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ESTIMATES OF OUTPUT, INCOME, VALUE ADDED AND EMPLOYMENT MULTIPLIERS FOR THE MALTESE ECONOMY

Ian P. Cassar[1]

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Corresponding author's email address: *ian.p.cassar@um.edu.mt*

Abstract

The study presents the first published estimates of industry specific multipliers which are derived utilizing a highly disaggregated symmetric input-output table for the Maltese Economy for 2008 which adheres to Eurostat System of National and Regional Accounts (1995). The application of selected input-output models, which are a deterministic class of models, to the symmetric input-output table allows for the estimation of industry specific multipliers. The aim of this study is to derive output, income, value added and employment multipliers at highly disaggregated industry level to study how an exogenous shock to the final demand of each of these industries would affect the Maltese economy. Both the open and the closed Leontief demand driven model (with respective to households) are utilized to derive type I and type II multipliers with which to undertake a comparative analysis of the direct, indirect and induced effects in terms of the income, output, value added and employment generation for each industry within the Maltese Economy.

JEL Classification: C67, D57.

Keywords: Input-output analysis, Output multipliers, Income Multipliers, Value added Multipliers, Employment multipliers, Malta.

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1. Introduction

This study[2] aims to derive and analyse a number of selected industry specific multipliers based on the input-output methodological framework which portrays, at a highly disaggregated industry level, how an increase in final demand to each of these industries could potentially affect the Maltese economy. A significant advantage of utilizing input-output methodology is that the resulting multipliers incorporate not only the direct effects, but also the indirect and the induced effects on the economy as a result of an exogenous shock to one of the components of final demand. Input-output multipliers are principally underpinned by the interrelations between production sectors. Their strength or weakness strongly influences sectoral growth which in turn has a significant impact on the overall economic activity.

This study presents the derivation and analysis of both type I and type II output (production), income (income-output), value added (value added-output) and employment (employment-output) multipliers. The analysis conducted within this study is based on techniques which have their foundation in the input-output methodology originally put forward by economist Wassily Leontief for which he was later awarded a Nobel Prize in economics in 1973[3]. Since then there have been numerous theoretical and empirical studies on the various aspects of multiplier linkages analysis within the input-output literature [4]. Over the years input-output analysis has grown into one of the most widely accepted methods of economic planning and decision making. There have been only a few studies[5] on the Maltese economy conducted via the application of input-output analysis and the majority of these studies been conducted with the aim to assess the impact of tourism[6] on the Maltese economy. However, these studies either utilize input-output tables which are not highly disaggregated, or which have missing components, or which do not comply with either the Eurostat System of National and Regional Accounts published in 1995 (ESA 95) or with the Eurostat methodological guidelines for the construction of a symmetric input-output table (SIOT).

[2] This study is in part based on the methodology also applied by the author in Cassar (2013).

[3] Refer to Leontief (1941).

[4] Refer to Blair and Wyckoff (1989) and Drejer (2002).

[5]Refer to Bonnici (1980), Bonnici (1983) and Gravino (2012).

[6] Refer to Briguglio (1992) and Blake et.al.(2003b)

2. Data and Methodology

The application of input-output techniques requires the utilization of symmetric input-output table (SIOT). An SIOT is an observed dataset illustrating the inter-industry transactions for a specific geographic region measured for a particular time period (usually one year) and which is generally recorded in monetary terms. The multipliers derived in this analysis are based on an industry-by-industry SIOT for the reference year of 2008 which was constructed by transforming the most recent set of supply and use tables for the Maltese Economy into a SIOT by following the fixed product sales assumption transformation model which follows the Eurostat Manual of Supply, Use and Input-Output Tables published in 2008. The SIOT was derived from the supply and use tables for the year 2008, published by the National Statistics Office of Malta in 2013. The supply and use tables were compiled according to the concepts and definitions of the ESA 95. The resulting SIOT for Malta for 2008 has a 59 industry level of disaggregation which follows in large part the classification according to the European Statistical Classification of Economic Activates (NACE)[7] Rev.2.

An input-output table records the economy's inter-industry transactions via the disaggregation of the economic activity into 'n' sectors or industries representing the various producing sectors of the economy. The core data required to populate the Leontief demand driven model essentially consist of the flows of products from each of the 'n' producing sectors to each of the 'n' sectors purchasing input requirements in order to undertake the production of output. The flow of products amongst the 'n' producing sectors of the economy is what is referred to as inter-industry flows (or transactions). The input-output table is therefore a data-set which essentially traces the monetary values of the numerous transactions amongst the pairs of sectors (for each sector 'i' to each sector 'j') for a given year. These recorded transfer payments portray a set of systematic relations which may then be represented as a large set of linear equations. Each of these linear equations ultimately illustrates the distribution of each industry's output throughout the whole of the economy.

The basic Leontief demand driven model presented within this study follows the methodology presented within Miller and Blair (2009). This model may be defined as a fixed price general static equilibrium model which describes the interrelations between industries taking into account the technical relations throughout the economy via fixed-coefficient production functions. At the core of the Leontief demand driven model is the concept of

[7] The European Statistical Classification of Economic Activates (NACE) Rev 2, disaggregated to a 59 industry level is presented in Appendix A.

technical coefficients denoted by 'a_{ij}'. Technical coefficients are a measure of the fixed relationships between a sector's output and its inputs. They describe the amount of input 'i' needed by sector 'j' to produce a unit of good 'j' such that, to produce 'x_j' units of good 'j', one would require '$a_{ij}x_j$' units of input 'i'. From this definition it follows that:

$$a_{ij} = \frac{z_{ij}}{X_j}; \quad i, j = 1,\ldots,n$$

Technical coefficients show, for each industry in the economy, the proportional value of inputs purchased from all sectors in the economy (including itself) per monetary unit of output. Leontief (1936) describes these fixed technical coefficients as constituting a "recipe" of production for each industry's output. Following the above definition of a technical co-efficient it is possible to construct a matrix of technical coefficients (denoted by matrix A) representing the structure of production of this economy. The columns of the technical coefficients matrix show the production functions of each productive sector within this economy. Once the matrix of technical coefficients has been derived it is then possible to compute the solution to the (open) Leontief demand driven model which is specified as:

$$X = (I - A)^{-1}Y$$

The solution to the input-output system implies that, given the Leontief Inverse matrix, the amount of total output (X) produced is determined solely by the structure of final demand (Y). The key component necessary for the derivation of the industry specific multiplier is thus the Leontief Inverse matrix (L) denoted by:

$$L = (I - A)^{-1} = [l_{ij}]$$

The elements within the Leontief inverse matrix (also known as multiplier matrix) incorporate the notion that increases in final demand have a larger impact, on the overall production of output, than solely the initial output produced (direct effects) required to supply the increase in final demand. The Leontief inverse incorporates the concept that the production process required to produce a unit of output for use by final demand, also requires the production of output by other industries for use as intermediate inputs. Furthermore, the production of these additional intermediate inputs requires subsequent increased rounds of production since output has to be produced to satisfy the second round of input requirements. All these

rounds of additional increases in output are referred to as the indirect effects of an exogenous increase in final demand on total output production.

The multipliers obtained from the open Leontief demand driven model are referred to as type I multipliers, since they reflect only direct and indirect effects on production caused by exogenous changes to final demand and omit the notion that increased production requires more labour input which in turn increases household income which further increases demand and consequently production. Households are thus not included within the matrix of technical coefficients (A), but are considered to form part of final demand (Y). Within input-output literature, type II output multipliers are generally referred to as the multipliers which are obtained from a closed Leontief demand driven model. The term closed relates to the fact that the technical coefficients matrix is closed with respect to households. The closed Leontief demand driven model is derived from a SIOT and its application entails endogenizing the behaviour of households within the economic system. These multipliers capture the inter-relationships between revenue, income, and expenditure flows made by households and the productive sector. The resultant multipliers also include the induced effects relating to the additional impact on domestic production caused by the demand for goods and services made by households induced through the additional income which is obtained via the production of the new output originally associated with the initial exogenous shock to final demand.

Solving the closed Leontief demand driven model for the household augmented technical coefficients matrix would generate a Leontief inverse matrix of dimension (n+1) x (n+1) in which each element would now capture the direct, indirect as well as the induced effects in output production caused by an increase in exogenous final demand:

$$\tilde{X} = (I_{n+1} - \tilde{A})^{-1}\tilde{Y}$$

Such that the corresponding Leontief inverse matrix for the closed Leontief model is specified as:

$$\tilde{L} = (I_{n+1} - \tilde{A})^{-1} = [\tilde{l}_{ij}]$$

The difference between type I multipliers derived from the open Leontief demand driven model and the type II multipliers derived from the closed Leontief demand driven model is

the induced effects which are caused by the added endogeneity of household behaviour. The induced multiplier effects on the production activities of the 'n' sectors may be captured and assessed individually via the computation of the difference between the truncated Leontief multiplier matrix which may be derived from the above equation and the Leontief multiplier matrix where households are treated as exogenous. Since the truncated household endogenized multiplier matrix and the SIOT type I multiplier matrix are of the same (n x n) dimension it would be possible to derive the induced multiplier effects for sector 'j' as the column summation of the derived matrix of the induced effects.

One of the main factors which has a significant role in determining the overall magnitude of the derived type I multipliers relates to the relative share of leakages from the domestic inter-industry system in terms of import use, labour use or even total primary inputs use as a share of the total input requirements for each industry. Given that Malta is a small open economy, of great significance to the relative magnitude of the multipliers for each industry is the extent of import use as a share of total input requirements per sector. The higher the import content within the production process of a sector the smaller the magnitude of the resulting multipliers for that sector will be. Additionally since we will also be deriving the type II multipliers, another factor which will have a significant impact in determining the size of these multipliers relates to the consumption pattern of households. The larger the share of household income that is spent on consumption expenditure rather than being leaked out of the system via, for example savings or taxation, the larger the induced effects would be.

Oosterhaven, Peik and Stedler (1986) assert that a realistic estimate of the true direct and indirect effects of an increase in final demand on output, income and employment generally lies roughly half way between the type I and type II multipliers. This statement is motivated by the suggestion that type I multipliers probably underestimate economic impacts given that they omit household and factor income activities, and that on other hand type II multipliers probably overestimate these impacts due to the rigid assumptions regarding the behaviour of household income-expenditure patterns.

