Local agglomerations and trade: an empirical investigation

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Abstract

This paper proposes an empirical investigation of a few outcomes of economic geography models. First, we intend to assess the role of the home market effect and of the level of transport costs on the outgoing trade flows. For this purpose we refer to a regional context looking at a chosen sample of European regions. In the second part, we focus on the analysis of the trade flows of a sample for Italian industrial districts. In addition, in this last part, attention is drawn to state the benefits that the common sharing of services provide to the firms that belong to a district, above all in terms of their international competitiveness.

Keywords: Agglomerations, Industrial Districts, Home Market, Transport Costs, Trade Flows.

JEL Classification: F12, R12, R15.

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1 Introduction

In the economic literature, there is an increasingly interest in joining the theory of comparative advantages with that of the location of firms. This stream of literature finds its origins in one of the principal unsolved dilemmas of the trade theory: why and where people decide to locate their production. For a long time, the empirical investigation on the trade flow directions aimed at finding empirical support to the Heckscher-Ohlin (HO) setting. Unfortunately, reaching this goal reavealed not to be an easy task: some unsolved dilemmas still exist. In particular, theoretic predictions do not match empirical results when researchers account for transport costs or intra-industry trade flows.

This paper aims at developing an empirical investigation on the determinants of export flows, accounting for the presence of transport costs and increasing returns. We distinguish between two settings of reference: a sample of European regions (hence called macro-setting) and a sample of local industrial districts (called micro-setting). For each of them we test an econometric model in order to disentangle the original and common features that affect the intensity of each relative trade flow. In this sense, our econometric applications rely mainly on some of the principal features presented in the gravity models, but, at the same time, we try to get ahead of them extending the range of the field these models concern. We proceed by having a first look at gravity models; we then go beyond the gravity approach.

1.1 Gravity models: space and increasing returns in bilateral trade flows

An interesting solution for accounting both increasing returns and transport costs in the same framework comes from gravity models. A gravity model is typically a log-linear relationship, expressing bilateral trade between a pair of countries as a function of two the countries' income level, population and distance.[1] They normally include also an adjacency dummy, a common language dummy and dummies for commercial preferences. In general their empirical applications state that the distance between trading counterparts matters and it produces a negative effect (via the hypothesis of the presence of transport costs) on the consistency of the trade flows. At the beginning, one of the major critiques addressed to these models was their lack of theoretical underpinnings; recently it is possible to generate them in many theoretical frameworks.The gravity equation has been derived theoretically through the properties of the Cobb-Douglas function, when each good is produced just in one country, and the assumption of monopolistic competition ensures it. In this sense, Anderson (1979) states that a sufficient condition for obtaining a gravity equation is perfect product specialisation, such that each commodity is produced just in one country. Moreover, according to this study, when the product specialization is the result of increasing returns to scale (IRS), the gravity results may be obtained even is absence of factor proportion differences, such to explain even the

[1] Indeed, Krugman and Helpman (1985) note that countries similar in size display a volume of trade proportional to their own GDP.

intra-industries conditions of trade. This contribution concluded also that the success of the gravity prediction for international trade relies on the presence of IRS when product differentiation and intra-industry trade prevail. Conversely, Evenett and Keller (1998) argue that this thesis is not exclusive for explaining the success of the gravity equation. Indeed, they identify the intra-industry trade as exchanges based on IRS, since they consider that the volume of this kind of trade is determined by the extent of product specialization which is due to IRS. Symmetrically, trading exchanges relying on factor proportion differences are compatible with the HO model. So they conclude that factor proportion differences are important determinats of trade flows within the context of imperfect specialization models, whereas there is evidence that increasing returns are a cause of product specialization.

The idea that the gravity and HO approaches are not so uncompatible is well argumented by Deardorff (1998), although the gravity models reveal to be a more flexible instruments in presence of impediments of trade flows. When trading flows suffers trade barriers, the HO model cannot reach the factor-price equalization and this dynamics prevents the complete specialization of a country. Under this viewpoint and supposing that each good is produced just in one country, he derives that the HO model essentially predicts the same outcomes as those of any other model with differentiated products, thereby driving the emergence of the gravity equation once again. The possible linkage between HO and gravity models passes through the Armington Assumptions, i.e the hypothesis that consumers may distinguish each commodity according to its place of origin. Moreover, Deardorff adds that in presence of identical, homothetic preferences and frictionless trade, a simple gravity model may emerge (with a constant of proportionality) from a HO setting. In this case, he labels it 'simple' because distance plays no role since there are not transport costs.

Nevertheless, there exists a difference between these approaches in the way in which trading advantages arise. In a setting of comparative advantages, the demand for goods that are not sufficiently produced in a country gives rise to flows of imported goods. Conversely, in presence of economies of scale and trade costs, a country that displays a strong demand for a good becomes an interesting site to locate the production of that good and it may became a net exporter of it. This last feature is well known as the home market effect, (i.e. local demand drives the patterns of trade) and this effect is useful for distinguishing the basic features of a world of comparative advantages from one of increasing returns (Davis and Weinstein, 1999). Extending this idea, we may conclude that large countries may be desiderable locations for producers, since they are more likely to display a larger home market effect. Applying this concept, Weder (1995) derives that in the open economy equilibrium each country is a net exporter of a group of differentiated goods, where it has a comparative home market advantage.

Basing on the centrality of the home market effect (via the role of the home demand), Davis and Weinstein (1999) question on the possible relation between the economic geography theory and that of Heckscher-Ohlin. Looking at case of Japan, they encapsulate these two theories in a single empirical model where the HO framework reveals to be useful for describing the sectorial specialization of a country, while economic geography helps in distinguishing the genre of specialization inside a single sector. They conclude that while economic geography may explain little about the international structure of production, it is very important for understanding the regional one. Regional data support better the economic geography hypothesis, since trade costs and barriers are lower between regions than between countries. Beside, between regions, factor mobility is higher and this reinforces the economic geography effects as accounted by its general theoretical framework.

1.2 Beyond the gravity approach

Although the econometric results of gravity models are remarkable, a critique may be addressed to them. Gravity models are usually concerned with the total trade between pairs of countries, while international economics is concerned with the trade of a country vis-a-vis the rest of the world and has little to say about the choice of its trading partners.

The empirical applications of the economic geography models cannot but consider the key features arising from the gravity models. Nevertheless, it should depass the limit of accounting only for bilateral trade flows.

