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**Measuring the local economic integration of farm households:  
Findings from two case study areas**

Roberts D.<sup>1</sup>, Majewski E.<sup>2</sup> and Sulewski P.<sup>2</sup>

<sup>1</sup>University of Aberdeen Business School, Edward Wright Building, Old Aberdeen, AB24 3QY

<sup>2</sup>Warsaw Agricultural University, Poland.

deb.roberts@abdn.ac.uk



# Measuring the local economic integration of farm households: Findings from two case study areas

Roberts D., Majewski E. and Sulewski P.

## *Abstract*

*Despite the emphasis given in EU agricultural policy to the local economic benefits of a maintaining a strong agricultural sector, relatively little research has focussed on the contribution farm households make to their localities. The lack of understanding is particularly acute given ongoing changes in the agri-food chain and changes in farm structures. The paper presents findings from an analysis of the direct transactions associated with a sample of farm households drawn from two European case study areas – Podlaskie, Poland and North East Scotland, UK. The results confirm that the concept of “local” in relation to farm household transactions depends on the economic geography of the area under analysis. With the exception of off-farm work, farm households within North East Scotland study have more distant and spatially-concentrated transactions due to the consolidation of upstream and downstream agri-businesses in the region. In contrast, transactions in Podlaskie take place far closer to the holding and are more spatially dispersed. Farm size does not systematically influence input purchasing and output sales patterns in either area but farmer attachment and supply-side factors are shown to be significant influences on behaviour.*

*Key words: local, spatial concentration, farm households*

*JEL Codes: R12, Q12, Q18.*

## 1. INTRODUCTION

European agricultural policy has always been (part) justified on the grounds that, by supporting agriculture, the CAP is also supporting the local economies in which farms are situated (European Commission, 2006). Through buying inputs, using local labour, and through the supply of output to customers and processors downstream in the food chain, farm households support employment and generate income in the local economy. In addition, farm households contribute to local economies through farm diversification, farm household consumption and off-farm work by household members.

In the US, there has been substantial research on the role of farm households in local economic development. Much of this stems from Goldschmidt's hypothesis on the socially detrimental effects of large scale farms and industrial agriculture (Goldschmidt, 1978). However, despite the policy emphasis, relatively little work has been done by economists on the role of farm households in sustaining local (as opposed to rural or regional) economies in the EU.

The paper reviews existing understanding of farm household economic integration and argues that insufficient attention has been given to the supply-side factors that influence transaction patterns. In particular it is argued that the relationship between farm households and their

localities is changing as a result of economic globalisation, societal change, and farm structural change and policy developments.

Empirical analysis focuses on two European case study areas: North East Scotland, UK and Podlaskie, Poland. The case study areas contrast strongly in terms of the nature and importance of the farm sectors in each area and the structure of the local economies. A survey of over 220 farm households in each area was conducted providing detailed information on their economic transactions. Following the approach adopted in the ARMS survey (USDA, 2008), information on the distance from the farm residence to urban settlements of varying size conurbations is collected as well as information on the distance over which transactions take place. This allows a context-specific, as opposed to absolute, definition of "local" to be developed. Importantly, information on the actual place of transactions is also collected which enables the degree of spatial concentration of transactions within the each study area to be explored.

Following a descriptive analysis of the results from the survey, multivariate probit analysis is used to indicate the relative importance of the various factors influencing individual farm household interactions in each area. This is supplemented by an investigation of the spatial pattern of flows. The results suggest that any future changes in production associated with CAP reform will have spatially differentiated effects across Europe, being concentrated on specific towns in some regions (like the UK region), more dispersed across rural space in other regions (such as the Polish region). It follows that context-specific development policies will be required to counter the negative local economic impacts of CAP reform.

The following section reviews the findings from previous studies of farm household economic integration, contrasting the various methodological approaches that have been adopted, highlighting gaps in existing understanding. Section 3 describes the methods adopted in this analysis, how the research builds on previous approaches, and the key characteristics of the two case studies areas. Section 4 presents results, starting with descriptive findings of the extent to which transactions are "local", and the factors which systematically affect the probability of local transactions occurring. The spatial pattern of transactions are illustrated and related to processes of changes within upstream and downstream businesses in each area as well as broader changes in the nature of rural economies. Section 5 concludes, drawing out both the methodological and policy implications of the findings.

## **2. BACKGROUND LITERATURE**

Farm households support jobs directly and indirectly through farm business operations and through the non-agricultural activities of household members. While farm lobby groups typically emphasise the importance of production-related links in sustaining local economies (see, for example, National Farmers Union Scotland, 2009), there has been a growing emphasis given to broader range of farm household linkages and the consequential importance of

maintaining a farming population in remote rural areas (see for example European Commission, 2006).

