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Openness, Specialisation and Vulnerability of the Nordic Countries

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Openness, Specialisation and Vulnerability of the Nordic Countries

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Openness, Specialisation and Vulnerability of the Nordic Countries

Abstract

In this paper we analyse to what extent the Nordic economies are vulnerable to external shocks. Specifically, we assess the conventional wisdom that the Nordic countries are small open economies that are significantly engaged in international trade, specialised in only few specific industries and, as a consequence, extremely dependent on the competiveness of their tradable sector and exposed to external shocks. To study this conventional wisdom, we employ a comprehensive set of indicators about trade openness, specialisation and vulnerability. While we do find that the Nordic countries are open economies, though not to an exceptional degree, we also find significant heterogeneity across these countries with respect to their vulnerability.

Key words: International trade, small open economy, Nordic countries, specialisation, vulnerability

JEL: F14, F6, L00

Pohjoismaiden avoimuus, erikoistuminen ja shokkiherkkyys

Tiivistelmä

Tässä tutkimuksessa tarkastellaan Pohjoismaiden alttiutta ulkoisille taloudellisille shokeille. Arvioimme vakiintunutta käsitystä, että Pohjoismaat ovat pieniä ulkomaankaupasta riippuvaisia avotalouksia, jotka ovat erikoistuneet vain harvoihin toimialoihin. Tämän seurauksena ne ovat hyvin riippuvaisia avoimen sektorinsa kilpailukyvystä ja alttiita ulkoisille shokeille. Analyysissa käytetään laajaa tilastomateriaalia ulkomaankaupan avoimuudesta, erikoistumisesta ja herkkyydestä. Tulosten mukaan Pohjoismaat ovat avoimia talouksia, joskaan eivät poikkeuksellisen avoimia. Maiden välillä on lisäksi huomattavia eroja shokkiherkkyyden suhteen.

Asiasanat: Kansainvälinen kauppa, pieni avotalous, Pohjoismaat, erikoistuminen, shokkiherkkyys

JEL: F14, F6, L00

1 Introduction

It is often argued that the Nordic countries – Denmark, Finland, Iceland, Norway and Sweden – are particularly vulnerable to external shocks and very dependent on the competiveness of their tradable sector. This argument is based on the conventional wisdom that the Nordic countries are small open economies that are specialised in just a few selected industries. Yet the recent economic and financial crisis has had heterogeneous effects on economic activity in the Nordic countries. Iceland and Finland were hit hardest, while Norway escaped with very little damage.

In this paper we aim to assess to what extent the conventional wisdom holds true. In particular, we employ a comprehensive set of indicators to analyse the openness and vulnerability of the Nordic economies to external shocks. We study foreign trade, export structure, foreign direct investment (FDI) and cross-border activities of multinational enterprises (MNEs). We note that traditional measures, based on gross trade figures, potentially mislead any interpretation of openness and the significance of international trade as they fail to acknowledge the nature of global value chains, where the production of export goods is increasingly geographically fragmented. In addition, we motivate that we need a heterogeneous set of indicators in order to evaluate vulnerability.

Our analysis first suggests that the Nordic countries are indeed open economies. This is supported by the significant share of value added that is created in their tradable sector. However, they are not significantly more open than comparable small economies in Europe, or even Germany which is a much larger economy. Second, we find that there is significant heterogeneity among the five countries in terms of specialisation. In particular, Iceland and Norway are extremely concentrated in producing and exporting a few goods (in particular fish, oil, natural gas and aluminium), but Finland, Sweden and especially Denmark, have a much more diversified export structure, which brings significant value added to the domestic economy. Third, we find that there exists heterogeneity in the extent that the Nordic countries are sensitive to external shocks. This is, among others, due to their differences in their terms of trade volatility and varying concentration of exports to a few exporting firms and products.

Previous studies suggest that Nordic economies are particularly vulnerable to external shocks due to their trade linkages and financial openness. For example, Vitek (2013) studies the influence of external macroeconomic and financial shocks to Nordic economies in a structural macro model and suggests that most of the cyclical output variation is driven by external factors. Similarly, Gulan et al. (2013) attribute most of the fall in Finnish economic activity during the recent economic and financial crisis to a lack of external demand and external financial stress. However, this literature which relies on historical decompositions of macroeconomic fluctuations, does not address the potential structural factors (industrial and export products) that impose risks on economic activity in the future and that may vary significantly across countries. We aim to complement this literature.

The rest of this paper is constructed as follows. Section 2 discusses the openness of Nordic economies based on various indicators, including international trade, foreign direct investment and the significance of multinational enterprises. Section 3 presents indicators on specialisation. Section 4 discusses vulnerability and exposure to external shocks. Section 5 concludes.

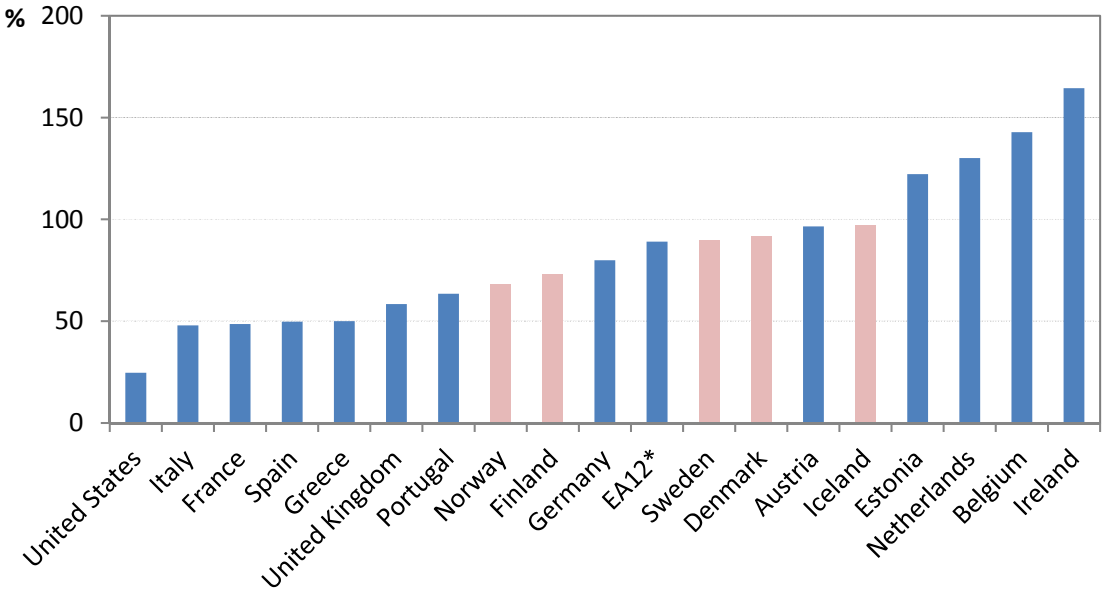
2 Openness

In this section, we first study the openness of the Nordic economies in terms of international trade. Second, we look at foreign direct investment statistics. Finally, we discuss openness in terms of multinational enterprises and their role in domestic economic activity. During our analysis, we keep Germany as a reference country whenever meaningful. This helps us to understand the particular characteristics of Nordic countries in contrast to a large but open economy.

2.1 Trade

A common measure of a country's openness is the sum of the value of its exports and imports divided by its gross domestic product, or trade openness in short. It is a measure of inter-connectedness and reflects the importance of both exports and imports for the domestic economy. Figure 1 shows trade openness in the Nordic countries and in a number of other OECD economies for comparison.[1] It shows, consistent with the conventional wisdom, that the Nordic countries are more engaged in international trade than the United States or most of the large economies in the euro area. The combined ratio of imports and exports is between 68 per cent of GDP in Norway and 97 per cent of GDP in Iceland. Yet, the figure also suggests that the Nordic countries are not particularly open when compared to other small economies. For instance, trade comprises a much larger share of economic activity in countries such as the Netherlands, Belgium and Ireland. Trade openness in Germany also exceeds that of Finland and Norway, even though it is a much larger economy.

Figure 1 Trade in goods and services, % of GDP, 2009



Note: Trade is measured as gross imports plus gross exports. *EA12 is an arithmetic average for the Euro Area.
Source: OECD.

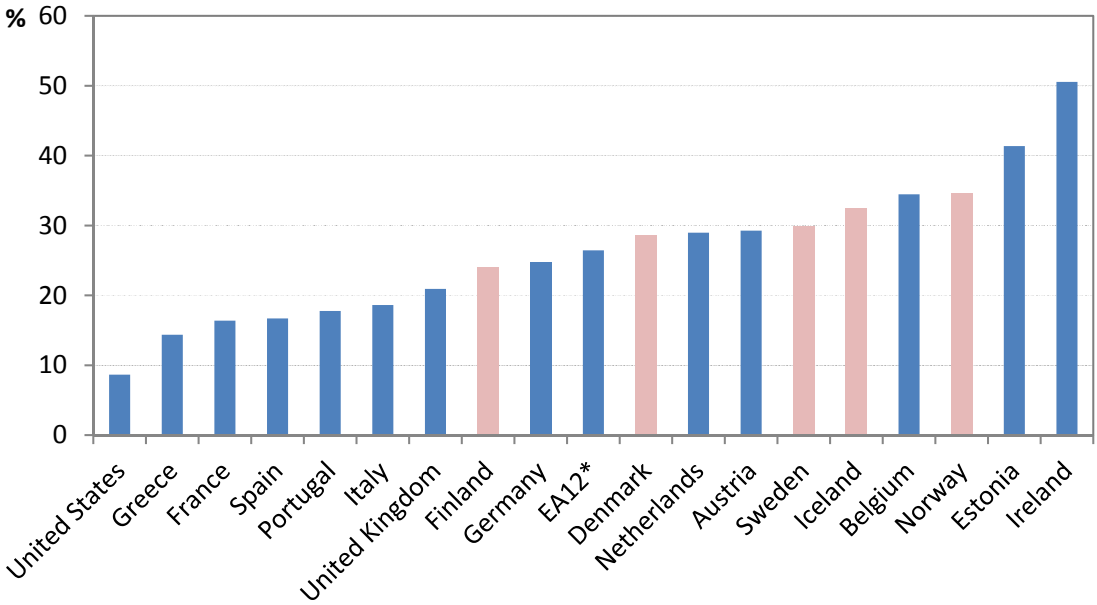
[1] For consistency we choose to present our figures for 2009. While 2009 was a year associated with significant turbulence in international trade, it does not affect the ranking of countries to any significant degree.

