The Impact of Agri-Business Processing Firms on the Local Economy

Mary Carey
mary.carey@ucdconnect.ie or mary.carey@teagasc.ie

Paper prepared for presentation at the 150th EAAE Seminar

'The spatial dimension in analysing the linkages between agriculture, rural development and the environment'

Edinburgh, UK, October 22-23, 2015

The Impact of Agri-Business Processing Firms on the Local Economy

Mary Carey[1]

PhD candidate in Public Policy, University College Dublin &

Walsh Fellow, Rural Economy Research Centre, Teagasc, Athenry, Galway, Ireland

Abstract: The linkages between agriculture and other sectors in the economy have been studied frequently and results generally point to high income and employment multipliers for agriculture. However, relatively few studies have looked at the spatial location of agriculture and even fewer studies have looked at the spatial location of the agri-business processing firms and their impact on the local economy.

This paper will provide an overview of the agri-business processing sub-sector in Ireland. The geographical pattern of economic linkages within the sector and with other sectors in the economy will be analysed to investigate the impact of agri-business processing firms on the local economy.

The economic linkages between the origin (location of the firm) and the destination of sales (downstream), purchases (upstream) and employment flows will be quantified. Exploring the factors influencing economic linkages in the agri-business processing sector will allow a greater understanding of the importance of the agri-food sector to the local economy. This analysis provides an interesting in-sight into the 224 agri-business processors surveyed[2] as part of a wider research programme developing a Spatial Input-Output model for the Irish economy.

Key words: Agri-food Sector, Local Economy, Input - Output, Spatial Linkages

[1] Supervisors: Prof. Cathal O'Donoghue, Rural Economy Research Centre, Teagasc; Prof. Aisling Reynolds-Feighan, School of Economics, University College Dublin

[2] With thanks to David Meredith, Research Officer, Teagasc for his assistance with data collection.

1. Introduction

The agricultural sector and its impact on the local economy have been studied frequently and results generally point to high income and employment multipliers for the agriculture sector. The idea of a multiplier is based on the notion of a feedback loop through linkages between the main economic agents such as firms and households in the economy. The basic multiplier effect refers to the boost to the local economy generated by money spent in the locality opposed to money leaking to the wider economy. Upstream linkages (inputs into the production process) and downstream linkages (selling output) in an economy measure the intensity of the multiplier using Input-Output (I-O) tables (Leontief, 1936).

A significant body of literature exists on the strength of linkages between sectors (Courtney & Errington, 2000 and Courtney et al, 2008). For example, the construction sector is considered to be better integrated, sources inputs and sells more locally, than the manufacturing sector (Williams, 1994). In an Irish context, the agricultural sector appears to be particularly integrated into the Irish economy. Riordan (2008) highlighted that the net foreign earnings of the biosector[3] contributes 40% of the total net foreign earnings of all primary and manufacturing industries, while the sector's contribution to exports was half the net contribution at 19% in 2008. The main reasons for the sector's disproportionately large net contribution to earnings from exports relate to low import dependence, and low levels of profit repatriation among its processing firms. Carey et al (2013) demonstrated the geographical spread of the agri-food sector across the regions of Ireland and highlighted the location of agri-business processing firms as a significant factor in the impact of the sector on the respective regional economies.

This research aims to further analyse the location of agri-business processing firms and their impact on the local economy by examining the linkages between the origin (location of the firm) and the destination of sales (downstream), purchases (upstream) and employment flows. An essential issue for local economic development is to understand the mechanisms underlying the location choice of firms' purchases and sales. It is well known and acknowledged that spending locally will contribute to the local economy through increased economic activity and jobs. It is therefore necessary to understand the nature of linkages (downstream, upstream and employment flows) between firms in order to examine their impact on the local economy and assess their degree of local economic integration.

From net income theories, it is possible to conclude that the growth of a local economy is dependent on reducing the leakage of income out of the locality and attracting external income into the local economy (Persky et al., 1993). Thus, there are two interconnected sides of the coin to local economic development – on one side encourage economic activity that produces goods or services for export out of the locality (generating external income) and on the other side of the coin encourage locally orientated economic activity to reduce imports into the locality (preventing income leakage). In the context of local economic development, Courtney et al. (2008) highlighted three aspects of linkages which influence a firm's degree of local economic integration; sectoral characteristics, organisational characteristics and locational (or contextual) characteristics. The organisational and locational characteristics will be considered further below.

