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The production and export structure of the Icelandic economy: An international comparison*

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Abstract

This paper describes the production and export structure of the Icelandic economy and compares it to other developed countries. We find that the composition of gross value added and investment is very similar to other developed countries with the exception of the high share of fisheries in Iceland. The organisational structure of the corporate sector is also found to be broadly similar. Despite its small size and narrow range of domestic production, the Icelandic economy is neither found to be markedly more open to trade than the average developed economy. It is, however, relatively integrated in terms of international finance. The EU and the euro area are Iceland's most important export markets and only a handful of countries in Europe have a higher share of exports to the EU and the euro area. Icelandic exports are however concentrated in few products and significantly diverges from the composition of exports in the average developed country with high dependence on commodities exports. Export production is also less sophisticated than in comparable countries with Icelandic export sectors less interconnected with other production sectors than in other developed countries. Despite a narrow export base, the volatility of export and terms of trade are found to be similar to that of other developed countries and the volatility of terms of trade is found to be lower than among other commodity exporters.

Keywords: Iceland, Production structure, Capital formation, Corporate structure, International trade integration, International financial integration, Export structure

JEL Classification: E22, E23, L22, F15, F36

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1 Introduction

To understand and explain the mechanisms and properties of aggregate economic fluctuations it can be useful to examine the underlying structure of the economy generating these fluctuations. This paper aims to highlight key properties of the Icelandic production structure by looking at the sectoral composition of production and investment, the organisational structure of the domestic corporate sector, and the economy's export structure and its integration with global financial markets. In particular, we look at how reliant Iceland is to trade, with whom it trades and in which types of goods.

This study also contributes to the current debate in Iceland on the appropriate exchange rate regime for such a small economy. A key ingredient of the optimal currency area literature is that the business cycles in all member countries are symmetric to ensure that the common monetary policy of the union is suitable for all members. This symmetry property will, *inter alia*, be influenced by how similar the countries' production structures are. The more similar the production structure among monetary union members, the more likely it is that the member countries are subject to symmetric shocks and that the shocks propagate through their economies in a similar fashion.¹

If there is a large divergence in the production structure between countries it is possible for regional specialisation to increase, in which case mobility of capital and labour can amplify the regional business cycle and lead to persistent divergence in output growth (Krugman, 1993). Most research, however, suggests that the effects of such regional specialisation are very small in reality and are outweighed by other factors that lead to more convergence of regional growth performance (see e.g. Rose, 2008, and the references therein). Such factors are for example increases in international trade following the adoption of a common currency which can lead to more convergent business cycles. A more synchronised business cycle can then lead to more trade which again adds to business cycle convergence. Therefore, dissimilar production structures need not be an argument against membership in a monetary union since the adoption of a common currency can lead to convergence and synchronisation of countries which are *ex ante* not well suited for membership, but after joining the union become more synchronised and thus fulfill the optimal currency area criteria *ex post* (see Frankel & Rose, 1998). It should also be borne in mind that a smaller economy usually implies a more specialised production structure. It is therefore likely that the production structure of small economies differ from that of larger economies and that they are thus subject to specific shocks related to their specialisation. If symmetric business cycles were the only criteria for the formation of currency unions it could be argued that the number of currency areas in the world would be markedly higher. On the other hand, other arguments for joining a currency unions could weigh heavier the smaller the economy.²

¹A companion paper discusses the similarities of and links between the business cycles in Iceland and other industrial countries in more detail (see Einarsson et al., 2013).

²These can include considerations of economies of scale and how effectively an independent monetary policy and a flexible exchange rate stabilises the economy. See Breedon et al. (2012) for a discussion.

The paper is organised as follows. Section 2 examines the key features of the production structure of the Icelandic economy and puts it into an international perspective. Section 3 analyses the composition of capital formation and section 4 looks at the organisational structure of Icelandic firms, both in an international perspective. Section 5 moves on to analysing the composition of trade, Iceland's main trading partners and Iceland's level of international financial integration. The stylised facts of Icelandic export and volatility of exports and terms of trade are also compared to that of other developed economies. Section 6 concludes.

2 The Icelandic production structure

2.1 Sectoral distribution

The composition of gross value added (GVA) in the Icelandic economy has changed considerably in the last four decades (see figure 1).³ As in other developed countries, the main change is that the share of service sectors has increased and is therefore the largest sector in Iceland over the whole period, 1973-2009.⁴ However, up to 1999, the share of the service sector remained largely stable around 60%, although its composition changed in that period. The shares of financial and other services like health care and public services increased while the share of commerce related services and hotel and catering services contracted. During the first decade of this century, the service share increased to about two thirds of GVA, mostly related to a further increase in financial services.⁵

The share of other sectors than services such as industry, fisheries, agriculture and construction was therefore relatively stable around 40% of GVA in the last three decades of the last century. The share of the construction sector has remained broadly stable over the last four decades or on average 8.5% of GVA. Over the same period the share of agriculture, fisheries and industry related sectors shrank somewhat. The combined share of these sectors was on average roughly 31% of GVA in the last three decades of the last century but declined to almost 24% in the first decade of this century.

The largest individual component of non-service industry over the whole period has been in the fishing industry, i.e. fisheries and seafood processing, where the share was on average almost 13% of GVA in the last three decades of the last century. This share declined to almost 9% in the first decade of this century. The second largest share is related to aluminium production, where metal and electricity production, gas and hot water utilities contributed to almost 5% of GVA in 1973-1999.⁶ In the first decade of this century the

³Data on classification of sectors are available from 1973.

⁴Service sectors are defined as trade, transport and communication services, business activities, financial services and other services (i.e. public service, health care and social service).

⁵As in other countries, this rising share of services is mainly explained by increased prosperity along with changes in demographics and social conditions (such as ageing populations and increased life expectancy), reclassification of some manufacturing activities as services (such as software development), and improved cross-country communication and increased capital flows (see, for example, HM Treasury, 2003).

⁶The largest part of these sub-components are in heavy industry.

share increased somewhat, to 5.3%. Sectors related to fisheries and aluminium production combined were almost 18% of GVA in 1973-1999 and roughly 14% in the first decade of this century.

It is clear from these data that the Icelandic production structure is rather narrow. Only 22% of GVA in 1973-1999 can be attributed to other production than services, fisheries and aluminium production and 19% in the first decade of this century. As previously mentioned the relative share of sectors related to fisheries and aluminium production has decreased considerably due to the increase in the service sectors, mainly in financial, health care and social services, in the first decade of this century.