Therefore, this study differs from the previous quoted studies, because we engage in an empirical approach focusing exclusively on the total outgoing trade flows from a region (or a district), as in the tradition of the classical trade theory, avoiding the bilateral exchange conditions. Indeed our purpose is to develop an econometric study in order to detect the way in which some geographic components may affect the export flows. To our knowledge, until now no study has dealt with this theme from a viewpoint that does not include exclusively the bilateral trade flows between two partners. In our specification we recall some basic features of the gravity models. We represent the home market effect (that include the IRS feature) by a proxy that accounts for the size of the local market (i.e. total population or total revenues), but we do not synthesize the existence of local transport costs with the distance between two trading partners. Because of our interest in focusing on the total trade flows (for a sample of regions and districts inside the European Union), we evaluate the surface of the exporting region (or district) as a proxy for the average level of transport costs.[2] In gravity models, it is the bilateral correpondence between two trading parts that drives the investigation of the geographical proxies in a model of trading. Here, we want to look for some further results with a more general perspective.

At the macro level, according to the regional export flow data at hand, we produce a comparative econometric study among some European regions that contain some industrial networks for testing some theoretical outcomes à la Krugman (1991). Focusing on the outgoing

[2] This assumption should be refined if we include in our sample regions or areas that are not so quite adjacent (for instance European regions and US counties). In addition, if it could be possible to select data by sector and by macro-area of destination, a way to satisfy our criterium should be to compute the average distance from the examined regions and its preferential destinations.

regional trade flows of the principal sectors of specialisation, we expect to detect a positive elasticity between the trade flows and the local demand (via the home market effect), while transport costs and physical distance should produce negative effects on the size of the regional export flows. On the contrary, the microeconomic contribution will be concentrated on data of industrial districts which belong to a single region (Lombardia). In this case, we focus on the direct relationship between the attractiveness of the districts and their international competitivity. As a consequence, we need to use very detailed information at a district level and, up to now, only Lombardia (which displays about 21 local districts in it) makes them available. Comparing the size of Lombardia's districts across three years (with a classification by sectors of activities), a pseudo-gravity model is applied. We expect to confirm that the districts size directly depends on the presence of services offered in those areas and on the geographical dimensions of the area itself. In a broader sense, competitiveness at micro level should mainly rely on the density of the services available in a particular location, regardless of any sectoral distinction.

The remainder of the paper is organized as follows. The theoretical model introduced in Section 2. In Section 3, we deal with the empirical investigation of the outgoing trade flows for a sample of European regions, while in Section 4 we concentrate our attention on the size and performances of a selected group of industrial districts. Finally, Section 5 concludes and discusses some possible extensions.

2 The theoretical framework

Let us consider a system in which we identify two trading counterparts: a region (or a district) (R) and the rest of the world (ROW). As in Krugman (1991), we assume that both countries are endowed with local firms (in a setting of monopolistic competition) and each of them hires its workers from the local population ($N_R; N_{ROW}$): These hypotheses are fundamental for stating that firms may have an advantage in locating in a bounded area (Krugman, 1991). For our purpose no assumption on the mobility of the factors of production is necessary. Instead what is important is to assume that each consumer of the two counterparts includes in its utility function the consumption of both the local and foreign (i.e. imported) goods.

The utility function of a consumer is a combination of the consumption of local (in proportion μ) and foreign goods (in proportion $(1-\mu)$):

$$U_R = C_R^{\mu} C_{ROW}^{(1-\mu)} \text{ and } U_{ROW} = C_{ROW}^{\mu} C_R^{(1-\mu)};$$

where

$$C_R = \left(\sum_{k=1}^{n} c_k^{\frac{\sigma - 1}{\sigma}} \right)^{\frac{\sigma}{\sigma - 1}} \text{ and } C_{ROW} = \left(\sum_{k=1}^{n^*} c_k^{\frac{\sigma - 1}{\sigma}} \right)^{\frac{\sigma}{\sigma - 1}};$$

in which n and n^* are respectively the number of firms in region R and in ROW, while σ is the elasticity of substitution between the different varieties of goods.[3] We also assume that there exists a single factor of production, i.e. labor force and each firm hires workers (L_i) for its production (x_i) according to its marginal productivity (γ), as in the following equation

$$L_{ij} = \beta + \gamma x_{ij}; \qquad j = R; ROW. \tag{1}$$

In the absence of unemployment, the number of firms in R and ROW corresponds to the following relation

$$n = \frac{N_R}{L_{iR}} \text{ and } n^* = \frac{N_{ROW}}{L_{iROW}}. \tag{2}$$

In a monopolistic competitive setting à la Dixit-Stiglitz, each firm produces a single good which is different from the other according to a degree σ. Each firm fixes its price as a mark-up over its costs. In particular, its costs are given by

$$c_{ij} = w_j L_{ij}; \qquad j = R; ROW$$

with w_j the level of wages[4] in region j; such that maximizing the profits, each firm fixes its price equal to

$$p_j = \left(\frac{\sigma}{\sigma - 1} \right) \gamma w_j; \qquad j = R; ROW.$$

Firms sell their good both on the local and foreign markets. When they export, they incur transport costs (defined as iceberg transport costs $\tau > 1$) and so the total demand facing the local firms in R is equivalent to:

[3] In our model we do not care about the differences in size that could exist between the number of firms of the region and of the rest of the world since we do not need.

[4] It is assumed to be equal for all firms and all workers, independetely of their skill.

$$D_R + D_{ROW} = \frac{n_R\,(p_r^{-\sigma})}{n_R\,(p_r)^{1-\sigma} + n_{ROW}\,(\tau p_{row})^{1-\sigma}}\,\mu Y_R + \frac{n_R\,(\tau p_r^{-\sigma})\tau}{n_R\,(\tau p_r)^{1-\sigma} + n_{ROW}\,(p_{row})^{1-\sigma}}\,(1-\mu)Y_{ROW}; \tag{3}$$

where Y_j $(j = R; ROW)$ is the j-country's income.

