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Aggregate and Regional Business Cycle Synchronisation in the Nordic Countries

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Swedish Institute for European Policy Studies

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PREFACE

This report is one of two reports published in December 2009 on Sweden and the European Monetary Union. The other report, *The effects of the euro on international trade and investment: A survey of theoretical and empirical evidence*, is written by Harry Flam.

With the tenth anniversary of the introduction of the European single currency, the euro, this year, the performance of the European Monetary Union has received increasing attention. In addition, the economic and financial crisis and the strong depreciation of the Swedish krona have triggered the public debate on Swedish membership to resurface after being politically dead since the referendum in 2003.

In a series of publications SIEPS evaluates and discusses different arguments for and against entering a monetary union like the euro area. One important disadvantage of giving up a national monetary policy is the increasing difficulty of practising a stabilization policy following a country-specific shock. However, it could be argued that the business cycles in member countries become more correlated over time as a result of increasing economic integration.

This research report uses unique national and regional data to evaluate the synchronization of aggregate and regional business cycle correlations in the Nordic countries. What makes the Nordic countries particularly interesting to study, as well as for other countries considering joining the European Monetary Union, is the large diversity in the degree of European integration combined with a great similarity of economic institutions and large labour mobility and trade flows across borders. Due to the similarities, the Nordic region has been suggested to qualify as an optimal currency area, and business cycle asymmetry between the countries could therefore be attributed to being at different stages of European integration.

By issuing this report SIEPS hopes to make a contribution to both the academic and the popular debate on monetary unions and European economic integration.

Anna Stellinger
Director, SIEPS

The Swedish Institute for European Policy Studies, SIEPS, conducts and promotes research and analysis of European policy issues. The results are presented in reports and at seminars. SIEPS strives to act as a link between the academic world and policy-makers at various levels.

ABOUT THE AUTHORS

Anna Larsson obtained her PhD in Economics from the Institute for International Economic Studies, Stockholm University, and is currently a researcher at the Department of Economics at Stockholm University. Her main fields of interest are Macroeconomics and Political Economics. She has primarily been working on the effects of monetary regimes on macroeconomic performance in small open economies. Her work is both theoretical and empirical and comprises the interactions between fiscal and monetary authorities in unionised economies, the impact of inflation targeting and central bank independence on labour market outcomes and real exchange rate dynamics under alternative currency regimes. Anna Larsson is the main author of this report.

Nevena Gaco and *Henrik Sikström* co-authored their bachelor's thesis, at the Department of Economics, Stockholm University, on regional business cycle synchronisation in Sweden. Nevena Gaco is currently enrolled in the Master's programme in Economics at Stockholm University. Henrik Sikström holds a Master's degree in Political Science from Umeå University.

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EXECUTIVE SUMMARY

This essay studies aggregate and regional business cycle asymmetries in the Nordic countries Denmark, Finland, Norway and Sweden. In light of the Euro-political decisions and monetary regime shifts that have divided the Nordic region in the last fifteen years, we also study tendencies towards synchronisation over time. Throughout the paper we relate regional and aggregate business cycles to each country aggregate, other Nordic countries, a Nordic aggregate, the EU-4 (France, Germany, Italy and Spain) and the eurozone. Finally, we relate our findings to key aspects of economic integration, primarily labour mobility.

A key criterion for a monetary union to be successful is a high degree of business cycle synchronisation between the member countries. A high degree of synchronisation indicates that the member countries are affected similarly by shocks, i.e. that the majority of disturbances to the area are symmetric. Conversely, if the area is prone to asymmetric shocks, it is poorly suited to a common currency since this entails a unified monetary framework where countries have relinquished the monetary weapon in offsetting booms and busts.

Prior to the launch of the European Economic and Monetary Union (EMU) on 1 January 1999, there was a vivid debate about whether Europe constituted an optimal currency area (OCA). Most economists agreed that, despite high capital mobility and a fair amount of trade within the eurozone, low labour mobility in particular made the area unsuitable for a unified monetary framework. However, the argument that the member countries might become more integrated over time and that their business cycles therefore would become more synchronised after the adoption of the common currency gained great support.

Even if aggregate business cycles are synchronised, economic disturbances may cause domestic asymmetries if regions within a country are heterogeneous. While this issue has gained increasing interest among researchers as well as policy makers in recent years, the area is largely unexplored and the empirical evidence fairly scarce.

The potential importance of regional asymmetries is of interest to any country, including those maintaining an independent monetary policy outside the EMU. Regardless of the monetary regime, it is valuable to understand how different regions respond to domestic monetary policy measures. The argument is the same as in a monetary union. If the central bank pursues, say, a contractionary policy to counteract inflationary pressure in booming areas, this is likely to amplify regional recessions that

may be taking place in other parts of the country. In other words, the one-size-fits-all principle that governs domestic monetary policy measures by construction may exacerbate regional asymmetries when the objective of the central bank is to stabilise the economy-wide aggregate.

Given that countries are heterogeneous and respond differently to shocks, there may be factors that smooth regional asymmetries. A key issue is how border regions are affected by being adjacent to countries that have adopted the euro. It has been suggested that the Swedish region Skåne is experiencing a brain drain, in particular since the launch of the Öresund Bridge in 2001. The argument is that workers from Skåne are fleeing towards more prosperous Danish regions where the peg to the euro, the favourable evolution of Danish wages and lower taxes on labour have made employment in Denmark more attractive.

The Nordic region is unique in several respects and constitutes an interesting object of study. First, the common history of the countries implies great similarities in economic institutions. Second, the similarities in languages and the geographical proximity promote labour mobility across borders. Third, there are large trade flows within the area.

Despite all their similarities, the Nordic countries are characterised by being at very different stages of European integration. Norway, at the lowest stage of European integration, is a member of neither the European Union (EU) nor the EMU. Sweden is a member of the EU but has chosen to remain outside the EMU and is maintaining a floating exchange rate. Denmark chose to opt out of the EMU in the referendum in 2000, but the Danish krone is pegged to the euro through the ERM system. Of the Nordic countries, Finland is the only one to have joined the eurozone and became a full member of the EMU at the launch of the euro in 1999. If it is the case that a common currency leads to more integration, we would then expect Finland, and possibly also Denmark, to be increasingly synchronous with the eurozone while there is little reason to expect such a pattern for Norway.

In this report we revisit the issue of asymmetric shocks by studying the behaviour of aggregate and regional business cycles in the Nordic countries using recent, and some previously unavailable, data. In addition to reporting cross-sectional correlations, we study tendencies towards synchronisation over time, i.e. changes in asymmetry between countries, regions and key European areas. We begin by studying correlations and synchronisation at the aggregate country level. The different monetary regimes in the Nordic countries enable us to address the issue of whether

having a common currency is conducive to synchronisation. Following the country analysis, we study within-country asymmetries at the regional level and identify which regions have become more synchronised with their respective countries, neighbouring countries and the euro area. While our study of synchronisation at the country level provides some insight into whether a common currency may help promote synchronisation, other factors are also likely to matter. In the final part of the analysis, we therefore address other aspects of economic integration, mainly labour mobility.

Our main findings are as follows. The results from the simple correlation analysis suggest that Denmark is the only Nordic country to display a positive correlation with the eurozone over the 1993–2007 period. Finland, Norway and Sweden are negatively correlated with this area over this sample period. Danish regions Hovedstaden and Jylland display the highest levels of positive correlation with the eurozone aggregate.

Turning to changes in asymmetry over time, the results suggest that, when we focus on the stricter test of statistically significant trends in our measure of synchronisation, Denmark has become significantly more synchronised relative to the EU-4 over the sample period 1970–2008. Consistent with previous literature, we do see tendencies that Sweden has become increasingly synchronised relative to the euro area, but the trends are not statistically significant.

We also address a potential effect of the Maastricht Treaty by studying changes in the asymmetry indices of the four countries over the period 1992–2009. We find that Denmark and Finland have become significantly more synchronous relative to the EU-4 as well as the euro area over this period. Norway, having remained outside the EU as well as the EMU, has become more asymmetric relative to the European reference groups from 1992 onwards. The trends for Sweden, a member of the EU but not the EMU, are not statistically different from zero, suggesting no change in synchronisation relative to the EU-4 or the eurozone after the enactment of the Maastricht Treaty. Taken together, these results suggest that a common currency may promote synchronisation.

At the regional level, Stockholm is the only region that has become significantly more synchronised with the euro area over the 1993–2007 period. Interestingly, Skåne has become more asymmetric relative to the Swedish aggregate but displays tendencies towards more synchronisation, albeit statistically insignificant, relative to Denmark.

At the regional level, we find a positive correlation between the business cycle and net migration inflow for 50 per cent of the regions. Turning to

commuting, the most interesting region is perhaps the Öresund area, where the launch of the Öresund Bridge coincided with a dramatic increase in commuting from Skåne to Hovedstaden. Interestingly, commuting between these two regions is indeed one-way: there are almost 40 times as many people commuting from Skåne to Hovedstaden as in the opposite direction. We find it plausible that these worker flows may be an important reason why Skåne displays increasing asymmetry relative to Sweden but increasing symmetry relative to Denmark. It is likely that the Danish system of Flexicurity has made hiring easier for Danish firms and therefore led to an inflow of commuters from Sweden.

Focusing on Sweden, where the prospect of future EMU membership is still subject to debate, our results suggest that Stockholm is the only region to have become more symmetric relative to the euro area. Skåne shows clear signs of being increasingly dependent on Denmark.

Since Skåne is so closely integrated with Denmark and shows significant signs of increased asymmetry relative to the rest of Sweden, it is likely that the region would benefit from adopting the euro. The result that the Stockholm region has become increasingly symmetric relative to the euro area suggests that the Stockholm region would also be well off in a monetary union.

Our most interesting finding is unquestionably the result that Denmark and Finland have become significantly more synchronous relative to the EU-4 and the eurozone since 1992 while we see no such significant trend for Sweden. Over the same period, Norway shows significant tendencies to become increasingly asymmetric relative to these areas. This set of results supports the view that a common currency is conducive to business cycle synchronisation.

There is a widespread consensus among economists that the most important cost of monetary unification is the lost ability to pursue independent monetary policy to stabilise the economy. However, our finding that a common currency may promote synchronisation suggests that this cost is likely to diminish over time.

1 INTRODUCTION

This essay studies aggregate and regional business cycle asymmetries in the Nordic countries Denmark, Finland, Norway and Sweden. In light of the Euro-political decisions and monetary regime shifts that have divided the Nordic region in the last fifteen years, we also study tendencies towards synchronisation over time. Throughout the paper we relate regional and aggregate business cycles to each country aggregate, other Nordic countries, a Nordic aggregate, the EU-4 (France, Germany, Italy and Spain) and the eurozone. Finally, we relate our findings to key aspects of economic integration, primarily labour mobility.

A key criterion for a monetary union to be successful is a high degree of business cycle synchronisation between the member countries. A high degree of synchronisation indicates that the member countries are affected similarly by shocks, i.e. that the majority of disturbances to the area are symmetric. Conversely, if the area is prone to asymmetric shocks, it is poorly suited to a common currency since this entails a unified monetary framework where countries have relinquished the monetary weapon in offsetting booms and busts.

Prior to the launch of the European Economic and Monetary Union (EMU) on 1 January 1999, there was a vivid debate about whether Europe constituted an optimal currency area (OCA) as defined by Mundell (1961).[2] Most economists agreed that, despite high capital mobility and a fair amount of trade within the eurozone, low labour mobility in particular made the area unsuitable for a unified monetary framework. However, the argument that the member countries might become more integrated over time and that their business cycles therefore would become more synchronised after the adoption of the common currency gained great support.[3] A decade after the launch of the euro, there are finally some data that allows us to address this issue empirically.

Even if aggregate business cycles are synchronised, economic disturbances may cause domestic asymmetries if regions within a country are hetero-

[2] Other seminal contributions to the literature on OCAs are McKinnon (1963) and Kenen (1969). More recently, Bayoumi (1994) provides a microfounded model. De Grauwe (1993, 1996) relates economic convergence to the possibility that Europe is an OCA.

[3] Frankel and Rose (1997a, 1997b) argue that countries trading extensively tend to be more synchronous over the business cycle, suggesting that monetary unification leading to increased trade and integration may promote synchronisation ex post.

geneous.[4] While this issue has gained increasing interest among researchers as well as policy makers in recent years, the area is largely unexplored and the empirical evidence fairly scarce.

The potential importance of regional asymmetries is of interest to any country, including those maintaining an independent monetary policy outside the EMU. Regardless of the monetary regime, it is valuable to understand how different regions respond to domestic monetary policy measures. The argument is the same as in a monetary union. If the central bank pursues, say, a contractionary policy to counteract inflationary pressure in booming areas, this is likely to amplify regional recessions that may be taking place in other parts of the country. In other words, the one-size-fits-all principle that governs domestic monetary policy measures by construction may exacerbate regional asymmetries when the objective of the central bank is to stabilise the economy-wide aggregate.

The notion of domestic heterogeneity also adds another layer to the discussion about asymmetric shocks: even if the country as a whole is fairly synchronous with, say, the eurozone, how do different regions cope with the effects of such a shock? Can we identify key characteristics of winners and losers from a common currency?

Given that countries are heterogeneous and respond differently to shocks, there may be intranational mechanisms that smooth regional asymmetries. Similarly, it is possible that links with neighbouring countries can offset adverse shocks at the regional level. A key issue is how border regions are affected by being adjacent to countries that have adopted the euro. For instance, it has been suggested that the Swedish region Skåne is experiencing a brain drain, in particular since the launch of the Öresund Bridge in 2001. The argument is that workers from Skåne are fleeing towards more prosperous Danish regions where the peg to the euro, the favourable evolution of Danish wages and lower taxes on labour have made employment in Denmark more attractive.[5]

The Nordic region is unique in several respects and constitutes an interesting object of study. First, the common history of the countries implies great similarities in economic institutions. Second, the similarities in languages and the geographical proximity promote labour mobility across

[4] Note that this concept of asymmetry refers to geographic areas being at different stages of the business cycles at a given point in time. This should not be confused with another type of asymmetry sometimes referred to in the business cycle literature, describing the phenomenon that downturns typically seem to occur faster than upturns.

[5] See for instance Olshov (2009a, 2009b).

Table 1: The different degrees of European integration in the Nordic Region.

	Denmark	Finland	Norway	Sweden
EU[a]	x	x		x
EMU		x		
ERM II	x			
Schengen	x	x	x	x
EFTA			x	
EEA			x	

Sources: European Commission (2007), Agerskov (2008) and Pedersen et al. (2008).
[a] Denmark joined the European Economic Community in 1973. Finland and Sweden joined the EU in 1995.

borders.[6] Free intra-Nordic mobility of labour was formalised as early as 1954 with the establishment of the Common Nordic Labour Market (see Pedersen et al., 2008). Third, there are large trade flows within the area. In fact, intra-Nordic trade constitutes approximately one-fifth of the total Nordic world trade in goods and services; Sweden has the highest share with 23.7 per cent of its total trade within the Nordic region (OECD, 2009).

Due to the similarities in institutions, language and high worker mobility, it has been suggested that the Nordic region is a strong candidate for an OCA. Indeed, the Scandinavian countries Norway, Sweden and Denmark formed an early version of a currency union in 1873–1924. Jonung and Sjöholm (1997) argue that an OCA for Sweden would consist of primarily Finland, but possibly also Norway and Denmark.

Despite all their similarities, the Nordic countries are characterised by being at very different stages of European integration, summarised in Table 1. Norway, at the lowest stage of European integration, is a member of neither the European Union (EU) nor the EMU. Sweden is a member of the EU but has chosen to remain outside the EMU and is maintaining a floating exchange rate. Denmark chose to opt out of the EMU in the referendum in 2000, but the Danish *krone* is pegged to the euro through the ERM system. Of the Nordic countries, Finland is the only one to have joined the eurozone and became a full member of the EMU at the launch of the euro in 1999. If it is the case that a common currency leads to more integration, we would then expect Finland, and possibly also Denmark, to

[6] Finnish is admittedly not well understood in the rest of the Nordic region. However, Swedish is one of two official languages in Finland and is spoken by 5.44 per cent of the population (Statistics Finland, 2008).

be increasingly synchronous with the eurozone, while there is little reason to expect such a pattern for Norway.

In Sweden there is still a vivid debate about whether the country would benefit from a common currency. In light of the financial crisis, many advocates of the euro have suggested that it is high time that Sweden joined. Moreover, the release of Flam et al. (2009) earlier this year spurred the debate. In this essay we therefore put special emphasis on Sweden.