The most common approach to investigating farm linkages has been through general equilibrium models, in particular, input output models (Midmore, 1993), SAM multiplier models (Roberts, 1995; Waters et al., 1999) or CGE modelling approaches (Kilkenny, 1993; Gohin and Latruffe, 2006). Such studies take into account the indirect and induced effects arising from farm and farm household activities and have provided valuable insights into, amongst other things, the types of farms that generate the largest direct and indirect income and employment effects. They have also been used to show how different farm policy instruments give rise to different economy-wide impacts depending on how support is transmitted through the economic system (Rocchi, 2009). However, with the exception of the studies stemming from Taylor and Adelman (1996) on village-level general equilibrium models, the studies focus on impacts at the rural, regional or national level as opposed to local level.

Another limitation of standard general equilibrium models is that they fail to provide an indication of the distribution of impacts within the area they are studying. Essentially, such models are aspatial with even the bi-regional rural-urban models treating each sub area as a point economy. Doyle, Mitchell and Topp (1997) address this limitation by using a gravity model and GIS techniques to estimate economic impacts within a region and find that the benefits of agricultural support are not constrained to those localities which have the highest direct income and employment from agriculture. However, as they acknowledge, their results, based on input-output multipliers, capture only upstream farm linkages and not the downstream impacts associated with food processing. They also fail to take into account non-agricultural linkages such as diversification activities, off farm work or farm household consumption expenditures.

Harrison (1993) conducted one of the few EU-based studies of the spatial distribution of agricultural linkages. Using a methodology based on post-code tracking, she mapped the origin (destination) of farm invoices (receipts) thus providing information on the spatial distribution of first-round or direct farm transactions. Results were analysed according to the distance over which they took place and whether their place of source/destination was rural or urban. Amongst other findings, smaller farms were found to have more transactions with rural areas while the mean value of transactions increased with distance. A limitation of the analysis, noted by the author, is that as well as ignoring the indirect and induced effects associated with direct transactions, the data did not distinguish between market intermediaries (wholesalers or retailers) and either producers or processors. This limits the ability to estimate the rural development implications of the findings.

Within the US, Goldschmidt's hypothesis on the socially detrimental effects of large scale farms and industrial agriculture (Goldschmidt, 1978) has given rise to large number of studies on the relationship between farm structure and community welfare (Hoggart, 1987; Lobao and Stofferahn, 2008). The results remain not only contentious but also highly ambiguous (Lobao and Stofferahn, 2008). Folz and Zeuli (2005) tested Goldschmidt's premise that small farms have

more local purchasing patterns and are thus more supportive of local economies than larger farms. Their findings fail to support Goldsmidt's underlying hypothesis in terms of farm size but do indicate the importance of allowing for community characteristics, including the diversity of marketing outlets, in analyses of farmer purchasing behaviour. The authors thus argue that the policy debate has been over-concerned with farm characteristics rather than the interactions between farms and the local business community.

Lambert et al. (2009) follow this up by exploring the extent to which farm spending patterns are influenced by the type of nature of the locality in which they are based. They found that farms in urban areas purchase household goods in close markets but travel further to purchase farm business items, while those located in rural locations had the opposite pattern of transactions. This idea of context-specific linkages is consistent with research on the impact of the restructuring that occurred in rural areas following the major agricultural policy changes in New Zealand where responses to agricultural deregulation were found to be highly diverse between rural towns and contingent on a range of local factors and community characteristics (Wilson, 1995; Cloke, 1989).

Specifically in relation to farm structures, Heady and Sonka (1974) modelled the rural community and consumer welfare impacts of farm structural change (in particular growth in farm size) using an Linear Programming modelling framework. The authors' initial hypothesis was that, given the low price elasticity of demand for food products and the lower productivity of small farms, a sector comprising high numbers of small farms will constrain supply, increase net farm income, and result in higher consumer costs but generate more income and employment in rural areas. Large farms would generate the opposite outcome. Results from the model supported the hypothesis that a structure of small farms leads to greater income generation in rural communities. However it reduced farm incomes to such a level that farm households would be required to participate in off farm work to be sustainable.

Heady and Sonka's findings in the 1970s would appear relevant to the current context in many EU areas. However, as Welsh (2009) notes, the underlying basis of Goldsmidts hypothesis (of a highly polarised class structure between farms of differing sizes) has been overtaken by changes in agricultural market and farming structures, as well regulations to mitigate negative impacts of agricultural industrialisation. It follows that there is a need for new research on the how farm households contributes directly and indirectly to local development goals.

