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Specialization and concentration: a note on theory and evidence

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Abstract We study the prediction of the theory in Rossi-Hansberg [Rossi-Hansberg E (2005) Am Econ Rev 95(5):1464–1491] that, under quite general circumstances, lower transport costs increase specialization of regions or countries and decrease (regional) concentration of industries. This prediction contradicts the contention of other models and many empirical papers that specialization and concentration should move in parallel. We use two data sets on manufacturing industries across US States and EU member countries to show specialization and concentration do not develop in parallel. The empirical data replicates some of the features of the divergence predicted in the model.

Keywords Spatial model of trade · Concentration of industries · Specialization of countries · European integration · NAFTA

JEL L16 · R11 · R12 · R13

1 Introduction and motivation

Specialization of countries in particular sectors and concentration of industries in regions or countries has long been treated as closely related economic phenomena, if not identical.[1] This contention had been at least supported by the fact that empirical

[1] The most prominent example maybe is in Krugman's seminal book (Krugman 1991a, b, p. 77 ff), where data on specialization in four US regions and four large European countries are used as background for the analyses of regional concentration.

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studies use the same matrix of country and industry shares, of some economic activity variable like value added, production or employment, to calculate indicators on specialization as well as on concentration.[2] In models with two countries and two industries, any increase (decrease) in specialization is tautologically replicated by a parallel increase (decrease) in concentration. Empirical studies then often focus either on specialization or concentration, sometimes intentionally, sometimes by assuming that these would develop in parallel.

In the literature, models explaining specialization originated mainly in trade theory, while models explaining concentration came from location theory. Traditional trade theory predicts that countries specialize in products using intensively the relatively abundant input factor. Location theory discusses the reasons for agglomeration and dispersion. While economies of scale, as well as forward and backward linkages, favor concentration, congestion, low costs of immobile factors in the periphery and transport cost, favor dispersion. The theoretical strands are converging in the ''New Trade Theory'' and in the ''New Economic Geography'', both emphasizing economies of scales and imperfectly competitive markets. Particular interest has been raised by a purported inverted U-shaped relationship in specialization and concentration in the ''New Economic Geography'': where a surprising number of models predict that declining transport cost would first foster specialization and concentration, but then for very low transport costs lead to dispersion.

In the policy debate, increasing specialization has been welcomed, for example in the European or North American integration process, since it increases productivity. Rising concentration on the other hand, specifically concentration of economic activities in the core or in the North, has been more controversial as it may aggravate asymmetries or differences in per capita income. This danger has been widely discussed in the course of European integration, where some economists expressed the fear that activities in the core may increase at the cost of the periphery (Krugman 1991a, b; Hallet 2000).

This note is structured as follows. Section ''The model and its prediction'' discusses the basic setup of the model in Rossi-Hansberg (2005), and illustrates the implication that specialization and concentration do go in opposite directions when transport cost change. In particular, lower transport costs imply *higher* specialization and *lower* concentration. The model features two industries, a continuum of regions, iceberg type transport costs and agglomeration effects via production externalities. Section ''Previous literature and robustness'' discusses the differences between this prediction and the ''New Economic Geography'' prediction where concentration and specialization move in most models in parallel. Section ''Measuring specialization and concentration in empirical research'' present two data sets for industries across US states and EU-member countries, and choose indicators on specialization and concentration. The main results for US and Europe are presented in section ''Empirical evidence and robustness'', while section ''Conclusions'' concludes.

[2] To be more specific the specialization of a given country or region is a distribution measure on its industry shares, and a country is said to be specialized if a number of industries produce a large share of the particular activity. Concentration of a specific industry is a distribution measure on its country shares, and an industry is said to be regionally concentrated if a few regions produce a large share of its value added. Overall specialization (e.g. of the US or Europe) is then a weighted or unweighted average over the regions and overall concentration over industries.

2 The model and its prediction

In this section, we describe briefly the model in Rossi-Hansberg (2005) and explain why this model predicts that decreases in transport costs will in general result in increases in concentration and decreases in specialization.

