Rural firms and the local economy -
A focus on small and medium-sized towns[1]

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Abstract: The paper analyses how rural firms are linked through their sales, purchases and employment to the local economy as well as to the regional, national and international markets. Using primary data collected in thirty small towns and their surrounding areas across five European countries, we identify firm's characteristics as well as characteristics of local context and local markets associated with local integration or wider behaviours. We show that the more traditional the firm (small and independent firm with low labour productivity and managed by a local owner), the more local its spatial sales and purchases behaviour. In addition, we highlight the weak effect of variables describing the potential linkages between firms and local outputs, inputs and labour markets, according to the theoretical results of the economic geography framework. The size of local output market, the strength of local competition or the characteristics of local labour market in terms of skill matching do not play any role. The only characteristic of the local markets that affects the firm's spatial behaviour is the gap between individual's demand for inputs and the local supply of such inputs.

Key words: Rural development - Rural firms - Local economic integration - Small towns

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1. Introduction

Small and medium-sized towns have traditionally formed an integral part of the agricultural sector and wider rural economy, acting as a source of farm inputs, a first destination of farm outputs and as a source of consumer goods and services to farm households. In recent years, this relationship has been substantially eroded through processes of socio-economic restructuring, including the transformation of agriculture and a decline in other primary industries (See MARSDEN *et al.,* 1993; HODGE and MONK, 1987; NEWBY, 1985; CHAMPION, 1989). Further, a number of endogenous and exogenous drivers have resulted in the uneven development of rural economies throughout Europe, leading not only to disparities (See BRYDEN and HART, 2001; TERLUIN and POST, 2000; TERLUIN, 2002) but also to the decline of small and medium sized towns as thriving economic and service centres (See POWE and SHAW, 2004; THOMAS and BROMLEY, 2002; COURTNEY and ERRINGTON, 2000).

As a result, these settlements have received increasing attention from policy makers aiming to both maintain the traditional socio-economic fabric of rural areas, and to stimulate rural development through territorial, as opposed to sectoral – and namely agricultural – approaches. However, it cannot be assumed that fostering business growth in and around these settlements will help generate local economic development either through economies of agglomeration or through spillover effects into the surrounding countryside. On the contrary, the expansion of economic activity within a particular town might simply lead to an increase in imports and commuter flows from other regions or neighbouring cities with relatively few benefits to the town or surrounding rural area. Ultimately it is therefore necessary to understand and evaluate the nature of production linkages between firms in and around small towns in order to assess their potential role in generating local economic development.

In parallel, during the two last decades, numerous theoretical and empirical works have emphasised the role of the markets in the localisation process of firms and households. Theoretical approaches such as those related to the New Economy Geography put at the heart of the location process imperfect (*i.e.* monopolistic) competition, increasing returns, size of the final demand market, the strength of vertical linkages and differential local labour costs (see for details KRUGMAN, 1991; KRUGMAN and VENABLES, 1995; FUJITA *et al.*, 1999; or, FUJITA and THISSE, 2002). Some empirical studies have attempted to test the influence of these factors in several contexts (for an overview of these studies, See COMBES and OVERMAN, 2003; or, OVERMAN *et al.*, 2001). Findings have emphasised the important role of the home market effect (*i.e.* size of the local final demand market) on the geographical concentration of firms as well as the influence of vertical linkages. Indeed, if these factors do influence the location process of firms, there is chance that they also influence the spatial economic flows to and from firms located in small towns and their surrounding rural areas. To examine this hypothesis, there is a need to analyse the nature and extent of rural production linkages within the local, regional and national markets for goods, services and labour, including the factors influencing the strength of these linkages.

Using primary data collected in a study of thirty towns across five European countries, this paper examines the degree to which rural firms are integrated into the local economies of such towns relative to other sectors, and identifies the organisational characteristics associated with strong and weak local integration. The following section provides a review of existing empirical evidence of local linkages and outlines the theoretical context from which testable hypotheses are derived. Section 3 goes on to describe the methods used for the collection of primary data and its analysis using econometric techniques, results of which are presented in section 4. The findings from the study are discussed in the context of relevant empirical, theoretical and policy debates in section 5 and the conclusions in section 6 include suggestions for further research into the dynamics of both rural and urban local economies.

2. Literature review and theoretical context

Findings from a number of studies of first round linkages serve to indicate the firm characteristics likely to be associated with strong local economic integration, and in turn to help develop some hypotheses to be tested in the present study. Existing evidence suggests that the firm's industrial sector is a factor that affects the strength of economic linkages with its locality. Recent studies indicate that private services have stronger economic linkages, particularly in terms of sales patterns, with the locality than do manufacturing firms. Consumer services have been found to have stronger direct upstream local linkages than all other sectors and business services have been found to source more locally than the manufacturing sector (WILLIAMS, 1994; CURRAN and BLACKBURN, 1994; ERRINGTON, 1994; COURTNEY and ERRINGTON, 2000). WILLIAMS, 1994, also found that the construction sector tended to both source and sell more locally than the manufacturing sector. Indeed, the limited local linkages of manufacturing firms have been confirmed by a number of studies. COURTNEY and ERRINGTON, 2000, compared the relative strength of local upstream and downstream linkages of agricultural firms (including agricultural merchants and services as well as holdings), with other sectors, concluding that the sector exhibited relatively weak downstream linkages. No significant differences were revealed in terms of upstream linkages.

A number of organisational characteristics have also been found to influence the degree of local economic integration of individual businesses, including firm size, ownership and age. Small firms have been found to source more inputs locally compared to larger firms (COURTNEY and ERRINGTON, 2000; HARRISON, 1993; ERRINGTON, 1994). One possible explanation is that larger firms have lower transport costs per unit associated with purchasing larger quantities of goods. There is also some evidence from the literature to suggest that smaller firms exhibit stronger linkages to their locality in terms of customer base, than larger firms (CURRAN and BLACKBURN, 1994; ERRINGTON, 1994; HARRISON, 1993). Ownership may also influence the level of inputs sourced locally. A number of studies have found that independent firms source a higher proportion of their inputs locally, and are therefore more strongly tied to locality than branches of national and multi-national corporations (COURTNEY and ERRINGTON, 2000; GRIPAIOS *et al.*, 1989; DOBSON, 1985). With respect to firm age, NORTH and SMALLBONE, 1996, argue that the majority of rural SMEs turn to local market opportunities at their initial stages of operation, a pattern which is especially evident in craft-based firms. Gradually, increasing competition makes such firms look for more distant or niche markets and to start diversifying into

new products. The finding that newly established firms initially turn to local markets is also confirmed by CURRAN and BLACKBURN, 1994.

Characteristics of the firm owner/manager have also been revealed as potentially important indicators of spatial behaviour in rural firms. In his work on the sourcing of business services by firms in southern England, MILLS, 2002, developed the concept of the indigeneity[2] of firms and explored its association with the spatial distribution of this particular sub-set of economic transactions. Findings indicated a negative relationship between the distance from the owner/manager's previous domicile and the degree of local sourcing. Further qualitative enquiry suggested that indigeneity was an important factor influencing sourcing decision-making by owner/managers in small rural producer services.

A parallel body of literature on spatial economics, and especially the New Economic Geography approaches based on Krugman's seminal paper (KRUGMAN, 1991), emphasises the influence of potential linkages between firms and households on location processes.

First, when the number of local firms belonging to the same sector and producing a non-differentiated good is high, local competition between them is strong and tends to scatter them more widely. Translated in terms of the spatial distribution of firm transactions, this 'traditional' finding from the spatial economics literature leads us to the following hypothesis: a strong level of local competition within a given sector tends to favour an extra-local sales behaviour.

However, the new economic geography literature also shows that firms might locate near the households when these are already concentrated (KRUGMAN, 1991). In theory, this allows them to both increase the size of their local market and to reduce transport costs. For the same reasons, households tend to locate near firms in order to obtain a wider consumer choice. The size of local final demand on the geographical concentration of production, often called the "Home Market Effect", could also influence the geographical distribution of firm transactions. Indeed, firms located in an area where the market for its output is large may sell its products more locally. A similar effect could be hypothesised for input markets. KRUGMAN and VENABLES, 1995, showed a positive relationship between the size of the local inputs market, the level of concentration in firms using these inputs. Thus, we hypothesise that a larger inputs market will favour a local purchasing behaviour.

The role of linkages between firms and households on the labour market is more ambiguous: when the geographical mobility of workers is perfect, they tend to favour a high level of firm concentration (KRUGMAN, 1991) but when workers are geographically immobile, they tend to scatter firms more widely (KRUGMAN and VENABLES, 1995; GAIGNÉ *et al.*, 2003). However, these approaches do not take into account the differentiation of workforce mobility by skill level (FUJITA and THISSE, 2002). By introducing this dimension, we may hypothesise that a high proportion of unskilled workers in the local workforce may favour a higher degree of local employment integration, caused by firms with a high demand for unskilled labour sourcing locally.