However, we cannot draw too strong conclusions about each country solely on the basis of its trade openness. In particular, gross trade figures do not include information on the domestic value added content in exports. In reality, domestic enterprises use imports as inputs in the production of their export products, but they are also used in re-exports thus inflating the trade figures. Consequently, gross trade data may bias any interpretation about each country's openness and the importance of international trade for the domestic economy and, as a consequence, the vulnerability of the domestic economy to external shocks.

One way around this problem is to look at the value added trade figures, which abstract from the foreign intermediate inputs employed in producing domestic exports, as suggested by recent literature.[2] Figure 2 shows the domestic value added embodied in foreign final demand or, in other words, the value added exports as estimated by the OECD. We find that exports account for between 24 percent and 35 per cent of domestic value added in the Nordic countries, implying that trade does contribute significantly to domestic value added. The Nordic countries fall between large economies, such as the United States and France where international trade accounts for 9 and 16 per cent of GDP respectively, and small economies such as Ireland and Estonia where exports account for 40 and 50 per cent of GDP respectively.

But the value added figures also convey information that is not clear from gross trade figures. First, the Nordic countries are in a different order in Figures 1 and 2. Specifically, exports contain the most significant source of domestic value added in Norway despite the fact that it was ranked the least open based on trade openness. The significant difference between the

Figure 2 Value added exports, % of GDP, 2009



Note: Domestic value added embodied in foreign final demand. *EA12 arithmetic average.
Source: OECD.

[2] See e.g. Hummels et al. 2001, Daudin et al. 2011, Johnsson and Noguera 2012, and Koopman et al. 2014 for a macro perspective and Ali-Yrkkö et al. 2011 for a micro and case-study perspective. These papers also consider the difficulties related to measuring the domestic value added of exports.

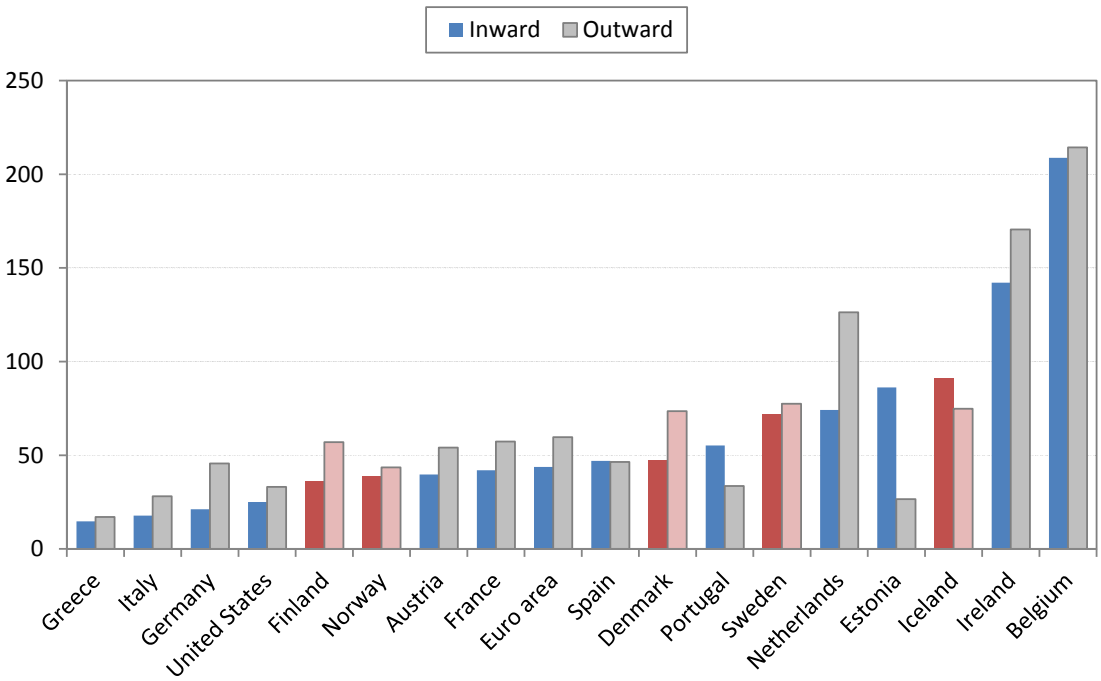
gross figures and value added figures reflects the fact that Norway exports products that have a high degree of domestic value added, such as crude oil, natural gas and fish (see Section 3 below). Consequently, the gross figures potentially underestimate the significance of international trade to Norway's economy. Second, we may observe that the Netherlands and Belgium now fall into the same category as the Nordic countries. This reflects the fact that a significant portion of international trade in these countries consists of re-exports or arbitrage trade that involves little domestic value added. Hence, the figure suggests that the Nordic countries are comparable to other small European economies when we consider the linkages of cross border activity.

2.2 Foreign Direct Investment

Foreign direct investment measures direct cross-border linkages in economic activity that concern longer lasting and more stable links between economies. FDI flows have the potential to transfers technological and business know-how internationally and increase the markets for domestic producers as well as financing possibilities for smaller firms. FDI data provide a measure of interdependence that is not accounted for in international trade flows.

Figure 3 shows inward and outward FDI in the Nordic countries and other OECD economies. The share of FDI varies significantly between the Nordic countries. The ratio is the highest in Iceland, even though it has the highest level of restrictions on FDI and ownerships among these countries.[3] In contrast, the FDI share is the lowest in Finland and Norway, which have

Figure 3 Foreign direct investment stocks in 2012, % of GDP



Note: Ordered by inward foreign direct investment. Nordic countries highlighted in red.
Source: UNCTAD.

[3] See OECD FDI index at www.oecd.org/investment/index. This is only in part explained by the recent crisis; see Gwartney et al. (2013).

fewer restrictions on capital movements and FDI. Furthermore, Iceland has attracted more inward FDI than it has outward FDI, while the opposite is true for the other Nordic countries, especially Denmark and Finland. The high FDI-to-GDP ratios in Belgium, Ireland and the Netherlands are largely due to specific tax-induced behaviour by multinational firms and due to low restrictions on foreign investment and ownership restrictions.

Figure 4 shows the significant increase in FDI in the Nordic countries during the last three decades, which is part of a global trend in FDI flows. The increase has been particularly dramatic in Iceland since 2003. This is partly explained by its size – its economy is so small that even a single large investment has a very strong impact on the aggregate flows. Another peculiarity is the inward FDI stock in Denmark which increased very rapidly in the late 1990s, but has since been flat with respect to the GDP. Overall, the Nordic countries' openness in terms of inward and outward FDI stocks does not stand out in Europe even if we include larger economies.

Figure 4a Outward FDI, % of GDP

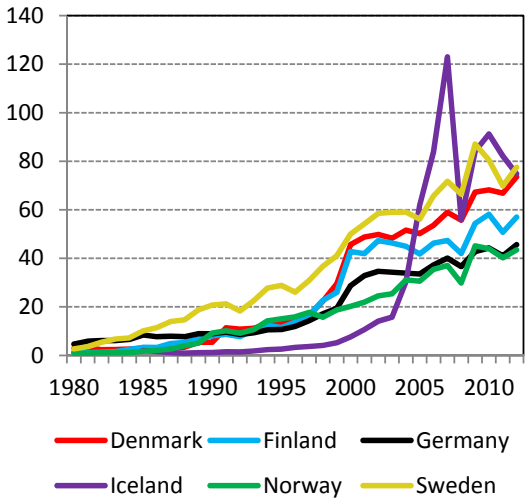
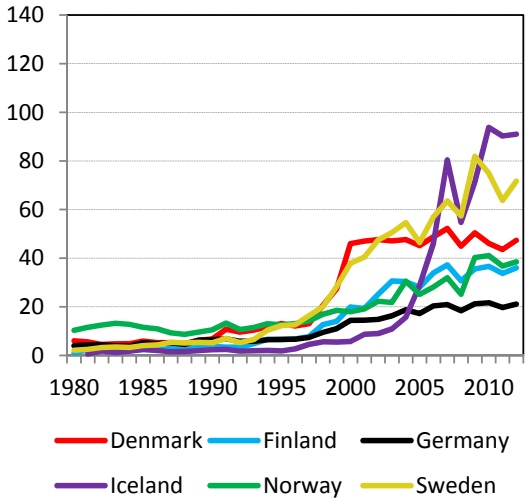


Figure 4b Inward FDI, % of GDP



Source: UNCTAD.

2.3 Multinational enterprises

Another angle to look at a country's openness is the interconnectedness of firms operating in each country, or the multinational enterprises (MNE).[4] Cross-border activity and world trade are to a significant degree intra-firm trade. In particular, a relatively limited number of multinational enterprises (MNEs) account for most of world trade. But studying MNEs also captures information about interconnectedness that might not be captured either by trade flows or by foreign direct investment data. For example, a domestic MNE that has activities abroad may benefit from resources that are not domestically available and is clearly in a different position in terms of shocks to the domestic economy than fully domestic enterprises and vice versa.

[4] These data are of course correlated with the FDI stocks that we just reviewed, but nevertheless they do offer an additional view.

