch companies invest in the country because of the stable and cheap production location and its growing middle class. The Vietnamese government realizes that it needs to avoid a 'middle income trap' by the upscaling of production, innovation and creating added value. For this purpose, Vietnam has developed the

'Vietnam 2035' agenda in collaboration with the World Bank. Agricultural reforms (in combination with water management) are also a priority for the government, which may create opportunities for Dutch companies in the agro-food sector as well.

In Thailand the high-tech sector is not (yet) a priority. Several companies are active in Thailand. The Thai government puts a lot of effort in attracting high-tech companies, and the Dutch semiconductor company NXP has become active in the country. Our analysis suggests that the largest export successes in Thailand thus far occur in aircraft parts, cathode tubes, and other machinery for special industries and food machinery, but there may be other opportunities as well, which will likely be linked to the attractiveness of Thailand as an FDI destination.

8 Conclusions

The Netherlands lags behind other countries in Western Europe with regard to exports to Asia. In 2015, only 2% of Dutch total gross exports of goods went to China, compared with around 6% for Germany or the UK. Similarly, Dutch gross exports to India in 2015 constituted only 0.5% of total Dutch gross exports, compared with 2.2% for Belgium. And countries like Germany and the UK generally export more to Southeast Asia, even as a percentage of total exports. The Netherlands also lags behind when looking at the value added of exported goods, i.e., taking out the value of imported components. The only area where the Netherlands does not lag behind is in exports of services to Asia, particularly in the areas of transport (logistics), trade, and financial services.

In order to identify the sectors in which the Netherlands particularly lags behind concerning exports to Asia, we first analysed the comparative advantages of the Dutch export sectors. Based on value added export data, we found that the Netherlands has the strongest comparative advantages in transport, trade, finance, agro-food, and petroleum products. Detailed gross export data revealed that there are additional comparative advantages in certain high tech machinery sectors, such as office machines, machinery for specialised industries, and telecom equipment.

Dutch export successes in Asia are thus far mainly found in services, high tech machinery, and some agro-food products. However, there are a number of sectors in which the Netherlands has a comparative advantage worldwide, but exports comparatively less to Asian countries, thereby constituting a 'potential opportunity'. We found that such 'opportunities' are likely to exist in certain agro-food sectors (including vegetables, meat, and flowers), certain high-tech machinery sectors, and medicaments.

Digging deeper into the agro-food sector, our analysis suggests that there could be specific opportunities for meat and vegetables exports to Asia. Thus far, Dutch meat exporters focus mainly on the European market, although certain types of meat exports are already a success in Hong Kong, Malaysia and the Philippines. Meat exports to China used to be constrained due to trade barriers, but given the recent removal of these barriers, meat exports to China are expected to grow and to constitute an important opportunity. Potential opportunities for pork and beef exports to India and Indonesia are likely more limited for religious and cultural reasons. Fruits and vegetables are another sector in which the Netherlands has a strong comparative advantage but is possibly too focussed on the European market. Fresh vegetable exports to Asia lag behind in particular. However, given the high transportation cost and perishable nature of agro-food products, the highest potential for agro-food exports to Asia probably lies in high quality agro-food products or technologies with a high value added, rather than low-quality physical agro-food exports.

Our second case study focussed on opportunities in high tech machinery exports. The most successful Dutch exports to Asia are in aircraft parts, machinery parts, and medical instruments. Dutch high tech machinery exports are particularly successful in Malaysia, but also in China, India and Thailand. However, certain Dutch high exports still lag behind in other Asian countries, particularly Indonesia and the Philippines. These are parts of office machinery, automatic data processing equipment and machinery for special industries.

We have several suggestions for further research:

- First, more sector-specific studies are needed to assess whether the potential opportunities identified by our methodology are in fact real business opportunities. In many cases, there may be good reasons why an apparent opportunity is not yet being exploited, but in some cases there may be obstacles that can easily be overcome, possibly with help of the government.

- Second, more research is needed on the interrelationship between Dutch export destinations and Dutch FDI destinations. In our case study on the high-tech machinery sector, we found that exports in the Dutch semiconductor industry may not necessarily reflect Asian demand, but are strongly related to Dutch FDI in these countries. It is then mainly national legislation and country risk characteristics, rather than domestic demand, that determine FDI destinations and the corresponding export destinations. Moreover, it is likely that spillover effects exist not only among Dutch exporters and among Dutch investors, but also between Dutch exporters and Dutch investors, in which case trade promotion policies can also promote investment, and vice versa.[24]

- Third, it would be useful to conduct a broad evaluation (or a review of previous evaluations) on the effectiveness of the many Dutch policy instruments that are currently being used, or that have been used in the past, to promote trade and investment. These instruments include the provision of country-specific or sector-specific trade and investment information (e.g. through RVO), trade and investment finance (e.g. through the Dutch Good Growth Fund), trade facilitation through trade missions, business dialogue, etc. Better understanding the effectiveness of these instruments, including by studying the experience of other countries, might also lead to recommendations for further improvement of these instruments.[25]

- Finally, more research into services exports is needed. This study has not been able to say much about successes and opportunities in exports of services, even though Dutch exports consist mainly of services, also to Asia. One reason is that the Netherlands mostly lags behind in exports of goods, hence there are likely more unexploited opportunities in terms of goods. However, this does not mean that there will not be any unexploited opportunities in terms of services exports. In order to identify such opportunities, better data on trade in services is needed, as the current data are limited in terms of coverage, consistency, and reliability. We therefore recommend both the Dutch government and other governments and multilateral agencies to continue to invest in sound and detailed services exports data.