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[2] Mills distinguishes firms established in a particular locality by a local resident from firms established in that locality by an in-migrant from firms established elsewhere by an in-migrant and subsequently brought to the locality by that in-migrant.

The review presented here allows a number of hypotheses to be tested in the present paper. In terms of organisational characteristics, one might expect firm sector, size and ownership and the indigeneity of the owner/manager, as well as technological characteristics of the firm, to influence the level of local integration. In the same way, elements of the New Economic Geography approach suggest that the strength of local competition, size of the local final demand market and input markets and skill levels in the local labour market will influence the degree of local integration.

As well as characteristics associated with the organisation and external economic environment, locational factors are also likely to play a very important role in the nature and strength of linkages in the local and wider economy. Indeed, the move towards territorial, as opposed to sectoral, approaches to rural policy indicates the increasing importance attached to local context in shaping development and growth in rural areas. In the case of small and medium-sized towns, the spatial pattern of production linkages is likely to vary between settlements of varying type and size. Previous studies of linkages and service provision in and around small towns economies go some way to quantifying the importance of contextual factors on local activity patterns. In particular, the relative proximity of towns to urban centres appears to be a potentially important predictor of the strength of local integration, as does location within the rural settlement hierarchy itself. Both COURTNEY and ERRINGTON, 2000, and MITCHELL *et al.,* 2005, found that firms located in more remote regions tended to exhibit stronger linkages to locality, in terms of sales, purchases and employment. Likewise, the influence of location within study areas also proved to be an influential factor, with firms located within the town tending to have stronger linkages to town economies than those located in the rural hinterland.

Whilst these findings provide useful testable hypotheses, there is potential to control for further contextual factors when examining the spatial patterns of rural production linkages. In terms of employment, rural economies in Europe can be broadly differentiated by their relative dependence on sectoral employment, of which agriculture and tourism are particularly important. Likewise, previous studies have not considered the potential influence of town size on the spatial distribution of production linkages. For example, one might hypothesise that larger towns have the ability to generate higher multipliers through economies of scale. On the other hand, smaller towns may be more likely to foster the development of niche markets or agglomerations of firms in certain sectors.

As the aim of paper is to analyse the factors influencing the spatial patterns of production linkages of rural firms in the context of Europe's small towns, it is therefore necessary to examine three categories of factors: 1) local contextual characteristics; 2) firm characteristics and 3) characteristics of the potential links between the firm and local markets.

3. Data collection and research methods

To test our hypotheses we used data collected as part of a trans-national project aiming to explore the spatial distribution of economic transactions in and around 30 small- and medium-sized towns and their rural hinterland in 5 European countries (UK, France, The Netherlands, Portugal and Poland). These countries were selected to reflect the varied conditions of the existing and enlarged European Union. Whilst the study examined the economic linkages of firms, farms and households,

the present paper focuses only on firms but uses data from the household surveys to help construct some of the variables.

Self-completion survey techniques were developed to measure the extent of economic integration of firms and households into the local, regional, national and international economy. The measure of integration is based on the proportion of a given entity's total economic transactions (input purchases, output sales, employment, consumers goods purchases, etc.) that takes place with other entities within given geographical areas or zones. Thus, where a firm exhibits strong integration into the local economy, customers or suppliers in this predefined area account for a large proportion of its respective revenue or expenditure and a large proportion of its workforce is drawn from this same area.

Selection of case study areas

Although all towns are unique, each with a different endowment of natural capital (by virtue of their location) and cultural capital (by virtue of their history), a purposive selection of towns was made within different types of rural context in order to facilitate a comparison between towns and across different countries. First, we distinguished towns according to their population size. For the purposes of this study, small towns are those with 5,000-10,000 inhabitants and medium-sized towns with 15,000-20,000. Second, we defined three types of area chosen to mirror the differing range of circumstances and contexts across rural Europe: areas where employment in agriculture is well above national average; areas where employment in tourism is well above national average; and, "accessible" peri-urban areas within daily commuting distance of metropolitan centre. Finally, we selected six towns in each country, one small and one medium-sized in each context (See Appendix A for the list of selected towns). In addition, the respective rural hinterlands were defined in terms of a 7 km radius from the town centre.[3]

Survey design and administration

Data was collected via structured questionnaires designed to allow collection of two types of information. The first set of questions gathered information on the firm's characteristics – the size and type of firm, the size and characteristics of the workforce, the length of time the business had been located in the study area, and the length of time the owner/manager had resided in the local area. The second set of questions sought to allocate particular economic transactions to different zones around the town. Eight pre-defined zones are used:

- Zone A   within the town
- Zone B   up to 7 Km from the town
- Zone C   7-16 Km from the town
- Zone D   elsewhere in the county
- Zone E   elsewhere in the region
- Zone F   elsewhere in the UK

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[3] The selection of a suitably defined boundary is likely to be fairly arbitrary, depending on the nature and objectives of the study. It might, for example, be taken as an administrative area (such as a NUTS4 region) or simply a given distance from the town.

- Zone G   elsewhere in the EU
- Zone H   rest of the world

Information about three types of economic transaction was sought from the firm survey: sales, purchases and employment. The questionnaire focused on the spatial distribution of firm sales and purchases across the eight pre-defined zones, as well as distinguishing between different types of input. Because a set of questions gathered information about the workforce - primarily occupation type, annual salary and place of residence within the eight pre-specified zones - it was also possible to define the spatial pattern of firm employment. The household questionnaire focused on spatial patterns of consumer purchases by distinguishing between different categories of goods and services, in turn corresponding to industrial sectors to which local firms could be allocated.

After selecting local samples of firms and households, surveys were carried out between September 2002 and May 2003. Usable data was collected for 2,688 firms and 6,116 households located within the 30 study areas. Data for all case study areas was subsequently weighted according to Standard Industrial Classification to ensure that multivariate analysis was carried out on broadly representative samples.

Specification of dependent variables

Specification of dependent variables also drew directly upon the hypotheses set out in section 2. We first studied the local economic integration and needed to define 'local'. To ensure comparability across the five countries given differences in settlement and transport patterns, and to take account of potential linkages between town and hinterland economies, dependent variables were specified in terms of the mean proportions of transactions (by financial value) attributed to the town plus the 7km hinterland around the town (equating to zones A + B). Separate variables were created to measure the strength of local integration in terms of a) sales (downstream transactions) and b) purchases (upstream transactions).

To both validate results obtained by local integration analysis and examine the spatial economic behaviours of firms throughout wider economies, a further dependent variable was derived from a factor and cluster analyses. Firms were clustered in seven categories according to the weight of economic transactions made in zones A and B ('local'), in zones C and D ('regional'), in zone F ('national'), and in zones G and H ('international'). Such characteristics of firm's spatial behaviour drew upon the relationship between patterns of sales, purchases and employment linkages across the four categories of zones (See Appendix B for a detailed description of the relevant variable).

Independent variable specification

To test our hypotheses we attempted to explain the level of local integration of firms sales and purchases as well as their spatial behaviour through three sets of independent variables. The first set concerns the general characteristics of the local context. This means we controlled for the country, for the town type (town size and type of study area) and for the nature of the zone where the firm is located (peri-urban, agricultural or tourism), in distinguishing between a location in the town centre (zone A) and a location in the hinterland (zone B).

The second set of explanatory variables describes the main intrinsic characteristics of the firm. We first introduced some usual characteristics such as the firm type (independent, branch of national or international firm), the industrial sector at which the firm belongs (we used a classification in 6 categories), the firm's size measured in terms of its number of employees, or the age of the firm. This set also contains variables aiming to examine the role of the firm's technology. Our data allow us (i) to calculate the share of unskilled workers within the firm's workforce, (ii) to approximate the firm's labour productivity (through the difference between output sales and inputs purchases divided by the number of full-time employees) and (iii) the intensity in intermediate goods of the firm's technology (by dividing the total firm's purchases by its total sales).

We also constructed four variables to evaluate the role of the local economic environment of the firm. Through them, we examine the relationships between the firm (according to its own needs) and the local markets of final demand, of intermediate goods and of labour. We first defined a local competition index by comparing the firm's sales and the total sales of its local competitors. This can be expressed as:

$$LCI_i^r = \frac{Sa_{i,s}^r}{\sum_j Sa_{j,s}^r}$$

where $Sa_{i,s}^r$ is the total sales of the firm i located in the study area r and belonging to the sector s. This index measures the weight of the firm i in the local sector s. When this ratio is close to zero, the economic environment of the firm presents a strong competition within its local output market and, if the ratio is equal to 1, the firm is in a local monopolistic situation.