Consider a finite region with a border at the west (north) given by $-S$ and one at the east (south) given by S. That is, the spatial structure is a line from $-S$ to S. Countries are closed intervals in the line. There are two industries, one that produces final goods and the other intermediate goods that are used as inputs in the production of the final goods. Firms cluster because of a location specific production externality that declines with distance. Final good firms need to buy the intermediate input from an intermediate good producer. Intermediate good firms receive final goods in return to pay for the inputs (labor and land) they use in production. Transporting goods is costly. The theory assumes ''iceberg transport costs'', so parts of the goods are lost in transportation.

Production per unit of land of a final good firm located at r is given by

$$x(r) = g^{\mathrm{F}}(z^{\mathrm{F}}(r))f^{\mathrm{F}}(n^{\mathrm{F}}(r), c^{\mathrm{I}}(r)), \tag{1}$$

where $n^{\mathrm{F}}(r)$ is the number of workers per unit of land hired by the firm, $c^{\mathrm{I}}(r)$ the units of intermediate input per unit of land, and $z^{\mathrm{F}}(r)$ denotes the productivity of a firm at location r. This productivity is determined by employment in the final good sector at other locations discounted by distance, namely

$$z^{\mathrm{F}}(r) = \int_{-S}^{S} \delta^{\mathrm{F}|r-s|} n^{\mathrm{F}}(s)\theta(s)\mathrm{d}s, \tag{2}$$

where $\theta(r)$ is the fraction of land at location r used for final good production.

Technology in the intermediate good sector is similar, except that the only two factors are land and labor. Productivity is also determined by an industry specific production externality.

Agents derive utility out of consuming the final good. They work for a firm at some location r and command a real wage $w(r)$ in units of final goods. For simplicity in this paper we assume that workers are freely mobile across space and industries. Rossi-Hansberg (2005) studies cases in which international migration is restricted.

Markets are assumed to be competitive so firms earn zero profits; in addition there is competition for production locations between industries. Under suitable technical assumption, one can show that in this framework, if the relative price of intermediate goods at location r, $p(r)$, is above a certain threshold, $\bar{p}(r)$, the location will be used for intermediate good production. If the relative price is below the threshold it is used for final good production, and if it is equal it is used to produce both goods. The threshold is determined by the relative productivity of both industries at that point in space.

In equilibrium, by no arbitrage and free entry, the relative price of intermediate goods will increase (as we move to a location to the east) at the rate of the sum of transport costs if intermediate goods are shipped from west to east (north to south) and will decrease at that rate if trade flows go in the opposite direction.

Consider now a decrease in transport costs, the slope of the relative price schedule will decrease in absolute value. This implies that small productivity differences

may still lead to trade between locations that are far apart. On the other hand, it provides an incentive to concentrate and take advantage of the production externality, since the cost of importing goods from the other industry, which is now further away because of the larger cluster, is lower. This in turn, implies an increase in the productivity of the clustered firms, and thereby an increase in productivity differentials in some locations.

These effects will lead to changes in specialization and concentration given a set of country or regional boundaries. In order for a particular region or country to specialize in the production of one good, agglomeration effects have to be stronger than the gain from being close to the market of that product (in the model, regions that produce the alternative good). As you move to the center of the agglomerated area, on one hand the agglomeration effect becomes stronger, on the other the loss from being away from costumers increases because of transport costs. For small transport costs, the productivity gain from agglomeration may dominate the loss resulting from closer customers. For high transport costs, the productivity gain does not dominate at the center of the cluster, and so a new cluster of firms producing the other good appears. Hence, the theory suggests that lower transport costs imply more specialization: a negative relationship between specialization and transport costs.

Concentration depends on densities of production in the areas specializing in the production of the different goods. Intermediate goods are needed to produce final goods and final goods are needed to pay workers that produce intermediate goods. Both goods use land as an input in production. As transport costs decrease, areas that are in the periphery will have better access to the markets at the center and so will produce more than before per unit of land. The extra production will imply higher productivity via the production externality. Hence, lower transport costs result in less concentration of employment in the industry. Given this, areas producing the other good will also produce relatively less at the center of the agglomeration and more in areas near regions producing the other good. This catching up of the periphery will be amplified by the production externality. Hence, lower transport costs in general result in less concentration: a positive relationship between transport costs and concentration.

There are rare cases in which responses in concentration are different from the one explained above. It may be the case, that as transport costs decrease and regions or countries become more specialized, productivity in some clusters of firms increases enough to yield increasing concentration. This happens when transport costs decrease sufficiently to eliminate completely some clusters of firms in the same industry, thereby increasing concentration in the remaining clusters.