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24 Van den Hengel, Oomes and Smits (2016) find evidence for the existence of experience effects and spillover effects among Dutch exporters. This means that a Dutch firm is more likely to export to a particular destination when it has experience with such exports itself, or when other firms in the same sector have experience with exporting to that destination. They argue that in this case Dutch government policies such as the provision of finance for exports to particular countries, can have a sustainable long-term impact on future Dutch exports to these countries.

25 For example, there could be a role for the Dutch government (e.g., through Dutch embassies) in making trade and investment policies implemented by partner countries more accessible, particularly for small and medium enterprises that may not be able to afford collecting such information themselves. While RVO already fulfills this function to some extent, the currently provided information could be enhanced with additional information that includes an overview of all relevant local trade policies, investment policies, tax policies and other government support policies such as subsidies that many Asian governments employ to attract foreign investment.

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Appendix A TiVA exports to Asia

Table A. 1 Dutch exports to Asian countries in million US$

Country:	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Transport and storage	656	285	524	325	668	40	615	54	0,51
Wholesale and retail trade; repairs	322	861	450	115	330	25	53	23	-0,17
Finance and insurance	2.054	127	640	241	159	206	457	3	0,40
R&D and other Business Activities	64	45	355	32	41	6	2	1	0,31
Chemicals and chemical products	556	28	137	43	44	17	44	23	0,10
Food products, beverages and tobacco	197	52	23	41	67	36	40	35	0,24
Coke, refined petroleum products and nuclear fuel	34	4	25	2	3	1	3	1	0,16
Other community, social and personal services	39	15	22	5	7	6	5	1	0,14
Agriculture, hunting, forestry and fishing	31	5	7	5	12	3	4	5	0,09
Machinery and equipment n.e.c	477	17	68	36	56	11	29	16	-0,11
Post and telecommunications	13	29	41	4	7	5	6	0	0,08
Computer and related activities	22	8	22	8	13	1	2	0	0,05
Computer, electronic and optical products	73	18	31	7	21	4	8	2	-0,28
Construction	27	4	47	2	8	2	3	1	0,05
Pulp, paper, paper products, printing and publishing	151	3	23	20	7	3	16	2	-0,01
Hotels and restaurants	56	36	9	4	11	9	5	0	-0,03
Fabricated metal products except machinery and equipment	58	3	18	8	10	2	16	9	-0,02
Motor vehicles, trailers and semi-trailers	49	2	7	2	4	1	2	27	-0,20
Basic metals	114	1	80	5	4	0	8	5	-0,21
Manufacturing n.e.c; recycling	49	8	11	5	7	3	5	1	-0,05
Rubber and plastics products	37	6	11	4	5	1	7	2	-0,04
Other transport equipment	39	7	24	8	4	1	18	1	-0,09
Public admin. and defence; compulsory social security	12	5	17	5	9	1	7	1	0,04
Mining and quarrying	2	0	9	0	1	0	1	0	-0,70
Textiles, textile products, leather and footwear	25	7	4	1	3	2	7	0	-0,14
Renting of machinery and equipment	13	8	10	5	10	1	8	1	-0,01

Country:	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Electricity, gas and water supply	1	1	5	1	1	0	0	-	0,00
Education	8	2	16	2	2	1	0	0	0,02
Electrical machinery and apparatus n.e.c	44	3	8	2	6	1	4	2	-0,10
Other non-metallic mineral products	14	1	9	1	4	0	2	1	-0,02
Real estate activities	13	3	5	1	3	2	2	0	0,00
Health and social work	9	3	3	1	2	4	18	1	0,01
Wood and products of wood and cork	2	0	1	0	1	0	0	0	-0,02
Private households with employed persons	-	-	-	-	-	-	-	-	0,00
TOTAL	5.261	1.596	2.660	943	1.530	395	1.398	220	0,00

Source: SEO Amsterdam Economics based on TiVA (2011)

Table A. 2 Dutch exports to Asian countries in percentage of total export to that country