Our empirical investigation focuses on the regional outgoing trade flows. We therefore uniquely concentrate on the second term on the right hand side of equation (3). Indeed, the exports of a single region to the rest of the world are exactly equal to

$$EXP_R = \underbrace{\frac{n_R\,(\tau p_r^{-\sigma})\tau}{n_R\,(\tau p_r)^{1-\sigma} + n_{ROW}\,(p_{row})^{1-\sigma}}}_{H}\,(1-\mu)Y_{ROW}: \tag{4}$$

Due to the scarcity of data we are not able to estimate this expression directly, so we look for a possible approximation. In particular, in a regional setting, the ratio H in equation (4) encapsulates the relative weight of the consumption of R's goods in comparison to the ROW's goods. Indirectly it stands for the degree of competitiveness of R's goods (determined by the price ratio). It is plausible to think of an approximation of it via an expression containing various elements which contribute to create the degree of competitiveness of a region.

As we want to refer to a typical geographic setting in which the geographical dimension and the home market effect emerge, we assume that the ratio H is proportional to the following expression:

$$H \propto (Geo_R)^{\beta_1}(HM_R)^{\beta_2}(SE_R)^{\beta_3}; \tag{5}$$

where GEO stands for a geographic feature of the region that captures the effect of the existence of transport costs, HM represents the home market effect and SE accounts for a series of specific (ad-hoc) regional features. This approximation relies on a few stylized facts. In particular, all studies that tackle the issues of performance of local agglomerations, agree in finding in the previous three components the principal sources of competitiveness of clustered firms.[5] Replacing expression (5) in equation (4) yields

$$EXP_R = \left[(Geo_R)^{\beta_1}(HM_R)^{\beta_2}(SE_R)^{\beta_3}\right](1-\mu)Y_{ROW};$$

that is equivalent to the following logarithmic form

[5] See Storper (1992) and Musyck (1994) for more details.

$$Log(EXP_R) = c + \beta_1 Log(Geo_R) + \beta_2 Log(HM_R) + \beta_3 Log(SE_R); \qquad (6)$$

in which $c = Log[(1-\mu)Y_{ROW}]$. Implicitly, by the previous definition we assume that the level of revenue of the rest of the world (ROW) is constant and not affected by the revenue of the examined regions. Equation (6) is the equation we use for our econometric implementation. Even if it recalls some basic features of the gravity models, since the intensity of the trade flows relies on the spatial dimension, it distinguishes itself by not accounting explicitly bilateral trade flows. This expression gives us the opportunity to account for two main effects of the model: trading costs and home market effects. In particular it will be of our interest to point out the possible similarities between the stylized facts and the outcomes of this specification.

The geographic component is embodied in the distance for reaching foreign markets. In that sense, the larger the region (i.e. the surface of a region) is, the more expensive trading is. But, as far as we consider an index of the local system of infrastructures, a higher value of it should correspond to a higher intensity in the trade flows. Indirectly, these two interpretations suggest that even if we consider a large region, the presence of an efficient internal transport system is expected to sustain the intensity of the interregional and international trading flows.

The home market effect is expected to affect positively the trend of the trade flows, since it is evaluated as the real source of competitiveness of a region. Here, it will be accounted for by the size of the local demand that, via the exploitation of increasing returns to scale, ensures to regional goods a certain degree of competitiveness over the others. In our estimation we will treat it by using the regional GDP.[6] Finally, the expected coefficients of the dummies depend on what we choose to insert in our regressions and we will address this below.

3 The determinants of the regional trade flows

In this section we estimate equation (6) for a sample of European regions. In particular, among all the European regions, we chose those that display a similar industrial structure and specialisation of the outcoming trade flows. We selected the sectors of specialization that are connected with the presence of local clusters (or agglomerations) of small and medium firms, in order to concentrate on the hypothesis that the clusters of firms are possible sources of competitiveness. Indeed, assuming that firms which belong to a same industry decide to set in a bounded area, indirectly they reveal that each of them produces slightly differentiated goods and by clustering they exploit positive externalities such as economies of scale and others.

Let us now turn to the estimation of equation (6). Our sample is composed by the following European regions: Baden-Württemberg (G), Emilia Romagna (I), Lombardia (I), Rhône-Alpes (F), Veneto (I) and West Vlaanderen[7] (B). According to various studies, in these regions there

[6] We obtained similar results replacing the regional GDP with the regional population.

[7] It is a part of the Vlaanderen region in Belgium.

are local clusters of small and medium firms that belong to the textile and mechanical (with machineries) sectors (Musyck (1994), OECD (1996), Storper(1992)). We consider the outgoing trade flows of the previous six regions in the textile and mechanical sectors for a period that covers the years from 1988 to 1993.

We build the dependent variable of equation (6) (LEXPO) with the purpose to apply a panel data methodology with three dimensions (years, regions and sectors).[8]

Box 1 contains a description of all the variables we will consider in the estimations of equations (4). First, we evaluate (in alternance) two different proxies for including a geographic component in the specification. With the surface of the region (intended as the total geographic area of a region), we want to test if the size of a region is a good proxy for the level of transport costs that firms have to sustain for delivering their goods abroad. Indeed, the larger the region is, the higher (on average) should be the distance and the cost of trading. On the contrary, if we introduce in our analysis a measure of the degree of the organisation of the transport system (i.e. the density of the transport network in each region of the sample),[9] we expect to obtain an opposite effect. Indeed the density of transport networks reflects the regional facilities for travelling, and an efficient system of communication reduces the transport cost, encouraging international exchanges. To represent the home market effect, we use either the size of the regional population or the level of the regional GDP, since they both account for the size of the local demand that affects the creation of increasing returns to scale. Finally, we deal also with a series of dummies. We introduce a dummy for defining better their reciprocal spatial location. So far, since all the regions of the sample belong to the EU, we introduce a dummy for detecting the existence of regional border sharing with other non EU countries.

In addition, dealing with a panel data with three dimensions, another hypothesis that turns out to be interesting to test is the existence of fixed effects at the regional and sectoral levels. So, in order to test this second group of hypotheses for each specification of equation (6), we present various versions of that equation. Those versions are obtained by relaxing progressively the restrictions on the coefficients of the equations and introducing regional or sectoral dummies.

The statistical procedure is briefly explained in Appendix. Investigating on the existence of fixed effects means looking for some common features that can affect the behaviour of a whole sample of regions in export matters. According to Egger (2000), fixed effects are due to hidden variables that are specific to cross sectional units. Some of the main forces behind the fixed effects should be tariff policy measures or export driving variables,[10] above all in samples that follow an ex-ante predeterminated criterium of selection. In this setting, focusing on export

[8] All these estimations are computed with the Eviews software package. In all the following estimations we apply the White methodology for correcting OLS estmations from the heteroskedastic errors.