### **3. METHODS AND STUDY AREAS**

This paper extends Harrison's (1993) analysis and the work done in the US farm sector by the USDA (2008) and focuses on the factors influencing and spatial pattern of first-stage (or "direct) farm household transactions. It thus ignores impacts associated with indirect and induced effects.

A key issue to the analysis was how to define "local" in the context of first-stage transactions. Several different approaches have been taken in previous studies. For example,

Chism and Levins (1994) define local on the basis of a set distance from a particular town, while other authors have used administrative boundaries to define what are recorded as local or non-local transactions, or alternatively, rural, urban and non-regional transactions (Roberts, 2000; Psaltopoulos et al., 2006). As Lambert et al. (2009) note, administrative boundaries and functional boundaries (such as travel-to-work areas or retail market areas) usually have little or no correspondence with one another, while simple distance-based measures of locality ignore the structural characteristics of the region. For example, a farmer may buy fertilizer from the local supplier but that supplier may be based in a different administrative area and/or may be distant from the farm simply due to a lack of outlets or geographic barriers. In other words, as argued by Foltz and Zeuli (2005), there is a need to allow for supply-side factors when determining whether a transaction is local.

The approach used in the paper corrects to some extent for these issues by defining local as being within market reach of the nearest conurbation of a certain size. This is the USDA convention used in their analysis of ARMS data (USDA, 2008). In particular, the distance over which each transaction takes place is compared to the distance of the farm household from the nearest settlement of a certain minimum population. If the transaction takes place within the reach of the nearest settlement, it is classified as local, while if it takes place at a distance further than the nearest settlement, it is classified as non-local. It follows that data was needed from farm households on the location of the farm in relation to various-sized urban settlements. This allowed the definition of local to be determined according to empirical evidence. In addition, to provide greater insights into supply-side considerations, the survey instrument collected data on the actual place of transaction were recorded so as to allow analysis of the spatial distribution of transactions.

The sampling frame for the farm household survey in both study areas was based on recipients of the Single Farm Payment (SFP), stratified to cover a representative range of farm sizes. The questionnaire had sections covering individual farmer and farm household characteristics, holding details, output sales and destination, on-farm diversification, labour, input expenditures and sources, and off farm work. The questions were primarily closed with the exception of a final section where some open questions on CAP reform and changes in the local economy were asked. In the UK area, interviews were conducted via telephone and a 75% response rate was achieved, resulting in a final sample of 224 farm households. In the Polish area, face-to-face interviews were conducted and a 95% response rate was achieved with a final sample of 244 farm households.

In addition to the survey data, secondary data was collected including the number of local agribusinesses and how this has changed over the last few decades, the urban structure of the region, unemployment rates in the areas, economic structure etc. Such data provided invaluable background information, needed to explain the differences that emerge between the study areas.

### **3.1. The Study Areas:**

#### *Podlaskie*

The Podlaskie region is located in the North-Eastern part of the country. It comprises 6.5% of Poland's area. GDP per capita for the year 2002 is only 77% of the national average. Sixty percent of the population live in urban areas in the region and the 'drivers' of the region's development are urban centres (Białystok, Łomża, Suwałki). Białystok, the only city, with a population of more than 291 thousand, accounts for nearly 37% of the region's economic potential and 45.8% of the employment in Podlaskie.

Agriculture accounts for 10.7% of GDP and is one of the region's main industries (Majewski and Sulewski, 2008). More than half the land area is utilised for agriculture and natural conditions for farming are diversified within the region. Three main types of areas can be distinguished: very good, heavy soils suitable for all types of agricultural production, with milk and cattle dominating in production structure; medium-quality soils, with less intensive agriculture, mainly consisting of mixed farms (mix of crops, cattle and pigs); poor, sandy soils, frequently threatened by droughts.

Family farms predominate in the region. In the past, in common with the rest of Poland, state or collective farms owned a very small percentage of the agricultural land. Average farm size in Podlaskie (11.5 ha) is relatively high for Poland, and has recently been increasing noticeably recently. Farmers in the region are quite dynamic and milk production has developed very strongly. There are 3 major dairies in the region, which belong to the most important group of dairies in Poland.

#### *North East Scotland*

The North East of Scotland Case Study Area (NUTS 3 area UKM50) comprises the two unitary authorities of Aberdeen City and Aberdeenshire. The region is economically buoyant, driven by activity within the Oil & Gas sector, with annual rates of growth to 2008 around 2.4% per annum and the third highest Gross Value Added in the UK. Nearly half the region's 450,000 population lives in the region's one city, Aberdeen (GROS, revised 2007).