Country:	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Transport and storage	12%	18%	20%	34%	44%	10%	44%	25%	0,51
Wholesale and retail trade; repairs	6%	54%	17%	12%	22%	6%	4%	10%	-0,17
Finance and insurance	39%	8%	24%	26%	10%	52%	33%	1%	0,40
R&D and other Business Activities	1%	3%	13%	3%	3%	2%	0%	0%	0,31
Chemicals and chemical products	11%	2%	5%	5%	3%	4%	3%	11%	0,10
Food products, beverages and tobacco	4%	3%	1%	4%	4%	9%	3%	16%	0,24
Coke, refined petroleum products and nuclear fuel	1%	0%	1%	0%	0%	0%	0%	0%	0,16
Other community, social and personal services	1%	1%	1%	1%	0%	1%	0%	1%	0,14
Agriculture, hunting, forestry and fishing	1%	0%	0%	0%	1%	1%	0%	2%	0,09
Machinery and equipment n.e.c	9%	1%	3%	4%	4%	3%	2%	7%	-0,11
Post and telecommunications	0%	2%	2%	0%	0%	1%	0%	0%	0,08
Computer and related activities	0%	0%	1%	1%	1%	0%	0%	0%	0,05
Computer, electronic and optical products	1%	1%	1%	1%	1%	1%	1%	1%	-0,28
Construction	1%	0%	2%	0%	1%	0%	0%	1%	0,05
Pulp, paper, paper products, printing and publishing	3%	0%	1%	2%	0%	1%	1%	1%	-0,01
Hotels and restaurants	1%	2%	0%	0%	1%	2%	0%	0%	-0,03
Fabricated metal products except machinery and equipment	1%	0%	1%	1%	1%	1%	1%	4%	-0,02
Motor vehicles, trailers and semi-trailers	1%	0%	0%	0%	0%	0%	0%	12%	-0,20
Basic metals	2%	0%	3%	0%	0%	0%	1%	2%	-0,21
Manufacturing n.e.c; recycling	1%	0%	0%	1%	0%	1%	0%	1%	-0,05
Rubber and plastics products	1%	0%	0%	0%	0%	0%	0%	1%	-0,04
Other transport equipment	1%	0%	1%	1%	0%	0%	1%	0%	-0,09

Country:	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam	NRCA
Public admin. and defence; compulsory social security	0%	0%	1%	1%	1%	0%	1%	0%	0,04
Mining and quarrying	0%	0%	0%	0%	0%	0%	0%	0%	-0,70
Textiles, textile products, leather and footwear	0%	0%	0%	0%	0%	0%	1%	0%	-0,14
Renting of machinery and equipment	0%	1%	0%	1%	1%	0%	1%	0%	-0,01
Electricity, gas and water supply	0%	0%	0%	0%	0%	0%	0%	0%	0,00
Education	0%	0%	1%	0%	0%	0%	0%	0%	0,02
Electrical machinery and apparatus n.e.c	1%	0%	0%	0%	0%	0%	0%	1%	-0,10
Other non-metallic mineral products	0%	0%	0%	0%	0%	0%	0%	1%	-0,02
Real estate activities	0%	0%	0%	0%	0%	0%	0%	0%	0,00
Health and social work	0%	0%	0%	0%	0%	1%	1%	0%	0,01
Wood and products of wood and cork	0%	0%	0%	0%	0%	0%	0%	0%	-0,02
Private households with employed persons	0%	0%	0%	0%	0%	0%	0%	0%	0,00
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	0,00

Source: SEO Amsterdam Economics based on TiVA (2011)

Appendix B Successes and opportunities

Table B. 1 'Successes' and 'opportunities' for Dutch value added exports to Asian countries

		total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam
success	Finance and insurance	6	✓		✓	✓	✓	✓	✓	
success	Transport and storage	6		✓	✓	✓	✓		✓	✓
success	Machinery and equipment n.e.c	4	✓			✓	✓			✓
success	Wholesale and retail trade; repairs	4		✓	✓	✓	✓			
success	Health and social work	3		✓				✓	✓	
success	Pulp, paper, paper products, printing and publishing	2	✓			✓				
success	Basic metals	2	✓		✓					
success	Hotels and restaurants	2		✓				✓		
success	Renting of machinery and equipment	2					✓		✓	
success	Food products, beverages and tobacco	2						✓		✓
success	Chemicals and chemical products	1	✓							
success	Private households with employed persons	1		✓						
success	R&D and other Business Activities	1			✓					

		total	China	Hong Kong	India	Indonesia	Malaysia	Philippines	Thailand	Vietnam
success	Real estate activities	1						✓		
success	Other transport equipment	1							✓	
success	Motor vehicles, trailers and semi-trailers	1								✓
success	Fabricated metal products except machinery and equipment	1								✓
opp	Coke, refined petroleum products and nuclear fuel	8	✓	✓	✓	✓	✓	✓	✓	✓
opp	R&D and other Business Activities	7	✓	✓		✓	✓	✓	✓	✓
opp	Agriculture, hunting, forestry and fishing	6	✓	✓	✓	✓		✓	✓	
opp	Chemicals and chemical products	6		✓	✓	✓	✓	✓	✓	
opp	Food products, beverages and tobacco	6	✓	✓	✓	✓	✓		✓	
opp	Other community, social and personal services	3			✓		✓			✓
opp	Transport and storage	2	✓					✓		
opp	Finance and insurance	1								✓
opp	Post and telecommunications	1								✓