[9] It is the ratio between the total length of the transport networks (railways, ways, highways etc) and the surface of each region.

[10] For instance, the Italian currency devaluation in 1992.

flows, we tackle this problem by testing the significance of sectoral or regional components that make the differences in export performances across the regions of this sample.

Firstly we report the results of our estimations of equation (6) introducing the 'surface' variable, then those with the regional densities of transport costs. As mentioned, in each table we offer three different specifications moving from that which displays more restrictions on coefficients. Looking at equation (1) in tables 5.1 and 5.2, we are able to confirm the basic effects we proposed to test. All the variables included in the regression are significant at 5% and the explicative power of the model increases as we introduce sectoral or regional dummies. As we expected, the surface affects negatively the size of the outgoing trade flows. Similarly, not being a region that shares its border with other countries seems to affect negatively the intensity of the exchanges.[11] The home market effect always has a positive effect on export flows, that indirectly means assuring a certain degree of competitiveness as derived in theoretical models. These results confirm that (i) the spatial location of regions seems to be important and (ii) the degree of competitiveness of a regional industry pass through the size of the trading flows that rely on the size of the local demand.

BOX 1.

D2	Dummy for absence of regional adjacency with foreign countries
LDST	Logarithm of regional density of the transport network
LEXPO	Logarithm of regional exports (Millions ECU)
LGDPS[12]	Logarithm of the regional GDP (Millions ECU) per Kmq
LPOP	Logarithm of the regional population (Millions)
LSURF	Logarithm of the regional surface (Km^2)

[11] We obtain a constrasting result when we allow for the presence of further dummies in the third specification of table 1. We do not account for this dummy when we are in presence of all other regional dummies because of collinearity.

[12] We selected this variable since it allows us to focus on the home market effect, avoiding the distorsions given by the regional size effects.

Table 1 : Regional trade flows : dependent variable LEXPO
Fixed effects: Sectoral dummies
Observations : 72

#	Dep.Var.	Method	Const.	LSURF	LGDPS	D2	F-test1	F-test2	R^2 Adj:
1	LEXPO	POLS	1,69 (0,04)	-0,64 (0,00)	1,13 (0,00)	-1,20 (0,02)			0,42
2	LEXPO	LSDV	2,25 (0,00)	-0,64 (0,00)	1,13 (0,00)	-1,20 (0,00)	42,15 [2,70]		0,67
3	LEXPO	LSDV (slope)	-0,41 (0,46)	-0,58 (0,00)	1,30 (0,00)	0,19 (0,01)	36,22 [2,70]	17,92 [2,70]	0,92

(Values in round brackets: 2-tail statistics[13] - Values in square brackets: critical value).

Table 2 : Regional trade flows : dependent variable LEXPO
Fixed effects: Regional dummies
Observations : 72

#	Dep.Var.	Method	Const.	LSURF	LGDPS	F-test1	F-test2	R^2 Adj:
1	LEXPO	POLS	7,53 (0,00)	-0,93 (0,00)	1,44 (0,00)			0,28
2	LEXPO	LSDV	3.70 (0,42)	-0,36 (0,37)	0,70 (0,47)	1,48 [1;92$^{\pm}$]		0,40
3	LEXPO	TWFE	4,27 (0,21)	-0,36 (0,23)	0,70 (0,32)	7 [2,5*]	4,03 [2,5*]	0, 66

(Values in round brackets: 2-tail statistics - Values in square brackets: critical value)
(F-value significance: * at 1%, $^{\pm}$ at 5%)

The augmented specifications of equation (1) (both in tables 1 and 2) that include sectoral or regional dummies, turn out to be more performing than the basic specification. Indeed the $R^2 - Adj$ increases as we introduce a higher degree of differentiation such that the LSDV (with changing slope) estimator reveals to be even more appropriate than the simple LSDV (see F-test2). Moreover, looking at the F-statistic tests in table 1, it seems evident that the export flows of this sample display fixed effects, either regional or sectoral.

Moreover, from the statistical tests of table 2 we draw some further conclusions. When we include in our estimations some regional dummies, we cannot reject the hypothesis of

[13] These statistics represent the probability that the t-stat of each coefficient is greater than the correpondent p-value.

identical fixed effects across the sample. Allowing for the presence of regional dummies means detecting the existence of fixed effects in the model selected by regions, but they disappear at the moment we introduce other sectoral dummies (TW FE estimator). Indeed regional effects alone are marginally significant, while regional and sectoral effects are significant.

Briefly, it appears that the differences in the intensity of the trade flows inside our specification for our regional model rise just as sectoral matters and not regional ones.

Now, we replace the surface variable with the density of the transport system as an index of the local facilities a region supplies to the local firms for trading. We compute again all the previous specifications and the basic previous results are confirmed.[14] In the basic equation (equation (1) in tables 3 and 4), the incoming variable affects positively the export flows. Indeed, the easiness in reaching a foreign destination affects positively the trade flows, since it drops the transport costs for unit of delivered good. Symmetrically, it should encourage also the incoming of foreign goods and stimulate the competition between local and foreign firms.

Finally, looking at the statistical tests (F-test) in tables 3 and 4, we obtain the same results as before and the comments made for the previous two tables also apply.

Table 3 : Regional trade flows : dependent variable LEXPO
Fixed effects: Sectoral dummies
Observations : 72

#	Dep.Var.	Method	Const.	LDST	LGDPS	D2	F-test1	F-test2	R^2 Adj:
1	LEXPO	POLS	7,53 (0,00)	0,80 (0,00)	0,75 (0,00)	-1,36 (0,01)			0,42
2	LEXPO	LSDV	8,09 (0,00)	0,80 (0,00)	0,75 (0,00)	-1,35 (0,00)	4,22 [2,70]		0, 67
3	LEXPO	LSDV (slope)	7,99 (0,00)	1,11 (0,00)	0,77 (0,00)	-0.01 (0,87)	30,71 [2,70]	14,29 [2,70]	0,91

(Values in round brackets: 2-tail statistics - Values in square brackets: critical value)

[14] Even in this table, the dummy variable D2 changes of significance corresponding to the third specification.

