TRADE IN PARTS AND COMPONENTS AND CENTRAL EASTERN EUROPEAN COUNTRIES’ INDUSTRIAL GEOGRAPHY

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Trade in Parts and Components and Central Eastern European Countries’ Industrial Geography∗†

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Abstract

Growing inflows of FDI and the increasing integration of domestic firms into International Production Networks (IPNs) set up by EU-15 principals have yielded a rise in trade in parts and components for Central Eastern European Countries (CEECs). As a consequence, new patterns of localisation of industrial activities have been observed in the region since mid-1990s. In this paper, I propose a comprehensive model of trade and production which tries to explain cross-country variations of sectoral output on the basis of both comparative advantages (Ricardo, Heckscher-Ohlin) and agglomeration forces (home market effect, market potential), and singles out the role played by trade in middle products. The empirical implementation, on a panel of the four sectors where the largest share of CEECs’ trade in intermediates with EU-15 is concentrated, reveals that the higher is the involvement in IPNs the larger is the domestic share of regional output. Comparative advantages are a crucial determinant of localisation as opposite to the negligible role played by possible magnification effects due to domestic demand and market potential. I argue that results can be interpreted as an assessment of the predictive power of two alternative trade theories.

Key words: Trade in Parts and Components, Fragmentation of Production, Industry Localisation, Comparative Advantages, New Trade Theory, Economic Geography

JEL classification: F10, F12, F14, F15

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1 Introduction

Central and Eastern European Countries (CEECs) have undergone massive changes in trade and production patterns of specialisation during the 1990s. This transformation process, still not completed, has taken place mainly in response to the prospect of accessing the European Union. Increasing trade integration with EU-15 has forced CEECs to adjust radically their production structures to benefit from participation into international markets\(^1\). Substantial flows of inward FDI, delocalization of production activities from EU-15 countries, and outsourcing helped most of transition economies to achieve this goal. As a result, EU-15’s and CEECs’ trade patterns have now reached an almost perfect complementarity.

According to many observers, trade in parts and components has played a major role in determining the trade patterns of new-members. This has been especially clear since trade statistics based on SITC (Standard International Trade Classification) Rev.2 have become available. The direct distinction of parts and components in four- and five-digit product groups has allowed researchers to assess the importance of trade in intermediates for several industries, according to the varying degree of differentiation of middle products across commodity groups. In particular, the focus has been on crucial Machinery and Transport Equipment product groups\(^2\), which are among those enjoying the best coverage.

On the basis of this type of information, Kaminski and Ng (2001) show that the increasing integration of CEECs firms in International Production Networks (IPNs) set by EU-15 principals have made middle products the fastest growing component of their trade flows.

One may expect that changes in trade patterns induced by the rise of trade in intermediates may cause a relocation of industrial activities. Focusing on the 1990s, De Simone (2007) finds that sectors in which most of the exchanges in intermediates between "new" and "old" EU-members are concentrated have experienced an astonishing increase in their relative weight with respect to regional output. This has led to a significant geographical redistribution of activities. On a country by country basis, trends reveal strong differences among CEECs: some of them are leading the process of acquisition of activities as opposite to others that are experiencing a despecialisation. But these results are obtained on the basis of descriptive statistics and do not allow for a full identification of a one-way link between trade in intermediates and the agglomeration/dispersion of industries.

In fact, in the wake of international fragmentation of production, flows of middle products from one location to the other could be generated by different kinds of relationships among firms. For example, they could arise because of the presence of subsidiaries of MNCs operating in that country, as well as because some firms wish to delocalize certain segments of the production process (offshoring), as well as because of independent firms developing an outsourcing

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\(^1\) See Hoekman and Djankov (1997).

\(^2\) Yeats (1998) shows that Machinery and Transport Equipment group (SITC 7) includes approximately 50% of world trade in all manufactures.
contract with a foreign partner. Aggregate data at country-industry level cannot help to distinguish among different ways in which cross-border production sharing can take place. But they still allow one to explore the influence that emerging trade patterns can have on the localisation of industrial activities, along with other possible forces at work in an integrated economy.

This is precisely the purpose of this paper. I propose a comprehensive framework where traditional trade theories (Ricardo, Heckscher-Ohlin) are combined with features of New Trade Theory (NT) and New Economic Geography (NEG) to trace localisation dynamics of industrial activities.

Ulltveit-Moe et al. (2000) develop a framework in which old and new theories coexist but, by assuming perfectly competitive markets and comparative advantages of the Heckscher-Ohlin type only, they neglect other possible driving forces (i.e. magnification effect of domestic demand on production) and cannot identify properly specialisation patterns due to scale economies and differences in technology. The EURORA model introduced by Forslid et al. (2002) to investigate the industrial geography of Europe seems to be as rich as the one proposed in this paper but, being a Computable General Equilibrium model, it has a limited empirical applicability. In particular, Forslid et al. (2002) cannot proceed to the direct estimation of parameters in the model and they use simulations to perform, in their own words, “theory with numbers”\(^3\). A direct assessment of localisation patterns’ determinants in CEECs has been performed by Hildebrandt and Wörz (2004). Unfortunately, lacking a structural model, the interpretation of results obtained through the estimation of a comprehensive reduced form equation is not unambiguous.

A part from these limitations, it is worth noticing that previous literature has not attempted yet an explicit assessment of the role of trade in parts and components in shaping the industrial geography in a region.

In this paper, localisation of industries at the country level is depicted as the outcome of several determinants: agglomeration and dispersion forces generated by trade in parts and components, comparative advantages, home market effect and forward\&backward linkages. Through a clear-cut econometric implementation, the structural model allows me to identify quantitatively and qualitatively how each factor affects the distribution of industrial activities in the CEECs’ region, singling out the role played by trade in middle products.

When I estimate the fundamental equation of the self-contained model on a panel with nine CEECs and four sectors over the second half of the 1990s, I find that the involvement into IPNs (as proxied by the share of imported intermediates in production) impacts positively the portion of regional industrial production localised in the domestic economy. Comparative advantages seem to be a significant determinant of localisation as opposite to NT\&NEG motives for agglomeration (home market effect, backward\&forward linkages) which do not seem to be in operation.

The paper is organized as follows: in Section 2 I present the theoretical

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\(^3\)On the other hand, the CGE methodology allows them to enrich their research with the analysis of welfare modification implied by changes in the industrial geography.
framework; then I introduce the econometric implementation of the model in Section 3, and provide details about the case study and the data used in Section 4. In Section 5 I report and discuss results obtained. In the same section, I argue that the proposed framework can be used to assess rigorously the effectiveness of competing trade theories in explaining CEECs’ industrial geography. Concluding remarks are in Section 6.

2 The model

A simple way to deal with the distribution of industrial activities across countries is to look at the share of global production in a certain industry taking place in a single location. This is what Overman et al. (2003) suggest by defining a straightforward localisation index,

\[ l_{ij} = \frac{D_{ij}}{\sum_j D_{ij}}, \]  

where \( D_{ij} \) denotes the production of industry \( i \) in country \( j \) and \( \sum_j D_{ij} \) indicates world production in that sector.