Source: SEO Amsterdam Economics based on TiVA (2011)

Appendix C Best and worst performing sectors by Asian export destination

Table C. 1 Dutch Exports to China

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Finance and insurance	39%	10%	29%	0,40	Success
Machinery and equipment n.e.c	9%	4%	5%	-0,11	Success
Chemicals and chemical products	11%	8%	2%	0,10	Success
Pulp, paper, paper products, printing and publishing	3%	1%	2%	-0,01	Success
Basic metals	2%	1%	1%	-0,21	Success
Agriculture, hunting, forestry and fishing	1%	4%	-3%	0,09	Opportunity
Transport and storage	12%	16%	-4%	0,51	Opportunity
Food products, beverages and tobacco	4%	8%	-4%	0,24	Opportunity?
Coke, refined petroleum products and nuclear fuel	1%	6%	-5%	0,16	Opportunity
R&D and other Business Activities	1%	9%	-8%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 2 Dutch Exports to Hong Kong

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Wholesale and retail trade; repairs	54%	10%	44%	-0,17	Success
Transport and storage	18%	16%	2%	0,51	Success
Hotels and restaurants	2%	1%	1%	-0,03	Success
Private households with employed persons	0%	0%	0%	0,00	Success
Health and social work	0%	0%	0%	0,01	Success
Agriculture, hunting, forestry and fishing	0%	4%	-3%	0,09	Opportunity
Food products, beverages and tobacco	3%	8%	-5%	0,24	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-6%	0,16	Opportunity
Chemicals and chemical products	2%	8%	-6%	0,10	Opportunity
R&D and other Business Activities	3%	9%	-7%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 3 Dutch Exports to India

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Finance and insurance	24%	10%	14%	0,40	Success
Wholesale and retail trade; repairs	17%	10%	7%	-0,17	Success
R&D and other Business Activities	13%	9%	4%	0,31	Success
Transport and storage	20%	16%	4%	0,51	Success
Basic metals	3%	1%	2%	-0,21	Success
Chemicals and chemical products	5%	8%	-3%	0,10	Opportunity
Other community, social and personal services	1%	4%	-3%	0,14	Opportunity
Agriculture, hunting, forestry and fishing	0%	4%	-4%	0,09	Opportunity
Coke, refined petroleum products and nuclear fuel	1%	6%	-5%	0,16	Opportunity
Food products, beverages and tobacco	1%	8%	-7%	0,24	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 4 Dutch Exports to Indonesia

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Transport and storage	34%	16%	18%	0,51	Success
Finance and insurance	26%	10%	16%	0,40	Success
Wholesale and retail trade; repairs	12%	10%	2%	-0,17	Success
Pulp, paper, paper products, printing and publishing	2%	1%	1%	-0,01	Success
Machinery and equipment n.e.c	4%	4%	0%	-0,11	Success
Agriculture, hunting, forestry and fishing	0%	4%	-3%	0,09	Opportunity
Food products, beverages and tobacco	4%	8%	-3%	0,24	Opportunity
Chemicals and chemical products	5%	8%	-3%	0,10	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-6%	0,16	Opportunity
R&D and other Business Activities	3%	9%	-6%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 5 Dutch Exports to Malaysia

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Transport and storage	44%	16%	28%	0,51	Success
Wholesale and retail trade; repairs	22%	10%	11%	-0,17	Success
Finance and insurance	10%	10%	1%	0,40	Success
Renting of machinery and equipment	1%	1%	0%	-0,01	Success
Machinery and equipment n.e.c	4%	4%	0%	-0,11	Success
Other community, social and personal services	0%	4%	-3%	0,14	Opportunity
Food products, beverages and tobacco	4%	8%	-3%	0,24	Opportunity
Chemicals and chemical products	3%	8%	-5%	0,10	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-6%	0,16	Opportunity
R&D and other Business Activities	3%	9%	-7%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 6 Dutch Exports to Philippines

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Finance and insurance	52%	10%	42%	0,40	Success
Food products, beverages and tobacco	9%	8%	1%	0,24	Success
Hotels and restaurants	2%	1%	1%	-0,03	Success
Health and social work	1%	0%	1%	0,01	Success
Real estate activities	0%	0%	0%	0,00	Success
Agriculture, hunting, forestry and fishing	1%	4%	-3%	0,09	Opportunity
Chemicals and chemical products	4%	8%	-4%	0,10	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-6%	0,16	Opportunity
Transport and storage	10%	16%	-6%	0,51	Opportunity
R&D and other Business Activities	2%	9%	-8%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 7 Dutch Exports to Thailand

