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A Study of the NUTS 2 Administrative Regions using Input-Output Analysis

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Abstract: In 1966 Roy Geary, Director of the ESRI, noted "the absence of any kind of import and export statistics for regions is a grave lacuna" and further noted that if regional analyses were to be developed then regional Input-Output (IO) must be put on the "regular statistical assembly line". Over 40 years later, the lacuna lamented by Geary still exists and remains the most significant challenge to the construction of regional IO tables in Ireland. The continued paucity of sufficient regional data sufficient to compile regional Supply and Use (SUT) and IO tables has retarded the capacity to construct sound regional economic models and provide a robust evidence base with which to formulate and assess regional policy. This paper makes a first step towards addressing this gap by presenting the first set of fully comprehensive symmetric Supply and Use and domestic Input-Output tables compiled for the NUTS 2 regions in Ireland: The Border, Midlands and Western (or BMW) region and the Southern & Eastern (or SE) region. These tables are general purpose in nature and are fully consistent with the official national SUT and IO tables and the regional accounts. The tables are constructed using a survey based or bottom-up approach rather than employing modelling techniques, yielding more robust and credible tables. In particular this approach should better take account of the magnitude and direction of inter-regional trade flows.

Keywords: input-output analysis, regional statistics, Ireland
JELs: R11, R15

1. INTRODUCTION

In 1966, Roy Geary, Director of the ESRI, giving a series of lectures on Input-Output (I-O) tables, noted "*the absence of any kind of import and export statistics for regions is a grave lacuna*" and further noted that if regional analyses were to be developed then regional I-O should be added to the "*regular statistical assembly line*" (1966: 2). More than 40 years later, the lacuna lamented by Geary still exists and remains the most significant challenge to the construction of regional I-O tables in Ireland. The continued paucity of regional data sufficient to compile regional Supply and Use (SUT) and I-O tables has retarded the capacity to construct sound regional economic models and provide an evidence base with which to formulate and assess regional policy.

This paper makes a first step towards addressing this gap by presenting a set of fully comprehensive symmetric SUT and domestic I-O tables compiled for the NUTS[2] 2 regions in Ireland: The Border,

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Midland and Western (or BMW) region and the Southern & Eastern (or SE) region. These tables are general purpose in nature (i.e. they are not compiled for a particular economic sector or industry) and are fully consistent with the official national SUT and I-O tables and the regional accounts. The tables are constructed using a survey based or bottom-up approach rather than employing modelling techniques, yielding more robust and credible tables. In particular this approach should better take account of the magnitude and direction of inter-regional trade flows.

The regional SUT and I-O tables will contribute to the understanding of the complex relationships that exist between the regions in Ireland. These tables should also make an important contribution to the development of the new satellite type accounts (e.g. environmental, tourism or transport) and social accounting matrices where the sub-national aspect is becoming increasingly recognised as important. In the context of the Stiglitz-Sen-Fituossi (2009) agenda these types of analyses are also gaining traction. The tables could also provide a platform for the construction of regional economic models such as that recommended by Fitzgerald and Morgenroth (2006) in their ex-ante evaluation that preceded the 2007 – 2013 NDP.

2. REGIONAL POLICY IN IRELAND

Any assessment of regional policy in Ireland must be done within the wider context of the development of the Irish economy. At the beginning of what might be considered the modern Irish economy (i.e. since the late 1950's) a dramatic change in macro-economic policy orientation was initiated following Whitaker's 1958 *Economic Development*. Ireland began a painful transition from an isolated, agricultural, and protected economy to ultimately, an extremely open industrial economy. From the outset policy makers faced the challenge of balancing a number of disparate requirements. Reliance on the UK market had to be systematically reduced. A weak and inefficient indigenous industry had to be restructured and modernised, so that Irish enterprises could compete in, and export to, the emerging Common Market. At the same time, general living standards had to be improved and the benefits evenly distributed across the country in order to arrest rural depletion and mass emigration.

Given the wide range of issues facing policy makers at the time, added to the uncertainty as to whether regional policy contributed to or detracted from national performance, it is perhaps not surprising that little priority was given to regional concerns. Whitaker was opposed to the dispersal of factors of production or public goods at sub-national level, arguing this would undermine national targets (Nolan et al, 2000).

Within a decade this view was being reassessed. The difficult balancing act of achieving a convergence of living standards and productivity with other European countries and finding a remedy to rural decay and emigration remained. But so too did the question; could rural and regional balance be achieved without making concessions to national performance? Advocates of regional policy argued that far from being counter productive, regionally differentiated policies would actually contribute to national growth by making fiscal policy more effective (O'Farrell, 1970). But even within this camp, there was no agreement between what O'Neill (1973) described as the "Dispersionists" and the "Centralists", over what type of regional policy was best suited to Ireland.

The Buchanan Report (1968) favoured a "centralist" approach, advocating concentration of industrial employment in a limited number of national and regional growth centres. A central theme of the report was that sufficiently large centres or poles were needed to attain a critical mass sufficient to compete with Dublin. Buchanan also argued (as did O'Farrell, 1975) that industrial policy was the only policy instrument available to accelerate regional expansion and reduce income and social disparities by creating employment in rural Ireland. Initially the policy of attracting foreign investment to Ireland began as a regional one (McAleese, 1997), the main aim of which was to create employment and combat rural decay (Telesis, 1982). However through the Industrial Development Authority (IDA) 1973 – 1977 Regional Industrial Plans the Government formally rejected the growth centre or concentration model advocated by Buchanan in favour of dispersed regional policy (Bradley and Morgenroth, 1999). O'Leary (2002) argues this was done for reasons of political expediency.

[2] NUTS (Nomenclature of Territorial Units) is the spatial classification system used by the European Union. See Appendix 4 for composition of NUTS regions in Ireland.

In 1973, two significant events impacted on Ireland, relegating regional policy to the back seat. Firstly, Ireland joined the European Economic Community (EEC) and secondly the first of two major oil crises hit. As a member of the EEC, Ireland, in the context of European regional policy and the European funding framework, was designated as a single Objective 1 region in accordance with the views of the Irish Government. This resulted in a re-focus away from regional to national policy, or more specifically towards a national strategy geared at maximising the benefit from structural, cohesion and in particular agricultural funds under the Common Agriculture Policy (CAP) as a region of Europe (Kinlen, 2003). In fact, much of the debate on whether or not to join the EEC centred on the benefits and implications of the CAP for Ireland (Barrington & Cooney, 1984). As the first oil crisis impacted and economic growth slowed the natural focus also shifted to national priorities. By the time the second oil crisis hit in 1979, heralding a world economic downturn, Irish economic policy had distilled to one of survival. This was reflected in the industrial policy of the 1980's where job creation was prioritised over location (Boyle et al, 1999; FitzGerald et al, 1999; Gleeson et al, 2006). By 1987, the Regional Development Organisations established in 1969 were abolished due to budgetary constraints (McAleer, 2007).

Although the first National Development Plan or NDP (1994 – 1999), which coincided with the "*unofficial birth date*" of the Celtic Tiger (McAleese, 2000), did not highlight regional development as a pressing issue, concerns over regional imbalance were beginning to re-emerge. Problems associated with economic success, most notably, congestion problems and infrastructural pressures in and around the *"dispersed city"*[3] or Greater Dublin Area (GDA) rather than problems associated with economic failure, such as rural decay and emigration were now the issue.

Up to and including the period of the Celtic Tiger, economic policy had essentially been geared towards convergence with western European living standards. While this worked at a national level, it resulted in a divergence at regional level. This divergence primarily arose from the unsustainable development in the Dublin, Mid-East and South-West regions and put regional issues and spatial planning back on the agenda (Bradley & Morgenroth, 1999; McAleese, 2000). There was of course another significant impetus for the resurgence of spatial and regional issues. In 1999, the European Commission accepting the agreements put forward by the Irish Government, removed Objective 1 status from the country as a whole, splitting Ireland into two NUTS 2 regions for Objective 1 purposes. Arguably it is this change more than any other that prompted the 2000 – 2006 NDP to highlight balanced regional development as one of four core objectives and led to the establishment of the BMW and SE regional assemblies to manage the Regional Operational Programmes (OPs). Kinlen (2003) supports this view, arguing that the regionalisation of Ireland was a pragmatic response in order to "optimise" EU funding rather than any real commitment to the creation of meaningful regional structures.

The National Spatial Strategy (NSS) published in 2002 was the "*first formal articulation of spatial policy*" in more than two decades (Gleeson et al, 2006) and described by Fitzgerald et al (2003) as the most important regional policy document since the Buchanan Report. The purpose of the strategy was to provide a broad 20 year strategic blueprint, the aim of which was to correct the spatial imbalance that had amplified during the economic boom of the 1990s. The report recognised that despite various industrial policies, foreign enterprises display a clear preference for proximity to the larger urban centres, most particularly Dublin. This concentration of economic activity had created congestion and an unwelcome "*socio-economic geography*". Consequently, in a return to the centralist approach advocated by Buchanan in 1968, one of the key aims of the strategy was to develop national *gateways*[4] that would have sufficient "*critical mass*" to counter balance the GDA. The national gateways would be supported by strategically located regional *hubs.*[5] It is noteworthy that the concept of balanced regional development had evolved since the 2000 – 2006 NDP from one of reducing disparities to enhancement of potential. In any event thirteen months after the publication of the NSS, Charlie McCreevy's 2003 decentralisation policy reverted to the dispersionist model, and can arguably be viewed as another formal rejection of the centralist model. O'Toole argues that the NSS was not "*simply ignored but actively destroyed*" sending a "*clear signal that the whole idea of organising space in a rational way was being abandoned*" (2009: 173).

[3] National Spatial Strategy (2002:22)

[4] The national gateways were the existing cities of Dublin, Cork, Limerick, Galway and Waterford and four additional centres: Dundalk, Sligo, Letterkenny/Derry and Athlone/Tullamore/Mullingar.

[5] The regional hubs were Cavan, Ennis, Kilkenny, Mallow, Monaghan, Tuam, Wexford, Ballina/Castlebar and Tralee/Killarney.

In 2007 the third NDP (2007 – 2013) was published. It is interesting to compare the 2000 – 2006 and 2007 – 2013 plans. The 2000 – 2006 plan defined balanced regional development to mean the achievement of regional equity or a reduction in "*disparities between the regions*". By 2007, in line with the NSS, this had changed to mean regional competitiveness or efficiency - "*balanced regional development means supporting the economic and social development of all regions in their efforts to achieve their full potential*". While some may have argued that equity was not sustainable, as a target it had the advantage of being measurable. In contrast, measuring potential does not easily lend itself to measurement.

Since the late 1950's the priority given to regional issues has ebbed and flowed with Ireland's economic and political fortunes. This inconsistency has stemmed from the uncertainty as to whether regional development undermines or supports national development. As a consequence, regional issues have remained secondary to national ones. In recent years there appears to be greater consensus that an effective regional policy should make a positive contribution to the national economy whereas unbalanced economic growth or underperforming regions will undermine and constrain national economic performance (Fitzgerald et al, 1999; Gardiner et al, 2004; OECD, 2005; IBEC, 2006). There also appears to be broad agreement that regional development should be "centralist" rather than "dispersionist" (Boyle et al, 1999; Fitzgerald and Morgenroth, 2006). The case for regional policy is by no means unequivocal however with both NESC (1997) and Martin (2000) warning that locating industry in poorer regions may reduce the efficiency of the overall economy. Certainly in a small, highly centralised country such as Ireland, it is valid to question whether a differentiated national and regional policy is realistic.

The inconsistent priority given to regional issues has led to reactive regional policy that typically has been short-term in perspective. Since joining the EEC, Ireland's regional policy has been shaped in such a way as to optimise funding. Now however there is a growing consensus that regional disparities must be addressed if the national society and economy are to function efficiently. Today, as Ireland grapples with a major economic and financial crisis, the "regional problem" has become more complex, so any cohesive regional policy must address congestion, pressure on infrastructure in the GDA, inadequate infrastructure and gaps in service provision in many other regional locations, a decline in traditional sectors, rural ghost estates and the return of emigration. Furthermore as the relative importance of manufacturing declines, regional policy will be formulated in a context where industrial policy will be a less effective regional policy instrument.

Despite a National Spatial Strategy and two National Development Plans having set balanced regional development as a core objective it can legitimately be argued that regional policy is still struggling for recognition. Today, many policies are still national in outlook. A BMW Regional Assembly submission to the National Economic & Social Council (2005) highlighted a number of key reports such as Enterprise Ireland's *Ahead of the Curve,* National Competitiveness Council's *Annual Report* and Central Statistics Office's (CSO) *Measuring Ireland's Progress* where regional targets, regionally differentiated policies, regional indicators or regional data were not provided or acknowledged. More recently, the same criticism can be levelled at the *National Recovery Plan 2011 – 2014* (perhaps not surprising given the scale of the economic problems being faced by Ireland at the moment). Nevertheless, this is a serious deficit when one considers the importance given by the National Statistics Board (NSB) and policy makers to evidence informed policy (NSB, 2003; NSB, 2009). In the most recent Survey of CSO Users (2006) regional data was the biggest gap noted in CSO statistics (NSB, 2007: 24).

The CSO acknowledged this criticism and published a special compendium report on regional indicators in 2008 - the *Regional Quality of Life in Ireland* (CSO, 2008). In the same year the Airport-Pairings Database was disseminated for the first time. This database details air traffic information for every airport in Ireland on a monthly basis. In 2009, the Total Vehicle-KMs data were published in the annual *Transport* compendium. This dataset gives detailed mileage estimates for vehicle type for every county going back to 2005. This year's Census of Population will introduce a number of innovations including, the introduction of Atomic Small Areas, the geo-coding of every dwelling in the state and the enhancement of the POWCAR[6] dataset to include place of school. The CSO's business register is also

[6] POWCAR – Place of Work Census Anonymised Records

being geo-coded so that more spatially delineated business demography data will be available in the near future. Other developments such as the forthcoming Job Churn Explorer database will most likely be able to provide quite detailed spatial breakdowns.

Nevertheless, despite the developments just outlined, from an information perspective the infrastructure supporting the compilation of regional or sub-national statistics in Ireland is sub-standard and dysfunctional. This poses a very significant challenge for the production of regional and local statistics. The absence of postcodes, which makes the compilation of many sub-national statistics prohibitively expensive, is a clear example. Furthermore multiple institutional territories exist in Ireland. In addition to the NUTS regions used for the purposes of objective 1 funding and most official statistics, a myriad of other regional classifications exist, ranging from health, environmental or police regions to tourism regions, none of which correspond to NUTS. There are perhaps good reasons why all state bodies and institutions are not spatially organised on the same basis but from an overall administrative perspective an equally strong case could be made that in a small country like Ireland, a single regional structure and classification system might yield more efficient outcomes.

3. SUMMARY OVERVIEW OF THE NUTS 2 ADMINISTRATIVE REGIONS

Membership of the EU led to the adoption of the NUTS regions in Ireland in 1993. In 1999, when it emerged that Ireland (as a single region) would no longer qualify for Objective 1 funding, the Irish Government divided the country into two NUTS 2 regions for structural funds purposes. The BMW region retained full Objective 1 status while the SE region was designated as a transitional region. This decision was driven by concerns for financial advantage rather than by a commitment to democratic regionalisation (Hayward, 2006).

Figure 3.1 – NUTS 2 Regions of Ireland

The disadvantage of the NUTS 2 regions in Ireland is that they do not correspond to any longstanding sub-national cultural, historical or economic frameworks or institutions. From an analysis perspective this poses difficulties as many data are not assembled in line with the NUTS structure. From a policy perspective the artificial nature of the NUTS 2 regions also presents challenges, as a region (from a spatial perspective) should be appropriate to policy setting and co-ordination (CEC, 1999). From an Irish perspective, a more appropriate or useful two region delineation might be the GDA and the Rest of the Country.

The SE Region includes Dublin, Cork, Waterford and Limerick and is the wealthier of the two regions. The BMW region is the more rural of the two regions with less industry and services (particularly financial) and a greater reliance on government expenditure. A selection of regional indicators is provided in Table 3.1 as an illustration of the disparities that exist between the two regions.

Table 3.1 – Selected Indicators for NUTS 2 Regions

Indicator	SE	BMW	State
	000's	*000's*	*000's*
Population - Persons (2006)	3,103	1,132	4,235
In Employment - Persons (Q3 2010)	1,383	469	1,852
	Unit	*Unit*	*Unit*
Population Density - Persons per KM^2	85	35	62
Unemployment rate (Q3 2010)	13.5%	15.1%	13.9%
Participation rate (Q3 2010)	62.2%	58.6%	61.2%
Indices of Disposable Household Income (2007)	102.7	92.5	100
Indices of Per Capita GVA (Basic Prices) (2007)	111.2	69.3	100

4. THE INPUT-OUTPUT FRAMEWORK

In 1758 French economist Francois Quesnay formulated the *Tableau Economique* describing the workings of a farm in terms of sales and purchases between producers and consumers.[7] Following this work, other classical economists, including Leon Walras, formulated general equilibrium models of the economy. Wassily Leontief is credited with compiling the first I-O tables in 1936, entitled "*Quantitative Input and Output Relations in the Economic System of the United States*". These tables were a 19 sector model of the United States economy for the years 1919 and 1929 (UN, 1999). Leontief was honoured with a Nobel Prize in Economic Science in 1973 for his work on the development of I-O methodology.