Figure 5 shows the inward activity of foreign MNEs in employment and value added as a percentage of total domestic employment and value added in the Nordic countries and Germany. In manufacturing, these shares are the largest in Sweden, where foreign MNEs account for 44 per cent of value added and 34 per cent of manufacturing employment. In Norway, the shares are 32 and 23 per cent, respectively. Denmark and Finland form a group of their own with Germany in terms of the share in value added. In services the importance of foreign MNEs is different. Specifically, MNEs have the largest share of labour and value added in Denmark, followed by Sweden, Norway and Finland. Overall, the inward activity of foreign MNEs is relatively similar in Germany as in the Nordic countries in terms of value added.

Figure 5a Inward activity of MNEs in manufacturing in 2010, % of total

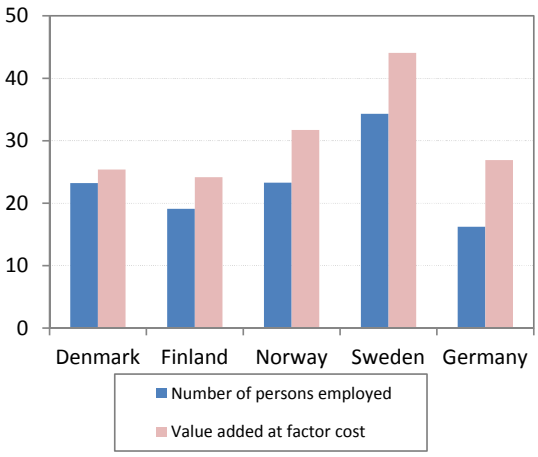
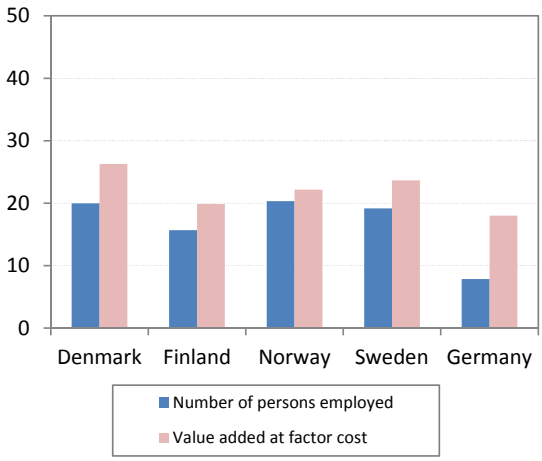


Figure 5b Inward activity of MNEs in services in 2010, % of total



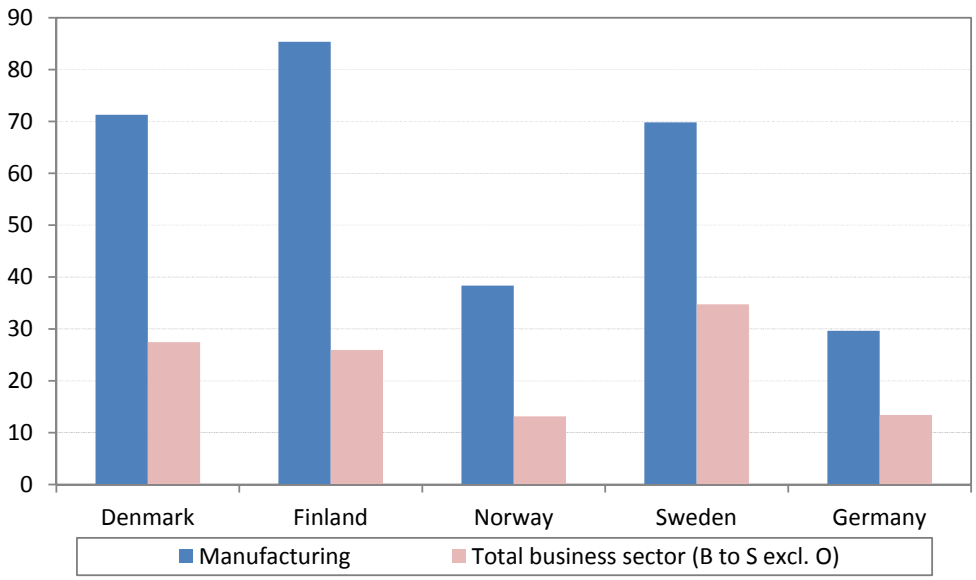
Note: No data for Iceland. Denmark in 2009.
Source: OECD.

In contrast, Figure 6 shows the outward activity of domestic multinationals in manufacturing and total business sector. Manufacturing MNEs have a significant share of their employment abroad. This is most significant in Finland where the ratio of domestic MNEs' employment abroad to domestic manufacturing employment was 85 per cent in 2010. The ratio is about 70 per cent in Denmark and Sweden, but much lower in Norway and Germany.

In total business sector, foreign employment is less significant than in manufacturing. Sweden has the strongest service sector firms (retail trade etc.) that lift the country to the first position in terms of foreign employment relative to domestic employment. With the exception of Norway, the Nordic countries are quite different from Germany in that the domestic MNEs have a larger share of their total activities abroad. This is natural due to their smaller size, but also reflects the extent that these countries are specialised in particular tasks in the production chain.

Table 1 shows which countries are the most important in terms of domestic MNEs' employment abroad. In general, Germany, China and the United States stand out as the main destination countries along with Sweden for the other Nordic countries. Interestingly, Finnish MNEs have the highest share of their labour in large transition and developing countries with Russia, China, India and Brazil totalling almost 30 per cent of total foreign employment.

Figure 6 Outward activity of domestic multinationals, number of persons employed abroad per domestic employment (%) in 2010



Note: Total business sector employment is calculated as total employment less agriculture, hunting, forestry and fishing, and less general government employment. According to the OECD, total employment in general government as a percentage of the labour force in Germany in 2011 was 10.6 per cent.
Source: OECD and own calculations.

Table 1 Domestic multinationals' employment abroad, total business sector in 2010, % of total

Denmark	*%*	*Finland*	*%*	*Norway*	*%*	*Sweden*	*%*	*Germany*	*%*
China	9.7	Sweden	13.0	Sweden	18.0	USA	16.0	USA	13.0
USA	7.7	Russia	9.8	USA	7.5	Germany	8.7	UK	6.6
Germany	7.7	China	8.8	Denmark	6.7	China	6.1	China	6.6
Sweden	6.9	Germany	8.4	UK	5.6	France	5.7	France	5.8
UK	6.5	India	6.5	Germany	5.0	Denmark	4.8	Poland	5.0
Poland	5.9	USA	5.7	Poland	3.8	UK	4.7	Brazil	4.4
India	3.7	Poland	4.8	India	3.7	Norway	4.4	Czech Rep.	4.4
Russia	3.4	Estonia	4.6	OFC	3.4	Poland	4.3	Austria	3.9
Norway	3.0	Brazil	3.4	Thailand	3.0	Finland	3.9	Spain	3.6
France	3.0	UK	2.9	China	2.9	Spain	3.4	Italy	3.1

Note: OFC = Offshore financial centres.
Source: OECD and own calculations.

Based on the international comparison, we conclude that the Nordic countries are open economies. They are much more dependent on international trade than large euro area countries, or smaller countries such as Greece or Portugal. But in terms of aggregate trade figures, the Nordic countries do not appear particularly open when compared to other small countries in

Europe. Furthermore, there is no clear ordering of the Nordic countries in terms of their openness using the different indicators. To understand what lies below the surface, we next look at the export structures of these countries.

3 Specialisation

This section studies the degree of specialisation of export industries in the Nordic countries. We first discuss the main export goods and industries for each country. Second, we assess how Nordic economies compare to world markets. Finally, we analyse the significance of the specialised sectors in value added terms.

3.1 Exports

Table 2 shows the Nordic countries' and Germany's top-five export products in 2012 using the three-digit level of SITC Rev 3 with 255 product categories. Despite the Nordic countries' highly educated labour force, the exports of raw materials and low-tech processed products comprise a relatively large share of their exports. Norway and Iceland are the clearest examples of this. In Norway, crude petroleum oil and natural gas add up to a combined share of 61 per cent and fresh fish an additional 5 per cent of total goods exports. In Iceland, 37 per cent of exports are aluminium and 35 per cent are fresh or lightly processed fish.

Table 2 Top-5 export goods, % of gross exports, 2012

Denmark	%	*Norway*	%
Medicaments (incl. veterinary medicaments)	8.1	Petroleum oils, oils from bitumin. materials, crude	33.9
Petroleum oils or bituminous minerals > 70 % oil	4.7	Natural gas, whether or not liquefied	27.0
Petroleum oils, oils from bitumin. materials, crude	4.6	Petroleum oils or bituminous minerals > 70 % oil	5.6
Other meat and edible meat offal	3.7	Fish, fresh (live or dead), chilled or frozen	4.7
Medicinal and pharmaceutical products, excluding 542	2.8	Aluminium	2.6

Finland	%	*Sweden*	%
Paper and paperboard	12.5	Petroleum oils or bituminous minerals > 70 % oil	7.8
Petroleum oils or bituminous minerals > 70 % oil	10.7	Paper and paperboard	5.7
Flat-rolled products of alloy steel	4.5	Telecommunication equipment, n.e.s.; & parts, n.e.s.	4.3
Telecommunication equipment, n.e.s.; & parts, n.e.s.	2.7	Parts & accessories of vehicles	3.8
Other machinery for particular industries, n.e.s.	2.4	Medicaments (incl. veterinary medicaments)	3.7

Iceland	%	*Germany*	%
Aluminium	37.1	Motor vehicles for the transport of persons	10.3
Fish, fresh (live or dead), chilled or frozen	27.5	Parts & accessories of vehicles	3.8
Fish, dried, salted or in brine; smoked fish	7.2	Medicaments (incl. veterinary medicaments)	3.2
Feeding stuff for animals (no unmilled cereals)	3.6	Aircraft & associated equipment; spacecraft, etc.	3.0
Pig iron & spiegeleisen, sponge iron, powder & granu	3.4	Apparatus for electrical circuits; board, panels	2.2

Note: Three-digit level of SITC Rev 3.
Source: UNCTAD, own calculations.