Table 4 : Regional trade flows : dependent variable LEXPO
Fixed effects: Regional dummies
Observations : 72

#	Dep.Var.	Method	Const.	LDST	LGDPS	F-test1	F-test2	R^2 Adj:
1	LEXPO	POLS	6,78 (0,00)	0,68 (0,00)	1,08 (0,00)			0,23
2	LEXPO	LSDV	7,68 (0,00)	0,86 (0,37)	0,69 (0,47)	1,86 [1,92±]		0,40
3	LEXPO	TWFE	8,24 (0,00)	0,86 (0,22)	0,70 (0,32)	7,69 [2,5*]	4,42 [1,92±]	0,66

(Values in round brackets: 2-tail statistics -Values in square brackets: critical value)
(F-value significance: * at 1%, ± at 5%)

Regional export data, as we applied here, seem to be coherent with the findings of the theoretical economic geography framework.

We move now to a micro-dimension of the local agglomeration of firms. We address the local clusters of firms (i.e. industrial districts) that are considered as the sources for regional competitiveness in various studies (for instance, Storper (1992)). We concentrate on the case of the industrial district in Lombardia in order to (i) state some specific local agglomeration forces that induce firms to cluster there and (ii) verify the compatibility of their sources of competitiveness with those we displayed for the European regions. In a broader sense we are interested in detecting what can be the linkage between the determinants of the competitiveness of the local structures of agglomerations, viewed as the micro-foundations for the competitiveness at macro-level (for instance at regional level)

4 The size and performance of industrial districts: an example

Moving from a regional dimension to that of industrial districts, our methodology is to change somewhat because of the different kind of data that are available. Our purpose continues to be to look for determinants of the outgoing trade flows of these clusters empirically. According to stylized facts (see, for instance, ICE (1996)), we are interested in testing the hypothesis that the existence of local facilities toward export sustain the rise and development of trading activities. When we refer to industrial structures like industrial districts, the framework for describing the existence of agglomeration forces may be integrated by other components, in addition to classical increasing returns to scale, home market effects or transport costs. For instance, there exists linkages incurring among the firms that may reinforce the clustering movement. This process has been precisely analyzed by Soubeyran-Thisse (1999) and we borrow their results for integrating our framework of reference. They prove that the cluster of firms, like industrial districts, are a form of geographical agglomeration in which its member benefits from the accumulation of the know-how associated with workers residing there. We assume that the information which is spread among workers is an expression of a learning process inside the district (usually as learning-by-doing) and it is expected to be proportional to the quantity of the good that is produced in that district.[15] Allowing for a local association that supplies services to the district firms (proportionally to the level of production of the district[16]) equation (1) becomes:

$$L_R = (1 - \psi)\beta + \psi\gamma x_R. \tag{7}$$

The term (ψ) embodies the positive extenalities given by the interaction between the local associations and the cumulated experience of the firms, viewed as the total sum of the previous total production. In this setting, the positive effects of these externalities are represented as a way to reduce the demand of inputs (here labour) for one unit of output.

So, replacing (7) in (2) yields the following result

$$n = \frac{N_R}{(1 - \psi)\beta + \psi\gamma x_R}, \tag{8}$$

and applying the logarithm function becomes

$$Log(n) = Log(N_R) - Log((1 - \psi)\beta + \psi\gamma x_R);$$

A possible equivalent econometric form of the previous equation is

$$Log(n) = c + \alpha_1 Log(N_R) + \alpha_2 Log(SVA_R) + \alpha_3 DUMMY + \varepsilon_R. \tag{9}$$

and we will concentrate on it.

In equation (9), N_R stands for the size of the district (i.e. the size of its local market), SVA represents an index of the services offered to the firms and $DUMMY$ encapsulates a few local features. Considering the case of the industrial district in Lombardia (see Appendix) we want to test the relation between the number of firms that belong to a district and some

[15] The more workers produce, the more they acquire skills in production and the experiences of each worker become common shared information across the members of a district.

[16] The level of the local production should be defined as the cumulated production of the goods in that district. However, this assumption is not binding in this context because we do not want to focus on the differences in productivity induced by a learning process.

other territorial components. Lombardia contains in its territory 21 industrial districts that have been selected by local authorities applying specific regional laws. We consider their performances in each sector of specialization for four years 1981, 1992, 1994, 1996 and we perform a cross-section estimation. In box 2, we define the variables we use in this section. In the first series of estimations, we want to test if the size of the local population and the presence of services addressed to the activities of the local firms are two sources for inducing firms cluster in an area (i.e. affecting the number of firms in the district). The number of persons located in an area stands for the potential level of demand that could be addressed to the local firms and its size represents potential economies of scale. In this particular framework, the home market effect should be viewed as an advantage that one district may display against other districts. In other words, the larger is the size of the local population, the higher is the probability that they will develop higher increasing returns to scale, enabling a higher degree of competitiveness in comparison of the other districts. Moreover we will also focus the attention on the relationship incurring between the presence of firms devoted to supply services to the other firms and the size of the district, via the hypothesis that this presence should be a sort of cohesion force for attracting more and more firms.

BOX 2

D3	Temporal dummy for 1981
D4	Dummy for border adjacency with foreign countries
D7	Sectorial dummy (wood & furniture)
LEXPAD	Logarithm of per-worker level of exports in a district (ECU)
LPOP	Logarithm of the population of each district
LPOPS	Logarithm of the density of population in a district
LSSS	Logarithm of the size of service activities in a sector
LSUP	Logarithm of the surface of a district (km^2)
LSVA	Logarithm of the number of firms that provide services in each district
LSVAS	Logarithm of the density of service firms in a district
LSVI	Logarithm of the density of employees in service activities in a district
LUNP	Logarithm of the number of firms active in the sector of specialization of a district
LUNPS	Logarithm of the density of firms active in the sector of specialization of a district

In order to select the most efficient combination among all the proxies we introduced to test equation (9), we propose various specifications in table 5. By these regressions we derive some fundamental results. First, the presence of local services (SVA or SVAS) for district firms affects positively (when it is significant) and consistently the number of firms that belong to a district. This sustains our hypothesis that inter-firm services may be a sort of inner centripetal force for a cluster. At the same time, even the size of the local population affects positively the size of the district. In this setting, the surface is viewed as a measure of the dimension of the internal market and so it engages the same kind of effects that the population itself. As a last remark, we add that the role of the dummies in these specifications is the same as in the other case. Indeed, the temporal dummy assumes importance statistically. The dummy variable for the adjacency with foreign countries matters only for levels of significance at 5% and the magnitude of its coefficient is lower than that of the other regressors.