3. Type I and type II output multipliers

An output multiplier for a given sector ‘j’ may be defined as the total value of production in all sectors of the economy that is necessary in order to satisfy a 1 Euro worth of final demand for sector ‘j's’ output. In other words the output multiplier measure captures the total sum of direct and indirect input requirements from all sectors needed to supply 1 Euro worth of sector ‘j's’ output to final demand. The type I output multipliers which captures solely the direct and indirect effects can be derived via the summation of the column elements of the Leontief inverse matrix as follows:

$$O^I(j) = \sum_{i=1}^{n} l_{ij}$$

The highest ranked industries in terms of the size of the type I output multipliers are presented in Table 1 below.

Table 1

The ten highest ranking type I output multipliers

No	Industry	Output Multiplier (Type I)
40	Insurance, reinsurance and pension funding, except compulsory social security	2.27
22	Electricity, gas, steam and air conditioning supply	2.26
30	Water transport	1.81
31	Air transport	1.79
50	Travel agency, tour operator reservation service and related activities	1.77
41	Activities auxiliary to financial services and insurance activities	1.76
13	Manufacture of other non-metallic mineral products	1.71
3	Mining and quarrying	1.69
25	Construction	1.69
36	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities	1.68

Source: Author's Calculations

It is observed that the industry with the largest type I output multiplier, is (40) Insurance, reinsurance and pension funding, except compulsory social security sector which has a type I output multiplier of 2.27 followed by the (22) Electricity, gas, steam and air conditioning supply sector which has a multiplier of 2.26. This implies that every additional Euro worth of final demand for the (40) Insurance, reinsurance and pension funding, except compulsory social security sector industry, through direct and indirect effects, would generate a total value in production from all sectors in the economy of 2.27 Euro. The type 1 multiplier estimates for all 59 sectors[8] may be viewed in Chart 1 by assessing the disaggregated direct and indirect component of the type II multiplier.

Type II output multipliers capture the direct, indirect and induced output multiplier effects that a 1 Euro increase in final demand of a specific industry will have on overall output production. These multipliers are based on the Leontief Inverse matrix derived from the solution to the closed Leontief demand driven model. Type II multipliers are derived via the summation of the column elements of the truncated household endogenized Leontief inverse matrix as follows:

$$O^{II}(j) = \sum_{i=1}^{n} \tilde{l}_{ij}$$

The ten highest ranking industries in terms of the size of the type II output multipliers are listed in Table 2 overleaf. Table 2 also portrays the disaggregation between the direct and indirect effects and the induced effects. The two industries with the largest type II output (production) multipliers are the (40) Insurance, reinsurance and pension funding, except compulsory social security sector with a multiplier of 2.96 and the (49) Employment activities sector with a multiplier of 2.63. Therefore, an additional Euro worth of exogenous final demand injection for the (49) Employment activities sector through the direct and indirect and induced effects on production generated an average total value in production from all sectors in the economy amounting to 2.96 Euro. Out of this 2.96 Euro, 1.21 Euro would be due to the direct and indirect production effects (effectively resulting in the type I output multiplier) and an additional 1.42 Euro as a result of the added household endogeneity.

[8] The resultant Type I and Type II output multipliers may be found in appendix C.

Table 2

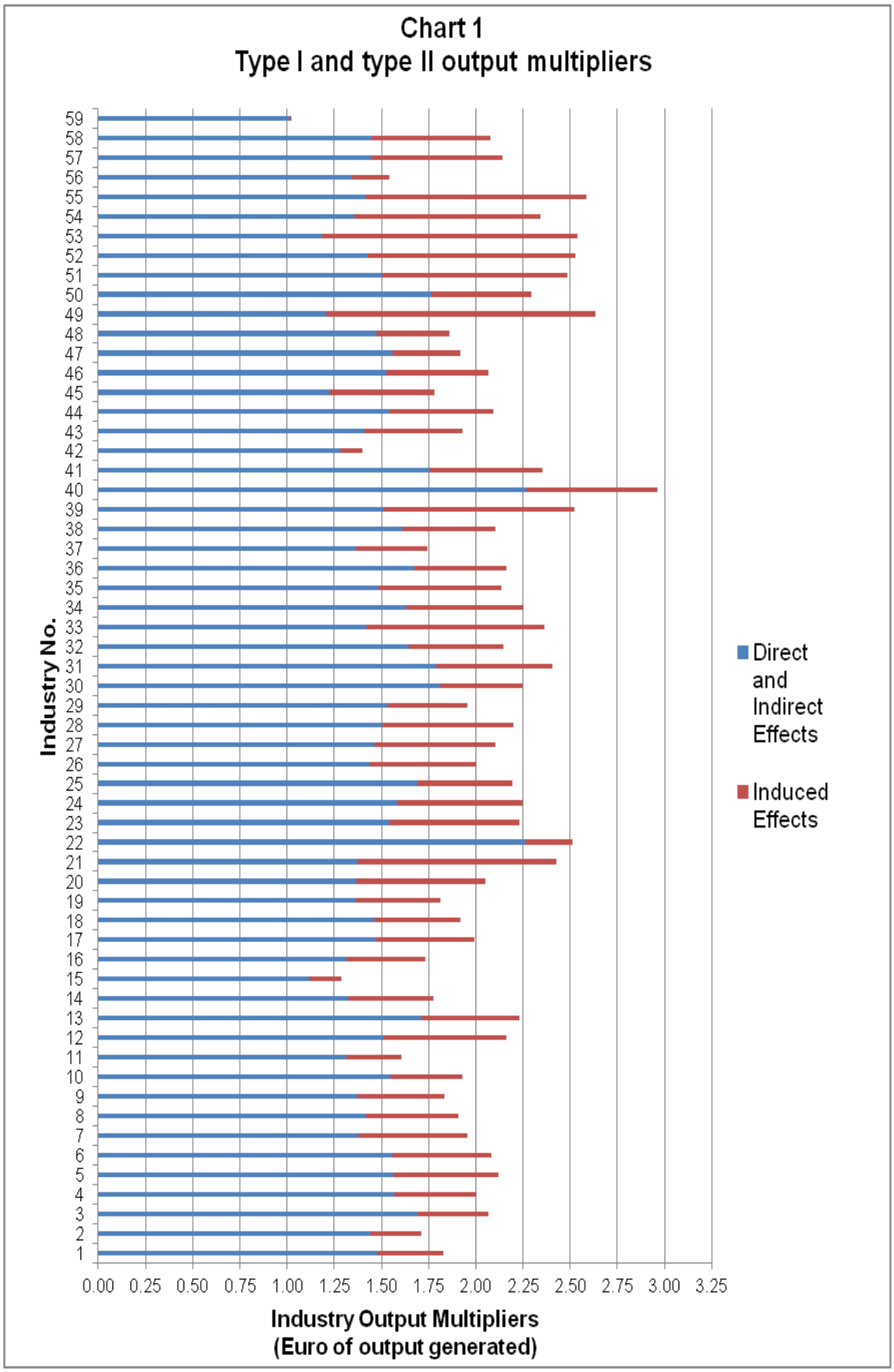
The ten highest ranking type II output multipliers

No	Industry	Direct and Indirect Effects (Type I)	Induced Effects	Type II Multipliers
40	Insurance, reinsurance and pension funding, except compulsory social security	2.27	0.69	2.96
49	Employment activities	1.21	1.42	2.63
55	Social work activities	1.41	1.17	2.59
53	Education	1.18	1.36	2.54
52	Public administration and defence; compulsory social security	1.42	1.10	2.53
39	Financial service activities, except insurance and pension funding	1.51	1.01	2.52
22	Electricity, gas, steam and air conditioning supply	2.26	0.25	2.51
51	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	1.50	0.98	2.49
21	Repair and installation of machinery and equipment	1.37	1.05	2.43
31	Air transport	1.79	0.61	2.41

Source: Author's Calculations

Comparing the results obtained from the type I and type II output multipliers, which are illustrated in Chart 1, it may be observed that the added endogeneity has generated a consistent upward pressure in terms of the magnitude of the multiplier effects for all the productive sectors in the economy. We may also note that the additional induced effects result in a number of significant changes in terms of the relative ranking amongst sectors[9]. The sectors which generate the largest overall levels of induced effects within the economy are the (49) Employment activities and the (53) Education sector sectors.

[9] The respective industry ranking of the type I and type II output multipliers may be found in appendix C.



Source: Author's Calculations

4. Income, value added and employment multipliers

The derived output multipliers show where increases in final demand could have the greatest impact in terms of Euro of output generated throughout the economy. However policy makers may be more concerned with the impacts that additional spending might have in terms of increased household income, value added or in terms of jobs created. Within the input-output literature there are various specifications of income, employment and value added multipliers. Since one of the aims of this study is to provide policy makers with measures that estimate the possible differential effects of an exogenous demand shock to final demand on the economy by industry, an appropriate specification to use would be the income-output, value added-output and employment-output multipliers. These multiplier measures directly convert the total Euro value of new final demand expenditure into new income earned by households, value added generated and new employment created.

4.1 Income multipliers

The type I income-output multipliers are calculated by the multiplication of the row vector 'a_h', a row vector of labour-input coefficients[10], with the SIOT Leontief inverse where $\mathrm{H^I(j)}$ represents the type I income-output multiplier for sector 'j'.

$$a_{h,i} = \frac{h_j}{x_j} \qquad H^I(j) = \sum_{i=1}^{n} a_{h,i}.l_{ij} \qquad H^{II}(j) = \sum_{i=1}^{n} a_{h,i}.\tilde{l}_{ij}$$

The resulting multiplier illustrates the effect of an additional Euro of final demand for the output of sector 'j', when all of the direct and indirect effects in the production process are converted into a Euro estimate of new household income generated. Similarly a type II income-output multiplier can be obtained for a sector 'j', which now includes direct, indirect and the induced effect in terms of a Euro estimate of new household income generated which results from a Euro worth of new final demand for the goods of sector 'j'. We can derive these type II income-output multipliers using the row vector of labour-input coefficients 'a_h' and truncated household endogenized SIOT multiplier matrix which measures the direct, indirect and induced effects on only the 'n' production activities which are caused by exogenous changes to final demand. From the type I and type II income-output multipliers it is also possible to decompose the individual direct, indirect and induced effects in terms of

[10] The labour input-coefficients may be found in appendix D.