In the other Nordic countries the pattern is less marked. In Finland, almost 20 per cent of exports are forest industry products, of which 12.5 percentage points are paper and paperboard. Also, petroleum oils or bituminous minerals, which are mainly manufactured from imported crude oil, have become one of the main export products. The formerly important mobile phone exports have all but ended, but there remains significant research and development (R&D) activity in this field. Denmark and Sweden have a more heterogeneous structure of export goods and no single product comprises such a large share of total exports, but petroleum and products thereof do constitute a significant share of exports also in these countries. A significant share of Germany's exports consists of cars, but otherwise no single product category plays a dominant role.

We may note already from this table that there are significant differences in the extent that the Nordic countries have concentrated on producing only in a few product groups. In particular, the top-10 export product groups account for 89 per cent of exports in Iceland, 80 per cent in Norway, 44 per cent in Finland, 36 per cent in Sweden and 34 per cent in Denmark. In Germany, the top-10 export product groups account for 31 per cent of total exports.

While a lot of manufacturing production has moved to China in particular, exports of services have become increasingly important for many countries. In 2012, Sweden accounted for 1.7 per cent of the global exports of services, Denmark for 1.5 per cent, Norway for 1.0 per cent, Finland for 0.7 per cent and Iceland for 0.1 per cent. After the turn of the century, the shares of Finland and Sweden have risen slightly, while that of Norway has declined a little. Meanwhile, all Nordic countries (especially Denmark, Finland and Sweden) have experienced declining shares in world merchandise exports.[5]

In order to assess the characteristics of Nordic countries more systematically, we next compare them to world markers. We first look at the diversification index of export goods. It measures to what extent the structure of exports of an individual country differs from the export structure of the world. The index is calculated as

$$S_j = \frac{\sum_i |h_{ij} - h_i|}{2},$$

where h_{ij} is the share of good i in the total exports of country j and h_i is the share of the good in total world exports.[6] Thus, the index takes values from zero to one, where a value closer to one indicates a bigger difference from the world total.

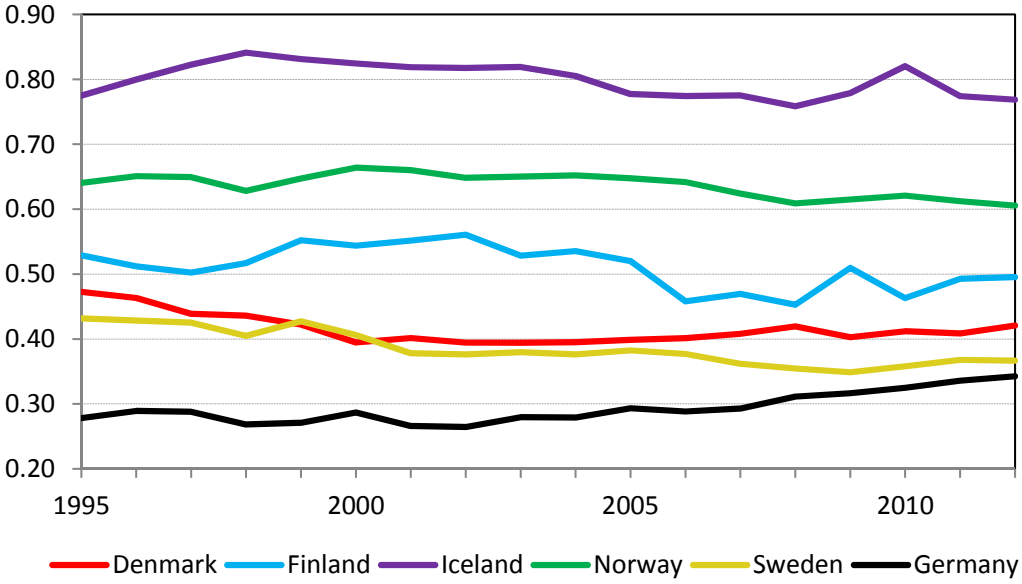
Figure 7 shows the diversification index of export goods for Nordic countries and Germany as calculated by UNCTAD.[7] Norway and Iceland score the highest index values, implying that the export structure in these countries differs significantly from the world average. Finland and Denmark rank next, while Sweden and Germany are closest to the structure of global exports. As we can see, the countries' export structures relative to the rest of the world have been relatively stable over the past almost two decades. The largest relative declines in the index have occurred in Sweden and Denmark, while there has been a relative increase in Germany.

[5] Data by UNCTAD.

[6] The index is a modified Finger-Kreinin (1979) measure of similarity in trade.

[7] For a comparison relative to EU countries' export structures, see Kaitila (2013).

Figure 7 Diversification index of export goods



Source: UNCTAD.

Next, we look at the concentration of each country's export goods. The degree of market concentration can be assessed by the Herfindahl-Hirschmann (HH) index. The index is given by

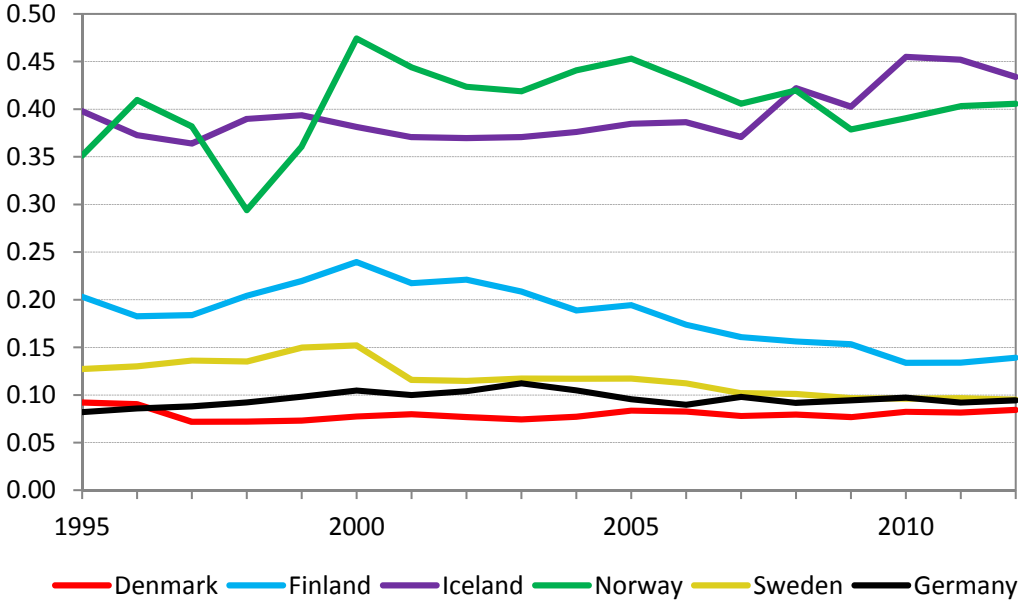
$$HH_i = \frac{\sqrt{\sum_{j=1}^{n}\left(\frac{x_{ij}}{X_i}\right)^2} - \sqrt{\frac{1}{n}}}{1-\sqrt{\frac{1}{n}}},$$

where x_{ij} is the value of exports for country j and good i, and $X_i = \sum_{j=1}^{n} x_{ij}$ with n the number of individual goods. The index takes on values from zero to unity, where unity denotes concentration to only a single good.

Figure 8 shows the HH index as calculated by UNCTAD. Unsurprisingly, Iceland and Norway are in a group of their own as countries that have very concentrated export structures. Denmark, Sweden and Germany are together at about the same level in terms of their export good concentration despite the fact that these countries differ considerably in their size. In contrast, we may observe that Finland has had a more concentrated export structure than its neighbours, but that there has been a considerable decline in the concentration of Finnish exports during the last fifteen years. A similar, albeit more moderate decline has also occurred in Sweden.

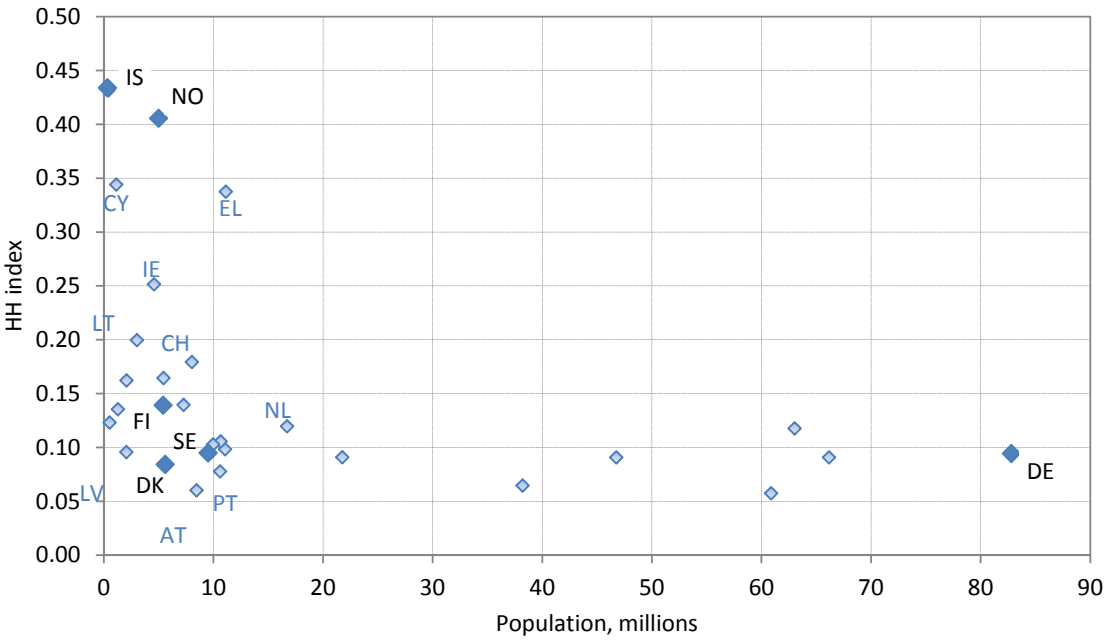
Intuitively, small countries are more likely to specialise in their production and exports than large countries. However, the Nordic countries tend to represent the extremes of this general tendency. This can be seen from Figure 9 which plots the HH index and population in the EU27 countries, Iceland, Norway and Switzerland. Especially Denmark and Sweden seem to be less specialised than small countries on average, while Iceland and Norway are much more specialised than the other countries.