Table 5: Size of industrial district in Lombardia

Dependent variable LUNP [17] for models (1) and (2) and LUNPS for models (3) and (4).

	(1)	(2)	(3)	(4)
C	-7,02 (0,00)	-0,47 (0.46)	-0,06 (0,54)	-6,00 (0,00)
LSUP	-0,04 (0,75)	0,41 (0,00)		
LSVA	-0,02 (0,84)	0,68 (0,00)		
LSVAS			0,68 (0,00)	0,01 (0,92)
LPOP	1,19 (0,00)			
LPOPS				1,15 (0,00)
D3		0,56 (0,00)	0,56 (0,00)	0,06 (0,68)
D4		0,28 (0,03)	0,30 (0,02)	0,02 (0,77)
R^2-Adjusted	0,86	0,75	0,66	0,80
N. Obs.	84	84	84	84

(Values in round brackets: 2-tail statistics)

Having taken into account the presence of services matters for the rise of local industrial agglomeration, the study continues with the purpose of proving that the existence of services devoted to firms may affect positively outgoing trade flows. For this objective we still rely on equation (6), but we introduce some changes. In particular, we do not dispose of specific information on outgoing trade flows from local districts, so that we have to introduce some further assumptions. Our data only include the export flows (by sectors) of all the regional small and medium firms in 1992 and 1994. It is well known that industrial districts in Lombardia are made of small and medium firms (SMEs) which encounter considerable problems when they decide to follow an internationalization process alone. Assuming this situation, it is reasonable to think that export flows are mainly the outcome of the firms belonging to districts. So far, our principal hypothesis is to identify the export flows of all the small and medium firms in Lombardia with those of district structures.[18] In order to make this hypothesis more testable,

[17] We repeted the computations for equations 1 and 2, replacing LSVA with LSVI and we obtain the same outcome. Indeed the correlation between LSVA e LSVI is equal to 0.978.

[18] Specifically, we assume that total exports of small and medium firms (SMEs) in a sector are connected with the activity of all the districts that display a specialisation in that industry. So, we share the amount of sectoral exports of SMEs among the districts that display a specialisation in that particular sector, proportionally to the number of workers hired in that sector in each district.

we share proportionally the total amount of sectoral exports from SMEs among all the districts that display a relative specialization in that sector, in accordance with the total number of workers installed there. With this assumption in the following estimation, the dependent variable becomes the level of export per worker (LEXPAD). Proceding with the reformulation of equation (6), we need to redefine the proportionality of expression H, still maintaining our interest for the geographical aspects and the home market effect. In particular we want to include in our test an index of the district competitiveness (relative to the rest of the world) by adding a proxy for the services available in them (variable SER). So, now we are dealing with [19]

$$H \propto (Geo_D)^{\beta_1} (HM_D)^{\beta_2} (SE_D)^{\beta_3} (SER_D)^{\beta_4};$$

and replacing it into equation (6) yields to

$$Log(EXP_D) = c + \beta_1 Log(Geo_D) + \beta_2 Log(HM_D) + \beta_3 Log(SE_D) + \beta_4 Log(SER_D): \quad (10)$$

The results of the estimation of equation (10) are reported in table 6, while a key for the symbols adopted are included in box 2.

Table 6 Exportation flows from Lombard districts.
Dependent Variable LEXPAD

	(1)	(2)	(3)
C	18,10 (0,00)	20,75 (0,00)	20,74 (0,00)
LSUP	-0,86 (0,03)	0,11 (0,48)	0,11 (0,48)
LPOP	0,35 (0,30)	0,13 (0,70)	0,13 (0,71)
LSVA		0,89 (0,00)	
LSSS		1,58 (0,00)	0,69 (0,03)
LSVI	0,69 (0,01)		0,89 (0,00)
D4	0,10 (0,39)	-0,01 (0,93)	0,01 (0,93)
D7	-1,70 (0,00)	-1,85 (0,00)	-1,85 (0,00)
R^2 Adj	0,90	0,91	0,91
N. Obs	42	42	42

(values in brackets: 2-tail significance)

[19] We recall that GEO stands for geographical features, HM for the home market effect and SE for other local features.

Table 7. Lombard Districts: dependent variable LEXPAD
Fixed effects: Sectoral effects
Observations: 42

#	Dep.Var.	Method	Const.	LSVI	LSSS	F-test1	R^2 Adj:
1	LEXPAD	POLS	20,98 (0,00)	1,04 (0,00)	0,01 (0,98)		0,72
2	LEXPAD	LSDV	22,36 (0,00)	1,03 (0,00)	0,93 (0,00)	2,72 [2,16±/3,00*]	0,92

(Values in round brackets: 2-tail statistics -Values in square brackets: critical value)
(F-value significance: * at 1%, ± at 5%)

In general, the specifications adopted to estimate equation (10) reveal to be satisfactory, even if the significance of all the regressors is not always so important as in the regional case. The three versions of the estimations computed for equation (10) are substantially equivalent both in terms of significance of the regressors and explicative power. Indeed their outcomes are perfectly in agreement. Across all the specifications what seems to really matter for the intensity of export flows is the diffusion and size of services supplied to the local exporters, while neither the geographic components nor the home market effect seems to deeply affect the export decisions of firms. Indeed, the geographical dummy for sharing borders is not significant, while surface is significant only in model (1) and in that case its effects toward exports are as they were expected to be. Finally, what is always significant is the dummy associated to a sector which (at that time) was following a restructuring process.

In addition, we also verified for our sample of districts the presence of a fixed sectoral effect that could partially contribute in explaining the intensities of the trading flows.

As a consequence of the results presented in table 6, let us consider a simplified version of equation (10). We consider the intensity of the trade flows (outcoming from local district firms) exclusively as a function of the number and dimension of the local firms which supplied their services to the manufacturing firms. Following what we did in the regional setting, we estimate this simple form of equation (10) by a POLS estimator and we compare it with a LSDV estimator that accounts for sectoral fixed effects. This new specification improves the R^2 of the regression and the level of significance of the selected regressors. So, the basic results appear to be quite robust. Moreover, applying the F test to this estimation (see the second part of table 7), we conclude that is possible that the sectoral fixed effects may be significant (at 5%), so that the POLS estimator cannot be better than the LSDV one. Indirectly, this results should confirm an important intuition: the decision choices about exports of the SMEs are driven by extra-sectoral components. As it has been often argued, the problems that these firms have to face in the internationalisation process have are not merely linked with the sector of the activity.[20] They are principally connected to specific characteristics, such as the small dimension or low bargaining power, that are not peculiar of a sector, but that are common shared in a category of firms.