Historically, the North East Scotland was an important agricultural region that has had an international impact (for example, it is the home of the Aberdeen-Angus cattle breed, and seed potatoes are exported globally). The majority of farms are owner-occupied and family-run. In line with national and international trends, the number of farms and employment within agriculture has been in long-term decline. However, part-time employment and part-time farms have increased in significance.

Farms are predominantly of the mixed type. Beef production remains important while, in sharp contrast to Podlaskie, only 100 farms are involved in dairy production, and there is only one major dairy in the region. Cereal production in the area has supported an important pig and poultry industry, and helps to supply Scotland's very significant whisky industry with malting barley.

*Sample Characteristics*

Table 1 shows characteristics of the sample of farm households from each study area. Although the sampling frame was not stratified by farm type, the distribution of farm types within each sample reflects well the characteristics of the agricultural sector in each study area. In particular, dairy farms predominate in the Podlaskie sample, cattle farms in North East Scotland. There are very few pig and poultry or dairy farms in the UK sample reflecting the degree of specialism in these sectors.

Table 1 Sample Characteristics by study area

Farm Type	Podlaskie (PL)		North East Scotland (UK)	
	n	Mean Ha	n	Mean Ha
Cattle	37	24	135	193
Crops	54	9	48	179
Dairy	98	39	3	n/a
Mixed	24	17	34	183
Granivores	31	13	4	n/a
Total	244		224	191
Mean SFP per farm (Euros)	2,651		41,383	
% of farms households with off farm work	27.5		45.5	
Mean % of total household income from off farm work	14		17.5	
% of farms households with on farm diversification	8.2		20.2	
Mean % of total household income from diversification	37.2		4.0	

Table 1 also shows the mean farm sizes by farm type for each study area. The data reported is farmed area and thus includes land rented in as well as owned land, after having allowed for any area rented out to other users. Again the mean sizes of farms in the sample are consistent with background information and are reflected strongly in the average level of SFP support received in each study area. In terms of non-agricultural activity, a far higher percentage of farm households in North East Scotland have a least one member of the households involved in off farm work than in Podlaskie but the percentage of total household income accounted for by off farm work is similar (17.5% compared to 14%). Similarly, a higher percentage of farm households in North East Scotland have some form of on-farm diversification than in Podlaskie but in this case the average contribution to total household income from diversification is higher in the Polish area (37% as compared to just 4%). The other important difference between the two study areas is that farms in Podlaskie has a higher percentage of produce that is used on-farm and not sold in the market. This difference in degree of formal market interaction underlies the locality analysis described below.

#### 4. RESULTS

Table 2 compares the average distance of the place of residence of the farm households to where they do most their household shopping, local services and conurbations. It provides the underlying spatial information on which the subsequent locality analysis is based. In both study areas, unlike in some EU regions, farm households live on-farm, not at a distance from their holding.

Table 2 Average distance from household to principal locations for household inputs (km)

	Podlaskie (PL)	North East Scotland (UK)
Groceries	4.1	11.0
Major household items	16.8	27.7
Local primary school	4.4	4.6
Local secondary school	17.6	11.3
Nearest hospital	20.4	19.4
Nearest town >3,000	10.8	13.2
Nearest city >50,000	24.5	44.9

The results suggest very different economic geographies in each region. In particular, while the mean distance to elementary/primary school or hospital are relatively similar, the average distance to where the household does its grocery shopping is far lower in Podlaskie and, importantly, much closer than the nearest town with a minimum of 3,000 inhabitants. The average distance to a city with more than 50,000 population is also lower in Podlaskie reflecting the fact the region has several large urban settlements while, in North East Scotland there is a single city that dominates. In both cases, distances travelled for major household items are further than for groceries, while the distances to the services included in the table (primary schools, secondary schools and hospital) follow a pattern consistent with an urban settlement hierarchy in each area.

Taking into account the location of each individual farm, Table 3 shows the proportion of farm input transactions of different types that take place within different market areas. In particular it shows the percentage of farm households that purchase inputs within reach of where the household does its grocery shopping, within reach of the nearest town, and finally, within reach of the nearest city, where town and city are defined as having minimum populations of 3,000 and 50,000 respectively.