A comparison of the composition of GVA in Iceland, the euro area and several other developed countries for the first decade of this century is shown in figure 2. As can be seen, Iceland differs in all sectors except services from the average of the other developed countries. The share of service sectors in Iceland, at 67%, is similar to the average share for all countries, 69%. Although the service sectors' share is somewhat lower in Iceland than in the euro area (roughly 71%), its composition is very similar. When individual countries are analysed, it can be seen that the share of services is lower in some countries, e.g. in Finland, Ireland, Norway and Slovakia. These countries have the highest share of industrial sectors among the countries examined, where Norway is a clear outlier at 37%, mainly due to its oil production.

The share of fisheries and agriculture of GVA in Iceland is high over the period considered (see figure 1) and is therefore a defining characteristic of the Icelandic production structure as the share of agriculture, hunting, forestry and fishing is much higher than among the comparison countries. The share was almost 7% in the first decade of this century of which the share of fishing accounts for 6 percentage points. The share of agriculture and fishing in New Zealand is also close to 7% but is due to agriculture activities rather than fisheries as in Iceland. The share of construction in the first decade was also higher than in the comparison countries at 9%. The second highest is Ireland, which is somewhat descriptive for the asset price developments that took place in these two countries in the period.⁷ The share of industry and utilities in Iceland was just 17% and thus far lower than in the comparison countries with the exception of France (15%). The average for the comparison countries is 23% and the euro area stands at 21%.

3 Capital formation

It comes as no surprise that the share of fisheries in capital formation is much higher in Iceland than is generally the case among other developed countries, as it measured on average 3.4% over the last decade.⁸ Among the other countries examined the share of agriculture and fisheries is on average below ½%. Gross capital formation attributed to

⁷House prices in Ireland and Iceland increased by 60-70% from 2000 to 2007 in real terms before they started decreasing in 2008.

⁸Fisheries are classified as a subcategory of agriculture in international statistics.

agriculture was also higher in Iceland (on average 3½% over the last decade) than among the comparison countries with the exception of Slovakia, Australia and New Zealand.

Figure 3 shows sectoral shares of business investment for several countries. The single largest sub-component of investment in Iceland over the last decade is construction or 54% of total investment, in other Nordic countries it measured 56% and 55% in the EU-15. There are, however, two outliers in this comparison, Ireland where investment in construction measured 76% of gross capital formation and Norway with 67%. The second largest sub-component of gross capital formation in Iceland was in machines and equipment, with a share around 29% in Iceland and around 26% in the other Nordic countries and in EU-15.

As can be seen in figure 4, some changes have occurred in the composition of capital formation during the last decade. The share of fisheries was 5½% between 2000-2004 but fell to 1¾% in the second half of the decade as investment in the fishery sector has been unusually low in recent years. Due to large projects in the energy intensive industries and in power plants investment in machines and equipment have increased considerably (up from 25% of gross capital formation in 2000-2004 to 31% in 2005-2010). These projects, along with increased demand for housing, led to a sizable increase of investment in construction (up from 49% to 58%). There has also been a relatively large contraction in investment in transportation in recent years (from 12% to 1%) which can mainly be explained by large disinvestment in aircrafts by both charter airlines and other airlines, which have downsized their operation or shut down. It should be noted that these aircrafts were in little or no operation in Iceland. A sizable amount of transportation equipment was also exported from Iceland in 2009-2010 following the financial crisis.

4 The structure and size of Icelandic firms

One of the defining characteristics of the Icelandic economy is the high number of firms per capita with around 12 Icelandic residents for each registered firm (see figure 5). For comparison, there are around 19 residents per firm in the euro area (European Commission, 2011) but it should be noted that there are considerable differences among individual countries within the euro area. Portugal has the highest number of firms per capita with roughly 10 residents per firm; in the other Nordic countries there are on average 18 residents per firm. Ireland and Germany have the lowest number of firms per capita with 50 and 44 residents respectively per firm. It would appear that there are more firms per capita in Southern Europe than in Central and Western Europe. This is probably a reflection of the relatively high ratio of small firms in Southern Europe. In this aspect, Iceland is more like Southern European countries than the large industrial economies of Western and Central Europe.

It must, however, be taken into consideration that relative to other countries Iceland has a higher labour force participation rate than most other countries. This is reflected in the fact that despite the high ratio of firms per capita the average number of employees per

firm is the same in Iceland as in the euro area and the other Nordic countries, on average 6 employees per firm (see figure 6). The highest average number of employees per firm is in Germany, the UK and Ireland with between 11 to 12 employees per firm.

The largest share of firms fall in the category of small and medium enterprises (SMEs), where the number of employees is less than 250. There are three subcategories for SMEs, micro entities (fewer than 10 employees), small companies (10-50 employees) and medium-sized companies (50-250 employees). According to Statistics Iceland, 99.7% of all registered companies in Iceland fall in the SME category while the corresponding number in the euro area is 99.5%.⁹ In Iceland the division is such that 91.3% of companies count as micro entities, 7% as small companies and around 1.5% as medium-sized companies. As figure 7 shows, this is a similar division as in the euro area and the EU-27.

The relative division of the labour force by the size of employer is such that 72% of the Icelandic labour force is employed by SMEs, which is a slightly higher share than average in the euro area and among the EU-27, as can be seen in figure 8. The largest difference is among medium-sized companies where 24% of the labour force is employed in Iceland but only 16% in the euro area and 18% in the EU-27. On the other hand, there are relatively fewer employees employed by large companies in Iceland (28%) than in the euro area (31%) and in the EU-27 (33%). On average 35% of the labour force is employed by large companies among the other Nordic countries and in Germany and France the share is 40%. The share of labour force employed by large companies is by far lower on average in Southern European countries in the EU-27 (20% of labour force) than among Northern and Central European countries within the union (35% of the labour force).

In conclusion, it can be seen that the structure and organisation of firms in Iceland is on the whole broadly similar to that of other European countries. The number of firms per capita in Iceland is the highest among the comparison countries, most likely due to the high labour force participation rate in Iceland. The size of companies with respect to number of employees and the share of labour force by company size is also very similar to the euro area and the EU-27.

5 International trade and finance

5.1 The openness of the Icelandic economy

As in other small economies the Icelandic economy is specialised in relatively few industries and relies on international trade for those items that are not produced locally. Considering how small the economy is and its disadvantages in a number of industries because of relatively adverse climatic and other natural circumstances, it would be reasonable to assume that Iceland is heavily reliant on international trade. However, when the data is examined it becomes apparent that the economy is not as open to trade as one would expect.

