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Abstract

This paper describes the construction of a Social Accounting Matrix (SAM) for Ireland for the year 2005. The SAM describes the full circular flow of money and goods in the Irish economy. The SAM includes 55 activities, 55 commodities, two factors of production (capital and labour), one account each for households, enterprises, government and investment/saving, three tax-related accounts (direct and indirect taxes and custom duties), a trade and transport margin account and three external sectors (UK, Rest of the EU and Rest of the World). Its construction takes place in three steps: (1) building the macro-SAM; (2) building an initial unbalanced SAM making use of a variety of additional data sources, and (3) balancing the SAM using the cross-entropy method. By treating the SAM as a linear model of the Irish economy and by specifying certain accounts as exogenous, the SAM can be used to simulate the effect of shocks to the exogenous variables or accounts. Examples of such multiplier analysis are presented at the end of this paper.

Keywords: social accounting matrix, macro SAM, cross-entropy method, input-output table, Ireland

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1 Introduction

"A social accounting matrix is simply defined as a single entry accounting system whereby each macroeconomic account is represented by a column for outgoing and a row for incoming in the form of a square matrix"(Round, 1981:5). Henry (1972, 1980, 1986) was the first to construct SAMs for Ireland for economic analysis. Subsequently, O'Toole and Matthews (2002) constructed a SAM for the year 1993 based on the published Input-Output table from 1993, with particular emphasis on the agricultural and food processing sectors. A consortium of the Letterkenny Institute of Technology, the University of Missouri, the National University of Ireland Galway, and the Central Statistics Office produced a regional SAM for the Border, Midlands and Western region for 2000 with 36 production sectors and calculated a variety of multipliers from this SAM (O'Herlihy, 2004). Dixon (2006) produced a 2003 SAM for Ireland using the 1998 Input-Output table and a type of RAS procedure to scale different data from various sources to match the aggregates for the macro-economy in 2003. Wissema (2006) also built a 1998 SAM for Ireland with a disaggregated energy sector.

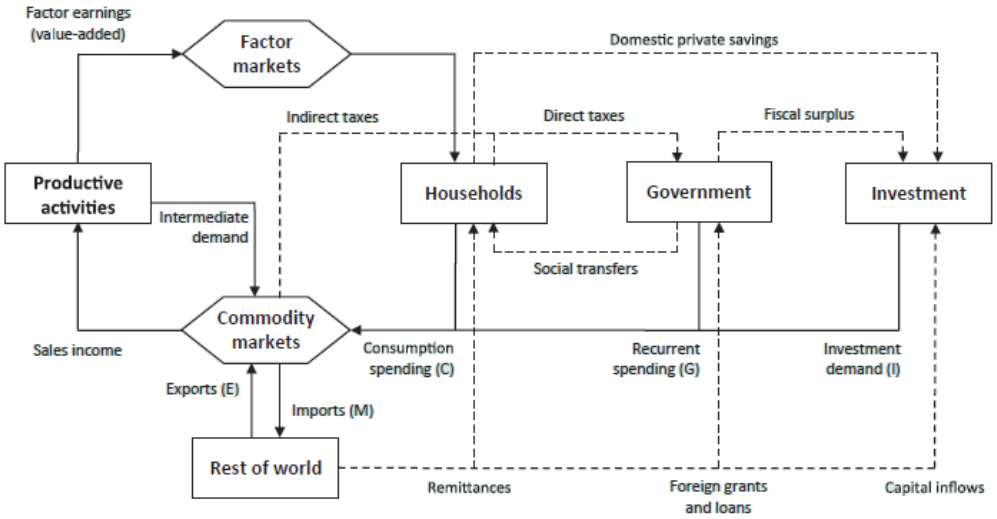
More recent information is now available which allows the production of a more up-to-date SAM for 2005. This information includes a comprehensive set of Input-Output (I-O) Tables for the year 2005 published by the CSO in 2009 based on a 55 sector commodity disaggregation; detailed data on marketing margins by commodity; detailed trade statistics data; and an updated Supply Table at Basic Prices, including aggregate taxes, margins and subsidies paid on each commodity, a Use Table at Purchaser Prices, direct allocation of imports and a Use Table for Imports at Basic Prices. The SAM documented in this paper is intended to offer a benchmark data set for economy-wide analysis in Ireland through techniques such as SAM multiplier analysis and computable general equilibrium (CGE) modelling.

The history of Social Accounting Matrices starts with F. Quesnay's "tableau économique" in the 18th century and was continued by Sir Richard Stone in his article *Input-Output and the Social Accounts* where he first developed the SAM framework (Stone, 1955). But it was only in 1976 that Pyatt and Thorbecke first described the SAM structure in a consistent way, and in 1977 Pyatt and Round gave the first comprehensive description using the example of Sri Lanka's SAM. Following this, SAM's have been used and applied in a wide variety of studies to address questions of distribution and redistribution, decomposition of activity multipliers and environmental and economic issues, and for both developed and developing countries and regions.

The SAM is a square matrix in which each transaction has its own row and column. Pyatt and Round (1985) give an extended discussion of the SAM structure. The convention is that the entries made in rows represent incomes or receipts; whereas the entries made in columns represent outlays or expenditures - so, for every income there exists a corresponding expenditure and their totals will be equal. Consequently, a SAM illustrates the relationships between the data on production, income generated by different institutional groups and data about expenditure of those incomes. The SAM integrates national income, input-output, flows of funds and foreign trade statistics into a comprehensive and consistent dataset.

Figure 1 offers an overview of the mechanisms influencing the flows in the SAM. The construction of a SAM involves distinguishing between Production, divided into factors of production, activities and commodities, on the one hand, and Institutions, divided into a current account, capital account and the rest of the world account, on the other. Table 1 outlines a basic SAM, in

Figure 1: Circular flow diagram of the economy



Source: Breisinger et al., 2009

which each account is represented twice and records the transactions between the sectors. This table is the matrix form of Figure 1, and can be interpreted as the representation of the circular flow production-income-expenditure-production. The SAM accounts follow the national income and product accounts relations. For example: GDP at market prices equals the value of production plus indirect taxes (Table 1 - 1st row/column); total absorption in the economy equals total demand (Table 1 - 2nd row/column); or GDP at factor cost equals value added (factor payments) Table 1 - 3rd row/column), and so on. The different accounts are valued at various prices: producer prices which exclude all indirect taxes such as value added taxes and import taxes and subsidies; basic prices, defined as the price received by the producer excluding trade and transport margins and the balance of taxes and subsidies on products, or the price the producer is ultimately left with; and purchasers' prices which include trade margins, transport costs and indirect taxes. The SAM row/column totals are valued at purchaser's prices.

The basic SAM presented in Table 1 distinguishes the following accounts, which can be described briefly as follows:

Production activities produce different goods and services by buying raw materials and intermediate goods and services, paying indirect taxes to the government and creating value added that is distributed to the factors of production. The income from production activities originates from sales to other production activities, households, exports and the government.

Factors of production accounts include labour and capital sub-accounts. These accounts illustrate the capital and labour expenditures of the activities accounts, the supply of labour and capital to the external sector and the compensation for labour used by the external sector. The compensation of capital received by the national institutions is the net operating surplus, which is gross operating surplus plus gross mixed income, plus compensation of property income paid by the rest of the

world, minus property income received by the rest of the world.

Institutions include the *current, capital and external accounts*. The *current account* includes households (which also contain non-profit organisations serving the households (NPOH)), enterprises (i.e. financial and non-financial corporations) and the government. Households receive factor income (wages and other labour income, rent, interest and profits) as well as transfers from government and from the rest of the nation and world (e.g. remittances). Household expenditures consist of consumption of domestically-produced and imported goods, and income taxes with residual savings transferred to the capital account. Enterprises receive profits and transfers and spend on taxes and transfers with their residual savings channelled into their capital account. The government account is distinct from administrative public activities included in the production activities' account. These public services (such as education, public defence, etc.) buy intermediate goods, pay wages and deliver public and administrative services. The government account per se allocates its current expenditures on buying the services provided by the production activities account. Also included in government expenditures are the transfers and subsidies to households and companies and the remaining savings are transferred to the capital account. On the income side, the government receives tax revenues from a variety of sources and current transfers from abroad. The other income sources of the institutions are net indirect taxes and current transfers. The current account also shows how its income is spent between final consumption, current transfers and/or savings.

The *capital account*, or capital accumulation account, on the income side, collects savings from households, enterprises, government and the rest of the world and, in turn, transforms these aggregate savings into investment. This account is considered as a balancing account corresponding either to the financing or the saving capacity requirements of the economy.

The *external account* presents the transactions between domestic residents and foreign residents. These transactions include, on the outlay side, payments for imports, payments to factors abroad and other transfers abroad. The external account receives income by means of factor income and transfers from abroad as well as exports and capital transfers. The difference between total foreign exchange receipts and imports is by definition net capital received from abroad.

This paper describes the construction of a 2005 SAM for Ireland emphasising the different sources of data and how they are used. The estimation of the Irish SAM involves a three-step process. (i) Building the macro-SAM: The macro-SAM has the structure shown in Table 1 but at a highly aggregated level. The basic information source for the macro-SAM is the national accounts, in that almost all of the flows that are part of the latter are integrated into the former. (ii) Generating the SAM:[2] This involves the disaggregation of the macro-SAM. Each cell of the macro-SAM corresponds to a matrix of accounts in the SAM. For example, the activity account is disaggregated among 55 activities producing 55 commodities, according to the 2005 Input-Output table. This process of disaggregation results in an unbalanced but complete SAM which requires the third step of (iii) Balancing the SAM. The method used is the cross-entropy approach based on information theory developed by Shannon (1948) and brought to economics by Theil (1967). The estimation procedure minimizes the cross-entropy measure of the distance between prior coefficients and the new estimated coefficients, given a choice of constraints imposed on the basis of prior knowledge

[2]This could be referred to as a micro-SAM but it is standard practice to refer to a disaggregated SAM simply as a SAM.

Table 1: Basic Social Accounting Matrix

OUTLAYS / INCOMES		PRODUCTION 1. Activities	PRODUCTION 2. Commodities	PRODUCTION 3. Factors of Production	INSTITUTIONS 4. Current Account	INSTITUTIONS 5. Capital Account	INSTITUTIONS 6. Rest of the World	Total
PRODUCTION	1. Activities		Production					Value of Production
	2. Commodities	Intermediate Consumption			Final Consumption	Gross Capital Formation	Exports	Aggregate Demand
	3. Factors of Production	Gross Added Value					Compensation of Factors from ROW	Aggregate Factor Income
INSTITUTIONS	4. Current Account	Other Net Taxes on on Production	Net Taxes on Products	National Product	Current Transfers		Current Transfers from ROW	Aggregate Income
	5. Capital Account				Domestic Savings	Capital Transfers	Capital Transfers from ROW	Investment Funds
	6. Rest of the World		Imports	Consumption of Factors to the ROW	Current Transfers to ROW	Capital Transfers from ROW		Transactions Value to the ROW
	Total	Total Cost	Aggregate Supply	Aggregate Factor Income	Aggregate Income	Aggregate Investment	Transactions Value from ROW	

Source: Adapted from Pyatt and Round, (1985)

from the SAM (Kullback and Leibler, 1951).

Section 2 describes the construction of the macro or aggregate 2005 SAM for Ireland. Section 3 disaggregates the accounts to estimate a 55 sector unbalanced SAM for Ireland. Section 4 describes the technique used in balancing the SAM. Section 5 presents the multiplier values derived from the SAM and discusses the implications they have for policy. The conclusions are summarized in Section 6.[3]

2 Constructing the macro-SAM

The 2005 Irish Macro-SAM is shown in Table 2. The main source of data for the macro-SAM is the recently revised National Accounts System (CSO, 2009b) and the 2005 Supply and Use and Input-Output Tables for Ireland constructed by the CSO and published by Eurostat (2009).[4] Other sources of data are the marketing margins rate derived from the 2005 Input-Output Table (CSO, 2009d), Annual Accounts by Current Account, Institutional Sector, Year and Uses and Resources (AACA) (CSO, 2009a), Household Budget Survey 2004 - 2005 (HBS 04/05) (CSO, 2005c), Statistical Year Book of Ireland 2008 (SYB 2008) (CSO, 2009c), Service Exports and Imports 2006 (CSO, 2007), Institutional Sector Accounts Financial and Non-Financial 2007 (CSO, 2008b), Balance of International Payments (CSO, 2008a) and Revenue Commissioners (2006).

As a data framework, the design and construction of a Social Accounting Matrix is not standardized. The classification used in a SAM depends on the available data and the purposes of the study underlying its construction. There is no standard model or way of disaggregating and organising the data in a SAM. There are just two conditions that have to be fulfilled: the matrix should be square and the column total of each account should equal the row total of the same account. The cell entries are referenced by their "row-column" position, i.e., gross value added is in the cell *"factor of production-activities"*, and are expressed in millions of euro. The following describes the macro-SAM entries and identifies their sources.

Row 1. Activities
Activities - Commodities - 331,360 - marketed production - total value of sales at purchaser prices in the activities row. This is the gross output figure reported in the 2005 Supply Table (CSO, 2009d). In principle, the value of household own consumption documented in the cell Activities-Households should be deducted from this figure. In practice this value is less then one million euro, as reported in the next paragraph and it is not subtracted out of the marketed production as it assumed not to have a significant effect on the structure of the SAM.