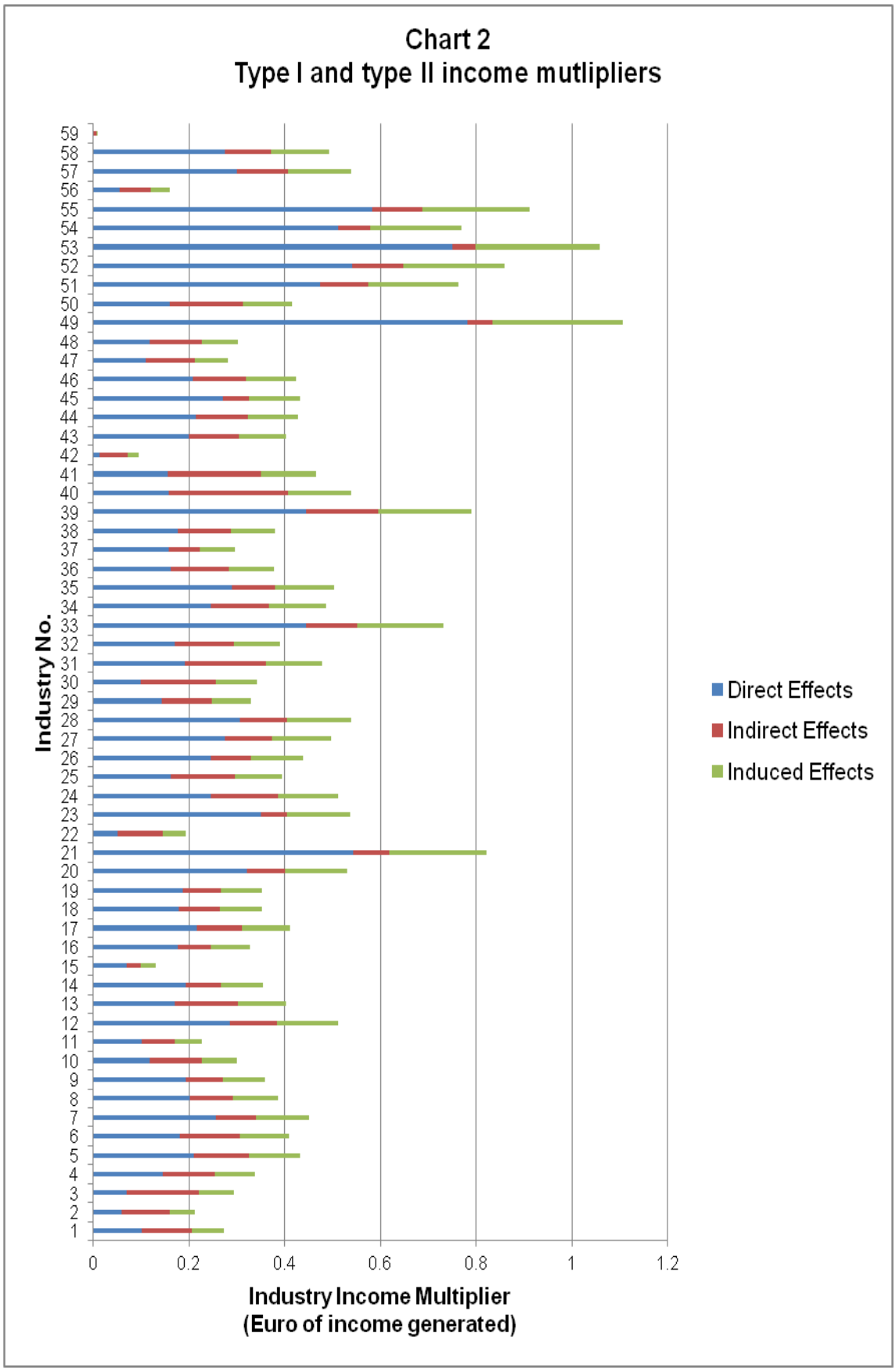
Euro of labour income per additional Euro worth of final demand for each sector. The elements of the vector of labour-input coefficient a_h, reflect the initial direct effect on labour income which is generated in response to an additional Euro of final demand for each sector j. The separate indirect effects may be estimated based on the differences between the type I income-output multiplier, which incorporates both the direct and indirect effects, and the initial labour-input coefficient, which represents the direct effects. Similarly the separate induced effects caused by the added household endogeneity may be estimated on the basis of the differences between the type II and the type I income-output multipliers. Summed together the direct, indirect and induced effects equate to the total effects reflected by the type II income-output multipliers.

Table 3

Decomposition of the ten highest ranking type II income-output multipliers

No	Industry	Direct Effects	Indirect Effects	Induced Effects	Type II Multipliers
49	Employment activities	0.78	0.05	0.27	1.11
53	Education	0.75	0.05	0.26	1.06
55	Social work activities	0.58	0.10	0.23	0.91
52	Public administration and defence; compulsory social security	0.54	0.11	0.21	0.86
21	Repair and installation of machinery and equipment	0.54	0.08	0.20	0.82
39	Financial service activities, except insurance and pension funding	0.44	0.15	0.20	0.79
54	Human health activities	0.51	0.07	0.19	0.77
51	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	0.47	0.10	0.19	0.76
33	Postal and courier activities	0.45	0.11	0.18	0.73
40	Insurance, reinsurance and pension funding, except compulsory social security	0.16	0.25	0.13	0.54

Source: Author's Calculations



Source: Author's Calculations

For both the type I and type II income-output multipliers generated[11] the three highest ranking sectors were respectively, the (49) Employment activities, the (53) Education and the (47) Social work activities sectors. Interpreting the disaggregated type II multiplier for the (53) Education sector observed from Table 3 it may be noted that in the year 2008 every Euro of final demand for this sector generated on average 1.06 Euro of household income. From this total, 0.75 Euro is paid in the form of salaries to the workers employed within the sector. Another 0.05 Euro is paid in the form of labour income throughout all the other productive sectors of the economy due to the linkages of this sector with the other sectors providing its input requirements. And finally an additional 0.26 Euro is paid in wages and salaries throughout all sectors of the economy, which corresponds to the resulting wages and salaries accrued to households for the labour services needed to generate the additional inputs required to satisfy the additional rounds of increased domestic consumption expenditure.

The full set of multipliers for all 59 sectors is presented in Chart 2, where the direct and indirect effects components represent the type I income-output multiplier which together with the induced effects component makes up the type II income-output multiplier. A high degree of stability in terms of the relative rankings between the type I and type II income-output multipliers for all the 59 sectors may be noted. This is due to the important role the labour-input coefficients play in affecting the overall magnitude of both the type I and type II income-output multipliers.

4.2 Value added multipliers

The type I value added-output multipliers are calculated via the multiplication of the row vector 'a_{va}', a row vector of value added coefficients[12], with the SIOT Leontief inverse where $\mathrm{VA^I(j)}$ represents the type I value added-output multiplier for sector 'j'.

$$a_{va,i} = \frac{va_j}{x_j} \qquad VA^I(j) = \sum_{i=1}^{n} a_{va,i}.l_{ij} \qquad VA^{II}(j) = \sum_{i=1}^{n} a_{va,i}.\tilde{l}_{ij}$$

[11] The results obtained from the derivation of both the type I and type II income-output multipliers are presented in appendix E.

[12] The value added coefficients may be found in appendix D.

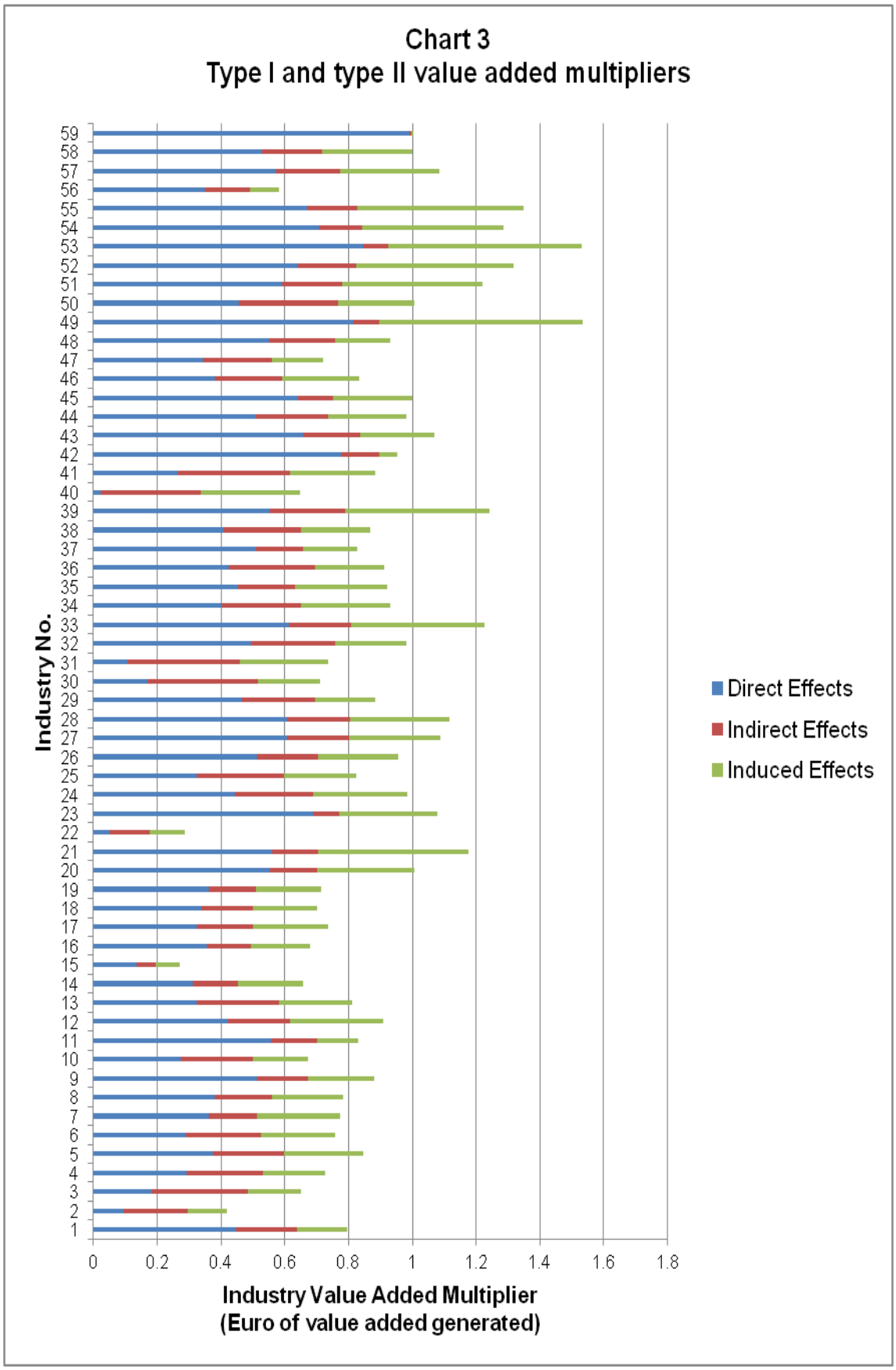
The resulting type I multiplier illustrates the effect of an additional Euro of final demand for the output of sector 'j', when all of the direct and indirect effects in the production process are converted into a Euro estimate of new value-added generated. Similarly a type II value-added multiplier can be obtained for a sector 'j', which now includes direct, indirect and the induced effect in terms of a Euro estimate of new value added generated which results from a Euro worth of new final demand for the goods of sector 'j' utilizing the truncated household endogenized Leontief Inverse. The separate direct, indirect and induced effects may also be derived by following the same approach utilized for the disaggregation of the income-output multipliers. The value added-output type I and type II multipliers for all the 59 sectors are presented in Chart 3 overleaf.