To summarize, the model will, in a broad set of circumstances, produce increases in concentration and decreases in specialization when transport technology improves. Specialization is favored by agglomeration, deconcentration by better market access for the periphery. Changes in concentration and specialization patterns with the same sign happen in rare cases, specifically for changes in transport costs that eliminate some industrial clusters altogether.[3] Many examples of the

[3] How rare these cases are in numerical exercises depends on the particular calibration. However, since clusters of firms in an industry have positive length and transport costs change the boundaries between these clusters continuously, the relationship between concentration and transport costs will be positive almost everywhere. This is the sense in which these cases are rare. Of course, in numerical simulations the changes in transport costs are discrete so one can find cases in which this relationship is in fact reversed.

density of employment in space, some of which include the elimination of particular clusters, can be found in Rossi-Hansberg (2005).

The model cannot be solved in closed form. The construction of equilibrium requires solving for prices given both productivity functions, and then for the productivity functions consistent with these prices. This is a functional fixed point problem that can be solved numerically. We solve the model for different values of transport costs (expressed in percentage of goods lost in transportation per unit of distance, kappa) to illustrate the arguments above. Note that in many cases each point in space is specialized in a particular industry. If we divide the line in intervals of positive length there will be some intervals that produce in both industries and are, therefore, not perfectly specialized. Thus, the particular location of borders (between regions or countries) may influence the numerical results on specialization. To circumvent this problem, we separate the continuum of locations in four regions or countries, $N = 4$, and calculate average specialization measures (Gini indexes) for 100,000 different sets of random borders. Each point in space has the same probability of containing a border (see Fig. 1).

Concentration measures can be directly obtained from the densities of production at each location, so borders do not play a crucial role. Figure 1 plots the result of the model fixing real wages (population in the region may vary), or population, in the region. The results are very similar for both cases. Figure 1 shows how, for a broad set of transport costs, specialization increases and concentration decreases as transport cost fall. There is one exception as transport cost decrease from $\kappa = 0.1$ to $\kappa = 0.09$. In this case a cluster of intermediate good firms disappears therefore increasing concentration in the remaining clusters as discussed above.

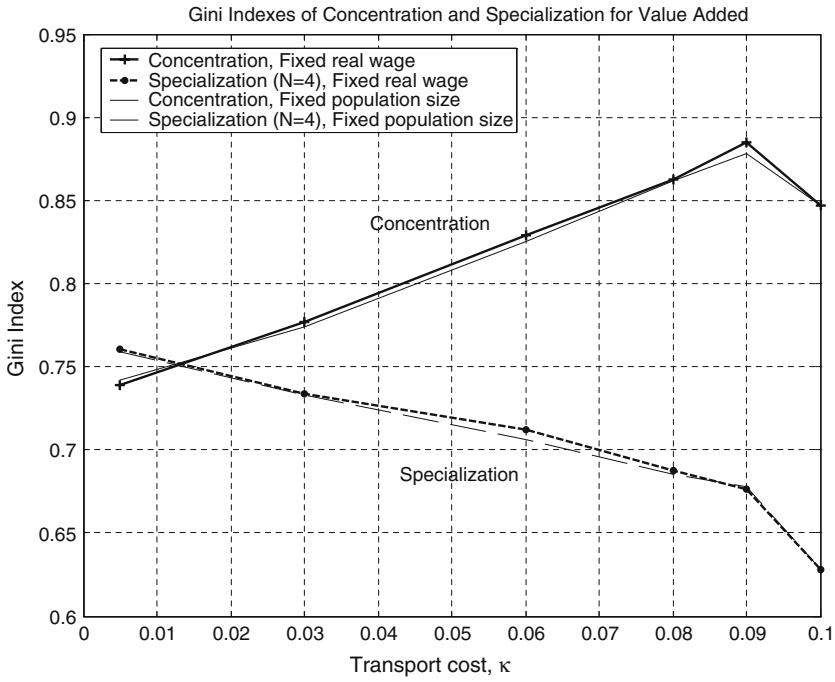

Fig. 1 Model predictions, concentration and specialization as a function of transport costs

Let us make a final remark important for the understanding of the model and for the empirical exercise: for concentration we use the distribution of production for all points in space, while for specialization we calculate average (over countries or regions) specialization in a country. Because each point in space is perfectly specialized we cannot calculate specialization for each location since this would give only ones's and zero's. We therefore calculate it for an aggregated spatial measure: A region or a country. This is the same in the data. Overall concentration is the sum or average over concentration in all regions of all countries (if there are 15 countries and 10 regions, concentration is measured within the countries and then averaged over the countries).[4]

The next section describes how these results on specialization and concentration compare to the predictions of the standard ''New Economic Geography'' literature.