Considering that there could be huge differences in size across countries and sectors, one may wish to normalize the localisation index. This can be done by dividing it by the share of a country \( j \) in total world production \( S_j = \frac{\sum_i D_{ij}}{\sum_j \sum_i D_{ij}} \).

Thus a new comprehensive measure called location quotient can be defined as follows:

\[ h_{ij} = \frac{l_{ij}}{S_j}. \]  

The location quotient can be considered as an assessment of industry \( i \)'s localisation in \( j \), relative to the localisation of industrial production as a whole in \( j \).

For the sake of simplicity, one can assume the total value of world production as numeraire: \( \sum_j \sum_i D_{ij} = 1 \). This implies that country \( j \)'s share of global output can be simply defined as \( S_j = \sum_i D_{ij} \) and, analogously, the industry \( i \)'s share of world production as \( S_i = \sum_j D_{ij} \). Thanks to this simplification, the location quotient in (2) can be rewritten as

\[ h_{ij} = \frac{D_{ij}}{S_j S_i}. \]  

The expression (3) will be at the basis of both the theoretical and the empirical work of this paper. The idea is to provide it with a rich functional form drawn from a structural model. The framework builds on Choudhri and Hakura (2001) and Ulltveit-Moe et al. (2000). It can be considered an attempt to integrate traditional frameworks (Ricardo, Heckscher-Ohlin) with the suggestions
of NT and NEG. The role played by trade in intermediates will be singled out explicitly by means of the econometric implementation. Then a comprehensive equation will be taken to data.

2.1 The demand side

Let \( I \) be the number of monopolistic-competitive industries in the \( J \) countries considered. It is possible to define the consumer demand for each variety produced in every single industry on the basis of a Dixit and Stiglitz (1977) utility function. The underlying assumption is that the same aggregate of manufacturing varieties demanded by consumers is also an input into the production of each variety, with the elasticity of substitution among varieties being the same in both cases\(^4\). Country \( m \) demand for a variety produced in the sector \( i \) of a country \( j \) can be written as

\[
d_{jm}^i = \frac{E_m^i \left( \frac{P_j^i B_{jm}^i}{B_{jm}^i} \right)^{-\sigma_i}}{\sum_{k \in J} n_k^i \left( \frac{P_k^i B_{km}^i}{B_{km}^i} \right)^{1-\sigma_i}} = \left( P_j^i B_{jm}^i \right)^{-\sigma_i} E_m^i (G_m^i)^{\sigma_i-1}
\]

where for each sector \( i \), \( G_m^i = \left[ \sum_{k \in J} n_k^i \left( P_k^i B_{km}^i \right)^{1-\sigma_i} \right]^{(1/1-\sigma_i)} \) is the price index in country \( m \), \( E_m^i \) is the total expenditure in country \( m \) on domestic and foreign varieties produced, \( P_j^i B_{jm}^i \) is the price on country \( m \)'s market of the variety produced in country \( j \) with \( B_{jm}^i \geq 1 \) capturing both an "iceberg" form of transport-cost and other possible obstacles to trade that would make the price of a variety different in \( j \) and \( m \), \( n_j^i \) is the number of firms (each producing one variety) and \( \sigma_i \) is the sector-specific elasticity of substitution among varieties.

The aggregation over \( m \) yields the value of industry \( i \) total output in country \( j \):

\[
D_j^i = \sum_m d_{jm}^i = n_j^i \left( \frac{P_j^i}{B_{jm}^i} \right)^{-\sigma_i} \sum_m \left( B_{jm}^i \right)^{-\sigma_i} E_m^i (G_m^i)^{\sigma_i-1}, \tag{4}
\]

and plugging (4) in (3), one obtains

\[
h_j^i = \frac{D_j^i}{S_j S_i} = \frac{n_j^i}{S_j S_i} \left( \frac{P_j^i}{B_{jm}^i} \right)^{-\sigma_i} \sum_m \left( B_{jm}^i \right)^{-\sigma_i} E_m^i (G_m^i)^{\sigma_i-1}. \tag{5}
\]

This is a measure of the systematic cross-country variation in sectoral output as captured by the location quotient index, \( h_j^i \), in its functional form.

\(^4\)In other words, it is assumed that intermediate demand and final demand use different varieties produced in sector \( i \) in the same proportions. This assumption allows the model to be manageable, but it is not crucial to obtain usual NEG results [see Fujita et al. (1999), p. 241-242]. Anyway, it is worth to be noticed that it applies best to sectors with a high "own input share" into final good production.

\(^5\)A variety produced in country \( j \) is available in the consumption location \( m \) at a delivered (c.i.f) price equal to the price in the country of origin multiplied by an industry and country pair specific trade barriers index.
2.2 The supply side

Jones and Kierzkowski (2001) point out that a world with international fragmen-
tation of production calls for an increased coordination in linking different
production segments. A firm involved in cross-border production sharing needs
to operate networking activities along with pure production. Thus, it can be
assumed that each variety is produced by a single firm with a technology that
combines a fixed amount of headquarter services (networking activities) and a
marginal requirement. Production takes place in a plant under constant returns
to scale according to the following production function

\[ q_j^i = \alpha_j^i F_j^p, \]  

where \( q_j^i \) is the output of the plant, \( \alpha_j^i \) is the technical coefficient and \( F_j^p \)
is the quantity of the composite factor employed in the plant.

\( F_j^p \) is a function of the vectors of primary factors, \( V_j^p \), and intermediate
goods, \( Z_j^p \), employed in the plant:

\[ F_j^p \equiv \phi_i(V_j^p, Z_j^p) \]

where the function \( \phi_i(.) \) is homogeneous of degree one and identical across
countries. Thus equation (6) allows only for Hicks-neutral technology differences
among countries.

Headquarter services require the employment of a fixed amount of composite
factor defined as a function of a specific vector of primary factors \( (V_h^j, Z_h^j) \):

\[ F_h^i \equiv \psi_i(V_h^j, Z_h^j). \]

In order to preserve the empirical tractability of the framework, headquarter
technology is assumed to be identical for all countries but specific to the sector.
This is in line with the fact that different industries may show different degrees
of "fragmentability" due to prevailing technologies in their production process.
On the other hand, being headquarter services related to networking and coor-
dination activities on the international markets, one may think that they are
operated according to standards increasingly common to different economies.

A unit of the composite factor can be employed incurring in the cost \( C_j^i = \chi_i(W_j^p, P_z^p) \), where \( W_j^p \) is the price vector for primary factors and \( P_z^p \) is the
price vector for intermediate inputs. The unit variable cost, \( C_j^i / \alpha_j^i \), can be easily
obtained from (6). Profit maximization at the firm level yields the producer
price for a variety as a mark-up over firm’s marginal cost:

\[ P_j^i = \left( \frac{\sigma_i}{\sigma_i - 1} \right) \frac{C_j^i}{\alpha_j^i}. \]  

Fixed headquarter costs equal \( F_h^i C_j^i \) and free entry drive profits to zero:
F_i^j C_i^j \frac{C_i^j}{\alpha_i^j} = P_i^j.

