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Out in the cold? Iceland's trade performance outside the EU*

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Abstract

Although entering a currency union involves both costs and benefits, an increasing body of research is finding that the benefits – in terms of international trade creation – are remarkably large. For example, Rose (2000) suggests that countries can up to triple their trade by joining a currency union. If true the impact on trade, income and welfare should Iceland join EMU could be enormous. However, by focussing simply on EMU rather than the broad range of currency unions studied by Rose, we find that the trade impact of EMU is smaller – but still statistically significant and economically important. Our findings suggest that the Iceland's trade with other EMU countries could increase by about 60% and that the trade-to-GDP ratio could rise by 12 percentage points should Iceland join the EU and EMU. This trade boost could consequently raise GDP per capita by roughly 4%. These effects would be even larger if the three current EMU outs (Denmark, Sweden and the UK) were also to enter EMU.

Keywords: Keywords: F15; F33.

JEL Classification: Currency unions; international trade; Iceland.

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1. Introduction

As the smallest country in the world with a freely floating currency, the question of exchange rate policy in general and EMU membership in particular is a significant one for Iceland.¹ Certainly, Iceland shares many of the characteristics of other small economies that the IMF (see Mussa et al., 2000) has judged to make them particularly strong candidates for exchange rate pegs of some sort. However, much of the current political debate in Iceland concerning possible EMU membership has been focused on the implications of EMU (and EU) membership for Icelandic fisheries, whether Iceland would be a net benefactor of fiscal transfers from the EU, and the relatively weak correlation of Iceland's business cycle with that of Europe. The equally fundamental issue of the potential effect of EMU membership on Icelandic trade has not been so widely discussed.

The trade creation effect of currency union membership has become a major area of research following the seminal paper by Rose (2000). His early results suggested that joining a currency union could increase trade with other countries by the astounding 100-300%, which in turn could have large beneficial effects on income and growth in these countries. In fact, if this result is correct, it is hard to think of any government policy that could have such a large welfare effect for the average family. More recent estimates, using country samples more relevant for potential EMU countries are much more modest, but still remain statistically significant and economically important. The consensus from this literature therefore seems to be that joining a currency union, such as the euro area, increases trade with the other members of the union with no corresponding negative impact on trade with non-members. These results are certainly consistent with the observed increase in trade intensity among the EMU members since the launch of the euro.

This paper analyses the potential implications of EU and EMU membership for Icelandic trade and income.² The results suggest that EMU (and EU) membership could increase Icelandic trade with other EMU members by about 60%. Overall, the

¹ In terms of population, using the IMF classification of actual exchange rate regimes. Although a number of smaller countries have their own currency, most of these are currency boards. Of the remainder, they are either pegged against another currency (Netherlands Antilles and Vanuatu), pegged against a currency basket (Samoa and Seychelles), operate a crawling peg (Tonga) or a managed float (Sao Tome Principe).

² Although the focus of this paper is very much on EMU rather than the EU, a full membership in the monetary union is really not an option without joining the EU. EU membership without adopting the euro could, however, be an option although the experience of the new EU members might suggest that this is no longer the case.

share of trade in GDP could rise by 12 percentage points. There are many theoretical and empirical arguments that suggest that more open economies tend to grow faster and enjoy a higher standard of living. The empirical findings used here suggest that the increased trade intensity could boost per capita income by about 4% which could be spread over two to three decades. However, we also find that Iceland's business cycle is remarkably unsynchronised with that of the EMU countries and, though not a focus of this study, would be an important factor in assessing the overall costs and benefits of EMU entry for Iceland.

The paper is organised as follows. The next section discusses Icelandic trading patterns and how trade with EU and EMU countries has gradually been increasing in importance. The third section reviews the literature on how currency unions affect trade and the early empirical findings. The fourth section tries to answer the question why countries join monetary unions, which provides candidates for instruments when estimating the trade creation effects of EMU membership to control for the fact that currency union membership is not a random event. Section 5 gives estimates of this trade creation effect using different model specifications and estimation techniques. The sixth section draws on these results to explore the potential impact of Iceland's EMU membership on Icelandic trade and income, and the seventh section concludes.

2. Icelandic trade patterns

Iceland is a very small (population just under 300 thousand), resource-based island economy which mainly exports products based on its abundant natural resources, i.e. fish and hydroelectric power, and imports final goods. These characteristics are reflected in the country's trade patterns. For example, it turns out that the share of trade in GDP is somewhat smaller than could be expected given the small population of the country (see, for example, Gudmundsson et al., 2000), as smaller populations have fewer opportunities to trade among themselves and therefore find it harder to take advantages of scale economies. Figure 1 shows the development of the trade share from 1960 to 2002 (the average of exports plus imports divided by GDP). The share of total trade has fluctuated between 30 and 40% of GDP in the last thirty years, with the merchandise trade share fluctuating within the 20-30% range. In fact the trade share has not increased over the whole period, although it has been recovering in

the last ten years from a historical low with most of the growth occurring in service trade.

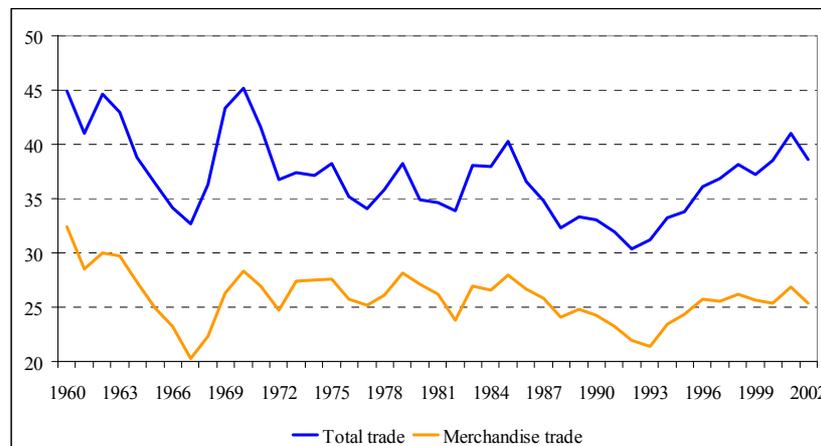


Figure 1. Iceland's trade share, $(\text{imports} + \text{exports})/2$, as a ratio to GDP (%)