3 Previous literature and robustness

Krugman (1991a, b) finds a U-shaped relationship between transport costs and specialization or concentration. For high transport costs the incentives to specialize are low. A firm moving to the area that does not produce the manufactured good would gain from increases in the demand for its product by local consumers, but will lose from paying higher wages (agents have to import all manufactured goods). The gain from the increase in sales (home market effect) outweighs the loss from higher wages (wage effect) because agents consume agricultural goods as well. Hence, regions do not specialize. As transport costs decrease, both the home market and wage effect decrease. However, the home market effect decreases faster than the wage effect. The reason is that agents substitute local manufactured goods for foreign manufactured goods, so the value of local sales decreases as transport costs decrease. Local wages decrease but at a lower rate, since part of the agents consumption is in agricultural goods. This implies that as transport costs decrease the incentives to move to the agricultural region decrease. Eventually, it becomes unprofitable for firms to deviate and specialization becomes an equilibrium. If transport costs are even lower, the loss in higher wages becomes less and less important, as does the gain from higher sales. However, for low enough transport costs the home market effect will decrease slower than the wage effect. The reason is

[4] One potential problem with this is—in the theoretical model—that the location of borders may matter. Because of this, we randomize on the location of borders, which leads to an average measure that does not depend on the location of these borders as discussed above.

We could, of course, calculate average concentration across countries in the same way. Calculate concentration for each region or country and then average them. This, however, would again imply that border location may be important and therefore would make us randomize over borders. If we do, we would then get an identical measure as the one we get if we use the whole distribution not broken down by countries.

Hence, although the spatial measures are in principle different (one is average across regions) the other uses the distribution point by point, this difference is not important given that computing average concentration across countries or regions would give identical results as long as we randomize border location.

As far as the question is concerned whether specialization and concentration may diverge, Aiginger & Davies, Journal of Applied Economics, 2004 show that in a two regions/two industry model this is the case for absolute indices and not for relative ones. This impossibility in this special case may exactly be the underlying reason why many economists (including Krugman) did not distinguish between concentration and specialization. If concentration and specializations are defined as relative concepts the trends over time cannot diverge in the two country, two industry case.

that if regions do not specialize, the location to which the firm is deviating will became almost as large as the original region. That is, local markets will increase and so the benefits from locating there will increase. Eventually, when transport costs are zero the wage and market effect will cancel out and there will be no incentives to deviate. This means that there will be no specialization.

In Krugman's model, specialization (one region specializes in agriculture and the other in agriculture and manufactures) implies concentration (all manufactures are produced in one region). The reason is that there are only two regions and the only possible equilibrium implies either identical regions or allocations where all firms producing manufactured goods locate in one region. The model cannot study how changes in transport costs change production in each of the goods in equilibria where neither region specializes completely. This problem is circumvented in Rossi-Hansberg (2005) because countries or regions do not specialize either completely or not at all. That is, any region (in the model an interval with positive length) may produce one or both goods, and we can analyze changes in the production of each sector at each location as we change transport costs (notice that each region can produce different amounts of goods even though they specialize in the same sector). Endogenous densities of employment at all locations add the possibility of understanding changes in concentration. These properties break down the tight link between specialization and concentration in Krugman (1991a, b) and in virtually all the papers that have used this seminal framework.

Interestingly there is an analogy to this U-shaped relationship in Rossi-Hansberg (2005). As transport costs go to zero, we get more and more specialization, however, when transport costs become zero, an equilibrium with no specialization (all locations produce the same proportion of both goods) appears. This is clearly an extreme case in this model, and this equilibrium is not stable, small increases in transport costs will result in a very specialized equilibrium.