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Transport and storage	44%	16%	28%	0,51	Success
Finance and insurance	33%	10%	23%	0,40	Success
Health and social work	1%	0%	1%	0,01	Success
Other transport equipment	1%	1%	0%	-0,09	Success
Renting of machinery and equipment	1%	1%	0%	-0,01	Success
Agriculture, hunting, forestry and fishing	0%	4%	-3%	0,09	Opportunity
Food products, beverages and tobacco	3%	8%	-5%	0,24	Opportunity
Chemicals and chemical products	3%	8%	-5%	0,10	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-6%	0,16	Opportunity?
R&D and other Business Activities	0%	9%	-9%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Table C. 8 Dutch Exports to Vietnam

Sector	Perc. Country	Perc. World	diff.	NRCA	Succes/opp.
Motor vehicles, trailers and semi-trailers	12%	1%	11%	-0,20	Success
Transport and storage	25%	16%	9%	0,51	Success
Food products, beverages and tobacco	16%	8%	8%	0,24	Success
Machinery and equipment n.e.c	7%	4%	4%	-0,11	Success
Fabricated metal products except machinery and equipment	4%	1%	3%	-0,02	Success
Post and telecommunications	0%	2%	-2%	0,08	Opportunity
Other community, social and personal services	1%	4%	-3%	0,14	Opportunity
Coke, refined petroleum products and nuclear fuel	0%	6%	-5%	0,16	Opportunity
Finance and insurance	1%	10%	-8%	0,40	Opportunity
R&D and other Business Activities	0%	9%	-9%	0,31	Opportunity

Source: SEO Amsterdam Economics based on Comtrade (2015)

Appendix D List of Comtrade export categories (up to 3 digits)

Code	Label
TOTAL	**Total all products**
0	Food and live animals
00	Live animals other than animals of division 03
001	Live animals other than animals of division 03
01	Meat and meat preparations
011	Meat of bovine animals, fresh, chilled or frozen
012	Other meat and edible meat offal
016	Meat, edible meat offal, salted, dried; flours, meals
017	Meat, edible meat offal, prepared, preserved, n.e.s.
02	Dairy products and birds' eggs
022	Milk, cream and milk products (excluding butter, cheese)
023	Butter and other fats and oils derived from milk
024	Cheese and curd
025	Birds' eggs, and eggs' yolks; egg albumin
03	Fish, crustaceans, molluscs and preparations thereof
034	Fish, fresh (live or dead), chilled or frozen
035	Fish, dried, salted or in brine; smoked fish
036	Crustaceans, mollusks and aquatic invertebrates
037	Fish, aqua. invertebrates, prepared, preserved, n.e.s.
04	Cereals and cereal preparations
041	Wheat (including spelt) and meslin, unmilled
042	Rice
043	Barley, unmilled
044	Maize (not including sweet corn), unmilled
045	Cereals, unmilled (excluding wheat, rice, barley, maize)
046	Meal and flour of wheat and flour of meslin
047	Other cereal meals and flour
048	Cereal preparations, flour of fruits or vegetables
05	Vegetables and fruits
054	Vegetables

Code	Label
056	Vegetables, roots, tubers, prepared, preserved, n.e.s.
057	Fruits and nuts (excluding oil nuts), fresh or dried
058	Fruit, preserved, and fruit preparations (no juice)
059	Fruit and vegetable juices, unfermented, no spirit
06	Sugar, sugar preparations and honey
061	Sugar, molasses and honey
062	Sugar confectionery
07	Coffee, tea, cocoa, spices, and manufactures thereof
071	Coffee and coffee substitutes
072	Cocoa
073	Chocolate, food preparations with cocoa, n.e.s.
074	Tea and mate
075	Spices
08	Feedstuff for animals (excluding unmilled cereals)
081	Feeding stuff for animals (no unmilled cereals)
09	Miscellaneous edible products and preparations
091	Margarine and shortening
098	Edible products and preparations, n.e.s.
1	Beverages and tobacco
11	Beverages
111	Non-alcoholic beverages, n.e.s.
112	Alcoholic beverages
12	Tobacco and tobacco manufactures
121	Tobacco, unmanufactured; tobacco refuse
122	Tobacco, manufactured
2	Crude materials, inedible, except fuels
21	Hides, skins and furskins, raw
211	Hides and skins (except furskins), raw
212	Furskins, raw, other than hides & skins of group 211
22	Oil seeds and oleaginous fruits
222	Oil seeds and oleaginous fruits (excluding flour)
223	Oil seeds & oleaginous fruits (incl. flour, n.e.s.)
23	Crude rubber (including synthetic and reclaimed)
231	Natural rubber & similar gums, in primary forms
232	Synthetic rubber