Table 4

Decomposition of the ten highest ranking type II value added-output multipliers

No	Industry	Direct Effects	Indirect Effects	Induced Effects	Type II Multipliers
49	Employment activities	0.82	0.08	0.64	1.53
53	Education	0.84	0.08	0.61	1.53
55	Social work activities	0.67	0.16	0.52	1.35
52	Public administration and defence; compulsory social security	0.64	0.18	0.49	1.32
54	Human health activities	0.71	0.14	0.44	1.29
39	Financial service activities, except insurance and pension funding	0.55	0.24	0.45	1.24
33	Postal and courier activities	0.61	0.19	0.42	1.23
51	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	0.59	0.19	0.44	1.22
21	Repair and installation of machinery and equipment	0.56	0.15	0.47	1.18
28	Retail trade, except of motor vehicles and motorcycles	0.61	0.20	0.31	1.11

Source: Author's Calculations



Source: Author's Calculations

In terms of the type I value added-output multipliers the three highest ranking sectors[13] were respectively (59) Activities of households as employers, (53) Education and (42) Real estate activities sector. It is interesting to note that once the induced effects are included allowing the generation of the type II multipliers, the relative magnitude, and thus ranking of both the (59) Activities of householder as employers and (42) Real estate activities decreased significantly due to the weak induced effects exhibited by these two industries. The ten highest ranking type II value added-output multipliers are provided in Table 4. Interpreting the disaggregated type II multiplier for the (54) Human health activities from Table 4 it is observed that in the year 2008 every Euro of final demand for this sector generated on average 1.29 Euro of value-added. From this total, 0.71 Euro is generated directly within the sector. Another 0.14 Euro is generated in the form of additional value added throughout the whole economy due to the linkages of this sector with the other sectors providing its input requirements. And finally another 0.44 Euro of value added is generated throughout all sectors of the economy, which corresponds to the additional value-added generated in response to the additional inputs required to satisfy the additional rounds of increased consumption expenditure.

4.3 Employment multipliers

Following Miller and Blair (2009) the employment-output multipliers derived in this section shall be referred to as physical employment-output multipliers. This is because rather than looking at the effects in terms of monetary income the derived multipliers shall assess the effects of changes in the final demand for a sector in terms of the physical amount of jobs created. To obtain these multipliers it has to be assumed that employment levels within an industry are closely tied to the amount of output generated. Following this assumption an employment-output ratios can be derived, which illustrate the numbers of (average) jobs per thousand Euro of output produced for each sector 'j', we may denote the row vector of employment-output ratios as 'a_e'[14]. These ratios were derived by dividing the average number of people in employment per sector over the year 2008[15] by the amount of gross output generated by sector. These employment-output ratios reflect the jobs created within the sector of production directly in response to an increase in production of thousand Euro worth of output (direct effects). It may be noted that contrary to the analysis of multipliers

[13] The results obtained from the derivation of both the type I and type II value added-output multipliers are presented in appendix F.

[14] The employment-output ratios may be found in appendix D.

[15] The figures for the average number of people employed per sector for the year 2008 were provided by the National Statistics Office of Malta.

conducted up to this point rather than analysing effects in per Euro of final demand, these employment-output multipliers have to be assessed in terms of thousand Euro of final demand.

$$a_{e,i} = \frac{e_j}{x_j} X\ 1000 \qquad E^I(j) = \sum_{i=1}^{n} a_{e,i}.l_{ij} \qquad E^{II}(j) = \sum_{i=1}^{n} a_{e,i}.\tilde{l}_{ij}$$

The type I employment-output multiplier, denoted by $\mathrm{E^I(j)}$, for a sector 'j' measures the additional physical employment that is generated by the direct and indirect effects on production due to an additional thousand Euro worth of final demand for sector 'j'. The type I employment-output multipliers are calculated by the multiplication of the row vector of employment-output ratios 'a_e', with the SIOT Leontief inverse. The type II employment-output multiplier for a sector j, $\mathrm{E^{II}(j)}$, reflects the direct and indirect effects as well as the induced effects in terms of additional jobs created in the economy in response to an additional thousand Euro of final demand for the output of sector 'j'. We can decompose the individual direct, indirect and induced effects following the same procedure undertaken for the income-output multipliers keeping in mind that in this case the elements of the vector of employment-output ratios 'a_h', reflect the initial direct effect in terms of jobs created in response to an additional thousand Euro of final demand for each sector 'j'. The derived multipliers were subsequently multiplied by a further one thousand in order to obtain a more feasible interpretation, such that employment-output multipliers should thus be interpreted in terms of 1 million Euro increase in final demand.

The industry with both the largest type I and type II employment-output multipliers[16] is the (55) Social work activities sector. Similar to what was observed for the case of the income-output multipliers, the larger the employment-output ratio (a_e, numbers of jobs per thousand Euro of output produced) for the industry and its supplying industries and the larger the total effects in terms of job creation would be.

[16] The results obtained from the derivation of both the type I and type II employment-output multipliers are presented in appendix G.

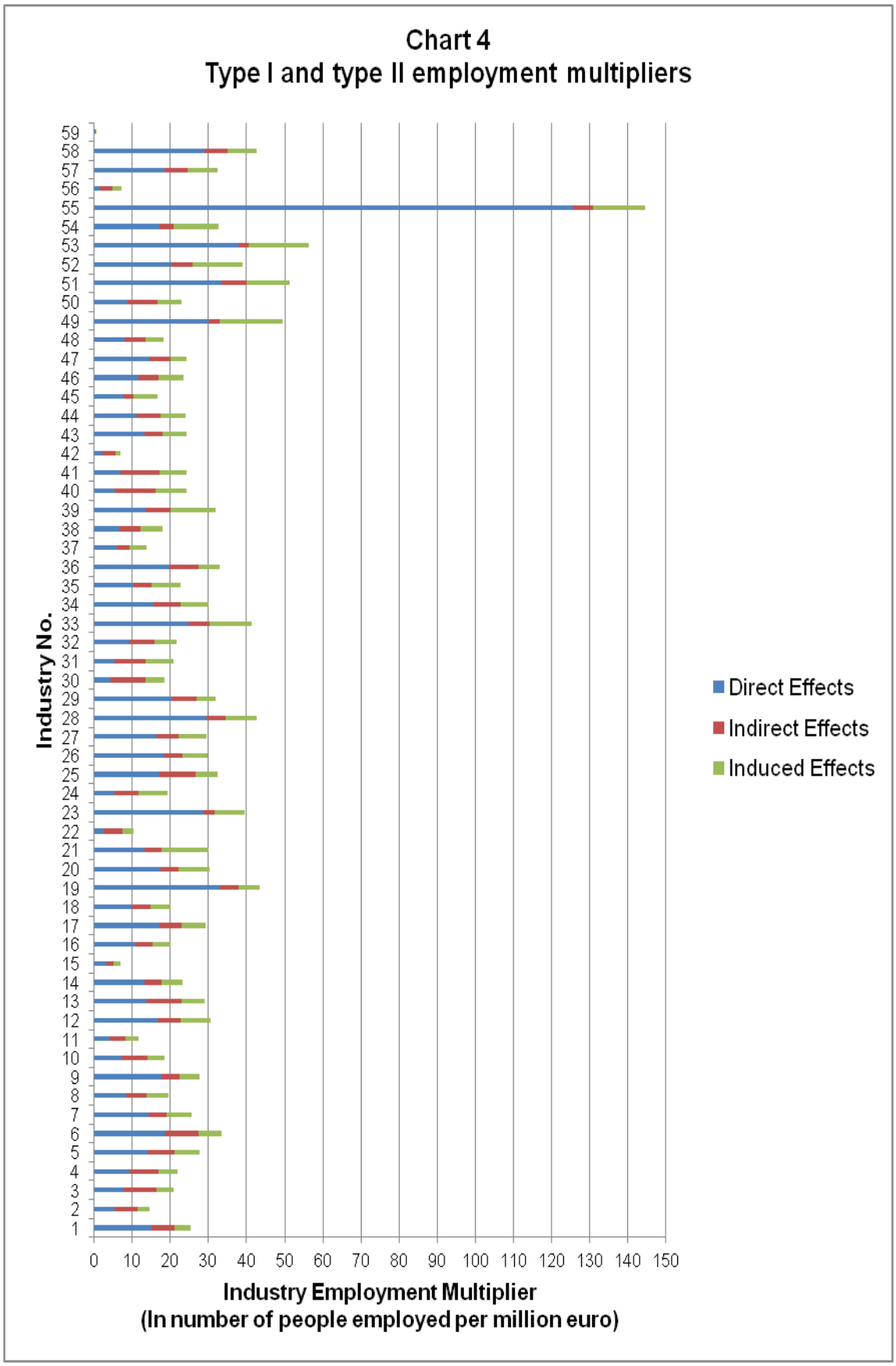
Table 5

Decomposition of the ten highest ranking type II employment-output multipliers

No	Industry	Direct Effects	Indirect Effects	Induced Effects	Type II Multipliers
55	Social work activities	126	5	14	145
53	Education	38	2	16	56
51	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	34	6	12	51
49	Employment activities	30	3	17	49
19	Manufacture of other transport equipment	33	5	5	43
28	Retail trade, except of motor vehicles and motorcycles	29	5	8	43
58	Other Service Activities (Activities of membership organisations, Repair of computers and personal and household goods and Other personal service activities)	29	6	7	43
33	Postal and courier activities	25	5	11	41
23	Water collection, treatment and supply	29	3	8	40
52	Public administration and defence; compulsory social security	20	6	13	39

Source: Author's Calculations

The industries with the lowest type II employment-output multipliers would be those industries which either have very low direct, indirect and induced effects on production, and/or a very low labour intensity (and also require inputs from industries which themselves also have a low labour intensity in production). The ten industries which rank highest in terms of the derived type II employment-output multipliers are displayed in Table 5, which are further decomposed into direct, indirect and induced effects in terms of jobs created per million Euro of final demand. The type I and type II employment multipliers for each of the 59 sectors are illustrated in Chart 4 overleaf.



