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EMU AND THE ICELANDIC LABOUR MARKET

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Abstract

In this paper we look at the costs and benefits for Iceland from joining the EMU from a labour-market perspective. We conclude that none of Mundell's three criteria for an optimal currency area are at present fulfilled for Iceland and the initial Euro zone. Shocks to the Icelandic economy are found to be asymmetric with those experienced in other countries, nominal wages rigid, and migration limited. The painful adjustment of the Faeroese economy to macroeconomic shocks in the early 1990s suggests that the disadvantages of not having a separate currency can be substantial if nominal wages are rigid. Substantial variation in labour market participation and frequent adjustments of the exchange rate seem to have held unemployment in check in Iceland, at least until around 1988.

Keywords: Monetary union, EMU, labour markets, Iceland

JEL Classification: E6

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1 Introduction

Many European countries are now facing the decision whether to adopt the European single currency. This paper looks at the potential labour-market problems following such a move in one of the smallest existing currency areas: Iceland. Adopting a common currency brings potential benefits, including a reduction in transactions costs, reduced exchange rate uncertainty, and an increase in the volume of international trade. On the other hand, consideration of the possible costs has revealed some disagreement about the wisdom of the whole enterprise. A key issue in this regard is the functioning of the labour market. The objective of this paper is to highlight some labour market considerations, and then proceed to evaluate whether the economic sacrifices caused by the loss of monetary autonomy pose a serious obstacle to Iceland's entry into the single-currency area. No attempt is made to estimate the benefits from linking the Icelandic krona to the *Euro* or adopting it as legal tender. The Central Bank of Iceland has estimated the savings from adopting the *Euro* at between 2 per cent and 2.5 per cent of GDP. They involve reductions in transactions costs and lower interest rate differentials. Other estimates vary, in Sweden this number has been estimated at 0.2 to 0.4 per cent of GDP. But in the words of Obstfeld (1998) "...our current theoretical basis for evaluating the microeconomic efficiency from currency unification is much too slim." This paper does not deal with the issue, focusing instead on the possible effects of closer monetary integration between Iceland and the rest of Western-Europe on the Icelandic labour market. This is where the pitfalls are likely to be found.

In the early sixties Mundell (1961) and McKinnon (1963) introduced the idea of an optimal currency area. Mundell's article looks at the possible disadvantages of using the same currency in two areas. He concluded that at least one of the following conditions had to be fulfilled if the areas were to have the same currency:

1. *Macroeconomic shocks* - be they demand or supply shocks - *are symmetric*, so that if one area is hit, the other is also affected at the same time. If this is the case then the two areas should have the same monetary policy and therefore it would be natural to have the same currency.
2. Nominal *wages are flexible*. In this case, if one area suffers an adverse shock, nominal wages and hence real wages in that area can fall. Here, nominal wage flexibility is the only route available to real wage flexibility as the price level is decided by a supernational authority. We note that nominal-wage and price flexibility is called for in the case of aggregate demand shocks, while real wage flexibility is called for in the case of a supply shock.
3. There is *labour mobility* between the two areas such that in the case of an asymmetric shock - one region is hit but not the other - labour will migrate from the region which faces adverse conditions so that even in the absence of a monetary policy response, total unemployment in the two areas does not increase.

If one or more of the above criteria is met, the costs of adopting a common currency may be sufficiently low to justify loss of monetary autonomy. If none of them are met, further analysis is needed to ascertain whether the benefits outweigh the costs. Two issues arise: First, the size of the idiosyncratic shocks become vital. If substantial demand or supply shocks are not to be expected, there is less reason to be concerned over the loss of monetary autonomy.[1] Second, adopting a common currency may conceivably change the structure of the labour market so that nominal wages become more flexible than before, shocks more symmetric, and labour more mobile.

This paper looks at these aspects and, more generally how the Icelandic economy is likely to change if the country takes some part in the integration of European currencies. We touch on the following points:

1. The likely effects of monetary integration on the structure of the Icelandic labour market. This part looks at which labour market changes are likely and which changes should be recommended if the Icelandic currency is linked closely to the *Euro*. The effects on individual industries are analysed as are the subsequent effects on labour supply and the bargaining strength of workers and employers.
2. The disturbances the Icelandic economy has experienced in the past. In particular we try to determine whether they are symmetric with shocks to specific regions of Europe and the US. The size of the shocks and their causes are looked at in detail.
3. The behaviour of nominal and real wages over the business-cycle in Iceland. This is largely caused by supply-side disturbances and we try to ascertain to what extent nominal and real wages have adjusted to insulate employment in cases of labour demand shocks. If real, but not nominal wages have adjusted we conclude that monetary policy has played a key role in responding to shocks.
4. Migration, labour market participation, and unemployment. An attempt is made to determine to what degree shocks to the Icelandic economy have caused migration to (or from) Iceland, entry (or exit) from the labour market and how this has affected the number of unemployed people.
5. The Faroe Islands have suffered economic hardships that can shed some light on the choices that Iceland currently faces. The islands use the Danish krona and for that reason do not have an autonomous monetary policy. The early 1990s brought severe supply shocks caused by overfishing, resulting in cutbacks and bankruptcies in the fishing industry and a bank crisis. Iceland is also very dependent on the fisheries sector and will have to be prepared for shocks of this nature. This comparison may prove revealing as to the limits of nominal-wage flexibility and inter-country migration.

[1] If the political process does not produce a sensible monetary policy, the loss of monetary autonomy could be a substantial benefit to a region.

2 EMU and the structure of the Icelandic labour market

The effects of EMU on wages and employment are felt directly in the labour market and indirectly through markets for goods and services. Directly, the effects on the labour market are mainly felt through changes in inflation and unemployment but changes affecting markets for goods and services can also affect labour markets indirectly through relative wages.

2.1 Direct effects

Models of the labour market often envisage equilibrium to be established when firms, on one hand, setting prices and taking nominal wages as given, and unions, on the other, setting wages and taking prices as given, are content with their shares of value added. This is the battle of the markups. Firms want to raise prices given wages, and unions want to raise wages for a given level of prices. What brings this equilibrium about is unemployment. As unemployment rises, unions become content with a smaller share of the pie - assuming they value the employment of the members. Firms, on the other hand, become more willing to pay higher real wages as employment contracts - that is nominal wages for a given level of prices. The exact unemployment rate which creates a truce in this battle of the markups is the natural rate of unemployment (the NAIRU).

In Iceland, a third party has traditionally taken part in this game. The government has used exchange rate policy to affect the level of prices in order to maintain close to full employment. We note that a regime change appears to have taken place in the past six years or so, as the government has accepted higher levels of unemployment and refrained from exchange rate devaluations. However, with its own national currency, the government's ability to affect prices - hence real wages in the short term - still exists. It is not difficult to imagine a macroeconomic downturn which is sufficiently large to call for exchange rate adjustments.

The sometimes active part taken by the government in the determination of real wages - and employment - has acted as insurance for unions and employers. This takes two forms: First, in the presence of uncertainty about future demand, unions have been willing to demand, and employers willing to accept, higher real wages knowing that if demand falls short of expectations, real wages can be brought down through devaluations. This is a form of social insurance against excessively high real wages. As with other forms of insurance, a moral hazard problem arises. In this case, unions and firms raise the probability of real wages becoming too high, and loss of jobs occurring, by negotiating higher nominal wages. Second, following negative labour demand shocks, there is no need to reduce nominal wages as prices can be used to lower real wages. While nominal wage increases have been used to raise real wages in good times, price increases have reduced them in bad times. For this reason, the role of labour unions has been made easier as nominal wage decreases are bound to be more problematic due to inter-union and inter-personal comparisons and rivalries.

Adopting the European single currency would effectively eradicate the government from this game. The possibility of devaluations would be eliminated, probably once and for all. The question is how labour market behaviour could change if this were to happen. The previous paragraph provides the beginning of an answer as it appears likely that unions will become more cautious in their wage demands. In the absence of insurance against high real wages causing job losses, unions will probably take less risk when demanding higher wages. Elements of this effect are already in place as a result of the apparent regime change in the early 1990's.

We are more sceptical about the possibility of nominal wages becoming downward flexible. Such downward flexibility is rarely observed for rather obvious reasons. While a general increase in prices is commonly understood to affect all workers equally, a fall in nominal wages has to be negotiated with every labour union.[2] An abundance of practical problems arises. If, as is most often the case, the macroeconomic downturn does not affect all sectors equally, firms in the less affected sectors will be tempted to reduce wages less, hence gaining the goodwill of their workers. But relative wages will change: some workers will experience a fall in both real and relative wages. Such changes are unlikely to occur without considerable strife. But even if all sectors, and all workers, are affected equally by the adverse labour demand shocks, the perceived lack of fairness of the nominal wage adjustment may create problems. It is likely that workers receiving lower wages may demand that those better off shoulder a disproportionate share of the wage reduction. This problem may be exacerbated by the apparent unfairness of the fact that those bringing the bad news - company bosses and their representatives - have much higher incomes than those asked to take a pay-cut.

Closer ties to the European currency area could, however, force unions to accept more flexible nominal wages and in some cases even explicitly negotiate a reduction of nominal wages. One way to gain more flexibility would be to rely on short term wage contracts, so that nominal wages can quickly be adapted to the business cycle.[3] However, such contracts would be likely to cause unrest in labour markets and increase the possibility of strikes. Iceland has experienced more days lost to strikes than any other OECD nation for the last 30 years and there is no sign of a diminishing strike incidence, cf. Ingólfsson (1997). This is especially troubling in light of the fact that other countries which historically suffered from frequent strikes, such as Italy, experienced a significant drop in the number and length of strikes around the mid eighties, (cf. ibid.).

[2] A general change in the price level may not affect all workers equally. As contracts expire in different time periods, some contracts may stipulate cost-of-living adjustments, and the price of some goods may rise more than that of others and consumption patterns differ across workers.

[3] Other methods may also be feasible, such as indexing wages to the growth in GDP or the terms of trade or increased reliance on profit sharing.

2.2 Indirect effects

In small economies, and Iceland certainly fits that description, it is well known that the production of certain goods and services is more costly than in larger economies since they are produced at an inefficient scale. It is also to be expected that consumers in small economies do not gain as much from free competition between firms as do consumers in larger ones. Only a few, sometimes just one firm, can survive in many industries in small economies where several firms survive and compete for customers elsewhere. These two problems are the main reason why the benefits of market integration across borders are greater for small economies than large.[4] Apart from their other effects, barriers to foreign trade can have significant implications for labour markets, play a decisive role in determining which industries will survive in a given region and affect the bargaining power of employees vs. employers.

The effects of separate currencies on trade between the regions are of the same nature as those of other barriers to trade.[5] The cost of currency conversion and the accompanying exchange rate risk drive a wedge between buyers and sellers in the same way as tariffs and transportation costs. Currency markets are like other markets in that they become more efficient the greater the turnover. This is of course not to the benefit of small economies with a separate currency. Such currencies are often hardly if at all usable outside the country of issue even when they can be exchanged freely for other currencies in that country.