A more recent related effort is the model in Chapter 18 of Fujita, Krugman and Venables (1999, from now on FKV). They study how in a setup with two countries, one of which has two regions, changes in trade costs between countries change the pattern of concentration and specialization. In contrast with Krugman (1991a, b), this model can and does predict different effect of trade costs on specialization and concentration patterns. The idea is that as trade cost decrease, agents consume less local products, thereby decreasing the benefits of concentration. On the other hand, the same effect creates an incentive for firms to cluster in a particular region since firms' sales depend less on local demand. All other forces are similar to the ones present in Krugman (1991a, b).

Even though the result of this model seem similar to our result, it is important to stress the differences. First, as we change transport costs, we alter the trade costs both between countries and between regions in a country. FKV only change trade costs between countries. Second, the continuity of regions in Rossi-Hansberg (2005) versus three locations in FKV, allows for a much richer set of distributions of the economic activity. In particular, it allows for a continuum of regions in all countries and not only in one of them. Finally, the source of congestion costs and agglomeration effects is different. Congestion costs in FKV are arbitrary while in Rossi-Hansberg (2005) they result from an increase in the distance to customers in other industries. FKV use the pecuniary externality model to generate agglomeration while we use a model with external effects. Given these differences, it is surprising and encouraging that the results in these two models are similar at least in this dimension. However, diverging trends between specialization and concentration

seem to be a rather robust prediction in the Rossi-Hansberg (2005) setting, while it is the exception in the models presented in FKV.

4 Measuring specialization and concentration in empirical research

Specialization of a country is defined as a distributional indicator on its industry shares. Our preferred indicator is the Gini coefficient. It measures how far away a country or region is from an equal distribution (in which each industry produces the same share of value added). The Gini is, however, not very intuitive quantitatively and is known to be influenced by the shares in the middle of the distribution. A good complement therefore is the share of the largest three industries. In parallel, (regional) concentration is a distributional measure on the country shares in an individual industry. The Gini coefficient now measures how far the actual distribution of countries is from the equal size of each country, therefore we also report which proportion of the value added is produced in the largest three countries.[5]

We use two data sets to calculate specialization and concentration. The first is a data set of 50 US states and 10 industries; the second is for 14 European States disaggregated into 23 industries. Both are available for the period from 1987 to 1996.[6] The value added is used as activity variable in both sets. This variable captures the overall importance of the economic activity of an industry or a country. The relative richness of the US data according to the number of geographic units versus the greater disaggregation of the European data set in the industry dimension is an advantage, as we want to learn whether the model prediction of diverging trends for specialization and concentration is replicated in empirical data under rather different circumstances and institutional settings (see Fig. 2).

5 Empirical evidence and robustness

For the US the average specialization of the states increased—as measured by the Gini index—from 0.1075 in 1987 to 0.1100 in 1996, or by 2.3%. The share of the largest 3 industries rises from 59.1% to 60.1%. The Gini coefficient for concentration of industries on the other hand declines from 0.2966 to 0.2892 or by 2.5%. Thus specialization increases and concentration decreases for the US as predicted by the model.

[5] We use absolute Ginis instead of relative. In the literature both forms of Gins are used, to our assessment the absolute ones are more popular. More importantly absolute and relative Gini's highlight different issues. Relative Ginis suggest that a country is specialized or concentrated if a few industries have together a high share relative to some other region. Ideally, specialization measures whether a country is engaged in a few sectors, and regional concentration measures whether a country is heavily populated in one region (e.g. the east). If this is the case and the west is barely populated then we assess its population to be concentrated. Relative coefficients standardize these tendencies by comparing the structure to a reference country. If the reference country is completely specialized or concentrated and the individual country is a little bit less, then relative indicators revealed it as not specialized or concentrated.

[6] The rising trend in specialization in Europe is statistically significant (as indicated by a significantly positive time dummy for the Ginis), as is the decreasing concentration in the US. The declining trend for concentration in the EU is not significant for these data (contrary to the evidence in Aiginger and Davies (2004) and in Wieser (2003) which use more disaggregated data and data sets including a longer span in the nineties. The same is true for the increase in specialization in the US. What is most important is that the difference between the coefficients for concentration and specialization (regressing both indicators on time) is significantly different for both the US and for the EU.