Using (6) and (7), one can express the employment of the composite factor at the plant level as a function of the fixed amount of composite factor required by headquarter operations

\[ F_i^{pj} = (\sigma_i - 1) F_i^h. \]

This allows one to use the total amount of the composite factor employed in the industry\(^6\), \(F_i^j = n_i^j (F_i^{pj} + F_i^h)\), as a proxy for the number of firms in sector \(i\) of country \(j\):

\[ n_i^j = \frac{F_i^j}{\sigma_i F_i^h}. \]

Thus, the total employment of the composite factor explicitly accounts for the impact of both country and sectoral size on firms’ localisation decision. In fact, according to NT, fixed costs and transport costs could induce differentiated-product industries to concentrate in locations with larger domestic markets. This result is usually called home market effect\(^7\).

Finally, let \(A_i^j\) represent the Total Factor Productivity (TFP) in sector \(i\) of country \(j\), defined as \(A_i^j = \frac{Q_i^j}{F_i^j}\), where \(Q_i^j \equiv n_i^j q_i^j\) is the industry output. By (6) and (8) one can identify the relationship existing between the coefficient \(\alpha_i^j\) (technology) and TFP

\[ \alpha_i^j = A_i^j \frac{\sigma_i}{\sigma_i - 1}. \]

which allows to re-arrange equation (7) as follows

\[ P_i^j = \left( \frac{\sigma_i}{\sigma_i - 1} \right) \frac{C_i^j}{\alpha_i^j} = \frac{C_i^j}{A_i^j} \]

Now it is possible to go back to (5) in order to enrich the equation by incorporating what has been obtained in the production side of the model. By means of (9) and (10) I obtain

\[ h_i^j = \frac{1}{\sigma_i F_i^h S_j S_i} \left( \frac{C_i^j}{A_i^j} \right)^{-\sigma_i} \left[ \sum_m \left( B_{ijm} \right)^{-\sigma_i} E_i^m (G_i^m)^{\sigma_i - 1} \right]. \]

A part from a sector-specific term, \(1/\sigma_i F_i^h\), that captures industry characteristics (i.e. elasticity of substitution among varieties, fixed cost due to networking

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\(^6\)Each firm employs the amount \(F_i^{pj}\) at the plant and \(F_i^h\) at the headquarter.

\(^7\)This issue was outlined first by Krugman (1980) with respect to export patterns of countries. Helpman and Krugman (1985) extended the result showing possible magnification effects on production.
activities), equation (11) brings together determinants of industry localisation coming from traditional frameworks, NT and NEG.

In fact, it encompasses:

a. Country \( j \)'s comparative advantages in sector \( i \) as captured by the ‘cost of factors / productivity’ ratio \((C_j^i/A_j^i)\). The cost of employment of the composite factor \((C_j^i)\) can be considered as the economic evaluation of country’s endowment of primary factors and intermediates (Heckscher-Ohlin), whereas the productivity term \((A_j^i)\) accounts for the Hicks-neutral differences in technology across countries (Ricardo);

b. The home market effect (HME) as proxied by the sectoral employment of the composite factor in country \( j \) normalized by the relative sizes of both country and sector in the world economy (respectively, \( S_j^j \) and \( S_j^i \)). The meaning of normalization is made clear in a series of influential contributions by Davis and Weinstein (1996, 1999, 2003). They show that the HME can be identified only in the presence of idiosyncratic demand differences between countries. Hence, it emerges only when a country is deviating from rest-of-world demand patterns in the given industry. This implies that in order to single out the more than one-for-one movements of production in response to idiosyncratic demand, one should clear out the base level of production that a country is expected to achieve given its own size and world’s average allocation of resources in that industry. Beherens et al. (2005) point out that HME intended as such is able to capture just a possible market size effect (attraction), but it neglects two other key-effects that might operate in a multi-country world: the hub effect (accessibility) and the competition effect (repulsion). In fact, in equilibrium, the endogenous international distribution of firms is such that better attraction and accessibility might be offset by fiercer competition: “an increase in one country’s expenditure share may well map into a less than proportionate increase in its output share as other countries ‘drain away’ some firms” (Beherens et al. 2005, p.3). Hence, only after controlling for cross-countries differences in accessibility a possible home market effect should appear in the data. The demand variation term in square brackets in (11) is supposed to reflect exactly such differential access to world markets, and its meaning is further explained at the following point (c);

c. Industry \( i \)'s market potential in country \( j \): if there were no trade costs (all \( B_{jm}^{ih} = 1 \)) then price indices and market potentials would take the same value in all locations and production would be determined by cost and size factors alone; if not, geographical forces would matter. Possible ‘third country effects’ are thus taken into account. It is worth to notice that the role of market potential as key-factor among those affecting the distribution of activities across locations is rather established in NEG theoretical and empirical literature. The underlining idea is that firms will prefer to settle in locations that allow them to minimize trade costs
related to the purchase and the sale of intermediate inputs (forward and backward linkages).

The right hand side of equation (11) contains a description of both "supply capacity" and "market capacity" of country $j$. Both of these capacities capture part of the role played by the internationalization of production and the subsequent cross-border splitting of the value chain. In fact, as part of IPNs, firms in a country will use imported intermediates on the supply side ($F_{ij}$) and sell new varieties of middle products according to location’s market potential.

3 The econometric implementation

3.1 Trying to disentangle the role played by internationalization of production

How can one account for the effect of trade in parts and components on concentration of industrial activities? So far the role played by imported intermediates in the determination of systematic cross-country variations in sectoral output has been inferred from more general findings rather than directly assessed. In this paper I try to go one step further and account explicitly for imported middle products through some assumptions on the functional form of $F_{ij}$.

Assume that the industry total use of the composite factor in sector $i$ of country $j$ is defined by a Cobb-Douglas function

$$\ln F_{ij} = w_i \ln L_{ij} + \sum r \theta_{ir} \ln Z_{jr},$$

(12)

where $L_{ij}$ is the amount of labour employed, $Z_{jr}$ is an aggregate measure of the intermediate inputs produced in sector $r$ and employed in sector $i$; $w_i$ and $\theta_{ir}$ are the shares in which labour and middle products are used to form one unit of $F_{ij}$, and they sum up to 1.

To simplify one can write

$$\ln F_{ij} \approx w_i \ln L_{ij} + \theta_i \ln I_{ij},$$

(13)

where $\ln I_{ij}$ is the aggregate of middle products employed and $\theta_i$ is their average share of utilization at the equilibrium scale.