5 Conclusions

This study offers an empirical approach of a subject widely treated theoretically, but not so well considered empirically. In the first part, we concentrated on a group of European regions. The estimations we derived sustain the correctness of the inclusion of spatial components in the analysis of the intensity of trade flows, such as the distance from the final destination and the density of the transport networks. At the same time, the home market effect helps in explaining the intensity of the outgoing flows, confirming that comparative advantages should be created rather than inherited. Furthermore, the analysis of micro agglomeration of firms (such as industrial district) takes into account that comparative advantages may also benefit from the support of other activities such as services to enterprises. In particular they could represent another kind of centripetal force because they reinforce the clustering of firms in a location. At this micro-level, the structural differences across exporting units or sectors are not fundamental for stating the intensity of the trade flows in districts. Indeed, the reasons for the performances of these industrial systems seem to be connected to the different forms of organisations among small and medium firms. All these results confirm that firms may be seen as active and strategic agents on the market. Given the availability of data, further empirical studies along these lines at a level of local agglomerations are warranted. For instance, it would be interesting to refine the variables that account for regional competitiveness by including some other proxies that could capture better the presence of increasing economies of scale. Finally, it is also worthwhile to extend this analysis to a wider dimension that might include more detailed information on the learning process inside each district (as a source of competitiveness). This possibility would also allow comparative studies among the performances of various forms (and degrees) of agglomeration.

References

[1] J.E. Anderson (1979): 'A Theoretical Foundation for the Gravity Equation', American Economic Review, vol. 69 (1), pp. 106-116.

[2] A.V. Deardorff (1998): 'Determinants of bilateral trade: does gravity work in a neoclassical world ?', in A.J. Frankel (ed.): 'The Regionalism of the World Economy', Chicago, The University of Chicago Press.

[20] For instance, they do not seem to be principally affected by unexpected changes in the economic trends.

[3] D. R. Davis - D.E. Weinstein (1999): 'Economic Geography and Regional Production Structure: an Empirical Investigation', European Economic Review, vol. 43(2), pp.379-407.

[4] P. Egger (2000): 'A note on the proper econometric specification of the gravity equation', Economic Letters, vol. 66(1), pp. 25-31.

[5] S.J. Evenett - W. Keller (1998): 'On theories explaining the success of the Gravity Equation', NBER Working Paper n. 6529.

[6] R.C. Feenstra- J.R. Markusen-A.K. Rose (1998): 'Understanding the Home Market Effect and the Gravity equation, the Role of Differentiating Goods', CEPR Discussion Paper n. 2035.

[7] W.H. Greene (1997): 'Econometric Analysis', III ed., Prentice-Hall.

[8] E. Helpman-P. Krugman (1985): 'Market Structure and Foreign Trade', MIT Press.

[9] D. Hummels-J. Levinsohn (1995): 'Monopolistic Competition and International Trade: Reconsidering the Evidence', Quarterly Journal of Economics, vol. 110 (3), pp.799-836.

[10] P. Krugman (1991): 'Geography and Trade', MIT Press.

[11] – – – – – (1995): 'Increasing Returns, Imperfect Competition and the Positive Theory of International Trade', in G.Grossman- K. Rogoff (Eds.) 'Handbook of International Economics', vol. III, North Holland, Elsevier.

[12] E.E. Leamer-J. Levinsohn (1995) : 'International Trade Theory: the Evidence' in G.Grossman- K. Rogoff (Eds.) 'Handbook of International Economics', vol. III, North Holland, Elsevier.

[13] B. Musyck (1994): 'Les caracteristiques de l'industrialisation autonome dans le sud de la Flandre Occidentale' in C.Courlet, B.Soulage (Eds): 'Industrie, Territoires et Politiques Publiques', Paris, Editions L'Harmattan.

[14] L. Nachum (1998): 'Economic Geography and Patterns of International Business Activity', ESRC Centre for Business Research University of Cambridge Working Paper n. 114.

[15] OECD (1996): 'Network of Enterprises and Local Development - Competing and Cooperating in Local Productive Systems', Local Economic and Employment Development Series.

[16] A. Soubeyran - J.F. Thisse (1999): 'Learning by doing and the Development of Industrial Districts', Journal of Urban Economics, vol. 45 (1), pp. 156-176.

[17] M. Storper (1992): 'The Limits to Globalization: Technology Districts and International Trade' Economic Geography, vol. 68, pp. 60-93.

[18] J. Torstensson (1998): 'Country Size and Comparative Advantage: an Empirical Study', Weltwirstschaftliches Archiv, vol.134(4), pp.590-611.

[19] R. Weder (1995): 'Linking Absolute and Comparative Advantage to Intra-Industry Trade Theory' Review of International Economics, vol. 3(3), pp. 342-354.

6 Appendix

6.1 Econometric Estimations: some details

In both the econometric exercises in sections 3 and 4, we deal with a cross-section sample with various dimensions.

In section 2 our panel (with three dimensions) is composed of 6 European regions, 2 sectors and 6 years, while the econometric study on the exports outgoing from local districts consists of a panel with two dimensions: 21 local districts (ranked according to 3 sectors of specialization) and 2 years.

In addition to the classic goodness-of-fit test, in our exercises we propose a further test: F test. This test allows for the possibility to test the presence of fixed effects (by regions or sectors). Looking for the presence of fixed effects across our sample means controlling for the possibility to include other variables that are constant over regions (or over sectors) in our sample. In particular, applying an F-test we plan to test two main hypotheses, namely whether the individual effects (α_{ij})-constant overtime- are constant across all unities and, in the case they are not constant, if there may exist some effects that change the slope of the regression.

We consider the general regression form of equation (6) for our panel at three dimensions

$$y_{ijt} = \alpha_{ijt} + \beta_{ijt} x_{ijt} + \varepsilon_{ijt};$$

with $i = 1, \ldots, n$; $j = 1, \ldots, s$; $t = 1, \ldots, T$; as index for regions, sectors and time.

