Monetary union and the economic geography of Europe

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1. Introduction

Does the economic geography of Europe matter for the success of the Euro, and will the development of the Euro, in turn, shape the economic geography of Europe? European integration has led to increased trade and more integrated production networks, but what does this imply about the specialisation of countries and regions? Might increased specialisation raise the likelihood that countries become more vulnerable to asymmetric shocks, posing problems for monetary union? Moreover, how will the introduction of the Euro itself affect Europe's economic geography – the location of particular activities, and ultimately perhaps also the location of population? Addressing these questions inevitably requires much speculation, but is the goal of this paper. Drawing on theoretical reasoning and on evidence from previous integration enables an informed discussion of these issues to be presented, and that is our objective.

The speculative nature of this discussion is of course increased by the facts that future membership of the Eurozone is unknown, and that establishing even the direct effects of monetary union (still less its full equilibrium effects) is not straightforward. Is monetary union just another reduction in transactions costs – and if so, how large a reduction? Is it something qualitatively different, to do with uncertainties faced by firms? Or will these effects be dominated by the success or failure of macro-economic management in the Eurozone? In considering these issues, we start with an overview of what is known about the costs of borders and the possible effects of monetary union on trade flows. At least to the extent that we believe the available empirical evidence, the Euro itself may substantially deepen integration.

As economic integration in Europe has increased trade flows, it has also changed the structure of EU economies, and monetary union is likely to extend this integration process. These changes affect the optimality of the EU as a currency area in several ways. On the one hand the integration stimulates trade and thus thickens the channels through which the effects of various shocks travel from country to country. On the other it can increase countries' specialisation, and thus their vulnerability to industry specific shocks.[1] The second of these forces was the subject of an early debate in which two opposing viewpoints emerged. The first of these, often known as the Krugman viewpoint, argued that increasing integration would inevitably lead to increased specialisation. The European Commission, on the other hand, argued that increased integration would tend to encourage intra industry rather than inter industry trade leading to less specialisation rather than more.[2] One of our tasks in this paper is to revisit this debate. Evidence that we present here suggests some support for the Krugman view; increasing product market integration has been associated with modest increases in specialisation across EU countries.

Following from this, we turn to investigate the spatial distribution of the likely effects of monetary union. Reductions in trade costs reduce the need for firms to be close to consumers, thereby facilitating relocation of activity. Employment will rise and wages will face upwards pressure in locations that become relatively favoured. Important in this context is the question of the 'ins' and the 'outs'. What is the cost to a country of foregoing the improved access to the Eurozone market?

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[1] When driven by the introduction of the Euro itself, these effects are referred to as "the endogeneity of optimality" by Kenen (2002). They may also arise as a result of increased product market integration that is not necessarily associated with the Euro.

[2] See de Grauwe (2003) for further discussion of the Krugman-Commission debate.

Enhanced labour mobility is often thought of as the key to the success of a monetary union as it provides a mechanism through which countries and regions can adjust to shocks. But increased labour mobility also has other consequences. What would happen to the economic geography of Europe if, following the integration of product markets and the adoption of the single currency, citizens in the EU became truly mobile across EU countries? Could increased labour mobility also reinforce a pattern of increased specialization and thereby increase the vulnerability to asymmetric shocks? What are the implications for the geographical distribution of overall economic activity? We address this issue by reflecting on the possible impacts on city sizes across the EU.

The rest of this paper is structured as follows. In section 2, we start by considering the relationship between exchange rate regimes and trade. The evidence we present there suggests that EMU may have substantial impacts on the trade between member states, implying that EMU is likely to thicken the channels through which shocks operate. In section 3, we turn to the issue of production structure and countries' vulnerability to asymmetric shocks, considering the role of both EMU and product market integration. Section 4 looks at the possible effects of EMU on the location of activity within the EU, focusing on the distribution between member and non-member countries. Section 5 takes a radical step further, looking at the potential effects of enhanced labour mobility on the city structure of the EU.

2. The impact of EMU on trade.

How much does a common currency influence real trade and investment decisions? The direct effects come through two main routes. One is the reduction in transactions costs, and the other is a reduction in uncertainty faced by firms. The second mechanism needs to be treated with some care. Exchange rate volatility is eliminated, but the effects of idiosyncratic supply shocks are likely to be increased. Also, exchange rate uncertainty can in principle be hedged, although doing this over the life of an investment project has never proved a realistic option.

The evidence on the importance of monetary integration comes from three main sources. A substantial empirical literature over some decades had failed to find significant effects of currency volatility on trade flows (for example Hooper and Kohlhagen, 1978, Kenen and Rodrik, 1986, Peree and Steinherr, 1989 and for a recent survey Goldstein 1995). But more recently, other economists have pointed to the massive importance of borders for trade flows, and the consequent ‘home market bias’. In particular, research on the US-Canada border showed that Canadian provinces traded with each other around 20 times more than with a comparable US state (McCallum, 1995). Correspondingly, price differentials between different provinces of Canada were much less than those across the US – Canada border (Engel and Rogers, 1998).