In this report we revisit the issue of asymmetric shocks by studying the behaviour of aggregate and regional business cycles in the Nordic countries using recent, and some previously unavailable, data. In addition to reporting cross-sectional correlations, we study tendencies towards synchronisation over time, i.e. changes in asymmetry between countries, regions and key European areas. We begin by studying correlations and synchronisation at the aggregate country level. The different monetary regimes in the Nordic countries enable us to address the issue of whether having a common currency is conducive to synchronisation. Following the country analysis, we study within-country asymmetries at the regional level and identify which regions have become more synchronised with their respective countries, neighbouring countries and the euro area. While our study of synchronisation at the country level provides some insight into whether a common currency may help promote synchronisation, other factors are also likely to matter. In the final part of the analysis, we therefore address other aspects of economic integration. Since the Nordic area is well known for its high labour mobility and its Common Nordic Labour Market, our focus is almost exclusively on worker migration and commuting.

Our main findings are as follows. The results from the simple correlation analysis suggest that Denmark is the only Nordic country to display a positive correlation with the eurozone over the 1993–2007 period. Finland, Norway and Sweden are negatively correlated with this area over this sample period. At the regional level, all the regions are positively correlated with their respective country aggregates. The Danish regions Hovedstaden and Jylland display the highest levels of positive correlation with the eurozone aggregate.

Turning to changes in asymmetry over time, the results suggest that, when we focus on the stricter test of statistically significant trends in our measure of synchronisation, Denmark has become significantly more synchronised relative to the EU-4 over the sample period 1970–2008. This corroborates the findings from the analysis of business cycle correlations. Consistent with Hassler (2003), we do see tendencies that Sweden has

become increasingly synchronised relative to the euro area, but the trends are not statistically significant.

Following Montoya and de Haan (2008), we also address a potential effect of the Maastricht Treaty by studying changes in asymmetry indices of the four countries over the period 1992–2009. We find that Denmark and Finland have become significantly more synchronous relative to the EU-4 as well as the eurozone over this period. In light of the fact that Finland has adopted the euro and that Denmark is a member of ERM II, this set of results suggests that the common currency is indeed conducive to synchronisation. This conjecture is corroborated by the finding that Norway, having remained outside the EU as well as the EMU, has become more asymmetric relative to the European reference groups from 1992 onwards. The trend for Sweden, a member of the EU but not the EMU, is not statistically significant, suggesting no change in synchronisation relative to the EU-4 or the eurozone after the enactment of the Maastricht Treaty. Taken together, these findings suggest that a common currency is indeed an important catalyst for synchronisation. This is a key finding.

At the regional level, Stockholm is the only region that has become significantly more synchronised with the euro area over the 1993–2007 period. Interestingly, Skåne has become more asymmetric relative to the Swedish aggregate but displays tendencies towards more synchronisation, albeit statistically insignificant, relative to Denmark.

While our findings suggest that a common currency is an important factor behind synchronisation at the aggregate level, it is unlikely to be the only factor. Also, the question of what drives regional synchronisation remains. Following the exploratory analysis, we therefore address potential causes for increased synchronisation in the Nordic region with a strong focus on migration and labour commuting. We find some evidence of a positive correlation between asymmetry and migration at the country level: if workers fail to find employment in a downturn, they are likely to move to neighbouring countries where the prospects for employment are better. We find such a positive correlation for migration between Denmark and Norway, Finland and Sweden and Norway and Sweden.

At the regional level, we find a positive correlation between the business cycle and net migration inflow for 50 per cent of the regions, specifically the Danish region Hovedstaden, the Finnish region Nyland, the Norwegian regions Østlandet and Nordnorge and the Swedish region Skåne. The result suggests that, in these regions, an economic boom is positively correlated with an inflow of workers to the area.

Commuting is arguably an even more important factor than migration for smoothing regional asymmetries, in particular in the Nordic region where cross-border commuting is extensive. The most interesting region is perhaps the Öresund area, where the launch of the Öresund Bridge coincided with a dramatic increase in commuting from Skåne to Hovedstaden. Interestingly, commuting between these two regions is indeed one-way: there are almost 40 times as many people commuting from Skåne to Hovedstaden as in the opposite direction. We find it plausible that these worker flows may be an important reason why Skåne displays increasing asymmetry relative to Sweden but increasing symmetry relative to Denmark. It is likely that the Danish system of *Flexicurity* has made hiring easier for Danish firms and therefore led to an inflow of commuters from Sweden.

Our results suggest that, on the regional level, Skåne, showing signs of decreased synchronisation relative to Sweden but increased synchronisation relative to Denmark, is the Swedish region the most likely to benefit from a common currency. Stockholm is also likely to do well in a monetary union on account of the capital region's business cycle displaying tendencies towards convergence relative to the euro area.

Our most important finding relates to the endogeneity of optimal currency areas. The result that Denmark and Finland, but neither Sweden nor Norway, have become significantly more similar to the eurozone after the implementation of the Maastricht Treaty strongly suggests that having a common currency is conducive to synchronisation. This implies that the cost of relinquishing monetary policy as a stabilisation tool is likely to decrease over time.

The rest of the paper is organised as follows. The related literature is reviewed in Section 2. Section 3 describes the data and the method. Section 4 presents business cycle correlations. Trends in business cycle synchronisation are analysed in Section 5. In Section 6, we provide some explanations for the findings on business cycle correlations by discussing different aspects of economic integration. Section 7 concludes.

2 RELATED LITERATURE

For our purposes it is useful to divide the related literature into three basic strands: (i) the literature on trade, economic integration, economic policy and business cycle synchronisation at the country level, (ii) corresponding studies at the regional level and (iii) studies of the Nordic countries.

The first strand of literature addresses potential trade effects of the euro and discusses whether increased trade leads to greater business cycle synchronisation; see for instance Baldwin (2006) and references therein. Lane (2006) concludes that the EMU has contributed to greater economic integration, but also that economic linkages with the rest of the world have increased, implying that the relative importance of trade within the EMU has not increased substantially. Frankel and Rose (1997a, 1997b) show that countries with closer trade links tend to be more synchronous in terms of business cycles. Inklaar et al. (2008) study the relationship between trade intensity and business cycle synchronisation for 21 OECD countries in 1970–2003.

More general studies on business cycle synchronisation at the country level include Darvas and Szapáry (2004), who provide a thorough measure of methodological issues when studying tendencies toward the synchronisation of old and new EU members. Darvas and Szapáry (2004) reject the structural VAR approach, i.e. the decomposition of fluctuations in output and inflation into demand and supply shocks, because of short sample periods. Instead they report various measures of the correlation of cycles computed by using both the Christiano–Fitzgerald band-pass filter and a Hodrick–Prescott filter to detrend the series. Goodhart (2007) discusses potential adjustment mechanisms when faced with an asymmetric shock and concludes that relative unit labour costs have typically increased relatively more than competitiveness in recent years.

Another sub-strand of this literature focuses on the impact of economic policy on business cycle synchronisation. Mihov (2001) discusses the importance of national monetary policy and provides some evidence on aggregate business cycle synchronisation in the euro area. Darvas et al. (2005) study how fiscal convergence may promote business cycle synchronisation and hence how the Maastricht convergence criteria may have moved Europe closer to an OCA.

The second strand of literature looks at regional business cycle synchronisation. One common strategy in this literature is to compare Europe with the US, exploiting the fact that the US is a common currency area; see for instance Kouparitsas (1999). Bayoumi and Prasad (1995) compare sources

of labour market and output adjustments in the US and eight European countries. They find that interregional labour mobility appears to be a much more important adjustment mechanism in the US, where labour markets are more integrated, than in the EU. The method used is to decompose short-term fluctuations in output between industrial, regional and aggregate disturbances.

A paper that is closely related to our study is Clark and van Wincoop (2001), who find that business cycles of US regions are much more synchronized than those of European countries. They also find a European border effect: within-country correlations are substantially larger than cross-country correlations. These results are robust to controls for distance and size. Clark and van Wincoop (2001) also report that, out of the four factors of sectoral specialization, the level of trade, monetary policy and fiscal policy, the lower level of trade between European countries explains most of the observed border effect. Montoya and de Haan (2008) provide an analysis of regional business cycle synchronisation in the euro area in 1975–2005 using HP (or Christiano–Fitzgerald) detrended gross value added for 53 regions. They conclude that on average and with some exceptions synchronisation has increased. In particular, regional cycles in the euro area are, on average, more in sync after 1992, a result that the authors interpret as a Maastricht effect. A much cited paper is that of Fatás (1997), who characterises regional and national fluctuations within the EU. He concludes that the significance of borders has decreased over time in a study of 38 regions belonging to Germany, Italy, France and the UK.

Afonso and Furceri (2007) study business cycle synchronisation of the new EU members on the aggregate (country) level in 1980–2005 while trying to identify which sector is driving the aggregate output business cycle synchronisation in each country. The focus in their study is on industries rather than geographic regions.

A third body of literature studies the Nordic region. Although this bulk of papers employs similar techniques to the aforementioned literature and is therefore technically not a separate strand, we choose to discuss them separately as they are of particular relevance to our study.

On the aggregate level, a fairly early paper is Bergman et al. (1997), who address the issue of whether the Nordic countries should join the EMU. Specifically, they use a structural VAR to estimate the responses of Nordic output to shocks emanating from Germany. They find that German shocks have a direct and large impact on Denmark, Belgium and the Netherlands while these shocks have no such impact on Finland, Norway and Sweden.

Another pre-EMU paper is Hansson and Sjöholm (1996), who relate the Swedish industrial structure and business cycle to those of other OECD countries that ex ante were expected to join the EMU. They construct and estimate an index of bilateral industrial asymmetries and find few similarities between Sweden and the eurozone in terms of industrial structure. Moreover, they conclude that, in terms of annual GDP growth, Sweden is not very correlated with the EMU countries over the period 1960–1993.

More recently, Olshov and Olofsdotter (2003) use the index developed by Jonung and Sjöholm (1998) and compare the industry structure of the Öresund region with those of the other EU member states. They find that the industry structure of Öresund displays the highest similarity to Austrian, Dutch, French and German industries. The similarities between the industry structures of the Öresund region and Sweden, on the other hand, are on a par with Finland, Spain and Greece. They report that the production structure of the Skåne region is most similar to that of Denmark, with an index value of .9 out of the maximum 1.0, while Skåne and Sweden obtain a .78 value on the Jonung–Sjöholm index. Olofsdotter and Olshov conclude by arguing that the highly diversified business sector in Skåne would benefit from a monetary policy set by the ECB.

Westlund et al. (2000) address potential causes for regional business cycle asymmetries by studying the extent to which different regions react to exchange rate changes in terms of changes in trade flows to six major trading partners. The authors claim to be able to identify some key properties of exchange-rate sensitive sectors in Sweden: they are typically small, dominated by one or two large firms, tend to be mature and characterised by large plants/economies of scale and dominated by labour-intensive industries.

A paper that we draw heavily on in terms of method is Hassler (2003), who studies tendencies to synchronisation at the country level. He uses band-pass detrended aggregate GDP data over the period 1960–2002 and compares, inter alia, the evolution of the Swedish business cycle with those of the major EU countries and the eurozone. Hassler (2003) concludes that there is a tendency towards synchronisation both within the EMU as well as between Sweden and the EMU over this period. He attributes periods of high asymmetry to the oil price shocks in the 1970s and to asymmetric economic policies, such as the devaluations in the late 1970s and early 1980s.

Jonung and Sjöholm (1997) make an attempt to identify an optimal currency area for Sweden. Based on country-specific as well as union-specific

criteria such as factor mobility, similarities in industrial structure, business cycle symmetries, similar economic policies and political similarities, they conclude that Finland constitutes the best fit for Sweden, followed by Denmark, Norway and Germany.

3 DATA AND METHOD

3.1 Data

Throughout the analysis, our measure of economic activity is real GDP. In the first part of the analysis, time series data at the country level are from the OECD Economic Outlook No. 85 and range from 1970 to 2009. Since we want to study business cycle synchronisation relative to other countries in the Nordic Region and different measures of the eurozone, we also include measures of these areas.[7] As pointed out by Hassler (2003), it is often argued that the European Central Bank pays more attention to the larger EU economies than the smaller ones, and it is therefore of interest to analyse whether the Nordic countries have become more or less synchronous with the largest economies in the euro area. We therefore also study business cycle asymmetries relative to a group consisting of France, Germany, Italy and Spain. We denote this group the EU-4.

We choose to express all the series of real GDP in the same currency. It is not obvious whether the business cycles should be measured in domestic currencies or in one common currency and there are pros and cons of both methods.

Our main rationale for choosing to express the series in the same currency is as follows. First, expressing all series in the same unit is seemingly the most consistent approach and simplifies comparisons across countries. Second, the analysis is focused on comparisons with aggregate measures of geographic regions such as the Nordic area, the EU-4 and the eurozone. In order for these measures to make sense, each individual series must be expressed in the same currency in the aggregation. Given that the individual components have been converted to the same currency, we find that the most consistent and logical approach is to express all the series in the same currency. It would be difficult to interpret the results from an analysis where the unit of measurement is series-specific.

What does our approach imply for country comparisons with the eurozone when some, but not all, of the countries have pegged their exchange rates to the euro? Consider the Nordic countries after the introduction of the euro. For Denmark and Finland, who operationally have the same currency as the eurozone, the denomination does not matter by definition: since they have the same currency, they will react to fluctuations in the nominal

[7] Comparisons with the Nordic aggregate are made excluding the country under study from the Nordic measure. When comparing, say, Norway with the Nordic Region, the measure of the latter comprises Denmark, Finland and Sweden. The same applies when comparing Finland with the euro area.

exchange rate symmetrically and the choice of currency denomination is of no importance. For Sweden and Norway, our business cycle measures also include asymmetries that are due to the countries maintaining floating nominal exchange rates. This means that if we do find evidence that Sweden and Norway have become more asymmetric to the eurozone, some of the synchronisation may indeed be due to the series being expressed in the same currency, thereby causing them to be correlated with the eurozone. However, if we fail to find such evidence, this conversely suggests that Sweden and Norway are uncorrelated with the eurozone, despite the GDP series being expressed in the same currency. In other words, when studying Sweden and Norway relative to the eurozone, evidence of no correlation between these regions strongly indicates that no such correlation exists.

For the regional series, we convert all series to euros. However, for the longer aggregate series starting in 1970, all the series are expressed in US dollars. This is done simply because the lack of a common European currency makes the US dollar the most natural candidate for normalising the series. Moreover, plotting the nominal exchange rates of the Nordic countries relative to the US dollar over the sample period indicates that the choice of denominating the series in dollars is innocuous as the Nordic exchange rates display strong signs of cointegration, i.e. they tend to follow each other closely over time.[8]

A major restriction when analysing regional convergence is the lack of data at the disaggregate level. This is also true for the Nordic area and data on the regional GDP has only recently been made available in the Nordic countries. The sample period is therefore fairly short and our panel is unbalanced. Data on regional GDP are available for the period 1993–2007 for Denmark, 1996–2006 for Finland, 1997–2006 for Norway and 1993–2006 for Sweden. The data on regions are from Statistics Denmark, Statistics Finland, Statistics Norway and Statistics Sweden, respectively. The series have been deflated using the Eurostat GDP deflator. When relating the regional series to aggregate country and eurozone levels, we use Eurostat data on the real GDP as well to make sure that the series are mutually consistent.

[8] This is hardly surprising given that, following the collapse of Bretton Woods, the Nordic currencies have been pegged to the currency snake, different trade-weighted currency baskets and/or the EMS system, all heavily influenced by the D-mark. Any variations in the exchange rates relative to the dollar are therefore likely to pick up variations in the D-mark–US dollar exchange rate and should affect the business cycles in the Nordic region symmetrically.

Table 2: Regional classification.

Country/Region	Counties comprised	Capital/Residential city
Denmark		
Hovedstaden	København, Frederiksberg	Copenhagen
Jylland	Sønderjylland, Ribe, Vejle, Ringkøbing, Århus, Viborg, Nordjylland	Århus
Finland		
Nyland	Helsinki	Helsinki
Lappland	Lappland	Rovaniemi
Norway		
Østlandet	Østfold, Akershus, Oslo, Hedmark, Oppland, Buskerud, Vestfold, Telemark	Oslo
Nordnorge	Nordland, Troms, Finnmark	Tromsø
Sweden		
Stockholm	Stockholm	Stockholm
Skåne	Skåne	Malmö
Norrland	Norrbotten, Västerbotten, Jämtland, Västernorrland, Gävleborg	Umeå

In the regional analysis, we divide the Nordic countries into key geographic regions. This is done for tractability: instead of studying the bilateral correlations between all the counties in the sample, we identify intranational geographical areas that comprise counties with similar features. The classification is displayed in Table 2.