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Table 3 Percentage of farm inputs purchased within different market areas

%	Podlaskie (n=244)			NE Scotland (n=224)		
	Grocery source	Town	City	Grocery source	Town	City
Fertilizer	61.9	83.2	94.7	13.7	19.3	71.8
Chemicals	64.3	85.2	96.7	22.4	30.1	80.1
Seed	51.2	78.2	90.6	29.5	35.5	78.7
Feed	n/a	66.4	73.8	25.7	30.5	73.5
Machinery	63.9	84.4	95.9	46.4	56.1	90.0
Fuel	64.7	85.7	97.1	33.5	43.2	91.0
Services	61.5	77.9	87.3	46.1	53.9	95.5

As expected, the percentage of transactions occurring within a given market area increases as the market area gets larger. However there are large differences between the study areas. For example, in Podlaskie, almost 62% of farm households in the sample purchase fertilisers within the distance of where the household does its grocery shopping. The comparable figure for North East Scotland is less than 14%. The North East Scotland percentages across all input categories change very little as the market reach is extended to that of the local town. It is only when the market reach is extended to city level that the percentage become more similar to those in the polish study area and, even then, for some inputs such as fertilisers and feed, over a quarter of farmers source from further afield. The much lower percentage of transactions that occur within the immediate locality of the farm may reflect farmer choice and/or a lack of purchasing opportunities as explored further below.

Comparing across input categories, as expected, there is evidence, particularly in North East Scotland, that the inputs associated with more frequent transactions (fuel and services) are sourced more locally than those inputs where transactions tend to be higher value and more infrequent.

Table 4 again considers the degree of integration of farm household transactions but in this case focuses on output sales patterns, in particular, the percentage of the main output produced on the farm was sold within different market areas. A much lower percentage of farm households in North East Scotland sell their main output close to the holding than is the case in Podlaskie. In contrast, as shown in Table 5, a very similar percentage of farm sin both study areas work within the distance of where the household does its grocery shopping (46% and 48%). With the exception of off farm work however, the results suggest that the degree of locality of farm households in North East Scotland is limited with, instead, the transactions occurring over a large spatial scale.

Table 4 Percentage of farm sales within different market areas: Main output

%	Podlaskie (n=244)			NE Scotland (n=194)		
	Grocery source	Town	City	Grocery source	Town	City
Local	34.4	49.6	83.2	25.3	25.9	77.7
Non Local	65.6	50.4	16.8	74.7	74.1	22.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

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Table 5 Percentage of off-farm work within locality (defined as within distance to nearest grocery/town/city)

%	Grocery source	Podlaskie (n=69) Town	City	Grocery source	NE Scotland (n=109) Town	City
Local	47.7	72.3	98.5	45.6	53.2	88.1
Non Local	52.3	27.7	1.5	54.1	46.8	11.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

To explore the premise that small farms have stronger local linkages than large farms, multivariate probit analysis was used. In particular, probit model was estimated to investigate whether or not there are any farm or farm household characteristics which systematically explain whether an individual farm household purchases fertilizers locally or from further afield. The analysis is focused on fertilizer transactions, as this the input with the highest number of observations and where there are clear differences emerging within the study areas in terms of purchasing behaviour. Following on from the findings above, a local purchase for North East Scottish farm households was defined as being within the market reach of the nearest city while a local transaction for the Podlaskie farm households was defined as being within the distance to where the household buys its groceries.

The explanatory variables in the model were selected to represent the theoretical factors influencing behaviour including farm characteristics (size, farm type, legal status), farm household characteristics (age of head of household, stage in life cycle, education, attachment to local community) and local context (distance to towns) influences farm purchasing patterns. The number of children less than 17 and number of retirees in the households were included to represent the stage in the life cycle, and the natural logarithm of output values was included to represent farm size.

Table 6 presents the results for the North East Scotland region. In this case, cropping farms, low attachment and risk-averse farmers are the omitted dummy variables for farm type, attachment level and risk attitude respectively.

Table 6 Results from the Probit analysis, North East Scotland (UK)  
 Dependent variable: Probability of purchasing fertilizer locally

	Coeff.		Std. Err.
Livestock_LFA	-0.444		0.352
Livestock_non_LFA	-0.049		0.415
Other_farm_type	-0.334		0.432
LnOutput	0.045		0.124
No of Children	0.140		0.143
No. of Retired	-0.374	**	0.169
Med. Attachment	1.423	***	0.517
High attachment	0.859	*	0.474
Risk Neutral	-0.274		0.303
Risk Loving	-0.438		0.382
Nearest_city	0.076	***	0.015
Constant	-2.172	*	1.309

Number of obs = 156                      Prob > chi2 = 0.0000

Pseudo R2 = 0.2700                      LR chi2(12) = 49.59

\*\*\*, \*\* and \* are used to denote coefficients that are significant at the 1%, 5% and 10% level respectively.