⁹Data from Statistics Iceland. Companies without any operations have been excluded.

	Trade	Finance
Australia	41	172
Austria	100	454
Belgium	153	809
Canada	72	180
Denmark	93	400
Finland	78	431
France	54	439
Germany	77	355
Greece	57	218
Iceland	82	651
Ireland	163	2034
Italy	53	239
Japan	26	153
Netherlands	133	786
New Zealand	60	141
Norway	72	347
Portugal	67	407
Slovakia	157	150
Spain	57	293
Sweden	89	434
Switzerland	91	1036
United Kingdom	57	904
United States	26	213
Mean	81	489
Median	72	400

Table 1: Trade openness and financial integration. Trade openness measured as the ratio of imports and exports of goods and services to GDP (in %). Financial integration measured as the ratio of foreign assets and foreign liabilities to GDP (in %). The ratios are the average of the annual ratios 2000-2010. *Sources:* IMF IFS, OECD.

5.1.1 Trade integration

Table 1 shows trade openness, measured as the ratio of imports and exports of goods and services to gross domestic product (GDP), and the level of financial integration, measured as the ratio of foreign assets and foreign liabilities to GDP (average over the last decade). As the table shows there are 12 countries where trade openness is greater than in Iceland and that the trade openness of the Icelandic economy is just above the sample mean and somewhat more open than the median country. If Belgium and the Netherlands are excluded from the sample, as these two countries are important transit-trade ports for trade across the Atlantic, the mean of the sample drops to 73% or just below the figure for Iceland. It is, however, clear that despite the fact that Iceland is close to as open to trade as the average country, there are many countries which are much more open and although many of them are also considered small they are all considerably larger than Iceland.

Iceland's position as an outlier in this respect can be seen in figure 9 which shows how low the openness to trade is in Iceland with respect to the size of the economy. This finding

can be supported with a simple regression of openness on the logarithm of population which indicates that Iceland's openness to trade should be considerably higher (cf. Krugman, 1991, and Gudmundsson et al., 2000). Andersen & Herbertsson (2003) obtain similar results using a multivariate factor analysis. The results of Mussa et al. (2000) further support this finding as they find that the average openness to international trade in small countries around the world is substantially higher than in Iceland.

There are several possible reasons for the relatively low openness to international trade in Iceland. To some degree it reflects the fact that Iceland is an island in the middle of the Atlantic ocean and thus transportations to and from the country are relatively costly. Agricultural products such as dairy, meat and egg products are produced domestically both because of long distance from key markets and considerable trade barriers. Another reason for the relatively low trade openness is the production structure of the Icelandic economy. In many other small European countries, imports of intermediate goods is a crucial part of international trade since these countries import semi-processed goods and export further or fully processed goods which leads to a higher measured trade openness.¹⁰

This "through-put" is however much smaller in Iceland since the main export sectors, the fishery industry and the aluminium industry, mainly export primary processed products. Secondary processing and high level value added processing is, however, a much smaller part of Icelandic exports since Icelandic export sectors depend mostly on domestic natural resources and the export of commodities as can be seen in figure 10. As the figure shows, the share of commodities of Icelandic goods export is around 82% in 2000-2010, which is much higher than in other OECD member countries, excluding Australia, Norway and New Zealand where this ratio is similar to Iceland. At the same time, the greatest part of Icelandic imports are final consumption and investment goods. Iceland does therefore, to a degree, stand outside of the international division of labour in international production of manufacturing goods. Lastly, it is probable that the relatively low degree of openness to international trade reflects the fact that an independent currency works, in part, as a deterrant to trade as it increases the transaction cost of trade and thus, *ceteris paribus*, reduces trade (see Rose, 2000, and Breedon & Pétursson, 2006).

5.1.2 Financial integration

For small economies it can be beneficial to take advantage of access to international financial markets to smooth fluctuations in domestic consumption that can be traced to idiosyncratic domestic shocks and to diversify the country's portfolio risk.¹¹ This would lead one to expect that small economies are highly financially integrated with a relatively high ratio of foreign assets and foreign liabilities relative to the size of the economy. When

¹⁰Theoretically speaking, value added in trade as a ratio of GDP is a more appropriate measure of an economies openness to trade but such data is not available for cross-country comparison. It can however be expected that value added in Icelandic exports as a ratio of GDP is higher than the ratio of total exports due to high value added in the marine sector (see Krugman, 1991 and Gudmundsson et al., 2000).

¹¹The recent experience of Iceland, as well as many other countries, does however illustrate that increased financial integration does entail risks, if care is not taken concerning excessive debt accumulation.

the measure of international financial integration is examined in table 1 it becomes apparent that the financial integration of the Icelandic economy is indeed considerable with only 5 countries being more financially integrated (see also figure 11). The ratio for Iceland is around 160 percentage points above the sample average and 250 percentage points above the median. Iceland is therefore above average integrated with the international financial system.

However, it should be noted that the average integration over the last decade can, to a certain degree, be a misleading indicator of the financial integration of the Icelandic economy. Although financial integration has been rather stable for most of the sample countries over the period of study, for some countries, including Iceland, the ratio has increased considerably. For Iceland, financial integration went from close to 150% of GDP in 2000 up to roughly 1,200% in 2010. The years following the financial crisis push the average up considerably but this mostly reflects the sizeable increase of foreign liabilities. When the winding up of the failed Icelandic banks is completed, these foreign liabilities will decrease again.

This can be seen if the dataset of Lane & Milesi-Ferretti (2006) is used which excludes the years after 2007 and looks at the average of 1998-2007. In this case the ratio is 394% for Iceland while the average of 23 industrialised countries is 422% and Iceland thus below average integrated with the international financial system. It is therefore clear that the years after 2007 have a significant influence on Iceland's position among the sample countries with regard to international financial integration. Nonetheless it remains true that the international financial integration of the Icelandic economy has increased over the last decade.

5.2 Main export markets

Table 2 shows exports of goods to the euro area, the 15 initial member states of the European Union (EU-15) and the 27 current members of the European Union (EU-27) as a share of total exports of goods, for a sample of industrial countries over the period 2000-2010. As the table shows, there are six countries that export a greater share of total goods exports to the euro area than Iceland but only four with a greater share to the EU-15 and five to the EU-27. The share of Icelandic exports of goods to these areas are in all cases higher than the mean of the country sample and considerably higher than the mean for exports to EU-15 and EU-27. It is therefore clear that despite the relatively low openness to international trade in Iceland, the euro area and European Union accounts for a large fraction of Icelandic exports. The euro area's share becomes even greater when exports to Denmark (which tightly pegs to the euro) are added in which case the share rises to 55% of total export of goods.