The Input-Output framework provides an accounting framework or statistical representation for representing inter-industry flows for a given time period. They are based on the premise that it is possible to divide all productive activities in an economy into sectors whose inter-relations can be meaningfully expressed in a set of simple input functions.

I-O tables have a number of uses. They play an important role in the construction and reconciliation of national accounts and supply the backbone of supplemental or satellite accounts[8] such as Tourism, Transport and Environment satellite accounts. They also provide the platform required to construct Computable General Equilibrium (CGE) models.

Like all formal economic models, the I-O system is derived from assumptions about economic behaviour and definitions of the variables used in the tables. I-O models are based on three basic assumptions:

[7] Not everyone it seems appreciates Quesnay's efforts. P.J. O'Rourke (2007:39) described the Tableau Economique as "a minutely labelled, densely zigzagging chart – part cat's cradle, part crossword puzzle, part backgammon board."
[8] Satellite accounts are supplementary estimates that do not change the official national accounts, including GDP. They provide greater detail than in the National Income and Expenditure accounts and allows analysis of a particular aspect of the economy. This is particularly useful for dispersed or fragmented sectors such as tourism that defy normal economic activity classifications.

1. Each commodity is supplied by a single industry or sector. The corollaries of this assumption are that (a) only one method is used for producing each commodity (i.e. no substitution of inputs or methods) and (b) each sector has only a single primary output i.e. producers do not engage in any secondary production and consequently there is no real distinction between industries and products.
2. Demand for inputs is in fixed proportion to total output (i.e. a linear production function). So the inputs purchased by each sector (i.e. the inputs required to manufacture or produce a good or service) are a function only of the level of output of that sector. Thus an increase in total output will lead to a specific increase in each input category which is used in the production of the output (i.e. constant returns to scale).

3. The total effect of carrying on several types of production is the sum of the separate effects.

These underlying commodity technology assumptions have often been criticised as they result in an overly simplistic model. A brief summary of the strengths and weaknesses of the I-O framework is outlined below:

4.1 Strengths

1. Comprehensiveness and consistency. I-O tables draw on a myriad of sources to encompass all formal economic activity occurring within an economy. The tables themselves force a completeness and internal consistency.

2. Interconnected system. I-O tables facilitate analysis of the economy as an interconnected system of industries and products that directly and indirectly affect one another. Thus I-O tables trace the linkages from raw materials or inputs, through the various stages of intermediate production to the final sale of a finished good or product.

3. Direction and magnitude of change. I-O tables facilitate the decomposition of structural change in the economy, helping to identify the source of change as well as the direction and magnitude of the change. It does so by enabling changes to output to be linked with changes in inputs or other factors such as imports, exports and technology.

4.2 Weaknesses

1. Constant returns to scale. The I-O system assumes a constant return to scale i.e. the same relative mix of inputs will be used to create a product regardless of quantity.

2. Homogeneity of products within industry. It is assumed that each good produced within a given industry is the same.

3. Technical coefficients are fixed. The I-O system assumes that the amount of each input required to produce a unit of output is constant. So the amount of inputs purchased by a sector is determined solely on the level of output. No consideration is made for price changes, changes in technology or economies of scale.

4. Efficient employment of resources. There is no under-employment of resources.

5. Timeliness of I-O data. There is a long time lag between the reference period and the availability of the data required to construct I-O tables.

Because the underlying assumptions are quite restrictive, it has been argued that I-O tables are not suitable for analysing the national economy or scenario modelling as they present too simplistic a model. However, Matthews and O'Toole (2000) have demonstrated for the agricultural sector in Ireland that by partially relaxing these assumptions the changes in agricultural output, prices and technology (or input coefficient structures) can be realistically captured. More generally Barna has countered, "*It is better to have a crude model which works than an elaborate system of algebraic symbols without a numerical counterpoint*" (1954: 27).

5. THE IMPORTANCE OF REGIONAL SUPPLY & USE AND INPUT-OUTPUT TABLES

In 1977, Eamon Henry presenting a paper to the Social and Statistical Inquiry Society of Ireland on problems associated with regional I-O stated "*If unbalanced regional development is to be avoided and regional disparities to be reduced,…then inter-regional effects need to be estimated, which implies regional I/O models or some near equivalent*" (Henry 1977: 5). This statement essentially lays down the gauntlet and defines the task of this study: to compile a set of general symmetric regional I-O that will support further analysis and modelling.

Historically the lack of appropriate and robust regional data has made this an all but impossible task. In turn the lack of an overall regional framework or model makes evidence informed regional policy very difficult. It also makes understanding the regions and their full range of complex dynamics all the more challenging. Consequently it is very difficult to apply any consistent or robust economic analysis or assessment of policy.

Properly measuring regional activity is a complex task. Issues like inter-regional transfers and commuting etc. mean that traditional measures of productivity and income must be used with caution and so a more comprehensive approach is required. In order to comprehend the regional economies of Ireland and the inter-regional trade between them, the compilation of a *set* of regional SUT (and ultimately a set of I-O tables) that are consistent with the national SUT and I-O tables and the regional accounts is the most logical approach.

Regional SUT and I-O tables describe how regional industries interact with each other and with the outside world, through imports and exports. The main difference between the regional and national tables is the separating out of trade into (a) trade with other regions and (b) trade abroad. This is an important distinction as local economies tend to be very open. Purchases from other regions are treated as if they were imports and sales to other regions are treated as exports. The dependence of a region on its own and on outside resources will therefore be apparent from R-SUT and RI-O tables.

6. A SUMMARY OF I-O TABLES COMPILED IN IRELAND

The first I-O table compiled for Ireland was for the reference year 1956. These tables were compiled by the CSO in 1961 but were never published officially. The 1956 table consisted of a 36 x 36 matrix and was later published unofficially by J. McGilvray (1964) when he used the table to perform tests on the stability of the direct requirement coefficients and assess four different methods of dealing with imports in an I-O table. A 29 sector version of the table was included in that paper, where 7 sectors with little or no intermediate consumption were excluded. A highly aggregated, 9-sector version of these tables (re-priced to 1960) also appeared in Geary's 1963 paper "Towards an Input-Output Decision Model for Ireland". A second table was compiled by the CSO for the year 1960. Again this was a 36 x 36 sector matrix and again the table was never published officially as they were *"somewhat conjectural because of the lack of detailed information on which to base reliable estimates*" (Geary, 1966: Foreword). The table was made available unofficially to Geary for his series of lectures given in the ESRI in 1966.

Although not strictly an I-O table, the dynamic model of the Irish economy presented to the Statistical and Social Inquiry Society of Ireland in 1961 by Paddy Quinlan (Quinlan, 1961) is nevertheless worthy of mention. This 10-sector econometric model of the Irish economy tried to overcome the static limitations of the I-O approach. While encompassing the whole economy, the model focused on the agricultural sector, where data was based on the 1955 – 1957 Farm Surveys.

O'Connor and Breslin (1968) of the ESRI produced an I-O table for reference year 1964. Like Quinlan their table was geared towards the agricultural sector. The table was a 32 sector inter-industry transactions matrix, of which 16 sectors were purely farming, 12 were related industrial sectors and 4 were artificial sectors.

Since then there have been nine official I-O tables published for the Republic of Ireland. The first official I-O table for Ireland was published by the CSO in 1970 and refer to the reference year 1964 (CSO, 1970).

Thereafter I-O tables were published in 1969 (CSO, 1978), 1975 (CSO, 1983), 1985 (CSO, 1992), 1990 (CSO, 1997), 1993 (CSO, 1999), 1998 (CSO, 2004), 2000 (CSO, 2006) and 2005 (CSO, 2009). The 1998, 2000 and 2005 I-O tables were supplemented and enhanced by the publication of Supply and Use tables. SUT have also been published for 1998 (CSO, 2004), 2001 (CSO, 2007), 2002 (CSO, 2007), 2006 (CSO, 2010) and 2007 (CSO, 2011). SUT were also estimated by CSO for 2003 and 2004 but these tables were never published.

In addition to the above, several I-O tables were compiled and published by Dr. Eamon Henry of the ESRI who deserves special mention.[9] Eamon Henry began his I-O work at CSO by compiling the 1956 tables mentioned above. Thereafter he published 33 sector tables for the years 1964 and 1968 (1972). The next was compiled for the year 1974 (1977) and consisted of 18 industrial sectors. This table was based on the National Accounts for 1974, but since many of the necessary data were unavailable, Henry recommended that the table "*be regarded as a possible rather than an actual 1974 IO transactions table*" (Henry, 1977: 2). Henry also compiled a 19-sector table for the year 1976 (1980). This report contained a detailed appendix describing the procedures used to derive the table. This table was updated in Henry (1981) for the industrial sectors using new data from the Census of Industrial Production.

In 1974, the Department of Town Planning of Cork Corporation undertook an ambitious study of the Greater Cork Area (Cork Corporation, 1976). It covered 39 sectors and was compiled for the reference year 1973. This study focused on manufacturing and services sectors and was based on extensive survey work. The agricultural, defence and religious sectors were specifically excluded from the study. In addition to the summary report outlined above, the Corporation produced a series of 46 working papers documenting the process of compiling an I-O table, including one for each sector of the economy. In addition to the typical output, income and employment multipliers, the study also generated some interesting "floorspace" multipliers.

Ni Dhubhain et al (1994) constructed a regional 16 sector I-O table for "Western Ireland" as part of a wider study including rural Scotland and rural Northern Ireland. The purpose of the table was to investigate the social and economic implications of increased afforestation. The table was constructed using the Generation of Regional Input-Output Technique or GRIT (see section 7.3) rather than from primary data. For the purposes of this table, Western Ireland was defined as those regions classified as disadvantaged or severely disadvantaged under EC Directive 268/75.[10] The table was based on the official 1985 I-O tables published by CSO. The Agriculture, Forestry and Fishing sectors were dis-aggregated, as were Saw-milling, Wood Products and Wooden Furniture into Agriculture, Forestry Planting, Forestry Harvesting, Fishing, Timber Processing, Wood Products and Wooden Furniture, using supplementary data from National Accounts, Census of Industrial Production and "superior" data from Coillte Teo (the Irish Forestry Board) and from a special 1992 Wood Processor Survey. The tables were updated to reference year 1989 and aggregated into a 16 sector table.

O'Connor & Matthews (2000) disaggregated the official 1993 I-O tables to construct a more detailed table of the agri-food sectors for 1993. This I-O table was compiled to support the FAPRI[11]-Ireland agricultural model which was built to test alternative scenarios for the Irish agricultural sector.

Dixon (2006) compiled a 66 sector I-O table for year 2003. This table was based on the official 1998 CSO 48 sector tables but projected forward and expanded to 2003 using macro-economic and other available aggregate data (e.g. NIE 2003, HBS 1999-2000, ASI 2003 etc). This I-O table was used to support the IMAGE 2 CGE model.

Wissema (2007) compiled a 26 sector SAM derived from the 1998 CSO Supply and Use tables. The CSO tables were aggregated into a 26 sector model but with additional disaggregation for the energy sectors to yield an Environmental Social Accounting Matrix (ESAM). The Mining & Quarrying, Other

[9] Roy Geary referred to Eamon Henry as the "Mr Input-Output of Ireland" and "Our national Wassily Leontief" - see discussion of Henry's paper "Problems of Designing and Using Regional Input-Output Models for Ireland, Illustrated by 1974 Numerical Data" in *Journal of the Statistical and Social Inquiry Society of Ireland.* Vol. XXIII, Part V, 1977/1978, pp1-28.

[10] Counties classified as disadvantaged were Donegal, Monaghan, Cavan, Leitrim, Longford, Sligo, Roscommon, Mayo, Galway, Clare, Kerry and Cork.

[11] FAPRI – Food and Agricultural Policy Research Institute

Manufacturing and Electricity & Gas sectors were disaggregated into 7 sectors: Coal, Peat, Crude Oil, Oil Products, Natural Gas, Electricty and Renewable Energy. The resultant CGE model was used to examine how carbon tax rates might affect emissions targets.

O'Doherty and Tol (2007) of the ESRI derived an environmental I-O (EI-O) table for reference year 2000 by combining the official CSO I-O tables for the same year with the CSO Environmental Accounts for 1997 – 2004. The model comprised of 19 sectors, 13 pollutants and 5 waste classifications and water use. This model was used to answer questions such as, which sectors of the economy produce the largest quantities of pollutants and which sectors add the most value, considering the environmental damage they cause? The authors note that issues such as waste, water and eutrophication are not national issues but regional and that further analysis would require using a regional I-O model or regionalising the national results.

Garhart, Moloney, O'Leary and Donnellan (1996) constructed a 30 sector I-O table for the Cork-Kerry region for the reference year 1994. The authors note that while reliable state level I-O tables are provided by CSO *"regional economies within the nation are sufficiently diverse to warrant separate study*"(1996: 1). The Cork-Kerry region provides an interesting case study where there is a high concentration of multi-national chemical and electronic industries located near Cork City, whereas the tourism and food co-operative industries dominate elsewhere in the region. The table was based largely on primary data obtained from extensive survey work and controlled by regional accounts estimates provided by CSO. A preliminary report presented an aggregated 10 sector model and outlined the methodology used to construct the table along with general findings. The full results were otherwise never published.

Fannin and Johnson (2004) constructed a regional I-O table for the year 2000 for the BMW region of Ireland. This was a highly aggregated 7 sector table (Agriculture, mining, manufacturing, construction, wholesale, transport and services). The purpose of this I-O table was to derive a 36 product and industry sector, regionally-balanced, Social Accounting Matrix (SAM) which was also constructed for 2000. The SAM was built in partnership with the BMW Regional Assembly, the CSO, University of Missouri, NUI Galway and the Letterkenny Institute of Technology.

Keogh and Quill (2009) reworked the published I-O tables from 1975 to 2000 to produce a consistent set of tables by aligning the classifications and accounting practices. The tables were compiled with 19 product and commodity groups and were compared using bi-proportional adjustment to identify and analyse the structural change that had taken place in the economy since 1975.

7. BROAD METHODOLOGICAL APPROACH USED TO COMPILE RI-O

A major challenge in the construction of all types of SUT and I-O tables is the availability of data. This is particularly true of R-SUT and RI-O tables, which are especially data hungry. To overcome this problem, some analysts have constructed R-SUT and RI-O tables using synthetic data to overcome data gaps. Thus R-SUT and RI-O tables can typically be classified into one of three types of model:

1. Survey based models. Here all or most of the data for tables are sourced directly from primary regional data. If sufficient data are available, survey methods are generally thought to produce "*the most accurate table*" but are expensive and time consuming and as West (1990) notes strictly survey-based tables are virtually unachievable in practice. The methodological approach required for survey based I-O tables are best outlined in United Nations and Eurostat methodological handbooks (UN, 1999; Eurostat, 2008). This approach was widely used in the 1960's (Isard et al, 1966; Bourque and Weeks, 1969) but is less common today.

2. Non-Survey model. Non-survey models employ very little primary data and usually obtain regional data by adjusting the national I-O table. Often known as Top-down models, they are relatively inexpensive and quick to compile. There are a number of top-down approaches that can be used: Simple Location Quotients (SLQ) or coefficients, the Supply-Demand Ratios (SDRs) approach, the Regional Purchase Coefficients (RPC) method or the Cross-Industry Location Quotient (CILQ). See (Flegg & Webber, 1997 & 2000, Comer & Jackson, 1997; Smith & Morrison, 1974, Round, 1978 & 1983 or Tohmo, 2004). These techniques usually estimate regional trade flows. It is generally thought that non-survey models achieve their objective of minimising cost and construction time, at the expense of accuracy.

3. Hybrid. Between the two extremes above lie a broad spectrum of methods, variously termed "partial survey" or "hybrid" methods which incorporate both survey and synthetically produced estimates. Hybrid models are the most common approach used to compile R-SUT and RI-O tables and can usually provide a satisfactory compromise between cost, timeliness and accuracy. Typically a "top down" approach maximises the use of published statistics (e.g. employment, earnings, production levels etc.) and other sources of published or unpublished regional data (such as industry reports, organisational studies etc). All of these data are put into the RI-O tables, and then the remainder or gaps are compiled using a selection of non survey methods. The GRIT (generating RI-O Tables) model is the best known examples of this approach, see (Jensen et al, 1979 and 1988; West, 1981 & 1990). In recent years there has been increasing focus on modelling the SUT rather than the end I-O tables as they are viewed as being closer to the data (and reality as they allow industries to produce more than one product) and potentially have broader application. (See Siddiqi and Salem, 1995; Eding at al, 1998; Juha, 1998; Madsen et al, 1998).

The primary objective of the tables presented in this paper was the compilation of an accurate set of general tables. Consequently, the approach taken to constructing the R-SUT and RI-O is similar (in as far as is possible) to that taken by the CSO when compiling the official State tables, in that the tables are built up from primary data rather than using location quotient or similar techniques to estimate regional dispersal of economic activity. So the general approach is survey based or bottom-up but constrained by the national tables and by the regional accounts.

The national SUT and I-O are compiled at NACE A60 x P60 (or 2 digit NACE[12] Section level) yielding a 58 x 58 matrix, but are disseminated with 53 sectors, as a select number of industries are aggregated in order to suppress some confidential sectors. The official national SUT and I-O are symmetric, static tables. The R-SUT and RI-O are compiled on the same basis (i.e. symmetric 58 x 58 matrices) for the NUTS 2 regions in Ireland. The reference year used is 2005 corresponding with the latest official national I-O tables. The results disseminated in this paper are presented as a 6 x 6 matrix for ease of presentation.[13]

In addition to the SUT themselves, the construction of balanced domestic I-O tables requires the compilation of several intermediate tables. Notably:

- Use Tables for International Imports;
- Trade Margin Tables;
- Product Subsidy Tables;
- Product Tax Tables; and,
- Domestic Use Tables.