Code	Label
24	Cork and wood
244	Cork, natural, raw & waste (incl. blocks, sheets)
245	Fuel wood (excluding wood waste) and wood charcoal
246	Wood in chips or particles and wood waste
247	Wood in the rough or roughly squared
248	Wood simply worked, and railway sleepers of wood
25	Pulp and waste paper
251	Pulp and waste paper
26	Textiles fibres and their wastes
261	Silk
263	Cotton
264	Jute, other textile bast fibre, n.e.s., not spun; tow
265	Vegetable textile fibres, not spun; waste of them
266	Synthetic fibres suitable for spinning
267	Other man-made fibres suitable for spinning
268	Wool and other animal hair (incl. wool tops)
269	Worn clothing and other worn textile articles
27	Crude fertilizers other than division 56, and crude minerals
272	Crude fertilizers (excluding those of division 56)
273	Stone, sand and gravel
274	Sulphur and unroasted iron pyrites
277	Natural abrasives, n.e.s. (incl. industri. diamonds)
278	Other crude minerals
28	Metalliferous ores and metal scrap
281	Iron ore and concentrates
282	Ferrous waste, scrape; remelting ingots, iron, steel
283	Copper ores and concentrates; copper mattes, cemen
284	Nickel ores & concentrates; nickel mattes, etc.
285	Aluminium ores and concentrates (incl. alumina)
286	Ores and concentrates of uranium or thorium
287	Ores and concentrates of base metals, n.e.s.
288	Non-ferrous base metal waste and scrap, n.e.s.
289	Ores & concentrates of precious metals; waste, scrap
29	Crude animal and vegetable materials, n.e.s.
291	Crude animal materials, n.e.s.

Code	Label
292	Crude vegetable materials, n.e.s.
3	Mineral fuels, lubricants and related materials
32	Coal, coke and briquettes
321	Coal, whether or not pulverized, not agglomerated
322	Briquettes, lignites and peat
325	Coke & semi-cokes of coal, lign., peat; retort carbon
33	Petroleum, petroleum products and related materials
333	Petroleum oils, oils from bitumin. materials, crude
334	Petroleum oils or bituminous minerals > 70 % oil
335	Residual petroleum products, n.e.s., related mater.
34	Gas, natural and manufactured
342	Liquefied propane and butane
343	Natural gas, whether or not liquefied
344	Petroleum gases, other gaseous hydrocarbons, n.e.s.
345	Coal gas, water gas & similar gases (excludinghydrocar.)
35	Electric current
351	Electric current
4	Animal and vegetable oils, fats and waxes
41	Animal oils and fats
411	Animals oils and fats
42	Fixed vegetable oils and fats, crude, refined or fractionated
421	Fixed vegetable fats & oils, crude, refined, fractio.
422	Fixed vegetable fats & oils, crude, refined, fract.
43	Processed Animal and vegetable oils and fats
431	Animal or veg. oils & fats, processed, n.e.s.; mixt.
5	Chemicals and related products, n.e.s.
51	Organic chemicals
511	Hydrocarbons, n.e.s., & halogenated, nitr. derivative
512	Alcohols, phenols, halogenat., sulfonat., nitrat. der.
513	Carboxylic acids, anhydrides, halides, per.; derivati.
514	Nitrogen-function compounds
515	Organo-inorganic, heterocycl. compounds, nucl. acids
516	Other organic chemicals
52	Inorganic chemicals
522	Inorganic chemical elements, oxides & halogen salts

Code	Label
523	Metallic salts & peroxysalts, of inorganic acids
524	Other inorganic chemicals
525	Radio-actives and associated materials
53	Dyeing, tanning and colouring materials
531	Synth. organic colouring matter & colouring lakes
532	Dyeing & tanning extracts, synth. tanning materials
533	Pigments, paints, varnishes and related materials
54	Medicinal and pharmaceutical products
541	Medicinal and pharmaceutical products, excluding 542
542	Medicaments (incl. veterinary medicaments)
55	Essential oils for perfume materials and cleaning preparations
551	Essential oils, perfume & flavour materials
553	Perfumery, cosmetics or toilet prepar. (excluding soaps)
554	Soaps, cleansing and polishing preparations
56	Fertilizers other than group 272
562	Fertilizers (other than those of group 272)
57	Plastics in primary forms
571	Polymers of ethylene, in primary forms
572	Polymers of styrene, in primary forms
573	Polymers of vinyl chloride or halogenated olefins
574	Polyethers, epoxide resins; polycarbonat., polyesters
575	Other plastics, in primary forms
579	Waste, parings and scrap, of plastics
58	Plastics in non-primary forms
581	Tubes, pipes and hoses of plastics
582	Plates, sheets, films, foil & strip, of plastics
583	Monofilaments, of plastics, cross-section > 1mm
59	Chemical materials and products, n.e.s.
591	Insectides & similar products, for retail sale
592	Starche, wheat gluten; albuminoidal substances; glues
593	Explosives and pyrotechnic products
597	Prepared addit. for miner. oils; lubricat., de-icing
598	Miscellaneous chemical products, n.e.s.
6	Manufactured goods
61	Leather, leather manufactures and dressed furskins