[3] The 'biosector' comprises the agriculture, forestry and fishing industries, and the industries processing their products, i.e. the food and beverage industries.

Characteristics of the firm

A vast array of characteristics relating to the organisational make-up of the firm can be expected to affect the level of economic integration in the locality. Courtney et al. (2008) considered firm size, ownership, age and productivity levels to be the potential organisational characteristics to influence the degree of local economic integration. In particular, small firms in comparison to large firms are found to source more inputs locally (Courtney & Errington, 2000).

Locational characteristics

Settlement patterns are also likely to influence the strength of linkages between the firm, farm, and household and the local economy and thus the magnitude of local multipliers. Courtney et al., (2008) considered the implications of the economic geography framework and made a number of interesting conclusions relating to the potential links between the firm and local markets. Courtney et al., (2008) found that the size of the labour and local final demand market does not influence the operation of rural firms in the local economy. The proximity to urban centres is also an important consideration – firms in more remote regions are more likely to be more integrated into the local economy and exhibit stronger linkages to the locality (Courtney & Errington, 2000 and Mitchell et al, 2005).

Structure of paper

The paper is structured as following; section 2 describes the survey data and summary statistics, section 3 describes the location of inputs, employees and outputs while section 4 concludes. This research has two primary objectives:

- Provide an overview of the Irish agri-business processing sector including dairy processing, beef processing, other meat processing, poultry processing, functional ingredients preparation, sea food processing and other consumer foods.
- Understand the economic linkages of the agri-business processing sector

2. Data and Summary Statistics

Overview of data

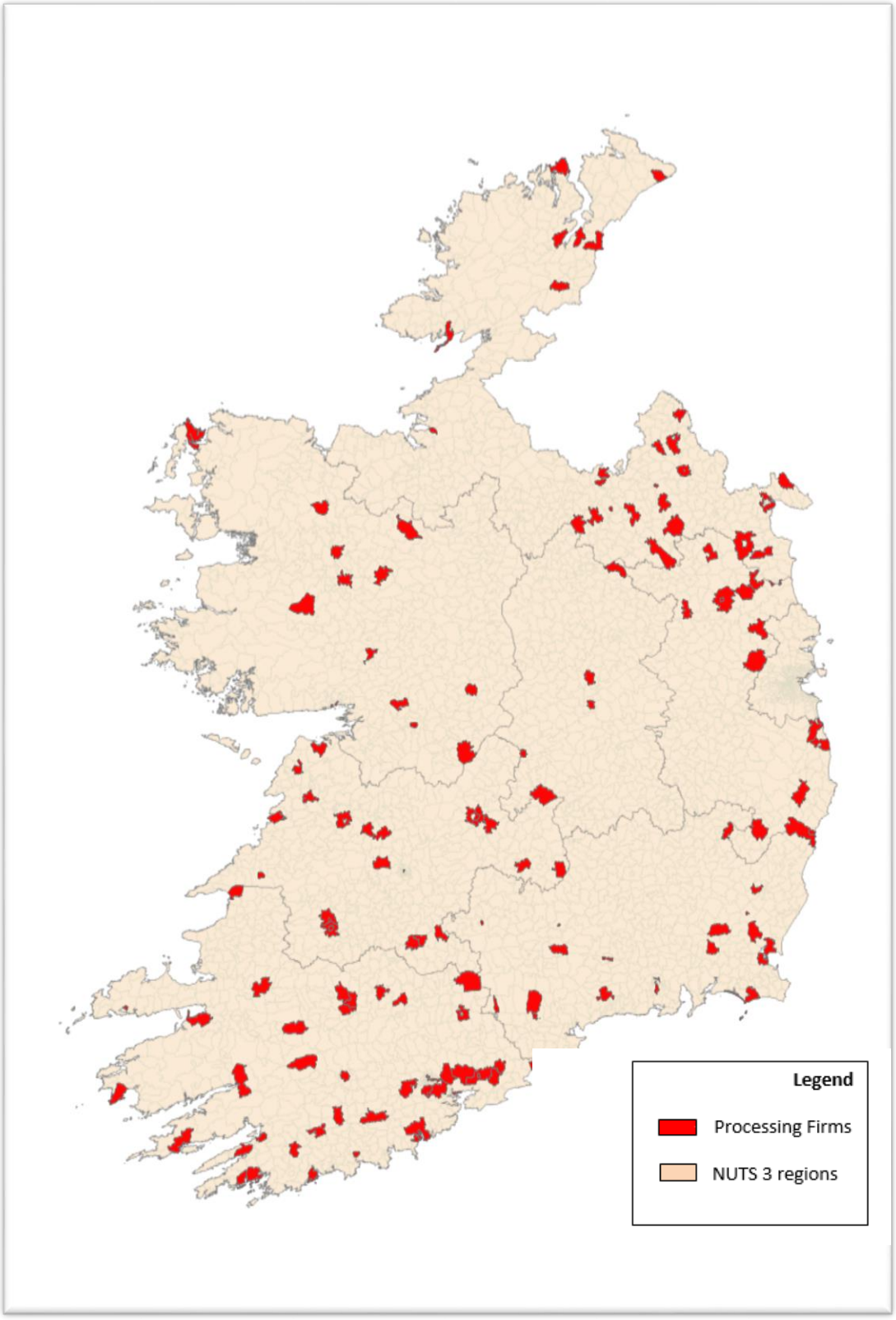
A dataset including the spatial pattern of the inputs and outputs of businesses involved in the agricultural sector was required to undertake this analysis. 224 agri-business processors were interviewed by a survey company in 2014. The survey was conducted across all sub-sector types as outlined above and quotas were set in order to ensure that the sample was sufficiently representative of the agri-business population in Ireland (some 1,170 firms).