The most recent evidence comes from estimating gravity models that contain dummy variables to capture currency union effects. The work of Rose (Rose 2000, 2002, Rose and Glick, 2002) points to extremely large effects – with a currency union trebling the volume of trade. The effect seems implausibly large – until perhaps it is compared with the magnitude of estimates of home market bias. Rose’s work triggered a substantial debate (eg Persson, 2001). Overall, it seems likely that, for large economies, trade effects will be very much smaller than Rose’s early estimates suggested, but still very substantial. Furthermore, there is now some recent work looking at the changes in trade flows in Europe since the monetary union. Barr, Breedon and Miles (2003) and Micco, Stein and Ordonez (2002) find that monetary union has increased intra-Eurozone trade by between 12 and 30% over this short period.

How large are these estimated trade effects compared to those associated with previous waves of economic integration? The EU has moved through various stages of deepening product market integration since its formation as the EEC in 1957. It is well known that this deepening integration has been consistently associated with a rise in intra-EU trade volumes both as a percentage of GDP and as a percentage of overall trade. For example, for the 6 founding members, intra-6 merchandise imports as a percentage of GDP increased from 4.5% in 1957 to 10.3% in 1987, before dropping back to 9.5% in 1997.[3] The EU Commission (1996) estimates that trade volumes for manufactured products between member states have increased by 20-30% since the Single Market programme was launched in 1985.

Comparing these numbers with the orders of magnitude suggested by Rose, or with the gains

[3] IMF Direction of trade statistics. The recent fall arises as these are only merchandise exports, and only to the original 6 countries.

estimated to have occurred in the last couple of years indicates that, by the standards of previous rounds of integration, the effect of EMU is likely to be large. It could have trade effects of a comparable order of magnitude to cumulative rounds of previous integration.

3. EMU, specialisation and industry shocks

As product market integration and monetary union increase trade flows, they also facilitate specialisation. In this section we turn from overall trade volumes to production structure and consider the extent to which greater product market integration has promoted increased sectoral specialisation. Such specialisation is a source of the efficiency gains from trade. However, if Eurozone countries develop more dissimilar industrial structures then they also become more prone to idiosyncratic shocks, raising macro-management issues for the Eurozone. This was the essence of the argument put forward by Krugman in his seminal article in 1993 (see Krugman, 1993) – and repeatedly afterwards – that integration is likely to encourage increased industrial clustering and specialization which, in turn, makes the EU states more vulnerable to asymmetric shocks.[4]

Specialisation of countries and regions in the EU

Theory suggests that integration promotes specialisation through two different mechanisms: comparative advantage and clustering. Differences in endowments or technologies are the standard drivers of comparative advantage. The driving forces underlying clustering are those emphasised by economic geography: knowledge spillovers, thick labour market effects, or linkages with customers and suppliers. Whatever the cause, trade integration reduces the extent to which firms need to be close to final consumers, and thereby enables production to move in line with comparative advantage and facilitates clustering.

What has happened to specialisation and industrial location in the EU over the last few decades? Has integration – and in the particular the Single Market – led to more specialisation? Have the changes been dramatic or gradual? To help answer these questions, Table 1 reports an index of specialisation for EU countries for four different time periods. The index is the 'Krugman specialisation index' and we use it to measure the difference

[4] Moreover differences in production structures may imply asymmetries in monetary policy transmission across the EU countries. To the extent that this gives rise to heterogeneous cross-country responses the single monetary

between each country's industrial structures and that of the rest of the EU. [5] The results in Table 1 are for the manufacturing sector only, using a disaggregation into 36 industries.

Cross-country differences in the index are not our first interest (small countries tend to come out looking more specialised), and we focus on the changes in values of the index through time. These indicate two trends. First, most European countries showed significant convergence of industrial structures during the 1970s. Second, this trend was reversed in the early 1980s, and there has been substantial divergence from the early 1980s onwards for all countries except the Netherlands.