In Section 6, when discussing potential causes for trends in synchronisation at the regional level, we add data on worker migration, commuting, geographic distance and industry structure. Data on migration and commuting are from the Nordic Council of Ministers, Statistics Denmark, Statistics Finland, Statistics Norway and Statistics Sweden. The data on geographic distance are compiled from our own calculations using the residence cities of each region, listed in Table 1, and employing the Google distance calculator. When measuring industry structure, we distinguish between services, industry and agriculture and use data from the OECD Regional Database to compute the employment share of each sector relative to the total number of employed in the geographic region.

3.2 Measuring business cycle asymmetry and synchronisation

We next describe how to detrend the GDP series and how to quantify asymmetries and synchronisation over time.

3.2.1 The asymmetry index

First, we detrend the GDP series using a Hodrick–Prescott (HP) filter. Ever since the seminal papers by Hodrick and Prescott (1980, 1997), the HP filter has been a standard component of the macroeconomist's toolbox. Although the filter has been criticised and more sophisticated methods such as band-pass filters have been developed, the HP filter remains a useful and accurate tool for detrending data.[9] Hassler et al. (1992) provide a thorough discussion of different filters in a large study of Swedish business cycles over the period 1861–1988. They find that, with some exceptions, their results are not sensitive to the filtering method. More recently, Montoya and de Haan (2008) find that using either the band-pass filter developed by Christiano and Fitzgerald (2003) or a standard HP filter yields very similar results in a study of European regions. In our study we will therefore focus exclusively on HP-detrended series. Following Ravn and Uhlig (2002), we set the smoothing parameter in the HP filter to 6.25 but perform some sensitivity analysis by also setting the smoothing parameter to 100.[10]

Once the series have been detrended, we compute a business cycle index. The business cycle index is based on the GDP gap, but we normalise the series so that they have a standard deviation of one.[11]

We begin the analysis by reporting simple correlation coefficients that capture the average correlation of the business cycle indices over time. This measure does not carry any information about synchronisation but

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[9] A simple alternative to detrending by filtering is simply to remove the trend by taking first differences. However, taking first differences is equivalent to removing a linear trend from the data and this method does not allow for variations in the long-run trend of GDP.

[10] A key issue when detrending data using the HP filter is how to set the smoothing parameter commonly denoted λ. While most users would agree on setting the smoothing parameter to 1600 as originally suggested by Hodrick and Prescott (1980, 1997) when detrending quarterly data, there is less consensus on how to set the smoothing parameter when detrending annual data. Following Backus and Kehoe (1992), a smoothing parameter of 100 has been much used in the literature; however, Baxter and King (1999) show that a value of approximately 10 is a much better fit for annual data. In a recent paper, Ravn and Uhlig (2002) show that setting the smoothing parameter to 6.25 produces almost exactly the same trend as when setting the smoothing parameter to 1600 for quarterly data. However, the accurate value of λ is series-specific and depends on the dataset.

[11] Denote the GDP series of region i by y_i and denote the HP-filtered series, i.e. the non-linear trend, by y_i^*. To obtain the business cycle index, c_{it}, the detrended series, $g_{it}=y_{it}-y_{it}^*$, is divided by its standard deviation, s_i, i.e. $c_{it}=g_{it}/s_i^*$. Let $\bar{g}_i$ denote the mean of the detrended series. To see that the business cycle index has a standard deviation of one, note that the variance is given by:

$$\mathrm{var}(c_{it}) = \frac{1}{T-1}\sum_{t=t_0}^{T}\left(\frac{g_{it}}{s_i} - \frac{\bar{g}_i}{s_i}\right)^2 = \frac{1}{s_i^{\,2}}\frac{1}{T-1}\sum_{t=t_0}^{T}(g_{it}-\bar{g}_i)^2 = \frac{s_i^2}{s_i^2} = 1$$

provides a first glance at the data. When studying simple cross-sectional correlations, we also perform some sensitivity analyses by computing the correlation coefficients of annual GDP growth rates.

Following Hassler (2003), we then compute an asymmetry index to quantify tendencies towards synchronisation over time. The value of the asymmetry index is given by the absolute value of the difference in the business cycle indices of the two regions (countries) that year.[12] Using the absolute value ensures that the asymmetry index always assumes positive values. If the index assumes the value zero, the two countries are perfectly symmetric and booms and busts occur at the same time. Conversely, if the index is high, country *i* is in a boom when country *j* is experiencing a downturn and vice versa. If the asymmetry index is falling over time, this may thus be interpreted as evidence that countries *i* and *j* have become more synchronised or similar over time.

When studying convergence, i.e. tendencies towards synchronisation, it is common practice in the literature merely to look at whether fitted trends are positively or negatively sloped; see for instance Hassler (2003) and EEAG (2009). We follow this convention throughout the analysis but we also provide a stricter test of synchronisation by fitting linear trends to the asymmetry indices by means of least-squares estimation and report the estimated slope coefficients and their associated t-values. However, one should be aware of the fact that this is a very strict test of synchronisation. In the regional analysis, the few observations imply that standard errors become so large that very large effects are required for statistical significance. Throughout the analysis we therefore follow the convention of also commenting on insignificant trends.

3.2.2 The business cycles in the Nordic countries

The GDP series and the fitted HP trends are displayed in Figure A1 in the Appendix. The plots demonstrate how GDP fluctuates around the non-linear long-run trend and is consistent with conventional views of the evolution of the business cycle in the Nordic countries. Although the depth and length of the cycles vary across countries, we clearly see some familiar patterns: the global recession following the oil crisis in 1973, the recession following the 1979 energy crisis, the global crisis in the early 1990s, the worldwide slump in the tracks of the dotcom crisis at the turn of the century and, finally, the deep recession resulting from the massive financial crisis

[12] The value of the asymmetry index between countries (regions) *i* and *j* at time *t* is thus defined as $A_{ijt}=|c_{it}-c_{jt}|$.

of 2008–2009. Focusing on events in recent years, the plots show that the slumps in the early 1990s were particularly severe in Finland and Sweden. In Sweden, the recession that followed the banking crisis was amplified by weak government finances. In Finland, the global recession was exacerbated by a huge drop in trade due to the collapse of the Soviet Union in 1991; see for instance Jonung et al. (2008).

The business cycle indices, i.e. the standardised GDP gaps, are plotted in Figure A2 in the Appendix. As described in Section 3.2.1, a positive value of the index indicates that the economy is in a boom and a negative value indicates that the economy is in a downturn. Since the plots are simply an alternative graphic representation of the data behind Figure A1, described in detail above, further comments are superfluous.

4 BUSINESS CYCLE CORRELATIONS

Below, we report business cycle correlations between regions and countries. This measure does not say anything about synchronisation over time but provides a first glance at the cross-sectional pattern.

4.1 Business cycle correlation in the Nordic region

Table 3 displays the correlation coefficients of the business cycle indices for countries and regions over the period 1993–2007. At the country level, Norway is essentially uncorrelated with the rest of the Nordic region with a correlation coefficient of .02 while Denmark and Finland display the strongest positive correlation with the Nordic area with correlation coefficients of .34 and .37, respectively. Also, Sweden is weakly positively correlated with its Nordic neighbours. Interestingly, the results suggest that Denmark is the only country that displays a positive correlation with the eurozone; the other countries all display a negative correlation with this area.

At the regional level we see that all the regions are positively correlated with their respective countries. The correlation is strongest in Sweden and weakest in Norway. The results suggest that the correlation is very high between the capital regions (HS, NY, ØS, STO) and their respective country aggregates: a possible indication that a large share of the aggregate business cycle is driven by the capital regions.

Turning to regional correlation with the euro area, the evidence is mixed and there is no clear pattern. Many relationships are weak as correlation coefficients are close to zero. Quantitatively, the coefficients are largest for the Danish regions Hovedstaden and Jylland, which are both positively correlated with the eurozone with correlation coefficients of .47 and .60, respectively.

For the Swedish regions we see that, somewhat surprisingly, Stockholm and Skåne display a weak negative correlation relative to the eurozone while Norrland displays a positive correlation relative to this area. However, Norrland's basic industry exports a large share of its output to the EU and it is therefore likely that, for instance, higher European demand for Norrland's mining output is conducive to an economic upturn in the Norrland region. In fact, Sweden is the EU's primary mining country and 12 out of Sweden's 15 active mines are located in Norrland. Almost 90 per cent of the European Union's total mining of iron ore takes place in Norrland county Norrbotten (Länsstyrelsen, 2008).

The correlation coefficients are typically small and we interpret them with some caution due to the small number of observations. We also find it

Table 3: Business cycle correlations 1993–2007. Regions.

HS	JY	NY	LA	ØS	NN	STO	SKA	NL	DEN	FIN	NOR	SWE	NC	EURO	
HS	1.00	0.15	0.70	0.36	-0.70	-0.75	0.11	0.24	0.58	0.78	0.06	-0.12	0.27	0.17	0.47
JY	0.15	1.00	0.26	0.29	0.20	0.20	-0.24	0.16	0.17	0.67	0.22	0.13	0.03	0.08	0.60
NY	0.70	0.26	1.00	0.61	-0.51	-0.65	0.62	0.58	0.57	0.85	0.74	0.02	0.60	0.58	0.11
LA	0.36	0.29	0.61	1.00	-0.63	-0.50	0.55	0.72	0.62	0.60	0.51	-0.13	0.68	0.53	0.16
ØS	-0.70	0.20	-0.51	-0.63	1.00	0.92	-0.49	-0.44	-0.59	-0.42	-0.40	0.52	-0.56	-0.59	-0.36
NN	-0.75	0.20	-0.65	-0.50	0.92	1.00	-0.47	-0.31	-0.55	-0.46	-0.50	0.57	-0.48	-0.53	-0.33
STO	0.11	-0.24	0.62	0.55	-0.49	-0.47	1.00	0.84	0.69	0.05	0.38	-0.01	0.91	0.10	-0.40
SKA	0.24	0.16	0.58	0.72	-0.44	-0.31	0.84	1.00	0.86	0.40	0.25	0.16	0.97	0.33	-0.07
NL	0.58	0.17	0.57	0.62	-0.59	-0.55	0.69	0.86	1.00	0.58	0.02	-0.05	0.89	0.17	0.25
DEN	0.78	0.67	0.85	0.60	-0.42	-0.46	0.05	0.40	0.58	1.00	0.24	0.13	0.33	0.37	0.62
FIN	0.06	0.22	0.74	0.51	-0.40	-0.50	0.38	0.25	0.02	0.24	1.00	0.05	0.24	0.22	-0.25
NOR	-0.12	0.13	0.02	-0.13	0.52	0.57	-0.01	0.16	-0.05	0.13	0.05	1.00	0.00	0.02	-0.03
SWE	0.27	0.03	0.60	0.68	-0.56	-0.48	0.91	0.97	0.89	0.33	0.24	0.00	1.00	0.17	-0.10
NC	0.17	0.08	0.58	0.53	-0.59	-0.53	0.10	0.33	0.17	0.37	0.22	0.02	0.17	1.00	-0.02
EURO	0.47	0.60	0.11	0.16	-0.36	-0.33	-0.40	-0.07	0.25	0.62	-0.25	-0.03	-0.10	-0.02	1.00

Note: The following abbreviations are used. Hovedstaden (HS), Jylland (JY), Nyland (NY), Lappland (LA), Østlandet (ØS), Nordnorge (NN), Stockholm (STO), Skåne (SKA), Norrland (NL), Denmark (DEN), Finland (FIN), Norway (NOR), Sweden (SWE), Nordic Countries (NC). The EURO area comprises Austria, Belgium, (Finland), France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

more interesting to study tendencies towards synchronisation over time as this measure reveals long-run tendencies and contains information about what to expect in the future.

Some sensitivity analysis involving the computation of correlation coefficients for annual growth rates reveals that qualitatively the results are not sensitive to the method. When looking at growth rates instead of HP-detrended data, the regional pattern is largely the same and qualitatively the correlation coefficients between the Nordic countries and the eurozone are the same. The correlation coefficients for Denmark, Finland, Norway and Sweden versus the euro area when studying growth rates are 0.68, -0.04, 0.00 and -0.10, respectively. It is thus only the coefficient for Norway that changes from slightly negative to zero when studying growth rates rather than HP-detrended data. However, the differences deriving from the choice of method are so small that they may indeed be considered negligible.

4.2 Summary of results

The results from the correlation analysis suggest that Denmark is the only Nordic country displaying a positive correlation with the eurozone over the 1993–2007 period. Finland, Norway and Sweden are negatively correlated with this area over the sample period.

At the regional level, all the regions are positively correlated with their respective country aggregates. The Danish regions Hovedstaden and Jylland display the highest level of positive correlation with the eurozone aggregate.

The results are robust to the detrending method: the correlation coefficients are qualitatively the same regardless of whether they are based on HP-detrended data or annual growth rates.

5 BUSINESS CYCLE SYNCHRONISATION

While correlation coefficients provide a descriptive statistic of average co-movements, we find it more informative and interesting to study changes in asymmetries over time as this carries some information about where each region is headed. Therefore, we next study tendencies towards business cycle synchronisation, i.e. changes in asymmetry over time. As in Section 4, we start at the country level and then proceed with the regional analysis.

5.1 Synchronisation at the country level

In this section, we study whether the four Nordic countries have become more or less similar to each other, the aggregate Nordic region, the EU-4 and the eurozone. Recalling that a decreasing trend in the asymmetry index suggests that the countries under comparison have become more synchronised over time, we also estimate linear trends by least squares and plot them alongside the data. Since the slopes of these trends are going to be highly dependent on the sample period studied, we proceed as follows. First, we study the evolution of the asymmetry indices and their estimated trends over the full sample period in Section 5.1.1. Second, we study the post-Maastricht period, 1992–2009, in Section 5.1.2.

5.1.1 The Nordic countries 1970–2008

Figure 1a displays asymmetry indices for Denmark relative to Finland, Norway, Sweden, the Nordic Region, the EU-4 and the euro area. The linear trends, fitted by least squares, are also plotted in each graph. In general we see that, relative to the Nordic countries, the trends for Denmark are very weak. Over this long sample period, Denmark displays weak trends towards greater symmetry relative to Finland, Sweden and the Nordic countries as a whole, while Denmark seems to have become slightly more asymmetric relative to Norway. Moreover, there is a stronger negative trend in the asymmetry index relative to the EU-4 and the euro area, suggesting that Denmark has indeed become more in sync with the eurozone over time. This may be interpreted as evidence that Denmark has become more similar to the euro area in recent years due to the peg to the euro through ERM II but it may also be that the increased synchronisation is due to higher integration with Europe in general. As pointed out in Table 1, Denmark became a member of the European Economic Community as early as 1973, while Sweden and Finland did not join until 1995. It is therefore plausible that Denmark's long-standing participation in Europe's single market and its strong ties with mainland Europe have promoted mobility of goods, services and factors of production and thereby been conducive to synchronisation.