When we estimate the previous equation by ordinary least squares, if we consider $\alpha_{ijt} = \alpha$ as a constant over all the three dimensions we obtain a POLS estimator. In addition, when we let α_{ijt} vary just across one dimension (for instance $\alpha_{ijt} = a_i$ or $\alpha_{ijt} = a_j$); we introduce $(n - 1)$ regional or $(s - 1)$ sectorial dummies variables in our specification and the estimation of this model is known as least square dummy variable model (LSDV). On the contrary, when we model the fixed effects including regional as well as sectorial specific dummies we are dealing with a two-way fixed effects (TWFE).

The F-tests we propose are useful for selecting which one of the previous estimators is the most efficient. In all our tables, when we apply the F-test 1 we want to test the hypothesis that the constant terms are all equal (i.e. LSDV or TW FE estimators versus POLS estimators). This means that when this hypothesis is accepted, the most appropriate estimator is pooled least squares (POLS). In other words, considering an F-function that corresponds to the following statistics

$$F(n-1; nT-n-k) = \frac{(R^2_u - R^2_{Pols})/(n-1)}{(1-R^2_{Pols})/(nT-n-k)};$$

in which k represents the number of regressors (excluding the constant), and R^2_u and R^2_{Pols} are statistics coming from the alternative and POLS estimations, we test the following hypothesis:

for regional effects

$$H_0 = \left\{\beta_{ijt} = \beta \text{ for all } i;j;t\right\} \text{ vs } H_1 = \left\{\beta_{ijt} = \beta_i \text{ for all } j;t\right\};$$

or for sectoral effects

$$H_0 = \left\{\beta_{ijt} = \beta \text{ for all } i;j;t\right\} \text{ vs } H_1 = \left\{\beta_{ijt} = \beta_j \text{ for all } i;t\right\}:$$

Each time the statistic F − test leads us to reject H_0 (i.e. the value of our statistical test is larger that those accounted for the tables for a F distribution at 1% or 5% level of significance), we conclude that the sectorial or regional effects are not the same in our sample. This finding implies that the LSDV, LSDV (slope) or the TW FE [21] estimator is the most appropriate estimator.

In addition, applying the F-test 2, we want to detect which estimator among LSDV and TW FE or LSDV and LSDV (slope) is the most appropriate one. We keep the basic features of the F − test1 and our hypotheses to test (for instance) LSDV versus TW FE are the following ones:

for regional effects

$$H_0 = \left\{\beta_{ijt} = \beta_i \text{ for all } j;t\right\} \text{ vs } H_1 = \left\{\beta_{ijt} = \beta_{ij} \text{ for all } t\right\};$$

or, for sectoral effects

[21] It depends if we are referring to equation 2 or 3.

$$H_0 = \left\{ \alpha_{ijt} = \alpha_j \text{ for all } i;t \right\} \text{ vs } H_1 = \left\{ \alpha_{ijt} = \alpha_{ij} \text{ for all } t \right\}:$$

As before, rejecting the hypothesis H_0 means that the TWFE is more appropriate than LSDV as an estimator, so that our sample contains both regional and sectoral fixed effects.

In order to verify if the differences among the components in our sample may be included only in the constant term, or if they affect even others coefficients, we apply the F-test to the LSDV and LSDV (slope) estimators. The LSDV (slope) estimator is obtained for a specification that includes a series a dummies that affect contemporaneously the parameters α_{ijt} and β_{ijt}. In this case, our statistic test deals with the following form

$$\begin{aligned} H_0 &= \left\{ \alpha_{ijt} = \alpha_i \text{ for all } i;t \,/\, \beta_{ijt} = \beta \text{ for all } i;j;t \right\} \text{ vs} \\ H_1 &= \left\{ \alpha_{ijt} = \alpha_i \text{ for all } i;t \,/\, \beta_{ijt} = \beta_i \text{ for all } j;t \right\}; \end{aligned}$$

and the way to interprete the results is identical to the previous tests.[22]

6.2 The Industrial districts in Lombardia

Our analysis of local forms of agglomeration (wiewed as industrial districts) takes into account the industrial districts of an Italian region: Lombardia. According to the information extracted from the documents of the regional Union Camere, Lombardia accounts for 21 industrial districts (see figure 5.1). The regional legislation on districts is well organized basing on the regional law n.531/91. In Lombardia, local authorities dispose of clear criteria for distinguishing a simple cluster of firms from a real district. Indeed a cluster may be viewed as a district if a series of indices are grater than one. These indices cosider the level of local industrialization in manufacture and the relative specialization in production, the degree of concentration of the activities, the size of the firms and the entrepreneurial density.

Legend (in brackets the sector of specialization of each district:

1. Asse Sempione (Textile-Clothing)
2. Comasco (Silk Industry)
3. Brianza Comasca/Milanese (Wood and Furniture)
4. Lecchese (Metal and Mechanical Industry)
5. Brianza (Mechanics)
6. Valbrembana (Mechanics)
7. Valseriana (Textile-Clothing)
8. Sebino Bergamasco (Rubber Gasket Industry)

[22] For any other detail, see Greene (1997).

Figure 1: The Industrial Districts in Lombardia.

9. Camuno Sebino (Metal Industry)
10. Valtrompia-Valsabbia (Metal products)
11. Bassa Bresciana (Textile-Clothing)
12. Castelgoffredo (Clothing)
13. Canneto s/Oglio (Wood and Furniture)
14. Trevigliese (Metal and Mechanical Industry)
15. Casalasco Viadanese (Wood and Furniture)
16. Belgioioso (Mechanics)
17. Vigevanese (Shoe industry)
18. Lomellina (Clothing and Goldsmith industry)
19. Palazzolo s/Oglio (Textile and Textile Machinary Industry)
20. Oltrepo Mantovano (Textile-Clothing)
21. Basso Mantovano (Metal Carpentry and Farm Machine Industry)

6.3 Data

The sources of the data we used for our empirical estimation are different. Data related to industrial districts in Lombardia may be found on the web site of the Unioncamere at the following addresses http://www.unioncamere.it and http://www.ring.lombardia.it, while data on regional exportation for small and medium firms by sector come from the CIDEL - Istituto G. Tagliacarne web database at the following address http://www.tagliacarne.it. Other regional data (at macro-level) come from the database Eurostat REGIO that has been consulted c/o Région Wallonne (and we acknowledge Mr. J.P. Duprez). Data of regional trade flows has been granted by local sources. We acknowledge:

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