In most markets, some sunk costs must be incurred for a firm to start operating. The environment that determines the profitability of firms in most markets changes over time. Even for firms already operating it may be hard to predict future developments and for potential entrants it may be almost impossible. The effect of a changing and unpredictable environment is one of the main reasons for the oligopolistic nature of most markets, even in the world's largest economies, cf. Gatsios (1989). Economies of scale is the other main reason.

Companies do not enter new markets unless there is a reasonable likelihood of a high return to their investment and they often do not exit, even when operating at a loss for some time, in the hope that eventually conditions will change in their favour. This means that the structure of markets evolves slowly over time and participants are more or less the same, year after year. This notwithstanding, new firms enter some markets and others exit but often radical changes, e.g. substantial changes in real exchange rates may be needed for firms in one country to start exporting to a new market.[6]

[4] This is the main justification for merging the markets of several small and medium sized countries within the European Union, see e.g. Chapters 2 and 3 in Hansen and Nielsen (1997).
[5] See e.g. Katz (1982), Dixit (1989), Baldwin and Krugman (1989), Dornbusch (1987), and Hooper (1978).
[6] See e.g. Baldwin and Krugman (1989). A well known example of how changed conditions in a market led to the entry of new participants that did not exit even if the market environment changed more or less back to the previous conditions is the entry of Japanese car makers into the U.S. market after the oil crisis of the seventies.

The importance of a particular barrier to trade depends on several factors, including the market environment in the exporting and importing countries, but in particular it depends on how large a fraction of the cost of getting a good from the exporting manufacturer to consumers in the importing country is incurred due to the barrier. If transportation costs are substantial or tariffs high it is unlikely that the extra cost incurred by having different currencies is pivotal.

The cost of currency conversion for Icelandic exporters and importers is small as a proportion of the amounts changing hands, regardless of whether Iceland adopts the *Euro* as legal tender, makes some other changes in its currency policy or no changes at all. Transporting any good across borders implies for some transportation costs, in many cases a substantial fraction of the value of the good. Such considerations make it seem likely that decisions on the future of the Icelandic currency will not significantly affect most markets for goods in Iceland or the country's exports, any more than the number of exporters and importers or the types or number of goods offered. If the *Euro* is adopted as a currency, though, this will slightly lower the cost of trade, especially with countries that also use the *Euro*. This would benefit exporters, importers, and consumers and have a small but adverse affect on the competitiveness of some firms that only produce goods for the domestic market.

The effect of Iceland's currency policy on the markets for services is somewhat different. Many types of services are never or almost never exported, the services of barbers is a textbook example.[7] Other types of services can easily and at very little cost be exported from one country to another. Here we will mainly focus on financial services such as banking and insurance. One of the main characteristics of financial markets is that markups are only a small fraction of turnover when compared to wholesale and retail trade of most goods. For this reason, a cost that is only a small fraction of the value of a given transaction can significantly affect firms' profitability and competitiveness.

Iceland's financial markets are oligopolistic. Since conversion costs are relatively important in the markets for financial services they can provide a significant protection from foreign competition. Traditional transportation costs are negligible, except perhaps the cost of communication and in some cases the cost of having employees travelling abroad or relocating there. The Icelandic financial market is still to a considerable extent isolated from that of the neighbouring countries, foreign banks do not have branches in Iceland and they do not offer services to individuals living in Iceland. One cannot open accounts denominated in Icelandic krona abroad and no credit card issued in another country is billed in Icelandic krona.

[7] Some types of services are not exported in the usual senses but firms nevertheless compete across borders, sectors that service tourists are a typical example. Icelandic hotels thus do not compete with foreign hotels in the sense that tourists can stay at foreign hotels when travelling in Iceland. This notwithstanding, Icelandic hotels compete with foreign hotels since tourists will not choose to go to Iceland unless Icelandic hotels offer competitive rates.

Of all the options open for Iceland's currency policy, adopting the *Euro* as legal tender would have the most radical effect on the cost for foreign firms of operating in the Icelandic financial market, reducing the location protection that Icelandic financial firms enjoy at present.[8] Other changes in the currency policy would affect the location protection less but in general one can expect that the closer the links between the Icelandic currency and another currency, the easier it will be for financial institutions in other countries that have adopted that currency to operate in Iceland. Other factors will have some weight, including the credibility of the exchange rate policy.

It is difficult to predict structural changes in a market, such as entry and exit, resulting from external changes to the market environment. Changes in the currency policy could significantly change the financial environment. Even so, it is safe to say that if Iceland adopted the *Euro*, Icelandic financial markets would become more tightly integrated with markets in the EMU countries. Competition would intensify and customers in Iceland could expect similar services at a similar cost as in neighbouring countries. Most likely, some Icelandic firms would exit the market and some foreign companies would enter.

The effects of this could be widespread and felt by the owners of financial firms, their customers and employees. Here, however, we will focus on labour market.[9] Increased competition from abroad would presumably lead to fewer domestic firms and they would have to cut costs to competitive levels.[10] This could reduce employment and lower wages. The bargaining power of employees (or unions) relative to firms becomes weaker, *ceteris paribus*, the more intense the competition firms face, at least if the same union does not negotiate with all the main competitors. The reason is simple, a firm that faces tough competition cannot afford to pay higher wages than its competitors - if it does, it risks going under. If a company is protected from competition to some degree, e.g. due to its location, a union may be able to negotiate a share in oligopoly rent. In this case, wages will be higher for the employees of the company than for workers doing comparable work in other industries where unions are not able to extract part of an oligopoly rent.

No attempt is made here to ascertain whether employees of Icelandic financial firms have benefited from part of any oligopoly rent generated by their companies. It is safe to say, though, that their bargaining position is not likely to improve if competition intensifies. As mentioned previously,

[8] The term location protection is here used to cover all the factors that isolate a market in one region from markets in other regions. In the markets for most goods, location protection is mainly due to transportation costs and tariffs but such factors as different customs, rules and tastes of consumers can also matter. A separate currency can provide some location protection.

[9] If the cost of capital changes significantly, the effects could be dramatic. A cost reduction would increase investment and improve the competitiveness of capital intensive firms operating in Iceland. Such effect would be felt in labour markets but no attempt is made here to quantify them.

[10] Location protection can work both ways, i.e. it can protect domestic firms from foreign competition but at the same time make it harder for them to expand into overseas markets. No attempt is made here to evaluate whether new markets would open to Icelandic firms abroad if Iceland adopted the *Euro* as legal tender or made other changes to its exchange rate policy.

there is no reason to believe that changes in Iceland's currency policy would significantly affect the goods market in Iceland, the country's goods exports or the domestic market for the kind of services that are not normally traded across borders. Thus there is little reason to expect significant changes in the number of workers employed in those sectors.

3 Symmetry of shocks in Iceland and abroad

3.1 A review of previous research

This section presents an analysis of random shocks to the Icelandic economy over the last thirty years or so and discusses statistical measures of their relationship to economic fluctuations in other countries. Ours is not the first venture into this territory. Related questions have been posed by Icelandic economists in a number of reports and published articles over the last few years. In the present subsection, we attempt to summarise the main results of this work with an emphasis on the possible symmetry of the business cycle between Iceland and other OECD countries. Specifically, the object of interest is the relationship between economic growth in Iceland and the countries expected to participate in the first phase of the monetary union. By way of comparison, some attention is also brought to the issue of symmetry between Iceland and other areas, such as the US, the UK as well as the larger group including all EU countries irrespective of their immediate plans concerning monetary union.[11]

A study by Magnússon and Einarsson (1985) sought to identify the most important negative shocks to the economy in the postwar period and to classify them according to their sources. Tómasson (1991) tackled the issue of whether a regular business cycle can be discerned in the OECD countries, including Iceland, and several studies have calculated the correlation between economic growth in Iceland and European and OECD countries (e.g. Harðarson and Guðmundsson (1991), Vísbending (1996), and the Icelandic Central Bank (1997)).

According to Magnússon and Einarsson major negative shocks to the Icelandic economy occurred eight times in the period 1945-1985. They argue that six of these can be traced directly to changes in the price of and demand for Icelandic export goods abroad, while only two of the recessions are primarily due to fluctuations in the fish catch. It may be added that by the same criteria, severe recessions have occurred twice since 1985, i.e. in 1988 and 1992. The former was caused by a fall in export prices *and* a drastic reduction in catches, while the latter was only due to a reduced fish catch (cf. Magnússon, 1998). Thus, at first sight a relatively high proportion of negative

[11] The countries that will participate in the first phase, sometimes referred to as 'the EMU area in a narrow sense', are the following: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain.

shocks to the Icelandic economy - six to seven out of ten in the postwar period - were caused by fluctuations abroad, while only three or four are specifically Icelandic in origin. This, of course, does not tell the full story concerning the symmetry between Iceland and the first-phase EMU countries. Many of Iceland's historically important trading partners do not belong to this group, including the UK and the US. Furthermore, a drop in the price of Icelandic goods in foreign markets should by no means be taken as a sign of a general recession in the countries concerned.

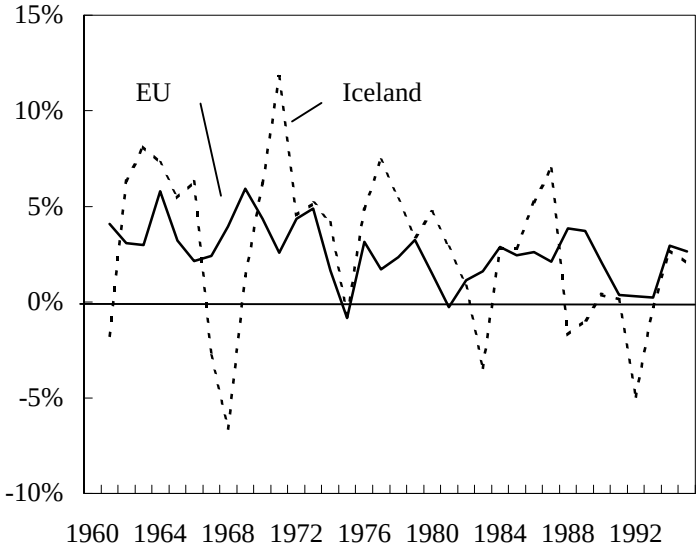
The Report of the Central Bank of Iceland (1991) includes a survey of some research on the Icelandic business cycle and its relation to fluctuations abroad. Some stylised facts are presented in the report. In the present context, the following two are most relevant.

- Economic growth in Iceland has exhibited greater fluctuations than is the case for most other OECD countries
- Fluctuations in Icelandic *exports* seem almost uncorrelated with those of the other OECD countries.

A study by Harðarson and Guðmundsson (1991) uncovered a strong relationship between economic growth and exports in Iceland. However, they found no significant relationship between Icelandic exports and economic growth in the OECD as a whole. This suggests that the latter of the above conclusions applies not only to exports, but also to economic growth, implying asymmetry of economic fluctuations in Iceland relative to those in other countries of the OECD.

Before proceeding, it is worthwhile to inspect graphically economic growth in Iceland and the EU.