The second index aims to evaluate the size of the local final goods market facing the firm in using both firm and household surveys. It is defined as:

$$SLGM_i^r = \frac{\sum_j HhPurch_{j,s}^r}{Sa_{i,s}^r}$$

where $HhPurch_{j,s}^r$ corresponds to the local purchases addressed by the households j living in the study area r to the firms located in r and belonging to the sector s, and $Sa_{i,s}^r$ the total sales of firm i located in study area r and belonging to sector s. Such an index measures the local purchases addressed by the local households j to the sector s weighted by the sales of the firm i belonging to the sector s. When this ratio is higher than 1, the local output market size is larger than the firm's sales. When this ratio is lower than 1, the size of local output market is smaller than the firm's sales: this has to export its outputs.

We also constructed an index to evaluate how intensive the local vertical linkages of the firm could be. The intensity of local vertical linkages for the firm i was measured through an index of potential intensity of local vertical linkages, computed as follows:

$$IPI_i^r = \sum_{s'} \frac{Purch_{i,s'}^r}{\sum_{s'} Purch_{i,s'}^r} \cdot \left(\frac{Purch_{i,s'}^r}{\sum_{s'} Purch_{i,s'}^r} - \frac{\sum_j Sa_{j,s'}^r}{\sum_{s'} \sum_j Sa_{j,s'}^r} \right)$$

where $Purch_{i,s'}^{r}$ is the total purchases made in the sector *s'* by the firm *i* located in the study area *r* and $Sa_{j,s'}^{r}$ the total sales of firms *j* located in study area *r* and belonging to the sector *s'*. This index corresponds to the weighted sum of the gap between the input demand of the firm *i* to the sectors *s'* and the local supply in the same sectors. When this index is higher than 0, the firm's needs in inputs is higher than the local supply of these inputs, thus and the firm needs to source its inputs from outside the study area. When the index is equal to or lower than 0, the firm can obtain its required inputs locally.

Finally, an index of potential local matching by skill on the local labour market was developed in the same way as the index of potential intensity of local vertical linkages. This compares the firm's demand for skilled labour to the local supply of skilled labour. It is defined as:

$$LLM_i^r = \frac{SkiLD_i^r}{LD_i^r} - \frac{\sum_j SkiLHhS_j^r}{\sum_j LHhS_j^r}$$

where $SkiLD_i^r$ is the need in skilled workers of the firm *i* located in *r*, LD_i^r the need in total workers of the firm *i*, $SkiLHhS_j^r$ the number of skilled workers in the households *j* living the study area *r* and $LHhS_j^r$ the number of workers in the households *j* living in *r*. Through this index we measure the difference between the share of firm's skilled employees and the share of skilled workers living in the study area. When it is close to -1, the firm needs a lower level of skilled work than what the local labour force can provide. When the index is close to +1, the firm needs a higher level of skilled work than what the local labour force can provide. Therefore the firm has to source its skilled workforce from elsewhere. Finally, there is adequacy between the firm's needs and the local labour supply when the index is close to zero.

Econometric issues

Two phases of multivariate analysis were undertaken: 1) A series of Ordinary Least Squares (OLS) Regressions to examine the key characteristics of entity and local environment associated with strong local economic integration; and 2) A multinomial logit model, to identify the key characteristics that help to differentiate the different patterns of spatial behaviour throughout the local, regional, national and international economy.

Ordinary Least Squares (OLS) Regression was employed to help identify key characteristics of towns, firms and attributes of the economic environment associated with strong local economic integration. The basic model can be expressed as:

$$y_i = X_i \mathbf{b} + \mathbf{u}_i$$

where $i = 1, \dots$ n, represents the number of firm in the model (also serving as number of observations), y_i = is the respective dependent variable (as set out in Table 1), X_i = is a vector of independent variables representing the relevant entity characteristics, $\mathbf{b}$ is a vector of parameters to be estimated, u_i is an independently distributed error term assumed to be normal with zero mean and constant variance $\mathbf{s}^2$. The advice of HAIR *et al.,* 1998, and GUJARATI, 2003, was taken with

regard to meeting and testing the suitability of data for multiple regressions, including examination of residual and normal probability plots and carrying out data transformations as appropriate[4]. Note that Chow tests were performed to formally test for structural differences between each of the five countries in turn and the remainder of the data set (i.e. UK=1, [FR+NL+PO+PR]=0; FR=1, [UK+NL+PO+PL=0], and so on). Results of Chow tests are given in Appendix C. All tests are statistically significant at the 1% level, therefore indicating that there are structural differences between the countries. It was therefore necessary to estimate separate OLS models for each country.

When we focused on the characteristics of entity and local environment associated with the various forms of spatial economic behaviour identified by the factor and cluster analyses presented in Appendix B, the nature of the dependent variable did not allow use of the OLS method. The variable is not continuous but categorical because it is based on the groups derived from the cluster analysis. Furthermore, our dependant variable suggests that firms face a multiple choice: its spatial behaviour could be totally local, partially local (combined with regional purchases, national purchases or national sales), regional or international. Because this multiple-choice variable is unordered, we used a multinomial logit model, which can be expressed as (GREENE, 1997):

$$\text{Prob}(Y_i = j) = \frac{e^{b_j x_i}}{\sum\limits_{k=1}^{J} e^{b_k x_i}} \qquad \text{for } j = 1, 2, \ldots, J,$$

where Y_i is a random variable that indicates the choice made by firm i, j the choice made by the firm J the total number of possible choices, x_i the characteristics of firm i that affect the choice (including study area characteristics), and b_j the parameter to be estimated. Estimation of the multinomial logit model requires using the Maximum Likelihood method.

4. Results

Factors influencing the firm's downstream local integration

The series of models for local sales by firms in each of the five countries is given in Table 1. UK and Poland exhibit the greatest variation in the proportion of local sales explained by included predictors, with R-square values of .383 and .402 respectively. Equivalent values for the French and Dutch models are considerably lower, which may imply a relative difficulty in influencing local sales at this geographical level.

[Table 1 here]

The influence of location within the study area, firm sector type (manufacturing firms, producer services), firm age, workforce size, proportion of unskilled workers within the workforce and firm's labour productivity are the parameters that most consistently influence local integration across the five countries. In all cases the directional influence of these variables is also consistent – i.e. across the countries and when compared with previous studies. Manufacturing firms and producer services

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[4] Angular transformations were carried out on the four dependent variables to improve distribution for OLS analysis.

have a relatively strong export base[5] in all countries apart from Poland and the UK respectively, where consumer services show a relatively strong degree of integration into the local economy. The agricultural sector (outside farming) has relatively weak ties to small and medium sized towns in France and the Netherlands. In all five countries, firms located in the town have stronger downstream linkages than those located in the hinterland, and in all, apart from the UK, it is older and smaller firms that draw a greater proportion of their sales revenue from the local economy. The *Unskilled* variable parameters indicate that in the UK, France and the Netherlands firms that employ a higher proportion of partly or unskilled employees tend to have stronger local downstream linkages. This pattern is reversed in Portugal and Poland, although the resulting coefficients are not statistically significant. In the UK, Netherlands and Portugal there is an inverse relationship between labour productivity and the strength of local downstream integration, with more productive firms tending to draw in more income from outside the local economy.

Examining town types, agricultural and tourism towns in the UK are unique in having relatively weak local downstream linkages and peri-urban towns in the Netherlands and Portugal are unique in having relatively strong downstream linkages. The results suggest that fostering local economic growth in areas where agricultural employment is above average is likely to prove more fruitful in medium sized towns in Portugal and Poland. In France there appears to be a significant difference between small and medium towns in peri-urban areas, with medium-sized towns retaining more local sales revenue than other town types.

Parameters of the firm's economic environment show some interesting relationships between firm location, technological parameters and local economic integration. First, the relationship between the local labour market and local economic integration appears to vary between the countries. In the UK, Netherlands and Portugal there is an inverse relationship between the local tensions between the firm's demand for skilled workers and the local supply of skilled labour and local sales integration. This indicates that where firms employ a greater proportion of skilled labour than is available in the local labour market, they also tend to export out of the local area to a greater degree. In France and Poland the situation is reversed; here it is those firms which are not utilising the availability of skilled labour that are selling less locally. While the size of the final market and local competition within the sector do not influence the local integration of sales in UK, French and Portuguese firms, the effects of these variables in the Netherlands and Poland are a little surprising. Indeed, in these latter cases, a greater size of final market decreases the level of local firm integration and stronger local competition positively influences the local integration of firms in the Netherlands. The expected inverse relationship between local competition and local integration is obtained only for Poland. The only countries where local vertical linkages influence the strength of local sales integration are the Netherlands and Portugal. In these cases, the higher the local supply of inputs (compared to the magnitude of demand), the more they sell their outputs outside the study area.

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[5] In other words they sell relatively little in the local economy in comparison to other sectors and export more of their goods and services out of the local area. (The term should not be confused with the export of goods and services between countries).

Factors influencing the firm's upstream local integration

Turning now to the upstream models, which examine the role of potential predictors of local purchasing in the five countries, we find that the strength of local integration is more readily influenced by included predictor variables in the UK and Portugal, with French and Dutch models again achieving the lowest R-square values. This may suggest that there is less scope for generating local economic growth through very local multipliers in towns in these countries.