Activities - Households - 0.92 - private home consumption, home consumption of own production estimated from the (HBS 04/05) and (CSO, 2009d).[5]

[3]The pdf version of the 2005 SAM for Ireland is available from the IIIS website, URL: http://www.tcd.ie/iiis/documents/A 2005 SAM for Ireland.pdf

[4]The 2005 Supply and Use and Input-Output Tables for Ireland (CSO, 2009d) are published using a 53 sector commodity disaggregation. Eurostat (2009) published the full 55 sector commodity disaggregation which is used in this paper.

[5]The estimation of own home consumption can be incorporated in the structure of the SAM for relevant analysis if need it.

Row 2. Commodities
Commodities - Activities - 188,169 - intermediate consumption at final use prices as documented in the Use Table (CSO, 2009d).

Commodities-Commodities - 0 - marketing margins - are the trade and transport margins associated with domestic and imported goods. This value is computed when the SAM is generated, as the value of the trade and transport production activity less intermediate consumption and final demand for the specific sector. In the aggregate version of the SAM this cell is zero as the entries in this cell are revenues for the trade and transport commodities accounts and expenditure for all other commodities accounts. Consistency is ensured as the sum of the entries in this cell is equal to zero.

Commodities - Households - 73,778 - private household marketed consumption plus consumption of private non-profit organisations serving households as documented in the 2005 Use Table (CSO, 2009d).

Commodities - Government - 24,905 - government consumption as documented in the 2005 Use Table (CSO, 2009d).

Commodities - Rest of the World - 132,368 - aggregate exports (FOB) as documented in the 2005 Input-Output Table (CSO, 2009d).

Commodities - Investment/Savings - 43,937 - gross capital accumulation (investment) including capital formation and inventory changes, as documented in the 2005 Input-Output Table (CSO, 2009d).

Row 3. Factors of Production
Factors of production - Activities - 143,083 - total value added as the sum of the primary factors of production, labour and capital, equivalent to GDP at factor cost, documented in the National Accounts System (CSO, 2009b).

Factors of production - Rest of the World - 42,657 - represents the compensation of primary factors of production paid by the rest of the world from non-resident employers, as documented in (CSO, 2009a).

Row 4. Institutions/Current Account - Households
Households - Factors of production - 89,275 - wages, salaries and household enterprise profits; compensation of employees as documented in the 2005 Input-Output Table (CSO, 2009d) plus self-employed household enterprise value added as documented in (CSO, 2009a).

Household - Household - 955 - inter household transfers. This value is taken from the (CSO, 2009a) and quantifies the transfer of income between households.

Household - Enterprises - 3,941 - enterprises' retained earnings distributed to households represents the distributed profits, social benefits other than social benefits in kind and miscellaneous current transfers from enterprises to households, as documented in (CSO, 2009a).

Table 2: Numeric 2005 Irish macro SAM (million euro)

		PRODUCTION			INSTITUTIONS						Total
		1. ACT	2. COMM	3. FACT	4. HH	5. ENT	6. GOV	7. TAX	8. ROW	9. SAV	
PRODUCTION	1. ACT		Marketed output (331,630)		Own consumption (0.92)						ACT income (331,361)
	2. COMM	Intermediate inputs (188,169)	Trade and transport margins (0)		Private consumption (73,778)		Gov consumption (24,905)		Exports (132,368)	Investments (43,937)	Demand (463,157)
	3. FACT	Value Added (143,083)							Factor from ROW (42,657)		Factor income (185,740)
INSTITUTIONS	4. HH			Factor income to HH (89,275)	Inter-HH transfer (955)	Surplus to HH (3,941)	Transfers to HH (16,974)		Transfers to HH from ROW (2,970)		HH Income (114,115)
	5. ENT			Factor income to ENT (27,710)	Transfers to ENT (5,893)	Transfers to ENT (1,383)	Transfers to ENT (1,591)		Transfers to ENT from ROW (1,518)		ENT Income (38,095)
	6. GOV			Factor income to GOV (1,179)				Taxes (50,179)	Transfers to GOV from ROW (454)		GOV Income Income (51,830)
	7. TAX	Producer Tax, value added tax (108)	Sales Taxes, tariffs, export taxes (18,977)		Transfers to GOV, direct HH taxes (23,711)	Direct ENT taxes (7,233)	Custom Duties (150)				Taxation (50,179)
	8. ROW		Imports (112,820)	Factor Income to ROW (67,558)	Factor Income to HH (109)	Surplus to ROW (3,948)	GOV transfers to ROW (527)			Capital transfers from ROW (76)	ROW Income (185,038)
	9. SAV				HH Savings (9,669)	ENT Savings (21,590)	GOV Savings (7,683)		ROW Savings (5,071)	Capital Transfers (2,864)	Savings (46,877)
	Total	ACT Expenditure (331,360)	Supply (463,157)	Factor Expenditure (185,740)	HH Expenditure (114,116)	ENT Expenditure (38,086)	GOV Expenditure (51,830)	Taxes (50,179)	ROW (185,038)	Investment (46,877)	

Source:Authors' calculation

Household - Government - 16,974 - social security; information on retirement and social insurance, price subsidies for preferential goods, transfers to local authorities and other expenditures, documented in (CSO, 2009a) and Revenue Commissioners (2006).

Household - Rest of the World - 2,970 - total net foreign transfers to households, represented by the social benefits other than social transfers in kind and miscellaneous current transfers from rest of the world to households (CSO, 2009a).

Row 5. Institutions/Current Account - Enterprises
Enterprises - Factors of production - 27,710 - gross profits including operating surplus and depreciation as documented in the 2005 Input-Output Tables (CSO, 2009d).

Enterprises - Households - 5,893 - net non-life insurance premiums, social benefits and miscellaneous current transfers from enterprises to households as documented in (CSO, 2009a).

Enterprises - Enterprises - 1,383 - miscellaneous current transfers within financial and non-financial corporations and non-life insurance claims from financial corporations to non-financial corporations as documented in (CSO, 2009a).

Enterprises - Government - 1591 - enterprise subsidies plus miscellaneous current transfers from government to non-financial and financial institutions as documented in (CSO, 2009a).

Enterprises - Rest of the World - 1,518 - total net foreign transfers to enterprises, such as non-life insurance claims received by non-financial and financial institutions from the rest of the world, reported in (CSO, 2009a).

Row 6. Institutions/Current Account - Government
Government - Factor of production - 1,197 - gross operating surplus received by the government, reported in (CSO, 2009a).

Government - Taxes - 50,179 - direct and indirect taxes and import tariffs, documented in (CSO, 2009b) and Revenue Commissioners (2006).

Government - Rest of the world - 454 - net foreign transfers to government, i.e. foreign aid (grants) to government, current international cooperation, reported in the Balance of International Payments 2008 and (CSO, 2009a).

Row 7. Institutions/Current Account - Taxes
Taxes - Activities - 108 - value added plus production activity taxes (e.g. turnover taxes from state enterprises, turnover taxes from non-state enterprises, VAT on imports plus production taxes), documented in the 2005 Input-Output Tables (CSO, 2009d).

Taxes - Commodities - 18,977 - commodity taxes covering imports tariffs and special consumption taxes (e.g. indirect taxes on imports excluding VAT and special consumption (excise) taxes), documented in the 2005 Input-Output Tables (CSO, 2009d).

Taxes - Households - 23,711 - current taxes on income, wealth, etc, social contributions by self-

employed and non-employed persons and miscellaneous current transfers from households to the government, as documented in (CSO, 2009a).

Taxes - Enterprises - 7,233 - current taxes on income, wealth, etc and miscellaneous current transfers from financial and non-financial institutions to government, documented in (CSO, 2009a).

Taxes - Government - 150 - import tariffs and export refunds as documented in Revenue Commissioners (2006) and (CSO, 2009d).

Row 8. External Account
Rest of the World - Commodities - 112,819 - aggregate imports (CIF) documented in the 2005 Input-Output Tables (CSO, 2009d).

Rest of the World - Factors of production - 67,558 - wages and salaries paid to non-resident employees and property income received by the rest of the world as dividends payments on foreign capital invested in Ireland, documented in (CSO, 2009a) and the 2005 Input-Output Tables (CSO, 2009d).

Rest of the World - Households - 109 - net non-life insurance, direct purchases made abroad by residents and miscellaneous current transfers from households to the rest of the world, documented in (CSO, 2009a).

Rest of the World - Enterprises - 3,948 - enterprise transfers abroad, i.e. net non-life insurance premiums received by the rest of the world from financial and non-financial institutions, reported in (CSO, 2009a).

Rest of the World - Government - 527 - net non-life insurance premiums, current international cooperation and miscellaneous current transfers from the government to the rest of the world reported in (CSO, 2008a) and (CSO, 2009a).

Rest of the World - Savings - 76 - represents the acquisitions minus disposables of non-produced non-financial assets, and other capital transfers to the rest of the world, documented in (CSO, 2009a).

Row 9. Capital Account
Investment/Savings - Households - 9,669 - household savings, documented in (CSO, 2009a).

Investment/Savings - Enterprises - 21,590 - enterprise savings, i.e., financial and non-financial institutions savings as documented in Institutional Sector Accounts Financial and Non-Financial 2007.

Investment/Savings - Government - 7,683 - government savings, reported in (CSO, 2009a).

Investment/Savings - ROW - 5,071 - investment grants and other capital transfers from ROW to different institutions, (CSO, 2009a).

Investment/Savings - Investment/Savings - 2,864 - net lending/borrowing from ROW of the Irish economy, documented in (CSO, 2009a) and Institutional Sector Accounts Financial and Non-Financial (CSO, 2008b).

Based on the data listed above, it can be observed from Table 2 that the accounts of what we call the macro social accounting matrix are balanced. Each and every one of the accounts shown in Table 2 can be further disaggregated to allow more detailed policy analysis. A well known method is to start disaggregating following a hierarchical top-down tree structure. The next section undertakes this step in constructing a 2005 SAM for Ireland.

3 The 55 sector 2005 Irish SAM

This section describes the main steps in disaggregating the macro-SAM into a 55 sector SAM for the Irish economy.

Activity/Commodity Accounts
The first step in the construction of the SAM is to break down the activities and commodities accounts into the 55 sector disaggregation according to the 2005 Input-Output Table (Eurostat, 2009).[6] In the formulation of the macro-SAM, there is only one account for activities and one for commodities. Making use of the symmetric input-output table and for the sake of simplicity it is assumed that each activity produces one type of product; therefore we have 55 activities producing 55 commodities.

Factors of Production Account
One of the main differences between the SAM approach and I-O methodology is that the former takes explicitly into account the distribution of income. A SAM offers an overview of the full circular flow of income between production, factors of production and institutions in the economy. Therefore, for a better understanding of the distribution of income from primary factors to households, government and the external sector, we disaggregate the factors of production into labour and capital. This disaggregation was done using the information provided by the Input-Output Tables (CSO, 2009d) and the National Account System (CSO, 2009b).

Taxes Account
The taxes account is split into direct and indirect taxes and custom duties. Direct taxes are paid by the households and enterprises, while the indirect taxes represent: (i) payments by activities for such items as business licenses, departure charges, motor vehicle taxes, road tolls, stamp duty, and other non-tax revenue, and (ii) commodity tax entry, such as excises and value-added tax. Import tariff and export tax rates by commodity category were derived from trade information from Revenue Commissioners (2006). The government receives income from taxes (direct and indirect) and transfers from the external sector and import duties.

Trade and Transport Margins
Trade and transport margins were directly taken from the 2005 Supply Table (CSO, 2009d) and represent the cost of managing and transporting commodities. This account row distributes the

[6]The industry classification and labelling of the SAM accounts are presented in the Appendix A 1

margins from the trade sectors over all other sectors and the column is the total margins for the trade sectors identified as the retail, wholesale and motor transport sectors.

External Account
The external account is split into three according to the export and import main destinations: UK, Rest of the EU and Rest of the World, based on the external account chapter in the Statistical Yearbook of Ireland 2008 (CSO, 2009c).

Overall, the above disaggregation results in a 124x124 Irish Social Accounting Matrix for 2005, with 55 activities producing 55 commodities, 2 factors of production, 3 institutions (households, enterprises and government), 3 tax-related accounts (direct, indirect tax and custom duties), 3 external accounts (UK, REU and ROW) and one savings/investments account.[7] However, the SAM at this stage is now unbalanced. The procedure to balance the SAM is described in the next section.

4 Balancing the SAM using a cross-entropy approach

Because of problems of data availability and consistency and the fact that the SAM is constructed using a variety of data sources, the initial disaggregated SAM is not balanced. The Robinson et al., (2001) cross-entropy (CE) approach was used in order to obtain a balanced and consistent SAM starting from an unbalanced data base that contains all available information. The method is described below.