Source: Author's Calculations

Out of these 39 new jobs created, 20 are generated directly within the industry itself, another 6 jobs would be created amongst the other productive sectors of the economy due to the existing linkages with the other sectors providing its input requirements. Together the direct and the indirect effect make up the type I employment-output multiplier of 26 jobs per million Euro of increased final demand. And finally, this leaves another 13 jobs which would be created throughout all sectors of the economy which are a result of the induced effects.

5. Conclusion

By assessing all the individual measures generated in this study it is possible to obtain a very clear picture of the strength of the inter-industry relations amongst industries. It is also possible to identify how the strength of these relations impacted the Maltese economy in the reference year of 2008 in terms of productive output generated, household income, value added generated and employment created. These measures can either be used for the study of the characteristics of the structure of production or crucially can be of aid to policy makers for the identification of industry-specific policies aimed at improving Malta's competitiveness and economic resilience.

Evaluating the results obtained from each multiplier measure for a single industry may provide policy makers with a broad range of analytically derived estimates with which to evaluate the strategic importance of a specific industry within the context of the national economy. Given that the tourism sector plays a significant role in determining the economic prosperity of a small island economy like Malta, we can use the derived multipliers to gain a better understanding of the impact this sector has on economy. Following Fletcher (1989) and thus utilizing the (34) Accommodation and food service activities sector as an approximation for the tourism sector, from the results obtained it is possible to provide policy makers with analytically derived estimates of the impacts generated throughout the economy by the tourism industry. Assessing the multiplier measures derived throughout this study it can be inferred that based on the reference year of 2008, an additional million Euro worth of exogenous final demand injections for the (34) Accommodation and food service activities (tourism sector) through the direct, indirect and induced effects on production would have generated an average increase in production from all sectors in the economy amounting to 2.25 million Euro (ranking 15th), an average increase in household income of 0.49 million Euro (ranking 20th), an increase in value added of 0.93 million Euro (ranking 25th) and would have created approximately 30 new jobs (ranking 21st).

The results generated by this study provide a different approach to evaluating the relative significance of an industry within the context of the entire production structure of the Maltese economy. For example, if one were to look at solely the share of output or value added of a particular industry[17] in relation to the total of the other industries, industries such as the (56) Creative, arts and entertainment activities; gambling and betting activities, libraries, archives, museums and other cultural activities industry would stand out as one of the most significant productive sectors in the economy. However, when evaluating the potential impacts this industry has in terms of the additional generation of domestic production, income and value added generation and employment creation, per Euro increase in final demand, it consistently ranks among the bottom quartile for each of the multiplier measures derived. On the other-hand sectors which have a relatively low share of total output such as (40) Insurance, reinsurance and pension funding and the (53) Education sector consistently rank amongst the industries which generate the highest overall multiplier effects in terms of output, income, value added as well as employment creation.

It should however be noted that interpreting multiplier estimates in the context of modelling marginal changes in activity (impact analysis), will implicitly invoke assumptions about how the economy behaves in response to changes in demand since these measures would effectively be estimating the resulting impacts in an economic scenario which differs from that of the given base year of 2008. Multiplier estimates derived from the Leontief demand driven model tend to overestimate the real impact on the economy caused by an exogenous increase in final demand due to the fact that economies do not exhibit the levels of excess capacity assumed by the model, especially in the short run for which most impact analysis is conducted (Ten Raa and Rueda-Cantuche, 2007). An alternate interpretation of the Leontief demand driven model put forward by Charney and Vest (2003) views it as a long run model implying that the estimates obtained from the various multiplier measures can be viewed as long run multiplier effects on the economy. Although the industry specific multipliers derived in this study should be evaluated with caution by policy makers, they still provide an analytically derived first cut estimate of the possible impacts that could be generated throughout the economy as a result of an exogenous increase in final demand.

[17] Selected analytical industry statistics are provided in appendix B.

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Appendix A

Classification of industries following NACE Rev.2.

Nace Rev.2	Industry No.	Industry
A01,A02	1	Crop and animal production, hunting and related service activities and Forestry and logging
A03	2	Fishing and aquaculture
B	3	Mining and quarrying
C10-C12	4	Manufacture of food products, beverages and tobacco products
C13-C15	5	Manufacture of textiles, wearing apparel and leather products
C16	6	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	7	Manufacture of paper and paper products
C18	8	Printing and reproduction of recorded media
C19	9	Manufacture of coke and refined petroleum products
C20	10	Manufacture of chemicals and chemical products
C21	11	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	12	Manufacture of rubber and plastic products
C23	13	Manufacture of other non-metallic mineral products
C24-C25	14	Manufacture Basic Metals and of fabricated metal products, except machinery and equipment
C26	15	Manufacture of computer, electronic and optical products
C27	16	Manufacture of electrical equipment
C28	17	Manufacture of machinery and equipment n.e.c.
C29	18	Manufacture of motor vehicles, trailers and semi-trailers
C30	19	Manufacture of other transport equipment
C31_C32	20	Manufacture of furniture; other manufacturing
C33	21	Repair and installation of machinery and equipment
D35	22	Electricity, gas, steam and air conditioning supply
E36	23	Water collection, treatment and supply
E37-E39	24	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
F	25	Construction
G45	26	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	27	Wholesale trade, except of motor vehicles and motorcycles
G47	28	Retail trade, except of motor vehicles and motorcycles
H49	29	Land transport and transport via pipelines
H50	30	Water transport
H51	31	Air transport
H52	32	Warehousing and support activities for transportation

H53	33	Postal and courier activities
I	34	Accommodation and food service activities
J58	35	Publishing activities
J59_J60	36	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
J61	37	Telecommunications
J62_J63	38	Computer programming, consultancy and related activities; information service activities
K64	39	Financial service activities, except insurance and pension funding
K65	40	Insurance, reinsurance and pension funding, except compulsory social security
K66	41	Activities auxiliary to financial services and insurance activities
L68	42	Real estate activities (Including imputed rents of owner occupied dwellings)
M69_M70	43	Legal and accounting activities; activities of head offices; management consultancy activities
M71	44	Architectural and engineering activities; technical testing and analysis
M72	45	Scientific research and development
M73	46	Advertising and market research
M74_M75	47	Other professional, scientific and technical activities; veterinary activities
N77	48	Rental and leasing activities
N78	49	Employment activities
N79	50	Travel agency, tour operator reservation service and related activities
N80-N82	51	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities
O84	52	Public administration and defence; compulsory social security
P85	53	Education
Q86	54	Human health activities
Q87_Q88	55	Social work activities
R90-R92	56	Creative, arts and entertainment activities; gambling and betting activities libraries, archives, museums and other cultural activities;
R93	57	Sports activities and amusement and recreation activities
S94_95_96	58	Other Service Activities (Activities of membership organisations, Repair of computers and personal and household goods and Other personal service activities)
T,U	59	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use and Activities of extra-territorial organisations and bodies

Source: Eurostat

Appendix B

Additional statistics derived from the symmetric input-output table of 2008

No	Sectors	Ratio to Total Output (%)		Industry Ratio to Total Value Added (%)		Intermediate Use as Proportion of output per industry (%)	
		xi/Xij	*Rank*	vai/VAij	*Rank*	Zi/Xi	*Rank*
1	Crop and animal production, hunting ...	1.23	*23*	1.29	*20*	31.0	*28*
2	Fishing and aquaculture	0.81	*33*	0.18	*51*	28.7	*35*
3	Mining and quarrying	0.44	*43*	0.19	*50*	45.0	*7*
4	Manufacture of food products, beverages ...	2.97	*12*	2.05	*16*	37.0	*15*
5	Manufacture of textiles, wearing apparel	0.56	*40*	0.49	*39*	35.5	*18*
6	Manufacture of wood and of products ...	0.12	*56*	0.08	*55*	36.9	*16*
7	Manufacture of paper and paper products	C*	C	C	C	C	C
8	Printing and reproduction of recorded media	1.19	*24*	1.06	*25*	27.7	*37*
9	Manufacture of coke and refined petroleum ..	C	C	C	C	C	C
10	Manufacture of chemicals and chemical...	0.32	*48*	0.21	*49*	35.0	*19*
11	Manufacture of basic pharmaceutical ...	1.64	*19*	2.14	*15*	20.6	*53*
12	Manufacture of rubber and plastic products	0.81	*34*	0.80	*30*	31.9	*26*
13	Manufacture of other non-metallic mineral ...	0.76	*36*	0.58	*36*	43.6	*9*
14	Manufacture Basic Metals and of fabricated...	0.82	*32*	0.60	*35*	21.5	*51*
15	Manufacture of computer, electronic...	C	C	C	C	C	C
16	Manufacture of electrical equipment	0.46	*41*	0.38	*43*	21.1	*52*
17	Manufacture of machinery and equipment...	0.18	*53*	0.14	*53*	31.9	*25*
18	Manufacture of motor vehicles, trailers...	C	C	C	C	C	C
19	Manufacture of other transport equipment	C	C	C	C	C	C
20	Manufacture of furniture; other manu....	1.51	*20*	1.96	*17*	23.9	*46*
21	Repair and installation of machinery and ...	1.40	*21*	1.83	*19*	23.7	*47*
22	Electricity, gas, steam and air conditioning ...	C	C	C	C	C	C
23	Water collection, treatment and supply	C	C	C	C	C	C
24	Sewerage; waste collection, treatment ...	0.44	*42*	0.46	*40*	37.4	*14*
25	Construction	6.19	*3*	4.72	*8*	44.1	*8*
26	Wholesale and retail trade and repair of ...	0.99	*26*	1.20	*22*	28.7	*34*
27	Wholesale trade, except of motor vehicles ...	4.15	*7*	5.93	*4*	29.5	*32*