[Table 2 here]

Examining the effects of town type and size on local input markets, we again find that local linkages are stronger in and around larger towns in areas of high agricultural employment in Poland and Portugal. A similar pattern is observed in the UK, although in France it is the smaller towns in such areas that enjoy a greater degree of local sourcing. In areas where tourism employment dominates, there is also variation across the countries. Whilst such towns in France and Portugal enjoy relatively strong local input linkages, those in the Netherlands and Poland exhibit relatively weak linkages. In comparison to the tourism medium-sized towns, the effect of urban proximity on local sourcing patterns is surprisingly weak. Only medium peri-urban towns in the Netherlands suffer from relatively weak levels of local integration and in fact such towns in Poland tend to foster local sourcing to a greater degree than other town types.

Unlike downstream integration, workforce size and firm age, as well as the proportion of unskilled workers within the workforce, have no significant influence on the strength of local integration; likewise, location within the study area also ceases to be important with respect to input markets at this geographical level. The most consistent finding in terms of sectoral influences is the propensity of construction firms to source locally. In comparison to other sectors such firms are found to purchase a greater proportion of inputs (by value) in the local economies of all five countries, a finding of potential interest to both European and national policy makers. Interestingly, producer services, which have an export base role in all five countries, appear to have a potential role as net income generators only in Poland and Portugal where such firms have relatively strong local input linkages, in comparison to other sectors. Agricultural firms (outside farming) are found to have relatively strong input linkages in the UK, France and Poland.

Whilst firm ownership is not a strong predictor of the strength of local upstream integration, the indigeneity of the owner/manager is. Firms where the owner/manager has lived within the study area for ten years or more are found to source a greater proportion of their inputs within the same area. Although this variable is not significant in the UK model, we find a significant coefficient for *Ind_EH* in this country as well as in the Netherlands. This indicates that, in comparison to firms where the owner/manager has never lived within the study area, a greater propensity to source locally is found amongst owner/managers who have moved into the study area from outside the county (NUTS II and beyond). This compares to the negative coefficient obtained in Poland for this type of firm. This pattern might suggest that those owner/managers who have moved into the area from further away continue to utilise their existing supply chain networks.

Finally, the firm's technological and economic environment parameters again help to explain patterns of local sourcing in and around small and medium sized towns. The most consistent influential parameters across the five countries concern the role of the individual intermediate goods intensity, of the local final market size and of the potential intensity of local vertical linkages. The first interesting result is the negative coefficients for the intensity in intermediate goods in all five models, although the coefficient for France is not statistically significant. These suggest that where the technological process is intensive in intermediate goods (i.e. where the value of total purchases is closer to the value of total sales), the proportion of inputs sourced within the local economy is consistently lower. Firms with high labour productivity tend to source outside the study area in most of the countries (France and Portugal are the exceptions). The negative parameters obtained by the potential intensity of local vertical linkages (except in UK where the parameter is not significant) indicate that, firms where the demand for inputs can be met by local supply, have a relatively high level of local upstream integration. Likewise, the positive effect of the output market size in all five models suggests that where a firm's size is small compared to the local final demand, its expenditure on local inputs is proportionally higher.

Factors influencing the firm's spatial behaviour

Results of the multinomial logit analysis are given in Table 3. These results nearly always confirm the results obtained by the OLS regressions focusing on the predictors of local integration. In addition, they allow us to identify the factors associated with wider forms of spatial economic behaviour.

[Table 3 here]

Examining the role of the local context components, it appears that the size and the type of the study area weakly influence firms' spatial behaviour. Firms located in medium-sized towns are less often internationally or nationally oriented in terms of purchases. Firms in tourism study areas are more internationally oriented while those located in peri-urban areas are more often locally integrated. The proximity to urban areas allows access to larger markets, and it follows that firms located in tourism areas are more able to develop links with international markets. Compared to French firms located in small and medium-sized towns and their hinterland, Portuguese and Polish firms are more locally integrated, whilst English and Dutch firms are less regionally oriented. However, Dutch firms appear to be more internationally integrated, which is most likely attributed to their historical development.

Compared to independent firms (the large majority in the sample), national branch plants tend to have a nationally orientated purchasing behaviour. They also make more use of the regional labour market. As one might expect, local branches of international firms tend to access international output and input markets and to make greater use of regional or national input markets. Firm size influences their spatial behaviour in a similar way. Whilst previous results have shown a negative correlation between workforce size and the strength of local integration, further exploration of our data reveals that only the largest firms have access to national or international markets. In the same way, whilst results of the OLS regression has revealed that low labour productivity is associated with local purchasing and selling behaviour, the multinomial logit analysis shows that firms with

intermediate labour productivity tend to purchase their inputs on the national markets or to adopt an international behaviour in terms of both sales and purchases. In addition, when labour productivity is very high, firms tend to adopt all behaviours except the entirely local one. Consistent with previous results, firm intensity in intermediate goods tends to favour regional and national purchasing behaviours as well as regional and international behaviours in terms of both sales and purchases; as one might expect it does not favour national sales combined with local purchases and labour. With increasing firm size, higher labour productivity and higher intensity in intermediate goods appear to favour non-local economic behavioural patterns. These findings imply that the largest, most productive and most intensive firms have the least potential to stimulate rural development through local multipliers.

As seen above, industrial sector also plays an important role in the firm's spatial behaviour. Compared to business services, manufacturing firms are more connected to the wider economy. Their purchases come more frequently from regional or national input markets, they often sell their outputs in the regional or international economy and their workforce is often recruited at the regional level. In contrast, construction firms are very locally integrated. Retailers and personal services, whilst selling locally and employing local labour, tend to purchase their inputs from regional, or even national, markets.

Whilst firm age plays a relatively weak role in explaining spatial behaviour (although the results do suggest that recently established firms tend to adopt a more international behaviour), indigeneity of the owner/manager does have an influence. Firms managed by non-residents and those managed by in-migrants who have moved from zones E to H are more nationally or internationally oriented and access regional labour markets more frequently.

The results of the multinomial logit analysis provide further evidence that local competition and size of the local final demand market have no influence on the spatial distribution of firm sales and do have only a relatively weak influence on local purchasing. Indeed, no significant parameter value is obtained for the local competition index (the weight of the firm sales compared to those of its local competitors). The influence of the local final market size is, however, a little more marked. A larger size of the output market disfavours national purchasing combined with local sales (and labour). When this local market is very large compared to the volume of firm sales, signs become significantly negative for regional and international behaviours in terms of both sales and purchases and for national and regional purchasing behaviours.

The only firm economic environment variable that has a clear effect on spatial economic behaviour is the ratio between demand for inputs and the local supply of such inputs. The greater the gap between the local supply of, and demand for, inputs, the more regional or national the firm purchases, and even the sales. When local input markets are relatively small and firms have a high demand for particular inputs, they tend to seek them on non-local markets. Inversely, when the local supply of required inputs is close to the level of demand, the firm tends to purchase its inputs locally. This favours its local integration through intensive local vertical linkages, which in turn affects its sales behaviour.

Finally, when a firm's demand for inputs or supply of outputs exceeds the respective local market size, two points can be noted. First, the firm sources its inputs from the regional, and then national, economy; second, it adopts an entirely regional or international behavioural pattern with respect to both sales and purchases.

5. Discussion and concluding remarks

The findings provide an important contribution to the literature on local first round linkages, especially as they consider integration into the regional, national and international economies, and explore the relationship between upstream, downstream and employment linkages. Findings confirm those of previous studies with respect to the influence of organisational characteristics on local integration. As found by WILLIAMS, 1994, and CURRAN and BALCKBURN 1994, the manufacturing and producer services sectors are found to exhibit relatively weak local downstream linkages. Indeed, the logit analysis confirms the limited potential of manufacturing to stimulate rural development through local multipliers; inputs are more frequently sourced from regional and national markets whilst employees are often recruited at the regional level.

WILLIAMS, 1994; CURRAN and BLACKBURN, 1994 and COURTNEY and ERRINGTON's, 2000, findings that consumer services tend to sell more locally are only confirmed by the analysis for UK and Polish towns. Further analyses reveal that retailers and personal services, whilst selling locally and employing local labour, tend to purchase their inputs from regional, or even national markets. This refutes WILLIAMS, 1994; 1997, assertion that, whilst consumer services may not provide a significant injection of income through export activities, they do help generate *net income* (which is determined by total external income, times a multiplier, minus total external spending) through their propensity to source locally. Of course, local employment will help foster induced effects if wages are spent locally. The construction sector, however, is found to be a potentially important generator of net income through its propensity to both source and employ locally, findings which support those of WILLIAMS, 1994. These findings have important implications for rural and small town development if planners wish to strike a balance between retail service provision, business development and local economic growth.