The survey focussed on the spatial distribution of the firm's sales and purchases across 6 predefined zones. The following predefined zones were used

- Zone A: less than 10km
- Zone B: between 10-20 km
- Zone C: between 21-40 km
- Zone D: elsewhere in the region (defined as NUTS III at the time)
- Zone E: elsewhere in the Republic of Ireland
- Zone F: international

Due to the commercial sensitive nature of business financial data, the survey focused on shares of inputs and outputs by type and location. However, information on the annual turnover and the number of employees provides an indication of the total inputs and outputs. The survey respondents were geo-referenced to provide the appropriate District Electoral Division (DED), of which there are over 3,400 in Ireland (see Map 1 below). As a result, the businesses are robustly characterised by location, which is a primary objective of this study.

Map 1: Location of Processing Firms



The survey data contains a number of dimensions including characteristics of the firm (sub-sector groupings, number of employees, turnover, year of establishment etc.), inputs (labour, raw material, fixed costs, variable costs, utilities, others across the 6 zones) and outputs sold across the 6 zones. Some of the key summary statistics are shown below.

As can be seen from Map 1 above and the table below, the Midland region has the lowest percentage of agri-business processing firms at just under 5 per cent while the South-West region has 25 per cent of all agri-business processing firms.

Table 1: Regional distribution of processing firms

	Freq.	**Percent**	**Cum.**
Border	31	13.8	13.8
West	16	7.1	21.0
Midland	11	4.9	25.9
Mid-East	26	11.6	37.5
South-East	32	14.3	51.8
South-West	56	25.0	76.8
Mid-West	24	10.7	87.5
Dublin	28	12.5	100.0
Total	224	100	

Census 2011 data is used to define the spatial characteristics of the District Electoral Divisions (DED) based on population. A DED with a population of less than 1,599 people is described as open countryside or village, small towns have a population between 1600-4999 people, medium towns have a population between 5000-9999 people and large towns have a population greater than 10,000 people. The 5 main cities are Dublin, Cork, Galway, Limerick and Waterford. Based on these spatial characteristics, 50 per cent of agri-business processing firms are located in the open countryside or in a village while almost 80 per cent are located in rural areas outside of the five main cities.

Table 2: Processing firms by settlement type

	Village	**Small Town**	**Medium Town**	**Large Town**	**City**	**Total**
Freq.	111	17	30	21	45	224
Percent	49.6	7.6	13.4	9.4	20.1	100
Cum.	49.6	57.1	70.5	79.9	100	

Based on the European Union definition of micro (EU recommendation 2003/361), Small and Medium Enterprises (SME) and large firms, 32.6 per cent of firms are micro (less than 10 employees), 52.7 per cent of firms are SME (between 10 and 250 employees) and just 14.7 per cent of firms are large firms (more than 250 employees). Using the spatial characteristics generated using Census data, the size of the agri-business firms can be further broken down by settlement type. It is interesting to see that almost 67 per cent of agri-business firms in medium sized towns are SMEs while only almost 17 per cent are micro firms. This is in stark contrast to the distribution of firms in village or open country with over 34 per cent of agri-business firms in the micro category. In the 5 main cities, almost 18 per cent of agri-business firms are large – the highest percentage of large firms across all settlement types.