As reported in Gudmundsson et al. (2000), this trade share is also lower than in most other small European countries. The relative lack of openness is also reported in Andersen and Herbertsson (2003), using a multivariate factor analysis to measure globalisation. They find that Iceland consistently ranks among the bottom half among the 23 OECD countries. Iceland's trade share is also relatively low compared with the average for small countries worldwide of about 50% (see Mussa et al. 2000). Gudmundsson et al. (2000) argue that the main reason for this is the characteristics of Icelandic trade mentioned above. Imports of intermediate goods is an important source of international trade in many other small European countries, where these countries import intermediate goods and export them as processed or final goods. This implies a large trade share in terms of imports and exports as a ratio to GDP. This 'through-put' is much lower in Iceland's case reflecting its heavy reliance on natural resources as the main source of exports.³ The theoretically more accurate measure of openness would be value added in trade as a share of GDP rather than trade volume, which would presumably give a larger trade share for Iceland than the data above suggest. Such data is, however, not available. Another reason for the relatively low trade ratio is the country's geographical distance from major population centres, as the empirical results reported below suggest.

³ This is also reflected in smaller imports of fossil fuels due to the country's relative self-sufficiency with respect to energy production.

Table 1 shows the development of the composition of Iceland's trade from 1970. Trade with EMU countries (the current EMU-12) has gradually been increasing in importance, from just below 30% of total merchandise trade in 1970 to close to 40% in 2002. Most of this growth has occurred in the export sector, with EMU's share in merchandise exports increasing from 26% in 1970 to over 47% in 2002. The share of imports from EMU has at the same time remained relatively stable around 30%.

Table 1. Icelandic merchandise trade patterns (%)

Area	1970-1980	1981-1990	1991-2000	2002
EMU	29.6	34.8	35.0	39.0
European Union	54.0	59.5	61.3	61.7
EU and Norway	59.4	64.2	68.7	68.1
Europe	65.6	68.6	72.5	71.5
United States	17.3	14.2	11.4	10.8
Other countries	17.2	17.2	16.1	17.7
Total	100.0	100.0	100.0	100.0

The table shows merchandise trade (imports and exports) to a region as a share of total trade.

The EMU trade share fell temporarily in the early 1990s, mainly due to a falling share of exports to the EMU countries after the depreciation of the ERM currencies, but has gradually been rising again in the last six years, reflecting a strong pick-up in the export share with the import share slightly falling.⁴ The share of EU trade has similarly been rising over the whole period, although the rise in the last decade has mainly been due to trade with the EMU countries. In fact, the trade share of the three EMU-outs (Denmark, Sweden and the UK) has been falling since the early 1990s. The data therefore suggest that the increasing importance of European trade for Iceland has mainly been reflected in trade with the EMU countries, not in trade with the EMU-outs or other European countries.

The table also suggests that the effects of a possible Iceland EMU membership critically hinges on the exact membership of EMU. Whereas the current EMU-12 account for just under 40% of Iceland's merchandise trade, an EMU including the three current EMU-outs would account for close to two-thirds of the country's trade. Further including Norway would increase EMU's share to roughly 70%. Hence, any potential boost to Iceland's trade from EMU membership would have a much greater

⁴ A potentially important stimulant for European trade has been the European Economic Area (EEA) agreement, which is a free trade agreement between EU and the EFTA countries (Iceland, Norway and Lichtenstein). This agreement guarantees free flow of goods, services, capital and labour and was signed in 1994. Other important free trade arrangements for Iceland include the GATT agreement in 1964, EFTA in 1970 and WTO in 1995.

effect on the country's openness if EMU would include these four countries.⁵ This especially applies to the UK, which historically is Iceland's most important export market (accounting for just under 18% of Iceland's total merchandise exports in 2002).

3. Currency unions and trade

3.1. Review of the literature

An interesting finding in the international trade literature is that trade within a country seems to be much more intensive than trade between countries, taking into account factors such as income, distance and other factors important for trade directions. This is the 'home bias', first recorded by McCallum (1995) who found that trade between two bordering Canadian provinces was up to twenty times greater than trade between a bordering Canadian province and US state, other things equal.

The modelling approach used by McCallum was the so-called gravity model of trade (see, e.g., Anderson, 1979), which tries to explain bilateral trade with factors such as output levels in both countries (often using GDP per capita or population). The idea is based on models of increasing returns to scale and product differentiation (e.g. Helpman and Krugman, 1985) which suggests that trade between two countries will be greater, the greater number of goods being produced in these countries, other things being equal. As the quantity of goods being produced in a given country is proportional to its size, this trade effect can be captured by standard measures of size such as GDP or population. One can also argue that countries that share common borders, language, or culture trade more, other things being equal. The same would apply the less the geographical distance is between them and if these countries are members of a custom or a free trade union. The findings by McCallum (1995) suggest that even taking account of these factors, the need to trade in different currencies can have important effects on trade, even though later theoretical developments have reduced this effect somewhat (see Anderson and van Wincoop, 2001).

Although this border-effect literature does suggest an important effect of currency unions on trade, it does not give a direct estimate of these effects. This was first provided in a seminal paper by Rose (2000). He used a simple gravity model,

⁵ This will be even further strengthened with the inclusion of the new Eastern European members, although bilateral trade between Iceland and these countries is much smaller.

adding a dummy variable for currency unions in a large data set consisting mainly of small developing countries.⁶ Rose finds a remarkably large impact of over 200% increase in trade for members of a currency union. The results also seem robust to different approaches with respect to specification of the model, variables or sample.

Rose's findings have, not surprisingly, generated controversy and many attempts to overturn his results but with surprisingly little success. In fact most studies tend to confirm an important currency union effect. This also applies to studies of the trade effect of currency unions in developed countries. They tend to confirm that the trade effect of currency unions is statistically significant and economically important, but much less than originally suggested by Rose (2000) derived from other currency unions.⁷ Some of these empirical results are discussed in more detail in Section 5.