Figure 8 Herfindahl-Hirschmann index of export good concentration



Source: UNCTAD.

Figure 9 Herfindahl-Hirschmann index and population in 2012 in the EU27 countries, Iceland, Norway and Switzerland



Source: UNCTAD.

3.2 Revealed Comparative Advantage

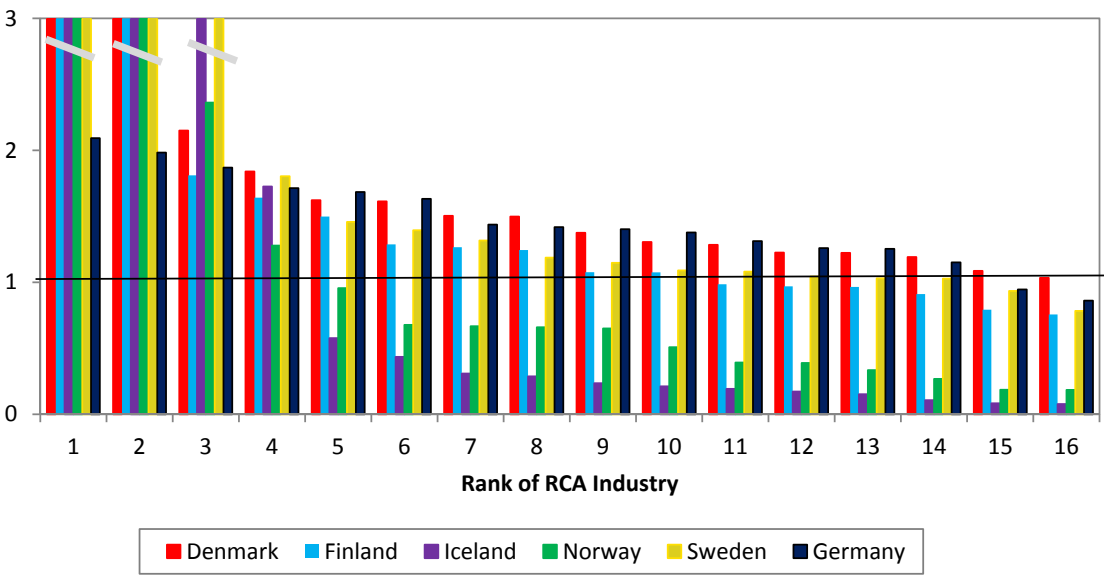
Another frequently used indicator of countries' specialisation is the revealed comparative advantage (RCA), following Balassa (1965). It compares a country's exports in a particular industry to a reference group's total exports in the same industry. More specifically, the RCA for industry is calculated as

$$RCA_i = \frac{X_i / \sum_i X_i}{X_{w,i} / \sum_i X_{w,i}},$$

where x_i denotes domestic exports of industry i and $X_{w,i}$ denotes the reference group's exports of industry i. Consequently, a higher-than-average export share in a specific industry is reflected in an RCA figure above one and a lower than average export share is reflected in RCA below one.

Figure 10 shows the RCA in 28 industries for the Nordic countries and Germany.[8] We rank the industries by their RCA to illustrate the structural differences and similarities in these countries. For example, rank 3 on the horizontal axis refers to the industry with the third-highest RCA in each country. Consequently, the ordering differs across countries.

Figure 10 Revealed Comparative Advantage (RCA)



Note: Industries ranked by their RCA. For a full list of the industries and rankings, see Table A1 in the Appendix. The top-3 RCA figures are Denmark (4.2, 3.1, 2.2), Finland (11.3, 5.1, 1.8), Iceland (24.4, 7.4, 6.5), Norway (18.7, 5.7, 2.4), and Sweden (7.1, 6.7, 4.3). Industries included (28 in total): Agriculture, hunting and forestry; Fishing; Mining and Quarrying; Manufacturing (Food and beverages; Tobacco; Textiles; Wearing apparel etc.; Leather etc.; Wood; Paper; Printing; Coke, ref. petroleum prod. and nuclear fuel; Chemicals; Rubber and Plastics; Other non-metallic; Basic metals, Fabricated metal prod.; Machinery and equipment; Office, accounting and computing machinery; Electrical machinery and apparatus; Radio, television and communication equipment; Medical, precision and optical instruments; Motor vehicles; Other transport; Furniture, other manufacturing), Electricity, gas and water; Real estate, renting and business activities; Other community and personal services.
Source: OECD.

[8] See Table A1 in the Appendix.

We may summarise the graph as follows. First, there exists an expected pattern in specialisation across countries. In particular, all the Nordic countries are highly specialised in some industries, as reflected in RCA figures that exceed three. In the case of Iceland and Norway, these industries include fishing, and mining and quarrying, while in Sweden and Finland they include wood and paper related manufacturing. In Denmark, food products constitute a highly specialised industry. In contrast, Germany – albeit a much larger though open economy – has no single industry as specialised as in the Nordic countries.

Second, the RCA figures show a particular pattern in Norway and Iceland, which are specialised in only a few sectors. In both countries there are four RCA industries, i.e., industries where the RCA value exceeds unity. In contrast, Denmark, even though it is a small country, has an RCA in 16 industries. Thus, based on the RCA indicator, Denmark has a more diversified export structure than any other Nordic country, or even Germany. Further, Finland and Sweden, while they are highly specialised in paper and wood related production, are not solely reliant on these industries. This also reflects the structural similarities in businesses in Finland and Sweden.

3.3 Value added exports

Similar to the gross export figures, a potential caveat with traditional specialisation indicators is that they do not necessarily tell anything about each industry's contribution to domestic value added. For example, it may well be that a particular industry has a revealed comparative advantage, but the industry is so small that it has a negligible effect on domestic value added. This would be the case if a significant portion of the sector's inputs were imported from abroad, or if the sector's overall role in international trade is very small. In the following, we aim to address this caveat.

The first step is to look at value added across industries in total exports. Table 3 shows the value added embodied in foreign final demand by industries as calculated by the OECD. Above, in Figure 2, we saw these data for the countries without the division into industries.

First, we note that manufacturing contributes the largest single share of domestic value added embodied in foreign final demand in all Nordic countries except Norway where mining industries are very dominant. Important value-added creating service industries are business services, transport and telecommunication, but also wholesale and retail trade. Financial intermediation brought significant value added exports to Iceland still in 2009, but it is likely to have lost some of its importance during the years that followed. In manufacturing, the most significant sources of value added are wood and paper related manufacturing (in Finland and Sweden), chemicals, machinery, and electrical equipment. Furthermore, basic metals and the manufacturing of transport equipment bring significant value added especially in Sweden and Germany.

Our second step is to look at the value added created in the industries in which each country is specialised, i.e. in which it has a revealed comparative advantage. This essentially addresses the question of how dependent the domestic economy is on its RCA industries. Unfortunately, there is little data on the value added exports based on the same industrial classification as shown above for the RCA industries. Also, making inference based on Table 3 would not make

Table 3 Value added exports by industry in 2009, % of GDP

	Denmark	*Finland*	*Iceland*	*Norway*	*Sweden*	*Germany*
Agriculture, hunting, forestry and fishing	0.9	0.6	3.2	0.6	0.7	0.2
Mining and quarrying	1.5	0.2	0.7	16.9	0.6	0.1
Manufacturing	12.0	10.6	12.7	5.2	12.5	12.2
– Food products, beverages and tobacco	2.3	0.2	0.5	0.5	0.3	0.4
– Textiles, textile products, leather and footwear	0.2	0.1	0.2	0.0	0.1	0.1
– Wood, paper, paper products, printing and publishing	0.5	1.8	1.4	0.5	1.7	0.7
– Chemicals and non-metallic mineral products	2.8	2.0	5.4	0.9	2.5	2.4
– Basic metals and fabricated metal products	0.9	1.2	0.5	0.8	2.1	1.9
– Machinery and equipment, nec	1.9	1.8	0.2	1.1	2.0	2.5
– Electrical and optical equipment	2.1	2.4	3.6	0.4	1.4	1.6
– Transport equipment	0.3	0.4	0.2	0.3	1.3	1.7
– Manufacturing nec; recycling	0.6	0.1	0.2	0.1	0.4	0.3
Electricity, gas and water supply	0.5	0.6	0.6	0.7	0.7	0.6
Construction	0.2	0.2	0.1	0.3	0.3	0.2
Wholesale and retail trade; hotels and restaurants	2.8	2.0	2.2	2.9	3.7	2.5
Transport and storage, post and telecommunication	5.9	4.1	3.3	3.4	2.8	2.0
Financial intermediation	0.9	0.9	4.0	1.3	1.0	0.9
Business services	3.6	4.5	6.0	3.4	7.3	5.6
Other services	0.9	1.0	0.2	0.7	1.2	1.0
Total	**28.6**	**24.1**	**32.4**	**34.5**	**29.9**	**24.7**

Source: OECD. According to the OECD, "Value-Added embodied in Foreign Final Domestic Demand shows how industries export value both through direct final exports and via indirect exports of intermediates through other countries to foreign final consumers (households, charities, government, and as investment). They reflect how industries (upstream in a value-chain) are connected to consumers in other countries, even where no direct trade relationship exists. The indicator illustrates therefore the full upstream impact of final demand in foreign markets to domestic output. It can most readily be interpreted as 'exports of value-added'".