Regional I-O tables are compiled on the same basis but require a set of tables for each region. Furthermore RI-O tables require an additional set of tables: regional Use Tables for Domestic Imports. These tables are at the heart of the R-SUT and RI-O as they describe the inter-regional trade between the regions. For the purposes of this paper, concentration will be given to the compilation of the SUT and the Use Tables for Domestic Imports.

The intermediate tables are important not only for derivation of the Domestic Use Tables and I-O Tables but also for understanding the valuation of the various tables. The Use Tables have values at purchaser prices across the upper rows. For example, the SE Use Table A4.1 shows a total value €6,406 million for agriculture, forestry and fishing products distributed across its top row. The corresponding Supply Table

[12] NACE is the EU classification of economic activity. In all cases the version of NACE referred to is NACE Rev.1.1.

[13] 48 x 48 matrix tables are available on request. Although the tables are compiled at the level of a 58 x 58 matrix, the tables can only be disseminated at a 48 x 48 level in order to suppress confidential results.

A3.1 row shows this total is made up of Domestic Supply (at basic or approximate basic prices) €4,369 million plus International Imports €737 million plus Domestic Imports €1,432 million at basic prices plus Trade Margin €475 million plus Product Taxes less Product Subsidies €-606 million. By contrast, the Agriculture row of table A7.1 SE Symmetric I-O Table shows values adding across to the total €4,369 million at basic prices. This implies extra tables needed to distribute the imports etc., as listed above, in order to make detailed subtraction of these components. Thus, the upper rows of the Symmetric tables A7.1 and A7.2 are at basic prices.

8. THE REGIONAL SUPPLY & USE TABLES

The basic approach used to compile the R-SUT is the same as that used in the construction of the national tables. In broad terms a "bottom up" approach, using the same data sources as those used for the national tables.

In some cases the R-SUT were supplemented by additional data sources where regional data were not available from the original source material. The primary data were used to calculate regional factors which were applied to the national tables so at all stages the data were reconciled with the national SUT. This approach was useful for two reasons:

1. In the compilation of national tables several adjustments or refinements are made to individual cells (for example, where the scope of primary survey data excluded some economic activity). Probably the most extreme example of this is the construction sector where, owing to the scope limitations of the Census of Building & Construction (CBC) which covers only enterprises with 20 or more persons engaged, output was supplemented by additional data. The net effect of adding an estimate for smaller enterprises and sub-contracting increased output from €14.6bn to €38.8bn. In cases where such supplementary adjustments were made but the overall impact was small, i.e. the main data sources accounted for at least 95% of the total output (or consumption) these refinements were ignored, and the regional distribution of activity was made on the basis of the primary data sources alone but applied to the national data to ensure consistency. However, in all cases where the primary data source accounted for less than 95% of total output, then the regional distribution of activity took into account both primary and supplementary estimates.

2. The regional tables sum exactly to the national tables at every cell and aggregate level.

The basic approach for allocating activity to a region was to attribute output (or consumption) to wherever activity was invoiced or booked. Broadly speaking this is same approach used to compile national and regional turnover/purchases in business statistics. For single location enterprises, all activity is booked to that location irrespective of where customers or suppliers may be located. If an enterprise had local units (e.g. retail units) in both regions, then output was split between the regions based on turnover generated by each local unit, again irrespective of where customers or suppliers are situated. Occasionally, this approach can produce an unusual result. For example, for insurance services, where the bulk of sales are made direct from the head office, via internet or phone, regional activity can be artificially skewed towards one region.

As the structural business statistics (i.e. the Annual Services Inquiry (ASI), Census of Industrial Production (CIP) and the CBC) are some of the main data sources used, it is worth noting that the regional estimates for the industrial and services/construction sectors are compiled using different methodologies. For the industrial sectors (NACE 10 – 41) sourced from the CIP, regional data are compiled directly from local unit data, which provides an accurate picture of regional activity, both in terms of location and actual activity. For the non-financial traded services (NACE 50 – 64, 70 – 74 and 92 – 93) and the construction sector (NACE 45) regional activity is imputed from summary local unit data. The main difference therefore is that for the manufacturing sectors, local unit and enterprise activity are not necessarily the same (i.e. their NACE may be different) whereas for the services and construction sectors local unit and enterprise activity are always the same. For enterprises in the construction sector in particular this is reasonable. For many of the services industries it is not an unreasonable outcome either, as many of the services industries with local units, such as retailing or accommodation, tend to be homogenous industries.

The approach and data sources used to estimate regional activity for the agricultural, forestry and fishing sectors, the financial sectors and the non-traded services sectors varied. Equally the distribution of final demand across the regions required a wide variety of data sources and approaches. A detailed description of the sources and methodologies used for each sector is not possible in a general paper such as this. However a list of the data sources used to compile the R-SUT and intermediate tables are listed in Appendix 10 to give some flavour.

9. INTER-REGIONAL TRADE FLOWS (USE TABLES FOR DOMESTIC IMPORTS)

The R-SUT and RI-O have an additional complication over and above that normally encountered when compiling a set of national tables. The Use Table for imports (or for the purposes of these tables, the Use Table for international imports) must be supplemented by an additional set of tables; Use Tables for domestic imports which capture the direction and value of inter-regional trade.

Consequently, the regional Supply tables must have an additional imports column, i.e. imports must now be distinguished between international and domestic imports. These domestic imports columns must be supported by corresponding Use Tables for Domestic Imports. As there are only two NUTS 2 regions, the domestic imports for one region must equal the domestic exports from the other. The regional Domestic Use Tables (i.e. the Total Use Tables adjusted for margins, taxes, subsidies and imports) used to compile the I-O tables must take account of all imports (i.e. both international and domestic imports).

Inter-regional trade was estimated using a variety of data sources. The movement of goods were estimated using transport freight statistics and then converted to values using average import prices. The regional imports and exports of services and construction were estimated using supplementary data collected as part of the 2006 ASI and CBC on regional purchases and sales. Non-traded service sectors were imputed using the traded element of those sectors. So for example, the behaviour of local authority refuse collection was imputed based on the behaviour of private enterprises in NACE 90. While necessary, this approach has some risks as it is not clear if private enterprises are more likely to purchase locally than public enterprises who may subscribe to a centralised purchasing agreement. Regional imports of electricity were estimated using average electricity transmissions for summer and winter periods, sourced from the Eirgrid Transmission Forecast Statements. A very brief summary of these methodologies are described in sections 9.1 – 9.5.

9.1 Inter-Regional movement of Goods in Ireland

The CSO Road Freight Transport Survey (RFTS) provided the main platform for estimating the value of inter-regional movement of goods. The RFTS provides details on the origin-destination of goods at NUTS 3[14] level, type of goods and commodities that are carried and the broad industry type or purpose to which these commodities are delivered to/used for. The RFTS provides information on the carriage of goods for 59 commodity groups, classified to NST/R (the EU standard classification for transport statistics). It also provides 10 broad industry type/purpose classifications. So for each region of destination (i.e. importing region), a 10 x 59 matrix was constructed.

The 59 commodity and the 10 broad purpose classifications were mapped to NACE Rev.1.1. A concordance from NST/R commodity groups to NACE sectors exists through an intermediary classification, the international trade CN classification. Consequently the commodities coded to NST/R were first mapped to the corresponding CN codes and then to NACE. The detail available from the NST/R, once converted to NACE divisions, provided tonnage for NACE 1, 10, 13, 14, 15, 17, 20, 21, 23, 24, 27, 28 and 29. The total for agriculture was apportioned across NACE 2 and 5 (forestry and fishing). Thereafter, the two main residuals "mixed loads" and "miscellaneous articles" were valued, summed and distributed across the NACE sectors for which no specific information was available. The distribution of products across industries was constructed using crude preliminary Domestic Use Tables (i.e. Total Use less international imports) for each region.

[14] See Appendix 2

While every effort was made to avoid double counting the domestic transportation of goods en route from/to international import/export, it is possible that some of the goods included in the estimates for inter-regional trade have already been included in regional international imports/exports. Issues may also arise around transportation of equipment (NACE 29), which may not necessarily involve a purchase transaction but may have only been leased or rented, in which case turnover would also be captured in NACE 71.

Another complication exists in that the RFTS only captures the activity of lorries with an un-laden weight (ULW) over 2 tonnes. Furthermore, only Irish registered vehicles fall within the scope of the survey. Consequently, a number of adjustments were made for small vans, cabotage and additional sea, air and rail freight. The net effect of these adjustments was to increase the volumes of inter-regional goods freight reported by the 2005 RFTS by approximately 8%, from 25.9 million to 27.9 million tonnes.

A number of commodities or services were excluded from the freight data as they are also included in the services data. For example, laundry, mail and refuse are treated as services (NACE 64, 90 and 93) and hence these services were deducted from the freight volumes, removing a total of 133,000 tonnes of inter-regional laundry/mail/refuse. The services data are seen as superior data (see section 9.2), in that they overcome the shortcomings detailed in the next section. Furthermore, freight supplying the Motor Trades, Retail and Wholesale industries (NACE 50, 51 and 52) were also deducted from the freight totals for the same reason. This removed a further 18.9 million tonnes of freight.

The profile of commodity or product use across the industry sectors was constructed based on the profiles from the regional Domestic Use Tables. These product-industry use profiles were used to distribute the value of domestic imports (products) across the industry sectors.

9.1.1 – Converting Volumes to Values

Average import price per tonne of commodities for 2005 sourced from the international trade data were used to convert the estimated inter-regional tonnage into monetary values. Import prices rather than export prices were used as it was reasoned that these would correlate better or be more consistent with the values used in the international imports table. This approach while necessary has a number of limitations or short-comings that are worth noting:

1. As noted above, average international import prices were used and these may not have been the appropriate prices to apply to goods being traded domestically. This could be particularly problematic for commodities such as chemicals where internationally-traded prices could contain a large element of value added or complications associated with transfer pricing;

2. The same average prices were used to value commodities going in either direction i.e. the average tonne of commodity *x* had the same price whether commodity *x* was being imported by the SE region or the BMW region;

3. The volume of trade reported in the RFTS is classified to an aggregate NST/R commodity code. Consequently the exact specifications of the commodity are unknown. Hence an average aggregate price per tonne was applied. This allows a wide margin for error i.e. to significantly undervalue or overvalue the loads being transported between the regions. For example, broad headings such as "*Toxic Chemicals"* or "*Vehicles, Machinery, Appliances and Parts thereof* " leave plenty of room for interpretation. This problem was even more pronounced for headings such as "*Mixed Loads*" or "*Miscellaneous Articles*". For example, the freight data contains 1.66 million tonnes of "mixed loads" (or approximately 6% of total inter-regional freight tonnage), of which 692,000 tonnes were moving from the BMW to the SE and 972,000 tonnes from the SE to the BMW.

The value of goods exported from the SE to BMW region was priced initially at €10.6bn. The corresponding value of exports from the BMW to SE region was €12.1 bn. However these values were excessively high when compared with the residual domestic regional production. Consequently, the values were reduced using a crude calibration methodology where a ratio of total export tonnage from each region over total domestic freight tonnage (adjusted for cabotage, vans, rail etc.) was calculated.

These ratios were applied to the value of the goods element of Total Use. This reduced SE exports of goods to €5.8bn and BMW exports to €4.9bn. This is a very significant reduction. One possible contributing explanation may be a double counting between international and domestic trade. Although every effort was made to exclude international imports and exports from the domestic trade flows, the possibility remains that hauliers who collect/deposit freight at ports may legitimately record journey as a domestic one, when in fact the ultimate origin/destination of goods is outside the State.

9.2 – Inter-Regional flows of Traded Services in Ireland

The inter-regional flows of traded services were estimated using the results of a one-off supplementary survey incorporated into the 2006 ASI. This survey asked a sub-sample of the sampled enterprises to apportion their turnover and purchases between the SE region, the BMW region or international trade. Enterprises were asked to apportion the value of their turnover between exports and the two NUTS 2 regions. For both purchases for direct resale and purchases of other goods and services, enterprises were also asked to apportion between imports and purchases from either of the two NUTS 2 regions.

The quality of the turnover data was far superior to that of the purchases data i.e. responding enterprises appeared to have a much clearer knowledge of the value and location of their customers than they did regarding their suppliers. Certainly the partial non-response for the purchases questions was markedly higher than for the turnover questions. In many instances the purchases for the inter-regional trade part of the questionnaire did not correspond with (or make sense *vis-a-vis*) the data provided in the main body of the questionnaire.

As the scope of this study is two regions, the inter-regional sales (or domestic exports) from one region should correspond with the inter-regional purchases (or domestic imports) to the other. In other words the domestic exports from one region must equal the domestic imports for the other, and vice versa. However, as noted above this was not the case. Rather than try and calibrate sales and purchases, the turnover data were used exclusively. As the SUT are symmetric the regional exports (sales) could be transposed so that services products were converted to regional imports (purchases) by industry sector. In other words, industry outputs were converted to commodity inputs. Thus turnover generated by the Business Services sector (NACE 74) located in the SE region from exporting to the BMW region, equalled the value of Business Services commodities (services) imported by the BMW region from the SE.

Rather than try and price adjust the 2006 values back to 2005 values, the sample data were simply weighted to the 2005 values as estimated in the 2005 regional Supply Tables (which equal the regional Use Tables) rather than the ASI 2006. This overcame two obstacles. Firstly, as already noted, the need to deflate the 2006 values to 2005 prices would require an extensive range of services deflators and secondly, the need to adjust for differences in scope between the ASI and Supply Table aggregates.

9.3 – Inter-Regional movement of Non-Traded Services in Ireland

In recent years the scope of traded services has extended into some sectors traditionally considered non-traded, such as health, waste collection etc. The 2006 ASI study on inter-regional trade covered enterprises in NACE 85 (Health & Social Work Services) and 90 (Sewage and Refuse Disposal Services). The traded element of these services did not report any inter-regional trade in 2006. This was the basis for imputing zero inter-regional trade for the sectors as a whole (traded and non-traded). The same pattern was applied to NACE 75 (Public Administration and Defence) and 80 (Education) also.

9.4 – Building & Construction

The CBC measures enterprises with 20+ persons engaged. For these enterprises a survey, similar to that described for services was conducted. This survey suggested that enterprises with their HQ based in the SE region, generated approximately 29% of their turnover in the BMW region. In contrast, enterprises with their HQ in the BMW region did not generate any turnover in the SE region.

Construction enterprises with 20+ persons engaged only account for 37% of total turnover for NACE 45. In order to compile the Supply Tables, adjustments for construction were made using Table A2.1 of the

DKM Economic Consultants review of the construction industry (DKM, 2007: 87). Additional adjustments were made to take account of payments made to sub-contractors and VAT. So the official measure of Construction output of €14.6bn published in the CBC for large enterprises is adjusted to cover smaller enterprises and make allowance for the value of sub-contracting, yielding an estimated value of €38.8bn.

It was assumed that the smaller building enterprises (i.e. those with less than 20 persons engaged) are only involved in local work and consequently are not involved in cross-regional activity. Thus approximately 11% of the total SE construction turnover was generated from exports to the BMW region, which equates to roughly €4.2bn. However there is some double count here. Consequently when the purchases of building materials (such as timber, stone etc.) are deducted (as they have also been captured in the inter-regional movement of goods) this was reduced to €0.8bn. There remains uncertainty as how best to treat sub-contractors, which are very important to the construction industry and possibly account for as much as 55% of output. For the purposes of this study, it has been assumed that sub-contractors, like smaller building contractors are not involved in cross-regional activity. This assumption may lead to an underestimate of imports of construction services in either direction.

9.5 – Regional Imports of Electricity

Getting reliable information on the regional production and consumption of electricity in Ireland proved surprisingly difficult. The best available source proved to be the Eirgrid Transmission Forecast Statement 2005 - 2011 (Eirgrid, 2005). The appendices to these reports (J and K) provide average electricity flows (and direction) in terms of megawatts (MW) and megavars (MV) between each node on the grid. The approach taken was to map each node to county and then isolate the nodes where electricity was transmitted between the SE and BMW regions. The detailed grid charts provide the megawatts (active) and megavars (reactive) of electricity leaving one node and reaching another. As megavars are not traded the calculations were based on the "inbound" megawatts figure (i.e. electricity lost during transmission was not counted). Annual flows of electricity between the regions was estimated by taking the simple arithmetic average of the transmissions for Summer and Winter 2005-06 and the Summer Night Valley and Winter Peak demand for 2005 (Eirgrid, 2006).

Converting MW to monetary values was problematic, as insufficient information was available on the relative consumption between residential and enterprises (by size class, sector and region). Consequently ratios of flows of electricity between the regions over total electricity consumed were applied to the electricity element of NACE 40 (approximately 45%) from the Total Use Tables 2005 net of imports. Only total intermediate consumption plus final household demand was included. The result was electricity worth approximately €413 million was imported by the BMW region from the SE while €132 million worth of electricity flowed from the BMW region to the SE.