The SAM is seen as a matrix $\mathbf{T_{ij}}$ of economic flows from an account i to an account j, representing expenditures and receipts of all the economic agents. Total expenditure and total receipts of an agent i must therefore be equal:

$$y_i = \Sigma_j \mathbf{T_{ij}} = \Sigma_j \mathbf{T_{ji}} \tag{1}$$

Dividing each cell entry of the matrix T by its column total we obtain a new column matrix A:

$$\mathbf{A_{ij}} = \frac{\mathbf{T_{ij}}}{y_i}, where \quad \Sigma_j \mathbf{A_{ij}} = 1, (\forall) i \tag{2}$$

The cross-entropy approach assumes that we have (i) information in the form of a preliminary matrix $\overline{\mathbf{A}}_{\mathbf{ij}}$ representing inconsistent and unbalanced data and (ii) exact information on the column totals. Therefore, the CE approach is described by the following optimization problem:

[7]The structure of this SAM is similar with other SAM's constructed for Ireland. This 2005 SAM for Ireland provides a grater degree of disaggregation for the activity/commodity, external and tax accounts.

$$min\Sigma_i\Sigma_j \mathbf{A_{ij}} * ln\frac{\mathbf{A_{ij}}}{\overline{\mathbf{A}}_{\mathbf{ij}}} = min(\Sigma_i\Sigma_j \mathbf{A_{ij}} * ln\mathbf{A_{ij}} - \Sigma_i\Sigma_j \mathbf{A_{ij}} * ln\overline{\mathbf{A}}_{\mathbf{ij}}) \quad (3)$$

subject to:
$\Sigma_i \mathbf{A_{ij}} * y_j = y_i$

$\Sigma_j \mathbf{A_{ij}} = 1$, where $\mathbf{A_{ij}} \in [0, 1]$

In other words, the problem consists of finding a new $\mathbf{A_{ij}}$ which minimizes the entropy distance between the preliminary $\overline{\mathbf{A}}_{\mathbf{ij}}$ and the newly estimated coefficient matrix.

Note that when $x = 0, xlnx = 0$. Therefore, in order to allow for zero entries in the SAM in the computer code, we add an epsilon small number to the arguments of the equation (3). Given that the equality in all but one row and column sum hold, the sum of the last row and column are also equal. Therefore one equation can be dropped, in this case it is the rest of the world equation which is then set exogenously.

Additional equality and inequality constraints are formulated as linear constraints on the SAM elements. According to Robinson et al (2001) imposing a set of known information can significantly improve the estimates "even when information is added in an imprecise way". Therefore we impose the following additional constraints: first, total GDP was fixed at its original value, reported in the national accounts, and equal with the GDP value reported in the SAM as well; second, the sum of overall factor payments is fixed to the aggregate value specified in the macro SAM (Table 2); third, trade flows (total imports and exports) are fixed to their initial level; and fourth, final demand categories (household and government consumption and investment) are fixed to their aggregate values. The aim of this approach is to use all available information in order to minimize the cross-entropy between the probabilities that are consistent with the information in the data and the prior information. Consequently the new SAM does not show any changes in these cells and columns compared with the initial SAM. The balanced macro-SAM is presented in Table 3.

The biggest difference between the initial macro-SAM and the balanced macro-SAM occurs in the reallocation of custom duties. The demand for intermediate inputs is unrestricted in the balancing process. Therefore, intermediate input demand decreases by €150 million, including total marketing margins for exports, to adjust to total value added. Taxes are split between direct and indirect taxes and custom duties in the SAM before balancing. Consequently, once aggregating the balanced SAM the custom duties are redistributed along the Tax row. Producer taxes and value added taxes increase by 1 percent as well as sales taxes by 0.13 percent. Overall there is a 0.05 percent change in taxes compared with the prior unbalanced SAM.

The distribution of factor income increased by 0.21 percent from the initial factor income payments to households and by almost 7 percent for government factor payments. The government receives €90 million more in capital distribution and €123 million less remittances from abroad. As a result, government expenditure decreases by €8 million.

In the initial unbalanced SAM the column sums do not equal the row sums, implying that it is not possible to achieve a cross entropy measure of zero, as the prior is not feasible. Therefore, the goal is to find a new feasible SAM that is close to the prior.

Table 3: New Macro-SAM for 2005 (million euro)

	1. ACT	2. COMM	3. FACT	4. HH	5. ENT	6. GOV	7. TAX	8. ROW	9. SAV	TOTAL
1.ACT		331,245 (-0.03)								331,245
2.COMM	188,019 (-0.08)			73,918 (0.19)		24,934 (0.12)		132,522 (0.12)	43,937	463,330
3.FACT	143,118 (0.02)							42,698 (0.10)		185,816
4.HH			89,463 (0.21)	944 (-1.11)	3933 (-0.20)	16,934 (-0.23)		2,844 (-4.24)		114,119
5.ENT			27,811 (0.37)	5,818 (-1.28)	1,380 (-0.21)	1,587 (-0.23)			1,499 (-1.26)	38,095
6.GOV			1,287 (6.88)				50,205 (0.05)	331 (-27.18)		51,822
7.TAX	109 (1.00)	19,001 (0.13)		23,698 (-0.05)	7,274 (0.19)	150				50,205
8.ROW		113,083 (0.23)	67,255 (-0.45)	108 (-1.04)	3,929 (-0.48)	521 (-1.09)			76 (-0.06)	184,972
9.SAV				9,633 (-0.37)	21,606 (0.08)	7,695 (0.16)		5,078 (0.12)	2,869 (0.18)	46,882
TOTAL	331,245 (-0.03)	463,330 (0.04)	185,816 (0.04)	114,119	38,095	51,822 (-0.01)	50,205 (0.05)	184,972 (-0.04)	46,882 (0.01)	

Source: Authors' calculation
Note: Percentage changes from initial unbalanced SAM reported in pharanthesis

5 Descriptive and multiplier analysis using the 2005 Irish social accounting matrix

5.1 Main aggregates in the 2005 SAM

As a general overview of the SAM, we briefly discuss the sources of income and expenditure by major account shown in Table 3. The activity/commodity account receives income from selling its goods and services on both domestic and external markets. Sales within this account contribute 41 percent, while the external sector accounts for 29 percent, of its income. Households provide the third largest source of income with 16 percent. The capital account contributes 9 percent, representing purchased goods from activities for the purpose of investment. The government account purchased goods worth 5 percent of the total income for the activity account. About 31 percent of the activity/commodity account was spent on remunerating factors, 41 percent on purchases between the activities themselves, while 24 percent was used to import intermediate inputs and 4 percent was spent on government taxes.

Labour and capital are the only factors included in the SAM factor account and are owned by institutions. The percentage shares in which the factor account spends its revenue are as follows, 48 percent accruing to households, 15 percent to enterprises, 36 percent to the ROW, and only 1 percent to government. The revenue of the factor account comes from two major sources, the activity/commodity account with 77 percent and the rest of the world account with 23 percent. As the principal owners of labour and capital, households receive the biggest share, 78 percent, of their income from factors, while government, through transfers, accounts for 15 percent, followed by ROW and enterprises with 3 percent each and inter-household transfers with 1 percent. Households

spend most of their income, 65 percent, on commodities produced by domestic activities, pay government about 21 percent of their income as tax and 5 percent to enterprises as net non-life insurance premium and miscellaneous transfers while savings accounts for 8 percent.

Enterprises receive 73 percent of their income from ownership of factors, 15 percent as household transfers, while government and ROW provide 4 percent each in the form of grants and subsidies, and royalties, profits and similar sources, respectively. Inter-enterprise transfers account for another 4 percent. This account spends 19 percent of its revenue as tax, while 57 percent was used for investment or capital formation, 10 percent spent on imported goods and 10 percent on households. The government account obtains its revenue from the tax account which collects indirect, direct and custom duties from the activities and institution accounts, approximately 38 percent in indirect tax, 47 percent in direct taxes from households, 14 percent in enterprises direct tax and 1 percent in custom duties. The biggest share of its revenue is spent on goods, 48 percent. The government allocates 33 percent as income transfers to households while enterprises received 3 percent of it expenditures. Only 1 percent of expenditure went to the ROW in the form of international cooperation and/or miscellaneous transfers and 15 percent was used for investment in capital.

There are two sources of income for the ROW account; the activities account with 61 percent and the factors with 37 percent, the remaining 2 percent represent transfers from the government and capital account as import payments. The income is spent mostly on buying commodities, 72 percent, and on the factor account, 23 percent in the form of wages and property income, 3 percent in returns to capital and 2 percent are distributed to households. The capital account receives the bulk of its income from private institutions, 67 percent, and from government, 16 percent. The ROW is the third most important contributor with 11 percent, which consists of foreign capital inflows. As far as capital expenditure is concerned, 94 percent is spent on activities. The remaining 6 percent represents transfers between the capital account and serves as a balancing factor.

The descriptive statistics presented above is in line with the main aggregates provided by the CSO National Accounts for 2005 and the Annual Accounts by Current Account, Institutional Sector, Year and Uses and Resources, 2005.

5.2 Multiplier analysis

A SAM is a database and not a model per se. It can be transformed into an economic model if it is assumed that all relations are of the linear type, prices are fixed and that all production activities function under the condition of excess demand, following Pyatt and Round (1979). The SAM is a singular square matrix and the first step in developing a SAM-based multiplier model is to calculate the column shares (coefficients) in order to compute the matrix multipliers. One or more accounts have to be made exogenous to allow the matrix to be invertible and consequently to calculate the multipliers.

For the multipliers reported in this section, the government account, the rest of the world account, the capital account and the account for indirect taxes are regarded as exogenous accounts as these accounts are either politically determined or outside domestic control. The remaining accounts are viewed as endogenous and include the production (activities, commodities), factors of production (value added) and institutions (households and enterprises) accounts. Consequently, the model becomes a demand-driven Keynesian model, as supply is assumed to adjust to demand. Table 4

shows a simplified macro SAM with four types of accounts: production activities, factors, institutions (households and enterprises) and one exogenous account. For simplicity, the exogenous accounts are aggregated into a single account which records the injections into the system and the leakages from it. The leakages include transfer income sent to the rest of the world, institutional savings, indirect taxes and imports, and the injections include transfers from the rest of the world, government transfers to institutions (households and enterprises), government consumption and export demand.

Table 4: Macro-SAM, Multiplier analysis

	Endogenous Accounts			Exogenous Accounts	
	Production Activities	Factors of Production	Institutions (Households and Enterprise)	Sum of other accounts	Total Income
Production Activities	T_{11}		T_{13}	X_1	Y_1
Factors of Production	T_{21}			X_2	Y_2
Institutions (Households and Enterprise)		T_{32}	T_{33}	X_3	Y_3
Sum of other accounts	L_1	L_2	L_3	T	YX
Total Expenditures	Y_1	Y_2	Y_3	YX	

Source: Adapted from Defourny and Thorbecke, (1984)

To introduce the multiplier analysis the following transaction matrix is defined:

$$\mathbf{T} = \begin{bmatrix} \mathbf{T_{11}} & 0 & \mathbf{T_{13}} \\ \mathbf{T_{21}} & 0 & 0 \\ 0 & \mathbf{T_{32}} & \mathbf{T_{33}} \end{bmatrix}$$

where $\mathbf{T_{11}}$ is the matrix of intermediate inputs needed; $\mathbf{T_{13}}$ is the matrix of consumption expenditure of institutions; $\mathbf{T_{21}}$ is the value added (labour and capital) matrix generated by activities; $\mathbf{T_{32}}$ is the income distribution matrix between institutions; and $\mathbf{T_{33}}$ is the matrix of transfers between institutions.

The revenue or income of the endogenous accounts is represented by Y_1, Y_2 and Y_3, which are the production activities, factors and institutions revenue, respectively. The sum of the exogenous injections is consolidated into one vector $X_i, i = 1, 2, 3$, and $L_i, i = 1, 2, 3$ represents the corresponding leakages.

In the transaction matrix, each endogenous total income, $Y_i, i = 1, 2, 3$, is given by the following equation:

$$Y_i = \mathbf{A_i} Y_i + X_i \tag{4}$$

Therefore, by definition:

$$\begin{aligned} Y_1 &= \mathbf{T_{11}} + \mathbf{T_{13}} + X_1 \\ Y_2 &= \mathbf{T_{21}} + X_2 \\ Y_3 &= \mathbf{T_{32}} + \mathbf{T_{33}} + X_3 \end{aligned} \tag{5}$$

or in matrix algebra :

$$Y = \mathbf{T} + X \tag{6}$$

By dividing each element in any of the endogenous accounts by its total income (column total), $\mathbf{A_{ij}} = \mathbf{T_{ij}}/Y_j$, the matrix $\mathbf{A_i}$ of average expenditure propensities is constructed.

$$\mathbf{A_i} = \begin{bmatrix} \mathbf{A_{11}} & 0 & \mathbf{A_{13}} \\ \mathbf{A_{21}} & 0 & 0 \\ 0 & \mathbf{A_{32}} & \mathbf{A_{33}} \end{bmatrix}$$

Re-writing equation (4)

$$Y_i = (I - \mathbf{A_i})^{-1} X = \mathbf{M} X \tag{7}$$

This equation shows the income Y_i of each endogenous account following an exogenous injection, X. The inverse matrix, $\mathbf{M}$, is the multiplier matrix obtained in a SAM multiplier analysis.