In general, the model has a significant chi square indicating that the variables are jointly different from zero. However, contrary to expectations, the results suggest that the probability of buying fertilizers locally is not explained by farm characteristics, with neither the farm type or farm size variables being statistically significant. In contrast, the degree of attachment to the local economy are significant influences on purchasing patterns. In particular, compared to those with low attachment (the omitted category), those with medium and high attachment are both significantly more likely to purchases locally. The number of retired household members is negatively related to the probability of purchasing locally. This was contrary to initial expectations – it was expected that older farmers would be more likely to buy locally not less likely. However, it could be explained if the number of retired household members is not indicative of older decision makers (as would be the situation if by retirement, purchasing decisions have been passed to successors living within the household). Finally, local context, as reflected in distance to nearest city, has a positive and significant influence on purchasing behaviour.

Table 7 reports equivalent results for Podlaskie. Again the dependent variable is a dummy variable representing whether the farm household buys locally or not, where in this case locally is within reach of where the farm household purchase groceries.

Table 7 Results from the Probit analysis, Podlaskie (PL)  
 Dependent variable: Probability of purchasing fertilizer locally

	Coef.	Std. Err.
Cattle farms	0.171	0.354
Mixed farms	0.821**	0.430
Dairy farms	0.160	0.397
Crop farms	-0.318	0.316
LnOutput	-0.006	0.124
Off farm work	0.472**	0.237
No of Children	0.012	0.088
No. of Retired	0.072	0.112
Med. Attachment	7.500***	1.352
High attachment	6.239***	1.243
Nearest_city	-0.007	0.006
Constant	05.939	

Number of obs = 227      Prob > chi2 = 0.039  
 Pseudo R2 = 0.07      LR chi2(12) = 20.51

\*\*\*, \*\* and \* are used to denote coefficients that are significant at the 1%, 5% and 10% level respectively.

As in the results for North East Scotland, farm size is found not to influence fertilizer buying patterns in Podlaskie, after having controlled for other farm characteristics. Similarly, the number of retirees or children in the household were not, in this model, significant influences on the probability of sourcing fertilizer locally. However, one of the farm type categories in the Podlaskie model, mixed farms, is significant, indicating that, compared to the excluded farm type category; mixed farmers are more likely to buy their fertilizer locally. The off-farm work dummy variable is also positive and significant, suggesting that those farm households with off-farm workers are more likely to buy fertilizer locally.

Importantly, the degree of attachment to the local economy is again shown to be a significant influence on purchasing patterns. In particular, compared to those with low attachment (the omitted category), those with medium and high attachment are both significantly more likely to purchase locally.

From a rural development perspective, a key question following from the findings above is the extent to which farm household transactions contribute to the local economy in monetary terms. Analysis showed that even though farm size does not significantly affect the probability of having local transactions, the higher expenditure levels of large farms means they leak far more input expenditure than their smaller peers. In particular, in North East Scotland, fertilizer purchases represent the highest expenditure leakage, with large farms spending an average of £44,952 on fertilizers from outside the locality compared to a mean leakage of £7,209 from a small farm.<sup>1</sup> The value of leakages associated with non-local feed expenditure is also high

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<sup>1</sup> Level of turnover was used as a proxy of economic size for this analysis. In particular, for the North East Scotland analysis, farms with an annual turnover of less than £30,000 are categorised as small, those with a turnover between £30,000 and £100,000 are categorised as medium-sized, and finally those with a turnover of more than £100,000 are categorised as large farms. The equivalent boundaries for the Podlaskie analysis are chosen except that turnover in this case is defined in PLN.

(£27,929 on average for large farms, £2,683 for a small farm). Equivalent analysis for Podlaskie also showed that the value of expenditure leakages, and hence local economic disbenefit, increase with farm size across all farm inputs with in this case, leakages on feed and fuel are particularly high.

As noted in section 3 above, respondents were asked to identify by name locations where transactions took place. This means that, in addition to the distance-based analysis, it is also possible to assess the extent of spatial concentration of farm household transactions.

Consistent with the long distances and low proportion of local transactions in the North East Scotland sample, the results revealed that there were a limited number of towns in the area which were either significant sources of inputs or significant destinations of agricultural output. The spatial pull of two such towns are well demonstrated in map form: See Figures 1 and 2 below. Figure 1 concentrates on the spatial pattern of fertilizer transactions, Figure 2 on the spatial pattern of cattle sales. In both cases, the origin of the arrows represents the postcode sector of the farms involved in the transaction, and the end of the arrow where the transaction takes place, while the width of the arrows indicates the number of farms involved in the transaction. Only those towns which attracted more than ten farms in the sample are included as a source/destination in the Figures.