10. BALANCING

The SUT are compiled using a wide variety of data sources (see Appendices 1 and 2). It is not unusual for different sources to occasionally yield data that are at odds or inconsistent with other sources. There are a variety of reasons why this happens, ranging from survey error, differences in scope or reference periods between sources to clerical errors or backlogs in administrative registers. The quality of data sources is not always clear and it can be hard to determine which estimation methodologies are superior. As a consequence a certain amount of conflicting data must be confronted when compiling R-SUT and RI-O. Reconciling different estimates or "balancing" as it is typically referred to, can be a subjective exercise, and requires the compiler to make judgement calls on data sources. The Eurostat methodological I-O handbook helpfully notes "*For balancing no general theory or useful mathematical programs are available*" (Eurostat, 2008: 208).

In broad terms the approach adopted was to balance the regional Use Table to the corresponding Supply Table as purchases data are typically of inferior quality to that of turnover. Typically, this approach would have been used for Manufacturing and Traded Services. However for some sectors where estimates were gleaned from a combination of sources and it was less clear cut whether the supply or demand side were the superior estimate, the approach to balancing varied.

Prior to balancing the discrepancy in total output between the tables for the SE region (Total Supply ≠ Total Use) was approximately 1.5%. However, the same absolute difference in the BMW region represented a discrepancy of the order of 7% (reflecting the relative size of the two economies). Discrepancies for individual sectors varied considerably more (or less) from the average, but the majority fell within 5% for the SE region. The SUT were balanced manually to ensure one region was not balanced at the expense of the other. The balancing of the final I-O tables was more straightforward and with the exception of a few sectors (NACEs 2, 11, 14, 19 and 35 where at least one cell had a negative value exceeding 1% of total sector input) it was largely cosmetic. This final stage balancing was done using a mechanical program "RAS". This final stage balancing is required when the negative cells that arise from the commodity technology assumption underpinning the I-O tables not holding perfectly true across all sectors are replaced with positive values (from the Domestic Use Tables).

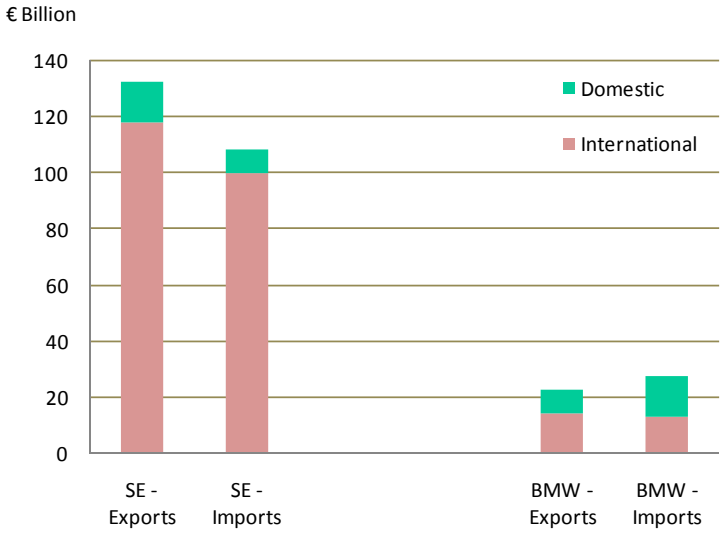
11. SUMMARY OF RESULTS

One of the hurdles associated with R-SUT and R-IO tables, given their size and complexity, is the challenge in presenting the results. For this reason a selection of summary data are presented in graphic and tabular form in this section. A 6 x 6 industry/product aggregation of the main transaction tables and multipliers are presented in Appendices 3 to 9.

11.1 - Trade

As noted above, the main difference between national and regional SUT is the inclusion of inter-regional trade flows. Consequently the R-SUT and the RI-O sum exactly to the national SUT and I-O once these regional flows (domestic imports) are deducted. This is simply because the I-O tables are domestic in scope and therefore each regional domestic economy nets out all imports (irrespective of whether they are domestic or international). In contrast, the State I-O table is not concerned with and does not take account of the inter-regional flows within its borders. Consequently, the differences between the RI-O and the State I-O arise because of inter-regional flows. Figure 11.1 demonstrates the relative importance of domestic trade to the two regions by illustrating the magnitude and composition of total trade flows (both international and domestic). Two points are immediately obvious, (1) total trade in the SE region dwarfs trade in the BMW region and (2) the net trade balance is different in both regions.

Figure 11.1 – Total Imports and Exports, S&E and BMW Regions, 2005



Total exports from the SE region are almost six times larger than those from the BMW region; €132.6 billion compared with €22.3 billion (see Appendices 3, 4 and 11). The SE region has a trade surplus with exports exceeding imports by some €24.3 billion. In contrast, the BMW region is running an overall trade deficit of €4.8 billion. Domestic trade is much more important to the BMW region than for the SE region, where domestic imports account for 53% of total imports into the BMW region compared with only 8% of total imports into the SE region. Equally, domestic exports account for 37% of total exports from the BMW region compared with 11% from the SE region.

Table 11.1 – Regional Net Trade Balances, 2005

	SE	BMW	State
	€ Million	*€ Million*	*€ Million*
Agriculture, Forestry & Fishing	-618	234	-383
Manufacturing	34,220	1,199	35,419
Construction	472	-481	-9
Distributive Trades & Communications	-685	-1,949	-2,634
Business Services	-9,424	-3,529	-12,952
Other Services	391	-284	107
Goods	*33,603*	*1,433*	*35,036*
Services	*-9,245*	*-6,243*	*-15,488*
Total	24,358	-4,809	19,549

As only two regions are presented and the domestic exports to one equals the domestic imports from the other, from a net trade balance perspective, the inter-regional trade flows cancel out. Consequently, the net trade balances for each region sum to the net balance for the State. Table 11.1 presents a summary of the net trade balance (exports less imports) for each of the regions. The BMW region only enjoyed a trade surplus in the Agricultural and Manufacturing (Goods) sectors, all other sectors (Services) were in deficit. Considering the relative size of the regional economies, the trade deficit of €6.2 billion generated by the demand for services is striking.

It should be noted that the trade deficit for services in the SE region is directly related to or connected with the trade surplus for goods as the same industries that are generating large exports (e.g. Pharma – Chem) typically have a significant multinational enterprise (MNE) presence who are also paying large royalties or purchasing other trade related services (e.g. marketing). These royalty payments and purchases are recorded in the Balance of Payments (BoP) as imports of services. For example, payments for royalties and licences in 2005 amounted to €15.5 bn and the purchases of trade related services amounted to €7.6 bn (see Table 2a of the Current and Capital Accounts – Balance of International Payments). Thus the trade deficit for services in the SE region is to some extent unavoidable as it arises directly from the international nature of trade i.e. *vis-a-vis* the Rest of the World, and is largely driven by MNEs. In contrast, the bulk of the trade deficit for services in the BMW region arises from domestic imports (i.e. *vis-a-vis* the SE region). 61% of this deficit arises from demand for Business, Real Estate and Financial Services.

When total trade is decomposed into international and inter-regional trade, the SE enjoys a trade surplus for both international and domestic trade. The BMW region is in surplus for international trade (€1.4 billion) but is in deficit for domestic trade (€6.2 billion) – See Appendix 9.

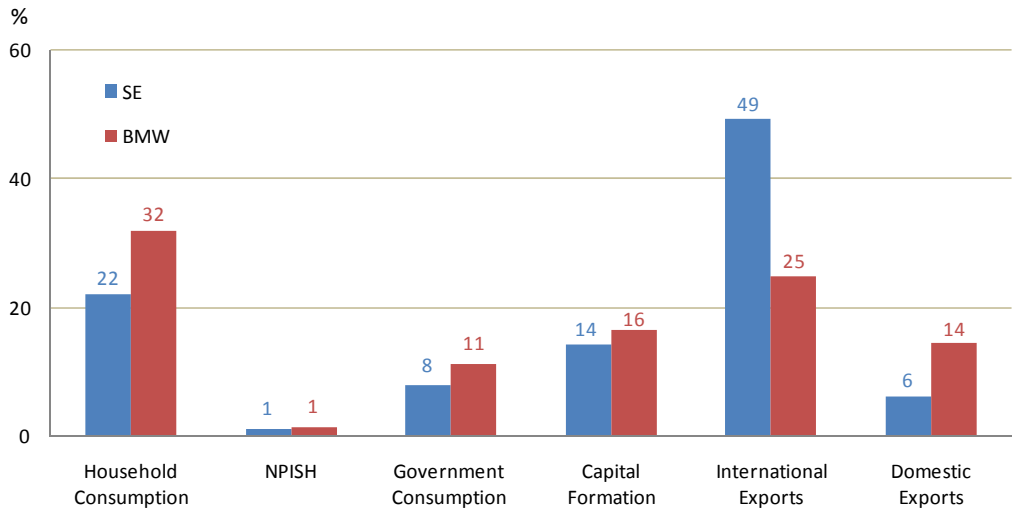
In the context of any economic recovery, these net trade balances are important, particularly if the recovery is to be export led (NCC, 2009; Dept. Finance, 2010). The data suggest that any export driven recovery will be led by the SE region. However it is interesting and cautionary to note that €24 billion or 69% of the Goods trade surplus generated in the State comes from the Pharma-Chem sector, making the

State and SE region in particular very exposed to a single sector. The data also suggest that with a services trade deficit of €15.5 billion, spread across both regions, but proportionately greater in the BMW region, there is some scope to further develop some services sectors in Ireland. Indeed the ESRI have suggested as much, stating that services exports may account for 70% of Irish exports by 2025 (NCC, 2009).

11.2 - Final Demand

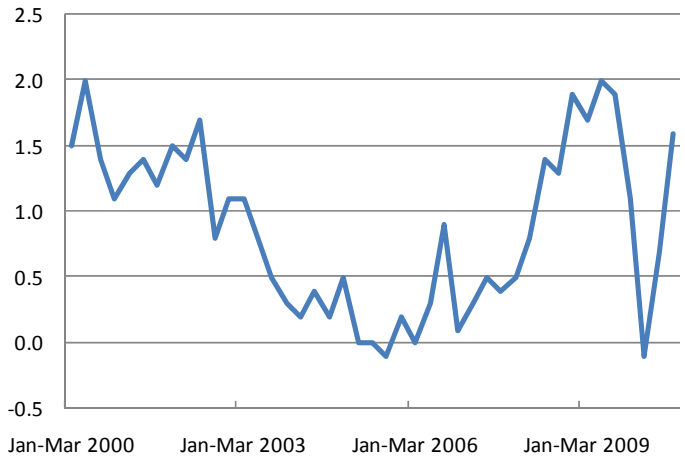
The greater dependence of the BMW economy on household expenditure and government consumption expenditure is clear from Figure 11.2. As seen earlier, relative to the SE region, a much greater share of BMW final demand is generated from inter-regional trade, although in absolute terms exports from the BMW to SE region are only slightly more than half than those from SE to BMW region (€14.3bn compared with €8.2bn). The greater importance of government consumption and capital formation to the BMW region is also evident.

Figure 11.2 – Percentage Distribution of Regional Final Demand, 2005



In the context of the current economic situation, where real household incomes, government expenditure (and government employee salaries) and capital investment are all falling and the construction sector has suffered a serious decline in output, this is likely to have a proportionately greater impact on the final demand within the BMW region and should lead to widening disparities between the regions. Again the influence of MNEs is important here. Over the past number of years the strong output and exporting performance of the "Modern" manufacturing sector has been evident from the Monthly Production Index and the International Merchandised Trade data. The modern sector is heavily influenced by MNEs which in turn will have a more significant impact on the SE region.

Figure 11.3 – Difference in NUTS 2 Unemployment Rates, Q1 2000 – Q3 2010

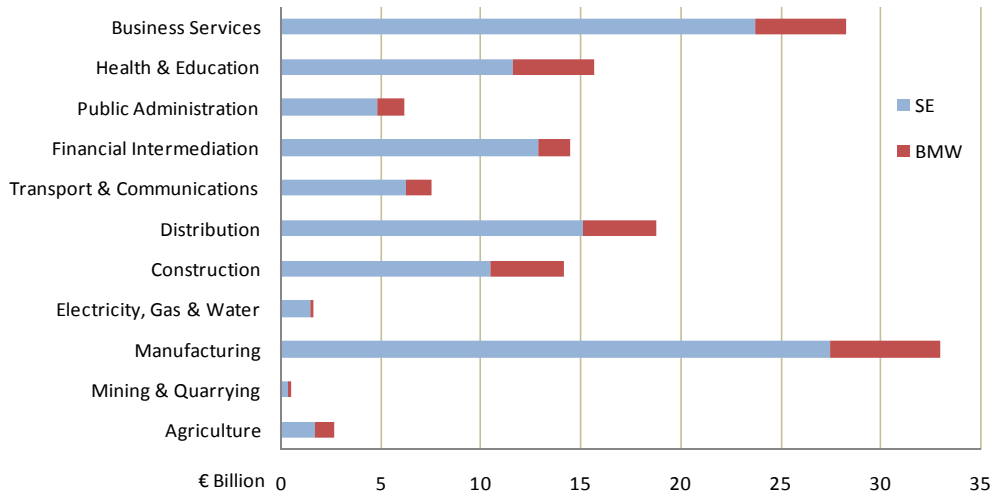


A crude barometer of this trend is already available from the Quarterly National Household Survey (QNHS). Figure 11.3 shows the difference in the percentage unemployment rates between the two regions since 2000. Between Q2 2000 and Q3 2005 the unemployment rate in the BMW region fell from 6% to 4.5% to converge with lower average unemployment rates in the SE region. By the time the national rate of unemployment began to rise steeply around the middle of 2008, a steady divergence between the regional rates of unemployment had already re-emerged a year earlier (apart from a rather sudden and temporary convergence in Q1 2010).

11.3 – Gross Value Added and Productivity

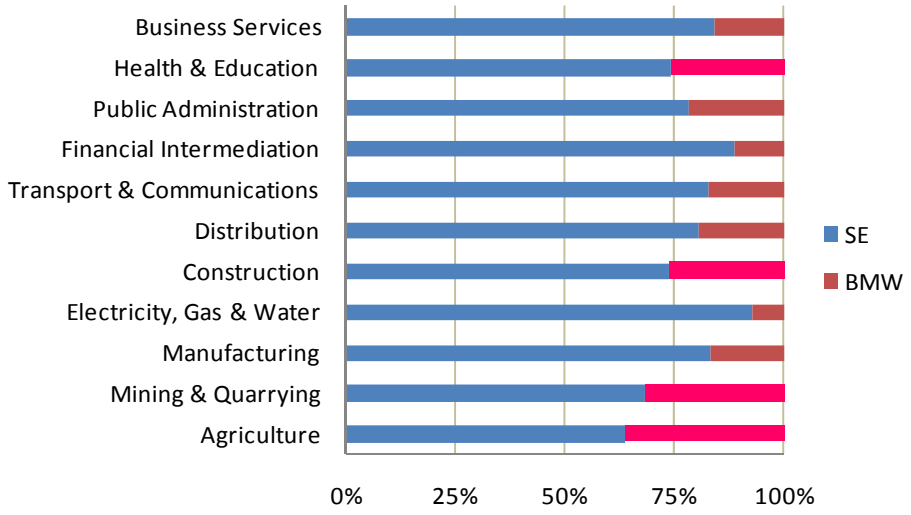
The absolute contribution of each region to total sector GVA (or GDP) is illustrated in Figure 11.4. The dominance of the SE region is clear, accounting for €116.2bn or 81% of total state GVA.

Figure 11.4 – Regional Contribution to GVA at Basic Prices byBroad Industry Sector, €Billions, 2005



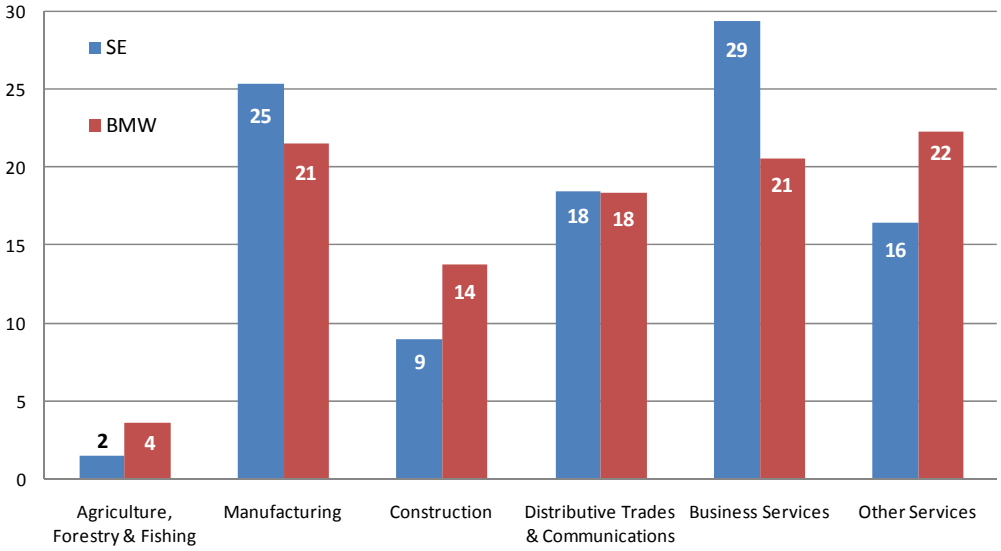
If regional contribution to sectoral GVA is presented in percentage terms, the relatively more significant contributions of the Agriculture, Mining & Quarrying, Construction and Health & Education sectors in the BMW region become clear. These are the only sectors in the BMW region where contribution to total State GVA exceeds 25%. Equally the important contribution made by the Utility and Financial Services in the SE region is also clear accounting for 93% and 89% of total GVA generated in the State by those sectors.