Figure 1. Economic growth in Iceland and the EU, 1961-1995



This figure clearly shows that the variance of economic growth is greater in Iceland than in the EU as a whole, and this difference is preserved when Iceland is compared to individual member states.[12] Furthermore, the figure reveals that it is quite common for economic growth to decelerate in Iceland as the EU average accelerates and vice-versa. Some major deviations are easily identified from the graph, e.g. 1968, 1971, 1977, 1983, 1988 and 1992. In four of these instances, the Icelandic economy went through a recession while growth increased in Europe, but twice it was the other way around.

More recent research into the relationship between economic growth in Iceland and in other countries leads to similar conclusions. An article published in Vísbending (1996) reveals that correlation coefficients between growth in Iceland and abroad tend to be low. Unfortunately, no rigorous inference can be made on the basis of these results, as no significance criteria are presented and methodological issues are not discussed.[13]

More recently, the results of a statistical investigation concerning the symmetry of shocks were published by the Central Bank of Iceland in a report on the EMU (1997). Economic growth in individual countries is regressed separately on growth in both phase I EMU countries and in the EU as a whole.[14] The resulting coefficient of determination from each regression R^2 is then interpreted as a measure the symmetry in growth fluctuations. For Iceland, this proportion appears negligible - close to 5 per cent for both areas - and much lower than the corresponding figure for most other European countries. It is interesting that the USA exhibits a much higher proportion of shocks symmetric with Europe than Iceland does: 19 per cent with the phase I area, and 34 per cent with the EU in general. Clearly, this evidence does not support the hypothesis that the Mundell criterion of symmetric shocks holds for Iceland and either the EU as a whole or the EMU in a narrow sense.

In spite of this, it may be worthwhile to pursue this inquiry a little further. Questions concerning the cause of the asymmetry are bound to arise. One possible way to tackle this issue is to focus on the question whether the Icelandic economy is fundamentally different from the EU economies in its structure, or whether the asymmetry should primarily be attributed to exogenous shocks, such as fluctuations in the fish catch. Obviously, no simple answer exists as structural factors will determine the way in which the economy responds to shocks, and conversely, the resource dependence of the Icelandic economy is likely to influence its structure. Nevertheless, if such questions can be simplified, a statistical approach may reveal which aspect is stronger.

[12] When a comparison is made between first differences of an individual time series and first differences of an average of many time series that are not perfectly correlated the variance of the latter may be dampened, cf. Working (1961).

[13] On the basis of some guesswork it seems that a likely critical value for the correlations at the 5 per cent level of significance would be at least 0.49. Given this assumption none of the correlation coefficients are significant except the one between current growth in Iceland and Norway lagged one year (0.6).

To achieve this, let us suppose that in the evolution of the gross domestic product three basic ingredients are present: a long term growth component, a cyclical and an irregular component. Broadly speaking, these components can be described in the following manner:

- A long-term growth component: GDP has grown considerably on average over the last decades in most countries.
- A regular business-cycle: Some economists believe that a regular and, to a certain extent predictable, cycle exists in the GDP of industrialised countries. This is the business-cycle, and it is sometimes thought be of some five to eight years' duration.[15]
- Unexpected random shocks: Fluctuations of GDP are only predictable to a very limited extent; examples of the opposite are easily found in the period studied here, such as the failure of the fish catch in 1967-1968 (domestic shock) and the oil crisis in 1973-1974 (international shock). We will define such unpredictable events as the irregular component of GDP.

Although the statistical nature of the components is a matter of debate, it seems reasonable to define the business-cycle as *regular deviations from a long-term trend*. As this is a regular component that changes only slowly over time but differs from one economy to another, its characteristics could be taken as an indication of the structure that determines the dynamics of each economy. Thus countries that have different business-cycles in this sense are likely to react in different ways to exogenous shocks, even if they affect all of them simultaneously as did the oil price increases in 1973-1974. Comparing two or more economies in this respect, very different regular components in GDP would then seem to preclude a Mundell-type symmetric relationship.

The irregular component is usually thought of as exogenous, because its fluctuations are unexpected by definition, and their causes can often be readily identified as particular outside events. However, the possibility that such shocks may originate in policy decisions can of course not be excluded. From a statistical point of view, the irregular component is a residual term, i.e. that part of GDP deviations from its long-term trend that is not explained by a model of the regular business-cycle. Accordingly, the magnitude and character of this component is dependent on the definition of the regular cycle, and if no regular cycle can be identified all deviations from long term trend will fall into this category.

3.2 Cyclical and irregular components of growth

In this section we will seek to determine whether an apparently low degree of symmetry between Iceland and the EU can be traced to structural differences in the sense that the regular component of the Icelandic business cycle is distinct from that of other countries. For this purpose a statistical

[14] In that study phase I EMU is defined as eight countries, i.e. the eleven listed in a previous footnote less Italy, Portugal and Spain. The present work suggests that this difference by itself does not significantly affect the results.

model was estimated for five different economic entities in the period 1963-1995: Iceland, US, UK, the first phase of the EMU and the EU. The question whether the growth series share a common cyclical component then forms a testable hypothesis. Pairing Iceland with each of the other areas and performing the tests revealed that the existence of a common cycle is not rejected between Iceland and any of the four other areas. However, the results tend to be more equivocal for the two EMU groups than the UK and US, and they may be sensitive to the period chosen and the particular choice of weights used to aggregate the growth series.[16]

To test whether the unexpected component in Iceland has anything in common with that in the other four areas, a cyclical model was estimated for each area separately and the resulting residuals compared. Over the whole period, the correlation is only significant in one case, i.e. between the irregular growth component in Iceland and the lagged component in the UK. Looking at a more recent period, i.e. 1980-1995, yields a stronger conclusion. In that case random shocks to growth are uncorrelated between Iceland and the UK. This also applies to the relationship with the other two areas in Europe, but a significant correlation is found between random shocks in Iceland and the US in this period. This conclusion should not be taken at face value, however. The share of the US market in Icelandic exports has dwindled in the eighties and the nineties, making it hard to see how a strong causal mechanism might have existed during this shorter period. Furthermore, particular instances that are easily identified as purely coincidental may unduly affect the result in the smaller sample. Thus the US economy exhibits negative growth in both 1982 and 1991, while Iceland does so in 1983 and 1992. However it is quite clear that the recession in Iceland is primarily caused by drastic reductions in the fish catch in both cases. Also, any 'lagged symmetry' that may exist is just another form of asymmetry in the sense of Mundell.

Although the hypothesis that Iceland shares a regular business cycle with the EU countries can neither be rejected for a wide nor for a narrow definition of the EMU, the correspondence between periods of expansion and recession between Iceland and these areas is weak. Part of the explanation may lie in the fact that the cyclical element in economic growth seems weak in most European countries. An examination of GDP in the OECD countries, principally aimed at detecting a regular business cycle, revealed that the cycle is either insignificant or of infinite duration in eight of the eleven countries of the first phase EMU, while in Iceland the cycle is well defined, cf. Tómasson (1991). The same is true of the cyclical model used in this investigation: it seems to describe the dynamics of economic growth in the two European areas rather poorly. Partly, this may also be due to

[15] Cf. Tómasson (1991) and Cooley and Prescott (1995), pp. 1-38.
[16] These and similar issues are discussed in more detail in Appendix A3.

an aggregation effect which would dampen cyclicality in the EMU11 and EU growth series if it is to some extent asymmetric within the areas.[17]

The conclusions of this analysis can be summarised as follows:

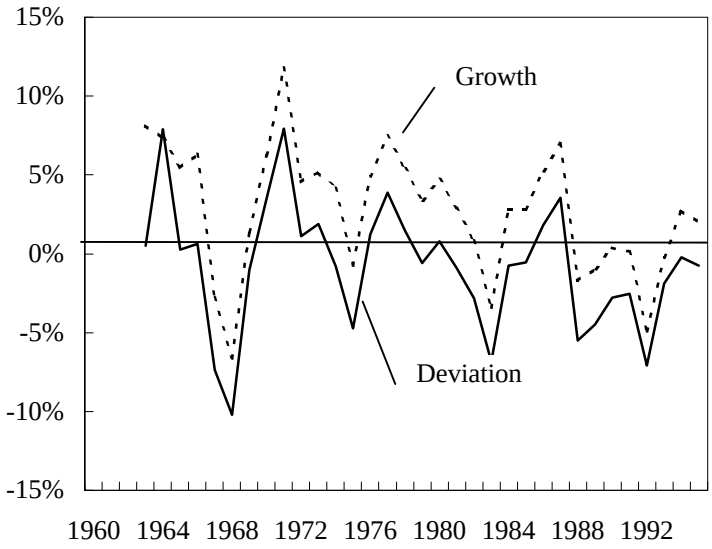
- Cyclicality of growth in the Icelandic economy is more similar to cyclicality in the USA and the UK individually, than in the EMU countries, whether we look at the eleven countries of the first phase or all fifteen EU countries. This may be due to the fact that a regular business cycle is hard to detect in many European economies.
- On the basis of historical evidence, it is unlikely that recession and expansion periods will occur simultaneously in Iceland and the rest of Europe, whether or not the cyclical component in growth is symmetric, because the random shocks are statistically uncorrelated.
- Although the existence of a common cyclical component in Iceland, the UK, and the US is a reasonable hypothesis from a statistical point of view, no significant contemporaneous relationship exists between random shocks in these countries either. This implies asymmetric shocks to growth, even in the presence of a common cyclical component.

3.3 A closer look at deviations in growth between Iceland and the EU

So far only quantitative aspects have been considered. In addition it may be worthwhile to try to gain a better understanding of the nature of the difference between growth in Iceland and the EU. In what follows, we will identify some of the more important episodes and interpret them to some extent in the context of economic history. Certain aspects are highlighted by a direct comparison of economic growth as illustrated in Figure 1. A clearer picture is likely to emerge from the inspection of residuals from a recursive regression of growth in Iceland on growth in the EU countries, as these can be interpreted as deviations from an estimated relationship (see further Appendix A). Interesting results emerge when such residuals are plotted together with the growth series itself for Iceland in this period.

[17] An investigation undertaken by Loufir and Reichlin (1992) concludes that the nominal convergence in exchange rates and prices implied by the ERM did not translate into convergence in real variables such as GDP growth.

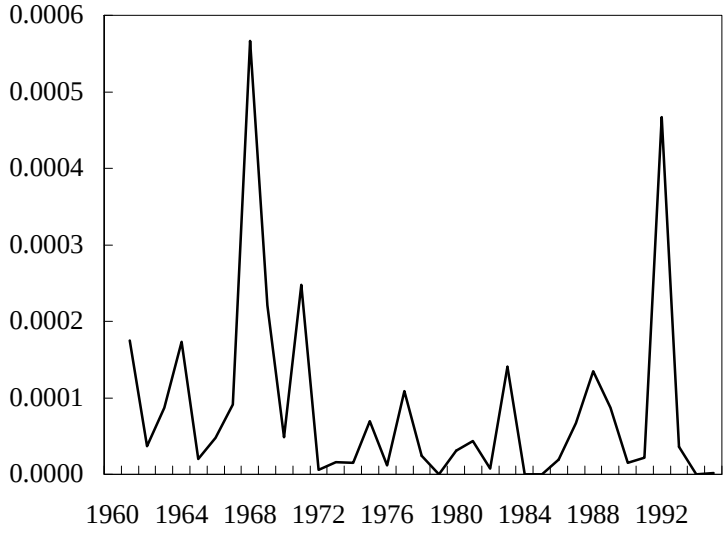
Figure 2. Economic growth in Iceland and its deviation from the estimated relationship with EU growth



The paths traced out by the two time series are almost identical. No information concerning growth in Iceland can be obtained from growth in the EU. In other words, this figure is simply an illustration of the fact that growth in Iceland and the EU are practically uncorrelated.