Equation (5) can be further re-written:

$$\begin{aligned} Y_1 &= \mathbf{A_{11}} Y_1 + \mathbf{A_{13}} Y_3 + X_1 \\ &= (I - \mathbf{A_{11}})^{-1} \mathbf{A_{13}} Y_3 + (I - \mathbf{A_{11}})^{-1} X_1 \\ &= (I - \mathbf{A_{11}})^{-1} (\mathbf{A_{13}} Y_3 + X_1) \\ Y_2 &= \mathbf{A_{21}} Y_1 + X_2 \\ Y_3 &= \mathbf{A_{32}} Y_2 + \mathbf{A_{33}} Y_3 + X_3 \\ &= (I - \mathbf{A_{33}})^{-1} \mathbf{A_{32}} Y_2 + (I - \mathbf{A_{33}})^{-1} X_3 \\ &= (I - \mathbf{A_{33}})^{-1} (\mathbf{A_{32}} Y_2 X_3) \end{aligned} \tag{8}$$

Consequently, equation (8) provides the main difference between an I-O multiplier analysis and the SAM multiplier analysis. In the I-O multiplier analysis $\mathbf{A_{13}} Y_3$ is determined exogenously. If we calculate the SAM multiplier assuming no endogenous final demand (the main assumption of the input-output model), even though $\mathbf{A_{13}} Y_3$ is part of the exogenous final demand, it depends on the level and distribution of income and is determined simultaneously with Y_1. The input-output multipliers will be smaller than the SAM multipliers with or without endogenized household demand in both analyses.

Pyatt and Round (1979) suggest that the multiplier matrix $\mathbf{M}$ can be decomposed into three multiplicative components: (i) $\mathbf{M_1}$, the transfer matrix or the direct effect multipliers which includes the Leontief output multipliers; (ii) $\mathbf{M_2}$, the open-loop matrix, which defines the indirect multipliers and captures the cross effects between different groups; and (iii) $\mathbf{M_3}$, the closed-loop matrix that captures the effect of an exogenous inflow on an endogenous account, revealing the full circular flow. Their suggested decomposition is as follows:

From equation (4), it follows that for any matrix $\tilde{\mathbf{A}}_\mathbf{i}$ of the same size as $\mathbf{A_i}$, such that the inverse $(I - \tilde{\mathbf{A}}_\mathbf{i})^{-1}$ exists, one can write:

$$
\begin{aligned}
Y_i &= \mathbf{A_i} Y_i + X \\
&= (\mathbf{A_i} - \tilde{\mathbf{A}}_\mathbf{i}) Y_i + \tilde{\mathbf{A}}_\mathbf{i} Y_i + X \\
&= (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} (\mathbf{A_i} - \tilde{\mathbf{A}}_\mathbf{i}) Y_i + (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X \\
&= \dot{\mathbf{A}}_\mathbf{i} Y_i + (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X
\end{aligned} \tag{9}
$$

where $\tilde{\mathbf{A}}_\mathbf{i}$ is the diagonal bloc matrix extracted from matrix $\mathbf{A_i}$:

$$
\tilde{\mathbf{A}}_\mathbf{i} = \begin{bmatrix} \mathbf{A_{11}} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & \mathbf{A_{33}} \end{bmatrix}
$$

and $\dot{\mathbf{A}}_\mathbf{i} = (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} (\mathbf{A_i} - \tilde{\mathbf{A}}_\mathbf{i})$

Multiplying by $\dot{\mathbf{A}}_\mathbf{i}$:

$$
\dot{\mathbf{A}}_\mathbf{i} Y_i = \dot{\mathbf{A}}_\mathbf{i}^2 Y_i + \dot{\mathbf{A}}_\mathbf{i} (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X \tag{10}
$$

Now subtracting $\dot{\mathbf{A}}_\mathbf{i} Y_i$:

$$
\begin{aligned}
Y_i &= \dot{\mathbf{A}}_\mathbf{i}^2 + \dot{\mathbf{A}}_\mathbf{i} (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X + (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X \\
&= \dot{\mathbf{A}}_\mathbf{i}^2 + (I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} (I + \tilde{\mathbf{A}}_\mathbf{i})^{-1} X
\end{aligned} \tag{11}
$$

Similarly, if equation (9) is multiplied by $\dot{\mathbf{A}}_\mathbf{i}^2$ and we then subtract $\dot{\mathbf{A}}_\mathbf{i}^2 Y_i$ we get:

$$
Y_i = (I - \dot{\mathbf{A}}_\mathbf{i}^\mathbf{3})^{-1} (I + \dot{\mathbf{A}}_\mathbf{i} + \dot{\mathbf{A}}_\mathbf{i}^2)(I - \tilde{\mathbf{A}}_\mathbf{i})^{-1} X \tag{12}
$$

Equation (12) decomposes matrix $\mathbf{M}$ into a product of three multiplier matrices $\mathbf{M_1}$, $\mathbf{M_2}$, $\mathbf{M_3}$.

$$
\mathbf{M} = \mathbf{M_3 M_2 M_1} \tag{13}
$$

Using equation (13), Stone (1985) and further developed by Pyatt and Round (1985) showed that the multiplier matrix $\mathbf{M}$ can be decomposed into four additive terms in order to provide an easier way of interpreting the results of a SAM multiplier analysis, of the form:[8]

$$
\mathbf{M} = \mathbf{I} + \mathbf{N_1} + \mathbf{N_2} + \mathbf{N_3} \tag{14}
$$

with

$$
\begin{aligned}
\mathbf{N_1} &= \mathbf{M_1} - \mathbf{I} \\
\mathbf{N_2} &= (\mathbf{M_2} - \mathbf{I})\mathbf{M_1} = \mathbf{M_2 M_1} - \mathbf{M_1} \\
\mathbf{N_3} &= (\mathbf{M_3} - \mathbf{I})\mathbf{M_2 M_1} = \mathbf{M_3 M_2 M_1} - \mathbf{M_2 M_1}
\end{aligned} \tag{15}
$$

The first term, $\mathbf{I}$, is the initial injection or diagonal identity matrix representing the impact of the exogenous shock on each account. The second term, $\mathbf{N_1}$, captures the direct effect within the blocks or intra-group effects as in the Leontief inverse in I-O analysis. The third term, $\mathbf{N_2}$,

[8]The additive decomposition is not unique (Round, 2003).

describes the net contribution of between blocks or extra-group effects affected by the shock as a consequence of a complete tour outside the original accounts without returning to it. The fourth term, $\mathbf{N_3}$, describes the net contribution of within-blocks or inter-group effects that arise from the shock having completed a tour through all groups of accounts and returned to the one where it originally started.

Table 5 presents the SAM multiplier matrix, $\mathbf{M}$, derived from the 2005 Irish SAM. Consider, for example, the multipliers shown in the first column of Table 5 for the Agriculture industry. For illustrative purposes, the standard assumption of an increase of €100 million in exogenous demand is adopted. Therefore, a €100 million increase in exogenous demand for agricultural products, induces an additional increase of €27 million in agricultural output as well as increases in the output of the food processing and chemical sectors of €16 million and €11 million, respectively. Overall the €100 million increase in the demand for agricultural products generates a total increase in aggregate output of €208.6 million.

In addition to output multipliers, it is also possible to calculate value added or GDP multipliers and household income multipliers. GDP multipliers show the increase in economy-wide value added at factor cost in response to a change in the exogenous accounts. For example, looking again at column 1 of Table 5, a €100 million increase in the final demand for agricultural output would lead to an increase in GDP at factor cost of €106.4 million. The income multiplier measures the total change in household incomes in response to the exogenous shock. For example, an increase of €100 million in agricultural output would lead to a total increase in household income of €42.1 million.

In general, sectors which are more embedded in the local economy and have fewer leakages (through imports, indirect taxes and savings) will have a higher multiplier. Looking at the multipliers in Table 5, the sectors with the highest output multipliers are forestry, sewage and refuse disposal services and supporting and auxiliary transport services with output multipliers of 2.920, 2.414 and 2.216, respectively. Therefore, a €100 million increase in demand for output from forestry will generate an additional €192 million in the output of all sectors in the Irish economy. Agriculture and Food have a relatively high output multiplier of over 2, while the chemical sector has an output multiplier of 1.597. The sectors with the highest value added multipliers are education, health and other services sectors, with multipliers ranging from 1.178 to 1.066 followed by the agricultural sector with a multiplier of 1.064.

To illustrate the use of the multiplier decomposition we focus on tracing the effects of an external shock arising from an increase in earnings on each of the following activities: agriculture, manufacture of food and beverages and chemicals and man-made fibres, with the previous assumption that government, capital, indirect taxes, and rest of the world accounts are classified as exogenous. These three sectors are selected to capture traded economic sectors with different degrees of embededness in the Irish economy (the fact that education and health have the highest GDP multiplier is of little policy relevance given that these are largely non-traded sectors where output can only be stimulated by additional government expenditure). The Stone decomposition is presented for these three sectors in Table 6. Overall, it can be noticed that the intra-group (N_1) dominates, while the circular or closed-loop (N_3) effects only prevail over very few accounts. From Table 6 we can see that out of the €108.6 million induced indirect increase in gross output due to an increase in demand for agricultural products of €100 million, 26.37 percent are attributed to net SAM linkages (see Adelman and Robinson, 1986). The net SAM linkages or the sum of N_2 and

Table 5: The Multiplier Matrix, M

Sectors	A_AGRI	A_FORE	A_FISH	A_CPUM	A_MING	A_FOOD	A_TABA	A_TEXT	A_FURS	A_LETH	A_WOOD	A_PAPE	A_PRME	A_PEMP	A_CHIM
A_AGRI	1.271	0.023	0.018	0.013	0.015	0.258	0.138	0.016	0.012	0.014	0.014	0.016	0.009	0.009	0.009
A_FORE	0.000	1.503	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.002	0.132	0.001	0.000	0.004	0.000
A_FISH	0.002	0.002	1.060	0.001	0.001	0.008	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_CPUM	0.004	0.008	0.005	1.051	0.010	0.003	0.002	0.003	0.003	0.002	0.004	0.003	0.001	0.113	0.001
A_MING	0.005	0.002	0.001	0.004	1.096	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.003	0.001
A_FOOD	0.162	0.054	0.062	0.029	0.034	1.134	0.042	0.034	0.027	0.033	0.033	0.036	0.021	0.021	0.020
A_TABA	0.001	0.001	0.000	0.001	0.001	0.001	1.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
A_TEXT	0.001	0.002	0.003	0.001	0.001	0.001	0.001	1.056	0.040	0.026	0.001	0.001	0.001	0.001	0.001
A_FURS	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.004	1.017	0.002	0.001	0.001	0.001	0.001	0.000
A_LETH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.005	0.000	0.000	0.000	0.000	0.000
A_WOOD	0.002	0.009	0.002	0.003	0.003	0.002	0.005	0.004	0.003	0.002	1.134	0.004	0.001	0.034	0.001
A_PAPE	0.002	0.003	0.001	0.001	0.002	0.007	0.010	0.004	0.004	0.003	0.005	1.096	0.006	0.004	0.002
A_PRME	0.007	0.069	0.005	0.007	0.008	0.007	0.006	0.008	0.006	0.007	0.013	0.022	1.040	0.005	0.006
A_PEMP	0.018	0.046	0.026	0.015	0.033	0.012	0.008	0.013	0.008	0.009	0.017	0.011	0.005	1.042	0.005
A_CHIM	0.110	0.051	0.014	0.031	0.027	0.046	0.023	0.096	0.038	0.016	0.056	0.053	0.014	0.015	1.114
A_RUBB	0.004	0.005	0.007	0.006	0.005	0.007	0.002	0.005	0.004	0.003	0.007	0.011	0.002	0.010	0.003
A_NOME	0.005	0.008	0.002	0.006	0.074	0.004	0.002	0.003	0.002	0.002	0.004	0.002	0.002	0.014	0.002
A_BAME	0.002	0.003	0.002	0.004	0.002	0.002	0.001	0.004	0.003	0.003	0.007	0.004	0.001	0.007	0.001
A_MEMA	0.013	0.010	0.006	0.011	0.008	0.007	0.004	0.007	0.006	0.010	0.023	0.007	0.002	0.016	0.002
A_MAEQ	0.008	0.005	0.002	0.009	0.003	0.003	0.003	0.003	0.002	0.003	0.007	0.004	0.001	0.003	0.002
A_OFMA	0.002	0.030	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.005	0.003	0.002	0.002	0.002
A_ELMA	0.001	0.004	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.001
A_RATV	0.003	0.007	0.002	0.003	0.004	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.002	0.002
A_MEDI	0.002	0.004	0.004	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.002
A_MOTO	0.001	0.003	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001
A_OTTR	0.000	0.010	0.009	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
A_RECY	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.005	0.009	0.000	0.001	0.000
A_ELGA	0.031	0.063	0.040	0.052	0.055	0.027	0.016	0.032	0.020	0.017	0.049	0.029	0.010	0.022	0.014
A_WATE	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.001	0.000	0.003	0.003	0.002	0.001	0.001
A_CONS	0.020	0.098	0.020	0.035	0.031	0.010	0.008	0.008	0.007	0.008	0.029	0.009	0.005	0.010	0.005
A_TRAD	0.005	0.005	0.003	0.011	0.009	0.003	0.002	0.003	0.002	0.003	0.004	0.003	0.002	0.003	0.002
A_WHSL	0.010	0.021	0.006	0.008	0.020	0.018	0.006	0.009	0.007	0.009	0.011	0.009	0.129	0.010	0.008
A_RETS	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.009	0.001	0.001
A_HORE	0.033	0.069	0.024	0.031	0.045	0.032	0.039	0.038	0.033	0.047	0.040	0.043	0.023	0.026	0.020
A_LATR	0.013	0.066	0.016	0.055	0.205	0.031	0.016	0.031	0.022	0.048	0.055	0.039	0.012	0.025	0.007
A_WATR	0.001	0.001	0.015	0.001	0.004	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
A_AITR	0.006	0.019	0.006	0.008	0.033	0.009	0.015	0.009	0.006	0.007	0.007	0.010	0.009	0.008	0.008
A_OTTRS	0.014	0.033	0.025	0.019	0.034	0.016	0.017	0.019	0.015	0.019	0.020	0.020	0.015	0.013	0.011
A_POTL	0.025	0.048	0.019	0.023	0.037	0.024	0.031	0.029	0.025	0.035	0.030	0.028	0.023	0.018	0.017
A_FISE	0.062	0.090	0.043	0.083	0.079	0.058	0.043	0.049	0.040	0.052	0.042	0.043	0.035	0.037	0.033
A_INSE	0.031	0.071	0.072	0.036	0.040	0.023	0.039	0.032	0.033	0.056	0.033	0.037	0.019	0.024	0.016
A_OFISE	0.012	0.022	0.015	0.020	0.019	0.013	0.013	0.014	0.012	0.017	0.012	0.013	0.009	0.010	0.009
A_REES	0.048	0.131	0.030	0.052	0.056	0.041	0.047	0.055	0.045	0.054	0.068	0.058	0.033	0.034	0.029
A_RESE	0.006	0.043	0.011	0.010	0.061	0.007	0.005	0.007	0.007	0.007	0.012	0.008	0.007	0.006	0.004
A_COSE	0.012	0.032	0.010	0.033	0.028	0.017	0.028	0.019	0.013	0.037	0.019	0.021	0.027	0.017	0.036
A_RESH	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.007	0.001	0.008
A_OTBU	0.047	0.067	0.028	0.062	0.042	0.107	0.038	0.040	0.044	0.048	0.045	0.044	0.116	0.039	0.158
A_PUAD	0.011	0.007	0.008	0.007	0.007	0.005	0.005	0.004	0.002	0.005	0.004	0.004	0.003	0.004	0.003
A_EDUS	0.012	0.020	0.007	0.013	0.014	0.010	0.011	0.014	0.011	0.013	0.014	0.015	0.008	0.008	0.007
A_HEAS	0.034	0.021	0.012	0.013	0.014	0.016	0.016	0.016	0.013	0.014	0.015	0.016	0.009	0.010	0.010
A_SEWA	0.004	0.009	0.013	0.006	0.006	0.006	0.009	0.013	0.015	0.033	0.015	0.005	0.003	0.005	0.003
A_MNEC	0.006	0.025	0.002	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.006	0.005	0.003	0.003	0.002
A_RECS	0.009	0.081	0.005	0.008	0.010	0.008	0.008	0.010	0.009	0.010	0.024	0.010	0.005	0.006	0.005
A_OTSE	0.005	0.009	0.015	0.010	0.010	0.006	0.004	0.007	0.005	0.009	0.007	0.009	0.003	0.005	0.003
A_PRHO	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000
Output Multipliers	**2.086**	**2.920**	**1.682**	**1.808**	**2.202**	**2.010**	**1.686**	**1.743**	**1.582**	**1.711**	**2.052**	**1.780**	**1.641**	**1.660**	**1.597**
LAB	0.230	0.625	0.115	0.368	0.401	0.252	0.241	0.438	0.355	0.373	0.410	0.471	0.185	0.260	0.156
CAP	0.834	0.396	0.665	0.407	0.387	0.495	0.712	0.300	0.263	0.393	0.384	0.277	0.420	0.202	0.449
GDP Multipliers	**1.064**	**1.022**	**0.779**	**0.775**	**0.788**	**0.747**	**0.953**	**0.738**	**0.618**	**0.767**	**0.794**	**0.748**	**0.605**	**0.462**	**0.605**
HHO	0.421	0.717	0.267	0.462	0.490	0.365	0.404	0.507	0.416	0.464	0.498	0.535	0.281	0.306	0.259
ENT	0.224	0.134	0.175	0.123	0.119	0.139	0.193	0.099	0.085	0.120	0.119	0.095	0.116	0.065	0.122
Income Multipliers	**0.644**	**0.850**	**0.442**	**0.584**	**0.609**	**0.504**	**0.597**	**0.606**	**0.501**	**0.583**	**0.617**	**0.630**	**0.397**	**0.371**	**0.381**