Table 1: The specialization of the EU Countries: the Krugman specialization index

	1970-73	1980-83	1985-88	1990-93	1994-97
Austria	0.307	**0.268**	0.280	0.288	0.340
Belgium	**0.314**	0.340	0.356	0.378	0.431
Denmark	0.554	**0.545**	0.582	0.578	0.578
Spain	0.416	**0.269**	0.294	0.323	0.317
Finland	0.591	**0.501**	0.513	0.522	0.582
France	0.169	**0.156**	0.175	0.170	0.166
UK	0.192	**0.160**	0.168	0.197	0.177
Germany	0.225	**0.224**	0.259	0.252	0.257
Greece	**0.527**	0.574	0.619	0.666	0.700
Ireland	0.698	**0.619**	0.661	0.673	0.769
Italy	0.307	0.305	**0.296**	0.322	0.380
Netherlands	**0.487**	0.543	0.533	0.505	0.495
Portugal	0.532	**0.473**	0.562	0.586	0.560
Sweden	0.409	**0.381**	0.389	0.386	0.480
Average	0.409	**0.383**	0.406	0.418	0.445

Source: Midelfart-Knarvik, Overman, Redding and Venables (2002).

Note: Krugman specialisation indices calculated for four year averages. This index allows us to compare each country's industrial structure with that of the average of the rest of the EU. It takes value zero if country *i* has an industrial structure identical to the rest of the EU, and takes maximum value two if it has no industries in common with the rest of the EU.

policy may induce idiosyncratic business cycles across the Euro area countries.

[5] For details on calculating the Krugman specialisation index see Krugman (1991) or Midelfart-Knarvik et al. (2002). For details on data see Midelfart-Knarvik et al. (2002)

A further interesting feature, illustrated in Figure 1, is drawn out by grouping countries according to their date of entry to the EU. Once again, the difference in heights of these curves between groups is not our primary interest, and we focus on the time trend. For the initial entrants there is a more or less steady increase in specialisation throughout the period. The 1970s and 1980s entrants (EC2 and EC3) exhibit an increase from the early 1980s. The last wave of entrants (EC4) show increasing specialisation from around 1992 onwards. This suggests then, that EU membership has been associated with divergence of members' industrial structures.

A further way to look at specialisation is by making bilateral comparisons, comparing the difference between each the industrial structure of all possible pairs of countries. Figures for these comparisons are reported in Midelfart-Knarvik et al. (2002) and confirm the findings above. Of 91 distinct country pairs, 71 exhibit increasing difference between the early 1980s and the 1990s. These findings of increased specialisation are consistent with other studies using different descriptive measures and data. See, for example, Amiti (1999), Brülhart (1998a,b), Brülhart and Torstensson (1996), CEPII (1997), OECD (1999), WIFO (1999) and Storper et al. (2002).

Of course, the bilateral comparisons also answer the question of which countries are most like (or most different) from each other. Matrices of bilateral comparisons are given in Midelfart-Knarvik et al. 2002), and here we simply note a few salient facts. First, the most similar pairs are the larger countries: France, Britain and Germany are most like each other; between Britain and France the degree of similarity has increased, but Germany has become somewhat different. Second, dissimilarities are greatest between the large countries and some of the smaller ones: France, Britain and Germany are most dissimilar to Greece and Ireland, and their dissimilarity is increasing. Third, amongst smaller countries there are similarities and dissimilarities: Greece, Portugal and Spain form one group, similar to each other but quite different from Finland, Sweden and Ireland.

All these studies point to there having been some increase in specialisation. An alternative way to look at the relocation of industry is to study the spatial concentration of particular industries, rather than the industrial specialisation of countries. The picture here is generally less clear-cut: some industries have become more dispersed and others more concentrated during the period. Perhaps the most noteworthy changes are in labour intensive industries such as textiles, apparel, and leather. These industries have become more spatially concentrated in the Southern EU countries, suggesting that these countries are vulnerable to further contraction of these sectors.

An EU-US Comparison

As argued by Krugman in (1993) and later by others, the US states are more specialized than the EU member states, while industries in the US are much more spatially concentrated than they are in the EU. The conjecture is that integration is likely to make the European economic geography more similar to that of the US. Unfortunately, it is difficult to find a precise way in which the US/ EU comparison can be made. The US and Europe are different sizes and geographical shapes, and this creates difficulties for direct comparison of levels of specialization and concentration measures, although time trends of the series can be compared.

Table 2 shows the Gini coefficients of specialization for the EU member states and the same statistics for the US. The obvious points here are the higher degree of specialization of US states, but a steady decrease in the specialization of US states, in contrast to the U-shaped performance of the European measures.

Table 2: Gini coefficients of specialization: US and EU

	1970-73	1980-83	1988-91	1994-97
US average	0.45	0.413	0.391	0.372
EU average	0.248	0.234	0.249	0.261

Source: Midelfart-Knarvik, Overman, Redding and Venables (2002).

Similarly, looking at the spatial concentration of industries, Braunerhjelm et al (2000) compute the spatial concentration of particular sectors relative to the spatial concentration of manufacturing as a whole, for both the US and the EU. This ‘Hoover-Balassa index’ indicates that, in six of the eight industries they study, the US is substantially more spatially concentrated than is the EU. On their measure the spatial concentration of EU industries has increased slightly, but this increase is substantially less than the continuing gap between the US and the EU.