The size of the residuals yields information about the timing of the biggest discrepancies. Influential observations in a regression can be identified by a technique intended for this purpose (see Appendix A3), and their relative influence quantified. If both series are defined in terms of deviations from long term trend, and no attempt is made to isolate the cyclical component from the irregular one, the effect of the year 1968 on the regression results is large. Considering the irregular component separately, after subtracting the cyclical component from the series, yields a slightly different result. In this case four years appear of roughly equal importance: 1967, 1976, 1988, and 1992. Four more years seem to have less, - although still substantial - influence: 1971, 1973, 1980, and 1983.

Figure 3. The influence of individual years on regression results for the random shocks to growth in Iceland and the EU



In interpreting Figure 3, it must be kept in mind that the maxima in the graph indicate large deviations of the irregular component in Icelandic growth from the trend and cycle of EU growth, and not fluctuations in the Icelandic growth rate as such. Comparison with Figures 2 and 3 reveals in each case whether the deviation is due to greater or lesser growth in Iceland than in the EU. Fluctuations in fish catches have played a considerable role, but the terms of trade and policy decisions also matter. A detailed analysis of the deviations is beyond the scope of this paper, but some attention can be brought to the most significant ones. We will consider the four largest deviations first and then briefly consider the lesser ones.[18]

- 1967: The collapse of the herring stock is a decisive factor in this economic crisis but prices of Icelandic exports in foreign markets also fell despite a general upswing in Europe.
- 1976: The extension of Iceland's exclusive fishing zone in the previous year may have been instrumental in this upswing.
- 1988: Fish catches were reduced this year. There are some indications that economic policy in the preceding expansion period may have played a role. This is manifested in three depreciations of the Icelandic krona in 1988.
- 1992: In 1992 Europe had not yet reached the trough, and growth was still positive. Iceland, on the other hand, experienced the largest drop in its GDP since the herring schools vanished in 1967. Although fish catches were practically the same as the year before, they had been steadily diminishing since 1988, owing to the introduction of a new quota system. These

[18] This discussion is partly based on Sigurður Snævarr (1993).

elements, taken together with a contractionary economic policy following a trilateral national consensus agreement in the labour market, may have amplified the effects of a 4 per cent deterioration in the terms of trade.

Out of the four less important, but non-negligible shocks apparent in Figure 3, reduced fish catches appear to be the main culprit in only one case and economic policy seems to play a greater role here than the cases above.

- 1971: This year Iceland had the second highest economic growth in a single year since World War II, and the fastest in the period under scrutiny here. This is probably due to a number of reasons. Physical capital and the labour force were under-utilised in the preceding years and considerable monetary expansion had taken place in 1969 and 1970, cf. Snævarr (1993:70). On the basis of a reduction in fish catches and stagnating terms of trade, it is tempting to conjecture that the positive shock in 1971 was policy induced. Other factors include an infusion of foreign capital in the form of an aluminium smelter and the entry of Iceland into the EFTA.
- 1973: The worldwide oil crisis seems to have hit the Icelandic economy one year later than the rest of the world. A likely reason for this lag is that the government attempted to respond to the crisis by fuel subsidies.
- 1980: Growth increased slightly in Iceland compared to the previous year, while Europe felt the effects of the second oil crisis. In Iceland this effect was partly offset by larger fish catches and a favourable development in the terms of trade.
- 1983: Here the failure of capelin catches two years in a row caused negative growth. Meanwhile other European countries were working their way out of an oil crisis that culminated in 1981.

The main methodological weakness of the present approach lies in the assumption that the nature of the business cycle, its separation into a cyclical and an irregular component, as well as the relationships between these components across different economic areas remain the same over time. This is a very strong assumption that is unlikely to hold in practice. For one, the trend in different areas' relative shares in total Icelandic exports suggests that Iceland should be converging towards Europe and drifting away from the US during this period. Furthermore, an analysis of the way these relationships have changed would require a much more detailed historical analysis than has been attempted here. This notwithstanding, the main conclusions emerging from this effort are fairly clear, i.e. that random shocks to growth in Iceland are completely unrelated to shocks in other countries and economic areas considered. This implies that Mundell's first condition for an optimal currency area, *symmetric shocks*, is not fulfilled for Iceland and EMU participants.

4 Wage flexibility in Iceland

4.1 Wage flexibility and the Icelandic labour market

Economic policy in Iceland 1950-1990 had two main objectives: maintaining full employment and guaranteeing profits for fish exporters. To reach these objectives, governments were willing to accept significantly higher inflation than in the neighbouring countries. Historically, when the fisheries sector has boomed, wages and costs have risen and caused inflationary pressure in other sectors. Declining catches or demand abroad have at times caused hardship but these have been alleviated through devaluations. In addition, the government has on numerous occasions intervened in wage bargaining or dictated changes to previously agreed wage settlements.

Figure 4. Changes in real wages and the difference between economic growth in Iceland and the EU

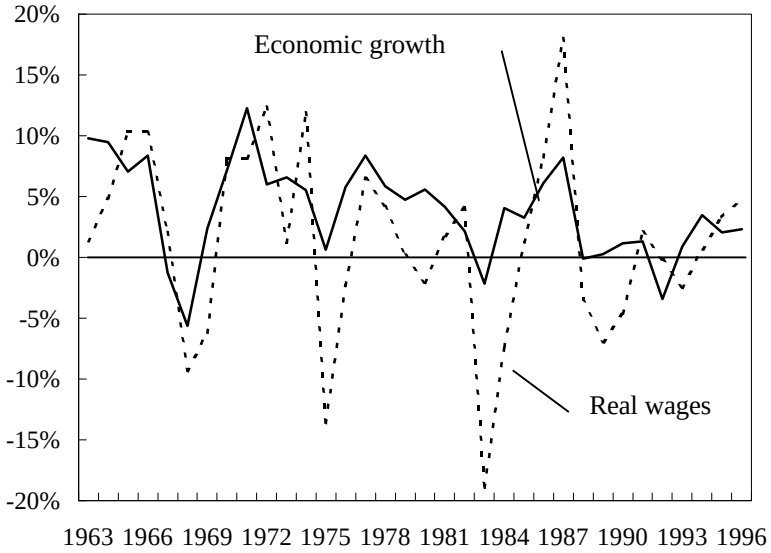


Figure 4 depicts changes in real wages and the difference between economic growth in Iceland and in the EU.[19] The figure shows that real wages respond quickly to shocks, wages increase in the wake of favourable shocks and decline following adverse shocks.[20] Real-wage flexibility has reduced the employment effect of macroeconomic shocks. We note that real wages have been more stable in the nineties than in the period 1963-1990 which reflects changing government policies.

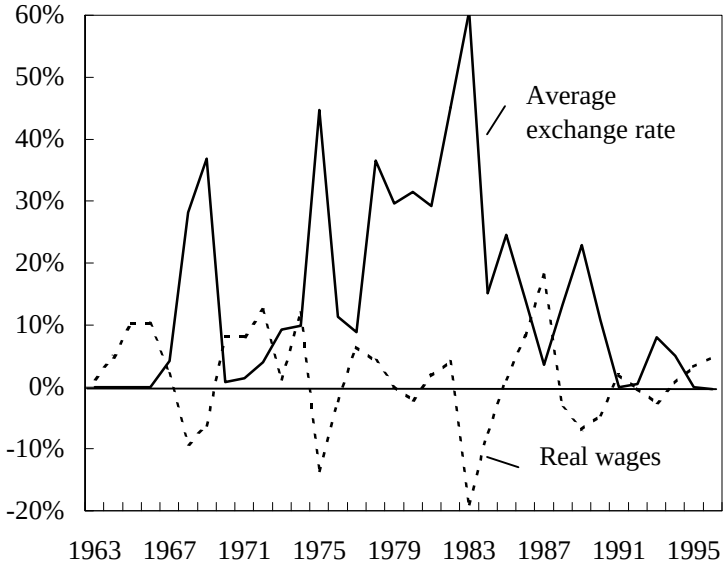
A report by the Central Bank of Iceland (1997) emphasises the close link between economic growth and changes in real wages. The flexibility of wages is measured using three different

[19] See also Figure 2 in Section 2.

methods, including the correlation between changes in output and real wages. The correlation between changes in real wages and economic growth is 0.67 for the period 1981-1996. The other two measures of real wage flexibility are based on the relationship between real wages and unemployment. According to one of the measures, real wages in Iceland drop considerably as unemployment rises and the other measure indicates that real-wage rigidity in Iceland is comparable to that in other countries in Western Europe and the US. A report by the National Economic Institute (1991) provides additional insights.[21] This report shows that wages are almost completely flexible in the fishing and fish processing industries in 1974-1988.

As mentioned earlier, exchange rate changes have often been used to moderate the impact of declining catches or reduced demand in export markets. Devaluations serve two purposes here; they increase the revenue of exporting firms, measured in the domestic currency, and reduce costs by lowering real wages. The negative relationship between the exchange rate and real wages clearly emerges from Figure 5: devaluations tend to cause a fall in real wages in the same or the subsequent year.

Figure 5. Changes in average exchange rate and real wages



If Iceland were to join a monetary union or establish a bilateral link with the *Euro* it would no longer be possible to use exchange-rate policy to respond to shocks. The report of the National

[20] A Granger causality test was performed to see if changes in wages followed economic shocks or the other way around. One could not reject the hypothesis that economic shocks Granger cause changes in wages at the 1 per cent significance level.

Economic Institute discusses some alternatives. It is assumed that Iceland has a fixed exchange rate policy and the effect of various policy instruments is analysed. These include policies aimed at affecting aggregate demand, price equalisation funds for the fisheries sector, and revenue sharing in fish processing. The authors conclude that "...a fixed exchange rate is unlikely to be sustainable, unless accompanied by powerful shock absorbing mechanisms instituted by firms in fishing and fish processing or the government.'[22]

4.2 Nominal wages

Nominal-wage adjustments constitute the most straightforward method to adjust real wages as the profitability of the fishing and fish processing industries changes.[23] Historical evidence, however, suggests that it is extremely difficult to reduce nominal wages. This has only happened once in the last four decades. This was in 1959 when the government decreed that wages and prices in the country should fall by 8 per cent.