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Table 5: The Multiplier Matrix, M - Continued

Sectors	A_RUBB	A_NOME	A_BAME	A_MEMA	A_MAEQ	A_OFMA	A_ELMA	A_RATV	A_MEDI	A_MOTO	A_OTTR	A_RECY	A_ELGA	A_WATE	A_CONS
A_AGRI	0.014	0.013	0.010	0.013	0.013	0.008	0.011	0.009	0.012	0.012	0.018	0.010	0.011	0.017	0.017
A_FORE	0.002	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.005
A_FISH	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_CPUM	0.005	0.008	0.058	0.009	0.005	0.001	0.002	0.002	0.003	0.004	0.004	0.014	0.050	0.006	0.004
A_MING	0.003	0.047	0.008	0.002	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.020
A_FOOD	0.034	0.031	0.022	0.030	0.029	0.018	0.026	0.020	0.031	0.027	0.040	0.023	0.024	0.040	0.035
A_TABA	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_TEXT	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002
A_FURS	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_LETH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_WOOD	0.012	0.004	0.002	0.004	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.003	0.003	0.022
A_PAPE	0.003	0.005	0.002	0.002	0.002	0.003	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.003	0.002
A_PRME	0.007	0.007	0.006	0.007	0.007	0.023	0.008	0.009	0.007	0.007	0.008	0.005	0.010	0.025	0.015
A_PEMP	0.017	0.020	0.032	0.012	0.010	0.005	0.009	0.007	0.012	0.009	0.012	0.013	0.056	0.018	0.015
A_CHIM	0.071	0.030	0.040	0.023	0.019	0.015	0.017	0.041	0.056	0.022	0.018	0.021	0.013	0.040	0.029
A_RUBB	1.078	0.006	0.004	0.008	0.012	0.002	0.005	0.004	0.016	0.013	0.005	0.003	0.003	0.008	0.017
A_NOME	0.012	1.104	0.006	0.007	0.005	0.001	0.003	0.002	0.002	0.002	0.003	0.002	0.003	0.007	0.056
A_BAME	0.013	0.010	1.053	0.093	0.035	0.002	0.003	0.003	0.005	0.033	0.018	0.152	0.002	0.004	0.008
A_MEMA	0.029	0.013	0.023	1.051	0.064	0.005	0.007	0.010	0.009	0.023	0.006	0.017	0.011	0.009	0.032
A_MAEQ	0.011	0.007	0.012	0.019	1.042	0.005	0.005	0.012	0.006	0.011	0.004	0.016	0.005	0.017	0.010
A_OFMA	0.003	0.002	0.002	0.003	0.003	1.307	0.036	0.060	0.008	0.020	0.004	0.002	0.007	0.007	0.006
A_ELMA	0.003	0.002	0.001	0.002	0.007	0.018	1.080	0.024	0.012	0.023	0.018	0.002	0.004	0.003	0.013
A_RATV	0.004	0.003	0.002	0.003	0.005	0.045	0.047	1.147	0.012	0.111	0.006	0.002	0.003	0.006	0.006
A_MEDI	0.002	0.002	0.001	0.001	0.003	0.012	0.004	0.015	1.160	0.004	0.009	0.001	0.002	0.008	0.004
A_MOTO	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	1.009	0.002	0.001	0.001	0.002	0.002
A_OTTR	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	1.039	0.000	0.000	0.000	0.001
A_RECY	0.001	0.001	0.040	0.011	0.002	0.000	0.000	0.000	0.000	0.002	0.001	1.068	0.000	0.000	0.001
A_ELGA	0.042	0.058	0.055	0.026	0.024	0.010	0.020	0.025	0.018	0.021	0.029	0.031	1.274	0.097	0.023
A_WATE	0.001	0.001	0.007	0.002	0.003	0.000	0.000	0.001	0.002	0.014	0.001	0.002	0.000	1.015	0.001
A_CONS	0.009	0.011	0.010	0.010	0.008	0.004	0.015	0.009	0.006	0.008	0.018	0.007	0.015	0.086	1.329
A_TRAD	0.003	0.004	0.003	0.003	0.003	0.002	0.005	0.003	0.002	0.002	0.006	0.003	0.002	0.009	0.004
A_WHSL	0.009	0.015	0.008	0.008	0.009	0.071	0.025	0.015	0.014	0.011	0.010	0.009	0.011	0.013	0.014
A_RETS	0.001	0.001	0.001	0.001	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_HORE	0.040	0.037	0.025	0.035	0.035	0.022	0.030	0.022	0.031	0.034	0.044	0.024	0.024	0.044	0.037
A_LATR	0.041	0.068	0.022	0.027	0.024	0.017	0.020	0.010	0.014	0.019	0.016	0.086	0.011	0.018	0.022
A_WATR	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
A_AITR	0.011	0.019	0.011	0.010	0.009	0.008	0.014	0.013	0.008	0.014	0.011	0.006	0.005	0.008	0.008
A_OTTRS	0.020	0.022	0.014	0.018	0.017	0.014	0.018	0.018	0.015	0.016	0.022	0.018	0.013	0.027	0.019
A_POTL	0.036	0.037	0.020	0.026	0.028	0.017	0.027	0.022	0.024	0.028	0.029	0.018	0.018	0.045	0.025
A_FISE	0.033	0.069	0.052	0.060	0.058	0.030	0.035	0.024	0.029	0.045	0.051	0.050	0.064	0.064	0.048
A_INSE	0.037	0.032	0.027	0.029	0.031	0.014	0.025	0.016	0.025	0.032	0.038	0.048	0.016	0.044	0.023
A_OFISE	0.012	0.017	0.013	0.015	0.015	0.008	0.010	0.007	0.009	0.013	0.015	0.015	0.014	0.016	0.012
A_REES	0.053	0.051	0.037	0.051	0.049	0.028	0.044	0.032	0.041	0.043	0.067	0.043	0.040	0.080	0.081
A_RESE	0.009	0.021	0.007	0.012	0.007	0.005	0.006	0.005	0.005	0.006	0.015	0.008	0.007	0.021	0.024
A_COSE	0.023	0.019	0.013	0.015	0.017	0.030	0.054	0.019	0.021	0.018	0.014	0.033	0.016	0.047	0.017
A_RESH	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.004	0.004	0.002	0.001	0.001	0.001	0.002	0.001
A_OTBU	0.052	0.045	0.032	0.032	0.048	0.122	0.090	0.040	0.067	0.036	0.041	0.034	0.032	0.103	0.043
A_PUAD	0.005	0.004	0.007	0.006	0.006	0.003	0.004	0.002	0.002	0.006	0.009	0.014	0.003	0.009	0.005
A_EDUS	0.013	0.013	0.009	0.013	0.012	0.007	0.011	0.009	0.011	0.011	0.017	0.010	0.010	0.018	0.015
A_HEAS	0.015	0.014	0.011	0.015	0.014	0.008	0.013	0.011	0.013	0.012	0.020	0.011	0.012	0.019	0.017
A_SEWA	0.008	0.006	0.023	0.022	0.005	0.002	0.003	0.002	0.003	0.006	0.006	0.006	0.010	0.055	0.013
A_MNEC	0.004	0.004	0.003	0.004	0.004	0.002	0.004	0.003	0.003	0.004	0.006	0.003	0.003	0.007	0.005
A_RECS	0.009	0.009	0.007	0.008	0.008	0.006	0.008	0.006	0.008	0.007	0.013	0.006	0.006	0.011	0.010
A_OTSE	0.007	0.007	0.005	0.007	0.005	0.002	0.004	0.003	0.004	0.004	0.006	0.010	0.003	0.006	0.005
A_PRHO	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
Output Multipliers	**1.827**	**1.909**	**1.752**	**1.765**	**1.716**	**1.917**	**1.764**	**1.696**	**1.742**	**1.755**	**1.730**	**1.857**	**1.825**	**2.104**	**2.130**
LAB	0.399	0.366	0.265	0.396	0.365	0.178	0.327	0.200	0.271	0.330	0.568	0.290	0.281	0.519	0.463
CAP	0.330	0.436	0.331	0.342	0.366	0.277	0.305	0.432	0.490	0.271	0.292	0.317	0.407	0.270	0.366
GDP Multipliers	**0.729**	**0.803**	**0.596**	**0.739**	**0.731**	**0.454**	**0.632**	**0.633**	**0.761**	**0.601**	**0.859**	**0.608**	**0.688**	**0.789**	**0.829**
HHO	0.475	0.467	0.341	0.475	0.449	0.241	0.397	0.299	0.383	0.392	0.635	0.363	0.375	0.581	0.547
ENT	0.105	0.130	0.098	0.108	0.112	0.080	0.095	0.120	0.139	0.086	0.104	0.096	0.118	0.096	0.117
Income Multipliers	**0.580**	**0.597**	**0.439**	**0.583**	**0.561**	**0.321**	**0.492**	**0.420**	**0.522**	**0.478**	**0.739**	**0.459**	**0.493**	**0.677**	**0.664**

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Table 5: The Multiplier Matrix, M - Continued