EU industrial structure and its impact on the EMU

Pulling the findings of this section together gives a number of conclusions that have implications for the functioning of monetary union. Manufacturing production structures are becoming more dissimilar across the EU. The process of divergence is slow, with most economies having seen only a few percent of their industrial production move out of line with that of the rest of the EU. Of course, more divergence might be expected to show up in more disaggregate data, but nothing in our results suggest that the process is particularly rapid. Furthermore, the EU remains less regionally specialised (and its industries less spatially concentrated) than the US, suggesting that the process could yet have a long way to run.

This suggests that asymmetric shocks resulting from asymmetric production structures are becoming more, not less, likely as product market integration continues. Although changes across time are interesting, we shouldn't ignore the huge differences that exist in levels. Some countries, particularly Ireland, Greece and Finland have manufacturing production structures that are quite different from other countries in the EU. Again, the implications for asymmetric shocks are clear.

However, we think it important not to exaggerate the importance of these shocks. Manufacturing is only a small share of total economic activity in the EU countries. According to Funke, Hall and Ruhwedel (1999) country specific shocks are far more important than common international and industry-specific shocks, suggesting that the degree of volatility introduced to an economy through industry specific shocks is quite low.

4. Ins and outs; the economic geography of market size

The preceding section argued that the greater trade integration that will arise because of the Euro, is likely to be associated with a modest increase in specialisation, thereby slightly increasing the extent to which industry specific shocks will impact differently across countries. However, it has also been suggested that greater trade integration will change the economic geography of Europe in a more profound way, benefiting some regions more than others. This issue becomes particularly pertinent in evaluating the differential impact of the Euro on countries that enter, relative to those that stay out.

The key mechanism is that reductions in trade costs change the 'market access' of different regions. Firms in a region become better able to serve other regions, raising their profitability, but at the same time their local markets become subject to more intense competition, tending to reduce profits. There may also be changes in each region's 'supplier access' – its proximity to other manufacturing centres producing the capital goods and intermediates used in production. The standard 'new economic geography' provides an analytical framework for analysing and quantifying these effects, and in the present context their impact can best be seen by a simple example, calibrated on EU data. Figure 2 has on the horizontal axis a measure of the average trade costs on bilateral trade flows in the Eurozone. Thus, a figure of 1.45 corresponds to a 45% trade cost mark up, and is taken as our initial value, calibrated from intra-EU trade flows. This number seems high, but just reflects the large border effects that we discussed in section 2.

The experiment we consider is to reduce trade costs on intra-Eurozone trade, holding other trade costs constant, i.e. to move to the left along this axis. The left-hand vertical axis reports changes in trade volumes, and the right hand axis changes in real wages. These are all long run changes, in which manufacturing employment in each country returns to its original level. Trade volumes change as trade creation and trade diversion occur, and wages change as firms seeking to enter (or exit) from particular locations bid up (or down) wages.

Looking first at trade volumes, there is trade creation within the Eurozone, but trade diversion for the non-Eurozone EU countries. However, it is noteworthy that, to get increases in the volume of trade of the magnitude suggested in section 2, requires large changes in transactions costs; a 50% increase in trade volumes requires a reduction in transactions costs equivalent to about 12% of the value of the goods traded. This is despite the fact that the example has a very high price elasticity of demand for the output of firms (compensated demand elasticity of 8). The decline in trade with outsiders (trade diversion) is in contrast to the empirical studies of Rose and others who suggest that monetary union is associated with 'double trade creation' – an increase both internally and externally.

Real wage changes are illustrated on the right hand scale, for three groups of countries, Eurozone South (Greece, Portugal, Spain), rest of the Eurozone (labelled EZ-N) and EU non-Eurozone members. The relative positions of these three curves illustrate the forces that are at work. The EZ-N countries are those that benefit most from the improvements in market and supplier access. Since this example is based on the long run wage change that restores manufacturing employment, this effect is manifest in an equilibrium wage change – a real income increase of around 2% in the case of a reduction in transactions costs corresponding to a 12% increase in the volume of trade.

The southern Eurozone countries benefit very much less. This is because the market access improvements benefit firms in the centre rather more than those in the periphery. This arises for two reasons. One is simply that the example assumes the same *absolute* trade cost reduction for all Eurozone countries. The *relative* disadvantage of peripheral countries therefore increases. The other is that the market access forces are operating to draw activity into central regions at the expense of peripheral ones, a force that is not (at these levels of trade costs) overturned by factor price differences (see Krugman and Venables, 1990).

Finally, Eurozone outsiders suffer real wage decline, reflecting the changes in market access. Essentially, the more competitive Eurozone makes it harder for firms in non-Eurozone countries to survive, and this is reflected in (slightly) lower long run equilibrium wages.