Service exports are on average 35% of total exports over the period 2000-2010. Figure 12 shows Icelandic service exports in 2010 by location.¹² The figure shows quite clearly

¹²The collection of data on service trade by destination was not initiated until 2009. Thus, it is not

	Euro area	EU-15	EU-27
Australia	6	11	11
Austria	56	58	73
Belgium	63	74	77
Canada	4	6	6
Denmark	42	64	69
Finland	34	50	58
France	51	61	65
Germany	43	54	64
Greece	43	44	63
Iceland	52	72	74
Ireland	41	61	63
Italy	48	54	62
Japan	11	14	15
Netherlands	64	77	81
New Zealand	9	14	14
Norway	44	78	80
Portugal	67	77	79
Slovakia	53	58	87
Spain	60	69	73
Sweden	40	53	59
Switzerland	52	58	62
United Kingdom	52	55	58
United States	15	20	21
Mean	45	55	51
Median	48	58	64

Table 2: Export of goods to the euro area and European Union as a share of total exports of goods 2000-2010. *Source*: OECD.

that the euro area is by far the most important destination for Iceland, with 34% of service exports.¹³ Besides the euro area, there are only three trading partners that have a larger share than 10%, Denmark at 15%, the US at 14% and the UK at 12%. Again, since the Danish krone is tightly pegged to the euro, service trade with Denmark could be added to trade with the euro area which brings the accumulated share up to roughly half of service exports, a similar share as in exports of goods.

5.3 Distinctive features of Icelandic merchandise exports

The Icelandic goods export base is in many respects special. As previously mentioned the fact that Iceland is a small island in the middle of the Atlantic ocean is reflected in a low import penetration of primary and semi-processed goods which are then exported as secondary or fully processed. Instead, the main Icelandic export sectors depend on the country's natural resources which are reflected in the fact that the share of commodities, mostly aluminium and marine products, in exports is much higher than in other OECD

possible to analyse service exports by destination further back in time.

¹³Share of service exports to those markets that account for more than 0.5% of total service exports.

countries (cf. figure 10).

The distinctive features of the Icelandic export base can be further illuminated by looking at the narrowness of the Icelandic export basket. To measure how narrow the export basket is, a Herfindahl-Hirschmann index is used which measures trade concentration, where a higher value indicates more concentration of trade. Figure 13 shows that Iceland and Norway have the most concentrated export baskets among the comparison countries with an index value of about 40 points, which is roughly three times the average among other developed countries. This reflects the large role natural resources play in these countries' exports, aluminium and marine products for Iceland and oil for Norway.

Another way to highlight the distinctiveness of the Icelandic export basket is to compare the export basket with that of the average country. This can be done by using a Finger-Kreinen index of trade diversification with a higher value indicating more trade diversification. Figure 14 shows quite clearly that the Icelandic export basket is the most diverse from the average with an index value of 80 points, which is around twice the sample average. It is thus clear that Iceland's export base is very specialised and relies on very few sectors which explains how little it has in common with the OECD "norm".

The International Monetary Fund (2010) further details the distinctive features of Icelandic exports. The analysis notes that in addition to exports being based on a concentrated and narrow product base, it also appears that the export base is unusually unsophisticated considering Iceland's high income level. This is based on a measure of the sophistication of exports which assesses the productivity level associated with the structure of exports of a country.¹⁴ Countries with high income usually tend to produce products associated with higher productivity levels. As can be seen in figure 15, the sophistication of Icelandic exports is low by that measure compared to other industrialised countries which is mostly due to the high share of marine and aluminium products in Icelandic exports, which is much closer to what would be expected among countries with lower income. As figure 16 shows, this divergence seems to be increasing compared with other Nordic countries over time.

The IMF analysis also estimates how related Iceland's largest export sectors are with other domestic high productivity sectors. As Hausmann & Klinger (2006) note, the more interconnected different sectors of the economy are the more robust and diversified its export sectors should be, since it is more likely that current production supports or sprouts new high productivity export products. When this "open forest" measure of Hausmann & Klinger (2006) is calculated for Iceland it can be seen that Iceland's main export sectors, marine and aluminium production, are relatively isolated from other sectors of the economy. As can be seen in figure 17, this is different from other countries with similar levels of income where export production is closely connected to the gravity center of domestic production and more closely connected to other production sectors which helps further development and growth in export production. This is not the case in Iceland since the production

¹⁴A necessary caveat is the Icelandic R&D-intensive sectors own large offshore production facilities and thus export sophistication may underestimate the sophistication of Iceland-owned production.

structure is based on relatively few products in the peripheral part of the product space. This is typical of very small economies, but an additional feature of the Icelandic case is the narrow export basket based on production of goods that are not closely interconnected with other production activities in the economy.

As Hausmann & Klinger (2006) and the International Monetary Fund (2010) show, this can place constraints on further growth of export production and the creation of new export products and thus reduces the economies' growth possibilities in the long run. According to IMF estimates, GDP growth could be 0.25-0.50% higher per year and export growth between 0.5-1.0% higher per year if the Icelandic economy were comparable to the Finnish economy with regards to the sophistication of exports and interconnectedness of export production and the gravity center of other domestic production.¹⁵

5.4 Fluctuations in exports and terms of trade

Despite the differences in the Icelandic export structure, the fluctuations in export volumes is similar to that of other developed countries, which should perhaps not come as a surprise as export production in Iceland is in large part constrained by fishing quotas on one hand and technical and financial issues in changing production quantities in the power intensive industry on the other.¹⁶ Figure 18 shows export volume growth for Iceland and the interval of the highest and lowest growth rate among several other developed countries. As can be seen, Icelandic export growth volatility is of similar magnitude as that of other developed countries. The standard deviation of export growth in Iceland over 1971-2010 is on average 6.2% while the sample average is 5.7%.¹⁷ This is a similar result as can be found in Sighvatsson (2004). It is interesting to note that while all the comparison countries were in a recession in 2009 exports contracted among all the countries except for Iceland, New Zealand and Australia: all commodities exporters as could be seen in figure 10.