Sectors	A_TRAD	A_WHSL	A_RETS	A_HORE	A_LATR	A_WATR	A_AITR	A_OTTRS	A_POTL	A_FISE	A_INSE	A_OFISE	A_REES	A_RESE	A_COSE
A_AGRI	0.018	0.014	0.024	0.093	0.017	0.022	0.013	0.026	0.016	0.014	0.011	0.009	0.009	0.009	0.011
A_FORE	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000
A_FISH	0.001	0.001	0.002	0.006	0.001	0.003	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_CPUM	0.003	0.002	0.003	0.003	0.005	0.004	0.006	0.003	0.002	0.002	0.001	0.001	0.001	0.002	0.002
A_MING	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.002	0.000	0.000
A_FOOD	0.042	0.032	0.057	0.279	0.041	0.047	0.034	0.072	0.037	0.032	0.024	0.023	0.020	0.021	0.027
A_TABA	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_TEXT	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_FURS	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A_LETH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_WOOD	0.002	0.001	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.001	0.001	0.001	0.005	0.001	0.001
A_PAPE	0.002	0.001	0.002	0.003	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
A_PRME	0.011	0.009	0.011	0.011	0.011	0.009	0.008	0.013	0.011	0.011	0.009	0.012	0.007	0.006	0.010
A_PEMP	0.015	0.011	0.014	0.013	0.036	0.027	0.047	0.019	0.011	0.008	0.007	0.006	0.006	0.008	0.008
A_CHIM	0.017	0.013	0.021	0.042	0.016	0.016	0.012	0.018	0.016	0.012	0.010	0.009	0.010	0.009	0.011
A_RUBB	0.006	0.003	0.004	0.004	0.007	0.004	0.003	0.004	0.008	0.002	0.002	0.002	0.003	0.002	0.003
A_NOME	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.002	0.002	0.001	0.009	0.001	0.002
A_BAME	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.001	0.001
A_MEMA	0.005	0.002	0.004	0.004	0.006	0.005	0.005	0.004	0.004	0.002	0.002	0.002	0.003	0.002	0.002
A_MAEQ	0.004	0.002	0.003	0.002	0.003	0.002	0.002	0.002	0.004	0.001	0.001	0.001	0.001	0.005	0.002
A_OFMA	0.003	0.002	0.003	0.002	0.003	0.003	0.003	0.003	0.011	0.002	0.002	0.002	0.003	0.002	0.008
A_ELMA	0.002	0.001	0.002	0.001	0.003	0.002	0.002	0.002	0.010	0.001	0.001	0.001	0.001	0.001	0.003
A_RATV	0.005	0.003	0.004	0.004	0.004	0.004	0.003	0.004	0.059	0.003	0.005	0.004	0.002	0.003	0.009
A_MEDI	0.002	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.006	0.001	0.001	0.001	0.001	0.001	0.003
A_MOTO	0.006	0.002	0.002	0.002	0.003	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.001
A_OTTR	0.000	0.000	0.000	0.000	0.002	0.010	0.008	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
A_RECY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_ELGA	0.024	0.016	0.034	0.036	0.020	0.020	0.014	0.022	0.020	0.013	0.010	0.012	0.010	0.014	0.017
A_WATE	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_CONS	0.009	0.007	0.014	0.012	0.010	0.011	0.008	0.019	0.020	0.009	0.009	0.005	0.049	0.006	0.006
A_TRAD	1.010	0.003	0.004	0.004	0.010	0.006	0.006	0.005	0.003	0.002	0.003	0.002	0.002	0.014	0.004
A_WHSL	0.007	1.008	0.008	0.015	0.008	0.010	0.014	0.012	0.024	0.006	0.006	0.006	0.005	0.005	0.042
A_RETS	0.001	0.001	1.001	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.003
A_HORE	0.042	0.035	0.065	1.042	0.049	0.069	0.060	0.194	0.043	0.033	0.025	0.024	0.021	0.023	0.032
A_LATR	0.027	0.024	0.024	0.023	1.040	0.036	0.013	0.040	0.021	0.011	0.009	0.009	0.008	0.020	0.014
A_WATR	0.003	0.002	0.001	0.003	0.002	1.142	0.007	0.008	0.005	0.001	0.001	0.001	0.001	0.001	0.001
A_AITR	0.011	0.009	0.009	0.012	0.016	0.031	1.078	0.148	0.017	0.009	0.007	0.006	0.005	0.008	0.008
A_OTTRS	0.036	0.044	0.033	0.034	0.086	0.185	0.098	1.130	0.031	0.021	0.017	0.019	0.014	0.022	0.018
A_POTL	0.042	0.029	0.043	0.044	0.032	0.041	0.032	0.041	1.302	0.039	0.076	0.068	0.022	0.027	0.061
A_FISE	0.055	0.035	0.059	0.055	0.051	0.056	0.062	0.075	0.053	1.241	0.079	0.107	0.124	0.104	0.063
A_INSE	0.042	0.027	0.038	0.033	0.028	0.034	0.043	0.033	0.022	0.042	1.471	0.148	0.029	0.027	0.036
A_OFISE	0.014	0.010	0.016	0.014	0.012	0.019	0.018	0.015	0.013	0.092	0.198	1.245	0.015	0.015	0.020
A_REES	0.084	0.063	0.121	0.070	0.070	0.075	0.052	0.066	0.065	0.058	0.047	0.036	1.040	0.039	0.047
A_RESE	0.012	0.007	0.010	0.010	0.032	0.015	0.052	0.022	0.009	0.013	0.005	0.006	0.006	1.112	0.013
A_COSE	0.023	0.016	0.022	0.022	0.036	0.050	0.047	0.055	0.030	0.029	0.022	0.029	0.014	0.018	1.176
A_RESH	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.006
A_OTBU	0.043	0.035	0.049	0.070	0.046	0.067	0.067	0.068	0.046	0.070	0.046	0.052	0.036	0.046	0.160
A_PUAD	0.003	0.003	0.004	0.004	0.023	0.006	0.004	0.004	0.004	0.003	0.002	0.002	0.011	0.002	0.003
A_EDUS	0.017	0.013	0.019	0.015	0.017	0.016	0.011	0.016	0.015	0.014	0.010	0.009	0.011	0.009	0.013
A_HEAS	0.019	0.014	0.021	0.019	0.018	0.018	0.012	0.015	0.016	0.015	0.012	0.010	0.009	0.010	0.012
A_SEWA	0.009	0.006	0.011	0.012	0.005	0.008	0.006	0.007	0.006	0.003	0.003	0.004	0.004	0.006	0.006
A_MNEC	0.005	0.004	0.006	0.005	0.005	0.005	0.003	0.005	0.005	0.004	0.003	0.003	0.003	0.003	0.004
A_RECS	0.011	0.009	0.012	0.015	0.012	0.011	0.010	0.016	0.013	0.009	0.007	0.007	0.006	0.007	0.012
A_OTSE	0.005	0.004	0.006	0.011	0.005	0.007	0.007	0.007	0.006	0.005	0.003	0.003	0.003	0.006	0.004
A_PRHO	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Output Multipliers	**1.712**	**1.535**	**1.804**	**2.069**	**1.814**	**2.117**	**1.886**	**2.216**	**2.005**	**1.849**	**2.160**	**1.899**	**1.540**	**1.627**	**1.894**
LAB	0.524	0.320	0.593	0.390	0.492	0.472	0.265	0.366	0.419	0.361	0.269	0.155	0.126	0.149	0.277
CAP	0.452	0.706	0.457	0.387	0.423	0.368	0.392	0.382	0.430	0.604	0.477	0.708	0.850	0.760	0.382
GDP Multipliers	**0.976**	**1.027**	**1.051**	**0.776**	**0.915**	**0.839**	**0.657**	**0.748**	**0.850**	**0.964**	**0.746**	**0.864**	**0.976**	**0.909**	**0.659**
HHO	0.628	0.482	0.698	0.479	0.589	0.556	0.355	0.454	0.518	0.499	0.378	0.317	0.320	0.323	0.365
ENT	0.142	0.196	0.147	0.119	0.133	0.118	0.113	0.116	0.131	0.172	0.135	0.188	0.222	0.201	0.112
Income Multipliers	**0.770**	**0.678**	**0.846**	**0.597**	**0.722**	**0.674**	**0.468**	**0.570**	**0.650**	**0.671**	**0.513**	**0.505**	**0.543**	**0.524**	**0.476**

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Table 5: The Multiplier Matrix, M - Continued

Sectors	A_RESH	A_OTBU	A_PUAD	A_EDUS	A_HEAS	A_SEWA	A_MNEC	A_RECS	A_OTSE	A_PRHO	LAB	CAP	HHO	ENT
A_AGRI	0.024	0.014	0.022	0.033	0.026	0.015	0.028	0.019	0.022	0.032	0.032	0.007	0.033	0.003
A_FORE	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000
A_FISH	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.003	0.003	0.001	0.003	0.000
A_CPUM	0.003	0.002	0.005	0.004	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.001	0.004	0.000
A_MING	0.001	0.001	0.002	0.001	0.001	0.006	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000
A_FOOD	0.049	0.035	0.048	0.061	0.056	0.036	0.072	0.045	0.049	0.071	0.071	0.016	0.072	0.008
A_TABA	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.000
A_TEXT	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.002	0.002	0.000	0.002	0.000
A_FURS	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.002	0.002	0.000	0.002	0.000
A_LETH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_WOOD	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.000
A_PAPE	0.003	0.002	0.003	0.005	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.003	0.000
A_PRME	0.013	0.019	0.015	0.026	0.012	0.022	0.017	0.015	0.016	0.014	0.014	0.003	0.014	0.001
A_PEMP	0.013	0.010	0.018	0.018	0.017	0.015	0.013	0.011	0.015	0.017	0.017	0.004	0.017	0.002
A_CHIM	0.025	0.014	0.026	0.028	0.104	0.062	0.029	0.024	0.034	0.027	0.027	0.006	0.028	0.003
A_RUBB	0.004	0.003	0.005	0.004	0.010	0.010	0.005	0.003	0.004	0.004	0.004	0.001	0.004	0.000
A_NOME	0.003	0.002	0.008	0.004	0.003	0.015	0.005	0.004	0.003	0.004	0.004	0.001	0.004	0.000
A_BAME	0.001	0.001	0.002	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000
A_MEMA	0.003	0.003	0.007	0.007	0.004	0.007	0.003	0.003	0.003	0.004	0.004	0.001	0.004	0.000
A_MAEQ	0.003	0.002	0.003	0.003	0.002	0.004	0.003	0.002	0.003	0.003	0.003	0.001	0.003	0.000
A_OFMA	0.005	0.003	0.006	0.007	0.003	0.007	0.004	0.005	0.004	0.004	0.004	0.001	0.004	0.000
A_ELMA	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.000	0.002	0.000
A_RATV	0.006	0.004	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.005	0.005	0.001	0.005	0.001
A_MEDI	0.003	0.002	0.003	0.005	0.022	0.003	0.003	0.002	0.002	0.002	0.002	0.000	0.002	0.000
A_MOTO	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.001	0.003	0.000
A_OTTR	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_RECY	0.003	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A_ELGA	0.026	0.021	0.036	0.045	0.024	0.038	0.024	0.028	0.030	0.025	0.025	0.006	0.025	0.003
A_WATE	0.001	0.000	0.001	0.001	0.001	0.002	0.008	0.001	0.001	0.001	0.001	0.000	0.001	0.000
A_CONS	0.011	0.012	0.069	0.027	0.010	0.029	0.014	0.012	0.012	0.012	0.012	0.003	0.012	0.001
A_TRAD	0.005	0.004	0.005	0.004	0.003	0.008	0.005	0.004	0.006	0.004	0.004	0.001	0.004	0.000
A_WHSL	0.009	0.012	0.010	0.011	0.009	0.014	0.011	0.008	0.009	0.008	0.008	0.002	0.008	0.001
A_RETS	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.000	0.002	0.000
A_HORE	0.049	0.043	0.053	0.064	0.054	0.039	0.056	0.043	0.050	0.068	0.068	0.016	0.069	0.007
A_LATR	0.020	0.016	0.035	0.022	0.019	0.051	0.018	0.014	0.020	0.019	0.019	0.004	0.020	0.002
A_WATR	0.001	0.001	0.002	0.001	0.001	0.012	0.002	0.002	0.001	0.002	0.002	0.000	0.002	0.000
A_AITR	0.012	0.015	0.010	0.017	0.010	0.011	0.013	0.010	0.011	0.010	0.010	0.002	0.011	0.001
A_OTTRS	0.031	0.030	0.024	0.031	0.025	0.039	0.034	0.025	0.032	0.034	0.034	0.008	0.034	0.004
A_POTL	0.044	0.051	0.051	0.046	0.030	0.053	0.058	0.039	0.049	0.038	0.038	0.009	0.039	0.004
A_FISE	0.061	0.061	0.057	0.053	0.041	0.082	0.099	0.065	0.066	0.050	0.050	0.011	0.051	0.005
A_INSE	0.032	0.028	0.028	0.041	0.031	0.047	0.029	0.030	0.034	0.036	0.036	0.008	0.036	0.004
A_OFISE	0.025	0.021	0.013	0.017	0.013	0.019	0.017	0.014	0.017	0.016	0.016	0.004	0.016	0.002
A_REES	0.089	0.066	0.151	0.107	0.090	0.062	0.081	0.089	0.110	0.122	0.122	0.028	0.124	0.013
A_RESE	0.010	0.010	0.009	0.009	0.006	0.038	0.012	0.015	0.022	0.008	0.008	0.002	0.008	0.001
A_COSE	0.041	0.044	0.039	0.019	0.022	0.077	0.050	0.022	0.032	0.011	0.011	0.003	0.011	0.001
A_RESH	1.011	0.002	0.002	0.002	0.002	0.005	0.002	0.001	0.001	0.001	0.001	0.000	0.001	0.000
A_OTBU	0.071	1.136	0.064	0.047	0.044	0.096	0.092	0.055	0.060	0.029	0.030	0.007	0.030	0.003
A_PUAD	0.006	0.015	1.009	0.004	0.004	0.004	0.004	0.007	0.005	0.003	0.003	0.001	0.004	0.000
A_EDUS	0.029	0.014	0.023	1.061	0.033	0.016	0.021	0.017	0.022	0.032	0.032	0.007	0.033	0.004
A_HEAS	0.026	0.015	0.021	0.029	1.238	0.020	0.023	0.018	0.028	0.034	0.034	0.008	0.035	0.004
A_SEWA	0.009	0.006	0.010	0.008	0.007	1.367	0.009	0.009	0.014	0.006	0.006	0.001	0.006	0.001
A_MNEC	0.006	0.006	0.006	0.008	0.007	0.004	1.084	0.019	0.008	0.009	0.009	0.002	0.010	0.001
A_RECS	0.014	0.012	0.018	0.036	0.014	0.016	0.096	1.098	0.017	0.019	0.019	0.004	0.019	0.002
A_OTSE	0.009	0.007	0.006	0.015	0.007	0.032	0.017	0.009	1.048	0.008	0.008	0.002	0.008	0.001
A_PRHO	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	1.001	0.001	0.000	0.001	0.000
Output Multipliers	**1.823**	**1.776**	**1.944**	**1.957**	**2.038**	**2.414**	**2.091**	**1.817**	**1.891**	**1.823**	**0.823**	**0.188**	**0.834**	**0.089**
LAB	0.701	0.370	0.616	0.924	0.771	0.376	0.624	0.471	0.711	1.154	0.001	0.000	0.001	0.000
CAP	0.276	0.422	0.392	0.255	0.337	0.344	0.306	0.528	0.355	0.231	1.155	0.036	0.157	0.017
GDP Multipliers	**0.977**	**0.792**	**1.008**	**1.178**	**1.108**	**0.720**	**0.930**	**0.999**	**1.066**	**1.385**	**1.157**	**0.036**	**0.159**	**0.017**
HHO	0.765	0.467	0.707	0.983	0.849	0.455	0.695	0.592	0.793	1.208	0.230	1.053	0.233	0.025
ENT	0.107	0.127	0.132	0.113	0.126	0.107	0.111	0.159	0.128	0.120	1.209	0.276	1.225	0.131
Income Multipliers	**0.872**	**0.593**	**0.838**	**1.096**	**0.975**	**0.562**	**0.806**	**0.751**	**0.921**	**1.328**	**1.439**	**1.329**	**1.458**	**0.156**