The argument above is that the 'market access' of Eurozone countries will improve, and this is predicted to attract investment and raise income in the zone. However, the argument was developed purely in terms of a rather simple theoretical example, albeit one calibrated to real data.[6] What evidence is there on these effects? One source of evidence on the role of market size in attracting investment is provided by the literature on foreign direct investment. Brainard (1997) and many subsequent authors, have established the importance of market size in attracting such investments. Braunerhjelm et al (2000), in a study of foreign investment by Swedish based multinationals show wages would have to be around 7.5% lower to compensate (i.e. hold investment flows unchanged) for a 10% smaller market size..

Other sources of evidence come from looking directly at spatial wage patterns. The presence of a wage gradient from 'central' to 'peripheral' locations is well documented. At the world

[6] Baldwin et al (2001) provides another simulation study of industrial location in Europe focusing on the impact of integration on outsiders. In line with the results here, they report increased activity and income within the

level, Redding and Venables (2000) construct measures of the 'market access' of each country, and find that this has a statistically and quantitatively significant effect on determining income levels. At the European level, Breinlich (2003) finds a significant negative coefficient on the effect of distance from Luxembourg on countries per capita GDP, although the effect has fallen steadily from the mid 1980s onwards.

What these studies suggest then, is both the importance of looking at the spatial distribution of the effects of monetary union, and the possibility that the outs may suffer real income loss absolutely, as well as relative to the ins.

5. Labour mobility: Zipf's law and city size.

Finally, we speculate on an even more long run issue. What happens if after product market integration and the adoption of the single currency, the EU achieves factor market integration? Theoretical models of new economic geography make a clear implication about the role of factor mobility. Everything else equal, economies with more factor mobility show more agglomeration than economies with lower (no) factor mobility. Of course, it is very difficult to make predictions about the location of aggregate activity in a single Europe. We try to do just that here, by appealing to a well-known regularity that applies to city sizes.

A feature of the urban system in many countries is that the city size distribution tends to follow the rank size rule. That is, if we rank cities by size from the largest to the smallest, then the nth city has population 1/n that of the largest.[7] Thus, the second largest city has population ½ the largest, the third largest city has population 1/3 the largest etc. This rank size rule is illustrated in Figure 3. The graph plots the (natural) log of population against the (natural) log of the rank of city size for the top 100 US cities. Cities are ranked from largest to smallest. The highest ranked city is New York with a population of 19,876,488 in 1997.[8]

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integrated area with an adverse impact on outsiders.

[7] The rank size rule is sometimes also referred to as Zipf's Law. Zipf's law states that the distribution of city sizes follows a Pareto distribution with coefficient equal to one. Although people tend to use the two terms interchangeably, there are important differences between these two concepts which revolve around the fact that the rank size rule is a deterministic relationship whereas Zipf's Law is a probabilistic statement. See Gabaix and Ioannides (2003) for more details. For our speculative purposes, these differences do not matter and so we consider the more intuitive rank size rule.

[8] Although we use the term "city", data are actually for Metropolitan Statistical Areas taken from the U.S. Bureau of the Census, State and Metropolitan Area Data Book 1997-98, Table B.1. For a variety of reasons, MSAs are the most appropriate spatial unit to take when considering the rank size rule for the US. See Cheshire (1999) for a discussion.

The 100th largest city is Santa Barbara with a population of 198,760. The straight line shows what the graph would have looked like if US cities exactly followed the rank size rule. We can see that the US city size distribution is pretty close to obeying the rank size rule.

To make this statement more precise, we can regress the log of population against the log rank of the city. For the top 100 US cities a simple OLS regression gives:[9]

$$\ln \text{population} = 10.43 - 0.95 \ln \text{rank}$$
$$(\text{s.e.} = 0.32)$$

The 95% confidence interval for the zipf coefficient is (-0.88,1.0) so we cannot reject the null hypothesis that Zipf's law holds.[10] The fact that the actual coefficient is less than one shows that US cities tend to be bigger than we would predict given their ranking relative to New York.

Figure 3 also shows the same graph for EU cities.[11] The graph is plotted for the top 96 cities in the expanded EU 25. To give some idea of the underlying cities, the ten largest and ten smallest cities and their populations are listed in table 3. As before, the straight line shows what the graph would have looked like if EU cities exactly followed the rank size rule. The upper most line shows the true relationship for the EU. Casual comparison with the same figure for the US clearly highlights some differences. To aid the comparison, the dashed line shows us what the city size distribution would have looked like if EU city sizes had the same relative sizes as in the US. That is, if the Rhein-Ruhr had been to Paris, what Los Angeles is to New York; London had been to Paris, what Chicago is to New York etc.