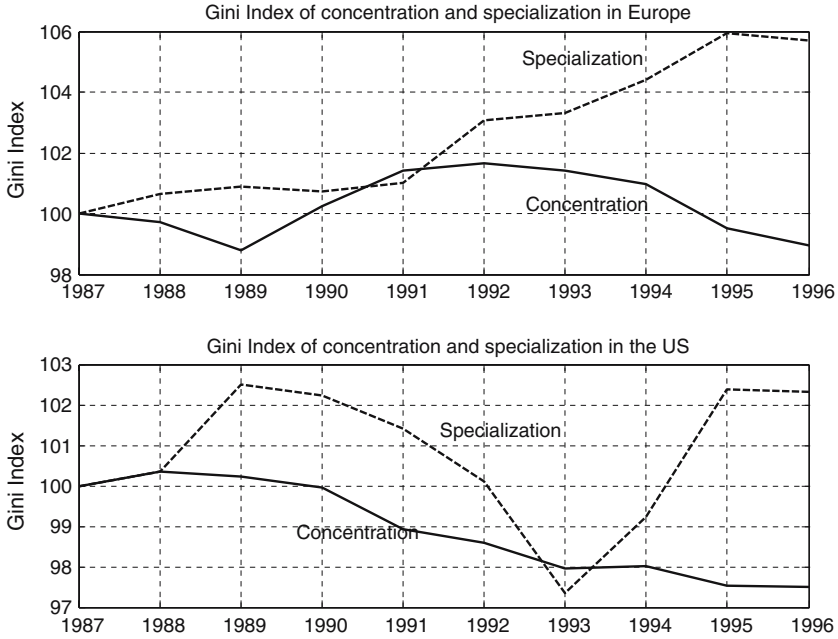

Fig. 2 Concentration and specialization trends in the US and Europe. *Source*: WIFO calculations using New Cronos (Eurostat) and US Census Bureau

For the European Union the average specialization of the member countries according to the Gini rises from 0.2001 to 0.2115 or by 5.7%, the share of the 3 largest industries increased from 37.0% to 37.8%. The average Gini for the concentration of industries decreased from 0.2994 to 0.2962 or by –1.0%.[7] Figure 2 presents the Gini coefficients for this period.

A thorough explanation of the economic and institutional determinants behind these trends is beyond the scope of this paper. But a few trends may add to intuition and indicate forces behind the development. In the US specialization is increasing firstly since the share of the largest industry—producing electrical and electronic products—is increasing in many states rather quickly. In Texas the increasing share of electrical and electronic industries more than compensates the decline of chemicals, in California that of the transport industry. Textiles, chemicals and machinery increase their share in value added in states where they are already large, indicating increasing specialization in scale intensive industries. Massachusetts specialized in paper & printing and machinery, Arkansas in food and paper. The decrease of regional concentration on the other hand comes from the largest states, namely New York, New Jersey, Massachusetts—and California to a lesser degree—lowering their shares in many individual industries and consequently in total manufacturing. Some very small industrialized states—the two lowest deciles—are increasing their share, indicating better market access of the periphery in a period of declining transport costs.[8]

[7] A more thorough description of the data, how they were made comparable, how errors were corrected, and missing values estimated see Aiginger and Leitner (2002).

[8] The share in value added of the 10 least industrialized countries increase from 1.48% to 1.97% or by 32% (Aiginger and Leitner 2002).

In Europe specialization is increasing since large countries like Germany, France and Italy increased their specialization in medium-tech industries, like machinery and chemicals. Nordic countries are increasing their shares in electronics and telecom (Finland, Sweden), or in pharmaceuticals (Denmark, Ireland). Southern low-income countries are specializing in labor intensive industries like textiles and shoes (Portugal, Italy). The trend for deconcentration became apparent after the enactment of the European Single Market Program in 1992 (before that a wave shaped pattern was observed). In general the larger countries and specifically Germany are lowering their share, and smaller peripheral countries in the North and the South are increasing their shares. Hence we observed a reduction in regional concentration as well as the core periphery pattern. Market access became better for countries at the periphery.