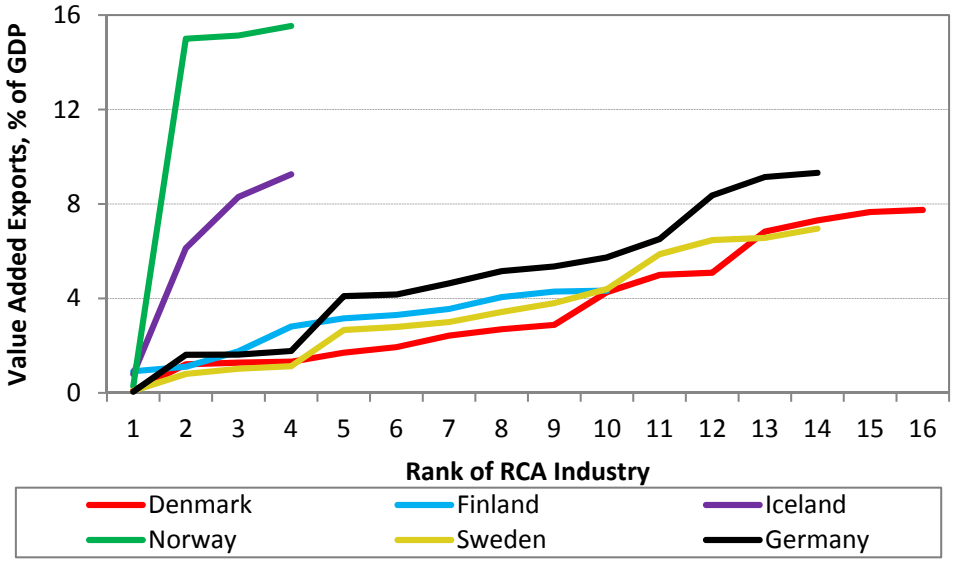
justice for differences across countries due to its relatively aggregated classification. Thus, we opt to estimate the value added embodied in RCA industries' exports by multiplying the value added created by each industry by the export share of its production.[9] This yields a reasonable approximation of the value added exports to the extent that the value added content of exports is similar to the production sold domestically.

Figure 11 shows the cumulative value added exports by RCA industries, including the first n industries that have an RCA above one. It illustrates the importance of the industries in which the countries are specialised in. For example, the first two RCA industries' combined value added exports is 6.1 per cent of Iceland's GDP. The third-ranked RCA industry raises this to 8.3 per cent.

The figure shows, consistent with the previous analysis, that the value added produced by only a few industries is significant in Norway and Iceland, as implied by the steep cumulative value added curve. In other countries, the value added of exports is more evenly distributed across RCA industries, as reflected in the slope of the curve that is much less steep and quite similar across countries.

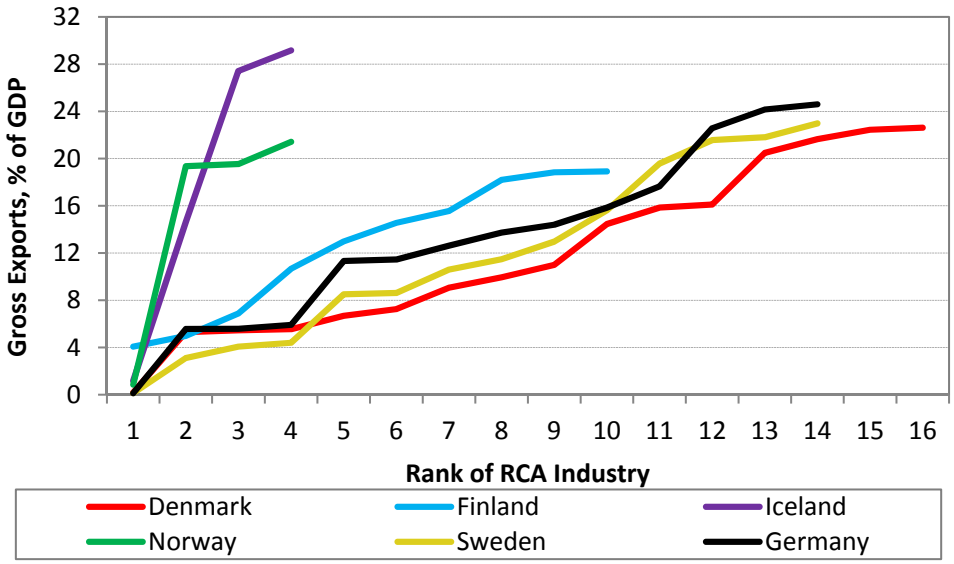
[9] In particular, we calculate the value added exports for industry *i* as $X_i^{VA} = VA_i * (\frac{X_i}{Y_i})$, where VA_i is total value-added, X_i is (gross) exports and Y_i is (gross) production. Due to data availability, the exports only include the exports of goods.

Figure 11 Cumulative value added exports by RCA industries in 2007–2009, % of GDP



Note: The cumulative value added embodied in foreign final demand of goods, including the first n industries that have an RCA above one and ranked by their RCA values. Data is for 2007 (Denmark, Norway, Sweden), 2008 (Germany) and 2009 (Iceland and Finland).
Source: OECD Structural Analysis Database and own calculations.

Figure 12 Cumulative gross exports by RCA industries in 2009, % of GDP



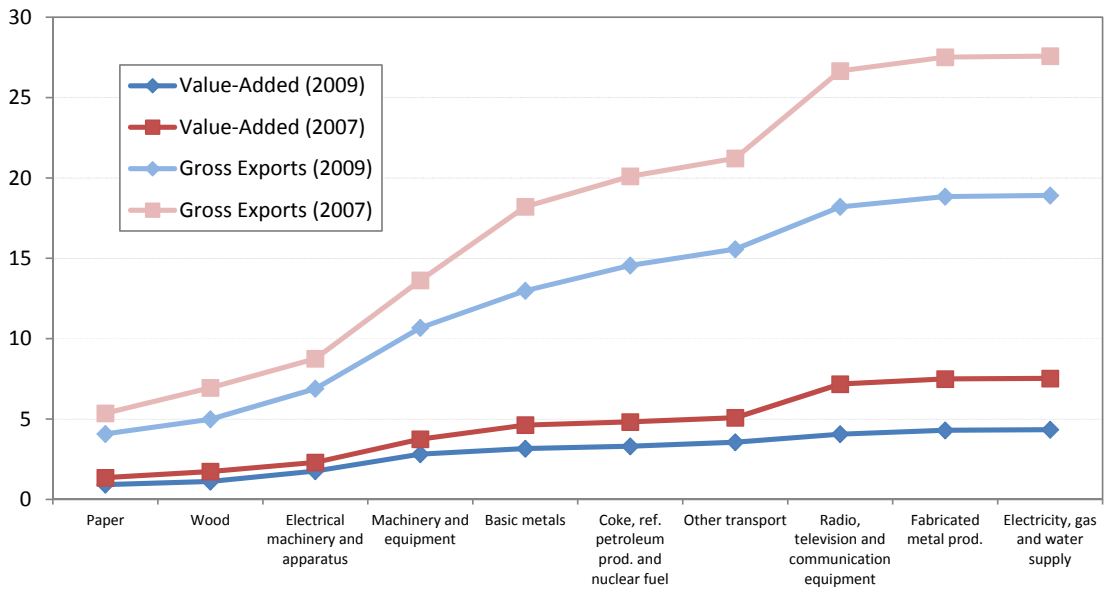
Note: The cumulative gross exports of goods, including the first n industries that have an RCA above one and ranked by their RCA values.
Source: OECD Structural Analysis Database and own calculations.

This is in contrast with the gross trade figures for the same industries (Figure 12). In particular, while in terms of gross exports Finland appears to be more dependent on its RCA industries, this is not directly supported by the value added figures. However, by comparing Figure 11 and Table 3, we may also note that the RCA industries only accounts for a portion of the total value added embodied foreign final demand. The service industries are significant for all Nordic countries, as can be seen from Table 3.

The gross exports of RCA industries overestimate the economies' dependency on these industries due to the import content. On the other hand, the value added exports underestimate it to the extent other domestic industries supply the RCA industries with intermediate products.

Since the data that we use are from 2007–2009 it is potentially influenced by the global recession and the fall in international trade towards the end of this three-year period. For example, the economic crisis and the fall of Nokia, the Finnish ICT giant, have had a significant effect on the Finnish economy. This can be seen from Figure 13 which shows the cumulative value of exports by RCA industries in 2007 and 2009, both in gross and value added terms. In particular, it shows the significant decrease in domestic value added from telecommunications equipment. Prior to the crisis, Finland was considerably more dependent on its RCA industries and in particular on the production of communication equipment and thus vulnerable to shocks in those industries. Since then major shocks have hit important export industries and Finland has experienced a sharp reduction in the significance of its RCA industries and their significance is now closer to Sweden and Denmark.[10]

Figure 13 Cumulative exports by RCA industries in Finland 2007–2009, % of GDP



Source: OECD Structural Analysis Database and own calculations.

[10] Unfortunately the data do not allow us to perform a similar sensitivity analysis for the other countries.