The theoretical reasons for currency unions to affect trade are numerous. The most obvious effect is that a common currency eliminates bilateral nominal exchange rate volatility, therefore reducing uncertainty and risk associated with international trade.⁸ Empirical studies, however, find mixed evidence for the importance of this effect. In fact most studies find quite small effects that seem declining over time (see, e.g. the survey in Edison and Melvin, 1990). A possible explanation for the failure to find empirical support for this popular notion is that these studies usually use short-term exchange rate variability to measure exchange rate risk. While it is relatively easy and cheap to hedge this type of risk in the derivatives market (at least in developed countries), hedging fully against large, long-lasting exchange rate changes is difficult as uncertainty about demand for the firm's product are also important in that case (see Kenen, 2002). It is likely that this latter type of exchange rate risk is more important for trade than the former measure typically used in empirical studies and that this effect is reflected in the large effect using Rose's currency union dummy.

⁶ His sample included 186 'countries', including dependencies, territories and colonies, generating over 300 common currency pairs. Most of these pairs are, however, either currency unions between very small or poor countries such as those in the Eastern Caribbean Currency Area, or very small or poor countries adopting a currency of large trading partners, such as Tonga adopting the Australian dollar or Panama adopting the US dollar.

⁷ Rose (2003) surveys 34 recent studies of the trade generating effect of currency unions. All imply an important trade generating effect, although smaller than originally found in Rose (2000). Using a meta-analysis he finds a currency union effect of between 30% and 90%.

⁸ Currency risk is obviously not completely eliminated if the country trades with countries outside the currency union. Overall currency exposure may even increase if fluctuations in the newly adopted currency are greater than those experienced by the old currency and as hedging possibilities arising due to a negative correlation between outside currencies and the union currency cannot be exploited. But one can probably argue that the greater the share of trade with the potential currency union, the greater the reduction in currency risk.

There are other reasons as well for believing that trade costs associated with multiple currencies goes beyond the cost of nominal exchange rate volatility (short and long-term). Currency unions, for example, eliminate (or at least reduce) the transaction costs arising from trading in different monies. For example, De Grauwe (1994) finds that the cost of exchanging Belgian francs for Dutch guilders or German marks is about ½%, which is similar to the cost of exchanging them for French francs, pounds sterling or US dollars, despite the low volatility of the Belgian franc vis-à-vis the guilder or the mark. Emerson et al. (1992) finds these costs to be as high as ½% of GDP for the EU as a whole (HM Treasury, 2003, give similar estimates for the UK), and even larger for the small, more open economies with less liquid currencies, or as much as 1% of GDP.

A common currency may also increase market transparency, increasing the information content of cross-border prices and therefore lead to greater specialisation and increased competition. For small economies with less liquid currencies, joining a monetary union may also improve its hedging possibilities in trade with non-member countries by opening access to much deeper and sophisticated domestic financial markets.

It is therefore clear that a common currency and a completely fixed exchange rate are not the same. The former is a much more serious and durable commitment that may be expected to effect trade well beyond any possible direct effects of suppressed exchange rate volatility on trade.⁹ In this paper we provide estimates of both these effects.

3.2. Criticism of Rose's findings

Criticism of Rose's (2000) findings mainly focuses on two issues. The first concerns the sample he uses. Before EMU there were few currency unions and those that existed were most often between small developing countries (such as the CFA Franc Zone in Africa). Thus within Rose's original sample of countries less than 1% were in a currency union, and even those were mostly unrepresentative of the larger developed countries such as those joining the EMU.¹⁰

⁹ A number of studies also suggest a positive correlation between increased international trade and foreign direct investment (see e.g. Brealy and Kaplanis, 1996). See also the discussions in Barr et al. (2003).

¹⁰ This criticism was also raised in the British Parliament during an EMU debate when the leader of the opposition questioned the Chancellor's assumptions concerning the trade benefits of EMU by asking

This led Persson (2001) to argue that the bilateral trade of the currency union pairs studied by Rose (2000) are atypical and one should therefore be careful in generalising his results to trade between other country pairs. To prove this point, Persson undertook an analysis similar to that of Rose but using different matching procedures to generate more comparable country pairs. He found some trade generating effects but much smaller than Rose (ranging from 13-65%). In a response Rose (2001) uses Persson's matching techniques on a more extensive data set with respect to period and countries (therefore including a number of currency unions that were dissolved after the Second World War) and still finds large and statistically significant effects.¹¹ These results are also consistent with Kenen (2002) who uses similar matching techniques. Although important for interpreting Rose's results and their implications for trade for any set of countries, the relevance of his and Persson's results to the set of countries studied here is limited, since the country group used is much more homogenous. That statistically significant trade effects are still found (and in other studies, such as Micco et al., 2003), suggests that this effect exists and that the results do not depend on the exact group of countries used (although the exact size of the effect certainly does).

The second criticism centres on the issue of endogeneity of the currency union dummy variable. If it were the case that countries expecting a large increase in trade tend to form currency unions, then the estimated relationship between trade and currency unions cannot be interpreted as a currency union effect. If this is a problem, the estimated impact of currency unions may to a significant extent be due to the impact of a third variable that predicts entry into a currency union and more trade, e.g. a historically close cultural relationship.

To explain the underlying problem the following two-equation model can be used

$$(1) \quad TRADE = \alpha + \beta EMU + \gamma X + \theta Z + \varepsilon,$$

$$(2) \quad EMU = \psi + \delta Z + \chi W + \xi.$$

“Will he confirm that that expert's assumptions, on which the Chancellor relies, are based on studies of currency unions involving Angola and Mozambique, Burkina Faso and Chad, Vatican City and San Marino, and Tuvalu and Tonga?”

¹¹ Using regression estimates gives similar effects as in his original study. Applying non-parametric methods (as Persson does) gives a much smaller effect although it remains statistically significant (ranging from 21-43%).

Here trade is a function of EMU membership, a variable X and a variable Z (equation 1), and EMU entry is a function of variable W , and is also a function of variable Z (equation 2). When the impact of EMU on trade is estimated, we must attempt to control for all possible variables that can influence trade other than EMU entry. In particular, were we to leave out variable Z from our model, then the estimate of β (the trade impact of EMU) would be biased since it would include both the impact of EMU and, indirectly, the impact of variable Z . The problem we face is that unless we control for all possible variables that influence trade, then we cannot be sure that our estimated EMU effect is correct since we may have excluded a variable like Z .