Figure 1a Asymmetry indices for Denmark

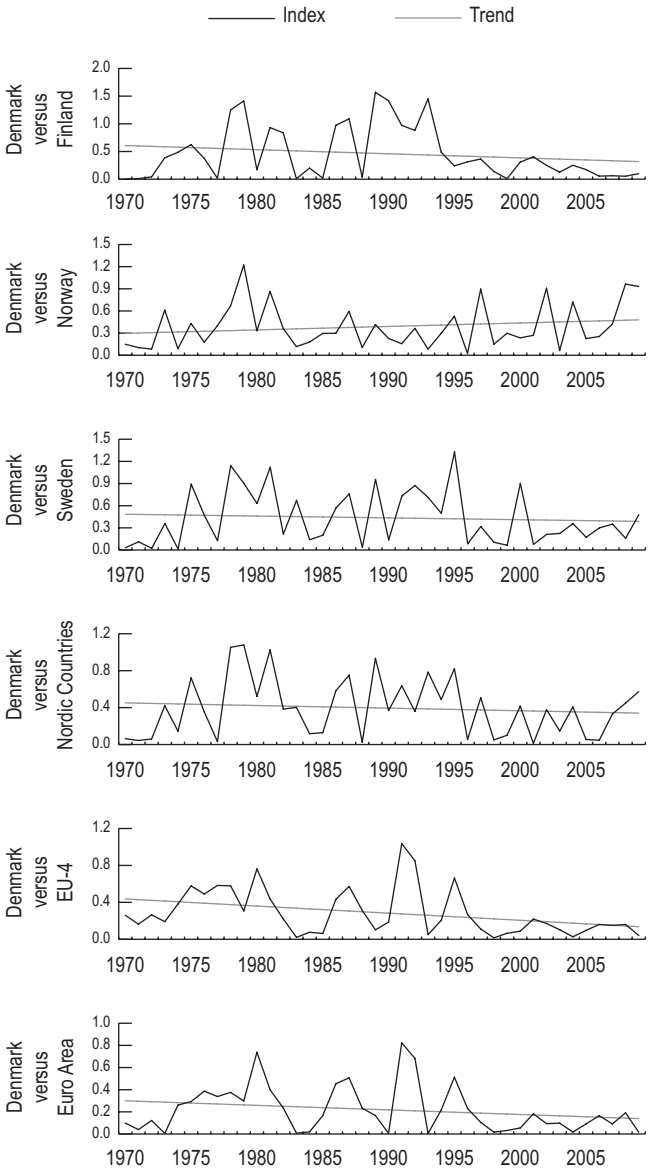


Table 4: Slope coefficients of estimated trends in synchronisation 1970–2009. Countries.

	DEN	FIN	NOR	SWE
DEN		-0.01	0.00	0.00
		-1.13	1.14	-0.49
FIN	-0.01		0.01**	0.00
	-1.13		2.26	0.55
NOR	0.00	0.01**		0.01**
	1.14	2.26		2.25
SWE	0.00	0.00	0.01**	
	-0.49	0.55	2.25	
NC	0.00	0.00	0.01**	0.00
	-0.65	0.59	3.00	0.35
EU-4	-0.01**	-0.01	0.00	0.00
	-2.38	-1.33	0.66	-0.84
EURO	0.00	-0.01	0.00	0.00
	-1.45	-1.17	1.25	-0.42

Note: t-values reported below each estimate. ** indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

The slope coefficients of the estimated trends along with their t-values are reported in Table 4. The reported estimates are the slope coefficients for the trends in the asymmetry indices for each pair of countries displayed in the rows and columns. The results shows that the only coefficient statistically different from zero at the 5 per cent level of significance is the slope of the Danish trend relative to the EU-4. This supports the claim that Denmark has become increasingly symmetric to the EU-4 over time.

The asymmetry indices for Finland are plotted in Figure 1b. The plots suggest that Finland has become slightly more symmetric relative to Denmark, the EU-4 and the euro area and more asymmetric to Norway, Sweden and the Nordic countries as a whole. This suggests that the Finnish economy has become more similar to the euro area over time, possibly due to Finland's participation in the Economic and Monetary Union.

However, Table 4 shows that we cannot reject the null hypothesis that the trend has slope coefficient zero at any acceptable level of significance for the majority of these results. Indeed, the only significant estimate is the positive slope coefficient of the Finnish asymmetry index relative to Norway, which suggests that these two countries have become less synchronous over time in a statistical sense as well.

Figure 1c displays asymmetry indices for Norway. The results are quite striking. Over the period 1970–2009, Norway has become more asymmetric not only relative to the Nordic countries but also relative to the EU-4 and the euro area. While this may be attributed to Norway remaining outside the EU as well as the EMU, Norway is also the only country in the sample endowed with oil. Being the only oil exporter, Norway is bound to be affected by oil price shocks quite differently from its oil importing neighbours.

Table 4 shows that the trend in the Norwegian asymmetry index has a statistically significant positive slope relative to Finland, Sweden and the Nordic region as a whole. The insignificance of the other estimates suggests that, while Norway has become less synchronised with the majority of its Nordic neighbours, there is no statistical support for the hypothesis that Norway has become more asymmetric relative to the EU-4 and the euro area.

Finally, Figure 1d displays the asymmetry indices for Sweden. The plots suggest that, since 1970, Sweden has become more asymmetric relative to Finland, Norway and the Nordic aggregate, but more symmetric relative to Denmark, the EU-4 and the euro area.[13] The latter results are consistent with Hassler (2003), who finds that Sweden shows signs of convergence to the euro area over the period 1960–2002.

However, Table 4 shows that the evidence of Swedish synchronisation is weak from a statistical point of view. The only significant estimate is the positive slope of the trend relative to Norway.

5.1.2 A Maastricht effect?

As mentioned in Section 2, Montoya and de Haan (2008) find that regional business cycles in the euro area are more synchronised after 1992. In an attempt to investigate whether there is such a Maastricht effect for the Nordic countries, we plot trends in synchronisation post-1992 in Figure 2. The plots indicate that the EU members Denmark, Finland and Sweden have become more symmetric relative to the EU-4 and the euro area since 1992. Norway, being the only non-EU country, has become more asymmetric relative to both these groups post-1992.

[13] Looking at the big picture, Figures 1b and 1d suggest that both Sweden and Finland have become more synchronous relative to the EU-4 and the euro area, but at the same time they have become less synchronised vis-à-vis one another. However, this is not a contradiction. First, the trends towards synchronisation are fitted on the entire sample period and it may well be that the increase in symmetry against the euro area has occurred under different time periods in Sweden and Finland. Second, none of these trends are statistically significant.

Figure 1c Asymmetry indices for Norway

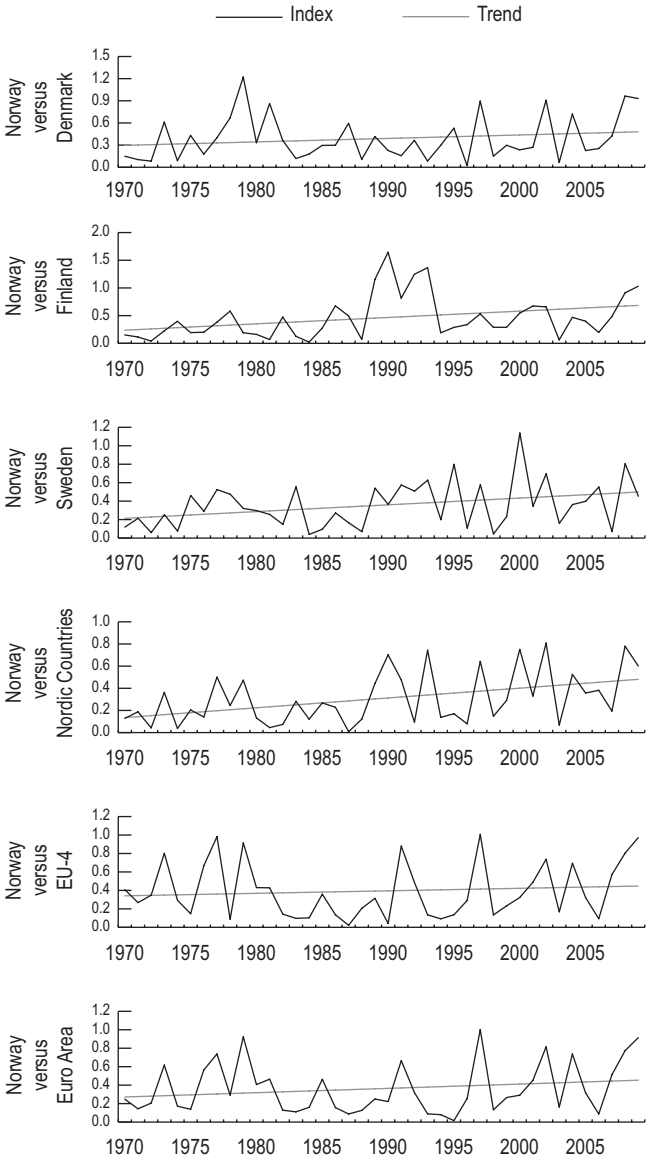


Figure 1d Asymmetry indices for Sweden

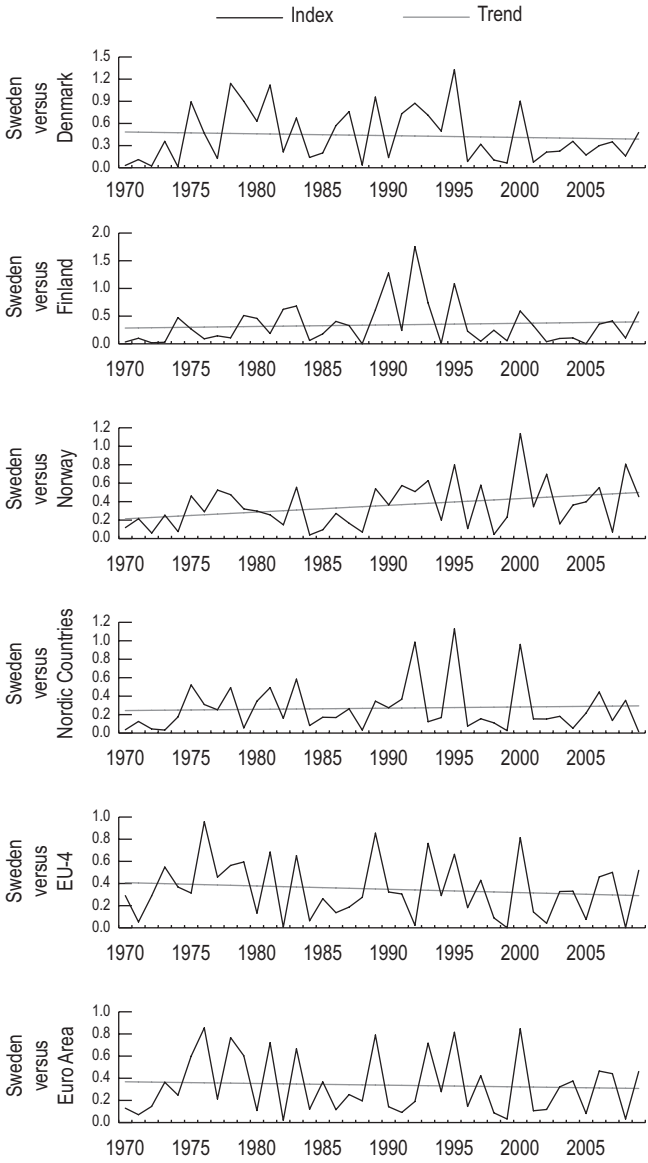


Figure 2 Business cycle synchronisation of the Nordic countries versus the EU-4 and the euro area, 1992-2009

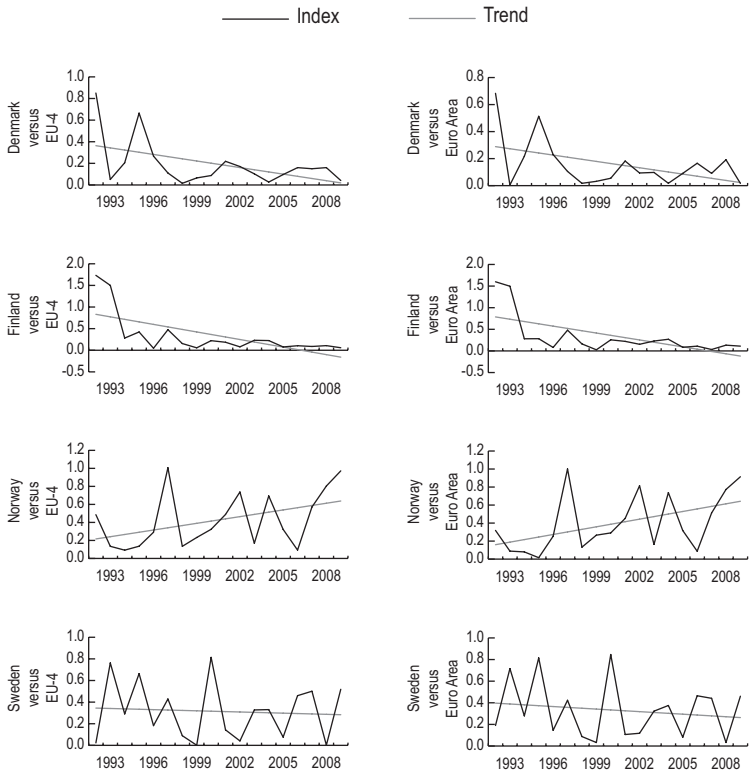


Table 5 reports the estimated slope coefficients and t-values for the fitted linear trends. Except for the Swedish case, the slopes of the estimated trends are all significantly different from zero at the 10 per cent level or lower. This suggests that, from a statistical point of view, Denmark and Finland have indeed converged towards the euro area post-1992. Norway, on the other hand, displays significant signs of divergence. In the Swedish case, there is no statistically significant change in the degree of symmetry following the Maastricht Treaty.

So why have Denmark and Finland, but not Sweden, become more synchronous relative to the big four and the eurozone since the enactment of the Maastricht Treaty? The floating Swedish exchange rate is an obvious

Table 5: Slope coefficients of estimated trends in synchronisation 1992–2009. Countries.

	DEN	FIN	NOR	SWE
EU-4	-0.02**	-0.06**	0.02*	0.00
	-2.26	-3.37	1.91	-0.29
EURO	-0.02**	-0.05**	0.03**	-0.01
	-2.12	-3.20	2.18	-0.65

Note: t-values reported below each estimate. ** indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

candidate. The finding is consistent with the conjecture that it is the euro or even the peg to the euro, rather than just increased integration through EU membership, that matters for business cycle synchronisation. This is a key finding.

However, it is also worthwhile looking at the economics behind the data to ensure that the results are not driven by extreme events. The results for Finland warrant some discussion as the sharply decreasing trend is largely driven by very high values of the asymmetry index in 1992. As discussed in Section 3.2.2, Finland experienced a sharp drop in GDP due to the substantial decline in trade with the Soviet Union from 1991 onwards. Nevertheless, even if these initial observations were excluded, the plot suggests that the asymmetry index would maintain its negative trend, which suggests that the sources of the synchronisation are structural rather than driven by one-time events.

5.2 Synchronisation at the regional level

We next turn to regional synchronisation over time and compute and plot the asymmetry indices for each region relative to the Nordic countries, the Nordic area and the eurozone.

The asymmetry indices for the Danish regions Hovedstaden and Jylland relative to the Nordic countries, the Nordic area and the eurozone are plotted in Figure 3a. The results suggest that, while both Hovedstaden and Jylland have become slightly more asymmetric relative to the Danish aggregate, they have become more symmetric relative to all the other Nordic countries and the euro area. Although Sjaelland, a key part of Denmark, is left out of the analysis, it still seems contradictory that both Hovedstaden and Jylland have become more asymmetric relative to the Danish aggregate. We therefore turn to statistical inference for guidance. The estimated slope coefficients or the trends and their associated t-values

Figure 3a Asymmetry indices for the Danish regions Hovedstaden and Jylland

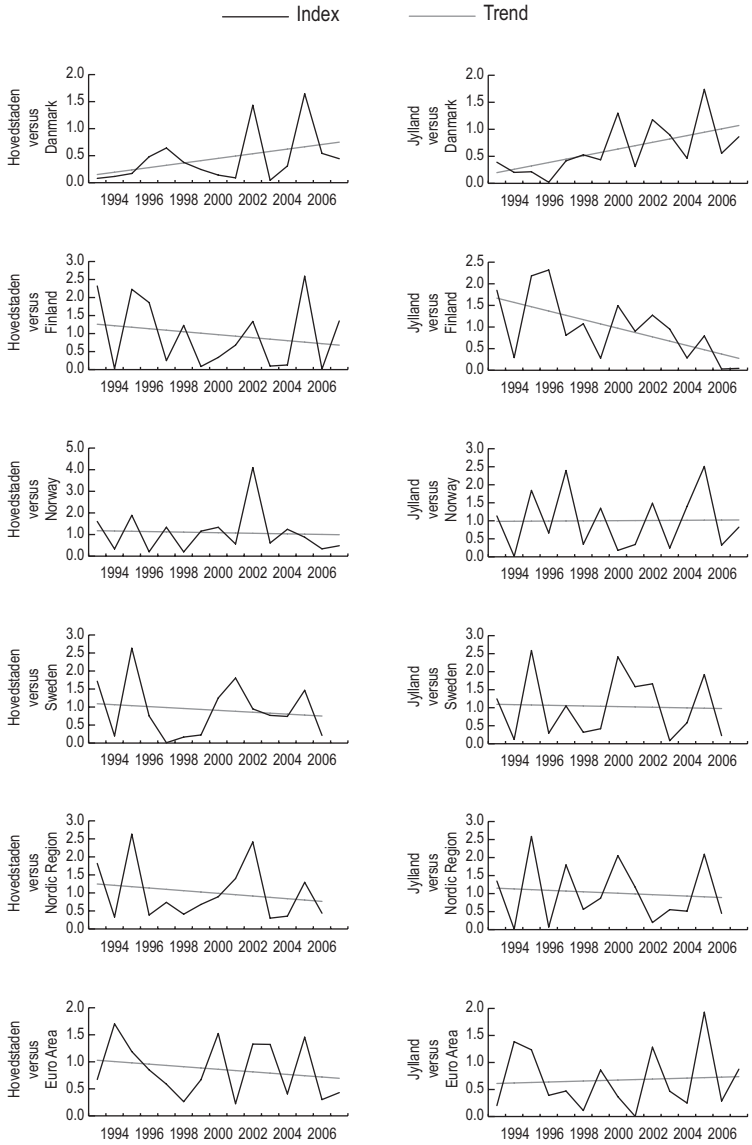


Table 6: Slope coefficients of estimated trends in synchronisation. Regions.