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8 Ulltveit-Moe et al. (2000) show that these kinds of linkages have been very effective in determining the localization of industrial activities across EU-15 in the 1980-97 period. A comprehensive survey of the evidence on the EU case can be found in Amiti (1998). For what concerns CEECs, their accession to the EU surely entails also huge modifications of different areas’ market potential. Brülhart et al. (2004) find that alterations in market access implied by EU-25 may induce significant relocation of economic activities with diversified effects across countries on the basis of geographic proximity or remoteness.
Domestically produced intermediates \( (DI_j) \) are used together with imported intermediates \( (MI_j) \). One can distinguish among these two components

\[
\theta_i \ln I_i^j \simeq \sum_r \theta_i^{z_r} \ln Z_i^{jr} = \sum_r \theta_i^{z_r} \ln Z_i^{jr} + \sum_r \sum_{m \neq j} \theta_i^{z_r} \ln Z_i^{mr} \\
\simeq \theta_i^d \ln DI_i^j + \theta_i^m \ln MI_i^j \tag{14}
\]

where the sum of the two shares for domestic \( (\theta_i^d) \) and imported \( (\theta_i^m) \) intermediates equals \( \theta_i \). Finally, (14) allows one to rewrite (13) in the following way

\[
\ln F_i^j \approx z_i \ln N_i^j + \theta_i^m \ln MI_i^j \tag{15}
\]

where the sectoral employment of the composite factor is expressed as the sum of primary factors and domestic intermediates needed for its production, \( z_i \ln N_i^j \approx w_i \ln L_i^j + \theta_i^d \ln DI_i^j \), plus imported intermediates \( (MI_i^j) \).

\( N_i^j \) still captures the country-sector size effects depending now on domestic supply capability. On the other hand, the aggregate of imported intermediates, \( MI_i^j \), accounts directly for the role played by trade in parts and components in determining the localisation of industry in country \( j \) by making foreign produced middle products available to domestic firms. It can also be seen as an indirect measure of country \( j \)'s involvement in IPNs.

A recent strand of literature tends to depict the theory of international fragmentation of production and the NEG as two alternative frameworks since, in an increasingly integrating world, the first would predict a dispersion of production activities, while the second would point to the direction of emerging agglomeration economies that would push activities to cluster in certain areas\(^9\). This approach does not seem to be extremely persuasive as long as both theories outline sets of circumstances under which either agglomeration or dispersion forces may emerge. This is especially clear if one looks at fragmentation of production phenomenon from the perspective of developing countries. Integration into international markets may well lead to an increasing substitution of intermediates produced at home with imported ones. But, simultaneously, it can lead to an increasing specialisation in certain segments of the production process that are complementary to those performed abroad, and that generate middle products to be sold competitively on international markets. The overall effect on the size of the industry (as measured by output) may therefore be positive. Since agglomeration and dispersion forces might be working at the same time, the sign of this impact is an empirical question, and an integrated framework is essential to qualify it.

\(^9\) See Jones and Kiezowski (2003, 2005) and Jones et al. (2005).
3.2 A comprehensive and estimable functional form for the location quotient

The location quotient in its functional form (11) can be now rearranged by means of (15) and, taking logs, it can be estimated in the following form

\[
\log h_{jt} = \beta_0 + \beta_1 \log NE_{jt} + \beta_2 \log MIE_{jt} + \beta_3 \log CA_{jt} + \beta_4 \log MP_{jt} + \epsilon_{jt} (16)
\]

where \( NE_{jt} = \left( \frac{N_{jt}}{S_{jt}} \right) \) captures the impact of cross-country difference in size at the sectoral level, \( MIE_{jt} = \left( \frac{MI_{jt}}{S_{jt}} \right) \) is meant to reveal how the engagement in IPNs and the employment of imported intermediates affects localisation of activities, \( CA_{jt} = \left( \frac{C_{jt}}{A_{jt}} \right) \) tells what part of localisation patterns are explained by comparative advantages, \( MP_{jt} = \left( \sum_m \left( B_{jm}^{im} \right)^{-\sigma} E_{jm}^{im} \left( G_{jm}^{im} \right)^{\sigma-1} \right) \) accounts for the role played by the market potential, \( \beta_0 = \left( \frac{1}{\sigma F_{jt}} \right) \) is sectoral fixed effect. An error term \( \epsilon_{jt} \) and a time subscript have been added.

The explicit inclusion of a variable such as \( MIE_{jt} \) in the functional form of the location quotient obtained from the structural model and, thus, the direct assessment of the influence of imported middle products on localisation patterns allow for an effective improvement of the empirical literature in the field.

The relationship between the employment of the composite factor \( \left( \frac{F_{jt}}{S_{jt}} \right) \) in equation (11) and its two components \( \left( NE_{jt} \right. \) and \( MIE_{jt} \) in equation (16) deserves further explanation. As said above, the normalized \( F_{jt} \) in equation (11) accounted for the HME. Hence, a value of 1 for the associated coefficient would describe a country that achieves its own base production given its relative size and the average size of the sector in the world economy. On the other hand, values greater than 1 would imply more than one-for-one movements of production in response to idiosyncratic demand shocks. The splitting up of the composite factor into two elements implies a different interpretation of coefficients. In order to establish whether or not the HME is in operation, responses to idiosyncratic demand of domestic factors and intermediates should be considered along with variations in the demand of imported intermediates on the domestic market \( (\beta_1 + \beta_2) \).

Passing from (11) to (16), one can notice that the structural model implies the following linear restriction on coefficients: \( \beta_1 + \beta_2 = \beta_4 \approx 1 \), which predicts a proportional response of output to both internal and external demand variations. Thus the theoretical framework advocates for a Ricardo-Heckscher-Ohlin world where comparative advantages are all that matters (null hypothesis). Should the HME and geographical forces be in operation, then the estimated value of the respective coefficients would be greater than one \( (\beta_1 + \beta_2 = \beta_4 > 1) \) suggesting that NT and NEG motives for distribution of industrial activities matter, as well (alternative hypothesis).

Furthermore, it is worth noticing that the comparative advantages’ coefficient would give us a measure of the elasticity of substitution between varieties.
in sector $i$: $\beta_3 = -\sigma_i$. Since it is assumed that the market structure is defined by monopolistic competition and zero profit, the size of each firm cannot vary and possible expansion in the sectoral output imply an increase in the number of firms (varieties) in the industry. Thus, an inverse one-to-one relationship will be observed between the elasticity of substitution and the elasticity of scale in equilibrium, and estimated values of $\beta_3$ for different sectors would reflect also the degree of scale economies in operation.

A significant idiosyncratic domestic demand, strong forward & backward linkages and a prompt response to external demand variations would induce firms to locate in the region. Hence, signs on the associated coefficients are expected to be positive. Being built as a ratio of factor cost and productivity, comparative advantages are expected to be inversely correlated with the dependent variable, since an increase in absolute terms may be due either to an increase of the cost of factors or to a decrease in productivity or both. This would imply a loss of attractiveness for the location. Finally, one cannot make an a priori statement about the sign on the coefficient related to the imported intermediates ($\beta_2$). In fact, if dispersion forces prevail, with imported middle products simply replacing domestic ones, then a negative sign would be associated to the coefficient: fragmentation would affect negatively domestic output in the given sector. Alternatively, if fragmentation of production induced countries to specialise in specific segments of sectoral production and to increasingly acquire related activities, then a positive sign would come out from the data.