[9] We report Newey-West standard errors which allow for heteroscedasticity and autocorrelation up to lag 1. Heteroscedasticity may result from the fact that larger cities may have larger variance. The ranking of observations may introduce autocorrelation. Allowing for lags greater than one does not change the results.

[10] As is well known, for the US, increasing the sample size up to approximately 140 cities brings the coefficient closer to 1. Increasing from 140 to 237 cities (the maximum number of agglomerations with population larger than 50,000) moves the coefficient back away from one. See Black and Henderson (2003) for more details.

[11] Data on EU cities is taken from the world gazetteer (www.world-gazatteer.com). Data are for metropolitan areas with population greater than 400,000. Metropolitan areas may comprise several cities linked to one another economically possibly extending across regional and national boundaries. Data comes from a variety of sources (both official and unofficial) and so is not guaranteed to be strictly comparable across countries. For our highly speculative purposes the data is more than adequate.

Table 3: Largest and smallest cities in the EU 25

Largest cities			Smallest cities		
Name	Rank	Population (thousand)	Name	Rank	Population (thousand)
Paris	1	11330.7	Grenoble	87	521.7
Rhein-Ruhr	2	11285.9	Szczecin	88	505.0
London	3	11219.0	Murcia	89	486.0
Ranstad (Netherlands)	4	6534.0	Belfast	90	484.8
Madrid	5	5130.0	Bari	91	480.7
Milano	6	4046.7	Montpellier	92	466.3
Berlin	7	3933.3	Bratislava	93	428.8
Barcelona	8	3899.2	Lublin	94	418.8
Napoli	9	3612.3	Messina	95	415.3
Manchester-Liverpool	10	3612.2	Coventry	96	409.1

From the figure it is clear that EU cities do not come as close to obeying the rank size rule as do US cities. Again, we can make the comparison more precise by considering a simple OLS regression for EU cities:

$$\ln \text{population} = 10.05 - 0.82 \ln \text{rank}$$
$$(\text{s.e.} = 0.04)$$

The 95% confidence interval for the zipf coefficient is (-0.74,-0.9). That is, we can clearly reject the null hypothesis that Zipf's law holds. Notice, further, that this confidence interval does not even include –0.95, the coefficient that we estimated for the US. As we work down the urban hierarchy in the EU, city sizes decrease much slower for the EU relative to both Zipf's law and the US. That is, the EU urban population is much more dispersed than either of these benchmark cases.

This evidence suggests that the EU city size distribution varies markedly from that found the US. In two recent papers, Gabaix (1999) and Duranton (2003) derive theoretical explanations for the emergence of Zipf's Law. Although the papers emphasise very different economic mechanisms (shocks to amenities and technological shocks, respectively), they do share one common feature: Zipf's Law arises in integrated economies when labour is mobile. Thus, in these models labour mobility is a necessary condition for the emergence of Zipf's Law. This begs the question, what might happen to the distribution of city sizes in the EU if (when) labour eventually does become mobile across member states?

Figure 3 already shows what would happen if we converged towards the US holding the size of the largest city constant around the 11 million mark. The relative city sizes of the top three cities would need to change so that the second and third city are both substantially smaller with populations of 8.9 million and 4.9 million respectively. This decline in city sizes would need to occur right across the urban hierarchy. If we take the US as an intermediate case, the smallest city we consider (Coventry) would see its population decrease from 409,100 to 229700. 37 cities would shrink to populations below 400,000. If the distribution actually converged to the rank size rule, the second and third ranked cities would have populations around 5.7 and 3.7 million respectively, while Coventry's population would shrink to just 118,000. 67 other cities would see their population decrease below 400,000.

The trouble with both of these scenarios is that the total urban population accounted for by the resulting agglomerations falls dramatically. If we converge to the US distribution the total urban population in these cities falls from 166.5 million to 102.6 million. If we take the rank size rule as the benchmark, then the total urban population more than halves to 58.3 million. This would imply a large increase in the number of smaller cities if the EU urbanisation rate is to remain stable.

Note that both of these predictions assumed that the largest city (be it Paris, Rhein-Ruhr or London) didn't change in size. An alternative is to allow the size of the largest city to increase sufficiently so that the top 96 cities still accommodate the entire urban population that currently live in these cities.[12] Taking the rank size rule as a benchmark, this would require the largest city to nearly triple in size to 32.4 million. At the same time, the second largest city would increase to 16.2 million and the fourth to eighth ranked cities would also increase in size. In contrast, the third largest city would shrink slightly to 10.8 million. All remaining cities would be smaller under the benchmark than they are in the current data. A

[12] Ignoring the integer nature of cities, the (log of) urban population for any given system is given by the area under the corresponding curve shown in Figure 3. Our first two examples took the intercept as given and imposed the relevant slope allowing the area to change. Our second two examples hold the area given and allow the intercept to change as we impose the relevant slope.

more plausible scenario emerges if we impose relative US city sizes as a benchmark. Now, the population of the largest and second largest city increase to 18.4 million and 14.4 million respectively. Again, the population of the third largest city shrinks somewhat to 8 million. Also, as before, other cities see their population rise. This time, the 4th to 10th ranked cities are bigger while all remaining cities see their population fall.