Figure 11.5 - % Regional Contribution to GVA by Broad Industry Sector, 2005



If GVA is examined from the perspective of the regional economies (in percentage terms) the importance of the Manufacturing (25%) and Business Services (29%) to the SE region is apparent. At first glance, the BMW region appears to have a more balanced distribution of economic activity, with Manufacturing (21%), Business Services (21%) and Other Services (22%) sectors all more or less equally important to the BMW region. However it should be noted that GVA in the Manufacturing and Business Services of the SE includes proportionately more activity in the particularly high value added industries, such as (Chemicals – NACE 24) and (Computer related services – NACE 72). Given the importance of MNEs to those industries in Ireland, care must be taken with this comparison. The relative importance of the Construction and Other Services sectors to the BMW region is also obvious (see Figure 11.6).

Figure 11.6 - % Sector Contribution to GVA by Region, 2005



Compensation of employees (COE) and Net Operating Surplus (NOS) are the two most important components of GVA, accounting for 88% of the overall total. However, across the two regions, the relative contributions of COE and NOS are quite different. Table 11.2 shows that COE makes a much larger contribution to GVA in the BMW region (52%) compared with the SE region (45%) and is consistent with the greater importance of household and government consumption to final demand. NOS makes a much greater contribution to GVA in the SE region (43%) compared with 38% in the BMW

region. This difference reflects both the relatively greater importance of Government Services to the BMW region and also the impact of MNEs in the SE region. It should be remembered that the profits generated by MNEs flow outside the State (region) and are not of direct benefit to the State (region). While the presence of MNEs generates obvious employment and trickle-down benefits, caution should be taken when interpreting the benefits of NOS, particularly across both regions.

Table 11.2 – Composition of Regional GVA, 2005

Components	State		SE		BMW	
	€ Million	*%*	*€ Million*	*%*	*€ Million*	*%*
Compensation of Employees	65,963	46	52,045	45	13,918	52
Net Operating Surplus	60,155	42	49,846	43	10,309	38
Consumption of Fixed Capital	16,965	12	13,848	12	3,117	12
Taxes	1,550	1	1,272	1	277	1
Subsidies	-1,442	-1	-801	-1	-640	-2
Gross Value Added	143,191	100	116,210	100	26,981	100

Productivity differentials between the two regions may contribute to this difference in composition. The indices of per capita GVA presented earlier in Table 3.1[15] suggest this is indeed the case. GVA per Full Time Equivalent (FTE) Persons Employed should yield a superior measure of labour productivity than per capita GVA. Indexing the data so that the State = 100 in 2005, the SE region has an index of 109.2 compared with an index of 73.4 for the BMW region (see Appendix 11 for the calculation). There are most likely several contributing factors to this differential. One important contributor must be the location of MNEs in Ireland. MNEs typically exert a positive influence on labour productivity and their location is heavily biased in favour of the SE region (as noted above, MNEs have exhibited a clear preference for the SE region, or more specifically proximity to the GDA or Cork's deep water port).

11.4 – Technical Coefficients

The commodity technology assumption facilitates the transformation of the SUT into a symmetric I-O and the subsequent derivation of Leontief Inverse Multipliers. These multipliers are not multipliers in the Keynesian sense and should be more accurately thought of as technical coefficients. Technical coefficients arise from direct linkages of an industry to other industries on which they are dependent for raw materials and other inputs. They are based on the production technique or input mix of an industry and determine the supply chain (or intermediate consumption) which arises from an increase in demand for a product. Hence they are of use for planning purposes. The output multipliers (see Appendix 8) suggest that industry inter-dependencies or linkages vary both by sector and region. At the level of aggregation presented in this paper, output multipliers are not particularly meaningful in that they describe a highly aggregate production function. Nevertheless, they illustrate for example that, for the Manufacturing Sector (NACE 15 – 41) the inter-dependencies or inter-linkages are slightly higher in the BMW region than for the SE region. The relatively greater dependence or use of agricultural produce as inputs to manufacturing in the BMW region is also evident.

The import multipliers show the extent to which an economy is dependent on imports to sustain Final Demand. The multipliers in Table 11.4 show that overall the SE region has a greater dependence on imports and thus is a more open economy than the BMW economy, i.e. the total import multipliers are typically higher in the SE region than the in BMW region. Consequently, with the exception of the "other services" and "agricultural" sectors, leakages are greater from the SE region than from the BMW region. The multipliers also suggest that the SE region is not only more open but also more globalised than the BMW region (i.e. the international import multipliers are higher in the SE region than in the BMW region).

[15] See Section 3.

Table 11.4 – Regional Import Multipliers, 2005

	SE			BMW		
	International Imports	Domestic Imports	Total Imports	International Imports	Domestic Imports	Total Imports
Agriculture, Forestry & Fishing	0.311	0.071	0.382	0.288	0.163	0.451
Manufacturing	0.591	0.016	0.607	0.388	0.145	0.533
Construction	0.313	0.027	0.341	0.180	0.115	0.295
Communications	0.238	0.017	0.256	0.089	0.085	0.174
Business Services	0.343	0.011	0.354	0.085	0.104	0.189
Other Services	0.144	0.010	0.154	0.109	0.084	0.193

An international export to production ratio can be derived by dividing International Exports (from the Use Tables) by Total Domestic Supply (see Appendix 12). Again, this ratio suggests that the SE region is more globalised, with approximately 42% of total output being exported abroad compared with 25% of output from the BMW region. Again, the MNE effect must be taken into account, as MNEs valuation of production and exports can be different. Notwithstanding this challenge, from a policy perspective, this has some interesting regional implications, in the context of balancing possible spill-over and leakage effects.

12. CONCLUSION

The "grave lacunae" identified by Geary in 1966 largely still exists. This study has shown that inter-regional trade flows can be estimated at the NUTS 2 level, but not without some difficulty. It is impossible to say exactly how accurate these estimates are other than to note they fall within the accepted minima and maxima for each product and industry (i.e. the values in the Domestic Use Tables are positive). The ease with which the first estimates of the inter-regional trade flows for the services sectors inserted into the R-SUT suggests they are reasonably robust. However, given the significant calibration required, it is likely that the estimates of the flows of merchandised trade between the regions are more tentative. Equally, the lack of available data on construction sub-contractors may have led to an underestimate of inter-regional trade for this sector. Consequently, the inter-regional flows between the regions cannot be considered definitive and should be thought of as somewhat speculative and thus must carry a health warning.

Perhaps not surprisingly, the study suggests that the approach used for estimating the flows of services between the regions, i.e. using customised survey data yields more robust results than deriving estimates from secondary sources. It would be interesting to compare the results of this type of approach with the methodology used to estimate the flows of goods. The study also suggests that compiling regional flows and R-SUT and RI-O tables at NUTS 3 level is not currently possible without modelling a significant amount of synthetic data. This is a pity as a more appropriate or interesting two-region study might be to compare the GDA with the rest of the country, which would require NUTS 3 level data. It should be noted that this challenge is not unique to Ireland; inter-regional trade data are not commonly available for most countries. Although the availability of sub-national data is steadily improving, the lack of a coherent data infrastructure (e.g. the lack of postal codes or the abundance of spatial classification systems used across the public service) in Ireland has not made this task easy or inexpensive.

Notwithstanding the caveats above, the R-SUT and RI-O tables presented here are as robust and comprehensive as is possible and by and large present a plausible picture of activity in the NUTS 2 regions in 2005. Tables such as these will be essential if regional modelling and satellite accounting for fragmented or dispersed industries such as tourism and transport are to be developed for Ireland. The dominance of the SE region is clear, accounting for 74% of total employment and 81% of total GVA. The tables suggest that the SE region is a more open and globalised economy than the BMW economy with a higher export to production ratio of 42% compared with 25%. However, the significant influence of MNEs on these metrics cannot be ignored. Caution must be exercised when drawing conclusions regarding the higher labour productivity, higher export to production ratio in the SE region or the

differences in composition of GVA. The paper has also highlighted the structural differences in the composition and nature of the trade balances in both regions largely arising from the greater influence of MNEs in the SE region. Consequently, any comparative analysis of the two regions must take in to consideration the impact of MNEs on both regions. Given the importance of MNEs to the Irish economy and the SE region economy in particular, this raises questions as to whether GVA is an appropriate measure for regional comparisons.

From a policy perspective this presents challenges. As noted earlier, the current NUTS 2 regions could be considered "artificial" and are perhaps not ideal from a regional policy perspective. Arguably, regional policy would be better targeted at a NUTS 3 level of aggregation. The achievement of balance between the regions, however defined, must take into consideration the differing profiles identified above. In the context of today's economic problems, the burden of an export driven recovery will fall largely to the SE region to address. Equally, the decline of the construction sector in recent years and the ongoing decline in government expenditure (which traditionally might have been considered as a stabiliser to the economy) will have a greater impact on the BMW region.

Over the past 50 years the importance of regional issues in Ireland has ebbed and flowed in reaction to economic circumstances. Publication of the two previous NDPs and the NSS suggest there is a growing recognition of the importance for rational spatial and regional planning. The conceptual changes regarding the definition of balanced regional development suggest the required policies and performance metrics must become more, rather than less complex in future. Consequently, the need for a coherent regional statistical framework to support regional models and regional economic analysis is greater than ever. It is hoped these tables will make a contribution towards this goal.

References

Barna, T. (ed.) (1954), *The Structural Interdependence of the Economy – Proceedings of an international conference on Input-Output Analysis, Verenna, Italy 1954*. John Wiley & Sons, New York.

Barrington, R. and Cooney, J. (1984), *Inside the EEC. An Irish Guide,* O'Brien Press, Dublin.

Border, Midland and Western Regional Assembly (2005), "More Effective Regional Policy & the Social Partnership Process" - *Submission from the Border, Midland & Western Regional Assembly to the National Economic and Social Council (NESC)*, Roscommon.

Borque, P.J. and E.E. Weeks (1969), "Detailed Input-Output Tables for Washington State", 1963 Circular No.508. Washington Agricultural Experiment Station, College of Agriculture, Washington State University.

Boyle, G. and T. McCarthy and J. Walsh (1999), "Regional Income Differentials and the Issue of Regional Equalisation in Ireland", *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XXVIII, Part I. 1998/1999, pp155-210

Bradley, J. and E. Morgenroth (1999), "Celtic Cubs? Regional Manufacturing in Ireland", *Medium-Term Review 1999-2005*, Economic and Social Research Institute, Dublin.

Buchanan, C. & Partners and Economic Consultants Ltd. (1968), *Regional Studies in Ireland*, Commissioned by the United Nations on behalf of the Government of Ireland, An Foras Forbartha, Dublin.

Comer, J. C. and R. W. Jackson (1997), "A Note on Adjusting National Input-Output Data for Regional Table Construction", *Journal of Regional Science*, Vol. 37, No. 1, pp145-153.

Commission of the European Communities (1999), "European Spatial Development Perspective: Towards Balanced and Sustainable Development of the Territory of the European Union", Brussels: European Commission.

Cork Corporation (1976), "Greater Cork Area Input-Output Study", Department of Town Planning.

Department of Environment and Local Government (2002), "The National Spatial Strategy 2002 – 2020: People, Places and Potential. Dublin", The Stationery Office.

Department of Finance (1958), "Economic Development", Pr. 4803, Dublin, The Stationery Office.

Department of Finance (1993), "Ireland - National Development Plan 1994 – 1999". www.finance.gov.ie.

Department of Finance (2000), "National Development Plan – Ireland, 2000 – 2006". www.finance.gov.ie.

Department of Finance (2007), "National Development Plan – Ireland, 2007 – 2013". www.finance.gov.ie.

Department of Finance (2010), "National Recovery Plan – Ireland, 2011 – 2014". www.budget.gov.ie.

Department for Transport UK (2009), "Survey of Foreign Road Goods Vehicles United Kingdom 2009 – Final results". www.dft.gov.uk.

Department for Transport UK (2009), "UK Van Activity Baseline Survey 2008". www.dft.gov.uk.

Dixon, J. (2006), "The 2003 Mid Term Review of the Common Agricultural Policy: A Computable General Equilibrium Analysis for Ireland", Thesis submitted for PhD degree, Trinity College Dublin.

DKM Economic Consultants (2007), "Review of the Construction Industry 2006 and Outlook 2007 – 2009". Dublin.

Eding, G., J. Oosterhaven, B. de Vet and H. Nijmeijer (1998), "Constructing Regional Supply and Use Tables: Dutch Experiences". Paper presented at the 12th International Conference on Input-Output Techniques, New York, 18-22 May 1998.

Eirgrid (2005), "Transmission Forecast Statement 2005 – 2011". www.eirgrid.com

Eirgrid (2006), "Transmission System Performance Report 2005 – System Data and Performance Statistics". www.eirgrid.com

Eirgrid (2009), "Generation Adequacy Report 2010 – 2016". www.eirgrid.com

Eurostat (2008), "Eurostat Manual of Supply, Use and Input-Output Tables. Eurostat Methodologies and Working Papers", ISSN 1977-0375, European Commission, Luxembourg.

Fannin, M. & T. Johnson (2004), "A Social Accounting Matrix Project for the Border, Midland and Western (BMW) Region of Ireland", BMW Regional Assembly & Letterkenny Institute of Technology.

FitzGerald. J, I. Kearney, E. Morgenroth and D. Smyth (eds.) (1999), "National Investment Priorities for the period 2000 – 2006", Economic and Social Research Institute (ESRI), Policy Research Series, Paper No.33, ESRI, Dublin.

Fitzgerald, J., C. McCarthy, E. Morgenroth, E. and P. O'Connell (2003), "The Mid-Term Evaluation of the National Development Plan and Community Support Framework for Ireland 2000 to 2006", Dublin: Economic and Social Research Institute www.esri.ie

Fitzgerald, J. and E. Morgenroth (2006), "Ex Ante Evaluation of the investment priorities for the National Development Plan 2007 – 2013", ESRI Research Series No. 59. Dublin, the Economic and Social Research Institute. www.esri.ie.

Flegg, A.T. and C. D. Webber (1997), "On the Appropriate Use of Location Quotients in Generating Regional Input-Output Tables: Reply". *Regional Studies,* Vol. 31, pp.795-805.

Flegg, A.T. and C. D. Webber (2000), "Regional Size, Regional Specialisation and the FLQ Formula". *Regional Studies*, Vol. 34.6, pp. 563 – 569.

Gardiner B., Martin R. and P. Tyler (2004) "Competitiveness, Productivity and Economic Growth across the European Regions", *Regional Studies*, Vol. 38.9, pp. 1045-1067.

Garhart, R. and R. Moloney (1995), "Irish Input-Output: A Survey", Department of Economics Working Paper Series 95(5), University College, Cork.

Garhart, R. and R. Moloney and E. O'Leary and T. Donnellan (1996), "An Input-Output Model of South-West Ireland: A Preliminary Report", Presented at the Regional Science Association International 43rd North American Meeting, Washington, November 1996.

Geary, R. C. (1963), "Towards an Input-Output Decision Model for Ireland", *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XXI, Part II, 1963/1964, pp67-119

Geary, R. C. (1966), "Lectures on Input-Output", The Economic and Social Research Institute, L Series No. 1, Dublin.

Gleeson, A. M. and R. Ruane and J. Sutherland (2006), "Public Policy, Sectoral Specialisation and Spatial Concentration: Irish Manufacturing 1985 – 2002", *Journal of the Statistical and Social Inquiry Society of Ireland.* Vol. XXXV, 2005/2006, pp110-150

Hayward, K, (2006), "A marriage of convenience: the EU and regionalization in Ireland", Paper delivered to the Political Science Association of Ireland Annual Conference, University College Cork, October 2006

Henry, E. W. (1972), "Irish Input-Output Structures, 1964 and 1968", The Economic and Social Research Institute, Paper No. 66, Dublin.

Henry, E. W. (1977), "Problems of Designing and Using Regional Input-Output Models for Ireland, Illustrated by 1974 Numerical Data", *Journal of the Statistical and Social Inquiry Society of Ireland.* Vol. XXIII, Part V, 1977/1978, pp1-28

Henry, E. W. (1980), "Irish Input-Output Structures, 1976", The Economic and Social Research Institute, Paper No. 99, Dublin.

Henry, E. W. (1981), "An Input-Output Analysis of New Industry in Ireland in 1976", The Economic and Social Research Institute, Paper No. 107, Dublin.

Irish Business and Employers Confederation (2006), "National Development Plan: A new approach to Balanced Regional Development", Dublin: Irish Business and Employers Confederation

Isard, W., T. W. Langford Jr. and E. Romanoff (1966), "Philadelphia region input-output study, preliminary working papers", Regional Science Research Institute, Philadelphia P.A., USA.

Jensen, R. C., T. D. Mandeville and N. D. Karunaratne (1979), *Regional Economic Planning: Generation of Regional Input-Output Analysis*. Croom & Helm Ltd, London.

Jensen, R. C., G. R. West and G.J.D. Hewings (1988), "On the study of regional economic structure using input-output tables". *Regional Studies* 22, pp209-220.

Juha, P. (1998), "Regional Input-Output Tables Based on Supply and Use Framework: The Finnish Case". Paper presented at the Research seminar "Structures and Prospects of the Nordic Regional Economies", Savonlinna, Finland, 4-7 June 1998.