Rose (2000) tackles this problem by including an extensive range of variables that might influence trade. This approach was also criticised by Persson (2001) who pointed out that even if the list of variable was exhaustive, if some of those variables influenced trade in a non-linear way, but were assumed to have linear effects, then the estimate of the currency union effect could still be biased. In his response, Rose (2001) adds non-linearity to his basic model, but still the trade effect remains statistically significant.

An alternative approach is to include country-pair fixed effects in the gravity model that control for any differences in characteristics of EMU and non-EMU countries. This involves allowing for a dummy variable for every country-pair and means that the EMU effect is only significant if there is a change in trade post-EMU rather than just higher trade on average for EMU-ins. As a result, even if all the differences in characteristics between countries cannot be explicitly identified, the fixed effect will pick them up.¹²

However, even allowing for fixed effects there is still a potential endogeneity problem. This arises if the variable inadvertently excluded predicts both the decision to join EMU and higher trade post-EMU. For example, if a country observes a change in its circumstances that will increase trade with the EMU countries in the future, it may choose to join EMU as a way of maximising the benefit of that change. As a

¹² As pointed out by Glick and Rose (2001) the simple gravity estimates in Rose (2000) only captures whether countries within a currency union trade more than countries not sharing a common currency. These models do not really give an answer to the more interesting question on how joining a currency union affects trade for a country joining the union. To answer this one needs to use a panel approach allowing for fixed effects. Both approaches are adopted here.

result, we will observe the decision to join EMU followed by higher trade and so even the fixed effect estimate will ascribe the increase in trade to EMU. To get around this problem, an instrumental variable is needed – something that predicts EMU entry, but cannot have been influenced by the potential trade increase post-EMU (such as variable W in equation 2). If such a variable (or variables) can be found, then we can use it to assess the probability that a country will join EMU, and see if that probability predicts higher trade post-EMU. If it does then we can ascribe the increase in trade to EMU membership since, if the instrument is valid, it could not have been influenced by the post-EMU increase in trade. It is this instrumental variables approach that taken in this paper (see also the discussion in Barr et al., 2003).

4. Why do countries join currency unions?¹³

Before undertaking an analysis of the trade effects of EMU membership, some explanation of why the outs chose to stay out and the ins chose to join is needed. Without such an explanation, it is difficult to argue that any observed differences between the ins and outs is due to monetary union as opposed to another factor that explains both the observed difference and the propensity to join EMU.

The starting point for such an explanation is the work of Alesina and Barro (2000) (which is itself an extension of the work of Mundell, 1961). They identify the main economic determinants of the propensity to join a currency union as:

- 1) *Trade* – the more two countries trade already the greater will be the benefit of forming a currency union (though this result depends on ‘reasonable’ assumptions about the elasticities of substitution). Alesina and Barro also argue that other variables that may influence trade (such as distance between countries) could have an independent effect on the desire to join a currency union – these effects are ignored in this section.
- 2) *Co-movements of output* – the greater the co-movement of output between countries, the smaller the cost of giving up monetary independence through a currency union.
- 3) *Co-movements of prices* – as with output co-movement, greater price co-movement reduces the cost of giving up an independent monetary policy.

¹³ This section draws heavily on Barr et al. (2003).

- 4) *History of high and volatile inflation* – a country may wish to join an existing currency union, or form a union with a larger partner, in order to gain the discipline and credibility of the anchor currency's monetary policy.

For the purposes of this paper, the first three of these determinants are the most relevant as EMU, arguably, has no one 'anchor' currency to which other countries are linked.¹⁴ Table 2 outlines estimates of these three determinants for countries within the EU and EFTA (excluding Luxembourg and Liechtenstein for data reasons).¹⁵

Looking at Table 2, in the row labelled 'all' we present the average value of each of the three determinants (trade, output co-movement and price co-movement) for all possible bilateral pairings in the country sample. The row labelled 'EMU' then shows the same calculation but now only for bilateral pairings involving two EMU countries. Focusing on the four non-EMU members in the sample, the average value of each determinant for all pairings involving each of these countries with every EMU member is also shown. So 'Iceland with EMU' shows the average value of the determinants for all pairings involving Iceland and an EMU country – similarly for Denmark, Sweden and the UK. For example, for trade we calculate bilateral trade as a share of GDP for every possible pairing in the sample (136 combinations) over the period 1978 to 1991 (up to the signing of the Maastricht treaty). The row labelled 'All' shows the average of all these combinations, the row labelled 'EMU' shows the average bilateral trade only for combinations involving two EMU members. The 'Iceland with EMU' row shows Iceland average trade share with each EMU country, similarly for Denmark, Sweden and the UK.

The table also reports z-tests to see if the EMU-ins are significantly different from the outs. For each indicator this involves finding the average value of the indicator for bilateral pairings involving two EMU-ins and comparing that with the average value of the indicator for all bilateral pairings involving at least one EMU out. The individual country tests (for Denmark, Iceland, Sweden and the UK) simply compare the EMU-in sample with the average indicator value for every pairing involving each of those countries. The z-test is then a test of whether the mean of the

¹⁴ Although Germany was the largest single economy in the union, the fact that a new currency and central bank were created suggests that EMU cannot be simply seen as a DM currency zone.

¹⁵ The countries are Austria, Belgium, Denmark, Germany, Greece, Finland, France, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK.

EMU-in sample is significantly different from the mean of the out, or individual country, sample.

Table 2. Indicators of the propensity to form a currency union

	Trade (bilateral trade as a share of GDP, %)	Output co-movement (lower figure indicates more co-movement, %)	Price co-movement (lower figure indicates more co-movement, %)
<i>Average of period 1978-1991</i>			
All	0.40	2.5	1.8
EMU	0.49*	2.1***	1.7
Denmark with EMU	0.29	3.0***	1.4
Sweden with EMU	0.34	2.5*	1.7
UK with EMU	0.31	3.1***	1.5
Iceland with EMU	0.27*	3.2***	3.4*
<i>Sub-period averages, all countries</i>			
1978-1988	0.39	2.2	1.6
1988-1998	0.41	1.7	1.1

Bilateral trade is the sum of exports and imports divided by two. Both trade and GDP are measured in US dollars and deflated by the US GDP deflator. *Output co-movement* is the average absolute deviation between output gaps (relative to their time series mean) using OECD output gap measures. *Price co-movement* is the standard deviation of the difference between annual inflation rates. The table gives a z-test of the difference in means for the two samples. The row labelled EMU shows test of all EMU pairings vs. all pairing involving at least one EMU-out. Individual country rows show tests of all EMU pairings vs. all pairing involving the named country. * [***] denotes significantly different at the 10% level [1% level].