Given our current focus on monetary union and economic geography, the actual numbers are of less interest than the overall trend. Notice that in all these scenarios urban population becomes increasingly concentrated in just a few urban areas. That is, labour mobility could imply more disparities and less apparent cohesion across the EU. A number of comments are in order. First, this unequal outcome is not necessarily a worse welfare outcome that a more equal distribution. Second, the implications of this greater concentration for the operation of monetary policy depend critically on what these cities produce. Evidence in section 2 suggests that EU countries are becoming more specialised. If this production is taking place in cities, then this implies large specialised agglomerations that are susceptible to asymmetric shocks. Comparisons with the US suggest that the pattern is likely to be more mixed. In the US, the very largest cities tend to be reasonably diversified, while medium to smaller size cities tend to be quite specialised. See Henderson (1988, 1997) for details. If this pattern is replicated in the EU, then an interesting possibility arises. As we have seen in early sections, both product market integration and EMU tend to increase the degree of specialisation. In this section, we have seen that labour mobility may lead to population becoming more unequally distributed across cities. If specialisation patterns in these cities match those we observe in the US then the outcome will be an EU with some larger diversified cities and many smaller specialised cities. This suggests the probability of asymmetric shocks decreases for a large proportion of the population who reside in large diversified cities, but may increase significantly for a smaller proportion of the population who live in more specialised cities.

Of course, these speculations raise intriguing questions, but should perhaps not be taken that seriously. The theoretical mechanism driving Zipf's law is not well understood and it is noteworthy that the countries in which it holds least well are those with well developed federal structures**.** With this caution in mind, we note that the area would benefit from additional research. In the debate so far, all of the analysis has concluded that greater labour mobility is a good thing for dealing with asymmetric shocks. To our knowledge there has been little focus on the issues that we raise here. To emphasise, once we take geography as endogenous, increased labour mobility may help foster both increased agglomeration and specialisation. Thus, while this increased labour mobility may help us adjust to asymmetric shocks, it may actually make such shocks more likely, at least for a subset of the urban population.

6. Conclusions

Evidence points to the fact that monetary union is likely to lead to a substantial increase in trade volumes. Associated with this there will be a further increase in specialization in the EU as firms relocate to benefit from comparative and clustering. There are real economic benefits from these changes, while the associated increase in exposure to industry specific shocks is likely to be quite small. The most interesting issues surround the very long term development of the EU as a truly integrated economic space. Frequently observed regularities in the size distribution of cities suggest that there could be considerable adjustment pressures particularly on some of Europe’s largest cities.

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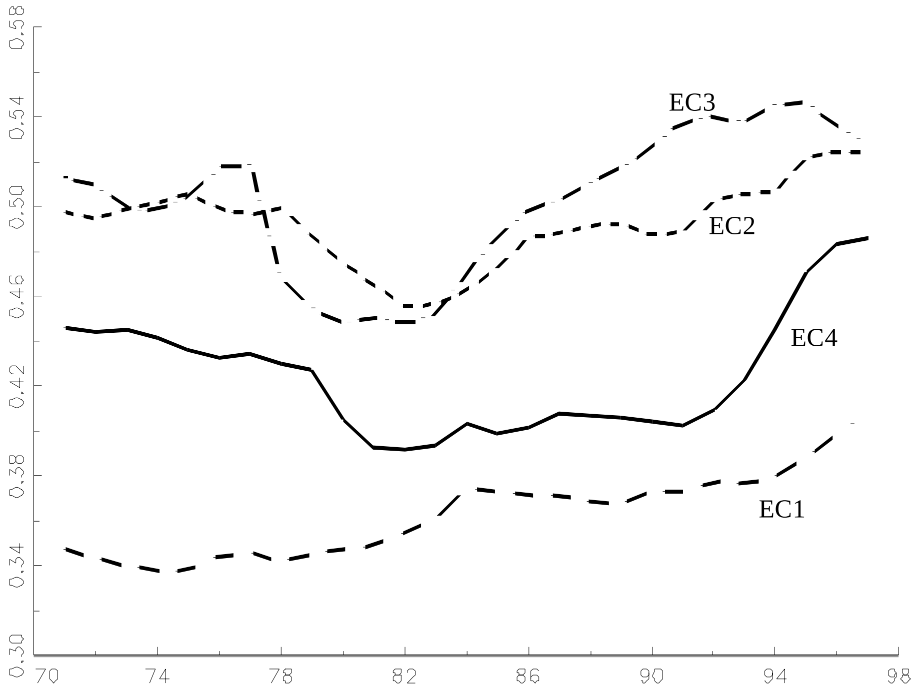
Figure 1: Specialization in the EU: Countries grouped according to entry date