	HS	JY	NY	LA	ØS	NN	STO	SKA	NL
DEN	0.04	0.06**	-0.06**	0.03	-0.02	-0.06	-0.08	-0.07	0.00
	1.57	2.64	-2.46	1.14	-0.19	-0.51	-1.34	-1.25	-0.08
FIN	-0.04	-0.10**	-0.05	-0.02	0.06	0.00	0.02	-0.01	-0.03
	-0.73	-2.72	-1.13	-0.40	0.46	-0.04	0.41	-0.19	-0.44
NOR	-0.01	0.00	-0.03	0.16	-0.15**	-0.08	0.02	0.08	0.05
	-0.22	0.06	-0.29	1.64	-3.44	-1.65	0.34	1.53	0.74
SWE	-0.03	-0.01	-0.06	0.01	-0.05	-0.04	-0.02	0.02**	-0.03
	-0.50	-0.15	-1.07	0.18	-0.32	-0.27	-1.48	2.40	-1.49
NC	-0.04	-0.02	-0.11**	0.06	-0.01	-0.03	0.02	0.04	0.06
	-0.69	-0.35	-2.25	1.38	-0.09	-0.16	0.38	0.94	0.98
EURO	-0.02	0.01	-0.02	0.04	-0.04	-0.07	-0.14*	-0.09	-0.03
	-0.77	0.26	-0.30	0.78	-0.51	-0.94	-2.00	-1.33	-0.64

Note: t-values reported below each estimate. ** indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

are reported in Table 6. The results suggest that we cannot reject the null that the slope coefficients for Hovedstaden are different from zero. However, the finding that Jylland has become increasingly asymmetric to the Danish aggregate and increasingly symmetric to Finland is supported at the 5 per cent level of significance.

Figure 3b plots the asymmetry indices for the Finnish regions Nyland and Lappland. The results suggest that the capital region Nyland has become increasingly symmetric to the other Nordic countries, the Nordic aggregate and the eurozone. The pattern for Lappland is quite different. Relative to all the other objects of comparison except for the Finnish aggregate, Lappland has become more asymmetric over the sample period.

However, the results in Table 6 show that only two of these results are supported by statistical inference: the business cycle in the capital region Nyland has indeed become more similar to the aggregate Danish business cycle and to the aggregate Nordic business cycle over the sample period.

The asymmetry indices for the Norwegian regions Østlandet and Nordnorge are displayed in Figure 3c. The plots seem to indicate decreasing trends for the majority of the comparisons. Østlandet has become more asymmetric relative to Finland and there is no change in asymmetry between Nordnorge and Finland, but except for these two results the plots

Figure 3b Asymmetry indices for the Finnish regions Nyland and Lappland

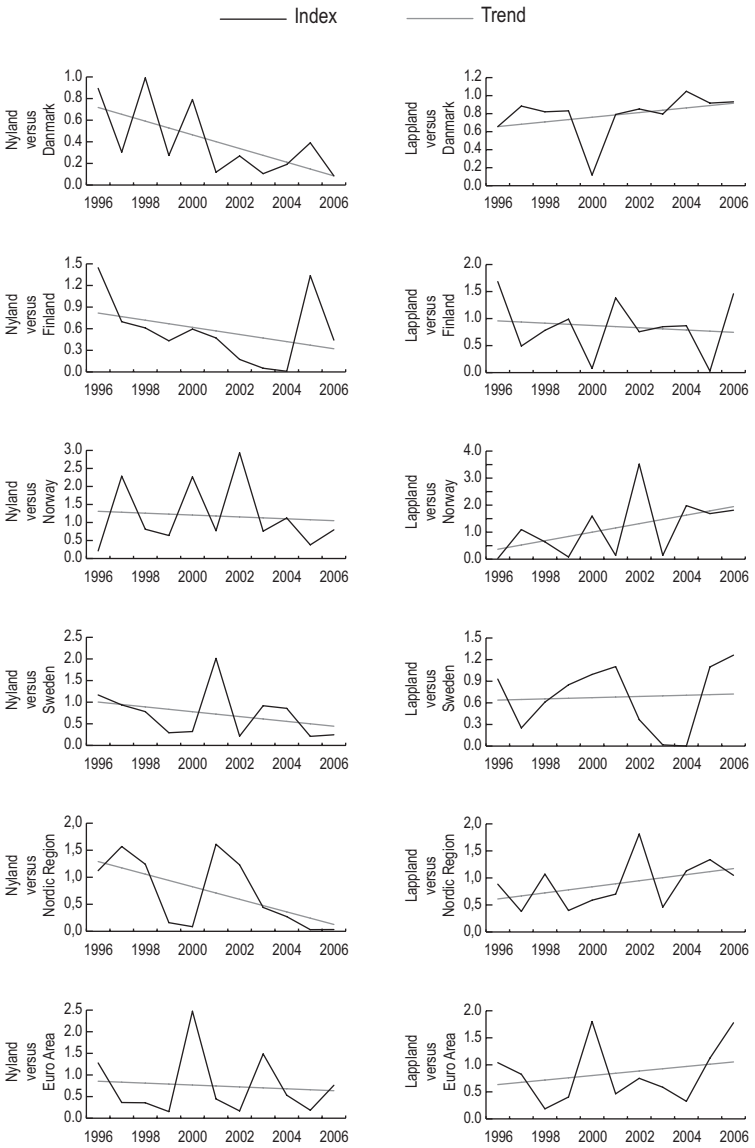
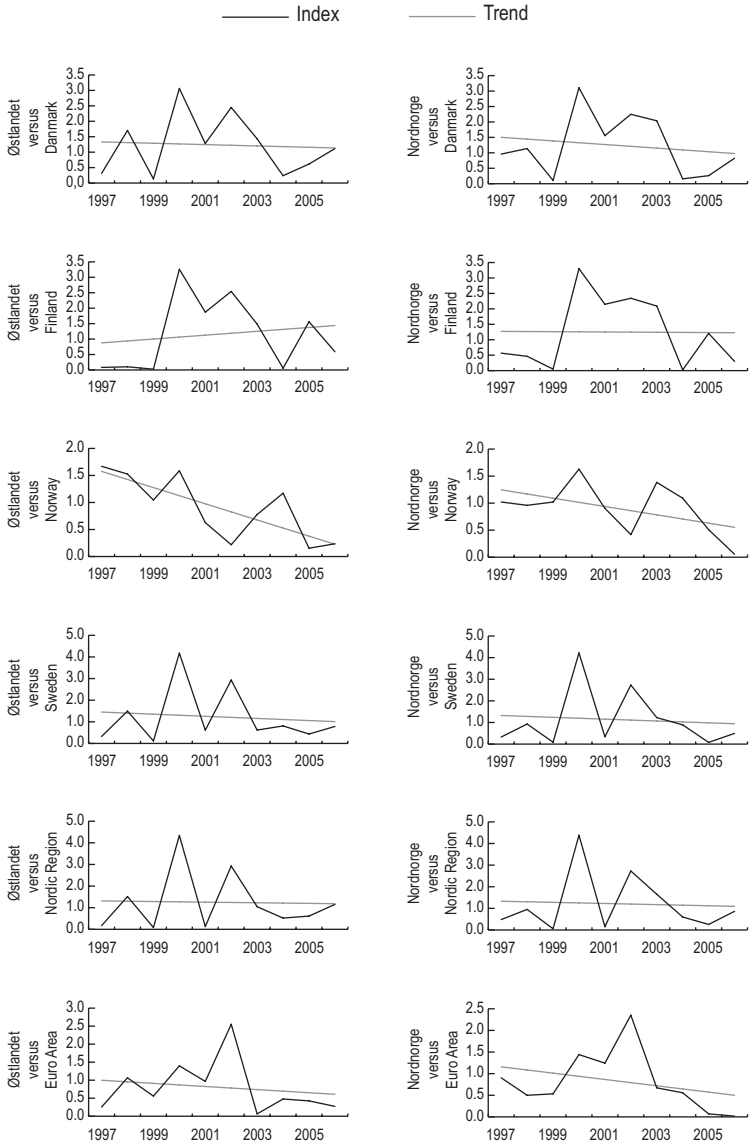


Figure 3c Asymmetry indices for the Norwegian regions Østlandet and Nordnorge



suggest that the two Norwegian regions have become more synchronous relative to the other Nordic countries, the Nordic region and the euro area.

However, the sample period for the Norwegian regions is the shortest in the set with data covering only nine years from 1997 to 2006. The results in Table 6 suggest that the large standard errors that follow imply that the only trends that are significantly different from zero are those of Østlandet relative to the Norwegian aggregate. The fact that this capital region has become more similar to the aggregate Norwegian business cycle is likely due to an increase in the region's relative importance to the country as a whole so that it is driving a large share of the aggregate variation.

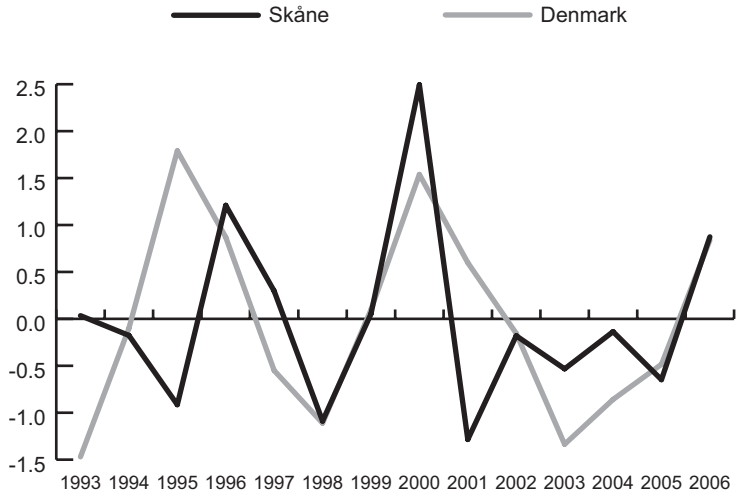
Finally, Figure 3d graphs the asymmetry indices for the Swedish regions Stockholm, Skåne and Norrland. We note that, while Stockholm and Norrland have become more synchronised relative to the aggregate Swedish business cycle, Skåne has become less synchronised with the Swedish aggregate. Both Stockholm and Skåne have become more synchronous with Denmark in recent years. We also see that the regional trends relative to Finland are very weak so there appears to be little change in synchronisation relative to the Finnish economy. All three regions seem to have become more in sync with the eurozone, but the southern regions Stockholm and Skåne more so than Norrland.

The results in Table 6 show that only two of these effects are statistically significant at the 10 per cent level or less: the Stockholm region has become more in sync with the euro area and the Skåne region has become more asymmetric relative to the Swedish aggregate during this period. While we elaborate on these findings in Section 6, it is worth noting that the case of Skåne is particularly interesting due to the launch of the Öresund Bridge in 2001. Akerman (2009) reports a strongly significant, positive effect of exports from Malmö to Denmark following the launch of the bridge. A possible explanation for the increase in asymmetry between Skåne and the Swedish aggregate is therefore increased integration with Denmark in recent years.[14]

Figure 4 plots the business cycle indices of Skåne and Denmark over the period 1993–2006. We do see some tendencies towards increased synchronisation after 2001. We revisit this issue when discussing commuting in Section 6.

[14] Interestingly, fitting a trend to the Skåne–Denmark asymmetry index on the sub-sample period 2000–2006 yields a negative slope coefficient of -.1966 with a t-value of -1.8591. Despite the extremely small number of observations, the coefficient is hence all but significant at the 10 per cent level.

Figure 4 Business cycle indices for Skåne and Denmark, 1993-2006



We perform some sensitivity analysis by setting the smoothing parameter in the HP filter to 100, as suggested in some of the previous literature. The main results were unaffected by this exercise. Increasing the smoothing parameter clearly affects the magnitude of the estimated slope coefficients and their associated t-values, but qualitatively the results were robust to a change in λ.

5.3 Summary of results

The results from the analysis of the asymmetry indices suggest that there are clear trends in many of the series and, even if we focus on the stricter test of statistically significant trends, some interesting results follow from the analysis. The results suggest that, over the full 1970–2008 sample, Denmark has become significantly more synchronous relative to the EU-4. Norway has become less synchronised with Finland, Sweden and the Nordic region as a whole. It follows that Finland and Sweden have become more asymmetric relative to Norway over this long sample. Consistent with Hassler (2003), the graphical analysis suggests that Sweden has become more synchronous with the eurozone over the period 1970–2009 but the trend in the asymmetry index is not statistically significant.

Following Montoya and de Haan (2008), we address a potential effect of the Maastricht Treaty by studying changes in asymmetry indices of the four countries over the period 1992–2009. We find that Denmark and Finland have become significantly more synchronised with the EU-4 as well as the eurozone over this period. The trend for Sweden, a member of the EU but not the EMU, is not statistically different from zero, suggesting no change in synchronisation relative to the EU-4 or the eurozone after the enactment of the Maastricht Treaty. Norway, having remained outside the EU as well as the EMU, has become more asymmetric relative to the European reference groups. In light of the fact that Finland has adopted the euro and that Denmark is a member of ERM II, this is a key finding that suggests that the common currency may indeed be an important catalyst for synchronisation.

At the regional level, Stockholm is the only region that has become significantly more synchronous with the euro area since 1993. Interestingly, Skåne has become more asymmetric relative to the Swedish aggregate but displays tendencies towards more synchronisation, albeit statistically insignificant, with Denmark.

6 POTENTIAL EXPLANATIONS FOR TRENDS IN SYNCHRONISATION

Having identified some interesting trends in business cycle asymmetry and synchronisation in the Nordic area, we next turn to potential explanations for these trends. While our results suggest that a common currency is a key determinant of synchronisation at the aggregate level, it is unlikely to be the only factor. Moreover, the question of what drives regional synchronisation remains unanswered.

The issue of mechanisms that may smooth regional asymmetries transcend the debate on monetary regimes. Regardless of whether a country is a member of the EMU or maintains an independent central bank, all the regions within a country are subjected to the same monetary policy measures. This raises a number of questions, including the following: (i) Are there factors such as factor mobility that effectively offset asymmetric shocks, domestically? (ii) Do workers in border regions, adjacent to countries with different monetary regimes, choose to migrate or commute abroad? (iii) Are border regions subject to the risk of a brain drain following regime-induced differences in wages across countries?

In the analysis that follows, our main focus is on labour mobility. However, we also briefly discuss other key factors suggested in the literature: distance, trade, industry structure and economic policy.

Due to limitations of the dataset, our hands are somewhat tied in the choice of method of analysis. Ultimately, we would like to approach these issues by means of regression analysis but due to a lack of data at the disaggregate level this is, unfortunately, not an option. We are forced to resort to correlations and abstract from the issue of causality. However, we are nevertheless able to provide some interesting empirical results by making the most of the data available.

6.1 Labour mobility

Labour mobility is one of the most important aspects of economic integration and is likely to be a key factor in explaining business cycle correlation and synchronisation. Worker flows may be of at least two different types: actual migration between regions, comprising workers who permanently relocate and reside in another area, and commuting. Below we discuss the two in turn.