Kinlen, L. (2003), "The Development of a Regional Social Accounting Matrix Policy Analysis System for the Border, Midland and Western Region of Ireland", June 2003.

Keogh, G. and P. Quill (2009), "The Construction and Analysis of a consistent set of Input-Output tables for the Irish Economy", *Journal of the Royal Statistical Society*, 172, Part 4, pp.771–788.

Madsen, B. and C. Jensen-Butler (1998), "Commodity Balance and Interregional Trade: Make and Use Approaches to Interregional Modelling". Paper presented to the 12th International Conference on Input-Output Techniques, New York 18-22 May 1998.

Martin P. (2000), "The role of public policy in the process of regional convergence. Paper prepared for the Conference on Regional Development Policy and Convergence in the EU", Brussels: European Investment Bank Papers.

Matthews, A. and R. O'Toole (2000), "Agribusiness and Economy-wide effects of the Agenda 2000 CAP EU reform", FAPRI-Ireland Working Paper No.10.

McAleese, D. (2000), "The Celtic Tiger: Origins and Prospects", *Options Politiques*. July/August

McAleer J. (2007), "Regional Governance in Ireland – Reflections from a practitioner at the coalface". Presented at the Southern and Eastern Regional Assembly Annual Conference, April 2007.

McAleese, D. (1997), "Economic Policy and Performance: The Irish Experience", *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XXVII, Pt. V, 1997/1998, pp3-32

McGilvray, J. (1964), "The Stability of Coefficients in an Irish Inter-Industry Model", *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XXI, Part III, 1964/1965, pp44-76

Morgenroth, E. (2003), "An Assessment of the National Spatial Strategy". Economic and Social Research Institute – www.esri.ie.

National Competitiveness Council (2009), "Driving Export Growth: Statement in Sectoral Competitiveness". www.forfas.ie

National Economic and Social Council (1997), "Population Distribution and Economic Development: Trends and Policy Implications", Report no. 102, Dublin: National Economic and Social Council.

National Statistics Board (2003), "Strategy for Statistics 2003 – 2008". www.nsb.ie

National Statistics Board (2007), "Survey of CSO Users 2006". Dublin. www.nsb.ie

National Statistics Board (2009), "Strategy for Statistics 2009 – 2014". www.nsb.ie

Ni Dhubhain, A. and J. J. Gardiner (Eds.) (1994), "The Socio-Economic Impact of Afforestation on Rural Development – Final Report", Contract No. 8001-CT90-0008, University College Dublin, The Queen's University of Belfast and University of Aberdeen.

Nolan, B. and O'Connell, P.J. and Whelan, C.T. (eds.) (2000), *Bust to Boom? The Irish Experience of Growth and Inequality*, Institute of Public Administration, Dublin.

O'Doherty, J. and R.S.J. Tol (2007), "An Environment Input-Output Model for Ireland". *Economic and Social Review*, 38 (2), pp157-190

O'Connor, R and M. Breslin (1968), "An Input-Output analysis of the Agricultural Sector of the Irish Economy in 1964", Paper No. 45, Economic and Social Research Institute.

O'Connor, D. & A. Matthews (2000), "Construction of a Disaggregated Agri-Food Input-Output Model for Ireland 1993". FAPRI-Ireland Working Paper Series No.8, Dublin, FAPRI-Ireland Partnership, Teagasc.

O'Farrell, P. N. (1970), "Regional Development in Ireland: The Economic Case for a Regional Policy", *Administration* (Winter)., Vol 18 (4), pp342-62

O'Farrell, P. N. (1975), "Regional Industrial Development Trends in Ireland, 1960 – 1973", *Industrial Development Authority – Publication Series 1*, Institute of Public Administration, Dublin.

O'Leary, E. (2002). "Sources of Regional Divergence in the Celtic Tiger: Policy Responses", *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XXXII, 2002/2003, pp1-32

O'Neill, H. (1973), "Regional Planning in Ireland: The Case for Concentration*", Irish Banking Review* (September). pp. 9-20.

Organisation for Economic Co-operation and Development (2005), "OECD Regions at a Glance", Paris: OECD Publishing.

O'Rourke, P. J. (2007), *On the Wealth of Nations*, Atlantic Books, London.

O'Toole, F. (2009), *Ship of Fools – How Stupidity and Corruption sank the Celtic Tiger*. Faber and Faber Ltd., London.

Quinlan, P. M. (1961), "A Dynamic Model of the Irish Economy", Dublin - *Journal of the Statistical and Social Inquiry Society of Ireland,* Vol. XX, Part V 1961/1962, pp1-51.

Round, J.I. (1978), "An interregional input-output approach to the evaluation of nonsurvey methods", *Journal of Regional Sciences,* 18, pp179-94.

Round, J.I. (1983), "Nonsurvey techniques: A critical review of the theory and the evidence". *International Regional Science Review* 8, pp189-212.

Siddiqi, Y. M. and M. Salem (1995), "Regionalization of commodity-by-industry input-output accounts: the Canadian Case". Paper presented at the Eleventh International Conference on Input-Output Techniques, New Delhi, November, 1995, *Mimeograph*, System of National Accounts, Statistics Canada 1995

Smith, P. and W.I. Morrison (1974), *Simulating the Regional Economy*, Pion, London.

Statistics Norway (2009), "Transport Performances for Vans and Small Lorries 2008". www.ssb.no

Stiglitz, E. J., A. Sen and J. Fitoussi (2009), "Report by the Commission on the Measurement of Economic Performance and Social Progress". www.stiglitz-sen-fitoussi.fr

Telesis Consultancy Group (1982), "A review of Industrial Policy", A report prepared for National Economic and Social Council, report No. 64, Dublin, The Stationery Office.

Tohmo. T, (2004) "New Developments in the Use of Location Quotients to Estimate Regional Input-Output Coefficients and Multipliers", *Regional Studies, Journal of the Regional Studies Association,* Vol. 38, No. 1, pp.43-54.

United Nations (1999), "Handbook of Input-Output Table. Compilation and Analysis", Series F, No.74. United Nations, New York.

West, G.R. (1981), "An efficient approach to the estimation of regional input-output multipliers", *Environment and Planning A*, Vol 13, pp. 857–867.

West, G. R. (1990), "Regional Trade Estimation: A Hybrid Approach", *International Regional Science Review*, Vol. 13, No.s 1 & 2, pp.103– 118.

Wissema, W. (2007), "Carbon energy taxation and revenue recycling: An applied general equilibrium analysis for the Irish economy", Thesis submitted for the PhD degree, Trinity College Dublin.

APPENDIX 1: GLOSSARY

ASI	Annual Services Inquiry
BMW	Border, Midland & Western
BoP	Balance of Payments
CAP	Common Agriculture Policy
CBC	Census of Building & Construction
CFC	Consumption of Fixed Capital
CGE	Computable General Equilibrium Model
CIE	Córas Iompair Éireann
c.i.f.	Customs, insurance and freight inclusive
CILQ	Cross-Industry Location Quotient
CIP	Census of Industrial Production
CN	Combined Nomenclature (Classification of Goods)
COE	Compensation of Employees
COICOP	UN system for Classification of Individual Consumption by Purpose
CSO	Central Statistics Office
DAFF	Dept. of Agriculture, Food and Fisheries
EEC	European Economic Community
EIO	Environmental Input-Output
ESAM	Environmental Social Accounting Matrix
ESB	Electrical Supply Board
ESRI	Economic & Social Research Institute
EU	European Union
FAPRI	Food and Agricultural Policy Research Institute
FOB	Free on Board
FTE	Full Time Equivalent
GDA	Greater Dublin Area
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GOS	Gross Operating Surplus
GRIT	Generating Regional I-O Tables
GVA	Gross Value Added
HBS	Household Budget Survey
IDA	Irish Industrial Authority
I-O	Input-Output Tables
LQ	Location Quotient
MNE	Multi-National Enterprise
MV	Mega-Vars
MW	Mega-Watts
NACE	Classification of Economic Activity
NDP	National Development Plan
NOS	Net Operating Surplus
NIE	National Income & Expenditure
NPISH	Non Profit Institutional Serving Households
NSB	National Statistics Board
NSS	National Spatial Strategy
NST/R	Standard Classification for Transport Statistics (EU)

Appendix 1: Glossary (*cont.*)

NUI	National University of Ireland
NUTS	Nomenclature of Territorial Units (spatial classification used in EU)
OPs	Regional Operational Programmes
QNHS	Quarterly National Household Survey
POWCAR	Place of Work Census Anonymised Records
SAM	Social Accounting Matrix
SDR	Supply-Demand Ratio
SE	Southern & Eastern
SEAI	Sustainable Energy Authority of Ireland
SILC	Survey of Income & Living Conditions
SLQ	Simple Location Quotient
SUT	Supply & Use Tables
RI-O	Regional Input-Output Tables
RFTS	Road Freight Transport Survey
RPC	Regional Purchase Coefficient
R-SUT	Regional Supply & Use Tables
ULW	Un-Laden Weight
UK	United Kingdom
UN	United Nations
VAT	Value Added Tax

APPENDIX 2: NUTS REGIONAL CLASSIFICATION

The NUTS 3 regions correspond to the eight Regional Authorities established under the Local Government Act, 1991 (Regional Authorities) (Establishment) Order, 1993, which came into operation on 1 January 1994. The NUTS 2 regions, which were proposed by Government and agreed by Eurostat in 1999, are groupings of the NUTS 3 regions. The composition of the regions is set out below.

NUTS 2 Region	NUTS 3 Regional Authority	NUTS 4 County
Border, Midlands and Western (BMW)	Border	Cavan
		Donegal
		Leitrim
		Louth
		Monaghan
		Sligo
	Midland	Laoghis
		Longford
		Offaly
		Westmeath
	West	Galway City
		Galway
		Mayo
		Roscommon
Southern and Eastern (SE)	Dublin	Dublin City
		Dun-Laoghaire
		Fingal
		South Dublin
	Mid-East	Kildare
		Meath
		Wicklow
	Mid-West	Clare
		Limerick
		North Tipperary
	South-East	Carlow
		Kilkenny
		South Tipperary
		Waterford City
		Waterford
		Wexford
	South-West	Cork City
		Cork
		Kerry

APPENDIX 3 – REGIONAL SUPPLY TABLES

Table A3.1 Supply Table, Southern & Eastern Region, Basic Prices €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Domestic Supply	International Imports c.i.f.	Domestic Imports c.i.f.	Trade Margins	Taxes less Subsidies	Total Supply (Purchasers' Prices)
Agriculture, Forestry & Fishing	4,369	-	-	-	-	-	4,369	737	1,432	475	-606	6,406
Manufacturing	-	90,986	-	77	72	23	91,159	47,423	3,667	15,587	8,704	166,541
Construction	-	1	29,252	-	-	-	29,254	7	-	-	3,113	32,374
Distributive Trades & Communications	22	2,390	-	41,358	537	-	44,307	10,572	1,526	-16,062	1,474	41,817
Business Services	44	1,950	245	663	72,801	221	75,925	41,060	1,170	-	2,896	121,051
Other Services	45	1	-	64	-	30,388	30,498	301	368	-	149	31,316
Output	4,480	95,328	29,497	42,163	73,410	30,633	275,512	100,101	8,164	-	15,730	399,506

APPENDIX 3 – REGIONAL SUPPLY TABLES (*CONT.*)

Table A3.2 Supply Table, Border, Midland & Western Region, Basic Prices €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction work 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Domestic Supply	International Imports c.i.f.	Domestic Imports c.i.f.	Trade Margins	Taxes less Subsidies	Total Supply (Purchasers' Prices)
Agriculture, Forestry & Fishing	2,831	-	-	-	-	-	2,831	324	1,111	180	-478	3,968
Manufacturing	-	15,766	-	10	2	9	15,786	8,649	5,178	3,174	2,327	35,114
Construction w ork	-	1	9,187	-	-	-	9,188	1	480	-	519	10,189
Distributive Trades & Communications	9	845	-	7,393	24	-	8,272	1,697	2,642	-3,354	448	9,704
Business Services	18	568	77	73	8,567	74	9,376	1,978	4,330	-	391	16,075
Other Services	25	1	-	28	-	10,341	10,395	69	623	-	40	11,126
Output	2,884	17,181	9,264	7,503	8,593	10,424	55,848	12,718	14,363	-	3,247	86,176

APPENDIX 4 – REGIONAL USE TABLES

Table A4.1 Use Table, Southern & Eastern Region, Purchasers' Prices €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Inter-Industry	Final Consumption & GFCF	International Exports F.O.B.	Domestic Exports F.O.B.	Total Uses
Agriculture, Forestry & Fishing	960	2,460	70	240	6	63	3,798	1,057	440	1,111	6,406
Manufacturing	1,373	28,042	8,394	6,741	2,182	3,477	50,208	31,022	80,133	5,178	166,541
Construction	43	156	7,508	150	427	453	8,737	23,157	-	480	32,374
Distributive Trades & Communications	70	6,304	289	7,385	3,896	1,039	18,983	11,421	8,772	2,642	41,817
Business Services	184	28,567	2,349	5,631	32,182	3,381	72,293	15,951	28,478	4,330	121,051
Other Services	104	396	401	591	650	3,140	5,283	24,973	437	623	31,316
Intermediate Consumption	2,734	65,925	19,010	20,738	39,343	11,552	159,302	107,581	118,260	14,363	399,506
Compensation of Employees	353	8,450	7,072	10,691	9,699	15,780	52,045				
Net Operating Surplus	1,646	17,815	3,105	7,763	17,740	1,777	49,846				
Consumption of Fixed Capital	429	2,772	292	2,396	6,553	1,405	13,848				
Taxes less Subsidies	-682	367	18	575	74	119	471				
Value Added	1,746	29,403	10,487	21,426	34,067	19,081	116,210				
Output	4,480	95,328	29,497	42,163	73,410	30,633	275,512				

APPENDIX 4 – REGIONAL USE TABLES (*CONT.*)

Table A4.2 Use Table, Border, Midlands & Western Region, Purchasers' Prices €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Inter-Industry	Final Consumption & GFCF	International Exports F.O.B.	Domestic Exports F.O.B.	Total Uses
Agriculture, Forestry & Fishing	519	1,474	4	11	-	4	2,012	286	238	1,432	3,968
Manufacturing	1,021	4,690	2,098	1,224	248	1,236	10,516	9,572	11,359	3,667	35,114
Construction	35	37	2,570	15	218	197	3,073	7,115	-	-	10,189
Distributive Trades & Communications	61	2,007	70	532	305	359	3,333	3,982	863	1,526	9,704
Business Services	192	3,086	747	680	2,194	1,103	8,003	5,293	1,609	1,170	16,075
Other Services	69	94	67	97	78	1,525	1,929	8,789	40	368	11,126
Intermediate Consumption	1,898	11,388	5,555	2,558	3,044	4,425	28,867	35,038	14,108	8,164	86,176
Compensation of Employees	178	2,525	2,312	2,525	1,269	5,109	13,918				
Net Operating Surplus	1,146	2,650	1,273	1,794	2,965	480	10,309				
Consumption of Fixed Capital	268	532	118	508	1,310	381	3,117				
Taxes less Subsidies	-606	86	6	118	4	29	-363				
Value Added	986	5,793	3,709	4,945	5,549	5,999	26,981				
Output	2,884	17,181	9,264	7,503	8,593	10,424	55,848				

APPENDIX 5 – REGIONAL USE TABLES FOR INTERNATIONAL IMPORTS

Table A5.1 Use Table for International Imports, Southern & Eastern Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total	Final Consumption & GFCF	International Exports F.O.B.	Total Uses
Agriculture, Forestry & Fishing	127	172	11	28	1	8	347	390	-	737
Manufacturing	670	19,760	4,218	3,330	946	1,835	30,759	12,705	3,959	47,423
Construction	-	-	7	-	-	-	7	-	-	7
Distributive Trades & Communications	1	5,649	5	2,139	1,293	28	9,115	1,457	-	10,572
Business Services	-	23,198	0	995	16,656	31	40,879	181	-	41,060
Other Services	0	1	0	2	2	131	137	164	-	301
Total	798	48,780	4,241	6,494	18,898	2,033	81,245	14,897	3,959	100,101

APPENDIX 5 – REGIONAL USE TABLES FOR INTERNATIONAL IMPORTS (*CONT.*)

Table A5.2 Use Table for International Imports, Border, Midland & Western Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing **1 - 5**	Manufacturing **10 - 41**	Construction **45**	Distributive Trades & Communications **50 - 64**	Business Services **65 - 74**	Other Services **75 - 95**	Total	Final Consumption & GFCF	International Exports F.O.B.	Total Uses
Agriculture, Forestry & Fishing	75	134	2	2	0	1	212	112	-	324
Manufacturing	457	2,356	804	265	80	745	4,707	3,041	901	8,649
Construction	-	-	1	-	-	-	1	-	-	1
Distributive Trades & Communications	1	1,186	1	103	27	8	1,326	371	-	1,697
Business Services	-	1,485	0	33	401	5	1,924	54	-	1,978
Other Services	0	0	0	0	0	12	12	56	-	69
Total	533	5,160	809	403	508	770	8,183	3,634	901	12,718