Figure 1 The spatial pattern of fertiliser supplies: North East Scotland (UK)

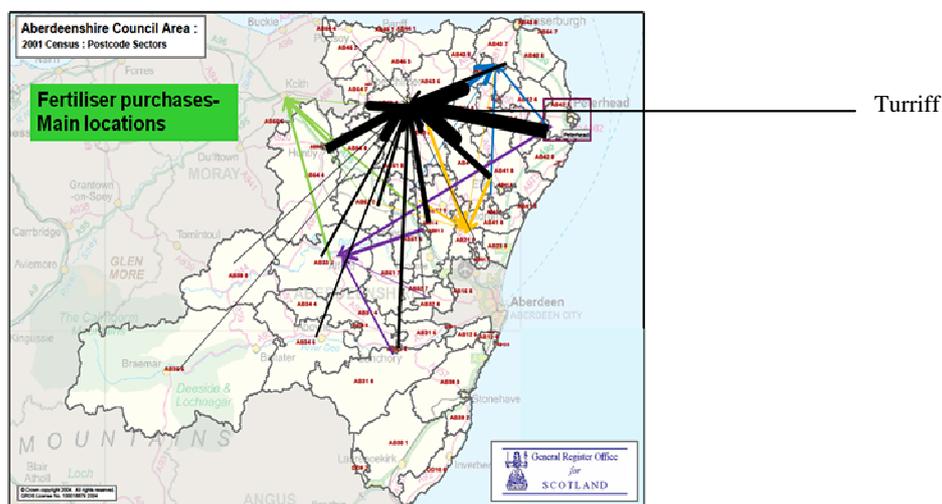
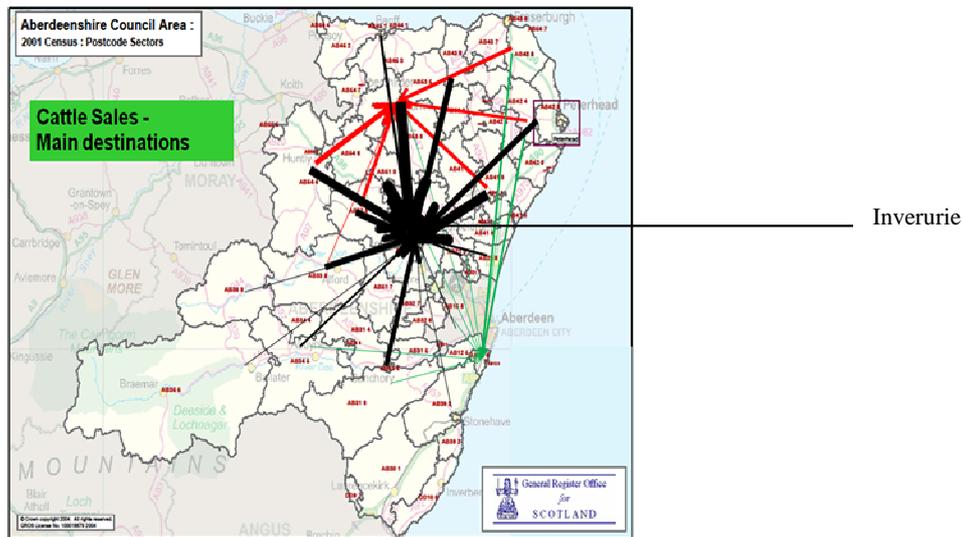


Figure 1 reveals that one town - Turriff - dominates fertiliser transactions, being the source of fertilizers for 40% of farm households in the region. There are a noticeable number of distant farms purchasing their fertiliser from suppliers located in Turriff, bypassing more local sources.

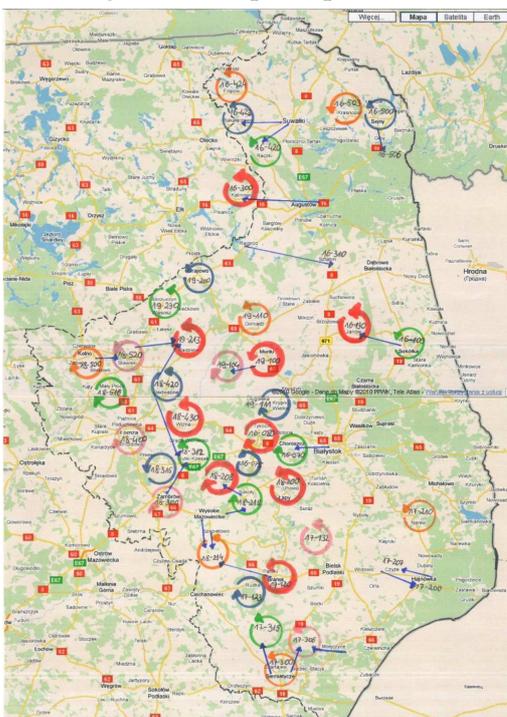
Figure 2 demonstrates the same pull effect for cattle sales. Here, sales are heavily focused on Inverurie, the location of the major regional auction mart, with farms from throughout the region converging here to sell livestock. Inverurie was found to be the destination of 63% of cattle sales in the sample.