Source: OECD database.

We find that both in terms of trade and output co-movement the countries that formed EMU were better placed to do so than the rest of the sample (on average). In particular, there is a highly significant relationship between output co-movement and subsequent EMU membership. This perhaps indicates that the issue of economic convergence had a significant impact on the decision to join EMU. Price co-movement (probably the least important of the three factors not least because of its interaction with the credibility effect), on the other hand, appears to have no significant link with EMU membership, except in Iceland.¹⁶

The results suggest that the links between Iceland and EMU are the weakest of the four outs analysed here. Bilateral trade between Iceland and EMU is less than for the others, and output and price co-movement the smallest. This is in line with the discussion in Section 2 and is consistent with the findings in Gudmundsson et al.

¹⁶ The low price co-movement between Iceland and the EMU countries reflects the very high inflation rates in Iceland in the 1970s and 1980s. The inflation difference has been much less in the last decade with inflation in Iceland closely matching the low inflation rates in other developed countries.

(2000). They find that business cycle co-movement with both EU and EMU, measured with output growth, terms of trade, export growth and export revenue, is in general much less for Iceland (and Norway) than for other European countries.¹⁷ They also suggest that the incentives to join EMU are the weakest for Iceland among the non-member countries analysed in this paper.

A potential problem with the results reported in Table 2 is that while they appear to help explain who will be in the currency union they do not tell us why the union was formed when it was. Given the use of time series averages to construct our indicators in Table 2, the timing of EMU is difficult to gauge. However, the latter half of the table indicates that when the period 1978-88 is compared with the period 1988-98, all of the indicators are more conducive to a currency union in the later period, indicating perhaps that costs of monetary union have fallen and the benefits risen over time. This goes some way to explaining why monetary union did not occur earlier.

Overall, it seems that economic variables that help explain why some countries chose to join EMU and some did not can be found. In particular, output co-movement proves to be an important predictor of the subsequent decision to join. Not only does such a result undermine the argument that the decision was purely political and unrelated to economic considerations, these predictors provide ideal candidates for instruments in the analysis of the trade effect in the gravity model as they have a very strong relationship with subsequent EMU entry.¹⁸ By focusing on co-movement for the period 1978 to 1991 (before the Maastricht Treaty was signed) one can be fairly confident that these co-movement variables are independent of the prospective trade impact of EMU. So, even though there is evidence that increased trade can increase co-movement (see for example Frankel and Rose, 1997), greater co-movement is unlikely to be caused by *future* increases in trade.

However, both the co-movement variables have the limitation that they have no time series variation (recall that they are defined as the average co-movement over the period 1978 to 1991). As a result, although they can be used to predict which

¹⁷ Using a simple small, open economy growth model to identify permanent and transitory shocks in a structural VAR framework, they also find that output fluctuations in Iceland are dominated by idiosyncratic permanent (supply) shocks.

¹⁸ Tenreyro and Barro (2003) propose another highly ingenious instrument – namely the joint probability that two client countries adopt the same anchor currency – on the assumption that bilateral trade between the two clients is not influenced by the anchor economy, only by the common currency. Unfortunately, this instrument is not appropriate for our study as EMU has no defined anchor currency, or any alternative anchors.

countries will enter EMU, they cannot be used to predict when EMU entry will occur. Fortunately, since the entry timing decision is highly correlated across countries (i.e. other than Greece the timing of entry is identical across countries), the information lost through not explaining the times series variation in entry decision is minor.

5. Trade impact of EU and EMU membership

This section reports estimates of the effect of EMU (and EU) on trade (see also Barr et al., 2003). The standard gravity model of Rose (2000) and a fixed effect version of the model is estimated for the period 1978Q1 to 2002Q1 for a panel of European countries. The sample of countries is once again all of the EU and EFTA except Luxembourg and Liechtenstein thus giving 11 EMU member countries and 6 non-member countries. Given that we are looking at every bilateral combination of the 17 countries, we have 136 different time series each covering the period 1978Q1 to 2002Q1 giving a total panel sample of 13,192 observations. Of these 136 country pairs, 55 pairs share the euro, which is roughly 40% of the sample (compared to 1% in the sample used by Rose, 2000).

Since the range of variables that might influence trade is myriad, the range of possible specifications of the gravity model is virtually limitless. The field is therefore narrowed by focusing on Rose's original simple specification (though former coloniser effects are excluded for obvious reasons). Table 3 gives the results for ordinary least squares (OLS) estimates and instrumental variables (IV) estimates using the two co-movement variables as instruments for EMU membership and exchange rate volatility.¹⁹

¹⁹ The results are robust to various experimentations, such as excluding different countries in the sample, excluding different variables in the gravity model, changing the estimation period and experimenting with different instruments. The details can be found in the appendix in Barr et al. (2003).