Code	Label
611	Leather
612	Manufactures of leather, n.e.s.; saddlery & harness
613	Furskins, tanned or dressed, excluding those of 8483
62	Rubber manufactures, n.e.s.
621	Materials of rubber (pastes, plates, sheets, etc.)
625	Rubber tyres, tyre treads or flaps & inner tubes
629	Articles of rubber, n.e.s.
63	Cork and wood manufactures (excluding furniture)
633	Cork manufactures
634	Veneers, plywood, and other wood, worked, n.e.s.
635	Wood manufacture, n.e.s.
64	Paper and paper manufactures
641	Paper and paperboard
642	Paper & paperboard, cut to shape or size, articles
65	Textile yarn and related products
651	Textile yarn
652	Cotton fabrics, woven
653	Fabrics, woven, of man-made fabrics
654	Other textile fabrics, woven
655	Knitted or crocheted fabrics, n.e.s.
656	Tulles, trimmings, lace, ribbons & other small wares
657	Special yarn, special textile fabrics & related
658	Made-up articles, of textile materials, n.e.s.
659	Floor coverings, etc.
66	Non metallic mineral manufactures, n.e.s.
661	Lime, cement, fabrica. constr. mat. (excludingglass, clay)
662	Clay construction, refracto. construction materials
663	Mineral manufactures, n.e.s.
664	Glass
665	Glassware
666	Pottery
667	Pearls, precious & semi-precious stones
67	Iron and steel
671	Pig iron & spiegeleisen, sponge iron, powder & granu
672	Ingots, primary forms, of iron or steel; semi-finis.

Code	Label
673	Flat-rolled prod., iron, non-alloy steel, not coated
674	Flat-rolled prod., iron, non-alloy steel, coated, clad
675	Flat-rolled products of alloy steel
676	Iron & steel bars, rods, angles, shapes & sections
677	Rails & railway track construction mat., iron, steel
Code	Label
678	Wire of iron or steel
679	Tubes, pipes & hollow profiles, fittings, iron, steel
68	Non-ferrous metals
681	Silver, platinum, other metals of the platinum group
682	Copper
683	Nickel
684	Aluminium
685	Lead
686	Zinc
687	Tin
689	Miscellaneous no-ferrous base metals for metallur.
69	Manufactures of metal, n.e.s.
691	Structures & parts, n.e.s., of iron, steel, aluminium
692	Metal containers for storage or transport
693	Wire products (excluding electrical) and fencing grills
694	Nails, screws, nuts, bolts, rivets & the like, of metal
695	Tools for use in the hand or in machine
696	Cutlery
697	Household equipment of base metal, n.e.s.
699	Manufactures of base metal, n.e.s.
7	Machinery and transport equipment
71	Power generating machinery and equipment
711	Vapour generating boilers, auxiliary plant; parts
712	Steam turbines & other vapour turbin., parts, n.e.s.
713	Internal combustion piston engines, parts, n.e.s.
714	Engines & motors, non-electric; parts, n.e.s.
716	Rotating electric plant & parts thereof, n.e.s.
718	Other power generating machinery & parts, n.e.s.
72	Specialised machinery

Code	Label
721	Agricultural machinery (excluding tractors) & parts
722	Tractors (excluding those of 71414 & 74415)
723	Civil engineering & contractors' plant & equipment
724	Textile & leather machinery, & parts thereof, n.e.s.
725	Paper mill, pulp mill machinery; paper articles man.
726	Printing & bookbinding machinery, & parts thereof
727	Food-processing machines (excluding domestic)
728	Other machinery for particular industries, n.e.s.
73	Metal working machinery
731	Machine-tools working by removing material
733	Mach.-tools for working metal, excluding removing mate.
735	Parts, n.e.s., & accessories for machines of 731, 733
737	Metalworking machinery (excludingmachine-tools) & parts
74	Other industrial machinery and parts
741	Heating & cooling equipment & parts thereof, n.e.s.
742	Pumps for liquids
743	Pumps (excluding liquid), gas compressors & fans; centr.
744	Mechanical handling equipment, & parts, n.e.s.
745	Other non-electr. machinery, tools & mechan. appar.
746	Ball or roller bearings
747	Appliances for pipes, boiler shells, tanks, vats, etc.
748	Transmis. shafts
749	Non-electric parts & accessor. of machinery, n.e.s.
75	Office machines and automatic data processing machines
751	Office machines
752	Automatic data processing machines, n.e.s.
759	Parts, accessories for machines of groups 751, 752
76	Telecommunication and sound recording apparatus
761	Television receivers, whether or not combined
762	Radio-broadcast receivers, whether or not combined
763	Sound recorders or reproducers
764	Telecommunication equipment, n.e.s.; & parts, n.e.s.
77	Electrical machinery, apparatus and appliances, n.e.s.
771	Electric power machinery, and parts thereof
772	Apparatus for electrical circuits; board, panels