4 Vulnerability

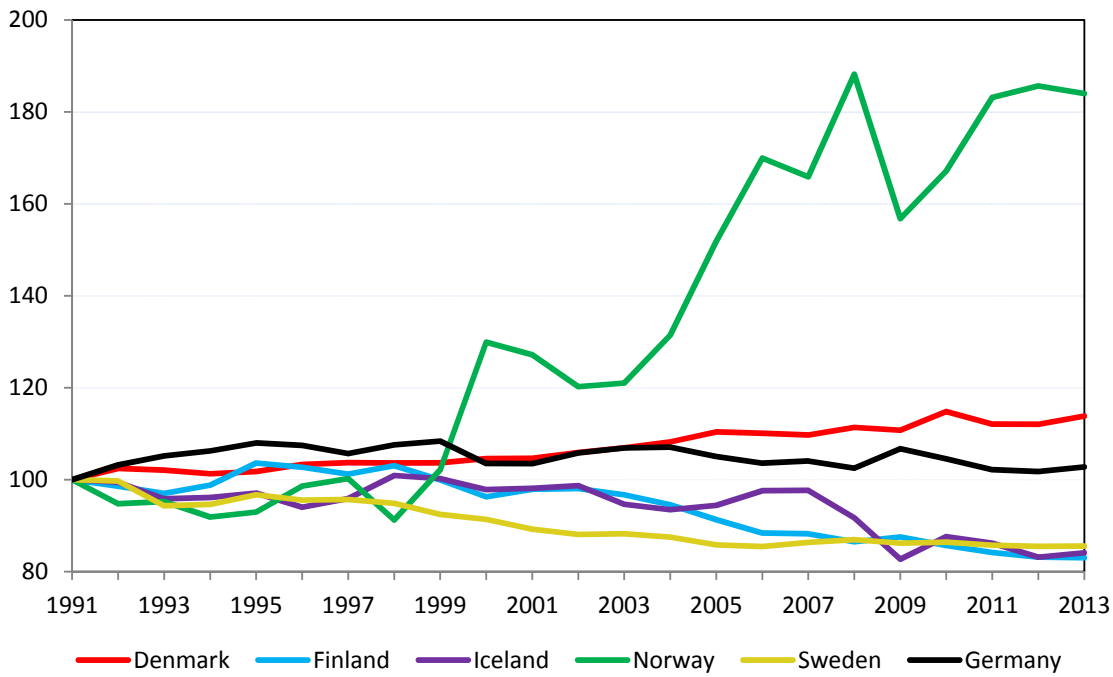
In order to assess the vulnerability of the economies to external shocks we suggest comparing three different indicators: the terms of trade, the degree of specialisation, and the concentration of exporting activities among exporting firms.

4.1 Terms of trade

First, the ratio of export to import prices, i.e. the terms of trade, may be used as an indicator of the domestic economy's vulnerability to external shocks (see e.g. Rodrik, 1996). The terms of trade carry two types of information. First, the trend component is an indication of the medium-to-long-term development of the domestic economy and the purchasing power of domestic exports given their volumes. Second, the volatility of the terms of trade around its trend tells about the sensitivity of the domestic economy to shocks. For example, the world market prices of raw materials have been rather volatile and on an upward trend recently, and we may thus expect countries with dependence on raw material exports to show positive but volatile terms of trade developments. This suggests that the purchasing power of such economies tends to fluctuate significantly unless the economy is buffered against the shocks.

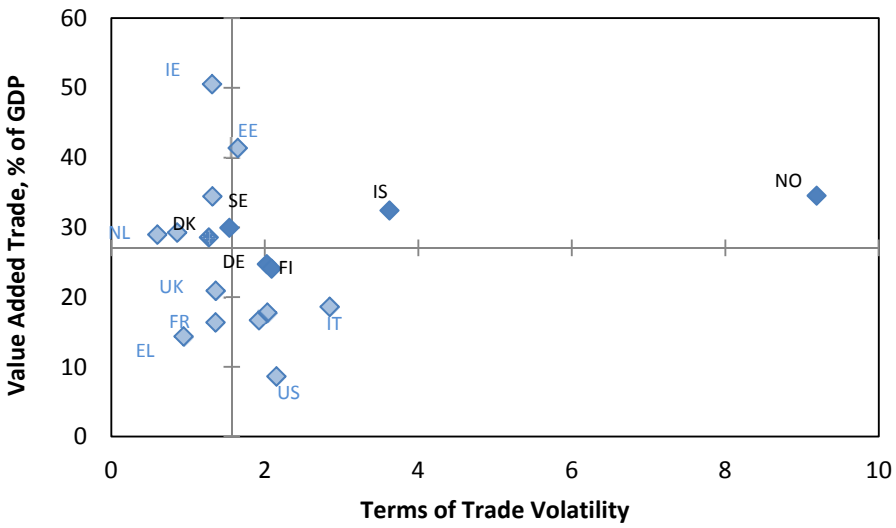
Figure 14 shows the terms of trade for the Nordic countries in 1991–2013. It shows the significant increase in Norway's terms of trade during the last two decades. In Iceland, the re-

Figure 14 Terms of trade, 1991=100



Source: OECD Economic Outlook No. 94 and own calculations. Terms of trade is the ratio of exports of goods and services deflator to imports of goods and services deflator. Denmark, Iceland and Germany in 2005 prices, Finland in 2000 prices, Norway in 2010 prices, and Sweden in 2012 prices. Note that the curves are affected by the choice of the national base years.

Figure 15 Terms of trade volatility



Note: Terms of trade volatility is measured by the standard deviation of the log of the first difference in the terms of trade. The axes are placed according to the arithmetic sample averages excluding Norway and Iceland.
Source: OECD and own calculations.

cent global recession brought a significant shock to its terms of trade. In contrast, Denmark and Germany have benefited from relatively steady terms of trade. In Finland, there has been a steady decline in terms of trade since the turn of the millennium. In Sweden, the trend decline seems to have ended in 2005.

Figure 15 plots the terms of trade volatility and the value added share of exports to GDP in 18 countries. The two axes, which are placed at the arithmetic averages, divide the graph into four quadrants, which illustrate different characteristics of economies.[11] For example, countries in the top-right quadrant are potentially highly vulnerable to external shocks due to the combination of high terms-of-trade volatility and a high value-added-trade share. In contrast, countries in the bottom-left quadrant are less vulnerable to external shocks due to a low level of value added from exports and low terms of trade volatility.

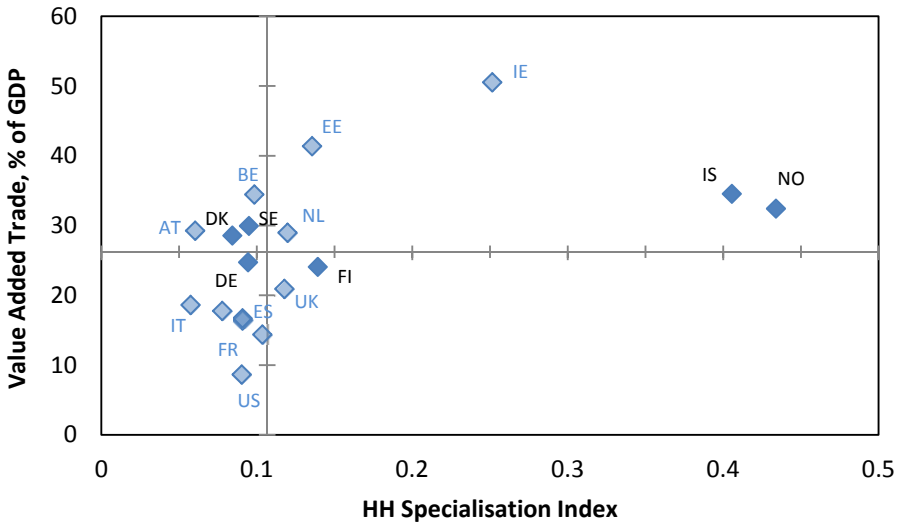
Clearly, Iceland and Norway are significant outliers in their exposure to international shocks. Their terms-of-trade volatility, which is driven by their reliance on commodity exports and the recent crisis, greatly exceeds that of any other economy in our sample. On the other hand, other Nordic countries are closer to the origin, reflecting their more stable terms of trade. In particular, Denmark has benefitted from stable terms of trade over time. In Finland, volatility has been more pronounced, but interestingly it has been equal to the volatility in Germany.

[11] We exclude Iceland and Norway from the arithmetic average as they are clear outliers.

4.2 Specialisation

The terms of trade volatility may not tell anything about the vulnerability that is due to export specialisation or export quantities as it only concerns nominal fluctuations. Yet, the more concentrated the export structure is, the more exposed the country is likely to be to external shocks in demand for its export products. This is most clearly illustrated in Figure 16 which shows the HH specialisation index against value added trade. However, while there are some significant differences in international comparison, it turns out that the specialisation and terms of trade volatility give broadly a similar picture of the vulnerability of Nordic countries. Iceland and Norway are again clear outliers in our sample and Finland is left to the right of the origin, reflecting a more specialised structure. In contrast, Germany is now placed in the bottom-left quadrant that could be characterised as including less vulnerable economies.

Figure 16 Specialisation



Note: The axes are placed according to the arithmetic sample averages excluding Norway and Iceland.
Source: OECD and own calculations.

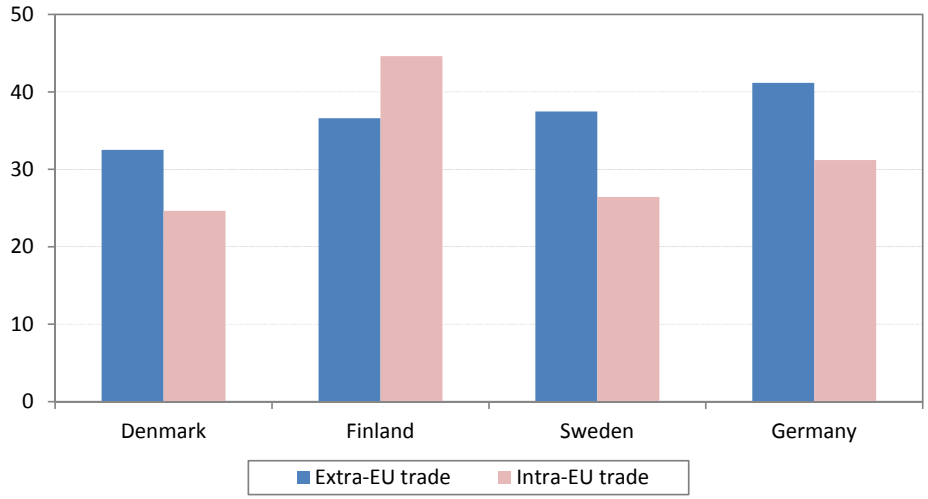
4.3 Exporting enterprises

So far we have focused on measures of specialisation and concentration in terms of export products. However, in many countries, it is not just the number of exported goods that can be quite limited, but also the number of exporting firms. This may expose countries to shocks that hit one particular firm, as has been the case in Finland recently due to the fall of Nokia. In particular, this is the case when traded products are differentiated or heterogeneous in terms of their quality and hence subject to changes in, e.g. consumer preferences in the world markets.