Table 3: Percentage of firm by size by settlement type

	Village	Small Town	Medium Town	Large Town	City	Total
Micro	34.2	41.2	16.7	33.3	35.6	32.6
SME	51.4	52.9	66.7	52.4	46.7	52.7
Large	14.4	5.9	16.7	14.3	17.8	14.7
Total	100	100	100	100	100	100
Freq	111	17	30	21	45	224

Information on the annual turnover was also provided by the vast majority of respondents and provides an indication of the total inputs and outputs. As can be seen from table 4, over 80 percent of agri-business firms have an annual turnover of less than €50 million (micro and SME from the EU definition of a firm). Based on the turnover measure, only 12 per cent of agri-business firms are large which is slightly below the almost 15 per cent figure measured by the total number of employees. However, it is also worth noting that over 7 per cent of the respondents did not respond (they either refused or stated that they didn't know).

Table 4: Firm Turnover

	Freq.	Percent	Cum.
Less than €1m	89	39.74	39.74
Between €1m and €5m	53	23.66	63.4
Between €5m and €50m	39	17.41	80.81
Over 50 million euro	26	11.61	92.42
Refused	7	3.13	95.55
Don't know	10	4.46	100
Total	224	100	

Courtney et al. (2008) highlighted ownership, amongst other factors, to be a potential organisational characteristics to influence the degree of local economic integration. From the literature, we would expect domestically owned firms to be more integrated into the local economy thus from a sectoral point of view it is important to consider the ownership structure of the sector. As can be seen in table 5, almost 94 per cent of agri-business firms are Irish owned. The high percentage of domestic ownership would suggest a strong degree of local economic integration with more inputs being sourced locally. Interestingly, looking at the distribution of ownership by settlement type, the 5 main cities have the highest percentage of foreign owned agri-business firms. These figures should be treated with some degree of caution given the small numbers involved.

Table 5: Percentage of firm ownership by settlement type

	Village	Small Town	Medium Town	Large Town	City	Total
Irish	94.6	100.0	90.0	100.0	88.9	93.8
Foreign	5.4	0.0	10.0	0.0	11.1	6.3
Total	100	100	100	100	100	100
Freq.	111	17	30	21	45	224

3. Results: Location of inputs, employees and outputs

The footprint of agri-businesses is presented in this section. In this analysis, the focus is on the origin of inputs (non-labour and employees) and the destination of outputs. The impact of agri-businesses on the local economy is examined by analysing the linkages between the origin (location of the firm) and the destination of sales (downstream), purchases (upstream) and employment flows. Quantifying the spatial distribution of the inputs and outputs of agri-businesses in Ireland provides a better understanding of their impact on the local economy and will eventually lead to the development of localised output and employment multipliers for the sector.

Firstly, looking at the composition of non-labour inputs, in terms of total costs, and the origin of such inputs (Table 6). Almost 40 per cent of non-labour inputs are sourced locally within a 10km radius, 76 per cent of all non-labour inputs are sourced within the NUTS3 level region and only 7 per cent of non-labour inputs are imported from outside of Ireland. The import share is significantly higher for raw materials at 23 per cent. We will investigate the high import share of raw materials in more detail below. Raw materials warrant further analysis as they represent the largest share of non-labour inputs (Table 7). Labour also warrants further analysis as it represents the second largest share of inputs.

Table 6: Non – labour inputs by zone

Zone	**A**	**B**	**C**	**D**	**E**	**F**
Distance	**0-9km**	**10-20km**	**21-40km**	**Region**	**Rest of ROI**	**Imports**
Raw Materials	0.16	0.09	0.11	0.15	0.27	0.23
Transport	0.38	0.17	0.15	0.10	0.17	0.04
Water	0.76	0.12	0.05	0.08	0	0
Energy	0.44	0.08	0.17	0.11	0.19	0.01
Communication	0.31	0.05	0.12	0.16	0.32	0.03
Other	0.29	0.15	0.18	0.17	0.11	0.10
W. Average	0.39	0.11	0.13	0.13	0.18	0.07
Cum.	0.39	0.50	0.63	0.76	0.93	1.00

Note: rows sum to 1 and may not sum exactly to 1 due to rounding.