The high share of commodities in goods exports leads to profit levels that can fluctuate significantly with fluctuations in prices of these commodities in international markets. Although the volatility in terms of trade is a bit higher in Iceland than on average among other developed countries, it is actually less than what is experienced among other commodity exporters such as Norway, New Zealand and Australia. For 1971-2010 the standard deviation of terms of trade is 4.9% in Iceland while the sample average is 4.3%. Terms of trade for the other commodity exporters are more volatile than in Iceland with Norway having the largest standard deviation at 8.2%. This is further illustrated in figure 19 which shows the development of terms of trade and figure 20 where the volatility of terms of trade

¹⁵A necessary caveat is that no account is taken of how difficult it may be for the Icelandic economy to increase the sophistication and interconnectedness of exports considering how small the economy is.

¹⁶The power delivery contracts currently and historically in place specify a fixed amount of power delivered making it optimal for smelters to always run at full capacity. Short-term changes in production are also infeasible due to technological production constraints. Long lead time in power intensive industry investment also constrains changes in export production. Large changes in export volume would therefore, to a large extent, be due to the shutting down of pot lines or the erection of new ones.

¹⁷If the standard deviation of export growth is calculated over 1994-2010 it measures 5.1% in Iceland while the sample average is 6.2%.

and exports are compared. It can be seen that Iceland is not much different in that regard to other developed countries while the other commodity exporters Australia, New Zealand and Norway stand out compared to the rest of the sample. High standard deviations of terms of trade among commodity exporters should not come as a surprise since their exports are also concentrated in few sectors and thus fairly distinct from that of the average country, as previously noted. If a country's exports are based on very few products it could be assumed that changes in the price of those products cause larger changes in a country's terms of trade than if its exports are based on a wide range of products (see Gerlach, 1999). The result for Iceland are therefore somewhat surprising.

One possible explanation could be that marine products are quite diverse with some having traditional commodity characteristics (e.g. fish meal and liver oil) while other products end as high-end culinary products and thus there is considerable risk diversification, both with regards to products and markets, as well as the tendency of consumer packaged end-product prices to be relatively stable. Another possible explanation could be the fact that the largest export sectors have to import other commodities as inputs in production (roughly 25% of total imports), e.g. alumina for aluminium production and oil for fishing, who also have rather volatile prices which offset the volatility of export prices in the calculation of terms of trade.¹⁸

6 Conclusions

This paper describes the production and export structures of the Icelandic economy and compares them to the structures of other developed countries. We find that there is little if any difference between Iceland and its main trading partners with regards to the composition of gross value added, investment and the corporate structure.

One of the main characteristics of the Icelandic production structure, compared to its main trading partners, is the high share of fisheries and agriculture which account for 7% of gross value added in Iceland for the years 2000-2009 while it is only 2% on average among other developed countries. As in other developed countries, services weigh heaviest and the service share is found to be similar among all countries. The high importance of fisheries and fish processing is again evident when looking at the composition of investment. Investment in these industries amounts to 7% on average over 2000-2010 in Iceland but less than 1% in most European Union member states. In other respects there is little difference between Iceland and the other countries with regards to the composition of investment.

The organisational structure of the corporate sector is also found to be similar to that of European Union countries, except that the number of firms per capita is found to be higher in Iceland. The high labour participation rate, however, results in the same average number of employees per firm in Iceland and the euro area. It is also worth noting that

¹⁸An additional aspect is that the greater share of the risk associated with aluminium price changes falls on the power supplier due to the fact that electricity prices are to a large extent linked to aluminium prices in current power contracts. The power suppliers aim to decrease this risk in future contracts.

a larger fraction of the labour force is employed in medium sized firms in Iceland than on average in the euro area and the European Union, while the share of the labour force working in large firms is smaller.

Despite its small size and the narrow range of domestic production, the Icelandic economy is not markedly more open to trade than the average economy. This can probably be traced to the geographical position of the country, its production structure and the use of its own currency, which can serve as a barrier to trade. On the other hand, the Icelandic economy is relatively integrated to the world economy in terms of financial integration, measured by the share of foreign assets and liabilities to GDP. This reflects to some degree the large build up of foreign assets and liabilities in the run up to the financial crisis in 2008, in which the country's external balance sheet grew enormously with its oversized banking system. With their collapse and when their winding up proceedings is completed, the external balance sheet will decline again and the countries financial integration decrease to a more normal level.

The European Union and the euro area remain Iceland's most important export markets and only a handful of countries in Europe have a higher share of exports to the EU and the euro area than Iceland. A clear difference emerges however when the composition of exports is analysed. Icelandic exports are both much more concentrated in few products and diverges from the composition of exports in the average developed country, with the share of primary commodities much larger than among other developed countries. Additionally, the level of sophistication of Icelandic export production is lower than among countries with comparable income levels and Icelandic export sectors are much less interconnected with other production sectors than is known to be the case in other developed countries.

Despite a specialised and narrow export base, the volatility of export and terms of trade are found to be similar to that of other developed countries on average. Low volatility of exports may not be surprising as the main Icelandic export sectors are subject to capacity constraints, i.e. quotas in the fisheries sector and technical and financial issues in changing production quantity in the power intensive industry. The volatility of terms of trade is found to be lower than among other primary commodity exporters, which can probably be explained by the diversity of marine products which are sold in many markets which smooths the effects of price changes and that the volatility of imported input prices into export production of marine and aluminium products which offset the volatility in export prices.

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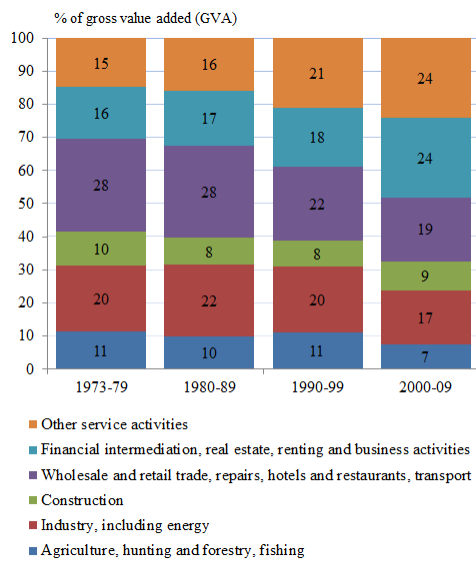


Figure 1: Sector contributions to GVA. *Source:* Statistics Iceland.