Figure 6. Annual rate of increase of nominal wages and an index of the level of nominal wages

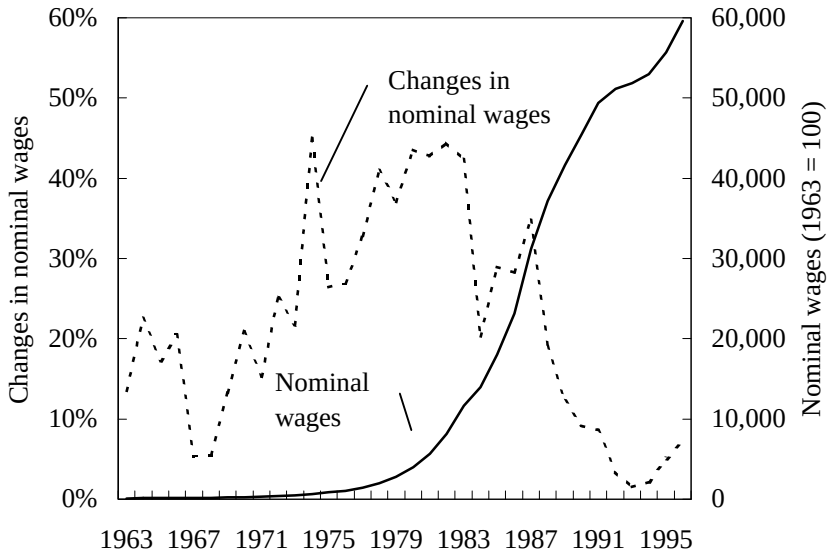


Figure 6 clearly shows that nominal wages never declined in the period 1963-1996 although the annual increase varied considerably. Here nominal wages are defined as average hourly wages paid (as opposed to officially negotiated hourly rates). There have been considerable differences

[21] In that report, perfect flexibility is defined as equivalent to a constant share of wages in gross factor income.
[22] *Op. Cit.* p. 21.

between hourly wages paid and hourly rates. The greatest increase in nominal wages occurred between 1973 and 1974, or by 45 per cent and in the period 1978-1983 nominal wages increased by between 37 per cent and 44.5 per cent per year. In recent years, nominal wages have risen at a much slower rate and since 1990 nominal wages have never increased by more than 10 per cent per year.

In view of this evidence, our conclusion is that Mundell's second criterion - flexibility of nominal wages - has not been satisfied in Iceland in the past. However, this does not rule out the possibility that it may be met in the future. Austria may be one example of this occurring. In 1974 Austria opted for an exchange rate peg with the D-mark at a time when the economic prerequisites for an optimal currency area were not yet met. Hochreiter and Winckler (1995) conjecture that the conditions for the optimum currency area were attained by 1980 because wage formation had become more flexible. In the early 1970s, wages were raised way beyond productivity advances. Later on, this changed, particularly in the 1980s. After 1982, wage settlements responded to slow growth and severe structural problems, in particular in the nationalised industries. In the second half of the 1980s, moderate wage agreements facilitated industrial restructuring. In the mid-1980s, the pace of the structural adjustment program was accelerated, especially in nationalised industries. According to these authors, the moderate wage settlements of the 1980s may imply that the trade union movement realised the importance of keeping wage increases in line with productivity advances in order to maintain competitiveness. By relinquishing some of its monetary policy options, the Austrian government may have gained sufficient credibility to foster nominal-wage flexibility and create an optimum currency area.

5 Migration, labour market participation, and unemployment

Economic growth spurs demand for labour, wages increase and it becomes easier for workers to find acceptable work. Okun's law (1962) describes the relationship between economic growth and unemployment over the business-cycle:

$$\Delta u = d_u + g_u g \tag{1}$$

where u denotes unemployment, g the rate of growth of GDP per capita, Δ is the first-difference operator and d_u and g_u are constants, $g_u<0$. The equation says that an increase in the rate of economic growth will lead to a decline in unemployment.

[23] It is assumed here that the profitability of the fishing and fish processing industries will continue to be of paramount importance for the Icelandic economy.

Okun's law does not tell the whole story, however. Economic growth can affect the supply of labour in many ways. If a particular region is facing adverse conditions and low growth, more people will emigrate and fewer immigrate, *ceteris paribus*. Labour-force participation may also fall. These relationships can be described by the following equations:

$$\Delta b = d_b + g_b g_{-1} \tag{2}$$

and:

$$\Delta n = d_n + g_n g \tag{3}$$

where *b* denotes the net proportion of the population that migrates from the region and *n* denotes the proportion of the population that is in the labour market (either employed or unemployed). One can expect that $\gamma_b<0$ and $\gamma_n>0$.

Statistics for Iceland fit this story quite well. Regressions were run using annual data for the period 1980-96 on unemployment, the size of the population, labour market participation and migration to and from the country. The resulting estimates were as follows:

Table 1. Okun's law

	d coeff.	*t*-stat.	*g* coeff.	*t*-stat.	R^2
Unemployment	0.0036	1.95	-0.078	-1.39	0.121
Migration	0.0078	0.79	-0.067*	-2.24	0.263
Labor market participation	-0.0010	-0.43	0.23	3.20	0.422

* denotes significance at the 1 per cent level.

The *d* coefficients are always statistically insignificant but the *g* coefficients are significant for equations (2) and (3) and close to being significant for equation (1). R^2 measures the proportion of the variation in the dependent variable explained by economic growth.

The effects of economic growth are here reported for men and women. Men's labour market participation was greater than that of women for the whole period but running a regression for each gender separately gave almost exactly the same *g* coefficient estimates.

Figure 7. Economic growth and unemployment in Iceland 1980-1996

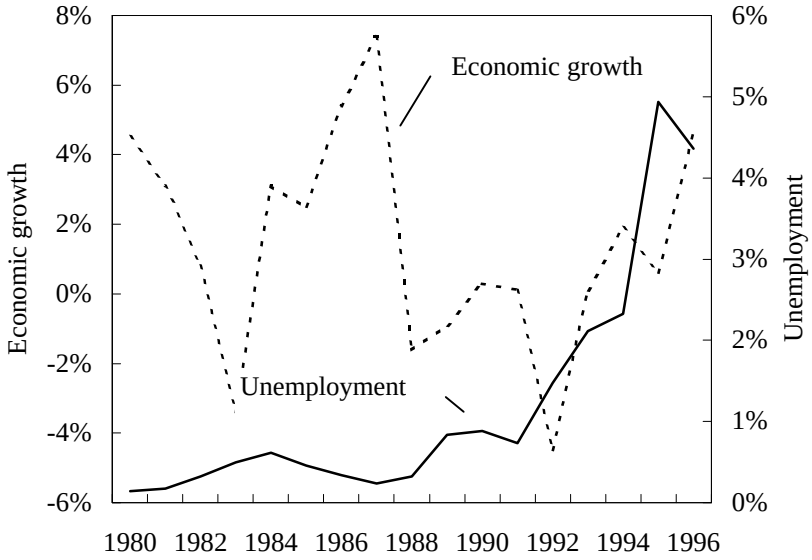


Figure 7 shows unemployment and economic growth. Figure 8 shows net migration from Iceland, i.e. emigration minus immigration, as a proportion of the population and economic growth. Figure 9 shows labour market participation and economic growth in Iceland 1980-1996.

Figure 8. Net migration from Iceland as a proportion of the population and economic growth 1980-1994

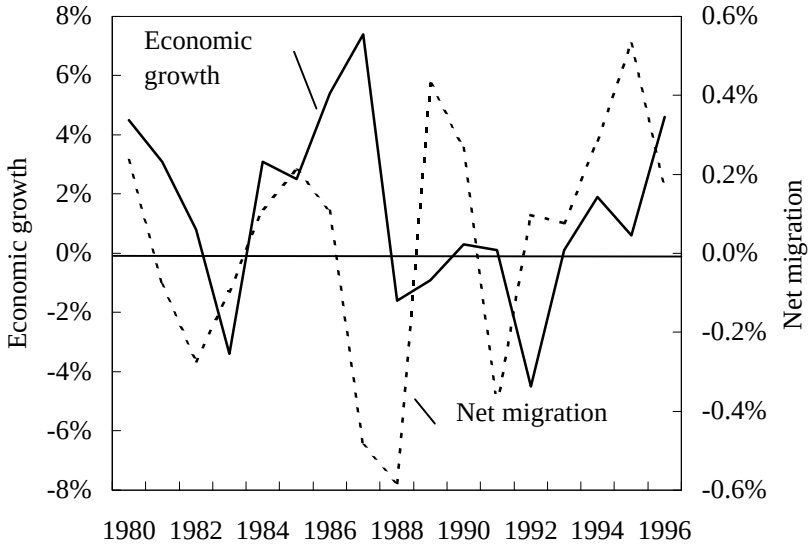
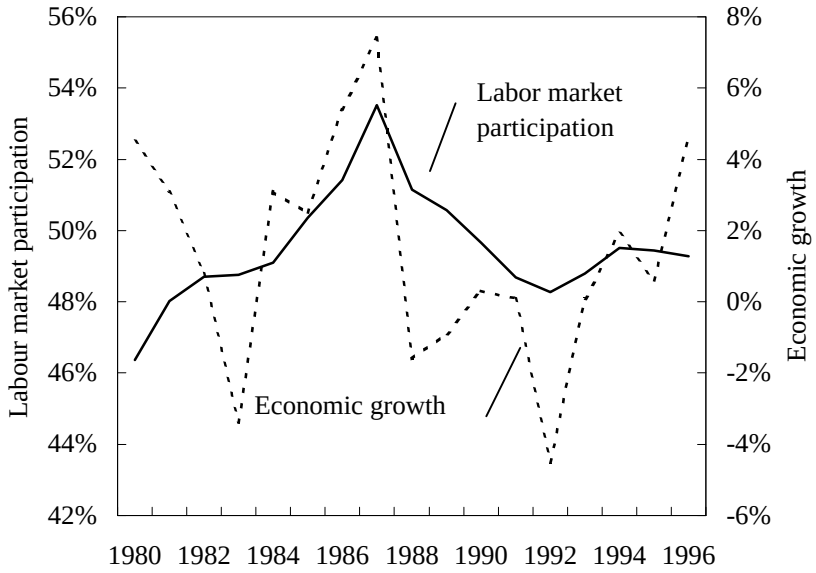


Figure 9. Labor market participation and economic growth in Iceland 1980-1996



The *g* coefficients indicate that a 1 per cent increase in GDP will, *ceteris paribus*, lead to a 0.078 percentage point reduction of unemployment, a 0.067 percentage point reduction in the net proportion of the population that emigrates and a 0.23 percentage point increase in the labour market participation rate which equals an approximately 0.46 per cent increase in the number of people in the labour market since the labour market participation rate is close to 50 per cent. The number of people that are employed will thus increase by 0.078 + 0.067 + 0.46 or a total of approximately 0.6 per cent.[24] It is especially noteworthy how low the coefficients for unemployment and migration are. This implies that movements in and out of the labour force are more important than changes in unemployment or migration.

One should keep in mind that the Icelandic labour market has changed dramatically in recent years. In particular, unemployment has risen - substantially - in fact one can hardly speak of any unemployment at all before the nineties. Previously, it was the norm that the number of vacancies exceeded the number of unemployed people. It is especially interesting to look at the exchange rate policy and how it appears to have been determined by the government's key goal of preventing unemployment.