Table 3. Gravity trade model (log of bilateral trade as function of)

<i>Variable</i>	Standard gravity model				Fixed effect model			
	<i>OLS estimates</i>		<i>IV estimates</i>		<i>OLS estimates</i>		<i>IV estimates</i>	
EMU membership	0.25	(0.033)	0.21	(0.040)	0.25	(0.016)	0.26	(0.014)
EU membership	0.46	(0.016)	0.45	(0.017)	0.25	(0.009)	0.25	(0.009)
Exchange rate volatility	-0.12	(0.009)	-0.15	(0.009)	-0.008	(0.0035)	-0.007	(0.0037)
Log of output	1.23	(0.010)	1.23	(0.008)	2.37	(0.264)	2.38	(0.195)
Log of output per capita	0.23	(0.031)	0.23	(0.028)	-1.16	(0.262)	-1.17	(0.195)
Log of distance	-1.24	(0.016)	-1.24	(0.016)	–	–	–	–
Contiguity	0.19	(0.019)	0.18	(0.024)	–	–	–	–
Language	0.25	(0.016)	0.26	(0.020)	–	–	–	–

Bilateral trade is the sum of exports and imports divided by 2. Both trade and GDP are measured in US dollars and deflated by the US GDP deflator. *Exchange rate volatility* is the standard deviation of monthly log changes in bilateral exchange rate for the year prior to observation date. *Output* is the product of GDP in both countries measured in US dollars deflated by the GDP deflator. *Per capita GDP* is the product of GDP divided by product of populations. *Distance* is the great circle distance between capital cities. *Contiguity* is a dummy variable that equals 1 for countries that share a common border. *Language* is a dummy variable that equals 1 for countries with languages from the same group (i.e. similar languages such as Norwegian and Swedish as well as common languages). Mixed language family pairs obtain fractional values (e.g. for France and Belgium the dummy takes the value 0.5). *EU membership* is a dummy variable that equals 1 for country pairs that are both in EU at the time. *EMU membership* is a similarly defined dummy variable for EMU membership. All the economic data is from the OECD database. Robust standard errors are given in parenthesis. Constant and time and country dummies are not reported.

The fixed effect specification includes country-pair dummies, capturing all time-invariant causes for greater trade intensity between country pairs (such as geography and language). For the instrumental estimation of the fixed effect model, time variation in the two instruments was introduced by splitting the pre-EMU sample in half.²⁰

Looking first at the standard gravity model regressors, the model gives similar coefficient estimates as in Rose's (2000) original model with all the variables entering significantly and with the expected sign.²¹ The larger the countries are, the more they trade. The same applies if they share a common border or similar language. The further apart they are, however, the less they trade. Not surprisingly, a membership in a free trade union, such as the EU, also supports trade among members. In fact, the estimates suggest that joining the European single market has similar positive effects on trade as adopting the euro.

²⁰ Hence, the instruments take on their 1978Q1-1987Q4 average values over that period and then their 1988Q1-1997Q4 average for the period 1988Q1-2002Q1. An alternative specification, setting the instruments equal to zero up until EMU entry (1998Q4), and then equal to their 1978-1991 averages post entry (1999Q1 onwards) gave very similar results.

²¹ The coefficient on GDP per capita in the fixed effects specification is hard to interpret as the small time variation of population makes it highly collinear with GDP and the country pair dummies.

The main focus of this study is the effect of EMU membership on trade. This variable is also found to be significantly positive and increases trade by 23-29% (given as the exponential of the coefficient estimate minus one), depending on the estimation method and model specification used. The estimated trade effect is therefore found to be quite robust across different specifications and different estimation techniques.²²

These estimates of the currency union effect are significantly smaller than that found by Rose (2000) (about 20-30% rather than more than 200%) – with the simple Rose specification and the fixed effect specification giving very similar results. The fact that the currency union effect is found smaller here than in Rose’s original study is, however, somewhat offset by the fact that a larger exchange rate volatility effect is found in the Rose specification of our model (12-15% trade impact for every 1% change in standard deviation rather than the 2% trade impact found by Rose). Alternative specifications also confirm that, unsurprisingly, the volatility effect interacts quite strongly with the EMU effect. As an example, excluding volatility from the simple Rose specification increases the EMU effect from 29% to about 40%.²³ The volatility effect is, however, much smaller in the fixed effect specification, with trade increasing by less than 1%, which is much closer to that found by Rose (2000) and Dell’Ariceia (1999) and De Grauwe and Skudelny (2000) who use a similar sample and approach to that used here. This suggests that the endogeneity problem survives when estimating the volatility effect, even when using relatively long time period samples. This also reflects the different interpretation of the coefficient estimates. In the Rose specification the estimate reflects that a set of countries trade more the less volatile the bilateral exchange rate is. The coefficient in the fixed effect specification, however, gives an estimate of how much trade is affected when bilateral exchange rate volatility is eliminated, which is again the more relevant question in our context.

²² These estimates do not give any information about how quickly these effects will take to work through. Frankel and Rose (2002) argue, based on their findings and those in Glick and Rose (2001) that roughly two-thirds of the trade creating effect may be realised within three decades. The dynamic panel estimates in Bun and Klaassen (2002) and Micco et al. (2003) suggest a shorter period for the EMU countries. Their results imply that the long-run effect is attained within about twenty years.

²³ The volatility coefficient also interacts strongly with the distance dummy, with the coefficient increasing significantly when the distance variable is dropped. This is consistent with findings in Engel and Rogers (1996) that relative price volatility increases with distance between Canadian and US cities.

Some may also find it surprising that the estimates using instrumental variables are so similar to the OLS estimates, since many would expect the OLS estimates to be significantly biased upward (arguing that countries with potential for significant growth in trade are more likely to form currency unions). However, as Barro and Tenreyro (2000) point out, the biases could go either way, and their study (Tenreyro and Barro, 2003) actually finds stronger currency union effects on trade once the currency union dummy has been instrumented. The fact that the same result is not found here probably relates to the more homogeneous sample used in this paper (no developing or hyperinflation countries) so that the endogeneity effect is only minor in the case of EMU. It is also worth noting that although the two sets of estimates of the direct EMU effect reported here are similar, Durbin-Wu-Hausman tests of endogeneity indicate that instrumentation is appropriate.

The fact that the instrumental variables estimate suggests that it is membership of EMU that is responsible for almost all the increase in trade within EMU (rather than vice versa), need not mean that all of the trade impact is due to the mere act of entering EMU. It is possible that countries that expected to enter EMU altered their policies in ways that encouraged more trade (thus the trade impact is still caused by EMU, but only indirectly). While it is difficult to unravel the direct from the indirect impact of EMU, it is interesting to note that if the trade model is estimated with time dummies just for the EMU-in countries, it appears that EMU is already affecting trade well before EMU actually occurs (as far back as 1994 for the fixed effect version of the model and 1998 for the Rose specification).²⁴ This suggests that the trade impact of EMU is more than just the impact of the single currency – the policy preparations seem to have influenced trade as well.