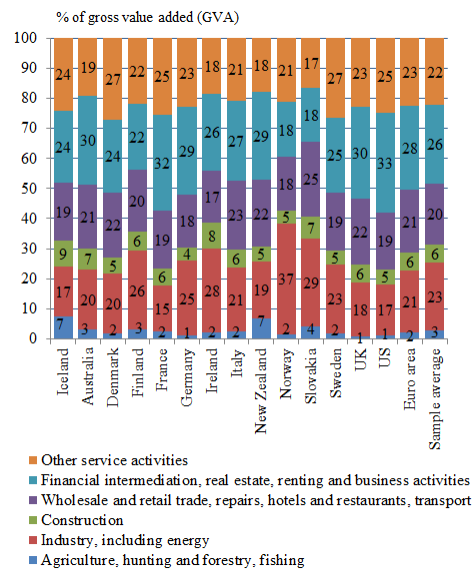


Figure 2: Sector contributions to GVA in various countries 2000-2009. *Sources:* Eurostat, OECD, Statistics Iceland.

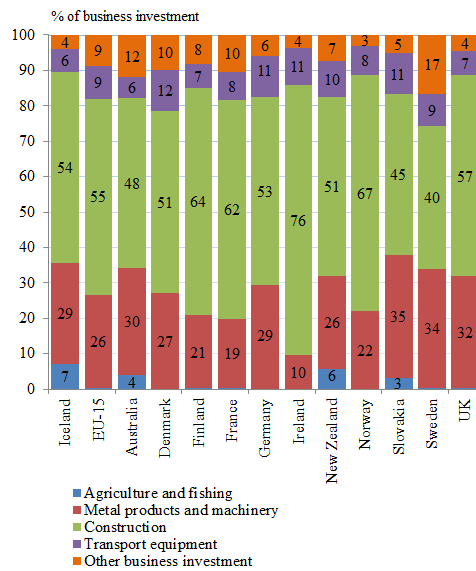


Figure 3: Sectoral share of business investment 2000-2010. *Sources:* Eurostat, Statistics Iceland.

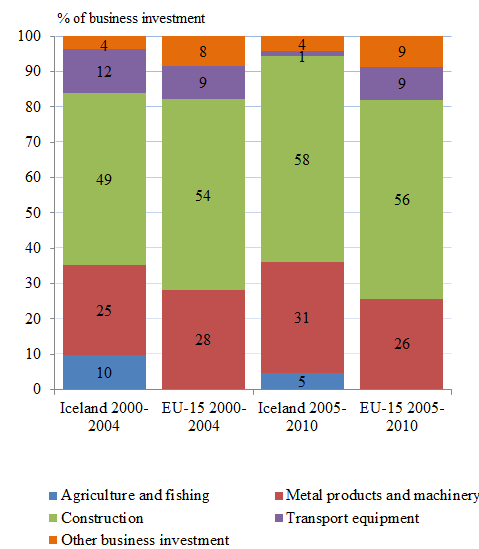


Figure 4: Sectoral share of business investment in Iceland and EU-15 2000-2010. *Sources:* Eurostat, Statistics Iceland.

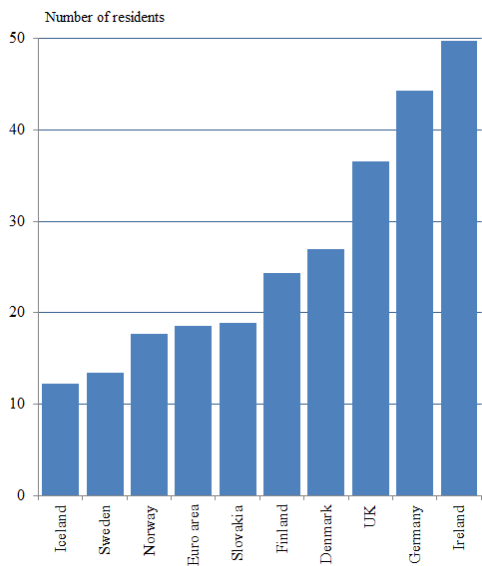


Figure 5: Number of residents per firm. *Sources:* European Commission (2011), Statistics Iceland.

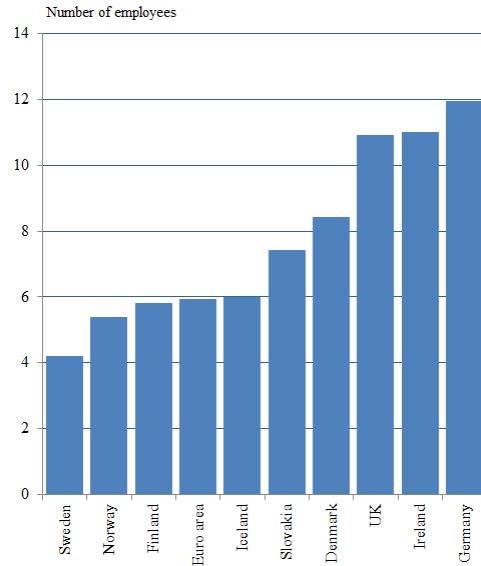


Figure 6: Average number of employees per firm. *Sources:* European Commission (2011), Statistics Iceland.

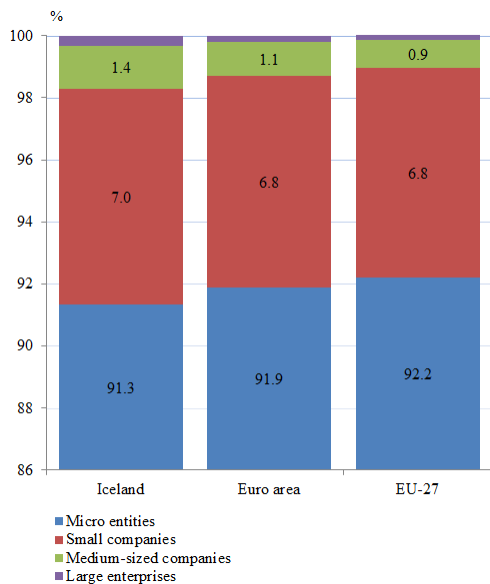


Figure 7: Structure by firm size. *Source:* European Commission (2011).

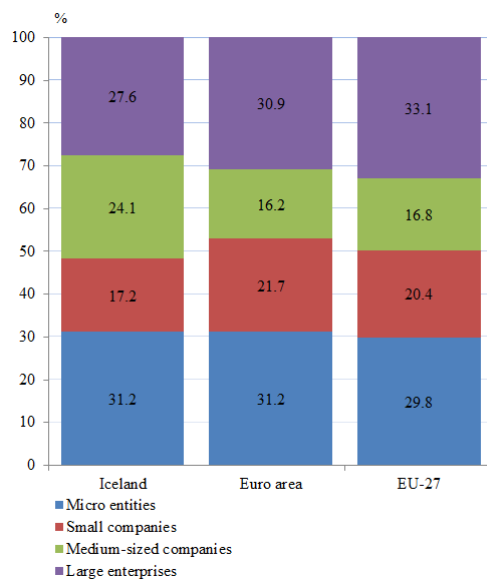


Figure 8: Division of labour by firm size. *Source:* European Commission (2011).