The results reported in general do not depend on the distributional indicator chosen, nor do they depend on the degree of disaggregation. As for the chosen activity variables, there is one important exception. The specialization of US states decreases in the last 10 years, if specialization is measured by employment. The reason for this is the extreme jump in productivity in the electronic sector (embedded in a broadly defined electrical and electronic product aggregate). The productivity increase is so large that the share of this industry in employment is decreasing, leading to decreasing in average specialization over US states. As for the period chosen, there are several studies reporting increasing specialization like Amiti (1999) and Bruelhart (1998) for Europe before the Single Market Program come into effect. A pattern of increasing specialization and wave shaped concentration has been reported by Midelfart-Knarvik et al. (2000) for Europe in the longer run perspective. For the US it is well established that regional concentration reached a maximum in the early twenties in the US (Krugman 1991a, b; Kim 1995). However, we recall that most studies do not investigate concentration and specialization separately. To our knowledge this is the first study to analyze specialization and concentration for both Europe and the US.[9]

[9] The results depend, however, on the use of absolute Gini-coefficients. In the literature both forms of Gins are used, to our assessment the absolute ones are more popular. But most importantly absolute and relative Gini's highlight different issues. Relative Ginis suggest that a country is specialized, if a few industries have together a high share, and an industry is concentrated, if a few regions have a high share. This to our understanding is what specialization wants to tell: whether a country is engaged in a few sectors, since in this case it might be open to industry risks etc. And regional concentration investigates the questions whether a country is heavily populated in one part, let us say in the east. If this is the case and the west is barely populated then we assess its population to be concentrated. Relative coefficients standardize these tendencies by comparing the structure to a reference country. If the reference country is completely specialized and the individual country is a little bit less it, then relative indicators revealed it as not specialized. The referee is correct insofar as the a priori of equal absolute amounts in case of big and small countries is not a realistic one. But look at the weaknesses of relative measures. If a country is very small let us say have a share of 1/1,000 of the total area and the share of its largest industry is originally at 1/1,000 too, and then a new plant is built its share increases to 1/200. This means its relative concentration is skyrocketing. Relative measures are very unstable for small countries, and weighted averages over countries are heavy influences by the development of small countries. But anyway, absolute and relative measures answer different questions. We think the absolute ones tell more for real world problems.

As far as the question is concerned whether specialization and concentration may diverge, Aiginger and Davies (2004) show that in a two regions/two industry model this is the case for absolute indices and not for relative ones. This impossibility in this special case may exactly be the underlying reason why many economists did not distinguish between concentration and specialization. If concentration and specializations are defined as relative concepts the trends over time cannot diverge.

6 Conclusions

We present the implication of the model in Rossi-Hansberg (2005) that, under rather general circumstances, decreasing transport costs will lead to an increase in specialization and a decrease in regional concentration. The driving force for the first effect is that lower transport costs allow firms to take advantage to a larger extent of the sector specific production externalities. The driving force for the second is that lower transport costs shifts production to regions far away from main markets since exporting to distant locations is less costly. This implication is in contrast with the result, advanced by most models in the ''New Economic Geography,'' that specialization and concentration react in parallel to changes in transport costs.

We use two data sets on manufacturing activity, one for US states and ten industries, the other for EU member countries and 23 industries. In both data sets specialization and concentration do not develop in parallel, and the kind of divergence is roughly in line with the model prediction. Specialization of industries is indeed increasing over the past years in Europe and the US, and regional concentration of industries is decreasing in both areas (in Europe to a less degree, starting from a much lower level).

Let us stress the caveats and goals of this note. We do not claim the empirical evidence as a test of the theory, since the empirical data are additionally influenced by variables not modeled and, above all, by institutional facts like the integration process of EU and NAFTA. However, the evidence confirms that specialization and concentration should be considered as phenomena, which can diverge, and the theory confirms that these differences can be rationalized with spatial theories. We do not extend or modify the framework introduced in Rossi-Hansberg (2005), we only illustrate its ability to rationalize the evolution of specialization and concentration. Similarly, the period for which evidence is presented is rather short, and the evidence is more illustrative than strong.

Earlier theoretical and empirical studies implicitly assumed that specialization and concentration were closely related or even equivalent phenomena. In this note we argue that they are not, and that understanding the differences between them is important to enhance our understanding of the distribution of economic activity in space. The goal of this note is to highlight the need for more empirical and theoretical research on this topic.

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