4 Estimation

4.1 What are sectors of interest?

Yeats (1998) finds that parts of motor vehicles, office machinery, telecommunication equipment and switch gears account for about the 70% of total world trade in parts and components. Kaminski and Ng (2001) observe that this pattern is reflected by the EU-CEECs’ patterns, as well. Thus, they focus on Motor Vehicles, Office Machinery, Telecommunication Equipment and Furniture, motivating the inclusion of the latter with the fact that a well established international production network has been effective for a long time within this sector.

Considering CEECs$^{10}$ as a whole, the relevance with respect to the total manufacturing output of the four sectors listed above has almost doubled in the second half of the 1990s: their share of CEECs’ total manufacturing output has risen from 8.9% in 1995 to 17.5% in 1999, with Motor Vehicles being the fastest growing sector$^{11}$ (Figure 1).

---

$^{10}$CEECs are actually CEECs-9 since lack of data on sectoral production for Slovenia restricts the group to Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.

$^{11}$Computations are made on the basis of data available in the UNIDO Industrial Statistic Data Base.
De Simone (2007) tracks the relocation dynamics for different industries in CEECs by depicting trends of several localisation indices. In particular, concerning variations in the location quotient over the second half of the 1990s, he finds that Estonia and Poland are the only locations with a share of output in the Furniture sector constantly and significantly greater than the CEECs average, while the Czech Republic seems to relatively despecialise over the period. The Motor Vehicles sector seems to be relatively more localised in Hungary, Slovakia and Czech Republic, whereas the share of output of the Baltic countries is far below the CEECs average in the sector. Poland reduces its location quotient over time. All countries a part from Hungary are significantly below the area average in the production of Office Machinery and Equipment. Thus Hungary is a sort of outlier and proves to be a far more attractive location than the others. Estonia, Bulgaria and Latvia loose quickly the larger than the average shares that they had at the beginning of the period. Similar trends are observed in the Telecommunication Equipment industry, with the Hungarian location quotient escalating and the Lithuanian one gradually reducing over time.

Hence it seems important to try to identify what forces are behind the subsequent redistribution of activities across CEECs in the four sectors. Despite severe limitations in data availability for developing countries such as CEECs, I managed to build a balanced panel dataset for the four sectors and the nine countries considered so far in the analysis over the crucial time period 1995-199912.

12 Aggregate data and small samples of countries and sectors do not allow a fruitfully employment of possible unbalanced versions of the dataset.
4.2 Data

As defined in equation (15), $F^{j}$ represents a key-variable in this model. In fact, two crucial regressors in the estimating equation ($NE^{j}_{it}$, $MIE^{j}_{it}$) originate from it. Moreover, knowing labour and intermediates shares in the production of one unit of the composite factor allows one to compute productivity ($A^{j}$) and the unit cost ($C^{j}$) that are the two components of the comparative advantage variable in the model.

Since data on domestic production of middle products are unavailable, I proxy the size variable, log $NE^{j}_{it}$, with the log of number of employees in the industry relative to country and industry shares of world manufacturing output as defined in Section 2. Data on sectoral employment and output are drawn from UNIDO Industrial Statistics Data Base integrated when necessary with the WIIW Industrial Database on Eastern Europe.

The aggregate value of imported intermediates employed by each sector $i$ in each country $j$, log $MIE^{j}_{it}$, can be computed on the basis of the data collected in the UN ComTrade database and data provided in the UNIDO Industrial Statistics Data Base. The lack of sectoral Input-Output tables for countries in the sample prevent me to take into consideration intermediates produced in other industries along with those produced in the own sector. This might look as a limitation since the importance of intra-industry intermediates relative to inter-industry intermediates affects the agglomeration dynamics of an industry in a given location. Forslid et al. (2002) compute sectoral ‘own input shares’ and ‘intermediate shares’ on the basis of 1992 data in I-O tables available in GTAP for selected countries. If one considers values they obtain for sectoral aggregates similar to those considered here (Wood, Transport Equipment, Machinery), the average ratio ‘own input shares / intermediate shares’ is 36%. So the measure adopted here is likely to underestimate the actual impact of trade in intermediates on the distribution of industrial activities.

In the model, comparative advantages are captured by a ratio: cost of composite factor over productivity. It follows that, as long as labour is the only primary factor considered at the basis of the composite factor, a consistent

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13 Products group in the UN ComTrade database are classified according to the SITC codes. Kaminski and Ng (2001) provide a table about parts and components for each of the considered industry as identifiable in SITC rev.2. I rearrange it for SITC rev.3 in order to assign each intermediate input to its final product group in the ISIC classification. I follow the concordance codes SITC rev.3 - ISIC rev.3 available in the World Matrix of Sectoral Economic Data (http://www.hwwa.de/wmatrix/Home.html). The table is reported in the Appendix A.

14 In fact, if the production heavily depends on middle products produced in sectors dispersed across regions or concentrated abroad, agglomeration of the home industry will be discouraged. On the contrary, a higher share of own industry inputs implies significant intra-industry cost linkages: the larger is the sector the higher is the number of intermediates producers, the lower is the price of inputs the higher is the incentive to locate in the region, and thus agglomeration is self-reinforcing.

15 Since the Dixit-Stiglitz approach followed to describe demand patterns does not properly accommodate possible inter-sectoral intermediate linkages (see Section 2.1), the proxy employed here does not mismeasure the theoretical variable.

16 Unavailability of data such as the stock of capital at the sectoral level ($K^{j}_{i}$) for most of the countries in the sample prevents one to consider this factor among those contributing to the
way to proxy that ratio is to use data on Unit Labor Cost (ULC). In fact, ULC itself is computed for each country as sectoral real yearly wages, $W_{jt}$, divided by labour productivity (real output per employee), $\pi_{jt}$. In this case, drawing series from UNIDO Industrial Statistics Database and WIIW Industrial Database on Eastern Europe, one can compute sectoral ULC for all countries. Namely,

$$\log CA_{jt} \simeq \log ULC_{jt} = \frac{W_{jt}}{\pi_{jt}}.$$

The standard analytical definition of market potential dates back to Harris (1954) who describes it as the capability for location $j$ to access purchasing power across the economy:

$$MP_j^i = \sum_m PP_{jm}^i (dist_{jm})^\delta$$ (17)

$PP_{jm}^i$ is the expenditure of location $m$ in sector $i$ and $dist_{jm}$ is a measure of distance between the two location $(j, m)$ which has a negative impact on market potential ($\delta = -1$). Carstensen and Toubal (2004) and Brühlhart et al. (2004) proceed to a direct estimation of this expression in two applications related respectively to the transition of CEECs to the market economy and the enlargement of the European Union. Head and Mayer (2004) point out that a measure such as $MP_j^i$ does not take in consideration adjustment for variation in the price index at the basis of the functional definition of market potential. Thus, they suggest to rename it in a more appropriate way: Nominal Market Potential (NMP). The underlying idea is that in Harris’ definition the impact of distance on market potential ($\delta$) is assumed to be the same regardless of location and sector considered. This assumption would be too strict and unrealistic in the present analysis that involves both orders of variation.