Code	Label
773	Equipment for distributing electricity, n.e.s.
774	Electro-diagnostic appa. for medical sciences, etc.
775	Household type equipment, electrical or not, n.e.s.
776	Cathode valves & tubes
778	Electrical machinery & apparatus, n.e.s.
78	Road vehicles
781	Motor vehicles for the transport of persons
782	Motor vehic. for transport of goods, special purpo.
783	Road motor vehicles, n.e.s.
784	Parts & accessories of vehicles of 722, 781, 782, 783
785	Motorcycles & cycles
786	Trailers & semi-trailers
79	Other transport equipment
791	Railway vehicles & associated equipment
792	Aircraft & associated equipment; spacecraft, etc.
793	Ships, boats & floating structures
8	Miscellaneous manufactured articles
81	Prefabricated buildings, sanitary, heating and lighting fixtures, n.e.s.
811	Prefabricated buildings
812	Sanitary, plumbing, heating fixtures, fittings, n.e.s.
813	Lighting fixtures & fittings, n.e.s.
82	Furniture and parts thereof
821	Furniture & parts
83	Travel goods, handbags, etc.
831	Travel goods, handbags & similar containers
84	Articles of apparel & clothing accessories
841	Men's clothing of textile fabrics, not knitted
842	Women's clothing, of textile fabrics
843	Men's or boy's clothing, of textile, knitted, croche.
844	Women's clothing, of textile, knitted or crocheted
845	Articles of apparel, of textile fabrics, n.e.s.
846	Clothing accessories, of textile fabrics
848	Articles of apparel, clothing access., excluding textile
85	Footwear
851	Footwear

Code	Label
87	Professional and scientific instruments, n.e.s.
871	Optical instruments & apparatus, n.e.s.
872	Instruments & appliances, n.e.s., for medical, etc.
873	Meters & counters, n.e.s.
874	Measuring, analysing & controlling apparatus, n.e.s.
88	Photo apparatus, optical goods, watches and clocks
881	Photographic apparatus & equipment, n.e.s.
882	Cinematographic & photographic supplies
883	Cinematograph films, exposed & developed
884	Optical goods, n.e.s.
885	Watches & clocks
89	Miscellaneous manufactured articles, n.e.s.
891	Arms & ammunition
892	Printed matter
893	Articles, n.e.s., of plastics
894	Baby carriages, toys, games & sporting goods
895	Office & stationery supplies, n.e.s.
896	Works of art, collectors' pieces & antiques
897	Jewellery & articles of precious materia., n.e.s.
898	Musical instruments, parts; records, tapes & similar
899	Miscellaneous manufactured articles, n.e.s.
9	Commodities and transactions, n.e.s.
96	Coin (other than gold coin), not being legal tender
961	Coin (other than gold coin), not being legal tender
97	Gold, non-monetary (excluding gold ores and concentrates)
971	Gold, non-monetary (excluding gold ores and concentrates)

Appendix E List of TiVA export categories

ICIO 34 industry list		ISIC Rev.32	approx. ISIC Rev.43
1	Agriculture, hunting, forestry and fishing	01, 02, 05	01, 02, 03
2	Mining and quarrying	10, 11, 12, 13, 14	05, 06, 07, 08, 09
3	Food products, beverages and tobacco	15, 16	10, 11, 12
4	Textiles, textile products, leather and footwear	17, 18, 19	13, 14, 15
5	Wood and products of wood and cork	20	16
6	Pulp, paper, paper products, printing and publishing	21, 22	17, 18, 58
7	Coke, refined petroleum products and nuclear fuel	23	19
8	Chemicals and chemical products	24	20, 21
9	Rubber and plastics products	25	22
10	Other non-metallic mineral products	26	23
11	Basic metals	27	24
12	Fabricated metal products except machinery and equipment	28	25
13	Machinery and equipment n.e.c	29	28
14	Computer, electronic and optical products	30, 32, 33	26
15	Electrical machinery and apparatus n.e.c	31	27
16	Motor vehicles, trailers and semi-trailers	34	29
17	Other transport equipment	35	30
18	Manufacturing n.e.c; recycling	36, 37	31, 32, 33
19	Electricity, gas and water supply	40, 41	35, 36
20	Construction	45	41, 42, 43
21	Wholesale and retail trade; repairs	50, 51, 52	45, 46, 47, 95
22	Hotels and restaurants	55	55, 56
23	Transport and storage	60, 61, 62, 63	49, 50, 51, 52, 79
24	Post and telecommunications	64	53, 61
25	Finance and insurance	65, 66, 67	64, 65, 66
26	Real estate activities	70	68
27	Renting of machinery and equipment	71	77
28	Computer and related activities	72	62, 63
29	Research and development	73	72
	Other Business Activities	74	69, 70, 71, 73, 74, 75, 78, 80, 81, 82
30	Public admin. and defence; compulsory social security	75	84
31	Education	80	85
32	Health and social work	85	86, 87, 88
33	Other community, social and personal services	90, 91, 92, 93	37, 38, 39, 59, 60, 90, 91, 92, 93, 94, 96
34	Private households with employed persons	95	97, 98

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