Table 7: Shares of Total Costs (including labour) by settlement type

	Village	**Small Town**	**Medium Town**	**Large Town**	**City**	**Total**
Labour	0.24	0.28	0.23	0.35	0.30	0.26
Raw Materials	0.45	0.46	0.49	0.36	0.37	0.43
Insurance	0.09	0.09	0.08	0.13	0.13	0.10
Transport	0.10	0.08	0.10	0.08	0.10	0.10
Utilities	0.09	0.09	0.11	0.09	0.08	0.09
Other	0.04	0.03	0.03	0.02	0.02	0.03

Note: columns sum to 1 and may not sum exactly to 1 due to rounding.

Looking at raw materials in more detail, we analyse the origin of raw materials by settlement type. 16 per cent of all raw materials are sourced locally within a 10km radius while over 50 per cent of all raw materials are sourced within the region. The agri-business processors in large towns source the highest share of inputs locally (28 per cent) and have the lowest import share (17 per cent) across settlement types which may reflect the larger market, the type of products produced in large towns and the organisational structure of the firms in large towns (almost 86 per cent of agri-business firms in large towns are micro or SMEs). Increasing the share of locally sourced raw materials and reducing the import share of agri-business firms would increase their contribution to the local economy. A supply chain approach in the development of local/regional food strategies should be encouraged.

Table 8: Raw materials by zone and by settlement type

Zone	A	B	C	D	E	F
Village	0.17	0.07	0.10	0.16	0.26	0.24
Small town	0.16	0.05	0.13	0.19	0.23	0.25
Med town	0.13	0.06	0.15	0.12	0.29	0.25
Large town	0.28	0.04	0.12	0.18	0.26	0.17
Cities	0.11	0.18	0.09	0.10	0.32	0.20
W. Average	0.16	0.09	0.11	0.15	0.27	0.23
Cum.	0.16	0.25	0.36	0.51	0.78	1.00

Note: rows sum to 1 and may not sum exactly to 1 due to rounding.

From table 7, we can see that labour costs accounts for 26 per cent of overall total inputs in the agri-business sector. The more urban centres (large towns and the 5 main cities) had a higher percentage of total costs going to labour which suggests the agri-business processing in these locations is more labour intensive. Looking at the origin of the employees, how far they travel from their place of residence, we find that the vast majority of agri-business employees come from zone A and zone B (i.e. less than 20km). Small and large towns have more employees from within zone A. Overall, the settlement type (village to city) doesn't seem to impact the distance travelled by agri-business firms' employees.

Table 9: Labour by zone and by settlement type

Zone	A	B	C	D	E	F
Village	0.72	0.18	0.07	0.01	0.01	0.01
Small town	0.85	0.11	0.05	0.00	0.00	0.00
Med town	0.71	0.18	0.07	0.02	0.01	0.00
Large town	0.84	0.13	0.02	0.00	0.00	0.00
Cities	0.70	0.24	0.04	0.01	0.00	0.00
W. Average	0.74	0.18	0.06	0.01	0.01	0.01
Cum.	0.74	0.92	0.98	0.99	0.99	1.00

Note: rows sum to 1 and may not sum exactly to 1 due to rounding.

To understand the degree of self-sufficiency of the locality, we will also analyse the spatial distribution of outputs by settlement type. Two different measures are estimated - the proportion of the agri-business outputs sold by industrial group and the spatial distribution of customers by zone and by settlement type. Table 10 describes the location of customers or the main markets for agri-business firms by settlement type. The agri-business firms in the open countryside and villages have the lowest proportion of customers (just 11 per cent) within a 10km radium while 46 per cent of customers for agri-business firms in large towns and cities are located within 10km. There appears to be relatively high heterogeneity between agri-business firms located in villages, towns and cities. For agri-business firms located in open countryside and village, the main market is outside of the NUTS3 region but within the country. The main market for firms in small towns is the small town itself. The main market for firms in medium sized towns is outside of the NUTS3 region and the export market. As stated, agri-business firms located in large towns and cities sell 46 per cent of their goods within a 10km radius. This finding seems quite strange as it would be expected from the literature that larger firms are more likely to sell their produce outside of the local area and specifically to export more.

Table 10: Outputs – Location of Customers

Zone	**A**	**B**	**C**	**D**	**E**	**F**
Village	0.11	0.10	0.11	0.13	0.32	0.25
Small town	0.32	0.20	0.15	0.08	0.08	0.17
Med town	0.18	0.06	0.07	0.14	0.29	0.28
Large town	0.46	0.11	0.18	0.10	0.03	0.12
Cities	0.46	0.23	0.06	0.06	0.09	0.11
W. Average	0.24	0.13	0.10	0.11	0.22	0.20
Cum.	0.24	0.37	0.47	0.58	0.80	1

Note: rows sum to 1 and may not sum exactly to 1 due to rounding.