6.1.1 Migration and the business cycle

Starting with migration, we have a complete dataset on migration at the country level 1980–2008. In this dataset, the origins of migrants as well as

their new locations are known. At the regional level, data are much scarcer. In general, we are not able to track migrants between regions. For some countries, we are able to determine the new home country of the regional emigrants but not their precise region of residence. For other countries, the situation is the reverse and we are able to determine the destination region but not the exact origin of the immigrant.[15]

Due to these data constraints, we use the following approach. At the country level, we track the total migration between countries *i* and country *j* and relate these worker flows to the asymmetry index for these two countries. Since we want to capture the extent of labour mobility, we choose to use the sum of immigrants and emigrants since this is likely to be a better measure of the extent of migration than net flows. At the regional level, where our data are limited to immigration, we study the relationship between the business cycle index and the net inflow to the area.

Table 7 displays mean immigration rates according to origins and destinations. The table illustrates how Norway and Sweden each represent on average almost half of the total immigration to Denmark while Finland's share is merely 6 per cent. Of all the immigrants to Finland, 79 per cent are Swedes, followed by Norwegians corresponding to 14 per cent and Danes corresponding to 7 per cent. Immigrants from Sweden comprise 61 per cent of the total immigration to Norway, followed by immigrants from Denmark at 31 per cent and immigrants from Finland. Finally, Sweden has the most even distribution among the 4 countries. Sweden receives the largest share, 40 per cent, of its Nordic immigrants from Norway, 31 per

Table 7: Immigration and emigration rates by origin and destination, mean rates 1990–2008, expressed as shares of the total number of immigrants and emigrants.

Immigration	To (reporting country)			
From	DEN	FIN	NOR	SWE
DEN		0.07	0.31	0.31
FIN	0.06		0.09	0.29
NOR	0.47	0.14		0.40
SWE	0.47	0.79	0.61	
Sum	1	1	1	1

[15] We cannot say that immigration (emigration) is equivalent to a net worker inflow (outflow) as large shares of all migrants are students or otherwise outside the labour force. For simplicity, however, we will use the terms migration and worker flow synonymously throughout the paper.

Table 8: Correlations between total migration and asymmetry indices for the Nordic countries, 1990–2008.

From	DEN	FIN	NOR	SWE
DEN		-0.84	0.27	-0.33
FIN	-0.84		-0.49	0.08
NOR	0.27	-0.49		0.07
SWE	-0.33	0.08	0.07	

cent from Denmark and finally 29 per cent from Finland. The pattern displayed in Table 7 suggests that Finns are the least mobile of the Nordic people; however, there is substantial emigration from Finland to Sweden. This result is likely to be related to distance as well as language barriers. Swedes tend to be very mobile and constitute a large share of the total immigration in the other Nordic countries.

The asymmetry index is likely to be positively correlated with migration for the following reason. Consider regions *i* and *j* and suppose that they are initially asymmetric so that if country *i* is in a boom, country *j* is in a recession and their asymmetry index is high. The recession in country *j* makes it hard for workers to find employment, so they migrate to country *i* where labour market conditions are much more favourable. This suggests that the asymmetry index and migration should be positively correlated.

The correlations between the asymmetry indices and the total worker migration are displayed in Table 8. We see that the asymmetry indices are positively correlated with the total migration between Norway and Denmark, Sweden and Finland and Sweden and Norway.[16] It seems that, if one of these countries is experiencing a slump while the other is in an upswing, people from the former country will migrate to the latter. These findings reflect the overall pattern in Table 7: Swedes tend to be the most mobile people in the Nordic region and they migrate primarily to Finland and Norway. Table 7 also suggests that a substantial share of all the immigrants to Denmark, 47 per cent, come from Norway.

In the remainder of cases, the correlation coefficients are negative and this goes against our prior according to the above reasoning. There are, how-

[16] The results in Table 8 are based on data reported by the countries in the column to the left. There is some discrepancy between the data reported by the immigrant country and the emigrant country. However, in all cases but one, the sign of the correlation coefficient is the same regardless of which country is providing the data. The exception is the correlation coefficient between Norway and Sweden, where the use of Norwegian data implies that the coefficient is negative and equal to -0.24.

Table 9: Correlations between net immigration and business cycle indices for the Nordic regions, 1993–2007.

Hovedstaden	0.33
Jylland	-0.13
Nyland	0.29
Lappland	-0.15
Østlandet	0.29
Nordnorge	0.09
Skåne	0.32
Stockholm	-0.03
Norrland	-0.24

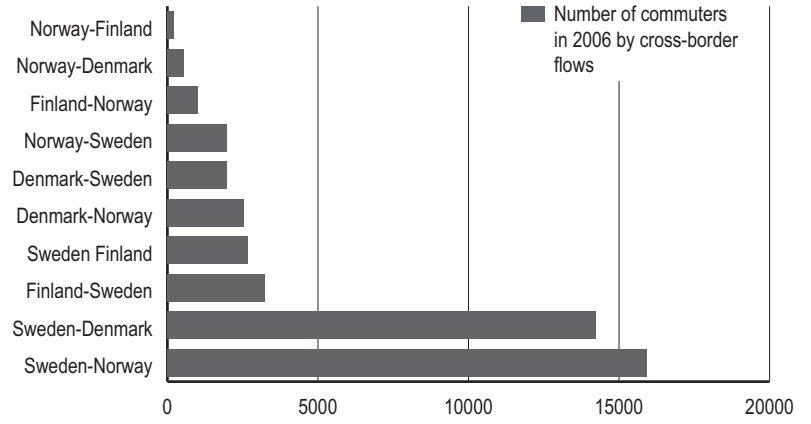
ever, a number of possible explanations for this finding. First, labour mobility may simply be low between these countries, so that asymmetric business cycles do not trigger worker migration. Second, it may be that, instead of migrating, residents in border regions choose to commute, in which case they are not represented in the migration data. Third, it may be that migration takes time and that worker flows respond to recessions with a lag, in which case simple correlation coefficients are insufficient. Plots of the asymmetry indices against migration are available on request.

Next, consider the regional level. Table 9 displays correlations between the business cycle indices and net immigration for the nine regions. A positive correlation between these two measures indicates that, when the regional economy is booming, this is associated with an inflow of agents to the area. The results indicate a positive correlation for all the capital regions except Stockholm, where the coefficient is negative but very close to zero. In the case of Sweden, Skåne is instead the only region where the business cycle is positively correlated with net immigration. The business cycle indices, plotted against the net migration inflow to the area, are available on request.

6.1.2 Cross-border commuting in the Nordic region

Similar to migration, cross-border commuter flows have the ability to offset the effects of asymmetric shocks. If there is an economic downturn, resulting in high unemployment in one country, workers can commute to a neighbouring country for work. In this section, we discuss some key aspects of commuting in the Nordic region. Due to our inability to match commuter data with our regional data on GDP, we are not able to present any econometric results. However, we provide a description of key commuter flows in the area and link them to our previous findings. Due to

Figure 5 Cross-border commuting in the Nordic region in 2006



space constraints, we focus on regions holding particular interest for our results on synchronisation.

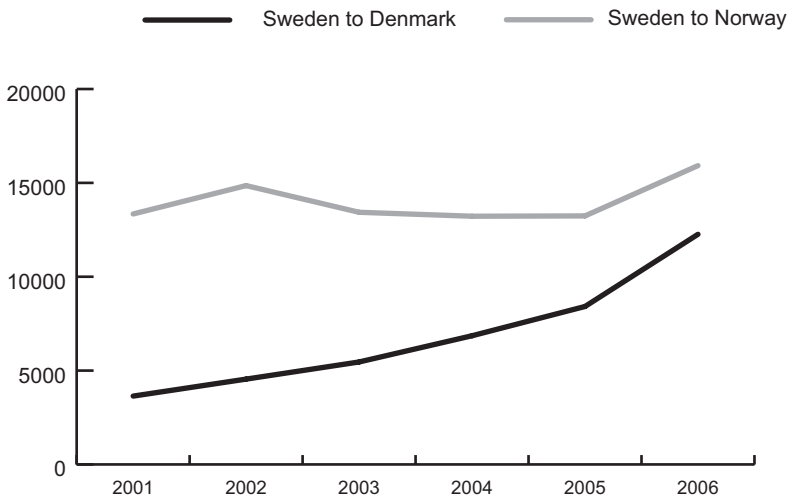
Swedish workers are by far the most prone to commute in the Nordic area. In 2006, Swedish commuting represented as much as 83 per cent of the total Nordic commuting. Moreover, Swedish commuting has increased rapidly in recent years.

The total number of cross-border commuters in the Nordic region is displayed in Figure 5. The results show that the strongest commuter flows took place from Sweden to Norway and from Sweden to Denmark. Recalling the results from Section 6.1.1, it therefore seems that Swedes tend to migrate to Norway and Finland but commute to Norway and Denmark. The weakest flows are those from Norway to Finland and from Norway to Denmark.[17]

Figure 6 plots commuting from Sweden to Denmark and from Sweden to Norway. While the latter is still more frequent than the former, we see evidence of a catching-up effect. Commuting from Sweden to Denmark has clearly grown more rapidly than commuting between Sweden and Norway. In fact, there was a 210 per cent increase in commuting from Sweden to Denmark from 2001 to 2006.

[17] In fact, the flows between Denmark and Finland are even smaller but these flows are so small that they have been considered negligible and are not even reported in the data.

Figure 6 Cross-border commuting from Sweden to Denmark and Sweden to Norway, 2001-2006



Except for commuting between Sweden and Norway, regional commuter flows closely mirror those at the aggregate level. In general, Sweden is the largest workforce exporter in the area while Norway and Denmark are the largest workforce importers. Moreover, the Öresund region comprises Denmark's largest labour market and Sweden's second largest labour market (Statistics Sweden, 2009).

Starting with commuting between Denmark and Sweden, the Öresund region has the most intensive interregional labour commuting in the Scandinavian area.[18] In 2006, 13 445 people commuted across the Öresund bridge. Figure 7 plots commuting from Sweden to Denmark along with commuting from Skåne to Hovedstaden. The exercise in the opposite direction is repeated in Figure 8, which graphs commuting from Denmark to Sweden and Hovedstaden to Skåne.

Figures 7 and 8 show that commuting in both directions comes very close to the country aggregate. Figure 7 shows a clear positive trend on both the aggregate and the regional level in commuting from Sweden to Denmark.

[18] However, there are large measurement errors in commuter flows between Norway and Sweden, suggesting that commuting across the Norwegian–Swedish border may be as extensive.

Figure 7 Commuting from Sweden to Denmark and Skåne to Hovedstaden, 1997-2007

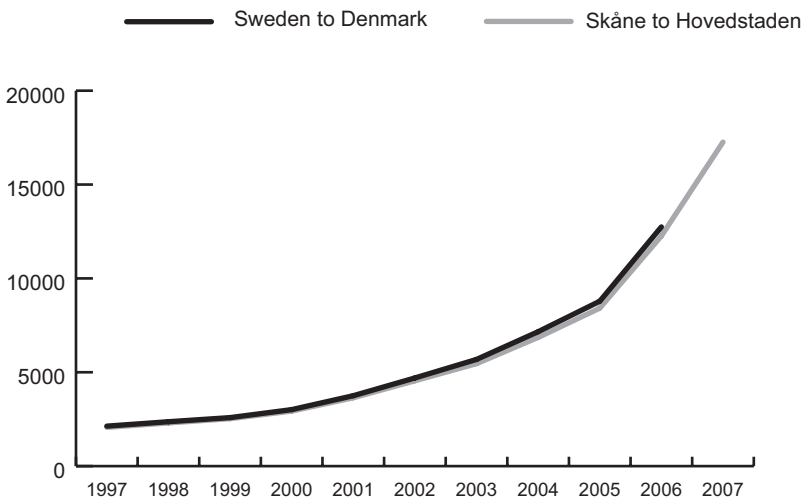


Figure 8 Commuting from Denmark to Sweden and Hovedstaden to Skåne, 1997-2007

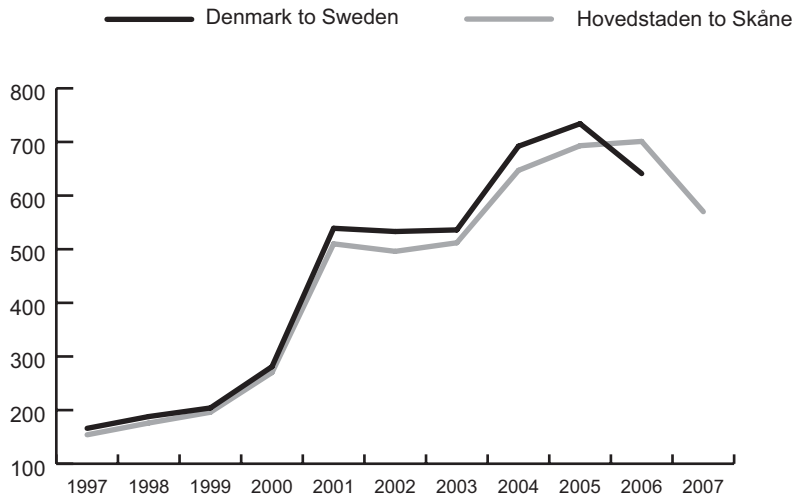
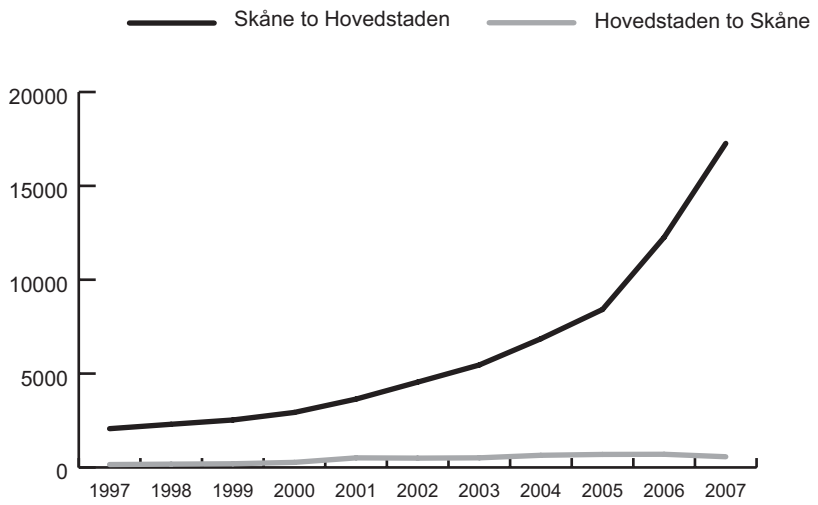


Figure 9 Commuting from Hovedstaden to Skåne and Skåne to Hovedstaden, 1997-2007



Regional commuting has grown by 22 per cent annually over the period 2001–2006. Between 2005 and 2006, there was a 45 per cent increase in commuting, the largest increase to date. The massive increase in commuting post-2001 is likely due to the completion of the Öresund Bridge, providing a connection between 2 conurbations.

Figure 8 shows that there was a sharp increase in commuting from Denmark to Sweden following the launch of the bridge. However, unlike commuting from Sweden to Denmark, there was a decrease in commuting from Denmark to Sweden in 2006 and 2007.

So how can we address the argument that Skåne is subject to a brain drain? Do skilled workers abandon Skåne in favour of higher wages in Denmark? First, note that the scales in Figures 7 and 8 are completely different. This is best illustrated in Figure 9, plotting commuting from Hovedstaden to Skåne alongside commuting from Skåne to Hovedstaden. The result is striking. In 2007, commuting from Skåne to Hovedstaden was almost 40 times as large as commuting in the opposite direction. It thus seems that commuting is indeed essentially one-way, and given that this is commuting rather than migration, it appears that a large share of workers are indeed choosing to reside in Sweden while working in Denmark. It is

quite possible that the Danish Flexicurity system has encouraged worker flows by its flexible hiring and firing rules.[19] Danish unemployment was a modest 1.8 per cent in total and 2.2 per cent in the region Hovedstaden in 2008 (Statistics Denmark, 2009).

Although commuting between Norway and Sweden is extensive, we choose not to comment on these flows as we were unable to detect any significant changes in the asymmetry indices of Norwegian and Swedish regions. The same applies to the remainder of commuter flows in the Nordic area: since we saw no significant tendencies towards convergence between any of these regions, we do not find further analysis to be warranted.

6.2 Other factors affecting synchronisation

Next, we briefly discuss other factors thought to affect business cycle synchronisation.

Starting with geographic distance, it serves primarily as a proxy for trade costs, in particular transportation costs. If regions or countries are located at close range to each other, trade costs are likely to be low and promote economic integration. Moreover, if neighbouring regions or countries share the same natural resources, their industry structures are likely to be similar and, consequently, they are likely to respond symmetrically to certain types of shocks.