Sector listing and labelling can be found in appendix A 1

N_3 divided by the elements of the total multiplier matrix, removing the initial injection, M-I, represent the additional effects on top of the I-O multiplier effects due to including the wider range of inter-relationships in the economy. The same pattern can be observed for the other two industries presented in Table 6, with net SAM linkages of 24.6 percent and 29.5 percent, respectively. Consequently, most of the multiplier effects for all those two industries come from the input-output linkages.

Considering the linkage structure shown in the SAM, an exogenous injection of an extra €100 million of revenue arising from additional exports of the specific product produced by each activity generates additional output of €108.6 million and €100.9 million when the injection occurs in the agricultural and food processing industries, respectively, and of €59.7 million in the chemical industry. Factors, labour and capital, gain €106.4 million when the injection occurs in the agricultural activity, and €74.7 million and €60.5 million for manufacture of food and beverages and chemical sector, respectively. The major factor beneficiary in all cases is capital with over 60 percent of the total factor gain. Additional household income of €42.1 million and €36.6 million is gained when the injection is into the agricultural and manufacture of food sectors, respectively, and only €25.9 million when we consider the injection in the chemicals products and man-made fibres sector, after taking into account the within-account transfer, spill-over and feedback effects.

5.3 Employment Multipliers

Table 7 presents the employment multipliers for the 55 sectors defined in the social accounting matrix. We define a vector of total employment by industry E of order 55, such that e is the 55 order vector of labour coefficients, with $e_j = E_j/X_j$. The change in employment for a particular industry is equal to the change in employment multiplied by the SAM multiplier matrix, $\mathbf{M}$, $E = \mathbf{M}e_j$. The employment multipliers measure the employment generated directly, indirectly and induced in the economy when there is an increase in exogenous demand for output. Like the output, GDP and income multipliers, the employment multipliers are demand driven. Employment figures are taken from the Census of Industrial Production, (2005b), Annual Services Inquiry, (2005a) and the Annual Review and Outlook for Agriculture and Food, (2007).

The first column shows the number of jobs in the sector supported per €1 million of output, obtained by dividing total sector employment by total sector output and multiplying by €1 million, vector e. The second column provides total employment created per €1 million of additional final demand in that sector. There is substantial variation between sectors from as high as 25 employees per million of euro to as low as 3.5 employees per million of euro. The agriculture sector generates one of the largest effects in employment, with a multiplier of 25. In the chemical sector the effect is the smallest of all with a multiplier of only 3.5. However, these multipliers make the strong assumption that the additional employment created by a marginal increase in final demand is the same as the average employment intensity in each sector. This assumption does not allow for the possibility that there may be underemployment in some sectors, for example, agriculture.

Table 6: Selected multiplier effects from the Irish SAM (injections of €100 million of income)

Sectors	A_AGRI	M	N_1	N_2	N_3	Net SAM linkages(%)	A_FOOD I	M	N_1	N_2	N_3	Net SAM linkages (%)	A_CHIM I	M	N_1	N_2	N_3	Net SAM linkages(%)
A_AGRI	100	27.10	25.98	0.00	1.12	4.13		25.83	24.86	0.00	0.97	3.76		0.86	0.17	0.00	0.69	80.50
A_FORE		0.05	0.02	0.00	0.03	67.38		0.05	0.02	0.00	0.03	58.87		0.03	0.01	0.00	0.02	72.76
A_FISH		0.19	0.10	0.00	0.09	48.42		0.84	0.77	0.00	0.08	9.33		0.06	0.01	0.00	0.06	90.59
A_CPUM		0.37	0.25	0.00	0.12	33.41		0.27	0.17	0.00	0.11	39.29		0.13	0.06	0.00	0.08	56.99
A_MING		0.50	0.46	0.00	0.03	6.61		0.16	0.13	0.00	0.03	17.61		0.09	0.07	0.00	0.02	22.63
A_FOOD		16.21	13.72	0.00	2.48	15.33	100	13.43	11.27	0.00	2.16	16.08		2.03	0.50	0.00	1.53	75.53
A_TABA		0.08	0.00	0.00	0.08	99.53		0.07	0.00	0.00	0.07	99.74		0.05	0.00	0.00	0.05	99.55
A_TEXT		0.10	0.03	0.00	0.07	70.92		0.07	0.01	0.00	0.06	81.04		0.06	0.01	0.00	0.04	75.14
A_FURS		0.08	0.00	0.00	0.07	95.10		0.07	0.00	0.00	0.06	96.64		0.05	0.00	0.00	0.05	95.37
A_LETH		0.01	0.00	0.00	0.01	77.92		0.01	0.00	0.00	0.01	82.21		0.01	0.00	0.00	0.01	78.90
A_WOOD		0.19	0.11	0.00	0.08	42.06		0.22	0.14	0.00	0.07	32.98		0.08	0.03	0.00	0.05	61.06
A_PAPE		0.24	0.16	0.00	0.09	35.46		0.68	0.60	0.00	0.07	10.99		0.20	0.15	0.00	0.05	26.15
A_PRME		0.68	0.20	0.00	0.47	69.66		0.66	0.25	0.00	0.41	61.72		0.61	0.32	0.00	0.29	47.13
A_PEMP		1.79	1.21	0.00	0.58	32.42		1.17	0.67	0.00	0.50	42.87		0.50	0.14	0.00	0.36	71.21
A_CHIM		10.97	10.01	0.00	0.95	8.69		4.60	3.77	0.00	0.83	18.00	100	11.37	10.78	0.00	0.59	5.16
A_RUBB		0.39	0.24	0.00	0.15	38.91		0.67	0.53	0.00	0.13	19.81		0.26	0.16	0.00	0.09	36.17
A_NOME		0.50	0.37	0.00	0.12	25.05		0.37	0.26	0.00	0.11	29.44		0.16	0.08	0.00	0.08	48.85
A_BAME		0.22	0.19	0.00	0.04	16.13		0.21	0.18	0.00	0.03	14.71		0.06	0.04	0.00	0.02	34.67
A_MEMA		1.26	1.12	0.00	0.14	11.29		0.70	0.57	0.00	0.12	17.73		0.21	0.12	0.00	0.09	42.07
A_MAEQ		0.80	0.71	0.00	0.09	11.32		0.35	0.27	0.00	0.08	22.63		0.21	0.15	0.00	0.06	27.07
A_OFMA		0.20	0.07	0.00	0.13	65.23		0.19	0.08	0.00	0.11	59.21		0.18	0.10	0.00	0.08	44.58
A_ELMA		0.13	0.06	0.00	0.07	52.23		0.11	0.05	0.00	0.06	53.47		0.08	0.03	0.00	0.04	55.03
A_RATV		0.25	0.08	0.00	0.17	67.86		0.24	0.09	0.00	0.15	63.23		0.18	0.08	0.00	0.11	57.11
A_MEDI		0.18	0.11	0.00	0.07	40.32		0.12	0.06	0.00	0.06	53.26		0.16	0.11	0.00	0.05	28.95
A_MOTO		0.14	0.02	0.00	0.12	87.08		0.12	0.01	0.00	0.10	87.91		0.08	0.01	0.00	0.07	91.67
A_OTTR		0.02	0.01	0.00	0.01	53.04		0.03	0.02	0.00	0.01	35.19		0.02	0.01	0.00	0.01	46.41
A_RECY		0.03	0.03	0.00	0.01	18.65		0.08	0.08	0.00	0.01	6.37		0.01	0.01	0.00	0.00	29.75
A_ELGA		3.05	2.19	0.00	0.86	28.13		2.70	1.96	0.00	0.75	27.60		1.37	0.84	0.00	0.53	38.64
A_WATE		0.15	0.13	0.00	0.02	13.00		0.12	0.10	0.00	0.02	13.77		0.13	0.12	0.00	0.01	9.07
A_CONS		1.99	1.56	0.00	0.42	21.29		0.95	0.59	0.00	0.37	38.59		0.45	0.19	0.00	0.26	57.38
A_TRAD		0.51	0.37	0.00	0.13	26.49		0.30	0.18	0.00	0.12	39.33		0.15	0.07	0.00	0.08	54.37
A_WHSL		1.03	0.76	0.00	0.28	26.71		1.80	1.56	0.00	0.24	13.33		0.82	0.65	0.00	0.17	20.79
A_RETS		0.08	0.02	0.00	0.06	72.46		0.13	0.08	0.00	0.05	38.77		0.06	0.03	0.00	0.04	55.12
A_HORE		3.26	0.88	0.00	2.38	73.08		3.19	1.12	0.00	2.07	64.96		2.01	0.54	0.00	1.47	73.10
A_LATR		1.35	0.67	0.00	0.68	50.19		3.12	2.53	0.00	0.59	18.85		0.68	0.26	0.00	0.42	61.18
A_WATR		0.08	0.03	0.00	0.05	67.39		0.11	0.07	0.00	0.05	40.30		0.05	0.02	0.00	0.03	60.41
A_AITR		0.57	0.21	0.00	0.36	63.60		0.92	0.60	0.00	0.32	34.45		0.77	0.54	0.00	0.22	29.35
A_OTTRS		1.42	0.23	0.00	1.18	83.57		1.55	0.53	0.00	1.03	66.10		1.09	0.36	0.00	0.73	66.83
A_POTL		2.47	1.13	0.00	1.33	54.05		2.44	1.28	0.00	1.16	47.55		1.69	0.87	0.00	0.82	48.64
A_FISE		6.19	4.45	0.00	1.75	28.22		5.79	4.27	0.00	1.52	26.22		3.27	2.19	0.00	1.08	32.94
A_INSE		3.13	1.89	0.00	1.24	39.57		2.32	1.25	0.00	1.08	46.36		1.61	0.85	0.00	0.76	47.37
A_OFISE		1.22	0.65	0.00	0.57	46.52		1.32	0.83	0.00	0.49	37.16		0.89	0.54	0.00	0.35	39.08
A_REES		4.83	0.57	0.00	4.26	88.15		4.12	0.42	0.00	3.70	89.85		2.95	0.33	0.00	2.62	88.88
A_RESE		0.55	0.28	0.00	0.27	49.80		0.68	0.44	0.00	0.24	35.29		0.39	0.22	0.00	0.17	43.03
A_COSE		1.17	0.78	0.00	0.39	33.00		1.73	1.40	0.00	0.34	19.33		3.59	3.35	0.00	0.24	6.62
A_RESH		0.15	0.11	0.00	0.03	23.69		0.13	0.10	0.00	0.03	23.82		0.82	0.79	0.00	0.02	2.64
A_OTBU		4.69	3.66	0.00	1.03	21.88		10.70	9.81	0.00	0.89	8.33		15.79	15.16	0.00	0.63	4.00
A_PUAD		1.09	0.97	0.00	0.12	11.12		0.54	0.43	0.00	0.11	19.56		0.33	0.26	0.00	0.07	22.52