28	Retail trade, except of motor vehicles ...	3.15	*10*	4.49	*9*	31.1	*27*
29	Land transport and transport via pipelines ...	0.89	*28*	0.98	*28*	33.2	*23*
30	Water transport	0.88	*29*	0.35	*45*	51.2	*3*
31	Air transport	C	C	C	C	C	C
32	Warehousing and support activities for ...	3.13	*11*	3.62	*11*	39.2	*13*
33	Postal and courier activities	C	C	C	C	C	C
34	Accommodation and food service activities	5.37	*4*	5.09	*7*	40.1	*12*
35	Publishing activities	0.39	*44*	0.42	*41*	30.4	*31*
36	Motion picture, video and television ...	0.37	*47*	0.37	*44*	42.5	*10*
37	Telecommunications	2.19	*16*	2.62	*13*	24.0	*45*
38	Computer programming, consultancy and ...	1.96	*18*	1.89	*18*	40.8	*11*
39	Financial service activities, except insurance...	2.83	*13*	3.69	*10*	32.7	*24*
40	Insurance, reinsurance and pension funding...	0.75	*37*	0.04	*56*	64.2	*1*
41	Activities auxiliary to financial services ...	1.31	*22*	0.82	*29*	49.5	*5*
42	Real estate activities (Incl. imputed rents) ...	3.29	*9*	6.01	*3*	17.7	*54*
43	Legal and accounting activities; activities of ...	2.18	*17*	3.38	*12*	26.4	*40*
44	Architectural and engineering activities; ...	0.87	*30*	1.05	*26*	34.5	*20*
45	Scientific research and development	C	C	C	C	C	C
46	Advertising and market research	0.56	*39*	0.50	*38*	33.5	*22*
47	Other professional, scientific and technical ...	0.21	*51*	0.17	*52*	36.4	*17*
48	Rental and leasing activities	0.99	*27*	1.28	*21*	30.9	*29*
49	Employment activities	0.37	*46*	0.72	*31*	13.0	*56*
50	Travel agency, tour operator reservation ...	1.10	*25*	1.19	*23*	45.3	*6*
51	Security and investigation activities; services..	0.79	*35*	1.10	*24*	30.8	*30*
52	Public administration and defence; ...	4.25	*6*	6.41	*2*	27.2	*39*
53	Education	2.77	*14*	5.51	*6*	11.7	*57*
54	Human health activities	3.48	*8*	5.78	*5*	22.4	*49*
55	Social work activities	0.19	*52*	0.31	*47*	25.0	*42*
56	Creative arts, gambling & betting activities ...	11.01	*1*	9.00	*1*	22.4	*50*
57	Sports activities and amusement and ...	0.31	*49*	0.41	*42*	29.3	*33*
58	Other Service Activities ...	0.83	*31*	1.03	*27*	28.6	*36*
59	Activities of households as employers; ...	0.13	*55*	0.30	*48*	1.0	*59*

Source: Author's Calculations

* The data denoted by “C” implies that the derived figure is based on data which was provided under strict confidentiality and is thus not available for publication

Appendix C

Type I and type II output multipliers

No	Sectors	Type I Output Multiplier (direct and indirect effects)		Induced effects		Total Type II multiplier (direct, indirect + induced effects)	
		Type I	*Rank*	Induced effects	Rank	*Type II*	Rank
1	Crop and animal production, hunting ...	1.48	*29*	0.35	*52*	1.83	*48*
2	Fishing and aquaculture	1.44	*36*	0.27	*54*	1.71	*54*
3	Mining and quarrying	1.69	*8*	0.38	*50*	2.07	*34*
4	Manufacture of food products, beverages ...	1.57	*15*	0.43	*44*	2.00	*36*
5	Manufacture of textiles, wearing apparel	1.56	*16*	0.55	*26*	2.12	*27*
6	Manufacture of wood and of products ...	1.56	*18*	0.52	*31*	2.08	*31*
7	Manufacture of paper and paper products	1.38	*43*	0.58	*23*	1.95	*39*
8	Printing and reproduction of recorded media	1.41	*41*	0.50	*36*	1.91	*45*
9	Manufacture of coke and refined petroleum ..	1.37	*45*	0.46	*39*	1.83	*47*
10	Manufacture of chemicals and chemical...	1.55	*19*	0.38	*48*	1.93	*41*
11	Manufacture of basic pharmaceutical ...	1.31	*53*	0.29	*53*	1.60	*55*
12	Manufacture of rubber and plastic products	1.51	*25*	0.66	*16*	2.16	*22*
13	Manufacture of other non-metallic mineral ...	1.71	*7*	0.52	*33*	2.23	*19*
14	Manufacture Basic Metals and of fabricated...	1.32	*51*	0.45	*40*	1.78	*51*
15	Manufacture of computer, electronic...	1.12	*58*	0.17	*57*	1.29	*58*
16	Manufacture of electrical equipment	1.31	*52*	0.42	*46*	1.73	*53*
17	Manufacture of machinery and equipment...	1.47	*31*	0.53	*30*	2.00	*38*
18	Manufacture of motor vehicles, trailers...	1.47	*32*	0.45	*42*	1.92	*44*
19	Manufacture of other transport equipment	1.36	*48*	0.45	*41*	1.81	*49*
20	Manufacture of furniture; other manu....	1.37	*46*	0.68	*14*	2.05	*35*
21	Repair and installation of machinery and ...	1.37	*44*	1.05	*5*	2.43	*9*
22	Electricity, gas, steam and air conditioning ...	2.26	*2*	0.25	*55*	2.51	*7*
23	Water collection, treatment and supply	1.54	*20*	0.69	*13*	2.23	*18*
24	Sewerage; waste collection, treatment ...	1.59	*14*	0.66	*15*	2.24	*17*
25	Construction	1.69	*9*	0.51	*34*	2.19	*21*
26	Wholesale and retail trade and repair of ...	1.44	*37*	0.56	*24*	2.00	*37*
27	Wholesale trade, except of motor vehicles ...	1.47	*33*	0.64	*18*	2.10	*28*
28	Retail trade, except of motor vehicles ...	1.51	*26*	0.69	*12*	2.20	*20*

29	Land transport and transport via pipelines ...	1.53	*22*	0.42	*45*	1.95	*40*
30	Water transport	1.81	*3*	0.44	*43*	2.25	*16*
31	Air transport	1.79	*4*	0.61	*21*	2.41	*10*
32	Warehousing and support activities for ...	1.64	*11*	0.50	*35*	2.14	*24*
33	Postal and courier activities	1.42	*39*	0.94	*9*	2.36	*11*
34	Accommodation and food service activities	1.63	*12*	0.62	*20*	2.25	*15*
35	Publishing activities	1.49	*28*	0.65	*17*	2.13	*26*
36	Motion picture, video and television ...	1.68	*10*	0.48	*38*	2.16	*23*
37	Telecommunications	1.36	*47*	0.38	*49*	1.74	*52*
38	Computer programming, consultancy and ...	1.61	*13*	0.49	*37*	2.10	*29*
39	Financial service activities, except insurance...	1.51	*24*	1.01	*6*	2.52	*6*
40	Insurance, reinsurance and pension funding...	2.27	*1*	0.69	*10*	2.96	*1*
41	Activities auxiliary to financial services ...	1.76	*6*	0.60	*22*	2.35	*12*
42	Real estate activities (Incl. imputed rents) ...	1.28	*54*	0.12	*58*	1.40	*57*
43	Legal and accounting activities; activities of ...	1.41	*42*	0.52	*32*	1.93	*42*
44	Architectural and engineering activities; ...	1.54	*21*	0.55	*27*	2.09	*30*
45	Scientific research and development	1.23	*55*	0.55	*25*	1.78	*50*
46	Advertising and market research	1.52	*23*	0.54	*28*	2.07	*33*
47	Other professional, scientific and technical ...	1.56	*17*	0.36	*51*	1.92	*43*
48	Rental and leasing activities	1.47	*30*	0.39	*47*	1.86	*46*
49	Employment activities	1.21	*56*	1.42	*1*	2.63	*2*
50	Travel agency, tour operator reservation ...	1.77	*5*	0.53	*29*	2.30	*14*
51	Security and investigation activities; services..	1.50	*27*	0.98	*8*	2.49	*8*
52	Public administration and defence; ...	1.42	*38*	1.10	*4*	2.53	*5*
53	Education	1.18	*57*	1.36	*2*	2.54	*4*
54	Human health activities	1.36	*49*	0.99	*7*	2.34	*13*
55	Social work activities	1.41	*40*	1.17	*3*	2.59	*3*
56	Creative arts, gambling & betting activities ...	1.34	*50*	0.20	*56*	1.54	*56*
57	Sports activities and amusement and ...	1.45	*34*	0.69	*11*	2.14	*25*
58	Other Service Activties ...	1.45	*35*	0.63	*19*	2.08	*32*
59	Activities of households as employers; ...	1.01	*59*	0.01	*59*	1.02	*59*

Source: Author's Calculations

Appendix D

Income, value added and employment ratios

No	Sectors	Income Ratio		Value Added Ratio		Employment Ratio	
		$a_{h,i}$	*Rank*	$a_{va,i}$	*Rank*	$a_{e,i}$	*Rank*
1	Crop and animal production, hunting ...	0.101	*51*	0.447	*30*	0.015	*23*
2	Fishing and aquaculture	0.060	*55*	0.096	*57*	0.005	*49*
3	Mining and quarrying	0.070	*53*	0.181	*53*	0.008	*42*
4	Manufacture of food products, beverages ...	0.146	*45*	0.294	*49*	0.009	*38*
5	Manufacture of textiles, wearing apparel	0.209	*25*	0.375	*38*	0.014	*25*
6	Manufacture of wood and of products ...	0.181	*33*	0.289	*50*	0.019	*13*
7	Manufacture of paper and paper products	C*	C	C	C	C	C
8	Printing and reproduction of recorded media	0.201	*27*	0.379	*37*	0.009	*38*
9	Manufacture of coke and refined petroleum ..	C	C	C	C	C	C
10	Manufacture of chemicals and chemical...	0.117	*48*	0.273	*51*	0.007	*45*
11	Manufacture of basic pharmaceutical ...	0.102	*50*	0.556	*17*	0.004	*53*
12	Manufacture of rubber and plastic products	0.286	*15*	0.420	*33*	0.017	*17*
13	Manufacture of other non-metallic mineral ...	0.169	*38*	0.324	*47*	0.014	*25*
14	Manufacture Basic Metals and of fabricated...	0.193	*29*	0.312	*48*	0.013	*30*
15	Manufacture of computer, electronic...	C	C	C	C	C	C
16	Manufacture of electrical equipment	0.177	*35*	0.354	*41*	0.011	*34*
17	Manufacture of machinery and equipment...	0.216	*23*	0.325	*45*	0.017	*17*
18	Manufacture of motor vehicles, trailers...	C	C	C	C	C	C
19	Manufacture of other transport equipment	C	C	C	C	C	C
20	Manufacture of furniture; other manu....	0.322	*11*	0.554	*18*	0.017	*17*
21	Repair and installation of machinery and ...	0.543	*4*	0.559	*16*	0.013	*30*
22	Electricity, gas, steam and air conditioning ...	C	C	C	C	C	C
23	Water collection, treatment and supply	C	C	C	C	C	C
24	Sewerage; waste collection, treatment ...	0.246	*20*	0.443	*31*	0.005	*49*
25	Construction	0.162	*39*	0.325	*45*	0.017	*17*
26	Wholesale and retail trade and repair of ...	0.244	*22*	0.512	*22*	0.018	*15*
27	Wholesale trade, except of motor vehicles ...	0.276	*16*	0.608	*12*	0.016	*22*
28	Retail trade, except of motor vehicles ...	0.307	*12*	0.606	*13*	0.029	*6*
29	Land transport and transport via pipelines ...	0.142	*46*	0.465	*27*	0.020	*10*