Other organisational characteristics examined include firm age, size and ownership. In accordance with the findings of CURRAN and BLACKBURN, 1994; ERRINGTON, 1994 and HARRISON, 1993, smaller firms are found to sell more locally, although contrary to COURTNEY and ERRINGTON, 2000; and HARRISON, 1993, no significant influence is found in terms of local sourcing patterns. Further analysis of spatial behaviours reveal that only the largest firms have access to national and international markets, implying that many SMEs in and around small towns are likely to reach out only as far as regional markets. With respect to firm age, however, the findings refute those of CURRAN and BLACKBURN, 1994, and NORTH and SMALLBONE, 1996 who assert that newly established firms turn to local markets in their initial stages of operation. The present findings support those of COURTNEY and ERRINGTON, 2000; GRPAIOS *et al.,* 1989; and DOBSON, 1985, who found that branch plants tend to be less tied to locality than independent firms. National branch plants tend to be more orientated toward national markets and regional labour markets whilst international branches reach out to international markets and source

outside the region. These findings highlight the potentially limited local economic value of exogenous business development in rural areas.

The present findings serve to reinforce and build on those of MILLS, 2002, with respect to the influence of indigeneity on local sourcing. This characteristic has an influence on spatial patterns of sourcing in terms of both length of time an owner/manager has lived in an area and (as MILLS, 2002, found in the producer service sector) the distance from previous domicile. Owner/managers who have lived in the local area for more than ten years tend to source more of their inputs locally, and findings suggest that those who have moved into the area from further a field continue to utilise exiting supply chain networks. Indeed, the reasons for the observed patterns may well be associated with the strength of social networks and the importance of embeddedness (GRANOVETTER, 1985) in business decision-making.

Arguably one of the most important findings of the study, with respect to both first round linkages and rural development, is the importance of local contextual factors on spatial patterns of economic activity. The strength and nature of local production linkages is found to vary according to town size and location, with substantial differences across the five countries. This would imply that all towns are to an extent unique, each with their own set of circumstances that will affect the functioning of the local economy. Of course, the fact that separate models were required for each country due to structural differences, itself implies that towns are not directly comparable across the five countries in terms of local integration. That said, all study areas are similar in that firms located within the town were more strongly integrated into local sales markets than those in the hinterland, which mirrors the findings of COURTNEY and ERRINGTON, 2000, and MITCHELL *et al.,* 2005, with respect to small town economies in England and Scotland. There is, however, no difference between town and hinterland firms in terms of the degree of local sourcing, which may be a consideration for planners wishing to stimulate rural and town development through local output multipliers. Whilst containment of development in towns may help preserve the open countryside it may not necessarily help foster higher levels of economic growth than more dispersed development in the hinterland of towns.

In terms of town type and size there are some patterns emerging that help inform the debate on the functioning of European small towns. In Portugal and Poland the greatest degree of local economic self-containment is found in larger agricultural towns, which exhibit relatively strong levels of upstream and downstream integration and thus (in theory) posses the greatest potential for fostering local economic growth. The influence of proximity to urban centres on local integration is not as pronounced as found in previous studies. Whereas COURTNEY and ERRINGTON, 2000, and MITCHELL *et al.*, 2005, found stronger linkages in and around more remote rural towns in the UK, this pattern is only strongly upheld for sales linkages in the UK, with the exception of small peri-urban towns in France (which enjoy relatively strong downstream linkages) and larger peri-urban towns in the Netherlands (which are more self-contained in terms of local sourcing). In fact, analyses of extra-local linkages indicates that peri-urban towns are often more locally integrated in terms of sales (most likely due to accessibility of local urban markets), although this is often combined with regional or national purchasing, which limits potential for income containment and local economic growth. The local economy of tourism towns, which have received little attention in the local and regional studies literature, are also found to vary greatly across the five countries. In

France and Portugal such towns enjoy relatively strong upstream linkages, whilst in the Netherlands and Poland they exhibit relatively weak linkages.

Among the local contextual factors, our approach paid special attention to the firm's local economic environment and characteristics in terms of their ability to satisfy the demand from local firms. Our findings emphasise the relatively low influence of these characteristics on the spatial patterns of rural firms. Potential local vertical linkages appear to be the only characteristic that significantly affects the firm's spatial behaviour - stronger local vertical linkages tend to favour a stronger level of local economic integration by rural firms. This finding is consistent with those obtained by AMITI and CAMERON, 2004, MION, 2004a and GAIGNE *et al.,* 2003, who highlight the positive role of vertical linkages in industrial location processes.

Our findings also show that the final demand market and the labour market do not significantly affect the spatial economic behaviour of rural firms. This may represent an important distinction between rural firms and their urban counterparts. However, it is worth noting that the role of final market demand in the location process is itself controversial. Whilst HANSON, 1998, and MION, 2004a, showed a positive effect of the local final demand market, GAIGNE *et al.,* 2003, found that local final demand had no significant effect on industrial location, and MION, 2004b, found negative relationship between the two. Empirical studies analysing the role of labour market on the location process are rare. GAIGNE *et al.,* 2003, showed that the labour market played an ambiguous role in firm location, and that the extent of its influence varied between sectors.

These findings have a number of implications for rural development, many of which are specific to countries, area types and in some cases sectors. At a general level two main conclusions can be drawn. First, the importance of local context highlighted by the findings should not be under-estimated. Whilst an attempt has been made here to identify patterns emerging from analyses of production linkages in thirty towns across Europe, it is clear that local economic activity will (in part) be shaped by local factors, some of which may be outside the control of planners and policy makers. Second, the findings suggest that those firms which exhibit the strongest degree of integration into their locality are 'traditional' rural firms broadly characterised by being small, old, run by local managers, employing unskilled labour and achieving relatively low levels of productivity. In effect, this represents a double-edged sword for policy makers wishing to foster economic growth in small towns and stimulate surrounding rural economies. Whilst 'traditional' rural firms may have stronger local linkages, and in turn help generate growth through multipliers, they may not have the capacity to benefit rural development or growth in the longer term. Conversely, whilst more technological firms or branches of externally owned companies may possess the required capacity to help foster local economic growth (at least through their ability to inject income into the economy) their inability to generate growth and development through local output multipliers is potentially limited.

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Appendix A - Selected case study areas

Type of Area	Small Town	Medium-sized Town
Agricultural	Brioude (FR) Leominster (UK) Dalfsen (NL) Glogówek (PL) Mirandela (PT)	Mayenne (FR) Tiverton (UK) Schagen (NL) Jedrzejów (PL) Vila Real (PT)
Tourism	Prades (FR) Swanage (UK) Bolsward (NL) Duzniki (PL) Tavira (PT)	Douarnenez (FR) Burnham-on-Sea (UK) Nunspeet (NL) Ultsron (PL) Silves (PT)
Periurban	Magny-en-Vexin (FR) Towcester (UK) Oudewater (NL) Ozarów (PL) Lixa (PT)	Ballancourt-sur-Essonne (FR) Saffron Walden (UK) Gemert (NL) Lask (PL) Esposende (PT)

Appendix B: Factor and cluster analyses for defining firm spatial behaviours

In order to determine the spatial behaviours of firms we first defined four levels of location for their sales, purchases and labour recruitment areas: local (which includes zones A, B & C), regional (zones D & E), national (zone F) and international (zones G & H). Because we put together national and international labour recruitment areas in one category, we then obtained eleven categories for describing the spatial behaviour of each firm. We introduced them in a Principal Component Analysis (PCA), which also included surveyed farms. The main factors resulting from this PCA were then used in a hierarchical cluster analysis to identify the main spatial behaviours of firms (and farms). Table B.1 contains the results of the PCA.

The first five factors explain 75% of the variance in the data set. The first factor, which explains 24% of the total variance, is characterised by a correlation between local sales and local employment as opposed to regional employment. Factor 2, which explains 15% of the total information, captures another type of firm, characterised by local sales and regional (as opposed to local) employment. Factor 3, which explains 14% of the variance, focuses on purchasing activity. Firms scoring highly on this factor would tend to source a relatively high proportion of their inputs locally, as opposed to elsewhere in the region. Factor 4 shows an inverse correlation between national purchasing and regional sales. Finally, Factor 5 tends to isolate firms with a strong level of international integration.

Table B.1 - Results of the Principal Component Analysis of firm (& farm) spatial behaviours

EigenValue	1	2	3	4	5
Value	2.599	1.628	1.538	1.382	1.157
% variability	0.2363	0.1480	0.1398	0.1256	0.1052
% cumulate	0.2363	0.3842	0.5241	0.6497	0.7549
	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
Purchases in zones A, B or C	-0.45841	0.23077	0.76193	-0.35929	-0.09129
Purchases in zones D or E	-0.01788	-0.38233	-0.69156	-0.38395	0.29627
Purchases in zones F	0.38307	-0.01564	-0.22600	0.71031	-0.48552
Purchases in zones G or H	0.35656	0.23436	0.00631	0.19812	0.58396
Sales in zones A, B or C	-0.70916	-0.60171	0.12265	0.30862	0.09954
Sales in zones D or E	0.29780	0.24428	-0.32186	-0.63503	-0.35983
Sales in zones F	0.55837	0.43356	0.09645	0.10944	-0.12548
Sales in zones G or H	0.31333	0.34864	0.07304	0.11584	0.57345
Employees living in zones A, B or C	-0.74195	0.55613	-0.34679	0.13606	-0.00636
Employees living in zones D or C	0.64450	-0.55615	0.20054	-0.12433	0.00820
Employees living in zones F, G or H	0.38393	-0.15196	0.36665	-0.05901	-0.00168

The hierarchical cluster analysis based on these five main factors allowed us to identify seven groups of firms (and farms) according to the spatial pattern of their sales, purchases and workforce living place. Table B.2 summarises the average characteristics in terms of spatial patterns for each group.