To illustrate the concentration of exports among exporting enterprises, Figure 17 shows the top-10 export firms' share of the exports of the top-1,000 exporter firms in the Nordic countries.[12] Almost 37 per cent of Finnish extra-EU exports are run by just ten firms, while the

[12] Unfortunately, these data are not available for Norway or Iceland.

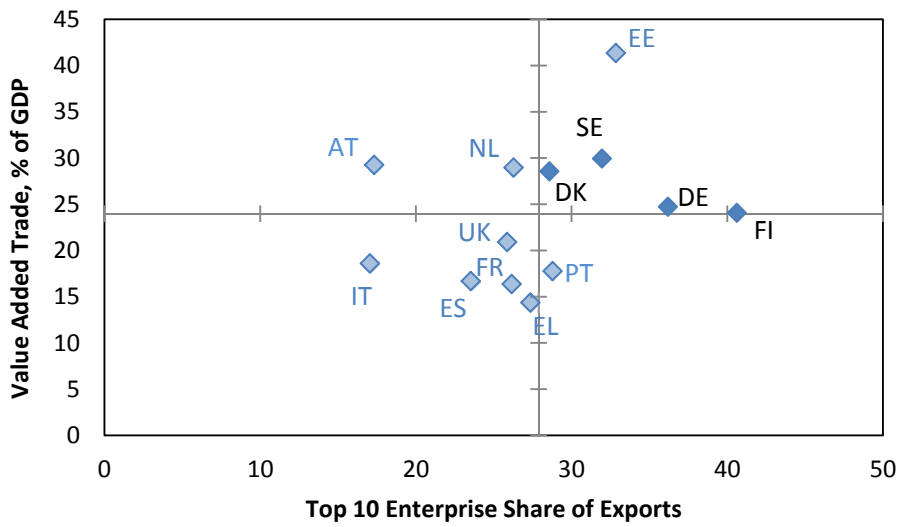
Figure 17 Top-10 exporter firms' export value in 2010, % of top-1000 exporter firms



Source: OECD.

figure in intra-EU exports is almost 45 per cent. The figures are somewhat lower in Denmark, Sweden and Germany, except in German extra-EU exports.[13] Also, the figure shows that intra-EU trade is more concentrated in a small number of exporting firms than extra-EU trade in Finland while the opposite is true in Denmark and Sweden.

Figure 18 Top 10 enterprise share



Note: Top-10 enterprise share of exports of the top-1,000 enterprise exports as measured by the average of extra- and intra-EU trade. The axes are placed at arithmetic averages.
Sources: OECD and own calculations.

[13] However, as a much larger country, the top-1,000 exporting firms must run a somewhat smaller share of total exports than in the much smaller Nordic countries. This bias twists the results to some degree, though probably not too much.

Figure 18 shows that these countries tend to have highly concentrated export markets when compared to other OECD countries. In particular, all Nordic countries have an above- average concentration of exports in a small number of exporting firms. While the concentration is likely to be affected by country size, it is notable that other small economies, such as Austria and the Netherlands, have a much less concentrated exporter-firm concentration.

5 Conclusions

We have discussed the openness and specialisation of the Nordic economies. We have demonstrated that they are open economies and deeply engaged in international trade although the domestic value added share in exports and GDP varies. We have shown that each Nordic country is specialised in some specific industries which also tend to constitute a significant source of value added to the domestic economy. This is consistent with the conventional wisdom regarding the characteristics of the Nordic countries.

However, we also suggest that there exist significant differences in the vulnerability of the Nordic countries to external shocks. First, Norway and Iceland are clear outliers in terms of their specialisation and potential vulnerability. Yet, while the Norwegian economy is more exposed to fluctuations in its export prices, its term of trade has evolved very favourably and after years of very large surpluses the country is well buffered against even drastic downturns in the prices. Second, Sweden and Denmark appear to be the least specialised among the Nordic countries in their exports as they have a relatively large number of industries where they have a revealed comparative advantage. Finland has fewer such industries. However, the economy's overall dependence on these industries is not much different from that of Sweden or Denmark, now that the exceptional dependency of Finnish exports on communication equipment has declined significantly. Denmark, seems to be the least vulnerable to external shocks and it has clearly benefitted from improved and more stable terms of trade.

Inward and outward FDI stocks and the cross-border activities of domestic and foreign multinationals are, with some differences, more or less at the same level in Denmark, Finland and Sweden. The latter has attracted the most FDI inflows relative to its GDP and these have been drawn especially into manufacturing. On the other hand, Denmark and Finland have more important manufacturing investments abroad. Iceland has the highest FDI-stocks-to-GDP ratios among the Nordic countries but on the other hand it is by far the smallest of the economies. Norway seems to be more closed than the other Nordic countries at least in terms of outward investments, which is peculiar given their vast financial resources.

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Appendix

Table A1. Industries ranked by RCA

RCA #	Denmark	Finland	Iceland	Norway	Sweden	Germany
1	Fishing	Paper	Fishing	Fishing	Fishing	Tobacco
2	Food and beverages	Wood	Food and beverages	Mining and quarrying	Paper	Motor vehicles
3	Electricity, gas and water supply	Electrical machinery and apparatus	Basic metals	Electricity, gas and water supply	Wood	Real estate, renting and business activities
4	Tobacco	Machinery and equipment	Other transport	Coke, ref. petroleum prod. and nuclear fuel	Printing	Printing
5	Fabricated metal prod.	Basic metals	Other non-metallic	Basic metals	Machinery and equipment	Machinery and equipment
6	Other non-metallic	Coke, ref. petroleum prod. and nuclear fuel	Medical, precision and optical instruments	Other transport	Electricity, gas and water supply	Electricity, gas and water supply
7	Electrical machinery and apparatus	Other transport	Other community, social and personal service activities	Food and beverages	Coke, ref. petroleum prod. and nuclear fuel	Rubber and plastics
8	Wearing apparel etc.	Radio, television and communication equipment	Machinery and equipment	Machinery and equipment	Fabricated metal prod.	Fabricated metal prod.
9	Agriculture, hunting and forestry	Fabricated metal prod.	Chemicals	Paper	Electrical machinery and apparatus	Paper
10	Machinery and equipment	Electricity, gas and water supply	Coke, ref. petroleum prod. and nuclear fuel	Fabricated metal prod.	Motor vehicles	Other transport
11	Medical, precision and optical instruments	Other non-metallic	Motor vehicles	Wood	Chemicals	Electrical machinery and apparatus
12	Wood	Medical, precision and optical instruments	Electrical machinery and apparatus	Medical, precision and optical instruments	Basic metals	Chemicals
13	Chemicals	Rubber and plastics	Agriculture, hunting and forestry	Electrical machinery and apparatus	Rubber and plastics	Medical, precision and optical instruments
14	Furniture, other manufacturing	Real estate, renting and business activities	Rubber and plastics	Chemicals	Medical, precision and optical instruments	Other non-metallic
15	Rubber and plastics	Chemicals	Fabricated metal prod.	Furniture, other manufacturing	Radio, television and communication equipment	Wood
16	Printing	Printing	Textiles	Other non-metallic	Furniture, other manufacturing	Food and beverages
17	Textiles	Motor vehicles	Printing	Printing	Other non-metallic	Basic metals
18	Leather etc.	Food and beverages	Wood	Rubber and plastics	Food and beverages	Furniture, other manufacturing
19	Paper	Agriculture, hunting and forestry	Paper	Radio, television and communication equipment	Other transport	Textiles
20	Coke, ref. petroleum prod. and nuclear fuel	Textiles	Mining and quarrying	Motor vehicles	Office, accounting and computing machinery	Wearing apparel etc.
21	Other transport	Leather etc.	Leather etc.	Other community, social and personal service activities	Wearing apparel etc.	Office, accounting and computing machinery
22	Mining and quarrying	Furniture, other manufacturing	Wearing apparel etc.	Office, accounting and computing machinery	Textiles	Other community, social and personal service activities
23	Office, accounting and computing machinery	Wearing apparel etc.	Office, accounting and computing machinery	Textiles	Tobacco	Leather etc.
24	Other community, social and personal service activities	Office, accounting and computing machinery	Furniture, other manufacturing	Leather etc.	Leather etc.	Radio, television and communication equipment
25	Motor vehicles	Fishing	Radio, television and communication equipment	Agriculture, hunting and forestry	Agriculture, hunting and forestry	Agriculture, hunting and forestry
26	Basic metals	Other community, social and personal service activities	Real estate, renting and business activities	Tobacco	Other community, social and personal service activities	Coke, ref. petroleum prod. and nuclear fuel
27	Radio, television and communication equipment	Mining and quarrying	Tobacco	Wearing apparel etc.	Mining and quarrying	Fishing
28	Real estate, renting and business activities	Tobacco	Electricity, gas and water supply	Real estate, renting and business activities	Real estate, renting and business activities	Mining and quarrying

Source: OECD

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