Sector specific values for the impact of distance on market potential, $\delta_i$, can be derived as suggested in Davis and Weinstein (2003). One can estimate a gravity equation where industry level bilateral trade is regressed over country dummies and trade costs as proxied by the distance between countries. $\delta_i$ is the coefficient on bilateral distance $(dist_{jm})^{17}$. Given the fact that EU absorbs formation of the composite factor. A way to overcome this problem would be estimating the values for the sectoral stock of capital through the well known Perpetual Inventory Method. But this methodology requires long series of data on sectoral investment that are unavailable, as well. Only relying on series that cover at least 10-15 years long time period would allow one to obtain a sensible estimation of the benchmark value of the stock of capital from which it would be possible to start deriving values from the following years. However, since the dataset used in the analysis covers a time span of five years only (short run), capital does not seem to be essential.

17The specification of the gravity model is a parsimonious version of the one that allows Redding and Venables (2004) to estimate coefficients at the basis of what they call Market Access:

$$\ln X_{jm}^i = \mu_j^{reporter} + \lambda_m^{partner} + \delta_i \ln dist_{jm} + u_{jm},$$

where $X_{jm}^i$ are the bilateral exports between country $j$ and the partner $m$ in sector $i$, reporter, and partner, are location dummies, and $dist_{jm}$ is the bilateral distance between the two locations. The estimated $\delta_i$ gives a measure of the impact of trade costs at the sectoral
nearly all the exports of CEECs in the four sectors considered in the analysis, the set of possible partners for each country includes only the rest of CEECs and EU-15. Data on bilateral trade can be drawn from UN ComTrade database; bilateral distances among pairs of countries are collected in the CEPII Distances Dataset\(^\text{18}\). Data on sectoral expenditure are not available, but can be easily proxied by means of sectoral absorption (output + import - export). Data on country level of output are taken from UNIDO Industrial Statistics Data Base rev.3.

Evaluating market potential as defined in (17) by means of sector specific \(\delta_i\) allows to take into account price adjustments at the industry level. This new measure accounts for sectoral Real Market Potential (\(RMP^j_{i}\)) of each location.

Production data taken from UNIDO Industrial Statistics Data Base rev.3 are also used to build series concerning the dependent variable, \(\ln h^j_i\), as described in Section 2.

4.3 Addressing the simultaneity issue

The endogenous determination of real market potential, the size variable and the employment of imported intermediates pose problems with the estimation of equation (16). Head and Mayer (2004) argue that «since NMP does not depend on locations of firms or on industry level costs, both of which are endogenous in economic geography models, [it] might be a good instrument for RMP». Thus, I use Harris’ \(MP^j_i\) as an instrumental variable for \(RMP^j_i\).

It is much more difficult to find an appropriate instrument for idiosyncratic variation of demand in its two terms (\(NE_{it}, MIE_{it}\)). In fact, this is an endemic problem in the empirical literature on home market effect and no conclusive remedies have been put forward yet. A reasonable instrument would be one that accounts for the size of the economy (“thickness” of the market) being, at the same time, uncorrelated with the concentration of industrial activities at the sectoral level. The absolute level of population in a country is certainly correlated with the demand for products in the home market, and it is likely to be correlated with the absolute level of production in that country. But it is not necessarily correlated with the relative level of production (\(h^j_i\)) at the industry level. In fact, as discussed in the theoretical section, the absolute level of demand would affect concentration of industrial activities just indirectly and by means of idiosyncratic variation of demand that are meant to be captured by the associated regressors. Hence, population looks like a reasonable instrument for home market effect\(^\text{19}\) in this setting. A second instrument, specifically related to the imports of intermediates, is the Horizontal Trade Specialisation index\(^\text{20}\).

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\(^{18}\) In this dataset bilateral distances are computed as weighted arithmetic distance over all region-to-region distances between country \(j\) and \(m\).

\(^{19}\) Series about population for all Central Eastern European Countries may be drawn from the International Monetary Fund IFS data base.

\(^{20}\) The index takes value zero when either the value of exports or imports is equal to zero, and it approaches one the more similar trade inflows and outflows are.
\[ HTS_i^j = 1 - \frac{|X_i^{jk} - M_i^{jk}|}{X_i^{jk} + M_i^{jk}} \]

where \( X_i^{jk} \) is country \( j \)’s sectoral export of part and components toward \( k \), \( M_i^{jk} \) is country \( j \)'s sectoral import of part and components from \( k \). In fact, in the wake of the increasing participation of CEECs’ firm into IPNs set by EU-based principals, Kaminski and Ng (2001) notice that there is a high degree of correspondence between imports and exports of parts and components (vertical specialization). I consider as partner \( k \) the EU-15.

5 Results

5.1 A first step: estimates at the sectoral level

Variables in the balanced panel assembled present three orders of variation: across countries, across sectors, over time. In order to single out the impact of regressors at the industry level, I interact each of them with four sectoral dummy variables. For simplicity’s sake Irename the first regressor in the following way \( \ln NE_i^{it} = \log NE_j^{it} \times SD_i \), where \( SD_i \) is the sectoral dummy, and \( i = \text{Furniture, Motor Vehicles, Office Machinery, Telecommunication Equipment} \). I index other regressors likewise.

In Table 1, I report results obtained under simple OLS correlations (first column), fixed effects (second column) and fixed effect with instrumental variables\(^{21}\) (third column).

Under all methodologies, where significant, signs of the coefficients are in line with theoretical predictions. The fit of the model is high, especially under fixed effects. Signs on coefficients obtained by means of the two fixed effects estimators look rather stable, but the scopes tend to vary across methodologies. When I take care of the possible biases due to the simultaneous determination of independents with the location quotient, just some of the coefficients remain statistically significant.

Focusing on results in the third column, one can see that imported intermediates have a relevant and positive impact on localisation of activities at least in the Office Machinery and Motor Vehicles industries. At higher levels of imports of middle products, and thus at higher degrees of involvement in IPNs, correspond higher relative shares of sectoral production. This suggests that, in presence of cross-border production sharing, possible agglomeration forces seem

\(^{21}\)Given the shortness of the time span considered (5 years), one may think that independent variables such as comparative advantages could present a small variability over time since they reflect the endowment of factors. On the other hand, at the sectoral level, there could be not much variability of Real Market Potential over individuals, since countries belong to a rather homogenous geographic area. These sorts of considerations may imply that the structure of the error term in our model should account not only for idiosyncratic disturbances (\( \epsilon_i^{it} \)), and might suggest the employment of a random effects regression model to estimate (16). However, the small number of observations in the sample as well as the structural implications of the theoretical framework suggest that the fixed effects methodology remain the most appropriate one.
to prevail on dispersion ones, in these two industries. The same can be said of comparative advantages. The localisation of these two industries seems to be sensitive to both remuneration and productivity dynamics of labour, but an increase in unit labour cost would produce a larger flee of activities from the automotive sector than from the other ones. The market potential does not seem to be a key-determinant of systematic cross-country variations in sectoral output, with the remarkable exception of Motor Vehicles production, though. This outcome might reflect the concentration of CEECs’ automotive production in countries sharing a common border with EU-15.