Micco et al. (2003) use a comparable, albeit shorter, data set to estimate the trade impact of EMU entry. Their estimates of the pure currency union effect are similar to those reported here, although the estimated coefficient in their preferred fixed effect specification is significantly smaller (ranging from 9% to 20% for the most comparable sample), while using a Rose-type specification their results are very similar to those reported here (an EMU effect ranging from 21% to 37%). Experimentation in Barr et al. (2003) using a shorter data sample reveals that when the sample is reduced to the period 1993 to 2002, the fixed effects version of the

²⁴ These pre-EMU effects are also reported in Micco et al. (2003). Details can be found in the appendix in Barr et al. (2003).

model used here gives a lower estimate of the EMU effect (9%) whilst the Rose specification gives very similar estimates (30%). Therefore, it seems that their shorter sample (1992-2003) explains the difference between the results of Micco et al. and those presented here and in Barr et al. (2003). Given that the analysis discussed above suggests that the EMU effect on trade began as early as 1994 it is likely that some of the EMU effect is subsumed into country fixed effects in the shorter sample. However, it is also possible that the lack of a dynamic specification introduces more biases into a longer time series such as the one reported here. Experimenting with dynamic specifications of the panel suggests, however, that our results remain robust.

Several other papers have attempted to estimate the trade effect of EMU membership.²⁵ Rose and van Wincoop (2001) attempt to estimate the potential trade effect of EMU membership based on pre-EMU data using a theoretical model of bilateral trade from Anderson and van Wincoop (2001). They estimate that EMU membership could increase trade by roughly 60%.²⁶ Other studies (based on actual post-EMU data), such as Bun and Klaassen (2002) and De Nardis and Vicarelli (2003), find broadly similar results to the results reported here.²⁷

6. Implications for Iceland

6.1. Implications for trade with EMU countries

Given the estimated effects of EU and EMU membership on trade flows in Table 3, we can now calculate the possible increase in international trade for Iceland had it been a member of the union (Table 4). Also reported are the effects for the three current EMU-outs for comparison. The table gives the pure currency effect of adopting the euro and the exchange rate volatility effect, which could follow elimination of exchange rate fluctuations vis-à-vis the euro. This effect is estimated by calculating the predicted increase in trade that would have occurred if exchange rate volatility had been zero since 2001 (Greece's entry date), using the estimated

²⁵ Also of some relevance are two studies using data from the gold standard period (Estevadeordal et al., 2002, and López-Córdova and Meissner, 2002). Both use a small sample of industrial countries, plus a small sample of large developing countries. Their results suggest that participation in the gold standard increased trade by roughly 30-70%.

²⁶ It should be kept in mind that Rose's and van Wincoop's (2001) results are not based on actual trade data after the formation of the EMU, but on a theoretical model that depends critically on a number of assumptions, such as the elasticity of substitution between the countries' goods.

²⁷ Another interesting study on the trade effects of Ireland's break from the pound sterling currency union by Thom and Walsh (2002) finds no significant effect.

exchange rate volatility effect in Table 3. Finally, the table includes a separate EU impact for Iceland.²⁸ We use the more conservative IV estimates (the OLS estimates are practically identical) of the fixed effect model as we believe that the fixed effect specification gives a more credible estimate of the exchange rate volatility and EU effects due to a potential endogeneity bias in the simple Rose specification of the model. Furthermore, as discussed earlier, the panel specification allows us to address the more relevant policy question of how joining EMU (and EU) would affect Iceland's trade patterns and trade intensity.

Even though the estimated currency union effect is much smaller than that estimated by Rose (2000), the results are still significant. The estimates in Table 4 suggest that Iceland's trade with EMU could increase by 60% as a result of EU and EMU membership, with roughly half of it stemming from EU membership and the other half from EMU membership. Using the simple Rose specification would double this trade creation effect.

Table 4. Trade effects of entering EU and EMU (average increase in trade with EMU member countries as a result of joining EU and EMU)

	EU effect (%)	Pure EMU effect (%)	Exchange rate volatility effect (%)	Total effect (%)
Denmark	-	29	0	29
Sweden	-	29	1	30
UK	-	29	2	31
Iceland	28	29	2	59

The table gives the trade creation effects of EMU (and EU entry in the case of Iceland) from the IV estimates of the fixed effect model in Table 3. The pure EMU and EU effects are given as $\exp(\alpha) - 1$ where α is the estimated coefficients on the EU and EMU dummies. The exchange rate volatility effect is found by calculating the predicted increase in trade, given by the estimated exchange rate volatility effect in Table 3, if exchange rate volatility had been zero since 2001.

²⁸ Iceland is the only country in this group that is not already a member of the European Union, therefore suggesting an additional trade boosting effect from the EU-dummy in Table 3. Even though Iceland is a member of the EEA free-trade agreement between EU and some EFTA members that was created in 1994, we find that by introducing a separate EEA-dummy, the transition from EEA to EU produces an almost identical impact on trade as the transition from outside the EEA to the EU. This result (available upon request) seems robust to various specifications although it may be hard to identify as any cross section variation relies on one country (Switzerland). Note that all the countries in the sample are currently in some form of free trade agreement with the rest of Europe, be it EMU, EU, EEA or EFTA. That implies that being outside the EEA does not mean a country is outside any free trade agreement with the rest of Europe.

6.2. Implications for openness

At first sight these results suggest a large trade cost of not being a member of the EU and EMU but an important caveat needs to be kept in mind as this model only estimates the trade impact with EU and EMU countries. If much of that impact is simply trade that has been from non-EU or EMU countries whose comparative advantage is almost identical to EU and EMU countries then the economic impact might be relatively small. However, Barr et al. (2003) find evidence against such trade diversion. If EMU has no impact on trade between EMU-outs, then trade diversion would imply that trade between EMU-ins and EMU-outs would decline relative to trade between EMU-outs with the creation of EMU. They add a dummy variable for trade between EMU-ins and EMU-outs and find no significant effects. This is supported by the findings in Micco et al. (2003). They add a dummy variable to their specification of the gravity model which is unity when only one of the countries involved in bilateral trade is an EMU member and zero otherwise. If joining EMU leads to trade diversion, the coefficient on this variable should be negative. They find no evidence of trade diversion. In fact, they find some evidence of independent trade creation, i.e. EMU membership not only increases trade with other EMU members but also with other countries.²⁹ Empirical evidence of an independent trade creation effect is also found in Frankel and Rose (2002), using a much larger country set.