[24] We are here assuming that people who emigrate or immigrate are divided between those who are in the labour market and those who are not in the same proportions as the rest of the population.

Figure 10. Cyclical unemployment and nominal exchange rate changes in Iceland 1960-1996

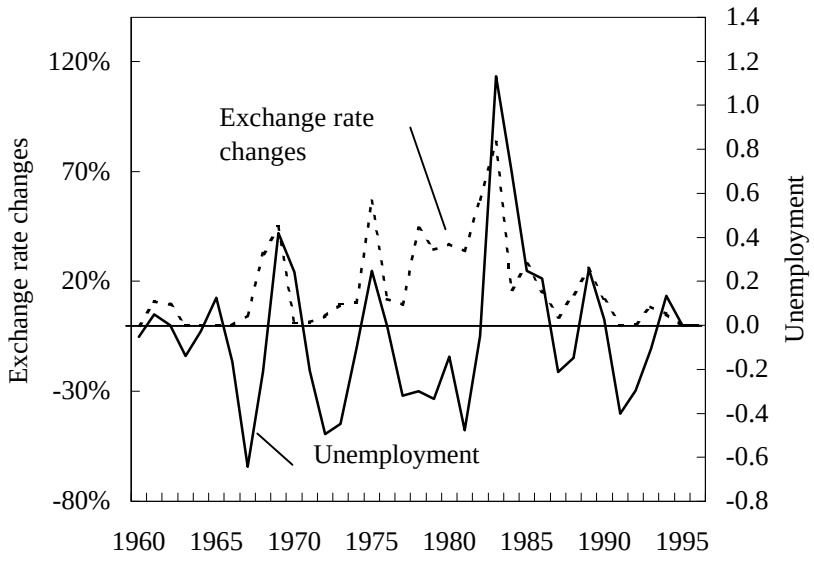


Figure 10 shows the close link between unemployment and exchange-rate changes in Iceland.[25] The figure shows unemployment in excess of the estimated natural rate of unemployment and changes in the nominal exchange rate, i.e. devaluations. In recent years the exchange rate of the Icelandic krona has been far more stable than in the seventies and eighties. If the Icelandic krona is linked more tightly to other European currencies or the *Euro* used as legal tender in Iceland this stability will be further strengthened. For this reason it may be wrong to infer too much about the nature of the Icelandic labour market at present from its behaviour in earlier periods.

Guðmundsson and Zoega (1997) find a structural break in the Icelandic labour market in 1988. They estimate an equation similar to our equation (1) but using somewhat different data. According to their estimates g_u equals 0.1 for 1970-1988. This is somewhat higher than our estimate (0.078) for the period 1980-1996. When they use data for the whole period 1970-1995, the parameter estimate is 0.3 or significantly higher than our estimate. The data series that were used for our study are too short to determine whether there was a structural break around 1988. If one uses Guðmundsson and Zoega's estimate of 0.3 but numbers for migration and labour market participation from our study, one would conclude that a 1 per cent increase in GDP would, *ceteris paribus*, lead to a 0.3 + 0.067 + 0.46 or approximately 0.8 per cent increase in the number of people who are employed, compared to the 0.6 per cent figure presented earlier. As noted in section 4, the exchange rate policy prevented shocks from having a big effect on production and employment, at least until 1988. It seems safe to conclude that changes in GDP due to external shocks would have a far greater effect on

[25] Source: Guðmundsson and Zoega (1998).

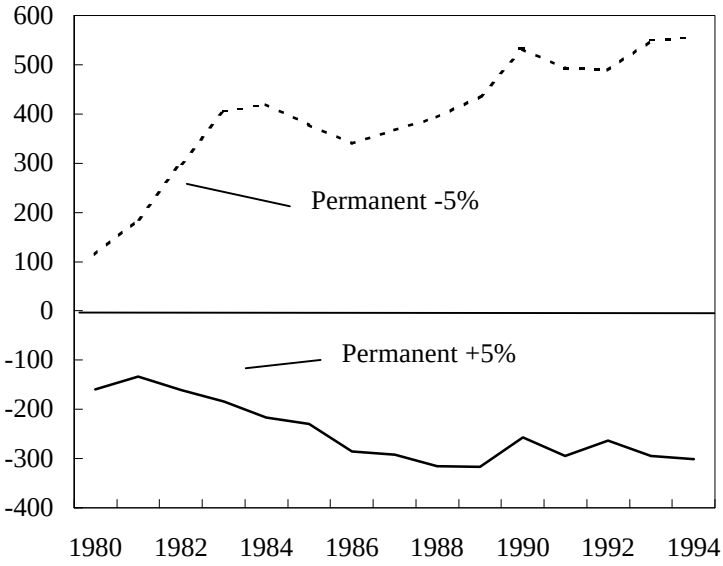
unemployment, labour supply and migration if Iceland lost its ability to conduct an independent monetary policy.

It is an interesting question whether those who emigrate in hard times are likely to return in better times. If that is not the case, substantial shocks to GDP could lead to a fall in the total population in the long run, even if GDP did not contract in the long run. To shed some light on this we simulated migration between Iceland's local communities and between Iceland and other countries, see Appendix B. The simulated model predicted that a contraction of GDP would lead to increased emigration but gave a significantly lower estimate for migration than our regression estimates of equation (2).

The simulation model was also used to analyse whether shocks to GDP would affect the population in the long run, in particular whether emigration in bad times would not be reversed in better times. Several scenarios were considered, a temporary contraction of GDP, a temporary increase, a permanent contraction and a permanent increase. In all scenarios, economic shocks explained only a small share of migration. As expected, a permanent increase of GDP led to less net emigration and a permanent decrease had the opposite effect. A 5 per cent permanent decrease of GDP had led to a decrease in the population by 436 individuals or 0.17 per cent after a decade.[26] The effect of a 5 per cent permanent increase was similar in magnitude, the population had risen by 317 a decade later. Figure 11 shows the effect on migration of a 5 per cent increase or decrease of GDP in 1980, assuming that the increase or decrease was not reversed later. Economic growth after 1980 is thus assumed to be the same as it was in reality.

[26] This is a fairly small number and only approximately one third of the estimate based on a regression using economic growth as an explanatory variable and net migration as the explained variable. The main reason is the small effect GDP seems to have on the choice of residence. Even if this effect of GDP on net migration were far greater in reality than in the simulations, one would get the same qualitative result. Changes in GDP are not likely to lead to net emigration in the long run since emigration seems to be fully reversed following a temporary contraction of GDP.

Figure 11. The effect on migration of a 5 per cent increase or decrease of GDP in 1980



The effects of temporary shocks were also analysed. In particular a 5 per cent increase of GDP in 1980 was simulated, assuming that it was fully reversed the year after. This led to an increase of the population by 160 individuals in 1980, the year of the shock. The increase was only temporary and a few years later its effect was no longer noticeable. Other temporary shocks were also analysed, both negative and positive, but the result was always similar: they affected the population in the year of the shock but a few years later their effects were no longer visible. Apparently, there is no cause for worrying that an increased frequency of shocks to the Icelandic economy will lead to a decline in the population.

The main conclusion of this section is that Mundell's third criterion about the mobility of labour was not satisfied in the period under consideration. Thus we have found that none of the conditions for an optimal currency area appears to be satisfied. Next we take a look at what can happen in a small, open economy belonging to a wider currency area when a large macroeconomic shock occurs.

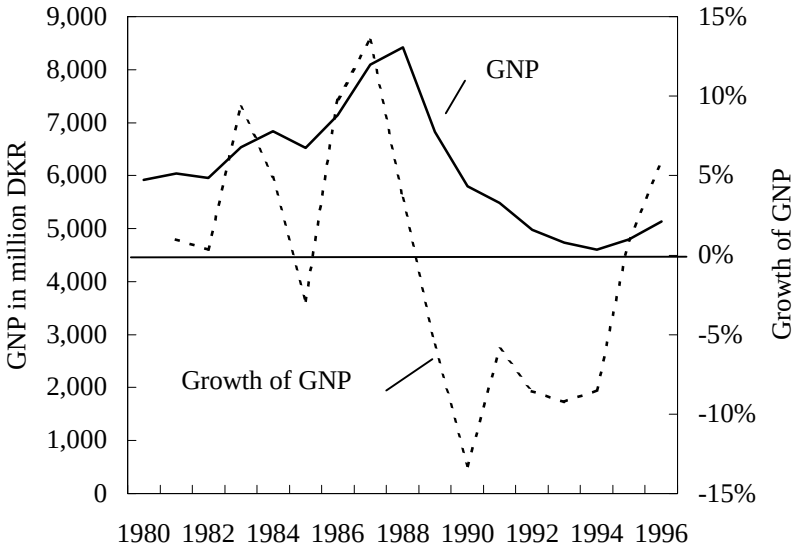
6 The crisis in the Faroe Islands: A case study

The Faroe Islands provide a clear example of the effects of a shock to an economy without a currency of its own. The islands are an autonomous region of the Danish state and have their own currency, the Faroese krone, but Danish currency is also legal tender and the exchange rate is fixed at one to one. In addition, nominal wages in the Faroe Islands were closely linked to wages in Denmark, as wages

of government employees were approximately the same in both countries. For this reason real wages in the Faroe Islands were to a large extent determined by prices and nominal wages in Denmark. In 1989-1994 the islands suffered a drastic shock and the Faroese government had no effective means of lowering real wages. It could neither reduce nominal wages nor pursue inflationary policies. The banking sector was severely hit at a great cost to the home rule government. This effectively ruled out an expansion of government employment. This resulted in unprecedented unemployment and emigration.

The macroeconomic shock in 1989-1995 was one of the worst that a western country has ever experienced in peacetime. GNP fell by 38 per cent in six years, from 1989 to 1994, thereof by 13 per cent in 1990 alone. See Figure 12 for details.[27]

Figure 12. GNP and growth of GNP in the Faroe Islands 1980-1995



The reasons for this downturn include a collapse of the fishing industry due to overfishing and general economic mismanagement that eventually lead to a banking crisis.[28] The resulting unemployment and emigration are shown in Figure 13 and 14. Figure 13 shows unemployment and GNP and Figure 14 shows net emigration and GNP.

[27] The figures in this section are based on data from the Statistical Bureau of the Faroe Islands.
[28] See Herbertsson and Magnússon (1994a, 1994b), Herbertsson (1995), Götz, Magnusson and Waagstein (1994) and Jonsson (1994).