Figure 2 The spatial pattern of cattle sales: North East Scotland (UK)



The equivalent results for Podlaskie suggest that it has a far more spatially diffuse agricultural economy with no spatial concentration of upstream agribusinesses apparent. To illustrate, in Figure 3, the spatial pattern of fertilizer purchases in the region is shown. Most farm households source their fertilizer from within their postcode area: this is shown as a circle in the diagram. Only relatively few (shown by arrows) source from another postcode area, and, even in these cases, sources are still close to the farm.

Figure 3 The spatial pattern of fertilizer supplies: Podlaskie (PL)



The pattern of output sales is also more dispersed in the Podlaskie region, with the exception of milk processing. In particular, the well-developed dairy industry in the region is exhibiting some of the same processor concentration trends that have historically been seen in the UK. In both areas, off-farm work was found to be spatially dispersed and jobs often occurred close to the farm household's place of residence. As anticipated, more highly paid, skilled jobs tended to be based further from the holding than less well paid occupations.

## **5. DISCUSSION AND CONCLUSION**

Despite the emphasis given in EU agricultural policy to the local economy benefits of a maintaining a strong agricultural sector and farm households numbers, relatively little research has focussed on understanding the contribution farm households make to their localities. What research has been conducted has largely ignored the spatial distribution of economic linkages (often conflating local and rural concepts) and has also paid insufficient attention to supply-side influences on local transactions. The lack of understanding is particularly acute given ongoing changes in market structures in the agri-food chain and changes in farm structures.

Against this background, the paper provides new insights into the spatial patterns of farm household transactions in two very different EU study areas. While farm households in the Polish study area of Podlaskie are shown to have many transactions within a short distance from the farm, farm households in the UK study area of North East Scotland were likely to trade with far more distant suppliers and purchasers. In general, off farm work tended to be closer to the holding.

More generally, the results confirm that the concept of "local" in relation to farm household transactions varies enormously depending on the economic geography of the area under analysis. In essence, what can be classed a local farm transaction in contemporary North East Scotland covers a far larger area than in the Polish study area of Podlaskie. It is also far larger than was previously case. This is attributed to an ongoing consolidation of upstream and downstream agri-businesses through acquisitions and mergers, which has been reflected in spatial as well as market consolidation: The opportunity for North East farmers to buy farm inputs and/or sell outputs close to their holding has declined. The economic geography and agricultural economy of the Podlaskie region was shown to be very different. Here farm and household-related transactions occur within the same market area.

As Foltz and Zeuli (2005) pointed out, there is a fundamental endogeneity issue in trying to analyse the relationship between farm businesses and their transaction patterns. The success of upstream and downstream businesses (and thus the number and range of outlets available to famers) depends on purchasing decisions of farmers, while the latter are influenced by the number of local market outlets/sources. This argument could be related to why there is a continuing preponderance of small farms in Polish agriculture and weak (non-farm) rural economy (Henningsen, 2009; Chaplin et al, 2007; Kondratiuk-Nierodzińska et al., 2007).

From the multivariate probit analysis, farm size does not appear to systematically influence the probability of purchasing inputs locally in either study region. However, there was

statistical evidence that the degree of farmer attachment to the local economy significantly increases the probability of purchasing locally in both study areas. Attachment may stem from loyalty factors or may be related to business structure (such as the equity investment of owners/cooperative members). It follows that ongoing changes in business practices (such as a reduction in local agents by upstream and downstream businesses or increased use of the internet for business transactions by farm households) could reduce the importance of attachment in the future and, in turn the extent of farm household local economic integration..

More generally in terms of policy, the results suggest that any reform of the CAP which has production-related impacts will have very different spatial effects in different EU regions. While in Podlaskie, the effects of CAP reform are likely to be spatially diffuse across rural space, in North East Scotland the impacts of CAP reform will be spatially concentrated in particular towns in the region. This in turn suggests that different types of policy assistance may be required.

Finally, in terms of methodology, the findings results suggest that there may be a case for extending the existing FADN survey by adding additional questions, similar to that included in the USDA Agricultural Resource Management Survey (ARMS) on farm household purchasing and sales patterns but also including information if possible on actual place of transactions. This would provide a better basis for understanding the links between European farm households and their local economies and thus for evaluating the wider beneficiaries of CAP support.

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