APPENDIX 6 – REGIONAL USE TABLES FOR DOMESTIC IMPORTS

Table A6.1 Use Table for Domestic Imports, Southern & Eastern Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total	Final Consumption & GFCF	International Exports F.O.B.	Domestic Exports F.O.B	Total Uses
Agriculture, Forestry & Fishing	209	522	18	53	1	13	816	241	101	274	1,432
Manufacturing	33	404	432	127	43	48	1,088	508	1,579	493	3,667
Construction	-	-	-	-	-	-	-	-	-	-	-
Distributive Trades & Communications	3	80	12	316	176	48	635	517	235	139	1,526
Business Services	1	147	41	57	304	26	575	179	350	66	1,170
Other Services	1	9	1	19	21	59	109	157	39	63	368
Total	247	1,161	504	572	545	194	3,223	1,601	2,304	1,035	8,164

APPENDIX 6 – REGIONAL USE TABLES FOR DOMESTIC IMPORTS (*CONT.*)

Table A6.2 Use Table for Domestic Imports, Border, Midland & Western Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing **1 - 5**	Manufacturing **10 - 41**	Construction **45**	Distributive Trades & Communications **50 - 64**	Business Services **65 - 74**	Other Services **75 - 95**	Total	Final Consumption & GFCF	International Exports F.O.B.	Domestic Exports F.O.B	Total Uses
Agriculture, Forestry & Fishing	148	411	1	3	0	1	565	83	69	394	1,111
Manufacturing	104	470	255	112	18	103	1,061	830	2,131	1,155	5,178
Construction	2	2	121	1	10	9	145	335	-	-	480
Distributive Trades & Communications	19	251	19	180	120	131	720	1,225	161	536	2,642
Business Services	46	665	180	197	536	300	1,923	1,853	292	262	4,330
Other Services	3	10	1	12	10	66	102	333	16	173	623
Total	321	1,807	578	505	694	610	4,515	4,659	2,668	2,520	14,363

APPENDIX 7 – REGIONAL SYMMETRIC INPUT-OUTPUT TABLES

Table A7.1Symmetric Input-Output Table of Domestic Flows, Southern & Eastern Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Inter-Industry	Total Consumption & GFCF	International Exports	Domestic Exports	Total Output
Agriculture, Forestry & Fishing	693	2,004	44	175	6	45	2,966	226	339	837	4,369
Manufacturing	321	5,112	2,552	1,617	747	806	11,155	2,101	73,218	4,685	91,159
Construction	40	150	7,495	150	374	423	8,631	20,143	-	480	29,254
Distributive Trades & Communications	363	2,951	1,275	5,930	2,715	1,303	14,538	17,353	9,914	2,503	44,307
Business Services	160	3,614	2,217	4,421	14,989	2,997	28,397	15,137	28,127	4,264	75,925
Other Services	99	346	396	568	670	2,929	5,008	24,532	398	560	30,498
Intermediate Consumption	1,676	14,177	13,978	12,861	19,501	8,502	70,695	79,492	111,997	13,328	275,512
International Imports	787	48,174	4,174	6,481	19,613	2,017	81,245	14,897	3,959	-	100,101
Domestic Imports	246	1,142	503	575	565	193	3,223	1,601	2,304	1,035	8,164
Product Taxes less Subsidies	-46	757	250	998	1,437	744	4,139	11,591	-	-	15,730
Total (Purchaers' Prices)	2,662	64,250	18,905	20,914	41,115	11,456	159,302	107,581	118,260	14,363	399,506
Compensation of Employees	328	7,489	7,059	11,407	10,005	15,757	52,045				
Gross Operating Surplus	2,061	19,083	3,272	11,367	24,743	3,168	63,694				
Other Taxes less Subsidies	-682	338	18	618	62	117	471				
Value Added	1,707	26,909	10,349	23,393	34,809	19,042	116,210				
Total Inputs	4,369	91,159	29,254	44,307	75,925	30,498	275,512				

Appendix 7 – Regional Symmetric Input-Output Tables (*cont.*)

Table A7.2 Symmetric Input-Output Table of Domestic Flows, Border, Midland & Western Region, €Millions, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95	Total Inter-Industry	Total Consumption & GFCF	International Exports	Domestic Exports	Total Output
Agriculture, Forestry & Fishing	378	1,170	3	20	1	7	1,578	46	169	1,037	2,831
Manufacturing	359	1,390	851	623	111	229	3,562	1,683	8,029	2,512	15,786
Construction	32	30	2,445	15	202	180	2,904	6,284	-	-	9,188
Distributive Trades & Communications	106	906	214	415	215	268	2,124	4,158	1,000	991	8,272
Business Services	138	728	535	447	1,352	679	3,878	3,273	1,317	909	9,376
Other Services	65	73	65	86	83	1,438	1,810	8,366	24	195	10,395
Intermediate Consumption	1,077	4,296	4,112	1,606	1,964	2,801	15,856	23,810	10,539	5,644	55,848
International Imports	534	5,088	811	405	575	771	8,183	3,634	901	-	12,718
Domestic Imports	316	1,733	575	517	770	604	4,515	4,659	2,668	2,520	14,363
Product Taxes less Subsidies	-46	-104	55	91	93	224	312	2,935	-	-	3,247
Total (Purchaers' Prices)	1,881	11,014	5,553	2,619	3,400	4,400	28,867	35,038	14,108	8,164	86,176
Compensation of Employees	162	2,160	2,309	2,758	1,422	5,108	13,918				
Gross Operating Surplus	1,394	2,543	1,320	2,760	4,551	858	13,426				
Other Taxes less Subsidies	-606	69	6	135	3	29	-363				
Value Added	950	4,772	3,635	5,653	5,976	5,995	26,981				
Total Inputs	2,831	15,786	9,188	8,272	9,376	10,395	55,848				

APPENDIX 8 – LEONTIEF INVERSE OF DOMESTIC PRODUCT FLOWS

Table A8.1 Leontief Inverse of Domestic Product Flows with Multipliers for other inputs, Southern & Eastern Region, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95
Agriculture, Forestry & Fishing	1.192	0.028	0.006	0.007	0.001	0.003
Manufacturing	0.101	1.064	0.130	0.048	0.016	0.037
Construction	0.017	0.003	1.347	0.007	0.009	0.022
Distributive Trades & Communications	0.124	0.045	0.080	1.164	0.054	0.064
Business Services	0.080	0.061	0.147	0.150	1.256	0.148
Other Services	0.033	0.006	0.023	0.018	0.013	1.109
Output Multipliers	1.546	1.209	1.734	1.395	1.349	1.383
Direct and Indirect Multipliers						
International Imports	0.311	0.591	0.313	0.238	0.343	0.144
Domestic Imports	0.071	0.016	0.027	0.017	0.011	0.010
Product Taxes less Subsidies	-0.007	0.011	0.018	0.030	0.026	0.032
COE	0.161	0.113	0.388	0.335	0.190	0.618
GOS	0.647	0.269	0.252	0.364	0.429	0.192
Other Taxes less Subsidies	-0.184	0.000	0.002	0.016	0.002	0.005

APPENDIX 8 – LEONTIEF INVERSE OF DOMESTIC PRODUCT FLOWS (*CONT.*)

Table A8.1 Leontief Inverse of Domestic Product Flows with Multipliers for other inputs, Border, Midland & Western Region, 2005

NACE Rev. 1.1	Agriculture, Forestry & Fishing 1 - 5	Manufacturing 10 - 41	Construction 45	Distributive Trades & Communications 50 - 64	Business Services 65 - 74	Other Services 75 - 95
Agriculture, Forestry & Fishing	1.169	0.096	0.013	0.011	0.002	0.004
Manufacturing	0.172	1.118	0.146	0.091	0.022	0.036
Construction	0.022	0.007	1.367	0.005	0.035	0.031
Distributive Trades & Communications	0.060	0.073	0.046	1.061	0.031	0.037
Business Services	0.084	0.072	0.106	0.074	1.175	0.095
Other Services	0.034	0.010	0.014	0.014	0.013	1.163
Output Multipliers	1.539	1.376	1.691	1.257	1.278	1.365
Direct and Indirect Multipliers						
International Imports	0.288	0.388	0.180	0.089	0.085	0.109
Domestic Imports	0.163	0.145	0.115	0.085	0.104	0.084
Product Taxes less Subsidies	-0.018	-0.007	0.009	0.012	0.012	0.026
COE	0.145	0.201	0.402	0.386	0.207	0.611
GOS	0.670	0.288	0.294	0.412	0.591	0.167
Other Taxes less Subsidies	-0.248	-0.014	0.000	0.016	0.001	0.003

APPENDIX 9 – REGIONAL NET TRADE BALANCES, 2005

	International Exports	Domestic Exports	Total Exports	International Imports	Domestic Imports	Total Imports	Net Trade (International)	Net Trade (Domestic)	Net Trade (Total)
SE Region	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*
Agriculture, Forestry & Fishing	440	1,111	1,551	737	1,432	2,169	-297	-320	-618
Manufacturing	80,133	5,178	85,311	47,423	3,667	51,090	32,710	1,511	34,220
Construction	0	480	480	7	0	7	-7	480	472
Distributive Trades & Communications	8,772	2,642	11,413	10,572	1,526	12,098	-1,800	1,115	-685
Business Services	28,478	4,330	32,807	41,060	1,170	42,231	-12,583	3,159	-9,424
Other Services	437	623	1,060	301	368	669	136	255	391
Goods	*80,573*	*6,289*	*86,862*	*48,161*	*5,099*	*53,259*	32,413	1,190	*33,603*
Services	*37,687*	*8,074*	*45,761*	*51,940*	*3,065*	*55,005*	-14,254	5,009	*-9,245*
Total (SE)	118,260	14,363	132,623	100,101	8,164	108,265	18,159	6,199	24,358
BMW Region	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*	*€ Millions*
Agriculture, Forestry & Fishing	238	1,432	1,670	324	1,111	1,435	-86	320	234
Manufacturing	11,359	3,667	15,026	8,649	5,178	13,827	2,710	-1,511	1,199
Construction	0	0	0	1	480	481	-1	-480	-481
Distributive Trades & Communications	863	1,526	2,389	1,697	2,642	4,338	-834	-1,115	-1,949
Business Services	1,609	1,170	2,779	1,978	4,330	6,308	-370	-3,159	-3,529
Other Services	40	368	408	69	623	692	-29	-255	-284
Goods	*11,597*	*5,099*	*16,695*	*8,973*	*6,289*	*15,262*	2,623	-1,190	*1,433*
Services	*2,511*	*3,065*	*5,576*	*3,745*	*8,074*	*11,819*	-1,234	-5,009	*-6,243*
Total (BMW)	14,108	8,164	22,272	12,718	14,363	27,081	1,390	-6,199	-4,809

APPENDIX 10 – DATA SOURCES

Table	Industry	Data Sources
Supply Tables	NACE 1 - 5	*Output, Input and Income in Agriculture 2005 - Final Estimate* (CSO, 2006)
		2005 Census of Agriculture (CSO, 2006)
		Regional Accounts for Agriculture 2004 - 2006 (CSO, 2007)
		2005 Annual Report & Accounts (Coillte Teoranta, 2006)
		Regional Accounts for Agriculture (CSO, 2008)
		2005 Farm Structure Survey (CSO, 2007)
		Special tables on fish catch by Port (DAFF)
		National Farm Survey 2005 (Teagasc, 2006)
	NACE 10 - 41	*Census of Industrial Production 2005* (CSO, 2007)
		ProdCOM 2005 (CSO, 2007)
	NACE 45	*Census of Building and Construction 2005* (CSO, 2007)
		Review of the Construction Industry 2006 and Outlook 2007 – 2009 (DKM, 2007)
		Quarterly National Household Survey Q1 - Q4 2005 (CSO, 2006)
	NACE 50 - 74, 92 - 93	*Annual Services Inquiry 2005* (CSO, 2006)
		Special tables on Mortgage Drawdowns 2005 (CSO)
		National Income and Expenditure 2005 (CSO, 2006)
		Census of Population 2006 (CSO, 2007)
		Transport 2005 (CSO, 2006)
		Airport - Pairings Database 2005 (CSO, 2006)
		Balance of Payments microdata
		2005 Corporation Tax Files (Revenue Commissioners)
		2005 P-35 Returns (Revenue Commissioners)

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Supply Tables (cont.)	NACE 75	*Quarterly National Household Survey Q1 - Q4 2005* (CSO, 2006)
	NACE 80	*Special tables on Numbers Pupils and teachers/lecturers employed* (Dept. Education) *Annual Statistical Returns 2005* (HEA, StatCentral) *Quarterly National Household Survey Q1 - Q4 2005* (CSO, 2006)
	NACE 85	*2005 Provisional Outturns for 8 HSE regions (Dept. of Finance, 2006)* *Household Budget Survey 2004 - 2005 (CSO, 2007)* *Census of Population 2006 (CSO, 2007)*
	NACE 90	*SE & BMW Use Tables 2005*
	NACE 91	*CSO Central Business Register* *Variety of websites*
	NACE 95	*County Incomes and Regional GDP 2005 (CSO, 2008)* *Household Budget Survey 2004 - 2005 (CSO, 2007)*
	Imports (c.i.f.)	*See Use for Imports Table*
	Trade Margins	*See Trade Margins Table*
	Product Taxes	*See Product Taxes Table*
	Product Subsidies	*See Product Subsidies Table*

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Use Tables	NACE 1 - 5	*Agricultural Output, Input and Income 2005 - Final Estimate* (CSO, 2006) *Regional Accounts for Agriculture 2004 - 2006* (CSO, 2007) *Special tables on Forestry Plantation* (DAFF) *Situation and Outlook in Agriculture 2008/09* (Teagasc, 2008) *Irish Fleet (Sea Fishing vessels)*(DAFF) *Annual Report 2005* (Central Fisheries Board)
	NACE 10 - 40	*Census of Industrial Production 2005* (CSO, 2007) *Fuel Balances* (Sustainable Energy Ireland)
	NACE 41	*Local Authority Financial Outturns 2007* (Dept. EHLG, 2009)
	NACE 45	*Census of Building and Construction 2005 (CSO, 2007)* *Special supplementary survey of Materials Purchased to CIP 2005 (CSO)*
	NACE 50 - 74, 92 - 93	*Annual Services Inquiry 2006 (CSO, 2007)* *Annual Services Inquiry 2005 (CSO, 2006)* *Annual Services Inquiry 2004 (CSO, 2005)* *Balance of Payments microdata*
	NACE 75	*Quarterly National Household Survey Q1 - Q4 2005 (CSO, 2006)*
	NACE 80	*Special tables on Pupils and teachers/lecturers numbers (Dept. Education)* *Annual Statistical Returns 2005 (HEA, StatCentral)* *Quarterly National Household Survey Q1 - Q4 2005 (CSO, 2006)*

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Use Tables (cont.)	NACE 85	*2005 Provisional Outturns for 8 HSE regions* (Dept. of Finance, 2006) *2006 Revised estimates for Public Service* (Dept. of Finance, 2006) *Household Budget Survey 2004 - 2005* (CSO, 2007) *Census of Population 2006* (CSO, 2007)
	NACE 90	*Local Authority Financial Outturns 2007* (Dept. EHLG, 2009)
	NACE 95	*Household Budget Survey 2004 - 2005* (CSO, 2007)
	Household Consumption	*Household Budget Survey 2004 - 2005* (CSO, 2007)
	NPISH Expenditure	*2005 Survey of Income & Living Conditions* (CSO, 2006) *Special tables on Numbers of teachers/lecturers employed* (Dept. Education) *Dept. of Finance Revised Estimates for Public Services* *Household Budget Survey 2004 - 2005* (CSO, 2007) *CSO Central Business Register* *Variety of websites*
	Government Consumption	*Local Authority Outturns Water Supply & Sewage (Public Water Supply Schemes) & Environmental Protection (Waste Disposal)* (Dept. EHLG, 2009) *Annual Services Inquiry 2005* (CSO, 2006) *Quarterly National Household Survey* (CSO, 2005) *2005 Provisional Outturns for the eight HSE regions* (Dept. of Finance, 2006) *Household Budget Survey 2004 - 2005* (CSO, 2007)

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Use Tables (cont.)	GFCF	*Annual Services Inquiry 2005* (CSO, 2007) *Census of Industrial Production 2005* (CSO, 2007) *Census of Building and Construction 2005* (CSO, 2007) *Quarterly National Household Survey Q1 - Q4 2005* (CSO, 2006)
	Changes in Inventories	*Census of Industrial Production 2005* (CSO, 2007) *2005 June Agricultural Survey* (CSO, 2006) *Special tables on Forestry Plantation* (DAFF) *Irish Fleet (Sea Fishing vessels)*(DAFF)
	Exports (f.o.b.)	*Annual Services Inquiry 2005* (CSO, 2006) *Census of Industrial Production 2005* (CSO, 2006) *Census of Building and Construction 2005* (CSO, 2006) *Output, Input and Income in Agriculture 2005* (CSO, 2006) *2005 Census of Agriculture* (CSO, 2006) *2005 Annual Report & Accounts* (Coillte Teoranta, 2006) *Regional Accounts for Agriculture* (CSO, 2008). *2005 Farm Structure Survey* (CSO, 2007) *Special tables on live Exports* (DAFF)
	COE, GOS, CFC	*Special tables used to compile County Incomes and Regional GDP 2005* (CSO, 2008) *Output, Input and Income in Agriculture 2005 - Final Estimate* (CSO, 2006) *National Income and Expenditure 2005* (CSO, 2006) *Census of Industrial Production 2005* (CSO, 2007) *Annual Services Inquiry 2005* (CSO, 2006)