Figure 13. Unemployment and GNP in the Faroe Islands 1980-1996

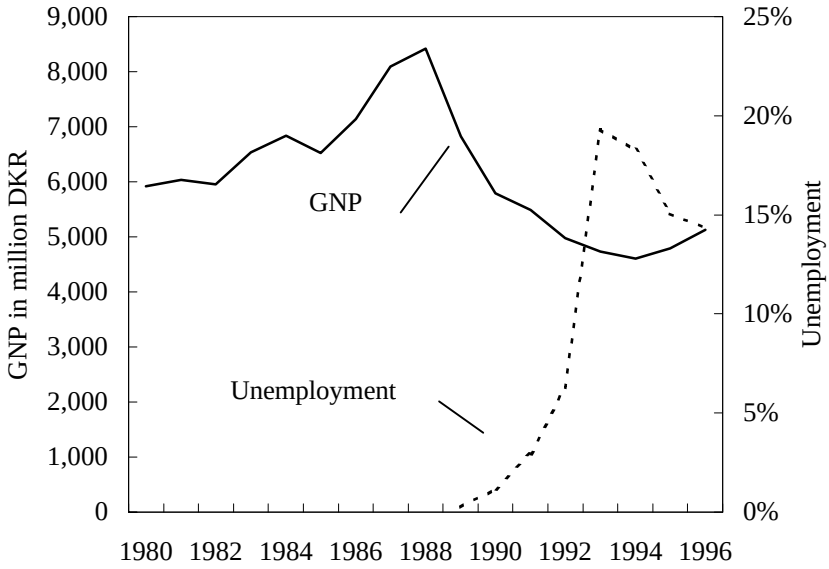
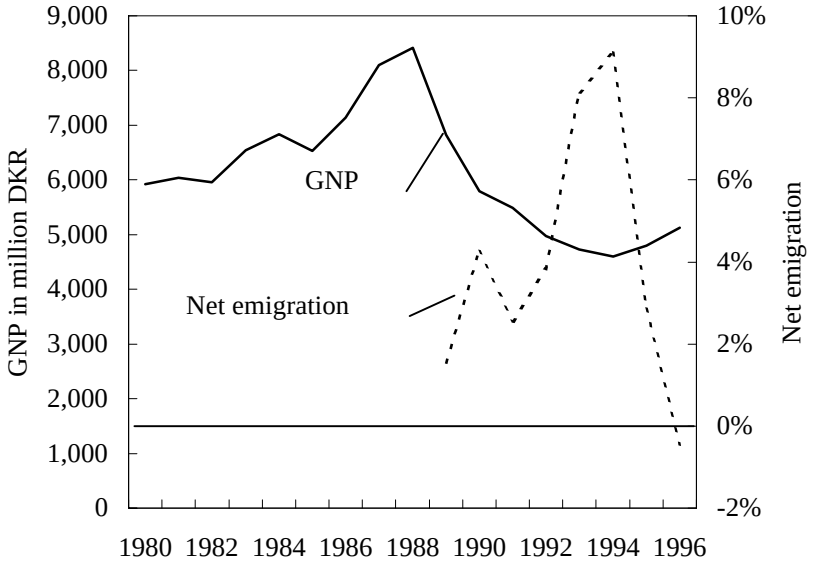


Figure 14. GNP and net emigration in the Faroe Islands 1980-1996



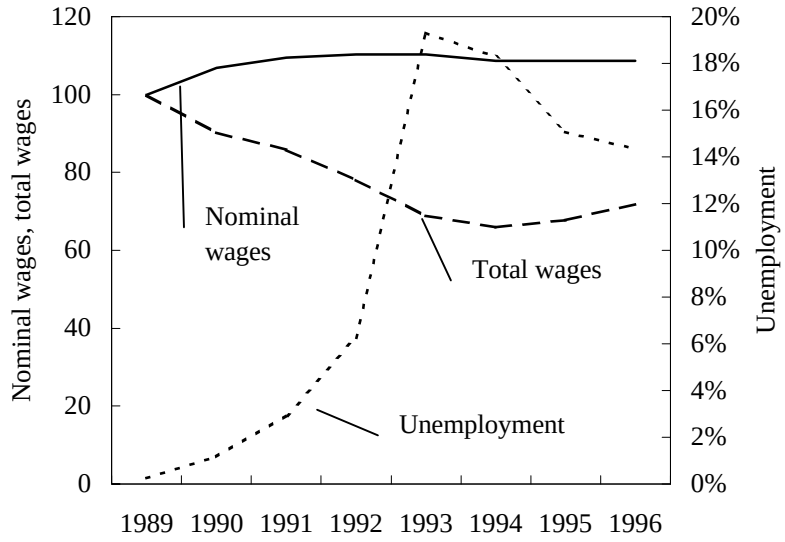
Unemployment was negligible in the islands before 1989 but increased rapidly until after the decline of GNP stopped in 1992. The peak in unemployment was reached in 1993 at 19 per cent but has since declined, and was around 7 per cent in 1997.

The year 1990 saw the onset of substantial emigration from the islands and in 1993 emigration led to a net outflow of 4 per cent of the population. This increased to 4.5 per cent in 1994. By 1996,

10 per cent of the population had emigrated. The year 1997 finally saw some respite and even some net migration to the islands (although only 0.2 per cent).

Figure 14 shows a clear link between the decline of GNP and emigration. Figure 15 shows that nominal hourly wages increased until the onset of the crisis but then remained unchanged. Total wages paid declined dramatically or by 44 per cent in 1990-1994. It seems that workers who kept their jobs had to accept a substantial reduction in their total pay, presumably through fewer working hours as the hourly wage did not decline in nominal terms and only slightly in real terms.

Figure 15. Nominal wages, total wages, and unemployment in Faroe Islands 1989-1996



It seems clear that the Faroese could have responded more effectively to the crisis if the option of devaluation had been open to them - if they had had an independent currency.

7 Conclusions

This paper has considered the labour-market aspects of linking the Icelandic krona closely to a common European currency. These links could take the form of commitments - either unilateral or bilateral - to a fixed exchange rate or, in the extreme case, joining the single-currency area.

Benefits in the labour market resulting from such a move would primarily involve increased nominal wage moderation, possibly leading to permanently lower inflation. This is because a commitment by monetary authorities not to use exchange rate policy to reduce real wages following excessive nominal wage increases or adverse macroeconomic shocks, becomes more credible. In the

event that the krona is replaced by the single European currency, such interventions would of course be impossible. It is likely that the behaviour of both employers and unions would change in such a way as to limit nominal wage increases to sustainable levels set by productivity growth when unemployment is close to its equilibrium or natural rate. Wage inflation could still arise if unemployment is maintained at very low levels but it would become less likely that employers and unions would take risk in raising nominal wages as they have done in the past, assuming that monetary policy provided insurance against mistakes.

An interesting question is whether nominal wages would ever become downward-flexible, but this would be needed to meet adverse supply shocks - real wages can only be reduced through nominal wage reductions with fixed prices. This is important if Iceland does not satisfy one of the three criteria set out by Mundell (1961) for an optimal currency area. We look at each of these criteria with respect to Iceland.

The first criterion involves symmetry of macroeconomic shocks. If two areas suffer symmetric shocks, they can have a common monetary policy at no cost, hence a single currency. Second, even with asymmetric shocks, if workers can move between areas, a negative shock in one can cause workers to move away, hence reducing the need for a monetary-policy intervention. Third, if one area is hit, employment can be maintained if nominal wages - hence real wages - are flexible. We found that none of these criteria are satisfied for Iceland.

Statistical analysis of output movements in Iceland from 1960 identified eight significant idiosyncratic macroeconomic shocks. These shocks - although often caused by external factors - are specific to Iceland and not shared by those countries now contemplating joining the single currency area. They involve changes in the catch of fish, terms-of-trade and policy shocks. The biggest shocks, such as those in the late 1960s and the early 1980s, are quite large both by our and international standards.

We found that changes in real wages in Iceland are closely correlated with the difference between the growth of domestic output, on one hand, and the average output of the EC countries, on the other. When output fell (rose) in Iceland relative to that of the EC countries, real wages also tended to fall (rise). This real-wage flexibility obviously worked to moderate the employment impact of domestic shocks. We also found that each time real wages fell, this was preceded by a drop in the nominal exchange-rate. In this way, monetary policy has been used to protect employment in the face of adverse idiosyncratic shocks.

Finally, we measured the responsiveness of unemployment, labour-market participation and emigration to changes in real GDP. We found that a 1 per cent fall in real GDP leads to an increase in net emigration by 0.067 per cent of the working-age population, a 0.23 percentage points fall in the labour force participation rate (implying a 0.46 per cent decrease of the labour force) and a 0.3 percentage point rise in the unemployment rate. The total effect is an approximately 0.8 per cent fall

in the number of employed workers. We identified several periods when real GDP in Iceland fell by around 5 per cent. The effect on employment would then be expected to be around 4 per cent. However, it must be noted that the relationship between output growth and unemployment has changed in recent years making these estimates imprecise. Moreover, the estimates are calculated using data from a period when exchange rate policy was actively used to insulate employment from macroeconomic shocks. As a result, we conclude that the effect on employment under a regime with irrevocably fixed exchange rates would be much greater. As an example of a possible (nightmare) scenario, we describe the experience of the Faroe Islands in the 1990s.

Using microeconomic simulation, we calculate whether emigration has been irreversible, i.e. whether those moving to other countries were likely to remain there once the economy had improved at home. We found that this was not so: workers moving away in bad times are likely to move back in good times.

Overall, we conclude, looking only at the labour market, that while there are potential benefits from increased credibility of monetary policy, the adoption (partial linkup or complete adoption) of the European single currency is likely to cause serious problems if the Icelandic economy suffers adverse shocks of the same magnitude as in the past. Buying credibility by tying Iceland's monetary policy to a common European one would prevent the government from responding to supply shocks. However, increased monetary discipline is likely to contribute to a more flexible labour market which is also more likely to generate nominal wage increases in a range justified by productivity growth.

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A Appendix to section 3

A.1 The data

The time series analysed in the text are first differences of log GDP per capita in USD at 1990 prices and exchange rates. GDP series were obtained from the Central Bank of Iceland. To form the growth series for the EMU areas the countries' real GDP in USD was added up before dividing by population size and subsequently taking logarithms and differences. This means that the weight of individual countries in the common series is to a great extent determined by their size, something that can be expected to hold also for their relative influence in forming a common monetary policy. Clearly this implicit weighting affects the conclusions to some extent. The analysis was also carried out employing a different weighting scheme, i.e. by calculating GDP per capita before adding up, which gives affluent countries the greatest relative weight. Although this led to slightly different results, the main conclusion remained the same: unexpected shocks to the Icelandic economy are asymmetric with those occurring to the EMU economies, regardless of whether the area is defined as the first 11 countries or all 15 prospective members. It is debatable which weighting scheme is appropriate: thus in the Central Bank of Iceland's 1997 report, the EMU countries' relative weights in the Icelandic foreign-trade basket are used.

A.2 Statistical tests

Cross correlations between economic growth in different countries at the same time and at lags $\pm k$ were calculated by the familiar formula:

$$r_{xy}(k) = \frac{\sum \left(x_t - \bar{x}\right)\left(y_{t-k} - \bar{y}\right)}{\sqrt{\sum \left(x_t - \bar{x}\right)^2 \sum \left(y_{t-k} - \bar{y}\right)^2}}$$

and compared to a critical value of 1.96 standard deviations of $1/\sqrt{N}$ where *N* denotes the number of observations. This critical value is not strictly correct unless both series are entirely random.