Output sold by agri-business firms is dominated by three industrial groupings – 61 per cent to the commerce group which includes wholesale and retail trade; 17 per cent to the manufactory group (functional ingredients used by other firms in the processing sector) and 16 per cent directly to the other industry group which includes hotels and restaurants. The interconnectedness between these three sectors and the position of agri-business processing firms in the supply and value chains are important considerations in terms of local/regional food strategies.

Table 10: Outputs – Sold to industrial group

Industry Grouping	**W. Average**
Agriculture, Forestry and Fishing	0.04
Manufacturing and Industry	0.17
Building and Construction	0.00
Commerce	0.61
Transport, Storage and Communications	0.01
Public Administration	0.00
Education, Health and Social Work	0.01
Other – Includes Hotels and Restaurants	0.16
Total	1

4. Conclusions and Future Research

This paper provides an overview of the agri-business processing sub-sector in Ireland by analysing the geographical pattern of economic linkages within the sector and with other sectors in the economy. The economic linkages between the origin (location of the firm) and the destination of sales (downstream), purchases (upstream) and employment flows are examined as part of the initial stage in developing a Spatial Interaction Model (SIM).

Some of the key findings of this preliminary contour of the Irish agri-business processing sub-sector include the following:

- The Midland NUTS3 region has a low percentage of the agri-business processing firms (5 per cent).
- 50 per cent of agri-business processing firms are located in the open countryside/village providing a critical employment base for rural remote areas.
- Small towns have a high percentage of micro agri-business processing firms (42 per cent of all agri-business processing firms in small towns).
- 94 per cent of agri-business processing firms are Irish owned and foreign owned firms are more likely to be based in one of the 5 main cities.
- Raw materials and labour account for almost 70 per cent of agri-business processing firms' total costs.
- 76 per cent of non-labour inputs are sourced within the NUTS3 region and only 7 per cent are imported (very low import dependency).
- Commuting patterns are relatively short with over 90 per cent of employees travelling less than 20km to work in an agri-business processing firm.
- The spatial distribution of outputs produced some surprising results – agri-business processing firms in large towns and cities sell 46 per cent of their outputs with a 10km radius. Agri-business processing firms in large towns and cities also have the lowest proportion of exports.
- Agri-business processing firms in villages and the open countryside have a higher propensity to export and are less reliant on the local market to sell their produce.

This paper provides an interesting in-sight into the 224 agri-business processors surveyed as part of a wider research programme developing a Spatial Input-Output model for the Irish economy. The economic contribution of agri-business processing firms to the local economy could be increased by sourcing more inputs locally and by increasing the proportion of outputs that are exported.

5. References

Carey, M., and O'Donoghue, C., (2014) "The Geographical Spread and the Economic Impact of Food Harvest 2020 – A Regional Perspective", Teagasc Working Paper Series

Courtney, P. and Errington, A. J., (2000) "The role of small towns in the local economy and some implications for development policy", Local Economy 15, 280–301

Courtney, P., Lépicier, D. and Schmitt, B., (2008) "Spatial Patterns of Production Linkages in the Context of Europe's Small Towns: How Are Rural Firms Linked to the Local Economy?" Regional Studies, 42:3, 355-374

European Commission Recommendation (2003) "The definition of micro, small and medium-sized enterprises", available at the following link EU recommendation 2003/361

Leontief, W. and A. Strout (1936) "Multiregional input-output analysis", in: Barna, T., (ed.), "Structural interdependence and economic development". London: MacMillan, 119-150

Mitchell M., Roberts D. and Courtney P., (2005) "Economic Linkages between Small Towns and Surrounding Rural Areas in Scotland", Final Report to the Scottish Executive, Scottish Government, Edinburgh

Persky J., Ranney D. and Wiewel, W., (1993) "Import substitution and local economic development", Economic Development Quarterly, 7, 18–29

Riordan, B., (2008) "The Net Contribution of the Agri-Food Sector to the Inflow of Funds into Ireland: a New Estimate", MPRA Paper No. 12587

Williams C., (1994) "Rethinking the role of the service sector in local economic revitalisation", Local Economy, 9, 73–82