30	Water transport	0.098	*52*	0.170	*54*	0.004	*53*
31	Air transport	C	C	C	C	C	C
32	Warehousing and support activities for ...	0.170	*37*	0.493	*26*	0.009	*38*
33	Postal and courier activities	C	C	C	C	C	C
34	Accommodation and food service activities	0.245	*21*	0.403	*35*	0.015	*23*
35	Publishing activities	0.289	*14*	0.452	*29*	0.010	*36*
36	Motion picture, video and television ...	0.162	*39*	0.425	*32*	0.020	*10*
37	Telecommunications	0.157	*43*	0.510	*25*	0.006	*48*
38	Computer programming, consultancy and ...	0.177	*35*	0.409	*34*	0.007	*45*
39	Financial service activities, except insurance...	0.444	*9*	0.554	*18*	0.014	*25*
40	Insurance, reinsurance and pension funding...	0.158	*42*	0.023	*59*	0.005	*49*
41	Activities auxiliary to financial services ...	0.155	*44*	0.266	*52*	0.007	*45*
42	Real estate activities (Incl. imputed rents) ...	0.013	*58*	0.776	*4*	0.002	*56*
43	Legal and accounting activities; activities of ...	0.199	*28*	0.659	*8*	0.013	*30*
44	Architectural and engineering activities; ...	0.213	*24*	0.511	*24*	0.011	*34*
45	Scientific research and development	C	C	C	C	C	C
46	Advertising and market research	0.207	*26*	0.382	*36*	0.012	*33*
47	Other professional, scientific and technical ...	0.110	*49*	0.343	*43*	0.014	*25*
48	Rental and leasing activities	0.118	*47*	0.550	*20*	0.008	*42*
49	Employment activities	0.781	*1*	0.816	*3*	0.030	*5*
50	Travel agency, tour operator reservation ...	0.159	*41*	0.457	*28*	0.009	*38*
51	Security and investigation activities; services..	0.473	*7*	0.591	*14*	0.034	*3*
52	Public administration and defence; ...	0.540	*5*	0.641	*9*	0.020	*10*
53	Education	0.750	*2*	0.845	*2*	0.038	*2*
54	Human health activities	0.511	*6*	0.707	*5*	0.017	*17*
55	Social work activities	0.584	*3*	0.670	*7*	0.126	*1*
56	Creative arts, gambling & betting activities ...	0.054	*56*	0.348	*42*	0.002	*56*
57	Sports activities and amusement and ...	0.299	*13*	0.572	*15*	0.019	*13*
58	Other Service Activities ...	0.274	*17*	0.530	*21*	0.029	*6*
59	Activities of households as employers; ...	0.000	*59*	0.990	*1*	0.000	*59*

Source: Author's Calculations

The data denoted by “C” implies that the derived figure is based on data which was provided under strict confidentiality and is thus not available for publication.

Appendix E

Type I and type II income-output multipliers

No	Sectors	Type I Income Multiplier (direct and indirect effects)		Induced effects		Total Type II Income multiplier (direct, indirect + induced effects)	
		Type I	*Rank*	Induced effects	Rank	*Type II*	Rank
1	Crop and animal production, hunting ...	0.21	*52*	0.07	*52*	0.27	*52*
2	Fishing and aquaculture	0.16	*54*	0.05	*54*	0.21	*54*
3	Mining and quarrying	0.22	*50*	0.07	*50*	0.29	*50*
4	Manufacture of food products, beverages ...	0.25	*44*	0.08	*44*	0.34	*44*
5	Manufacture of textiles, wearing apparel	0.33	*26*	0.11	*26*	0.43	*26*
6	Manufacture of wood and of products ...	0.31	*31*	0.10	*31*	0.41	*31*
7	Manufacture of paper and paper products	0.34	*23*	0.11	*23*	0.45	*23*
8	Printing and reproduction of recorded media	0.29	*36*	0.10	*36*	0.39	*36*
9	Manufacture of coke and refined petroleum ..	0.27	*39*	0.09	*39*	0.36	*39*
10	Manufacture of chemicals and chemical...	0.23	*48*	0.07	*48*	0.30	*48*
11	Manufacture of basic pharmaceutical ...	0.17	*53*	0.06	*53*	0.23	*53*
12	Manufacture of rubber and plastic products	0.38	*16*	0.13	*16*	0.51	*16*
13	Manufacture of other non-metallic mineral ...	0.30	*33*	0.10	*33*	0.40	*33*
14	Manufacture Basic Metals and of fabricated...	0.27	*40*	0.09	*40*	0.35	*40*
15	Manufacture of computer, electronic...	0.10	*57*	0.03	*57*	0.13	*57*
16	Manufacture of electrical equipment	0.25	*46*	0.08	*46*	0.33	*46*
17	Manufacture of machinery and equipment...	0.31	*30*	0.10	*30*	0.41	*30*
18	Manufacture of motor vehicles, trailers...	0.27	*42*	0.09	*42*	0.35	*42*
19	Manufacture of other transport equipment	0.27	*41*	0.09	*41*	0.35	*41*
20	Manufacture of furniture; other manu....	0.40	*14*	0.13	*14*	0.53	*14*
21	Repair and installation of machinery and ...	0.62	*5*	0.20	*5*	0.82	*5*
22	Electricity, gas, steam and air conditioning ...	0.15	*55*	0.05	*55*	0.19	*55*
23	Water collection, treatment and supply	0.40	*13*	0.13	*13*	0.54	*13*
24	Sewerage; waste collection, treatment ...	0.39	*15*	0.13	*15*	0.51	*15*
25	Construction	0.30	*34*	0.10	*34*	0.39	*34*
26	Wholesale and retail trade and repair of ...	0.33	*24*	0.11	*24*	0.44	*24*
27	Wholesale trade, except of motor vehicles ...	0.37	*18*	0.12	*18*	0.50	*18*
28	Retail trade, except of motor vehicles ...	0.41	*12*	0.13	*12*	0.54	*12*

29	Land transport and transport via pipelines ...	0.25	*45*	0.08	*45*	0.33	*45*
30	Water transport	0.26	*43*	0.08	*43*	0.34	*43*
31	Air transport	0.36	*21*	0.12	*21*	0.48	*21*
32	Warehousing and support activities for ...	0.29	*35*	0.10	*35*	0.39	*35*
33	Postal and courier activities	0.55	*9*	0.18	*9*	0.73	*9*
34	Accommodation and food service activities	0.37	*20*	0.12	*20*	0.49	*20*
35	Publishing activities	0.38	*17*	0.12	*17*	0.50	*17*
36	Motion picture, video and television ...	0.28	*38*	0.09	*38*	0.38	*38*
37	Telecommunications	0.22	*49*	0.07	*49*	0.30	*49*
38	Computer programming, consultancy and ...	0.29	*37*	0.09	*37*	0.38	*37*
39	Financial service activities, except insurance...	0.60	*6*	0.20	*6*	0.79	*6*
40	Insurance, reinsurance and pension funding...	0.41	*10*	0.13	*10*	0.54	*10*
41	Activities auxiliary to financial services ...	0.35	*22*	0.11	*22*	0.46	*22*
42	Real estate activities (Incl. imputed rents) ...	0.07	*58*	0.02	*58*	0.09	*58*
43	Legal and accounting activities; activities of ...	0.30	*32*	0.10	*32*	0.40	*32*
44	Architectural and engineering activities; ...	0.32	*27*	0.11	*27*	0.43	*27*
45	Scientific research and development	0.33	*25*	0.11	*25*	0.43	*25*
46	Advertising and market research	0.32	*28*	0.10	*28*	0.42	*28*
47	Other professional, scientific and technical ...	0.21	*51*	0.07	*51*	0.28	*51*
48	Rental and leasing activities	0.23	*47*	0.07	*47*	0.30	*47*
49	Employment activities	0.83	*1*	0.27	*1*	1.11	*1*
50	Travel agency, tour operator reservation ...	0.31	*29*	0.10	*29*	0.41	*29*
51	Security and investigation activities; services..	0.58	*8*	0.19	*8*	0.76	*8*
52	Public administration and defence; ...	0.65	*4*	0.21	*4*	0.86	*4*
53	Education	0.80	*2*	0.26	*2*	1.06	*2*
54	Human health activities	0.58	*7*	0.19	*7*	0.77	*7*
55	Social work activities	0.69	*3*	0.23	*3*	0.91	*3*
56	Creative arts, gambling & betting activities ...	0.12	*56*	0.04	*56*	0.16	*56*
57	Sports activities and amusement and ...	0.41	*11*	0.13	*11*	0.54	*11*
58	Other Service Activities ...	0.37	*19*	0.12	*19*	0.49	*19*
59	Activities of households as employers; ...	0.01	*59*	0.00	*59*	0.01	*59*