Considered on their own, coefficients on log NE(i) are never close to the unity. Once summed up with those on imported intermediates, one can see that for Motor Vehicles and Office Machinery $\beta_1 + \beta_2 \approx 1.1 > 1$. But testing for imposed linear restrictions reveals that there is no statistical significant difference from 1. Thus, the HME is not in operation.

<table>
<thead>
<tr>
<th>Table 1: Overall Estimates with OLS, FE and IV-FE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel of Annual Data from 1995 to 1999</td>
</tr>
<tr>
<td>9 Countries - 4 Industries</td>
</tr>
<tr>
<td>Dependent Variable: location quotient (log $h_{it}$)</td>
</tr>
<tr>
<td>Estimator:</td>
</tr>
<tr>
<td>lnNE (Furn.)</td>
</tr>
<tr>
<td>lnNE (Mot. V.)</td>
</tr>
<tr>
<td>lnNE (Off. Mac.)</td>
</tr>
<tr>
<td>lnNE (Telecom.)</td>
</tr>
<tr>
<td>lnMI (Furn.)</td>
</tr>
<tr>
<td>lnMI (Mot. V.)</td>
</tr>
<tr>
<td>lnMI (Off. Mac.)</td>
</tr>
<tr>
<td>lnMI (Telecom.)</td>
</tr>
<tr>
<td>lnCA (Furn.)</td>
</tr>
<tr>
<td>lnCA (Mot. V.)</td>
</tr>
<tr>
<td>lnCA (Off. Mac.)</td>
</tr>
<tr>
<td>lnCA (Telecom.)</td>
</tr>
<tr>
<td>lnRMP (Furn.)</td>
</tr>
<tr>
<td>lnRMP (Mot. V.)</td>
</tr>
<tr>
<td>lnRMP (Off. Mac.)</td>
</tr>
<tr>
<td>lnRMP (Telecom.)</td>
</tr>
<tr>
<td>No. of Obs</td>
</tr>
<tr>
<td>R-sq</td>
</tr>
</tbody>
</table>

NOTE: Std.Err. in parenthesis. * = Sign. 5%; ** = Sign. 1%.
Coeff. of time dummies and constant not reported.
5.2 One step further

The results presented so far tell us that the model is not able to describe effectively all sectors in the sample. But can one exclude that the four determinants of localisation of industrial activities play a significant role at a general level regardless of specific sectoral characteristics? A way to answer this question is to impose linear restrictions over sectoral coefficients \( \beta_k(i) = \beta_k(i) \), where \( i = \text{Furniture, Motor Vehicles, Office Machinery, Telecommunication Equipment} \) and test their significance. This would reveal whether or not some of the variables are playing a definite common role in all industries. I present the results of these tests in Table 2.

<table>
<thead>
<tr>
<th>Linear restriction imposed</th>
<th>Coefficients from IV-FE estimates</th>
<th>Test Result</th>
<th>( H_0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_1(\text{Furn.}) = \beta_1(\text{Mot. V.}) = \beta_1(\text{Off. Mac.}) = \beta_1(\text{Telecom.}) )</td>
<td>( \text{Chi2}(3) = .53 )</td>
<td>Prob &gt; Chi2 = 0.912</td>
<td>not rejected</td>
</tr>
<tr>
<td>( \beta_2(\text{Furn.}) = \beta_2(\text{Mot. V.}) = \beta_2(\text{Off. Mac.}) = \beta_2(\text{Telecom.}) )</td>
<td>( \text{Chi2}(3) = 5.53 )</td>
<td>Prob &gt; Chi2 = 0.137</td>
<td>not rejected</td>
</tr>
<tr>
<td>( \beta_3(\text{Furn.}) = \beta_3(\text{Mot. V.}) = \beta_3(\text{Off. Mac.}) = \beta_3(\text{Telecom.}) )</td>
<td>( \text{Chi2}(3) = 23.67 )</td>
<td>Prob &gt; Chi2 = 0.0000</td>
<td>rejected</td>
</tr>
<tr>
<td>( \beta_4(\text{Furn.}) = \beta_4(\text{Mot. V.}) = \beta_4(\text{Off. Mac.}) = \beta_4(\text{Telecom.}) )</td>
<td>( \text{Chi2}(3) = 2.01 )</td>
<td>Prob &gt; Chi2 = 0.569</td>
<td>not rejected</td>
</tr>
</tbody>
</table>

It appears one cannot exclude that imported parts and components have a unique cross-industry impact in the determination of localisation of production. The same can be said of real market potential and market size, but not of comparative advantages. As shown in Section 3.2, coefficients on comparative advantages \( (\beta_3 = -\sigma_i) \) provide both a measure of the elasticity of substitution between varieties and a measure of scale economies in the sector. A restriction that imposes elasticities to be identical across industries is not viable in the data.

In Table 3 I report results obtained by running an instrumental variables regression where "not rejected" restrictions are imposed.

I observe that imported parts and components have now the same significant and positive impact on the concentration of activities for all industries, suggesting that the higher is country \( j \)'s engagement in IPNs the larger is the share of CEECs’ production achieved. Comparative advantages keep their importance at the sectoral level and become a relevant determinant for location in the low-tech Furniture sector as well. It seems that substitutability between varieties decreases as the technology content of the products increases. The opposite holds for what concerns scale economies; i.e. low-tech Furniture industry is characterized by a higher elasticity of substitution and thus lower scale
economies than high-tech Office Machinery industry. RMP becomes very significant once it is no longer considered as sector specific, but its coefficient is not statistically different from 1, as predicted by the theoretical model \( H_0 : \beta_4 = 1 \), \( \text{Prob} > \chi^2 = 0.78 \). Coefficient on log \( NE \) is lower than one. When I consider it jointly with the coefficient on the imported intermediates (log \( MI \)), I can see that the HME is not in operation \( H_0 : \beta_1 + \beta_2 = \beta_4 = 1 \), \( \text{Prob} > \chi^2 = 0.87 \) and that the linear restriction imposed by the structural model is empirically verified. Thus, idiosyncratic demand differences across-countries (HME) and accessibility (RMP) are not key-determinants of industrial localisation across CEECs: production response to variation of domestic demand and market potential is one-to-one.

### Table 3: Estimates with Linear Restrictions

<table>
<thead>
<tr>
<th>Dependent Variable: location quotient ( \log h_{jt} )</th>
<th>Estimator: IV-FE with Specific Time Eff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnNE</td>
<td>0.76 (0.15)**</td>
</tr>
<tr>
<td>lnMI</td>
<td>0.27 (0.06)**</td>
</tr>
<tr>
<td>lnCA(Furn.)</td>
<td>-0.85 (0.37)*</td>
</tr>
<tr>
<td>lnCA(Mot. V.)</td>
<td>-0.73 (0.11)**</td>
</tr>
<tr>
<td>lnCA(Off. Mac.)</td>
<td>-0.67 (0.10)**</td>
</tr>
<tr>
<td>lnCA(Telecom.)</td>
<td>-0.08 (0.09)</td>
</tr>
<tr>
<td>lnRMP</td>
<td>1.10 (0.36)**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Obs</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-sq</td>
<td>0.77</td>
</tr>
</tbody>
</table>

**NOTE:**

* = Sign. 5%; ** = Sign. 1%.