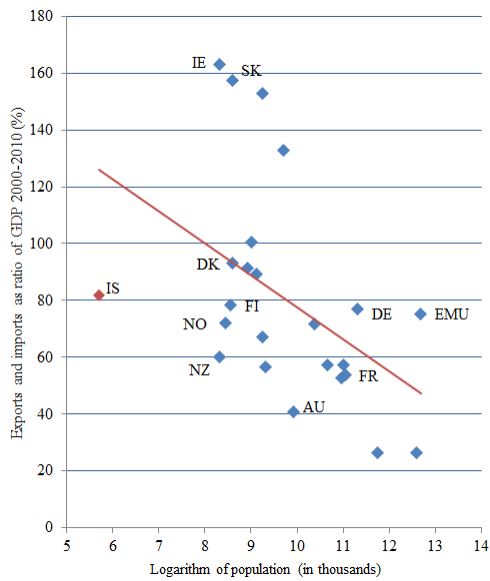


Figure 9: International trade integration and population. *Sources:* Eurostat, OECD.

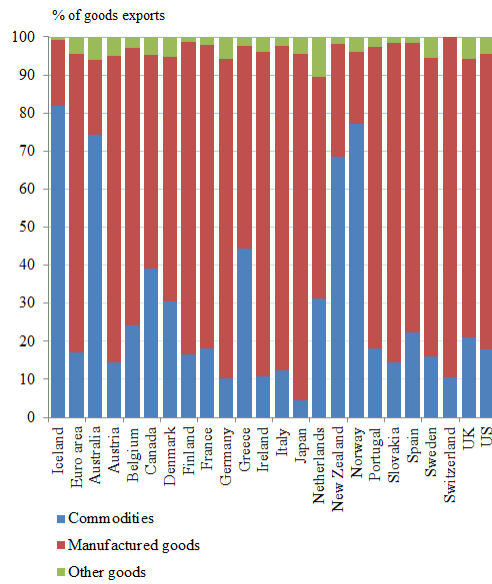


Figure 10: Composition of goods exports 2000-2010. *Source:* UN UNCTAD database.

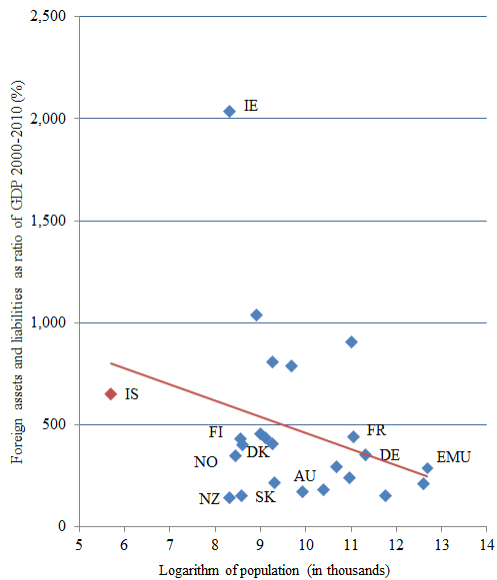


Figure 11: International financial integration and population. *Sources:* Eurostat, IMF.

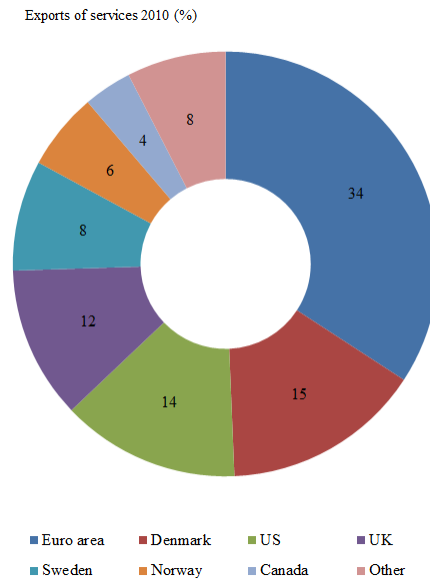
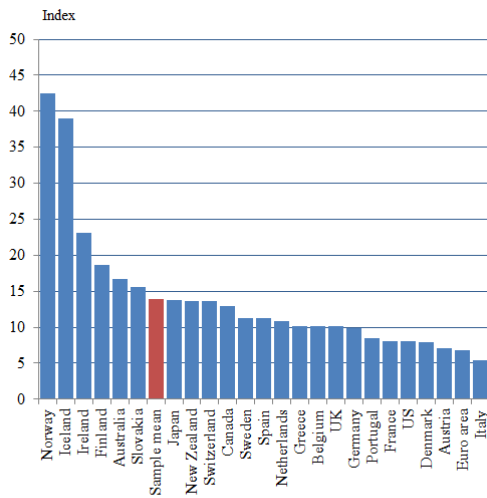
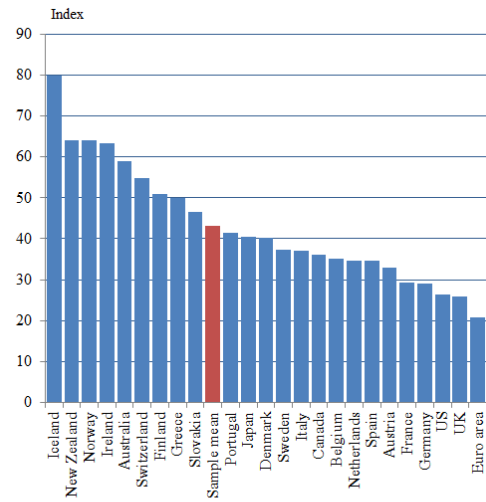


Figure 12: Service exports by location. *Source:* Statistics Iceland.



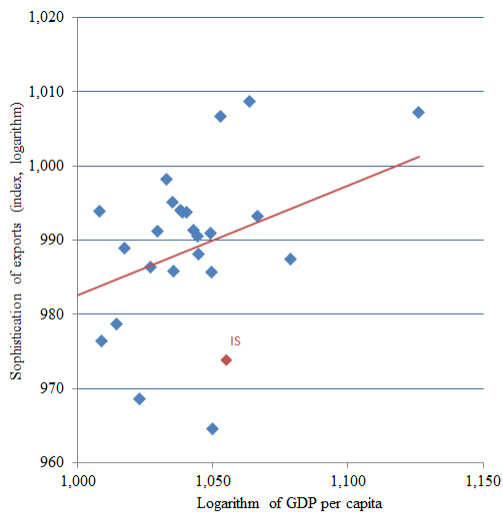
Herfindahl-Hirschmann index which measures the concentration of a country's export base. The index lies between 0 and 100 where a larger number indicates more concentration.