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Table 6: Selected multiplier effects from the Irish SAM (injections of €100 million of income) – Continued

Sectors	A_AGRI M	N_1	N_2	N_3	Net SAM linkages(%)	A_FOOD I M	N_1	N_2	N_3	Net SAM linkages (%)	A_CHIM I M	N_1	N_2	N_3	Net SAM linkages(%)
A_EDUS	1.17	0.04	0.00	1.12	96.19	1.02	0.04	0.00	0.98	96.02	0.74	0.05	0.00	0.69	93.04
A_HEAS	3.44	2.26	0.00	1.19	34.50	1.59	0.56	0.00	1.03	64.92	0.97	0.24	0.00	0.73	75.38
A_SEWA	0.39	0.19	0.00	0.20	51.53	0.61	0.43	0.00	0.18	28.83	0.28	0.16	0.00	0.12	44.24
A_MNEC	0.57	0.24	0.00	0.33	58.11	0.37	0.08	0.00	0.29	77.69	0.24	0.04	0.00	0.20	84.21
A_RECS	0.87	0.22	0.00	0.66	75.17	0.77	0.20	0.00	0.57	74.34	0.53	0.13	0.00	0.40	75.48
A_OTSE	0.51	0.24	0.00	0.27	52.32	0.58	0.35	0.00	0.23	39.95	0.26	0.10	0.00	0.17	63.41
A_PRHO	0.05	0.00	0.00	0.05	99.93	0.04	0.00	0.00	0.04	99.79	0.03	0.00	0.00	0.03	99.56
LAB	22.96	0.00	17.56	5.41		25.19	0.00	20.49	4.70		15.61	0.00	12.28	3.33	
CAP	83.41	0.00	75.42	8.00		49.51	0.00	42.56	6.95		44.91	0.00	39.99	4.92	
HHO	42.06	0.00	34.82	7.24		36.54	0.00	30.25	6.29		25.90	0.00	21.44	4.46	
ENT	22.37	0.00	20.06	2.31		13.89	0.00	11.88	2.01		12.22	0.00	10.79	1.42	
Output Multipliers	108.65	80.00	0.00	28.64	26.37	100.95	76.07	0.00	24.88	24.65	59.69	42.05	0.00	17.63	29.54
GDP Multipliers	106.38	0.00	92.97	13.40		74.70	0.00	63.06	11.64		60.52	0.00	52.27	8.25	
Income Multipliers	64.44	0.00	54.88	9.56		50.43	0.00	42.13	8.30		38.11	0.00	32.23	5.88	

Sector listing and labelling can be found in appendix A 1

There is considerable interest among policy makers in asking about the employment effects of switching a certain percentage of household expenditure from imported to domestic goods. The employment effects will depend on the composition of household expenditure and the total employment intensity of each expenditure element. In Table 7, the third column shows the average sectoral share in household spending, and the fourth column provides the average employment multiplier if €1 million is spent on domestically produced goods and services. Consequently, if the household final demand for domestically produced goods increased by one million euro, 10.3 positions for employees would be created in the economy as a whole. From Table 3, we know that total household expenditure on both domestic and imported goods in 2005 was €73,778 million. Thus, switching 5 percentage points of this expenditure to domestic goods would create 38,000 jobs, assuming employment has follow an output change in each sector.

6 Conclusions

This paper describes the construction of an Irish social accounting matrix for the year 2005. To complete this task a wide range of data are used from national accounts to national survey data. The discrepancies and gaps encountered during the 'building' process were fixed through the use of the cross-entropy method, designed to balance the flows of income and expenditure at sectoral level. Despite these adjustments, the information provided by the resulting SAM well reflect the structure of the Irish economy in the base year.

This paper also presents multipliers derived from the 2005 SAM for Ireland. These illustrate the different degrees to which individual economic sectors are embedded within the economy and the strength of the indirect and induced effects of an exogenous increase in the demand for sector output. The results confirm that an expansion in the food and drink industry has greater multiplier effects for the rest of the economy than an expansion of the modern manufacturing sectors, although the differences are not as significant as sometimes supposed. For example, an exogenous increase of €100 million in exports from the food and drink industries would lead to a total increase in output of €200.9 million and additional value added of €74.7 million. A similar increase in the exports of the chemical industry would lead to a total increase in output of €159.6 million and additional value added of €60.5 million. If we focus on household income only, the figures are €36.4 million and €25.9 million, respectively. We have also calculated total employment multipliers which are 10.3 per €1 million of output for the food and drinks industry and 3.5 for the chemical industry. However, much of the employment change attributed to the food industry would show up in the agricultural sector, and particularly for this sector there is reason to doubt that using the average employment intensity to infer employment changes in response to marginal increases in output is valid.

Using the Stone (1985) additive decomposition of the SAM multiplier matrix shows the relative importance of traditional I-O type multipliers compared to the added contribution made by taking into account the re-spending effect of additional income by and between the institutions. These effects are always less important than the traditional I-O multiplier, but are nonetheless significant. They increase the size of the traditional input-output multipliers by around one-quarter.

In a separate experiment, we investigate the jobs impact of a switch in household expenditure from imported to domestically-produced goods and services. We estimate that switching an average of 5 percentage points of household expenditure would create 38,000 jobs. We stress again that the SAM model from which these multipliers are derived is based on rather stringent assumptions.

Table 7: Employment Multipliers

Sectors	Direct employment coefficient per €1 million domestic output (No.)	Total employment created per €1 million domestic output (No.)	Average sectoral shares in household spending (%)	Average employment multiplier per basket of €1 million spent on domestically produced goods and services (units)
A_AGRI	17.1	25.2	1.4	0.363
A_FORE	6.0	15.8	0.1	0.009
A_FISH	4.7	8.2	0.3	0.023
A_CPUM	3.5	7.6	0.4	0.028
A_MING	4.6	10.8	0.0	0.000
A_FOOD	2.6	10.5	9.7	1.017
A_TABA	1.7	6.7	2.6	0.175
A_TEXT	7.4	11.0	0.8	0.090
A_FURS	10.0	13.1	3.8	0.503
A_LETH	9.3	13.0	0.7	0.096
A_WOOD	5.6	11.0	0.2	0.018
A_PAPE	5.6	9.6	0.6	0.061
A_PRME	1.2	4.6	1.5	0.069
A_PEMP	3.2	6.4	7.7	0.489
A_CHIM	0.8	3.5	2.3	0.081
A_RUBB	6.0	10.2	0.9	0.087
A_NOME	4.6	9.1	0.4	0.033
A_BAME	3.2	6.5	0.0	0.000
A_MEMA	6.1	9.8	0.4	0.035
A_MAEQ	5.4	9.1	0.6	0.057
A_OFMA	1.0	4.4	0.4	0.016
A_ELMA	4.7	8.4	0.4	0.030
A_RATV	1.8	4.5	0.6	0.028
A_MEDI	4.4	8.0	0.1	0.011
A_MOTO	5.7	9.2	5.1	0.464
A_OTTR	10.2	14.2	0.1	0.010
A_RECY	5.0	9.1	0.0	0.000
A_ELGA	2.2	5.4	1.9	0.102
A_WATE	8.7	13.8	0.0	0.003
A_CONS	5.9	11.8	0.4	0.044
A_TRAD	15.2	18.9	0.4	0.070
A_WHSL	6.0	8.8	0.0	0.000
A_RETS	21.4	25.5	0.2	0.043
A_HORE	13.3	19.0	10.9	2.082
A_LATR	7.6	11.9	1.6	0.195
A_WATR	10.6	17.2	0.1	0.018
A_AITR	1.4	5.7	0.7	0.039
A_OTTRS	4.4	11.3	3.4	0.381
A_POTL	4.2	8.9	3.6	0.321
A_FISE	2.1	5.7	2.8	0.159
A_INSE	2.5	6.7	3.6	0.240
A_OFISE	2.8	6.2	0.9	0.056
A_REES	1.3	3.8	15.3	0.586
A_RESE	1.7	4.5	0.7	0.031
A_COSE	2.3	6.5	0.0	0.000
A_RESH	2.2	6.6	0.0	0.000
A_OTBU	6.6	10.6	0.5	0.054
A_PUAD	9.1	13.8	0.1	0.014
A_EDUS	16.1	21.7	3.8	0.823
A_HEAS	11.8	18.6	3.5	0.649
A_SEWA	0.0	5.4	0.4	0.020
A_MNEC	0.0	5.6	1.0	0.059
A_RECS	8.1	12.4	2.2	0.273
A_OTSE	20.8	25.9	0.9	0.242
A_PRHO	0.0	4.6	0.2	0.009
Total				**10.308**

Sector listing and labelling can be found in appendix A 1

The most important are that the economy is demand-constrained and that supply can respond elastically to additional increases in demand, and that the marginal employment effects are similar in size to average employment intensities. At least the first of these assumptions is now more realistic than would have been the case at the height of the Celtic Tiger.

The current SAM can be used as the basis for further analysis. One direction to pursue is further disaggregation of particular sectors of policy interest. In our own work, we intend to proceed with a disaggregation of the agricultural and food sectors for the purposes of agricultural policy analysis. Another direction is to use this SAM as the basis for a CGE model of the Irish economy. The SAM can be made available in an Excel workbook to be used for this purpose on request.

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Appendix

Table A 1: SAM Sector listing and labelling

SAM Sectors	LABEL	
	Activities	Commodities
Products of agriculture, hunting and related services	A_AGRI	C_AGRI
Products of forestry, logging and related services	A_FORE	C_FORE
Fish and other fishing products; services incidental of fishing	A_FISH	C_FISH
Coal, peat, petroleum and metal ore extraction	A_CPUM	C_CPUM
Other mining and quarrying products	A_MING	C_MING
Food products and beverages	A_FOOD	C_FOOD
Tobacco products	A_TABA	C_TABA
Textiles	A_TEXT	C_TEXT
Wearing apparel; furs	A_FURS	C_FURS
Leather and leather products	A_LETH	C_LETH
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	A_WOOD	C_WOOD
Pulp, paper and paper products	A_PAPE	C_PAPE
Printed matter and recorded media	A_PRME	C_PRME
Petroleum and other manufacturing products	A_PEMP	C_PEMP
Chemicals, chemical products and man-made fibers	A_CHIM	C_CHIM
Rubber and plastic products	A_RUBB	C_RUBB
Other non-metallic mineral products	A_NOME	C_NOME
Basic metals	A_BAME	C_BAME
Fabricated metal products, except machinery and equipment	A_MEMA	C_MEMA
Machinery and equipment n.e.c.	A_MAEQ	C_MAEQ
Office machinery and computers	A_OFMA	C_OFMA
Electrical machinery and apparatus n.e.c.	A_ELMA	C_ELMA
Radio, television and communication equipment and apparatus	A_RATV	C_RATV
Medical, precision and optical instruments, watches and clocks	A_MEDI	C_MEDI
Motor vehicles, trailers and semi-trailers	A_MOTO	C_MOTO
Other transport equipment	A_OTTR	C_OTTR
Secondary raw materials	A_RECY	C_RECY
Electrical energy, gas, steam and hot water	A_ELGA	C_ELGA
Collected and purified water, distribution services of water	A_WATE	C_WATE
Construction work	A_CONS	C_CONS
Trade, maintenance and repair services of motor vehicles and motorcycles; retail sale of automotive fuel	A_TRAD	C_TRAD
Wholesale trade and commission trade services, except of motor vehicles and motorcycles	A_WHSL	C_WHSL
Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods	A_RETS	C_RETS
Hotel and restaurant services	A_HORE	C_HORE
Land transport; transport via pipeline services	A_LATR	C_LATR
Water transport services	A_WATR	C_WATR
Air transport services	A_AITR	C_AITR
Supporting and auxiliary transport services; travel agency services	A_OTTR	C_OTTR
Post and telecommunication services	A_POTL	C_POTL
Financial intermediation services, except insurance and pension funding services	A_FISE	C_FISE
Insurance and pension funding services, except compulsory social security services	A_INSE	C_INSE
Services auxiliary to financial intermediation	A_OFISE	C_OFISE
Real estate services	A_REES	C_REES
Renting services of machinery and equipment without operator and of personal and household goods	A_RESE	C_RESE
Computer and related services	A_COSE	C_COSE
Research and development services	A_RESH	C_RESH
Other business services	A_OTBU	C_OTBU

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Table A 1 – Continued

SAM Sectors	LABEL	
	Activities	Commodities
Public administration and defence services; compulsory social security services	A_PUAD	C_PUAD
Education services	A_EDUS	C_EDUS
Health and social work services	A_HEAS	C_HEAS
Sewage and refuse disposal services, sanitation and similar services	A_SEWA	C_SEWA
Membership organisation services n.e.c.	A_MNEC	C_MNEC
Recreational, cultural and sporting services	A_RECS	C_RECS
Other services	A_OTSE	C_OTSE
Private households with employed persons	A_PRHO	C_PRHO
Labour	LAB	
Capital	CAP	
Households	HHO	
Enterprises	ENT	

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