A regular business-cycle is modelled by assuming that log GDP is an ARIMA(2,1,0) process, implying that economic growth is stationary and partly dependent on growth in the preceding two years. This is the simplest model that can account for cyclical movements and for such a small data set the only one that can be realistically estimated. To test whether the cyclical component in this sense is significantly different in Iceland from the other areas, a Chow test for structural break was performed: The variance of the growth series was standardised by dividing through by their standard deviation. Then each of the other series were appended to the Icelandic one, yielding four series of

double the original length, where each consists of growth in Iceland and one of the other areas. The model was then estimated by OLS and the hypothesis of no structural break at the junction was tested. The results are summarised in Table A1.

Table A1. Results of tests for common cycles

Areas	*F*-statistic	*p*-value
Iceland and UK	0.682	0.566
Iceland and USA	0.639	0.593
Iceland and EMU (11 countries)	1.994	0.124
Iceland and EU (15 countries)	1.985	0.126

The null hypothesis is that all the coefficients of the AR(2) model are the same for both areas in each pair and the *p*-value show the probability of obtaining the actual estimates given that this hypothesis is true. The null can not be rejected at the 10 per cent significance level. In the text, the results in Table A1 are loosely interpreted as implying that the cyclicality in Icelandic growth has more in common with that of growth in the UK and the US than in Europe.

A.3 The definition of the irregular component

To form the series of random shocks, an AR(2) model was estimated for each area separately. The residuals were taken as the irregular component after testing whether they differed significantly from white noise. The estimation results did not reveal a second AR(2) coefficient significantly different from zero in all cases. This is true of many EMU 11 countries in particular and it is not surprising in view of the results in Tómasson (1991) presented in Table A2.

Table A2. Evidence of cyclicality in some OECD countries

Country	Length of cycle (years)	*p*-value
Austria	∞	0.13
Belgium	∞	0.11
Canada	7.1	0.27
Denmark	3.6	0.00
Finland	5.2	0.00
France	∞	0.11
Greece	∞	0.03
Iceland	5.3	0.00
Ireland	∞	0.19
Italy	6.3	0.09
Luxemburg	4.3	0.00
Portugal	6.7	0.12
Netherlands	∞	0.18
Sweden	6.6	0.00
Spain	∞	0.00
UK	4.9	0.00
USA	5.4	0.00
W-Germany	4.9	0.00

Source: Tómasson (1991).

A.4 Notes on figures

Three figures are presented and interpreted in Section 3. They were obtained as follows:

- Figure 1 shows economic growth in Iceland on one hand and the fifteen EU countries on the other. The latter is an average for each year, calculated as explained in the first subsection of this appendix.
- Figure 2 shows economic growth in Iceland, as well as the residuals from a recursive regression of the irregular component of Icelandic growth on that of growth in the EU and a constant term.
- Figure 3 in the text shows influence statistics obtained from the above recursive regression. The influence statistic for each observation *i* is obtained by comparing the slope coefficient from a regression over the whole sample, with that obtained by skipping observation *i*. The resulting squared difference is then standardised by the corresponding variance term, i.e.

$$\boldsymbol{I} = \left(\tilde{\boldsymbol{b}} - \tilde{\boldsymbol{b}}(\boldsymbol{i})\right)' \boldsymbol{F}_i^{-1} \left(\tilde{\boldsymbol{b}} - \tilde{\boldsymbol{b}}(\boldsymbol{i})\right)$$

In the present context the influence statistics provide a graphical representation of the magnitude of deviation in growth between Iceland and EU for each year in the sample.

B The effect of economic growth on migration

The model used explains how individuals[29] react to shocks to their income[30] in the community where they live and their potential income in other communities. The basic premise is that individuals try to maximise their expected lifetime earnings in present value by choosing where to settle. In particular, once a year, every year that an individual is in the labour market, he chooses whether to stay in his present location or relocate to one of the other locations available.

For the purposes of the study, the country was divided into 60 locations as follows: the capital region, a region of all the areas outside the capital where there is negligible or no fishing or fish processing and 58 villages that depend to a large, but varying, degree on fishing and/or fish processing for employment.[31] The rest of the world makes up the 61st community. For brevity all possible locations, including the capital and the rest of the world, will hereafter be referred to as villages.

Data on migration in Iceland shows that the rate of migration is greatest among people in their early 20's and then slowly declines until people reach their mid-sixties, after that there is a slight increase. The model focuses on individuals that are active in the labour market and no attempt is made to model the rate of migration for people under the age of 20 or above the age of 64.[32]

The migration model is based on the following assumptions:

1. It is assumed that people enter the labour force between the ages of 20 and 29 with the rate of entry decreasing with age over that period and that they stay in until the age of 65. The parameter α describes how large a proportion of any given cohort enters when they are aged 20 through 24 with the remainder entering between the ages of 25 and 29.[33]
2. Every time a person relocates she incurs a lump sum cost Φ.[34]
3. All individuals have the same discount factor, b.

[29] The paper ignores the fact that most individuals are part of a family that makes joint decisions on migration. This is a simplification.

[30] The term income is used here in a loose sense and covers both pecuniary and non-pecuniary benefits, i.e. utility.

[31] The boundaries between villages chosen are in most cases based on current boundaries between local governments. The few exceptions are where the data made it more practical to use boundaries based on now defunct administrative divisions. The capital region consists of nine local government districts in two electoral districts.

[32] It is assumed that the effect of people in these age groups moving on the population of the various villages is proportional to that of the people of working age who do move, scaled up or down for each age group as appropriate to take into account the number of people in the age group and how frequently people in the group migrate.

[33] Cohort is here used to refer to all individuals born in the same year.

[34] Assuming that all individuals have the same cost of relocation is of course a simplification. Setting up the model assuming that there is some distribution of this cost is straightforward but would unfortunately have made the estimation of the parameters of the model considerably more computer-time consuming. Since estimating the parameters is already very computer-time consuming this was not done.

4. Income in any given year is determined by two factors, p and Π, and an individual's location at the start of the year. p is idiosyncratic or individual specific. Π is the same for all members of a given cohort and highly correlated across cohorts. Both p and Π are vectors with 61 elements, one for every possible location. An individual, i, born in year b and living in village N in year t will in that year have the following income (utility):

$$u(p_{i,t}, \Pi_{b(i),t}, N) = p_{i,t}(N) + \Pi_{b(i),t}(N) \tag{4}$$

Each year every village experiences a shock that changes the element of each Π vector corresponding to that village. The shock is the same for all cohorts that have entered the labour force. The shocks are assumed uncorrelated across villages and uniformly distributed on $[-\lambda, \lambda]$.[35] In addition, each year every individual sees his (real and) potential individual specific income in each village change by a random factor. These shocks are also uncorrelated across villages and individuals and each shock is uniformly distributed on $[-\lambda^*, \lambda^*]$. When the parameters of the model were estimated, λ^* was chosen to be normalised as equal to 1 and λ and $\mathbf{\Phi}$ estimated relative to that.[36] Thus, if the vector of common shocks is called ξ^1, we have:

$$\Pi_{b,t+1} = \Pi_{b,t} + x_t^1 \tag{5}$$

And, if the idiosyncratic shock vector for individual i is called ξ^2, we have:

$$p_{i,t+1} = p_{i,t} + x_{i,t}^2 \tag{6}$$

Note the nature of the transition of the p and Π vectors, the *pdf* of the annual change in each of them is independent of the level. In addition, the shocks to the separate elements of the vectors are independent of each other. In the year that a cohort reaches age 20, the cohort specific payoff vector is assumed to be:

[35] The uniform distribution is used for several reasons. One is that it means that shocks are bounded in any given year and this simplifies integration. It also has the advantage that pseudo-random draws from a uniform distribution can be generated on a computer faster than for more complex distributions and in general calculations are faster based on the uniform distribution than e.g. the normal distribution. It is of course reasonable to question the assumption that shocks in one tail of the distribution are equally likely as shocks towards the centre of the distribution. The uniform distribution has this characteristic for one draw. It is however more important for the model used that this does not hold for the sum of several draws. The sum of several draws from the uniform distribution has a bell shaped *pdf*.

[36] Hereafter we will ignore l^* for the most part and, to save on notation, functions that depend on both l and l^* will be presented as if they only depended on l.

$$\Pi_{t-20,t} = \sum_{j=0}^{J} x_{t-j}^{1} \tag{7}$$

Where J is a non-negative number. Likewise, when an individual reaches age 20, *b(i)=t-20*:

$$p_{i,t} = \sum_{j=0}^{J} x_{t-j}^{2} \tag{8}$$

An individual maximising her expected lifetime earnings will implicitly maximise the following value function in any given year from the time she enters the labour force and until retirement

$$\begin{aligned} &U\left(t-b(i), N, p_{i,t}, \Pi_{b(i),t}, b, l, \Phi\right) = p_{i,t}(N) + \Pi_{b(i),t}(N) + \\ &MAX_{X \in c}\left[E_t\, bU\left(t+1-b(i), X, p_{i,t+1}, \Pi_{b(i),t+1}, b, l, \Phi\right) - I\left(X \neq N\right)\Phi\right] \end{aligned} \tag{9}$$

Where χ denotes the set of villages and $I(\cdot)$ denotes an indicator function, in particular *I(W)*=1 if the condition *W* is true and *I(W)*=0 if it is false.

In the last year before retirement, the value function is

$$U\left(\bar{t}, N, p_{i,t}, \Pi_{t-\bar{t},t}, b, l, \Phi\right) = p_{i,t}(N) + \Pi_{t-\bar{t},t}(N) \tag{10}$$

As p and Π always enter the value function added together and the distribution of the sum of any pair of elements, one from each vector, in future time periods does not depend on anything except their sum today and l, each individual only cares about the sum of p and Π, not the individual components.

To find what drives migration in the model one has to find what values of p and Π and the structural parameters b, l, and, Φ will induce an individual of a given age to move from her present location to one that has more promise. This kind of problem is easily solved in theory by backwards induction from the year of retirement.[37] In practice, this is however not feasible using brute force methods unless the stochastic state variables and time periods are far fewer than in this problem as otherwise the multiple numerical integrations needed will quickly overwhelm even the fastest of

[37] A lot of research has been done recently on models involving sunk costs and heterogeneous agents, see Dixit and Pindyck (1994) for an overview of the theory.

computers. The method used to estimate the parameters of the model is described in Magnússon (1997) and will not be described here.

The main result was that the parameter estimates were b = 0.95 (0.00078), Φ = 8.4 (0.0066), l=0.48 (0.00084), J = 8.0 (0.069), and a = 0.73 (0.0021) with the numbers in parenthesis indicating the standard error of each estimate. The method also gave estimates of the shocks that each village had experienced in each year of the period 1970-1994.

To estimate how much of the shocks that each village had experienced could be linked to changes in GDP, a regression was performed using the estimated shocks (changes in utility) as explained variables and changes in GDP per capita as the explanatory variable. It was clear that changes in GDP had a statistically significant effect on utility but did though only explain a small fraction of the changes in utility. These estimates allowed us to simulate the effects of shocks to GDP on migration as discussed in Section 5.[38]

[38] The simulation is performed by taking data on actual GDP and actual migration and the estimated shocks and analysing how migration would have changed if GDP had been less than or greater than it was in fact. All the numbers quoted for migration are thus deviations from the actual numbers.