Figure 13: Concentration of goods exports 2000-2010. *Source:* UN UNCTAD database.



A version of the Finger-Kreimen index which measures how different a country's export base is from the export base of the average country. The index lies between 0 and 100 where a larger number indicates more diversification.

Figure 14: Diversification of goods exports 2000-2010. *Source:* UN UNCTAD database.



Export sophistication assesses the productivity level associated with the country's export structure. A higher rate represents more sophistication of exports. Figures are for 2007.

Figure 15: Sophistication of exports and GDP per capita among OECD countries. *Source:* International Monetary Fund (2010).

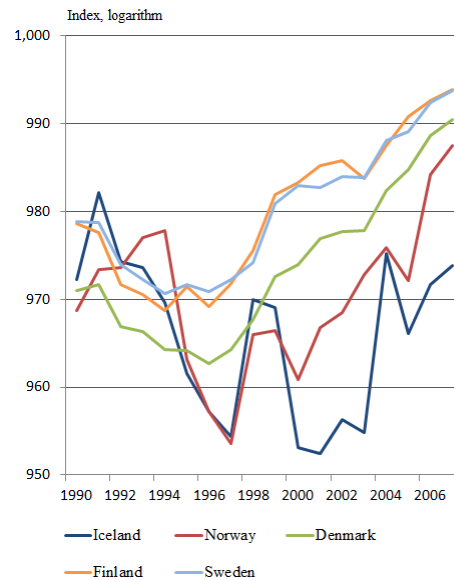


Figure 16: Sophistication of exports in the Nordic countries. *Source:* International Monetary Fund (2010).

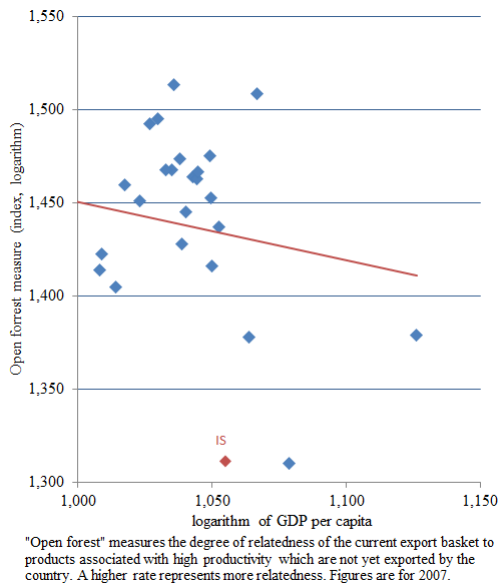
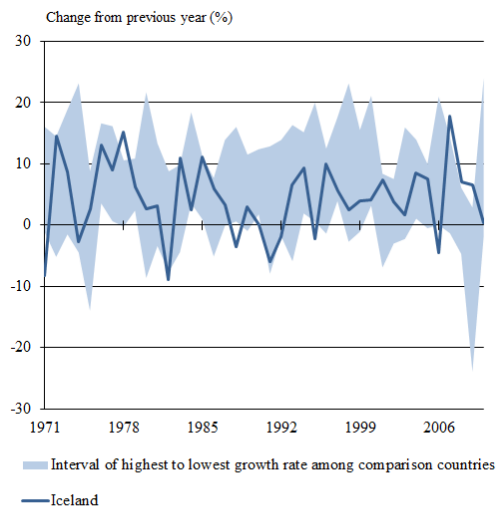
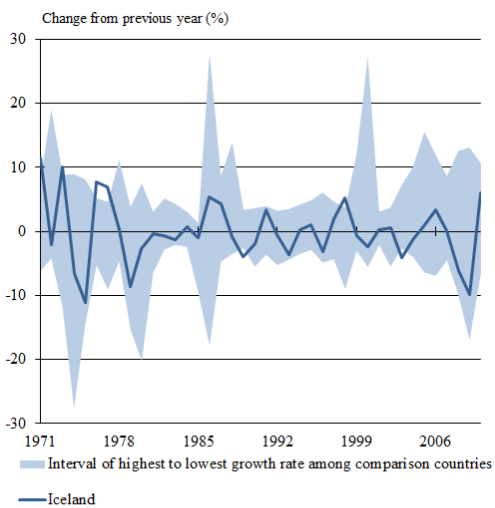


Figure 17: "Open forest" measure of exports and GDP per capita among OECD countries. *Source:* International Monetary Fund (2010).



Comparison countries are Australia, Canada, Denmark, Finland, France, Italy, Japan, Norway, New Zealand, Switzerland, Sweden, UK, US og euro area. From 1985 Ireland and Germany are added to the sample and from 1993 Slovakia.

Figure 18: Export growth 1971-2010. *Sources:* Macrobond, Central Bank of Iceland.



Comparison countries are Australia, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Norway, New Zealand, Switzerland, Sweden, UK, US and euro area. From 1993 Slovakia is added to the sample.

Figure 19: Terms of trade 1971-2010. *Sources:* Macrobond, Central Bank of Iceland.

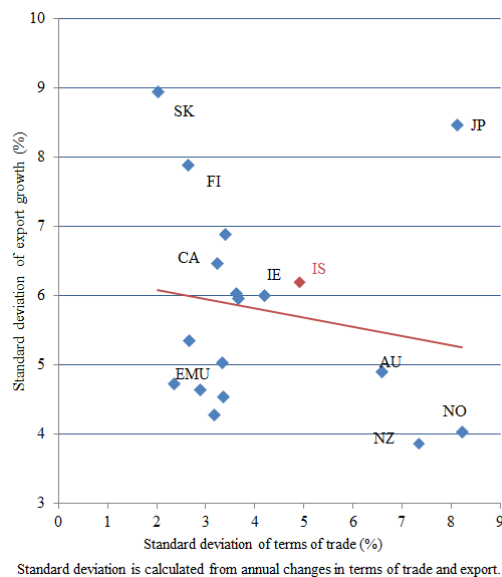


Figure 20: Fluctuations in terms of trade and export 1971-2010. *Sources:* Macrobond, Central Bank of Iceland.