Source: Author's Calculations

Appendix F

Type I and type II value added-output multipliers

No	Sectors	Type I Value Added Multiplier (direct and indirect effects)		Induced effects		Total Type II Value Added multiplier (direct, indirect + induced effects)	
		Type I	*Rank*	Induced effects	Rank	*Type II*	Rank
1	Crop and animal production, hunting ...	0.64	*33*	0.16	*52*	0.80	*40*
2	Fishing and aquaculture	0.30	*57*	0.12	*54*	0.42	*57*
3	Mining and quarrying	0.48	*53*	0.17	*50*	0.65	*54*
4	Manufacture of food products, beverages ...	0.53	*43*	0.19	*44*	0.72	*46*
5	Manufacture of textiles, wearing apparel	0.60	*37*	0.25	*26*	0.85	*34*
6	Manufacture of wood and of products ...	0.52	*44*	0.23	*31*	0.76	*43*
7	Manufacture of paper and paper products	0.51	*46*	0.26	*23*	0.77	*42*
8	Printing and reproduction of recorded media	0.56	*41*	0.22	*36*	0.78	*41*
9	Manufacture of coke and refined petroleum ..	0.67	*29*	0.21	*39*	0.88	*32*
10	Manufacture of chemicals and chemical...	0.50	*49*	0.17	*48*	0.67	*52*
11	Manufacture of basic pharmaceutical ...	0.70	*25*	0.13	*53*	0.83	*36*
12	Manufacture of rubber and plastic products	0.62	*36*	0.29	*16*	0.91	*29*
13	Manufacture of other non-metallic mineral ...	0.58	*40*	0.23	*33*	0.81	*39*
14	Manufacture Basic Metals and of fabricated...	0.45	*55*	0.20	*40*	0.66	*53*
15	Manufacture of computer, electronic...	0.19	*58*	0.07	*57*	0.27	*59*
16	Manufacture of electrical equipment	0.49	*51*	0.19	*46*	0.68	*51*
17	Manufacture of machinery and equipment...	0.50	*48*	0.24	*30*	0.74	*44*
18	Manufacture of motor vehicles, trailers...	0.50	*50*	0.20	*42*	0.70	*50*
19	Manufacture of other transport equipment	0.51	*47*	0.20	*41*	0.71	*48*
20	Manufacture of furniture; other manu....	0.70	*24*	0.30	*14*	1.01	*16*
21	Repair and installation of machinery and ...	0.70	*22*	0.47	*5*	1.18	*9*
22	Electricity, gas, steam and air conditioning ...	0.18	*59*	0.11	*55*	0.29	*58*
23	Water collection, treatment and supply	0.77	*15*	0.31	*13*	1.08	*13*
24	Sewerage; waste collection, treatment ...	0.69	*28*	0.29	*15*	0.98	*20*
25	Construction	0.60	*38*	0.23	*34*	0.82	*38*
26	Wholesale and retail trade and repair of ...	0.70	*23*	0.25	*24*	0.96	*23*
27	Wholesale trade, except of motor vehicles ...	0.80	*11*	0.28	*18*	1.09	*11*
28	Retail trade, except of motor vehicles ...	0.81	*10*	0.31	*12*	1.11	*10*

29	Land transport and transport via pipelines ...	0.69	*27*	0.19	*45*	0.88	*31*
30	Water transport	0.52	*45*	0.20	*43*	0.71	*49*
31	Air transport	0.46	*54*	0.27	*21*	0.74	*45*
32	Warehousing and support activities for ...	0.76	*17*	0.22	*35*	0.98	*22*
33	Postal and courier activities	0.81	*9*	0.42	*9*	1.23	*7*
34	Accommodation and food service activities	0.65	*31*	0.28	*20*	0.93	*25*
35	Publishing activities	0.63	*34*	0.29	*17*	0.92	*27*
36	Motion picture, video and television ...	0.70	*26*	0.22	*38*	0.91	*28*
37	Telecommunications	0.66	*30*	0.17	*49*	0.83	*37*
38	Computer programming, consultancy and ...	0.65	*32*	0.22	*37*	0.87	*33*
39	Financial service activities, except insurance...	0.79	*12*	0.45	*6*	1.24	*6*
40	Insurance, reinsurance and pension funding...	0.34	*56*	0.31	*10*	0.65	*55*
41	Activities auxiliary to financial services ...	0.62	*35*	0.27	*22*	0.88	*30*
42	Real estate activities (Incl. imputed rents) ...	0.90	*3*	0.05	*58*	0.95	*24*
43	Legal and accounting activities; activities of ...	0.84	*6*	0.23	*32*	1.07	*14*
44	Architectural and engineering activities; ...	0.74	*20*	0.25	*27*	0.98	*21*
45	Scientific research and development	0.75	*19*	0.25	*25*	1.00	*19*
46	Advertising and market research	0.59	*39*	0.24	*28*	0.83	*35*
47	Other professional, scientific and technical ...	0.56	*42*	0.16	*51*	0.72	*47*
48	Rental and leasing activities	0.76	*18*	0.17	*47*	0.93	*26*
49	Employment activities	0.90	*4*	0.64	*1*	1.53	*1*
50	Travel agency, tour operator reservation ...	0.77	*16*	0.24	*29*	1.01	*15*
51	Security and investigation activities; services..	0.78	*13*	0.44	*8*	1.22	*8*
52	Public administration and defence; ...	0.82	*8*	0.49	*4*	1.32	*4*
53	Education	0.92	*2*	0.61	*2*	1.53	*2*
54	Human health activities	0.84	*5*	0.44	*7*	1.29	*5*
55	Social work activities	0.83	*7*	0.52	*3*	1.35	*3*
56	Creative arts, gambling & betting activities ...	0.49	*52*	0.09	*56*	0.58	*56*
57	Sports activities and amusement and ...	0.77	*14*	0.31	*11*	1.08	*12*
58	Other Service Activities ...	0.72	*21*	0.28	*19*	1.00	*18*
59	Activities of households as employers; ...	1.00	*1*	0.00	*59*	1.00	*17*

Source: Author's Calculations

Appendix G

Type I and type II employment-output multipliers

No	Sectors	Type I Employment Multiplier (direct and indirect effects)		Induced effects		Total Type II Employment multiplier (direct, indirect + induced effects)	
		Type I	*Rank*	Induced effects	Rank	*Type II*	Rank
1	Crop and animal production, hunting ...	21	*25*	4	*52*	25	*29*
2	Fishing and aquaculture	11	*51*	3	*54*	15	*52*
3	Mining and quarrying	16	*38*	4	*50*	21	*42*
4	Manufacture of food products, beverages ...	17	*36*	5	*44*	22	*39*
5	Manufacture of textiles, wearing apparel	21	*24*	7	*26*	28	*26*
6	Manufacture of wood and of products ...	27	*10*	6	*31*	33	*11*
7	Manufacture of paper and paper products	19	*29*	7	*23*	26	*28*
8	Printing and reproduction of recorded media	14	*45*	6	*36*	20	*45*
9	Manufacture of coke and refined petroleum ..	22	*21*	5	*39*	28	*27*
10	Manufacture of chemicals and chemical...	14	*44*	5	*48*	19	*48*
11	Manufacture of basic pharmaceutical ...	8	*54*	3	*53*	12	*54*
12	Manufacture of rubber and plastic products	23	*20*	8	*16*	30	*18*
13	Manufacture of other non-metallic mineral ...	23	*18*	6	*33*	29	*25*
14	Manufacture Basic Metals and of fabricated...	18	*32*	5	*40*	23	*36*
15	Manufacture of computer, electronic...	5	*57*	2	*57*	7	*57*
16	Manufacture of electrical equipment	15	*41*	5	*46*	20	*43*
17	Manufacture of machinery and equipment...	23	*17*	6	*30*	29	*24*
18	Manufacture of motor vehicles, trailers...	15	*43*	5	*42*	20	*44*
19	Manufacture of other transport equipment	38	*4*	5	*41*	43	*5*
20	Manufacture of furniture; other manu....	22	*22*	8	*14*	30	*19*
21	Repair and installation of machinery and ...	18	*31*	12	*5*	30	*20*
22	Electricity, gas, steam and air conditioning ...	7	*55*	3	*55*	10	*55*
23	Water collection, treatment and supply	32	*8*	8	*13*	40	*9*
24	Sewerage; waste collection, treatment ...	12	*50*	8	*15*	19	*46*
25	Construction	27	*13*	6	*34*	32	*15*
26	Wholesale and retail trade and repair of ...	23	*16*	7	*24*	30	*22*
27	Wholesale trade, except of motor vehicles ...	22	*23*	7	*18*	30	*23*
28	Retail trade, except of motor vehicles ...	34	*6*	8	*12*	43	*6*

29	Land transport and transport via pipelines ...	27	*12*	5	*45*	32	*17*
30	Water transport	13	*48*	5	*43*	19	*47*
31	Air transport	14	*47*	7	*21*	21	*41*
32	Warehousing and support activities for ...	16	*40*	6	*35*	22	*40*
33	Postal and courier activities	30	*9*	11	*9*	41	*8*
34	Accommodation and food service activities	23	*19*	7	*20*	30	*21*
35	Publishing activities	15	*42*	8	*17*	23	*38*
36	Motion picture, video and television ...	27	*11*	6	*38*	33	*12*
37	Telecommunications	9	*53*	4	*49*	14	*53*
38	Computer programming, consultancy and ...	12	*49*	6	*37*	18	*50*
39	Financial service activities, except insurance...	20	*28*	12	*6*	32	*16*
40	Insurance, reinsurance and pension funding...	16	*39*	8	*10*	24	*31*
41	Activities auxiliary to financial services ...	17	*34*	7	*22*	24	*32*
42	Real estate activities (Incl. imputed rents) ...	5	*56*	1	*58*	7	*58*
43	Legal and accounting activities; activities of ...	18	*30*	6	*32*	24	*33*
44	Architectural and engineering activities; ...	17	*33*	6	*27*	24	*34*
45	Scientific research and development	10	*52*	7	*25*	17	*51*
46	Advertising and market research	17	*35*	6	*28*	23	*35*
47	Other professional, scientific and technical ...	20	*27*	4	*51*	24	*30*
48	Rental and leasing activities	14	*46*	5	*47*	18	*49*
49	Employment activities	33	*7*	17	*1*	49	*4*
50	Travel agency, tour operator reservation ...	17	*37*	6	*29*	23	*37*
51	Security and investigation activities; services..	40	*3*	12	*8*	51	*3*
52	Public administration and defence; ...	26	*14*	13	*4*	39	*10*
53	Education	40	*2*	16	*2*	56	*2*
54	Human health activities	21	*26*	12	*7*	33	*13*
55	Social work activities	131	*1*	14	*3*	145	*1*
56	Creative arts, gambling & betting activities ...	5	*58*	2	*56*	7	*56*
57	Sports activities and amusement and ...	24	*15*	8	*11*	33	*14*
58	Other Service Activities ...	35	*5*	7	*19*	43	*7*
59	Activities of households as employers; ...	0	*59*	0	*59*	1	*59*

Source: Author's Calculations