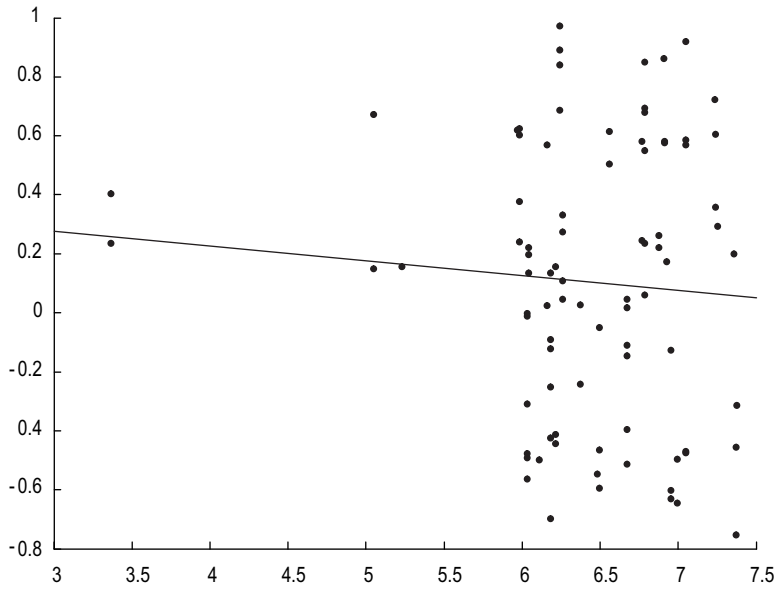
Figure 10 displays a scatter plot of log of distance on the horizontal axis and business cycle correlations on the vertical axis. The plot suggests that a weakly decreasing trend can be fitted to the data. It therefore seems that regions and countries at close proximity to each other tend to be positively correlated in terms of business cycles while distant regions and countries tend to be negatively correlated with each other. This confirms our prior. However, the result seems to be driven by two extreme observations and should be interpreted with caution.

It has been suggested in the literature that similarities in industry structure may cause countries or regions to become more synchronous; see for instance Afonso and Furceri (2007), Jonung and Sjöholm (1997) and Westlund et al. (2000). Hansson and Sjöholm (1996) provide a thorough discussion of the topic and conclude that the Swedish industry structure is not very similar to that of the euro area.

We briefly address this claim by plotting the distribution of employment shares in the agricultural, service and industry sectors in the Nordic

[19] For an analysis of the Danish Flexicurity system, see Andersen and Svarer (2007).

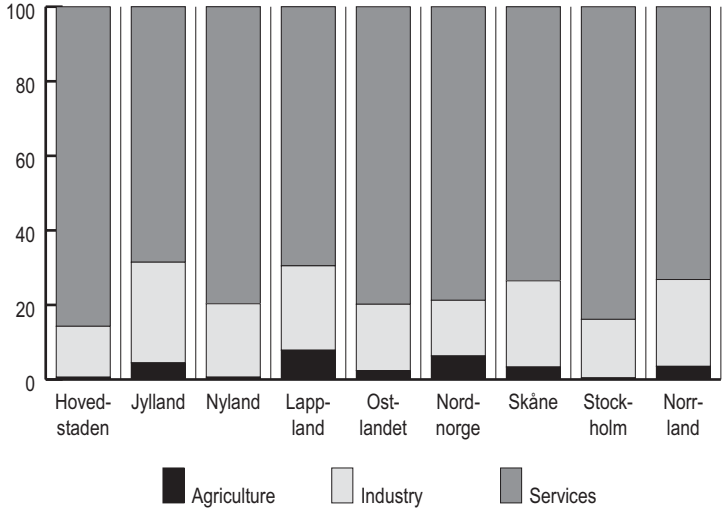
Figure 10 Business cycle correlations versus (log of) distance



regions in Figure 11. We see that the distribution is fairly homogenous across regions but some patterns can be detected. Although the service sector is the largest sector in all the regions, it is particularly large in the capital regions. Agriculture is the largest in rural areas. Since the distribution of industries is so homogenous across geographic regions according to this measure, it is difficult to argue that any of the regional asymmetries that we find are due to differences in industry structure.

Economic policy convergence is another factor believed to promote business cycle synchronisation between countries. We have already established that, in terms of monetary regimes, the Nordic area has become increasingly heterogeneous in recent years. While the Finnish and Danish exchange rates are pegged to the euro, the exchange rates in Sweden and Norway are floating freely. However, it is difficult to address this issue empirically as policy responses are endogenous to the business cycle and an empirical investigation of this relationship is beyond the scope of this essay. A discussion of the fiscal policies implemented in Denmark and Sweden since the launch of the EMU is given by Flam et al. (2009).

Figure 11 Industry structure in the Nordic regions



Finally, the extent of bilateral trade is clearly an important determinant of economic integration but data on bilateral trade are unfortunately unavailable at the regional level and the issue is left for others to address. Flam et al. (2009) provide a thorough discussion of the trade effects of the euro on the aggregate country level.

7 DISCUSSION

This essay studies regional and aggregate business cycle synchronisation among the Nordic countries Denmark, Finland, Norway and Sweden. We compute pairwise asymmetry indices, based on the HP-detrended real GDP, for countries and regions and study their evolution over time. Due to data constraints, our study of regions is limited to the period 1993–2007; however, we also consider a longer sample at the aggregate country level.

The results from simple correlation analysis suggest that Denmark is the only Nordic country to display a positive correlation with the eurozone over the 1993–2007 period. Finland, Norway and Sweden are negatively correlated with this area over this sample period. At the regional level, all the regions display a positive correlation with their respective countries. The Danish regions Hovedstaden and Jylland display the highest level of positive correlation with the eurozone aggregate.

Our findings show that over the long run, 1970–2008, Denmark has become significantly more synchronised relative to the EU-4. We do not find any statistically significant effects of Sweden or Finland becoming either more or less synchronous relative to the euro area over this long sample.

However, we do find a potential effect of the Maastricht Treaty when studying changes in the asymmetry indices of the four countries over the period 1992–2009. We find that Denmark and Finland have become significantly more synchronous relative to the EU-4 as well as the euro area over this period. In light of the fact that Finland has adopted the euro and that Denmark is a member of ERM II, this is a key finding that suggests that the common currency is an important determinant of synchronisation. This hypothesis is supported by the finding that Norway, having remained outside the EU as well as the EMU, has become significantly more asymmetric relative to the European reference groups. The trend for Sweden, a member of the EU but not the EMU, is not statistically different from zero, suggesting no change in synchronisation relative to the EU-4 or the euro area after the enactment of the Maastricht Treaty. Taken together, these findings suggest that the euro has indeed caused Denmark and Finland to become more synchronous relative to the euro area.

At the regional level, Stockholm is the only region that has become significantly more synchronous with the eurozone over this period. Skåne has become more asymmetric relative to the Swedish aggregate but displays tendencies towards more synchronisation, albeit statistically insignificant, with Denmark. The Swedish region Norrland shows no sign of divergence or convergence relative to the euro area or to Sweden as a whole.

When addressing potential causes for changes in synchronisation at the regional level, our analysis suggests that migration and labour commuting are important factors. We find evidence of a positive correlation between asymmetry and migration: if workers in one region fail to find employment in a downturn, they are likely to move to other areas where the prospects for employment are better. We find such a positive correlation between the two measures for Denmark and Norway, Finland and Sweden and Norway and Sweden.

At the regional level, we find a positive correlation between the business cycle and net migration inflow for 50 per cent of the regions. The result suggests that, in these regions, an economic upswing is positively correlated with an inflow of workers to the area.

Commuting is a key factor in the Nordic region. Interestingly, the launch of the Öresund Bridge has caused a dramatic increase in commuting from Skåne to Hovedstaden. Studying the direction of flows in this area reveals a striking picture: commuting from Skåne to the Danish capital region Hovedstaden is almost 40 times as frequent as commuting in the opposite direction. We find it plausible that the favourable evolution of Danish wages, lower taxes on labour in Denmark and the Danish Flexicurity system, with its flexible hiring and firing rules, are factors that have made this development possible.

Focusing on Sweden, where the prospect of future EMU membership is still subject to debate, our analysis suggests that the three Swedish regions Stockholm, Skåne and Norrland have become increasingly asymmetric over the 1993–2007 period. While Stockholm is the only region to have become more symmetric relative to the eurozone, and we see no significant changes in synchronisation for Norrland, Skåne shows clear signs of being increasingly dependent on Denmark and the Öresund region in particular after the launch of the Öresund Bridge in 2001.

Given that Skåne is so closely integrated with Denmark and shows significant signs of increased asymmetry relative to the rest of Sweden, it is likely that the region would benefit from adopting the euro. Since the results suggest that the Stockholm region has become increasingly symmetric relative to the eurozone, there is reason to believe that the Stockholm region would also be well off in a monetary union. Norrland displays a weak trend towards greater synchronisation relative to the euro area but the trend is weak and statistically insignificant.

Our most interesting finding is unquestionably the result that Denmark and Finland have become significantly more synchronous relative to the euro

area since 1992 while we see no such significant trend for Sweden. Over the same period, Norway shows significant tendencies to become increasingly asymmetric relative to the rest of Europe. This set of results supports the view that a common currency is conducive to business cycle synchronisation.

There is a widespread consensus among economists that the most important cost of monetary unification is the lost ability to pursue independent monetary policy to stabilise the economy. However, our finding that a common currency may promote synchronisation suggests that this cost is likely to diminish over time.

SAMMANFATTNING PÅ SVENSKA

Denna rapport behandlar aggregerade och regionala konjunkturasymmetrier i de nordiska länderna Danmark, Finland, Norge och Sverige. Eftersom de nordiska länderna valt att implementera vitt skilda penningpolitiska regimer de senaste 15 åren, studerar vi även tendenser till synkronisering över tid. Vi relaterar regionala och aggregerade konjunkturcykler till den aggregerade konjunkturcykeln i varje land, övriga nordiska länder, ett nordiskt aggregat, gruppen EU-4 (Frankrike, Tyskland, Italien och Spanien) samt Euroområdet. Slutligen relaterar vi våra resultat till viktiga aspekter på ekonomisk integration, huvudsaklingen arbetskraftsrörlighet.

Synkroniserade konjunkturcykler är ett krav för att en monetär union ska fungera väl. En hög grad av konjunktursymmetri innebär att medlemsländerna reagerar likartat på chocker, det vill säga att störningar huvudsakligen är symmetriska. Om området å andra sidan i stor utsträckning drabbas av asymmetriska chocker så är det inte lämpat för en gemensam valuta. Detta eftersom en monetär union innebär en gemensam penningpolitik där nationella penningpolitiska åtgärder inte längre kan användas för att reglera konjunktursvängningar.

Innan den Ekonomiska och Monetära Unionen (EMU) trädde i kraft den första januari 1999, förelåg en livlig debatt om huruvida Europa utgjorde ett optimalt valutaområde (OCA). De flesta ekonomer var eniga om att trots hög kapitalmobilitet och relativt omfattande handel inom Euroområdet, gjorde låg arbetskraftsrörlighet att området inte lämpade sig för en gemensam penningpolitik. Argumentet att medlemsländerna skulle bli mer integrerade över tiden och att deras konjunkturcykler därför skulle bli alltmer synkroniserade över tid fick dock starkt gehör.

Även om aggregerade konjunkturcykler är synkroniserade så kan ekonomiska störningar ge upphov till inhemska asymmetrier om regioner inom ett land är hetrogena. Även om intresset för denna fråga ökat på senare år så är området relativt outforskat med få empiriska studier inom fältet.

Frågan om regionala asymmetrier är av intresse även för länder som håller fast vid en självständig penningpolitik utanför EMU. Oavsett monetär regim, så är det värdefullt att förstå hur olika regimer svarar på penningpolitiska åtgärder. Argumentet är här detsamma som i en monetär union. Om centralbanken exempelvis vidtar en kontraktiv penningpolitisk åtgärd för att motverka ett inflationstryck som har uppstått i områden som befinner sig i en högkonjunktur, så är det sannolikt att denna åtgärd förstärker eventuella lågkonjunkturer som äger rum regionalt i andra delar

av landet. Det är med andra ord troligt att principen "one-size-fits-all" som präglar penningpolitiken per konstruktion, kan förvärra regionala asymmetrier om centralbankens mål är att stabilsera den aggregerade ekonomin.

Givet att länder är heterogena och reagerar asymmetriskt på olika chocker kan det finnas faktorer som hjälper till att jämna ut regionala asymmetrier. En viktig fråga är hur gränsregioner påverkas av närheten till grannländer som redan infört Euron som valuta. Det har exempelvis föreslagits att Skåne riskerar en "brain-drain" efter Öresundsbrons införande 2001. Anhängare av denna teori hävdar att arbetskraft från Skåne flyr till danska regioner där den danska valutans koppling till Euron, den gynnsamma utvecklingen av danska löner och lägre skatt på arbete har gjort Danmark till ett attraktivt alternativ för svenska arbetare.

Den nordiska regionen är unik i flera avseenden och är ett intressant studieobjekt. För det första så gör den gemensamma historien att länderna är lika i termer av ekonomiska institutioner. För det andra gör likheterna i språk och den geografiska närheten att området karaktäriseras av hög arbetskraftsrörlighet över gränserna. För det tredje så föreligger mycket handel inom regionen.

Trots deras likheter så karaktäriseras de nordiska länderna av olika grader av ekonomiska integration relativt övriga Europa. Norge, det minst integrerade av länderna, är varken medlem av EU eller EMU. Sverige är medlem i EU men har valt att stå utanför EMU och upprätthåller en flytande växelkurs. Danmark valde att inte gå med i EMU vid folkomröstningen 2000, men den danska kronen är knuten till Euron via ERM II. Finland är det enda av de nordiska länderna som har valt att gå med i EMU och blev en fullvärdig medlem vid starten 1999. Om det är så att en gemensam valuta leder till ökad integration så kan vi därför förvänta oss att Finland, och möjligen också Danmark har blivit mer symmetriska relativt Euroområdet men förväntar oss inte att se sådana tendenser för Norge.

I denna rapport undersöker vi frågan om asymmetriska chocker genom att studera aggregerade och regionala konjunkturcykler i de nordiska länderna med hjälp av aktuell, och i vissa fall helt ny, data. Utöver tvärsnittskorrleationer studerar vi tendenser till synkronisering över tid, det vill säga förändringar i asymmetri mellan länder, regioner och viktiga områden i Europa. Vi börjar med att studera korrelationer och synkronisering på landsnivå. De olika monetära regimerna som råder i de nordiska länderna gör att vi kan studera huruvida en gemensam valuta främjar synkronisering. Utöver landsstudien studerar vi inhemska asymmetrier på regional

nivå och identifierar regioner som blivit mer symmetriska med det egna landet, grannländer och Euroområdet. Även om vår studie av synkronisering på landsnivå ger en indikation på huruvida en gemensam valuta främjar synkronisering så är det troligt att även andra faktorer spelar in. Sist i analysen kartlägger vi därför andra aspekter på ekonomisk integration, huvudsakligen arbetskraftsrörlighet.

Våra huvudresultat är som följer. Resultaten från korrelationsanalysen indikerar att Danmark är det enda av de nordiska länderna som uppvisar positiv korrelation med Euroområdet över perioden 1993-2007. Finland, Norge och Sverige är negativt korrelerade med detta område under perioden. De danska regionerna Hovedstaden och Jylland uppvisar den starkaste positiva korrelationen med övriga Europa under urvalsperioden.

Vad beträffar förändringar i asymmetri över tiden, så visar resultaten att när vi fokuserar på statistiskt signifikanta trender i vårt mått på synkronisering, så har Danmark blivit mer synkroniserat relativt EU-4 över urvalsperioden 1970-2008. I likhet med tidigare studier ser vi tendenser till att Sverige har blivit allt mer synkroniserat relativt Euroområdet men trenderna är inte statistiskt signifikanta.

Vi undersöker även om Maastricht-avtalet haft betydelse genom att studera förändringar i vårt asymmetri-index för de fyra länderna över perioden 1992-2009. Vi finner att Danmark och Finland har blivit signifikant mer synkroniserade relativt EU-4 och Euroområdet över denna period. Norge, som varken är medlem i EU eller EMU, har blivit allt mer asymmetriskt relativt de Europeiska jämförelsegrupperna efter 1992. Trenderna för Sverige, som är medlem i EU men inte i EMU, är inte statistiskt signifikanta vilket tyder på att Sverige varken blivit mer eller mindre synkroniserat relativt EU-4 eller Euroområdet efter Maastrich-avtalet. Sammantaget indikerar dessa resultat att en gemensam valuta faktiskt främjar synkronisering.