Coeff. of time dummies and constant not reported.

### 5.3 Is this a test for competing theories?

Davis and Weinstein (1999, 2003) use a setting comparable with the one presented here and attach broad implications to the value of coefficients on HME. They assess the impact of HME on output at the good (composite of varieties) level, estimating an equation where, a part from sectoral idiosyncratic demand differences across countries, a vector of endowments is included as a control. According to them, an estimated coefficient on home market bias equal to 0 would suggest that we are in a frictionless world where location of industry is determined by comparative advantages or IRS only. A coefficient grater than 0 but below (or equal to) unity would imply a world where comparative advantages are in operation along with transport costs (frictions). A coefficient greater than one would support the idea that geographical forces (HME and
market access) are the main determinants of localisation of production. Thus, they use coefficients’ values to test for either acceptance or rejection of three fundamental theoretical hypotheses.

In Section 3.2 I showed that a similar exercise can be implemented here by comparing the following hypotheses:

- $H_0 : \beta_1 + \beta_2 = \beta_4 = 1$  
  second-type world (CA + frictions);

- $H_1 : \beta_1 + \beta_2 > \beta_4 > 1$  
  third-type world (HME and geography).

Results in Table 3 seem to point to the direction of a second-type world: comparative advantages keep playing a significant role whereas HME and geography do not. Hence, the null hypothesis is not rejected. This is in contrast with results obtained by Davis and Weinstein that support the hypothesis of a third-type world.

It can be argued that differences in empirical findings are due to differences in the equation taken to data and in the choice of the level of aggregation. This is partially true, but in my approach comparative advantages are not treated just as a control\textsuperscript{22}; they descend directly from the theoretical model as a determinant of industrial activities distribution. Furthermore, here I fully account for crucial “third country effects” (see Section 2) in the spirit of Behrens et al. (2005).

These results challenge a rather established view: manufacturing industries are on average more likely to show a magnification effect on production\textsuperscript{23}. In particular, Brühlhart and Trionfetti (2005) show that, given the huge response to home biased demand, a model with non competitive market and increasing returns fits particularly well sectors such as Motor Vehicles and Office Machinery and more generally mechanical and electrical engineering industries. Here I provide evidence that even in a framework with non competitive markets and increasing returns to scale, these sectors might not show any magnification effect on production due to idiosyncratic demand differences, provided that other possible determinants of localisation of industrial activities are included in the analysis.

To sum up, results tend to exclude the presence of the HME. In the time period covered in the dataset at my disposal, comparative advantages (unit labor cost) along with trade in part and components seem to be the driving forces behind the relocation trends observed. Countries such as CEECs, at early stages of industrial development after the central planning experience, may not rely on a sufficient market thickness both in terms of demand for final goods and intermediates to make such agglomeration forces arise.

6 Concluding remarks

Recent works have highlighted that the increasing participation of CEECs firms in the International Production Networks set up by EU-15 partners encouraged

\textsuperscript{22} In their setting Davis and Weinstein assume that comparative advantages determine industry output but not that of single goods in the industry.

\textsuperscript{23} This point is extensively discussed in Head and Mayer (2004).
both changes in the countries’ production structures and relocation of industrial activities.

The main idea of this paper is to try to identify factors playing a major role in driving the process of redistribution of activities singling out, among the others, the role played by trade in middle products.

I propose a comprehensive framework in which home market effect, trade in parts and components, comparative advantages and market access are considered all together as possible determinants of the industrial geography in the region. Differently from the existing literature, the proposed structural model enjoys a straightforward econometric implementation and its predictions can be directly tested. The focus is on the four sector in which most of the trade in parts and components with EU-15 is concentrated: Furniture, Motor Vehicles, Office Machinery, Telecommunication Equipment.

Estimates at the sectoral level show that the model proves to be rather successful in describing localisation trends for the Office Machinery and Motor Vehicles industries only. For both sectors I observe that the contribution of the imported intermediates is positive and substantial: at higher levels of import of middle products correspond higher relative shares of sectoral production; suggesting that, in presence of cross-border production sharing, agglomeration forces possibly associated with fragmentation seem to prevail on dispersion ones. Furthermore, the distribution of output across CEECs seems to be very sensitive to variation in the unit labour cost (comparative advantages) while HME is not in operation. Proximity to EU-15 clearly drives the reshaping of economic geography just in the automotive industry.

A far more parsimonious specification is estimated after having tested the hypotheses that the role played by each determinant is not sector-specific. I find that HME and geographical forces are not in operation, whereas imported parts and components have a significant and positive impact on the concentration of activities for all industries. Findings on trade in middle products suggest that the higher is the country’s ability to engage in IPNs the larger is the share of CEECs’ industrial output attained. Comparative advantages keep their industry-specific importance.

Finally, I argue that the comprehensive framework proposed in this paper may be useful to test for the effectiveness of alternative trade theories (comparative advantages vs NT/NEG). My findings challenge the established view according to which the presence of agglomeration forces in manufacturing industries due to HME and market potential is an empirical regularity.
APPENDIX

A Concordance table

<table>
<thead>
<tr>
<th>ISIC rev.3</th>
<th>361 Furniture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts</td>
<td>Components</td>
</tr>
<tr>
<td>SITC rev.3</td>
<td>82119</td>
</tr>
<tr>
<td></td>
<td>8212</td>
</tr>
<tr>
<td></td>
<td>8218</td>
</tr>
<tr>
<td>ISIC rev.3</td>
<td>34 Motor vehicles, trailers and semi-trailers</td>
</tr>
<tr>
<td>Parts</td>
<td>Components</td>
</tr>
<tr>
<td>SITC rev.3</td>
<td>784</td>
</tr>
<tr>
<td></td>
<td>7132</td>
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<td></td>
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<td>Parts</td>
<td>Components</td>
</tr>
<tr>
<td>SITC rev.3</td>
<td>759</td>
</tr>
<tr>
<td>ISICs rev.3</td>
<td>32 Radio, television &amp; communication equipment &amp; apparatus</td>
</tr>
<tr>
<td>Parts</td>
<td>Components</td>
</tr>
<tr>
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</table>

B Impact of distance at the sectoral level

Table 1B: Estimates for sectoral $\delta_i$

<table>
<thead>
<tr>
<th>Dependent Variable: $\log X_{ij}^{lm}$</th>
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<tbody>
<tr>
<td>Estimation Technique:</td>
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<tr>
<td>$\delta_{\text{furniture}}$</td>
</tr>
<tr>
<td>$\delta_{\text{motor vehicles}}$</td>
</tr>
<tr>
<td>$\delta_{\text{office mach}}$</td>
</tr>
<tr>
<td>$\delta_{\text{telecomm.}}$</td>
</tr>
<tr>
<td>No. of Obs</td>
</tr>
<tr>
<td>Adj. R-sq</td>
</tr>
</tbody>
</table>

NOTE: Std.Err. in parenthesis. * = Sign. 5%; ** = Sign. 1%. Constant and coeff. of dummies for time, reporting and partner countries not reported.
REFERENCES