Taking these estimates at face value and assuming that no trade diversion would follow, the potential effect of EMU membership on Iceland's openness to international trade could be economically important. Given that Iceland's merchandise trade as a share of GDP in 2002 was about 50% and that over 60% of this trade was with the EU and almost 40% with the current EMU-12, this would imply a total rise in merchandise trade as a share of GDP of 12 percentage points, which amounts to roughly 1 billion US 2002 dollars per year.³⁰ The effect on Icelandic trade would obviously be larger if the EMU would also include the three current EMU-outs. The estimates in Table 4 imply that the trade share would rise by

²⁹ Micco et al. (2003) suggest that this additional trade creation effect with non-member countries could be because adopting a more liquid currency could enhance currency risk hedging, thus making trade with non-member countries less risky.

³⁰ This is, however, much less than suggested by the estimates in Frankel and Rose (2002), which imply that Iceland's merchandise trade as a share of GDP would rise by as much as 40-50 percentage points, or close to 3 billion US dollars just due to EMU.

18 percentage points in that case and 20 percentage points if Norway would also become a member.

6.3. Implications for income and growth

The increased trade intensity that would follow EU and EMU membership could also have important effects on real income in Iceland.³¹ Classical trade theory suggests that increased trade could increase the level of real income by allowing countries to focus on the production of goods and services which they have comparative advantages in producing, whether that stems from better technology or greater endowment in factors required for production. More recent trade theory strengthens this claim by introducing important roles for increasing returns to scale and scope, trade in imperfect substitutes, and endogenous technology (see e.g. Helpman and Krugman, 1985). Some new trade theory even suggests that international spillover of technology, ideas and knowledge (to name but few possible avenues) can result in a relation between openness and the growth rate of income rather than just the level of income. See the discussion in Frankel and Rose (2002) and some empirical support in Gylfason and Herbertsson (2001).

There are also reasons to believe that a common currency will reduce the home bias in domestic financial markets, thus promoting financial market integration and risk sharing among individuals in the member countries, which again can promote macroeconomic stability and welfare. It is also likely that these benefits are more important for small countries, whose scope for internal specialisation is relatively limited, and therefore fewer gains from internal trade, and where there is relatively low degree of financial risk diversification available.

An alternative macroeconomic benefit often mentioned may follow via reduced inflation and increased monetary policy credibility, therefore promoting macroeconomic stability. The importance of this channel is, however, less in the countries discussed here as all have low levels of inflation. In fact, Frankel and Rose (2002) find that most of the currency union benefit to income comes via trade. Currency unions can in fact also entail costs in terms of macroeconomic stability if the business cycles in the member countries are poorly correlated; a finding that

³¹ A close relationship between real domestic income and export revenue at constant import prices (or purchasing power of exports) is a well documented empirical finding in Iceland. See, for example, Andersen and Gudmundsson (1998), page 5.

seems important for Iceland as discussed in Section 2. This should, however, be measured against the findings in Frankel and Rose (1997) that international trade seems to promote business cycle synchronisation, and evidence that foreign exchange markets can be an independent source of shocks (see, for example, Neumayer, 1998). Finally, Alesina and Barro (2000) suggest that a currency union may be an efficient institutional arrangement for handling credibility problems.

In a comprehensive review of the empirical evidence on the effects of international trade on income, HM Treasury (2003) suggests that ‘it seems reasonable to assume that each 1 percentage point increase in the trade to GDP ratio increases real GDP per head by at least $\frac{1}{3}$ per cent in the long run’. This is consistent with the conservative estimates in Frankel and Rose (2002), but the results in Frankel and Romer (1999) suggest even a larger effect. Using the conservative estimate of $\frac{1}{3}$, would imply that a 12 percentage points in trade intensity following EU and EMU membership could boost long-run real GDP per capita in Iceland by something like 4%, which amounts to over 1 thousand US 2002 dollars, or 6% if the current EMU-outs would also be members. A representative estimate from Frankel and Romer (1999) would be around 1 percentage point increase in GDP per capita for each percentage point increase in the trade share, thus tripling the above numbers to 12% for the currency union containing the current EMU-12, or 18% for a currency union also containing the current EMU-outs.

7. Conclusions

This paper uses information on international trade from the first four years since the launch of the euro to try to estimate the potential effect of EMU membership for Iceland. The results suggest that the Icelandic króna acts as a barrier to international trade, and that by adopting the euro Icelandic trade with other EMU members could increase by 60%, and that the share of trade in GDP could rise by 12 percentage points which could boost per capita income by about 4% in the long run. We estimate that about half of this effect comes from joining the EU and the other half from EMU membership. These effects would be even larger would the three current outsiders (Denmark, Sweden and the UK) also become members.

There are important caveats that need to be kept in mind. First, it should be remembered that these are early days. The short history of the euro makes it unlikely

that the estimates in this paper are capturing all the long-run effects. This may suggest that the effect of EMU membership on trade is even larger than reported here. Second, this paper only focuses on the trade creating effects of EMU membership, thus leaving out other potentially beneficial microeconomic effects of a common currency, such as increased market transparency, specialisation and competition in the economy, and financial services deepening with increased possibilities for risk sharing across countries. Against this, there may be important macroeconomic costs of the loss of independent monetary policy in the face of asymmetric business cycles. Historical evidence from Iceland suggests that this can be a significant cost. This loss may, however, be dampened if increased trade intensity leads to greater business cycle co-movement as some empirical findings suggest. Finally, it is important to keep in mind that there are substantial uncertainties surrounding these estimates that should be considered in the overall assessment of the likely costs and benefits of Iceland membership in EU and EMU. The decision to enter EU and EMU should be based on a number of economic and political criteria of which the potential trade creation effect is only one of important elements. Although these important issues are not covered, we hope that this paper can contribute to the discussion on whether Iceland should join the EU and adopt the euro.

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