På regional nivå är Stockholm den enda region som blivit signifikant mer synkroniserad med Euroområdet över perioden 1993-2007. Ett intressant resultat är att Skåne har blivit mer asymmetriskt relativt Sverige i övrigt men uppvisar tendenser till ökad synkronisering, om än statistiskt insignifikanta, relativt Danmark.

På regional nivå finner vi positiv korrelation mellan konjunkturcykeln och ett nettoinflöde av arbetare för hälften av regionerna i urvalet. Vad gäller pendling är kanske Öresundsregionen mest intressant eftersom lanseringen av Öresundsbron sammanföll med en dramatisk ökning av pendlare från Skåne till Hovedstaden. Pendlingen mellan dessa regioner är nästan uteslu-

tande enkelriktad: närmare 40 gånger så många människor pendlar från Skåne till Hovedstaden som i motsatt riktning. Det är troligt att dessa arbetskraftsflöden är en viktigt anledning till varför Skåne uppvisar avtagande symmetri relativt Sverige med allt högre symmetri relativt Danmark. Det är rimligt att anta att det danska Flexicurity-systemet har gjort det enklare för danska företag att anställa ny arbetskraft och att inflödet av pendlande arbetare från Sverige därför ökat.

Om vi fokuserar på Sverige, där frågan om ett framtida EMU-medlemskap fortfarande debatteras flitigt, så indikerar våra resultat att Stockholm är den enda regionen som har blivit mer symmetrisk relativt Euroområdet. Skåne visar tydliga tecken på ett ökat beroende av den danska ekonomin.

Eftersom Skåne är så nära integrerat med Danmark och uppvisar signifikanta tendenser till ökad asymmetri relativt övriga Sverige, finner vi det troligt att Skåne skulle vinna på en gemensam valuta. Vårt resultat att även Stockholmsregionen blivit alltmer symmetrisk relativt Euroområdet indikerar att även Stockholm skulle klara sig bra i EMU.

Vårt huvudresultat är att Danmark och Finland har blivit signifikant mer synkroniserade med EU-4 och Euroområdet efter 1992, samtidigt som Sverige inte uppvisar några sådana tendenser och vi ser tydliga tecken på att Norge blivit mer asymmetriskt relativt dessa områden. Sammantaget indikerar dessa resultat att en gemensam valuta är en starkt bidragande faktor till konjunktursynkronisering.

Det råder en utbredd enighet bland ekonomer om att förlusten av den självständiga penningpolitiken som stabiliseringspolitiskt instrument utgör den största kostnaden med att gå med i en monetär union. Vårt huvudresultat, att en gemensam valuta främjar synkronisering, antyder dock att denna kostnad avtar över tiden.

REFERENCES

Afonso, A. and Furceri, D. (2007), "Sectoral Business Cycle Synchronization in the European Union", Working Papers 2007/02, Department of Economics at the School of Economics and Management (ISEG), Technical University of Lisbon.

Agerskov, U. (ed.) (2008), *Nordic Statistical Yearbook*, Volume 46, Nordic Council of Ministers, Statistics Denmark, Nord 2008:001.

Akerman, A. (2009), "The Effect of Intra-Industry Trade on Aggregate Productivity: Is there a Bridge between Theory and Data in Oresund?", mimeo, Department of Economics, Stockholm University.

Andersen, T.M. and Svarer, M. (2007), "Flexicurity – Labour Market Performance in Denmark", CESifo Working Paper No. 2108, CESifo, Munich.

Backus, D.K. and Kehoe, P.J. (1992), "International Evidence on the Historical Properties of Business Cycles", *American Economic Review*, 82:4, pp. 864–888

Baldwin, R. (2006), *In or Out: Does It Matter?* An Evidence-Based Analysis of the Euro's Trade Effects, Centre for Economic Policy Research, London.

Bayoumi, T. (1994), "A Formal Model of Optimum Currency Areas," CEPR Discussion Paper 968, London.

Bayoumi, T. and Prasad, E. (1995), "Currency Unions, Economic Fluctuations and Adjustment: Some Empirical Evidence", CEPR Discussion Papers 1172, London.

Baxter, M. and King, R. (1999), "Measuring Business Cycles in the UK: Approximate Band-Pass Filters for Economic Time Series", *Review of Economics and Statistics*, 81:4, pp. 573–593.

Bergman, M.U., Hutchison, M.M. and Cheung, Y-W. (1997), "Should the Nordic Countries Join a European Monetary Union? An Empirical Analysis", UCSC Dept. of Economics Working Paper No. 389.

Christiano, L.J. and Fitzgerald, T.J. (2003), "The Band Pass Filter", *International Economic Review*, 44, pp. 435–465.

Clark, T.E. and van Wincoop, E. (2001), "Borders and Business Cycles", *Journal of International Economics*, pp. 59–85.

Darvas, Z. and Szapáry, G. (2004), "Business Cycle Synchronization in the Enlarged EU: Comovements in the Old and New Members", *Open Economies Review*, 19(1), pp. 1-19, February.

Darvas, Z., Rose, A.K. and Szapáry, G. (2005), "Fiscal Divergence and Business Cycle Synchronization: Irresponsibility is Idiosyncratic", NBER Working Paper 11580, National Bureau of Economic Research.

De Grauwe, P. (1993), "The Political Economy of Monetary Union in Europe", CEPR Discussion Paper 842.

De Grauwe, P. (1996), "Monetary Union and Convergence Economics", *European Economic Review*, Elsevier, 40:3–5, pp. 1091–1101, April.

EEAG (2009), *Report on the European Economy 2009*, Chapter 1, European Economic Advisory Group, CESifo, Munich.

European Commission (2007),"*One Currency for one Europe – The Road to the Euro*", EU Publications Office, Brussels.

Fatás, A. (1997), "EMU: Countries of Regions? Lessons from the EMS Experience", *European Economic Review*, pp. 743–751.

Flam, H., Fatás, A., Holden, S., Jappeli, T., Mihov, I., Pagano, M. and Wyplosz, C. (2009), *Konjunkturrådets Rapport 2009: EMU efter 10 år. Ska Danmark, Sverige och Storbritannien ansluta sig?*, SNS förlag, Stockholm.

Frankel, J.A. and Rose, A.K. (1997a), "Is EMU more Justifiable Ex Post than Ex Ante?", *European Economic Review*, Elsevier, 41:3–5, pp. 753–760, April.

Frankel, J.A. and Rose, A.K. (1997b), "The Endogeneity of the Optimum Currency Area Criteria", *The Economic Journal*, 108:449, pp. 1009–1025, July 1998.

Goodhart, C. (2007), "Currency Unions: Some Lessons from the Euro-Zone", *Atlantic Economic Journal*, International Atlantic Economic Society, 35:1, pp. 1–21, March.

Hansson, J. and Sjöholm, F. (1996), "Asymmetriska chocker – ett hinder för svenskt medlemskap i EMU?", *Ekonomisk Debatt*, 1996, 24:3.

Hassler, J. (2003), "Är Sverige i takt med Europa", in Ulf Jakobsson (ed.), *Därför euron – tio ekonomer om den gemensamma valutan*, Ekerlids förlag, Stockholm.

Hassler, J., Lundvik, P., Persson, T. and Söderlind, P. (1992), "The Swedish Business Cycle: Stylized Facts over 130 Years", Federal Reserve Bank of Minneapolis Discussion Paper No. 63, Minneapolis.

Hodrick, R.J. and Prescott, E.C. (1980), "Postwar U.S. Business Cycles: An Empirical Investigation", Carnegie Mellon University Discussion Paper No. 451.

Hodrick, R.J. and Prescott, E.C. (1997), "Postwar U.S. Business Cycles: An Empirical Investigation", *Journal of Money, Credit and Banking*, 29:1, pp. 1–16.

Inklaar, R., Jong-a-Pin, R. and de Haan, J. (2008), "Trade and Business Cycle Synchronization in OECD-countries: A Re-examination", *European Economic Review*, 52:4, pp. 646–666, May.

Jonung, L., Kinander, J. and Vartia, P. (2008), "The Great Financial Crisis in Finland and Sweden, the Dynamics of Boom, Bust and Recovery, 1985-2000", Economic Papers 350, European Commission, December.

Jonung, L. and Sjöholm, F. (1997), "Hur ser ett optimalt valutaområde ut för Sverige?", *Ekonomisk Debatt*, 1997, 25:5.

Jonung, L. and Sjöholm, F. (1998), "Should Finland and Sweden Form a Monetary Union?", Working Paper Series in Economics and Finance No. 224, Stockholm School of Economics.

Kenen, P. (1969), "The Theory of Optimal Currency Areas: An Eclectic View", in R.A. Mundell and A.K. Svoboda (Eds.), *Monetary Problems of the International Economy*, Chicago University Press.

Kouparitsas, M.A. (1999), "Is the EMU a viable Currency Area? A VAR Analysis of Regional Business Cycles", *Economic Perspectives*, Federal Reserve Bank of Chicago, issue Q IV, pp. 2-20, Chicago.

Lane, P.R. (2006), "The Real Effects of EMU", The Institute for International Integration Studies Discussion Paper Series 115, IIIS.

Länsstyrelsen (2008), "Regional systemanalys 2010-2020 – De fyra nordligaste länen", Region Västerbotten, Umeå.

McKinnon, R.I. (1963), "Optimum Currency Areas", *American Economic Review*, September, pp. 717–725.

Mihov, I. (2001), "One Monetary Policy in EMU. Countries, Regions, Channels", *Economic Policy*, October, pp. 370–406.

Montoya, L.A. and de Haan, J. (2008), “Regional Business Cycle Synchronization in Europe?”, *International Economics and Economic Policy*, 5:1, pp. 123–137.

Mundell, R.A. (1961), “A Theory of Optimum Currency Areas”, *American Economic Review*, 51, pp. 657–665.

Organisation for Economic Cooperation and Development (2009), *OECD Factbook 2009*, OECD, Paris.

Olshov, A. and Olofsdottter, K. (2003), ”Euron och Øresund”, Øresundsinstituttet, Malmö.

Olshov, A (2009a), ”Skåne bör hellre välja euron”, DI Debatt, *Dagens Industri*, March 27, 2009.

Olshov, A. (2009b), “Läget talar för Euro: Skånsk industri mer dansk än svensk”, ØI Analyse, Øresundsinstituttet, 2009

Pedersen, P.J., Røed, M. and Wadensjö, E. (2008), *The Common Nordic Labour Market at 50*, Tema Nord, 2008:506, Nordic Council of Ministers, Copenhagen.

Ravn, M. and Uhlig, H. (2002), “On Adjusting the HP-filter for the Frequency of Observations”, *Review of Economics and Statistics*, 84:2, pp. 371–375.

Statistics Denmark (2009), StatBank Denmark Database, www.statbank.dk/AULKP01

Statistics Finland (2009) “Finland in Figures 2009”, Helsinki.

Statistics Sweden (2009), ”Nordisk Pendlingskarta 2009”, SCB, Stockholm

Westlund, H., Johansson, M. and Molinder, J. (2000), “Exchange Rate Sensitivity of Swedish Regions”, ERSA Conference Papers 140, European Regional Science Association.

APPENDIX

Figure A1 The evolution of GDP in the Nordic Region 1970–2009

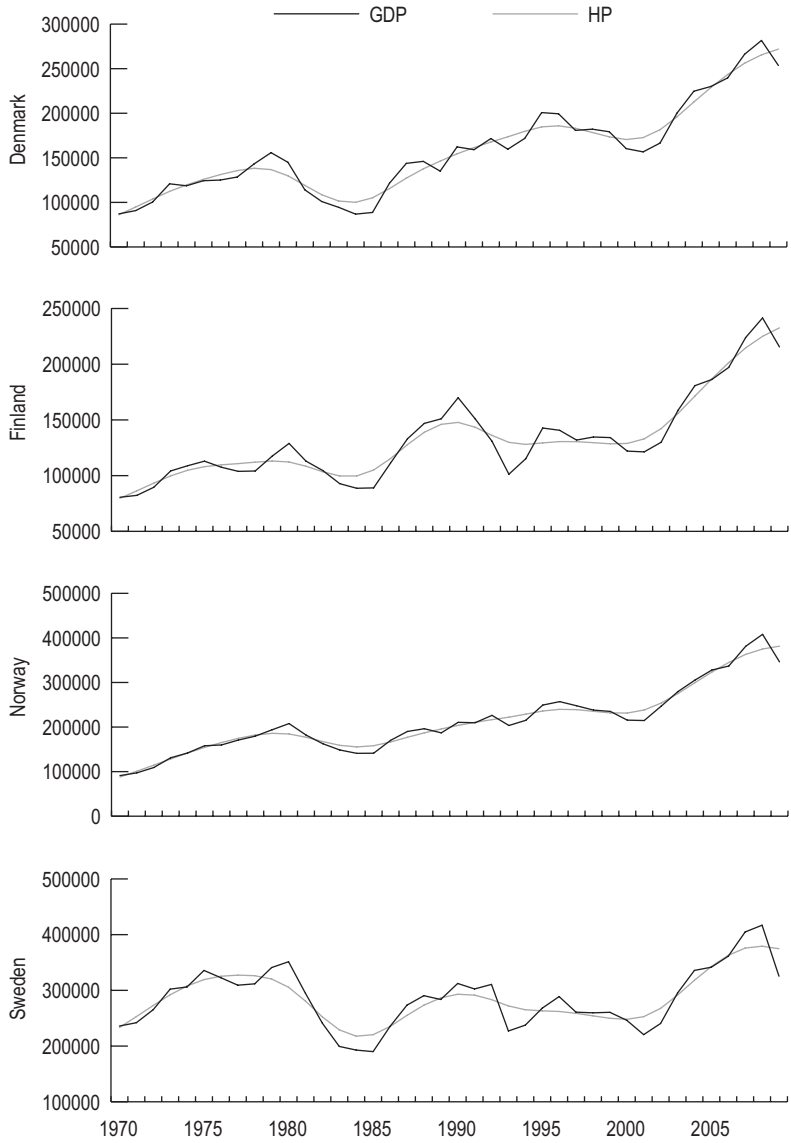
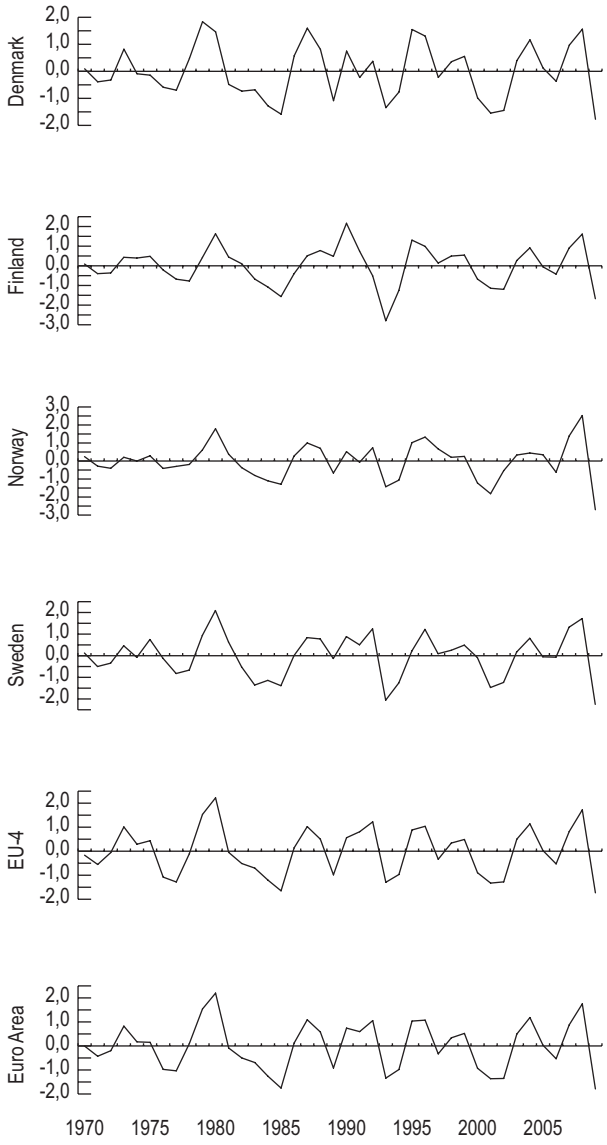


Figure A2 Business cycle indices for the Nordic Region, the EU-4 and the euro area 1970-2009



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