Firms in group I have a local behaviour in terms of sales, purchases and employment while firms in group II differ by having more regional purchases. Firms in group III have a regional behaviour (except in terms of employment), while firms in group IV combine national purchases with local sales and employment. Firms in group V exhibit an inverse behavioural pattern by combining national sales with local purchases and employment. Group VI comprises internationally integrated firms with international sales and purchases, whilst retaining local employment. Finally, group VII groups firms that are sourcing a significant part of their workforce from the regional labour market.

Table B.2 – Average characteristics of firms (and farms) in the seven groups obtained through the cluster analysis

Group	N firms (n farms)	Purchases				Sales				Employment		
		ABC	DE	F	GH	ABC	DE	F	GH	ABC	DE	FGH
I = Local behaviour	620	95.39	3.51	0.63	0.47	96.98	1.86	0.74	0.42	98.53	0.86	0.61
	(615)	(8.82)	(7.20)	(2.73)	(3.64)	(7.97)	(5.43)	(4.03)	(2.97)	(6.70)	(4.97)	(4.37)
II = Local behaviour with regional purchases	761	29.88	56.28	12.32	1.52	95.39	2.85	1.42	0.34	99.45	0.54	0.01
	(109)	(25.64)	(31.94)	(18.24)	(6.67)	(9.54)	(6.56)	(6.01)	(2.47)	(2.93)	(2.92)	(0.30)
III = Regional sales & purchases	257	44.43	42.38	10.24	2.95	17.36	70.60	9.30	2.74	99.57	0.43	0.00
	(256)	(34.87)	(33.20)	(20.17)	(11.55)	(21.82)	(30.98)	(20.12)	(9.52)	(2.17)	(2.17)	(0.00)
IV = Local behaviour with national purchases	526	9.96	7.24	80.26	2.54	64.65	11.97	20.49	2.89	93.99	4.94	1.07
	(20)	(12.62)	(11.39)	(18.36)	(7.42)	(38.32)	(19.14)	(32.11)	(10.35)	(13.24)	(11.79)	(5.94)
V = Local behaviour with national sales	155	80.69	10.57	8.11	0.62	26.42	21.12	51.59	0.87	97.39	1.58	1.04
	(130)	(19.96)	(14.34)	(14.29)	(3.50)	(24.73)	(21.93)	(38.74)	(3.49)	(7.88)	(5.90)	(5.42)
VI = International behaviour	190	33.05	8.72	13.37	44.87	23.42	5.93	24.22	46.43	87.33	9.18	3.49
	(27)	(37.94)	(16.95)	(22.14)	(39.61)	(34.97)	(12.37)	(31.48)	(39.04)	(23.82)	(20.55)	(12.22)
VII = Regional labour market	179	31.64	39.55	26.00	2.81	46.38	25.44	26.43	1.75	40.73	43.04	16.22
	(38)	(34.84)	(35.71)	(33.10)	(10.73)	(43.02)	(33.33)	(37.17)	(7.15)	(24.71)	(31.88)	(28.18)
Total firms (total farms)	2688	52.42	24.21	19.24	4.14	68.48	15.39	12.21	3.92	94.04	4.37	1.59
	(1195)	(39.83)	(31.77)	(31.30)	(15.70)	(39.79)	(28.10)	(26.78)	(15.56)	(17.42)	(14.73)	(9.10)

Standard deviations are given in parenthesis.

Appendix C: Results of Chow tests

We performed Chow tests to formally test for structural differences between each of the five countries in turn and the remainder of the data set (*i.e.* UK=1, [FR+NL+PO+PL]=0; FR=1, [UK+NL+PO+PL]=0 and so on). The method of computing the tests is provided by Gujarati (2003). If the resulting F-value is statistically significant we can reject the hypothesis of parameter stability and conclude that the slope of the regressions are different. The F values for all Chow tests are given in Table A.1. All computed Chow tests are statistically significant at the 1% level, therefore indicating that there are structural differences between the countries. This suggests that more reliable parameters will be derived from fitting separate-country models.

Table A.1 - Results of Chow tests: F-values for local sales and local purchases models

(H$_{o:}$ Parameter stability)

	Country				
	UK	**France**	**Netherlands**	**Portugal**	**Poland**
Sales $F_{(26, 2937)}$[1]	4.3128***	4.5750***	5.8880***	6.3487***	7.2695***
Purchases $F_{(26, 2937)}$	2.0251***	4.2987***	2.2757***	7.2531***	4.2313***

*** sig. at 1 percent level (p<0.01) ** sig. at 5 percent level (p<0.05) * sig. at 1 percent level (p<0.1)
[1] Distribution of test statistic F(k, N_1+N_2-2*k)

Table 1 – Results for local integration of firm's sales
(dependant variable: proportion of firm's sales made in zones A or B, OLS)

	All countries	Country				
		UK	France	NL	Portugal	Poland
Constant	1.132*** (.125)	2.583*** (.438)	.754** (.334)	1.22*** (.298)	1.481*** (.229)	.704*** (.195)
UK	-.0587 (.036)	-	-	-	-	-
NL	-.172*** (.035)	-	-	-	-	-
Poland	.250*** (.035)	-	-	-	-	-
Portugal	.131*** (.031)	-	-	-	-	-
Small & agricultural town	.0322 (.034)	-.247** (.100)	.04757 (.080)	.09824 (.088)	.07332 (.118)	.07678 (.074)
Medium-sized & agricultural town	.128*** (.033)	-.145 (.103)	.133 (.082)	.07469 (.083)	.137** (.055)	.228*** (.068)
Small & tourism town						
Medium-sized & tourism town	.0318 (.033)	-.268*** (.097)	.276*** (.082)	.03975 (.082)	-.07865 (.053)	.122* (.070)
Small & periurban town	-.0355 (.033)	-.187* (.101)	-.214** (.086)	.02935 (.091)	.141** (.059)	-.02832 (.067)
Medium-sized & periurban town	-.0074 (.034)	-.351*** (.109)	.225** (.090)	.07459 (.084)	.0459 (.056)	-.02109 (.067)
Location in zone B	-.139*** (.020)	-.167*** (.060)	-.117** (.051)	-.108** (.050)	-.04862 (.033)	-.148*** (.036)
Independent firm						
Branch of a national firm	.0377 (.035)	.242** (.101)	.02686 (.068)	.174 (.139)	-.118* (.065)	.04117 (.071)
Branch of a international company	.0150 (.045)	-.05261 (.126)	.118 (.349)	.09090 (.149)	.0284 (.070)	-.167** (.078)
Agricultural sector	.0702 (.065)	.814** (.368)	-.289* (.153)	-.979* (.520)	.03996 (.085)	.253 (.290)
Manufacturing sectors	-.290*** (.043)	-.302*** (.115)	-.262** (.104)	-.395*** (.134)	-.257*** (.078)	-.136 (.090)
Construction	-.107** (.047)	.143 (.125)	-.09937 (.096)	-.06632 (.138)	.08195 (.105)	-.227** (.091)
Business services	-.235*** (.038)	-.0868 (.102)	-.165** (.079)	-.215** (.109)	-.140* (.083)	-.181** (.075)
Consumer services	.0675* (.036)	.232** (.102)	.009557 (.084)	-.143 (.111)	-.00005689 (.075)	.199*** (.069)
Age of firm (years in ln)	.0463*** (.008)	.01238 (.023)	.07322*** (.018)	.02882* (.017)	.03377** (.015)	.05027*** (.019)
Size of workforce (ln, number of employees)	-.0959*** (.012)	.01029 (.041)	-.0808** (.032)	-.09940*** (.033)	-.202*** (.023)	-.05609** (.026)
Owner always lived in zones A or B	.0868*** (.027)	-.03519 (.076)	-.03806 (.067)	.180*** (.067)	.143*** (.047)	.106** (.052)
Owner moved to zones A or B from C or D	.0100 (.049)	-.03756 (.115)	.04811 (.097)	.160 (.160)	-.05339 (.092)	-.08798 (.106)
Owner moved to zones A or B from E or H	-.0356 (.044)	-.116 (.099)	-.08925 (.103)	.199** (.096)	.3566 (.076)	-.473*** (.137)
Proportion of unskilled workers (%)	.0019*** (.000)	.00353*** (.001)	.002345** (.001)	.004085*** (.001)	-.0001725 (.001)	.001487 (.002)
Index of intensity of intermediate goods	-.0006 (.000)	-.001308 (.001)	.001014 (.001)	.0006137 (.001)	-.0001845 (.001)	-.00009797 (.001)
Labour productivity	-.0270** (.011)	-.172*** (.037)	-.01536 (.030)	-.05502** (.025)	-.03757** (.019)	.007558 (.020)
Local competition index	-.0072 (.006)	.00427 (.019)	.02583 (.018)	.03049* (.018)	.01981 (.013)	-.0461*** (.013)
Index of size of local final goods market	-.0031 (.006)	.01289 (.018)	.01247 (.016)	-.0317** (.015)	.006459 (.011)	-.02112* (.011)