Source: Midelfart-Knarvik et al. 2002
Notes: The figure plots two year moving averages of the Krugman specialisation index for countries grouped according to entry date. Definitions of groups are as follows:
EC1 Belgium, France, German, Italy, Luxembourg, Netherlands
EC2 Denmark, Ireland, the UK
EC3 Greece, Portugal, Spain
EC4 Austria, Finland, Sweden

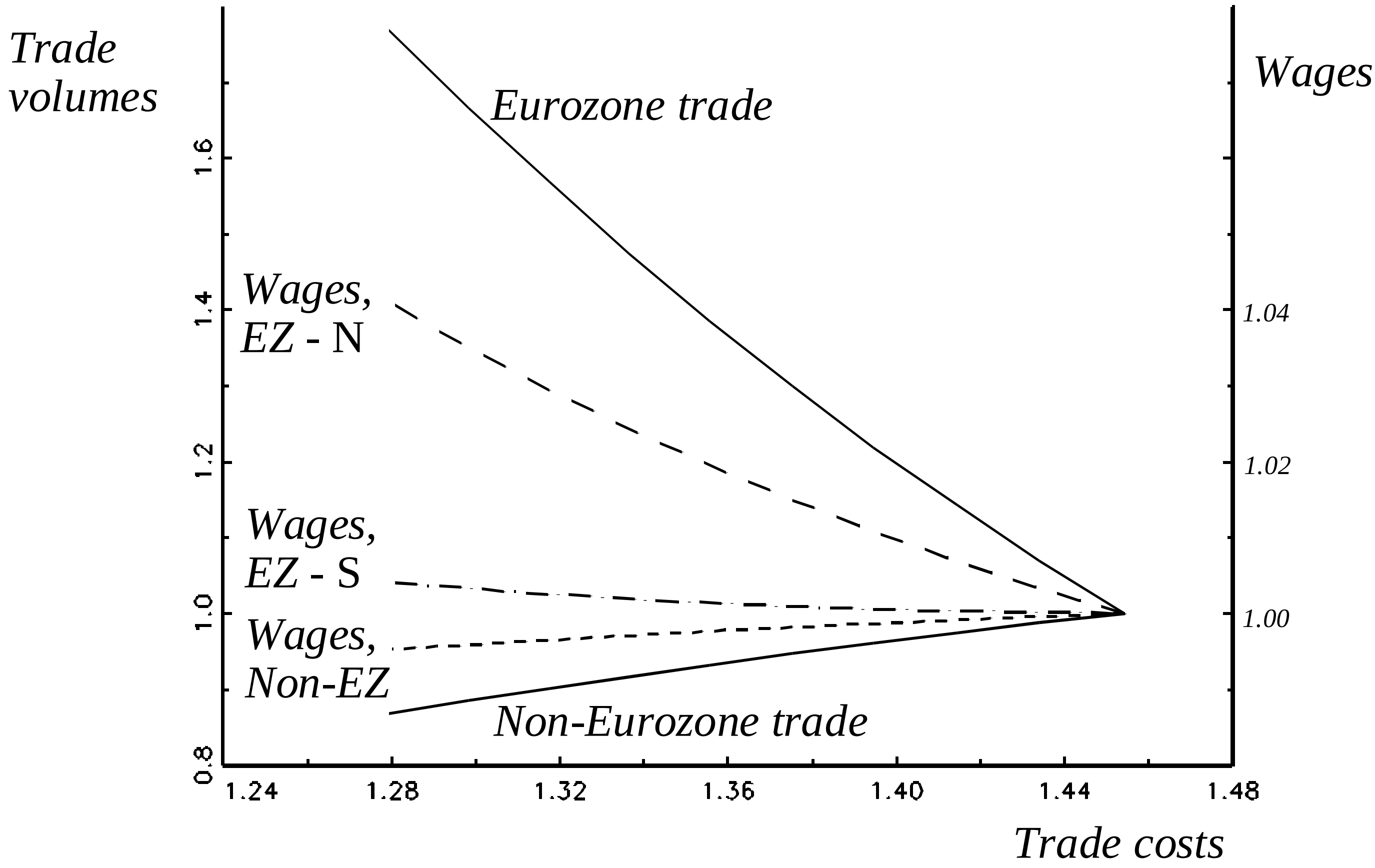


Figure 2: Trade and Wages

Figure 3: Zipf's law in the US and the EU.