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Use Tables (cont.)	Production Taxes	*Special tables used to compile County Incomes and Regional GDP 2005* (CSO, 2008) *Output, Input and Income in Agriculture 2005 - Final Estimate* (CSO, 2006) *National Income and Expenditure 2005* (CSO, 2006) *Census of Industrial Production 2005* (CSO, 2007) *Annual Services Inquiry 2005* (CSO, 2006)
	Production Subsidies	*Special tables used to compile County Incomes and Regional GDP 2005* (CSO, 2008) *Output, Input and Income in Agriculture 2005 - Final Estimate* (CSO, 2006) *National Income and Expenditure 2005* (CSO, 2006) *Census of Industrial Production 2005* (CSO, 2007) *Annual Services Inquiry 2005* (CSO, 2006)
Use Tables for International Imports	All Industries	*See Use Tables*
Use Tables for Domestic Imports	NACE 1 - 37	*Road Freight Transport Survey 2008* (CSO, 2009) *Transport* 2006 (CSO, 2007) *UK Van Activity Baseline Survey* (DfT, 2009) *Transport Performance for Vans & Small Lorries 2008* (Statistics Norway, 2009) *Survey of Foreign Road Goods Vehicles United Kingdom* (Dft, 2009) *Special tables on International Cabotage 2005* (Eurostat) *Special Tables on origin-destination of Rail Freight by Commodity* (CIE) *Statistics of Port Traffic 2005* (CSO, 2006) *Special Tables on 2005 Import Unit Prices* (CSO)

APPENDIX 10 (*CONT.*) – DATA SOURCES

Table	Industry	Data Sources
Use Tables for Domestic Imports (cont.)	NACE 40	*Transmission Forecast Statement 2005 - 2011 (*Eirgrid, 2005). *Transmission System Performance Report 2005* (Eirgrid, 2006 *Generation Adequacy Report 2010 – 2016* (Eirgrid, 2009)
	NACE 45	*Supplementary data to Census of Building & Construction 2006* (CSO)
	NACE 50 - 74, 92 - 93	*Supplementary data to Annual Services Inquiry 2006* (CSO)
	NACE 75 - 91	*Imputations based on Supplementary data to Annual Services Inquiry 2006 (CSO)*
Product Tax Tables	All industries	*Special tables used to compile County Incomes and Regional GDP 2005 (CSO, 2008)* *Output, Input and Income in Agriculture 2005 - Final Estimate (CSO, 2006)* *Census of Industrial Production 2005 (CSO, 2007)* *Annual Services Inquiry 2005 (CSO, 2006)*
Product Subsidies Tables	All industries	*Special tables used to compile County Incomes and Regional GDP 2005 (CSO, 2008)* *Output, Input and Income in Agriculture 2005 - Final Estimate (CSO, 2006)* *Census of Industrial Production 2005 (CSO, 2007)* *Annual Services Inquiry 2005 (CSO, 2006)*
Trade Margin Tables	All industries	*Census of Industrial Production 2005 (CSO, 2007)* *Annual Services Inquiry 2005 (CSO, 2006)*

APPENDIX 11 – REGIONAL GVA PER FULL TIME EQUIVALENTS, 2005

Region	Employment Type	Persons in Employment (ILO) , 2005	FTE 2005	GVA 2005	GVA Per FTE 2005	GVA Per FTE 2005
		000's	*000's*	*€Millions*	*€000's*	*Index*
BMW	Full-Time	417.7	417.7			
	Part-Time	85.2	28.4			
	Total	502.9	446.1	26,981	60.5	73.4
SE	Full-Time	1,208.7	1,208.7			
	Part-Time	251.2	83.7			
	Total	1,459.8	1,292.4	116,210	89.9	109.2
State	Full-Time	1,626.3	1,626.3			
	Part-Time	336.4	112.1			
	Total	1,962.7	1,738.4	143,191	82.4	100.0

APPENDIX 12 – REGIONAL INTERNATIONAL EXPORT TO PRODUCTION RATIOS, 2005

	SE			BMW		
	Domestic Supply	International Exports	Export - Production Ratio	Domestic Supply	International Exports	Export - Production Ratio
	€ mlllion	*€ mlllion*	*%*	*€ mlllion*	*€ mlllion*	*%*
Agriculture, Forestry & Fishing	4,369	440	10.1	2,831	238	8.4
Manufacturing	91,159	80,133	87.9	15,786	11,359	72.0
Construction work	29,254	-	0.0	9,188	-	0.0
Distributive Trades & Communications	44,307	8,772	19.8	8,272	863	10.4
Business Services	75,925	28,478	37.5	9,376	1,609	17.2
Other Services	30,498	437	1.4	10,395	40	0.4
Total	275,512	118,260	42.9	55,848	14,108	25.3

FIRST VOTE OF THANKS PROPOSED BY EAMON HENRY, FORMERLY ECONOMIC AND SOCIAL RESEARCH INSTITUTE AND CENTRAL STATISTICS OFFICE

In proposing a vote of thanks to the three authors, I wish to cover some three aspects of their paper, so that we can be clearer as to what we should thank the authors for. I also wish to suggest a possible development, fairly easily attainable from their results, as now available. The first aspect is the volume of detailed work required, to get two-region Input-Output (I-O) results at the level of 44 sectors, available on request per their footnote 13. The authors have said that they may have 48-sector versions also available. Secondly, even at the level of 6 sectors, as shown in the paper, a considerable amount and variety of economic detail is available, for inter-regional comparisons. Thirdly, I wish to outline what is possible by way of further impact calculations, preferably at 44-sector level, but with matching 6-sector calculations also to hand for informative comparison. And fourthly, as follow-up work by the authors, would they please consider an employment further dimension, so as to obtain regional employment impacts in "full-time equivalent" units, and effects of inter-regional exports. Data preparation for this would best be done within the CSO. The methodology for employment impacts is available in the Quill and Henry paper of title "Input-output tables and employment-generating industries" presented at the CSO Input-Output Symposium of 20th October 2010. We would like to see any 2005 employment impacts available or published in one way of another. I now discuss briefly the three aspects referred to above.

Brief Overview of Data Details for Two-Region I-O Symmetric Tables

In an algebraic sense, there are many thousands of variable values to be estimated, for a much smaller number of simultaneous linear equations specifying row and column totals and cell combined values. Let us start with a supposed national I-O symmetric table of 53 rows, with supporting matching background tables. The symmetric table has 53 inter-industry columns and some 6 final output columns, with all values at basic prices. There are also extra bottom rows showing total imports c.i.f. cost, and various Gross Value Added (GVA) components, across the 53 inter-industry columns. The sum of entries in each of these columns, namely total input, is equal to the sum of entries along the corresponding row, namely total output, and this equality makes the table symmetric. The matching background tables have dimension 53 rows and 59 columns (including final demand), and specify distribution of imported goods and services c.i.f. in one table, with tables for each of trade margins, transport margins, product taxes, and product subsidies (negative).

Now, to get two regional tables from these national tables, every cell value of the latter must be divided into two parts, corresponding to each of two regions. The controlling constraints are firstly that in each cell the two parts must add together to give the national value and secondly that the parts for say region SE must add across that row to satisfy the SE row total estimate, which may include products of both regions. In the typical row this further complication arises, namely cross-border flows between the two regions, with such exports from region SE necessarily of the same total value as corresponding imports absorbed by region BMW. This implies further row subdivision for each region, showing own-region and other-region shares.

The authors have to some extent outlined how this huge estimation problem has been tackled, in sections 7 to 10 of the paper, but details of methodology of course could not be allowed to take up an excessive part of the paper. The estimation process used by the authors is of high quality, in that it uses factual data to a maximum extent. Their work on freight data shows great commitment towards getting realistic cross-border flows of such items. However, the resulting outcome is what matters towards regional impact calculations, and these two regional I-O symmetric tables should be put to extensive use.

Various Economic Results of the Two-Region I-O Analysis

The two NUTS2 regions selected for 2005 analysis are of great European Union significance, because since 1999 the BMW region has retained full Objective 1 funding status, whereas the SE region has been designated a transitional region. Table 3.1 of the paper gives summary statistics not involving I-O analysis, for years within the period 2006-2010. The BMW region has population (1132 thousand) and employment (469 thousand) about one-third of those of the SE region, for SE showing a population density some 2.4 times that of BMW. The per capita GVA of SE is some 60 percent greater than that of BMW. Table 11.2 shows some 2005 GVA comparisons, as basis to I-O analysis. Total GVA in €million units is 116,210 for SE, roughly four times that of BMW valued at 26,981 units. Total Compensation of Employees is 52,045 units for SE, again roughly four times the BMW figure 13,918 units. In summary, the BMW region is economically smaller and relatively less prosperous than the SE region which includes Greater Dublin Area.

We may now consider results of the I-O 2005 analysis as such, and only at the 6-sector level of detail shown in the paper. Appendix 9 gives the two regional symmetric tables valued at basic prices. Even at this level of detail many comparisons may be made, as to how much larger the SE region is than BMW. In €million units, SE shows Manufacturing output of value 91,159, versus the 15,786 units of BMW. Likewise, international exports from the six sectors show 111,997 units for SE, versus a mere 10,539 units for BMW. I need not discuss this aspect any further, but leave it to others to make further comparisons, while keeping in mind the dominance of the Pharma-Chem sector in output and exports in the SE region, as noted by the authors.

Further Economic Impact Calculations, Actual and Possible

The 44-sector or 48-sector symmetric tables at basic prices should be used to get the best available impact calculations. I have been told by the authors that, for 44-sector analysis, the Appendix 9 final output column "Total Consumption & GFCF" can be further broken down so as to show separate columns for Households, Government Current Expenditure, and Capital Formation, with the latter possibly separating Fixed Capital from Changes in Inventories as two separate columns. However, the paper's Appendix 10 6-sector multiplier results are indicative and can be discussed here. The upper part of each regional table shows the detailed sectoral "direct and indirect" output multipliers per unit final demand (or final output). These can be multiplied by matching final demands, to give output results. This upper part of each table is usually called the "Leontief Inverse". All the ratios here are based on values at basic prices.

Of even greater interest are the lower rows of direct-plus-indirect multipliers for the imports and GVA components, per unit final demand. Some few negative entries for Taxes less Subsidies need to be recognized as negative, the main negative entries being in the Agriculture etc. column, and indicating relatively large subsidy support for Agricultural input costs. A subsidy is treated as a negative tax in the I-O system. We can see that SE has multipliers of International Imports generally larger than corresponding BMW values. A property of these lower six rows of multipliers is that they sum to unity in each column, subject to small rounding in the third decimal place.

Given 44-sector regional tables and derived multipliers, for final demand columns in more detail than that of Appendix 9, several interesting and useful impact calculations are possible, per 2005 data. As one example, the SE 6-sector data can be used as illustration, to show the "direct plus indirect" Compensation of Employees impact of international exports. Matching the Table A10.1 COE multipliers 0.161 etc. with the Table A9.1 international exports (in €million units) 339 etc., and multiplying by pairs, the product sum gives 17,239 units, which is 33.1 percent of the total 52,045 units of COE of the SE region.

The authors have raised questions as to whether Gross Value Added as such is a valid measure for inter-regional comparisons, given the dominance of the Pharma-Chem sector in the SE region, and the impact of multi-national enterprises on the economies of both regions. I wish to suggest two other measures as possible, one directly available now based on Compensation of Employees. The second would be Employment full-time equivalent, if the employment dimension were added to the I-O analysis. We may of course look at direct impacts only, as well as direct-plus-indirect impacts.

In conclusion, I propose the vote of thanks to our three authors, for an outstanding paper, of great interest, and providing a basis for very useful further economic analysis. You may express your appreciation in the usual way.

SECOND VOTE OF THANKS PROPOSED BY KIERAN MOYLAN, BORDER, MIDLAND & WESTERN REGIONAL ASSEMBLY

I wish to congratulate Steve and his colleagues for completing this important study and for presenting it to us here this evening. I welcome this opportunity to comment on some of the policy lessons that can be drawn from the findings.

A refrain that can be frequently heard from regional interests is the lack of detailed regional data, lack of comprehensive regional analysis and lack of coherent policy attention from national authorities in relation to regional issues. This comprehensive study does indeed fill an important gap and provides a solid foundation upon which further more focused studies can be constructed.

The paper adds considerably to our understanding of the economic structure of the regions and of the sources of the differentials in regional incomes and productivity over recent decades. Studies in recent years by Edgar Morgenroth, ESRI and Eoin O'Leary, UCC (among others) had highlighted the differences in the sectoral composition of employment and in sectoral productivity, along with differing rates of restructuring. This study confirms these factors and adds to these other key factors such as the lower export proportion for BMW regional outputs and the region's greater reliance on domestic trade, primary manufacturing, construction and government expenditure. It is clear that the sectors with the highest productivity and export orientation are present to a far greater extent in the S&E region.

An analysis of innovation trends and knowledge intensive services in the BMW region to be published shortly, by the BMW Regional Assembly will show that the sectors that have shown the greatest resilience in the current crisis are more prevalent in the S&E region generally. On the basis of this Input-Output analysis, the BMW region's vulnerability to wider gaps in the future is clearly exposed as domestic demand remains weak, government expenditure severely constrained and while increased exports are one of the few positives to emerge in the past few years, the tables in this study suggest that the BMW Region will not benefit from this to the same extent as the S&E region.

The prospects for the immediate future do not look good! The locational decisions of FDI, declining EU receipts, lower state aid thresholds and a central government less able to prime the under-performing parts of the country, do not give cause for optimism as regards regional disparities in the immediate future.

The National Economic and Social Council has clearly stated that regional economic development is constitutive of national economic development and not merely reliant on national economic development. This paper notes that unbalanced growth and underperforming regions do constrain national performance, so we as policy makers and as analysts do need to confront this challenge. This paper does indeed help us in this task.

Regional development is not well served by spatially-blind public policies that lack territorial differentiation. All economic activity has a locational component and practically all public policy decisions have a differential territorial impact. The national economy could be considered like an engine with multiple pistons of unequal character and strength. We cannot rely on one or two of the 'pistons' to drive the economy entirely, we need to ensure that all pistons are operating optimally. The challenge therefore is how to territorialise national policies without compromising overall economic wellbeing. Two current policy areas are worthy of specific mention in this respect.

The first is research and innovation policy. The Innovation Taskforce report published last year lacked a single reference to the word 'region' and yet one of the assumptions upon which the National Spatial Strategy is built is that the designated gateways will act as dynamic growth centres, hosting world class indigenous and foreign-owned firms providing high value employment to their hinterlands. I attended a workshop on the Finnish Research and Innovation system at Dublin Castle last year hosted by the Taoiseach and his Finnish counterpart. One clear lesson was that while Irish researchers and Irish public policy on science and research were at least on a par with Finland, the Finnish had a very explicit regional innovation policy approach and Ireland has none.

As a second example, the policy area receiving a very high proportion of public capital investment in the past decade was the national roads programme. The completion of the 5 inter-urban motorways and the M50 Upgrade illustrate a revealed preference to improve overall national efficiency, while the radial connectivity of individual gateways to extend their functional areas was of lesser priority. This in my view copper-fastens the economic dominance of the Greater Dublin area and lessens the likelihood that the 4 smaller cities and the 4 non-city gateways can compete with or provide a counter-balance to Dublin, as anticipated under the National Spatial Strategy. In my view, when urban centres of unequal strength are connected, the economic benefit flows in direct proportion to the economic strength of the centres. At a micro-level one could see how the development of the M4 dual carriageway as far as Mullingar is of far greater benefit to the Liffey Valley Shopping Centre than it has been to the Mullingar Shopping Centre. I'm not suggesting that the national roads programme was mis-judged, but merely saying that it has had important spatial implications, whilst also changing the economic geography of Ireland by bringing the 5 cities closer together.

The paper kicks off with a reference to the lacuna identified in 1966 by Roy Geary of the ESRI. I think there are other lacunae, some perhaps less complex than this study, limiting our analysis of Ireland's

regional economies. One of these in my view is a lack of comparative analysis of regional competitiveness at NUTS III level. Forfás produces excellent international benchmarks of Ireland's national competitive position using a coherent framework of analysis, including inputs and outputs. Indeed had greater attention been paid to this analysis in the past decade many of the competitiveness losses incurred could have been avoided. Forfás has also produced regional competitiveness agendas focusing on the industrial profile and the investment priorities identified by the enterprise support agencies as an input into the Regional Planning Guidelines, updated last year. We really should in my view be paying far greater attention to regional competitiveness. The regional studies literature is replete with references to the fact that regions are the arenas for competitive and comparative advantage and dynamic cities are the loci for technology driven innovation and growth. Although I note with some interest that one of the greatest advocates of city-led development in the recent past, Professor Gerry Boyle, is now advocating a re-evaluation of the contribution of the agri-food industry to economic competitiveness.

My final point relates to the appropriateness of GVA or GDP as a measure of economic progress, which is highlighted in the paper. It remains a very relevant measure with respect to our entitlement to EU structural funds and will again be the yardstick for the post-2003 period in which the BMW region's entitlement to continued transitional funding will depend on average GDP per capita falling to below 90% of the EU average over the 2007-09 reference period. The figure has already fallen from a peak of 102% in 2007 to 93% in 2008, requiring a further fall to about 75% in 2009 for the region to qualify. This is unlikely to occur, but the direction and pace of the current trajectory should be taken into account in my view.

It is with pleasure that I second the vote of thanks to Steve and his colleagues and I do hope this comprehensive study will provide the foundation for a wide range of studies on sectoral/spatial impacts of policy alternatives and spawn a renewed interest in regional economics and spatial analysis. Thank you.