Index of potential local vertical linkages	-.0011*** (.000)	.0008036 (.001)	.0007082 (.001)	-.001815** (.001)	-.001634*** (.001)	-.001093 (.001)
Potential skilled matching on local labour market	.0050 (.000)	-.00216** (.001)	.001755* (.001)	-.001214* (.001)	-.001631*** (.001)	.005553*** (.001)
Adj. R² **F-value** **Residual *d.f***	**0.271** **39.278*** **2959**	**0.383** **9.288** **309**	**0.155** **4.849** **501**	**0.156** **4.338** **426**	**0.263** **13.667** **864**	**0.402** **22.093** **760**

*** sig. at 1 percent level (p<0.01) ** sig. at 5 percent level (p<0.05) * sig. at 1 percent level (p<0.1)

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Table 2 – Results for local integration of firm's purchases

(dependant variable: proportion of firm's sales made in zones A or B, OLS)

	All countries	Country				
		UK	France	NL	Portugal	Poland
Constant	1.099*** (.114)	1.055*** (.352)	.374 (.256)	1.351*** (.273)	.821*** (.244)	1.16*** (.201)
UK	-.007044 (.031)	-	-	-	-	-
NL	.01525 (.030)	-	-	-	-	-
Poland	.158*** (.035)	-	-	-	-	-
Portugal	.149*** (.026)	-	-	-	-	-
Small & agricultural town	.01493 (.028)	.03241 (.076)	.294*** (.062)	-.194*** (.069)	-.02323 (.054)	-.06822 (.058)
Medium-sized & agricultural town	.126*** (.027)	.142* (.079)	.02712 (.060)	-.02445 (.066)	.191*** (.056)	.192*** (.055)
Small & tourism town	.02234 (.028)	.03253 (.073)	.170*** (.060)	-.186*** (.069)	.119** (.054)	-.108* (.063)
Medium-sized & tourism						
Small & periurban town	-.04998* (.027)	-.103 (.073)	-.05143 (.064)	-.01239 (.073)	.01001 (.056)	-.06449 (.049)
Medium-sized & periurban town	.007931 (.028)	.113 (.077)	-.0331 (.066)	-.162** (.068)	-.05584 (.055)	.185*** (.053)
Location in zone B	.003008 (.017)	.03674 (.046)	-.02007 (.038)	-.006871 (.042)	.0202 (.033)	.007199 (.033)
Independent firm	-.00408 (.030)	-.02109 (.076)	-.007545 (.050)	-.009772 (.116)	.116* (.066)	.009612 (.065)
Branch of a national firm						
Branch of a international company	-.09239** (.047)	.01821 (.114)	-.01561 (.100)	-.0627 (.165)	-.08716 (.094)	-.107 (.092)
Agricultural sector	.07841 (.056)	1.040*** (.277)	.210* (.113)	-.241 (.437)	-.0808 (.086)	.803*** (.264)
Manufacturing sectors	-.08943** (.037)	-.146* (.087)	-.118 (.077)	.05598 (.112)	-.08191 (.079)	.113 (.082)
Construction	.178*** (.04)	.307*** (.094)	.144** (.071)	.379*** (.116)	.325*** (.107)	.175** (.083)
Business services	.147*** (.033)	-.0009629 (.077)	-.02535 (.059)	.134 (.091)	.454*** (.084)	.333*** (.068)
Consumer services	-.02864 (.031)	-.04161 (.077)	-.06529 (.062)	.06457 (.093)	.01291 (.076)	.03866 (.063)
Age of firm (years in ln)	-.00254 (.007)	.02455 (.017)	-.01877 (.014)	-.01613 (.014)	.01838 (.015)	-.02607 (.018)
Size of workforce (ln, number of employees)	-.0259** (.011)	.01944 (.031)	.009539 (.024)	-.01043 (.028)	-.01985 (.023)	-.03756 (.023)
Owner always lived in zones A or B	.124*** (.023)	.08143 (.057)	.115** (.050)	.142** (.057)	.0856* (.047)	.118** (.047)
Owner moved to zones A or B from C or D	.007508 (.042)	-.003737 (.087)	.01063 (.072)	-.106 (.134)	-.01643 (.094)	.06806 (.097)
Owner moved to zones A or B from E or H	.07038* (.038)	.125* (.074)	-.03085 (.076)	.138* (.081)	.03154 (.077)	-.314** (.125)
Proportion of unskilled workers (%)	.0000642 (.000)	-.001131 (.001)	.0006379 (.001)	-.00006703 (.001)	-.00004422 (.001)	.001229 (.001)
Index of intensity of intermediate goods	-.003335*** (.000)	-.0040*** (.001)	-.0009448 (.001)	-.002795*** (.001)	-.003792*** (.001)	-.003371*** (.001)
Firm's labour productivity	-.04926*** (.009)	-.05308* (.028)	.0002107 (.022)	-.07681*** (.021)	-.02084 (.019)	-.05214*** (.018)
Local competition index	.005304 (.022)	-.01402 (.014)	-.01245 (.013)	.03877** (.015)	.006352 (.013)	-.03142*** (.012)
Index of size of local final goods market	.01311*** (.063)	.03719*** (.013)	.04579*** (.012)	.02274* (.012)	.04502*** (.011)	-.02927*** (.010)

Index of potential local vertical linkages	-.00284*** (.000)	-.00168** (.001)	-.00053 (.001)	-.002232*** (.001)	-.004081*** (.001)	-.002483*** (.001)
Potential skilled matching on local labour market	-.0001311 (.000)	-.00133** (.001)	.0001453 (.001)	.0006672 (.001)	-.0004478 (.001)	.001412** (.001)
Adj. R-squared	**.215**	**.343**	**.178**	**.169**	**.326**	**.255**
F-value	**29.156***	**6.447**	**5.562**	**4.679**	**18.190**	**11.725**
Residual *d.f*	**2959**	**309**	**501**	**426**	**864**	**760**

*** sig. at 1 percent level (p<0.01) ** sig. at 5 percent level (p<0.05) * sig. at 1 percent level (p<0.1)

Table 3 - Results of logit multinomial model for analysis of firm's spatial behaviour
(dependent variable: firm's spatial behaviour, ML)

	N	Local behaviour	Local behaviour with regional purchases	Regional behaviour	Local behaviour with national purchases	Local behaviour with national sales	International behaviour	Regional labour behavior
N	2688	620	761	257	526	155	190	179
Intercept		Ref	-1.9261 (0.000)	-0.8009 (0.7843)	-2.3850*** (0.6081)	-1.3289 (1.2179)	-5.5674*** (1.8181)	-2.7774* (1.4394)
Town size (reference: Small town, 1321 firms)								
Medium-sized town	1367	Ref	-0.1121 (0.6700)	0.0280 (0.1542)	-0.2406** (0.1155)	0.2620 (0.1966)	-0.5389*** (0.1834)	-0.1696 (0.1971)
Study area type (reference: Agricultural area, 882 firms)								
Tourism town	898	Ref	-0.0850 (0.1522)	0.2168 (0.1932)	-0.0637 (0.1417)	-0.0906 (0.2615)	0.6440*** (0.2469)	-0.0646 (0.2373)
Peri-urban town	908	Ref	-0.6422*** (0.1370)	-0.0313 (0.1723)	-0.8918*** (0.1373)	-0.5753*** (0.2178)	-0.1186 (0.2027)	-0.2897 (0.2141)
Country (reference: France, 345 firms)								
United Kingdom	227	Ref	-0.4776 (0.3268)	-0.7892** (0.3115)	0.3511 (0.2290)	0.000560 (0.3987)	0.5991 (0.4435)	-0.6671** (0.3233)
Netherlands	532	Ref	-0.8035*** (0.2459)	-0.6693*** (0.2361)	0.2906* (0.1765)	-0.0382 (0.3086)	0.6837** (0.2705)	-0.1694 (0.2464)
Poland	730	Ref	-1.2308*** (0.2523)	-1.8714*** (0.2835)	-0.7289*** (0.2286)	-1.5408*** (0.3831)	-0.9054*** (0.3338)	-1.6873*** (0.3620)
Portugal	854	Ref	-0.9401*** (0.1484)	-1.5438*** (0.1826)	-1.2117*** (0.1457)	-1.1537*** (0.2483)	-0.0225 (0.2004)	-2.4237*** (0.2852)
Location (reference: Zone B, i.e. hinterland, 1034 firms)								
In town centre	1654	Ref	0.1716 (0.1218)	0.1069 (0.1517)	0.4083*** (0.1242)	-0.2003 (0.1873)	0.0944 (0.1803)	-0.0458 (0.1982)
Firm type (reference: independent firms, 2365 firms)								
Branch of national firms	204	Ref	0.0430 (0.2600)	-0.3710 (0.3536)	0.4044* (0.2104)	-0.4744 (0.5213)	-0.0661 (0.3822)	0.8715*** (0.2465)
Branch of international firms	119	Ref	0.9061** (0.4494)	1.0377** (0.4062)	1.1457*** (0.2647)	-0.2982 (0.8691)	1.9873*** (0.2752)	1.6453*** (0.3234)
Sector of activity (reference: businesses services, 413 firms)								
Agriculture	78	Ref	0.3147 (0.3623)	-0.8934 (0.6005)	0.0138 (0.4135)	-19.480*** (0.0945)	0.7272 (0.5104)	-1.4079 (1.2160)
Manufacturing sectors	263	Ref	1.5009*** (0.3193)	1.4464*** (0.2811)	1.6319*** (0.2280)	0.5740 (0.3642)	1.3131*** (0.3076)	0.6800** (0.3428)
Construction	274	Ref	-0.5582** (0.2444)	-0.6721*** (0.2432)	-1.7929*** (0.2577)	-1.1241*** (0.3092)	-2.0599*** (0.3899)	-1.0204*** (0.3003)
Retailers and wholesalers	1203	Ref	0.9070*** (0.1523)	-0.0274 (0.1726)	0.2785* (0.1434)	-0.6441*** (0.2491)	0.1744 (0.1966)	-0.7817*** (0.2309)
Personal services	457	Ref	0.9202*** (0.1589)	-0.2892 (0.2293)	0.2288 (0.1837)	-0.5726* (0.2994)	-0.8844* (0.4547)	0.2126 (0.2503)
Age at this address (reference: More than 15 years, 1138 firms)								
less than 5 years	934	Ref	-0.1224 (0.1405)	0.2086 (0.1791)	0.0796 (0.1376)	0.0382 (0.2288)	0.4913** (0.2150)	0.5471*** (0.2028)
between 5 and 10 years	616	Ref	-0.0490 (0.1425)	0.2174 (0.1760)	0.1557 (0.1348)	0.2987 (0.2115)	0.5724*** (0.1966)	0.1792 (0.2267)
Indigeneity of the owner (reference: always lived in AB, 1990 firms)								
Moved to AB from CD	119	Ref	0.0870 (0.3089)	0.7104** (0.2811)	-0.0474 (0.2857)	-0.2669 (0.4995)	0.0723 (0.4572)	0.5608 (0.4220)
Moved to AB from EH	163	Ref	0.1490 (0.2989)	0.2448 (0.3051)	0.4425** (0.2221)	0.5000 (0.3085)	1.0061*** (0.2802)	0.6560* (0.3656)
Don't lived in zone AB	416	Ref	0.3726* (0.1985)	0.0488 (0.2494)	0.5140*** (0.1604)	0.3969 (0.2899)	1.2821*** (0.2017)	2.1974*** (0.1762)
Workforce, number of employees (reference: less than 1, 118 firms)								
1-2 employees	911	Ref	0.6038** (0.2734)	-0.5220* (0.3003)	-0.2770 (0.2828)	0.3196 (0.4148)	0.0462 (0.5120)	-0.1146 (0.4697)
3-4 employees	976	Ref	0.6899*** (0.1389)	-0.8574*** (0.1980)	-0.3010** (0.1441)	0.2545 (0.2304)	0.4980** (0.2412)	0.7603*** (0.2511)
more than 5 employees	683	Ref	1.1112*** (0.1808)	0.0221 (0.2072)	0.3679** (0.1482)	1.2647*** (0.2309)	1.6772*** (0.2220)	1.5429*** (0.2037)
Index of intensity in intermediate goods, purchases/sales (reference: Less than 35 € 651 firms)								
35-57 €	675	Ref	0.4467*** (0.1649)	0.3338* (0.1940)	0.5734*** (0.1641)	-0.2525 (0.2392)	0.6013** (0.2339)	0.3206 (0.2434)
57-76 €	687	Ref	0.6573*** (0.1456)	0.4238** (0.1904)	1.1897*** (0.1372)	-0.0926 (0.2493)	0.8932*** (0.2057)	0.8050*** (0.2131)
More than 76 €	675	Ref	0.9728*** (0.1522)	0.6482*** (0.1958)	1.5759*** (0.1457)	-0.2885 (0.3044)	1.3009*** (0.2217)	0.8269*** (0.2403)

Labour productivity (reference: < 3,953 €per worker, 674 firms)								
3,953-13,406 €per worker	670	Ref	0.0954 (0.1502)	0.2016 (0.2093)	0.9101*** (0.1718)	0.008384 (0.2719)	0.4740* (0.2724)	0.1526 (0.2776)
13,406-35,072 €per worker	672	Ref	0.001671 (0.1471)	0.1472 (0.1804)	1.4040*** (0.1388)	-0.0867 (0.2424)	0.6628*** (0.2232)	0.1781 (0.2327)
>35,072 €per worker	672	Ref	0.5808*** (0.1880)	0.5624*** (0.1734)	2.1438*** (0.1302)	0.7485*** (0.1999)	1.7996*** (0.1919)	1.1012*** (0.1910)
Local competition index (reference: I < 0.6, 670 firms)								
0.6 < I < 2.6	673	Ref	0.2442 (0.1562)	0.0481 (0.2086)	0.0397 (0.1596)	-0.2811 (0.2482)	-0.4582* (0.2721)	0.0984 (0.2876)
2.6 < I < 11.0	651	Ref	0.0303 (0.1407)	0.0650 (0.1824)	-0.3728** (0.1478)	-0.2792 (0.2245)	-0.4258** (0.2152)	0.2280 (0.2183)
I > 11.0	694	Ref	0.0638 (0.1491)	0.3163* (0.1641)	-0.1025 (0.1232)	-0.2207 (0.2140)	-0.0438 (0.1818)	0.1785 (0.1776)
Index of final goods market size (reference: I<0.8, 1025 firms)								
0.8 < I < 1.3	186	Ref	0.1406 (0.2572)	-0.004125 (0.3014)	-0.4947** (0.2383)	0.000112 (0.4056)	-0.0251 (0.3465)	0.4972 (0.3082)
1.3 < I < 10.0	826	Ref	-0.0890 (0.1412)	0.0824 (0.1724)	-0.2923** (0.1292)	0.0309 (0.2077)	-0.4697** (0.1964)	0.2853 (0.1926)
I > 10.0	651	Ref	-0.4044*** (0.1269)	-0.3783** (0.1645)	-0.8770*** (0.1447)	-0.3091 (0.1976)	-0.6270*** (0.2174)	-0.1779 (0.2187)
Index of potential intensity of local vertical linkages (refernce: I < 1.0, 175 firms)								
1.0 < I < 40.0	1003	Ref	0.6425*** (0.1988)	0.4713** (0.2352)	0.0868 (0.1941)	0.4259 (0.3001)	0.6503* (0.3406)	-0.3887 (0.2823)
40.0 < I < 75.0	862	Ref	0.8867*** (0.1316)	0.6940*** (0.1620)	0.7827*** (0.1300)	0.5365*** (0.1994)	0.9227*** (0.2073)	0.4071** (0.1837)
I > 75.0	648	Ref	1.0841*** (0.1466)	0.7497*** (0.1712)	1.0896*** (0.1213)	0.6710*** (0.2103)	1.4284*** (0.1726)	0.3845** (0.1957)
Index of potential skilled matching on local labour market (refernce: I < -50, 139 firms)								
-50 < I > 0	746	Ref	0.2052* (0.1132)	0.3002** (0.1463)	0.7042*** (0.1138)	0.4399*** (0.1654)	0.8919*** (0.1569)	0.5377*** (0.1426)
0 < I < 50	984	Ref	0.6561*** (0.1013)	0.4499*** (0.1162)	0.9495*** (0.0900)	0.6355*** (0.1505)	1.7170*** (0.1247)	0.7231*** (0.1462)
> 50	819	Ref	0.6665*** (0.0940)	0.0619 (0.1558)	0.3831*** (0.1133)	0.7499*** (0.1662)	1.4466*** (0.1834)	0.4306** (0.1883)

*** sig. at 1 percent level (p<0.01) ** sig. at 5 percent level (p<0.05) * sig. at 1 percent level (p<0.1)