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Conference Paper

Spatialised Social Accounting and its application in the Greater South East of England

50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Grinevich, Vadim; Jin, Ying; Zachariadis, Vassilis (2010) : Spatialised Social Accounting and its application in the Greater South East of England, 50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden, European Regional Science Association (ERSA), Louvain-la-Neuve

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Spatialised Social Accounting and its application in the Greater South East of England

WORK IN PROGRESS DRAFT

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Abstract:

The paper presents a new extension to the Social Accounting Matrix (SAM) in the assessment of land use, transport and utility infrastructure development options from the perspective of a UK region. A geographically detailed model is required to analyse spatially heterogeneous impacts of land use, transport and utility infrastructure developments. On the other hand, a robust assessment must be built upon a systematic representation of the links among production, consumption, investment and trade such as in a SAM. A spatialised SAM has thus been developed. The paper discusses the methodological and empirical approach, focusing on model calibration at the Base Year, empirical testing of the projection procedure, and the new insights this model offers into the effects of policy and technology options on the demand for land, travel, water, energy, emissions and waste disposal.

Keywords: Land-use – transport interaction; household location; Input-Output tables; Social accounting; random utility models.

1. Generation of demand

A single causal chain is used to model the interrelated impact of exogenously input and endogenously generated production and demand of industries, factors of production (land, labour, capital) and institutions (households, government) (Echenique 2005). The process is repeated until equilibrium between supply and demand is reached, subject to exogenously set constraints.

Typically the process is triggered by inputting export outputs estimates by industry (and/or institution), and estimated government expenditure and investment. Alternatively, the demand for employment for exports, investment and government expenditure can be used.

The implemented causal chain follows the flowchart of Figure 1. Industries, factors of production and institutions¹ generate demand for inputs (industries, factors or institutions) in the zones where their activities are located². The sum of demands for an input factor across all factors in a zone will determine the total demand for this input in this zone. Supply of

¹ They will be referred to simply as factors for the rest of the paper. When their relation to other factors needs to be highlighted, they may be referred to as inputs or outputs.

² The number of units of input factor m needed to generate one unit of factor n will be referred to as demand coefficient a^{mn}

input factors for a zone is assigned to production zones using weighted random utility models (Equation 1 for the case of the logit model).

$$T_{ij}^n = Y_j^n \times b_{ij}^n = Y_j^n \times \frac{s_i^m \times \exp(-\lambda^n \times U_{ij}^n)}{\sum_{i'} s_{i'}^m \times \exp(-\lambda^n \times U_{i'j}^n)} \quad (1)$$

Where T_{ij}^n represents the trade of factor n from zone i to zone j , Y_j^n the demand in j , b_{ij}^n is the trade coefficient between zone i and j , U_{ij}^n is the modelled disutility of factor n from zone i to zone j , λ^n represents the size of the random element of disutility, and s_i^m is the weighting factor for zone i that represents the factor-specific size of the zone and reflects the number of opportunities or alternative production sources in the zone.

The modelled part of disutility U_{ij}^n is equal to the sum of production costs (in utility units) and disutilities of the input factor in its production zone and transport costs (in utility units) and disutilities between production and consumption zone (Equation 2).

$$U_{ij}^n = \mu^m \times {}^M p_i^m + {}^M u_i^m + {}^T u_{ij}^m + {}^T z_{ij}^m \quad (2)$$

Where ${}^T u_{ij}^m$ and ${}^T z_{ij}^m$ are transport disutilities and exogenous trade disutilities, ${}^M u_i^m$ is the production disutility, ${}^M p_i^m$ is production cost and μ^m is the marginal utility of money.

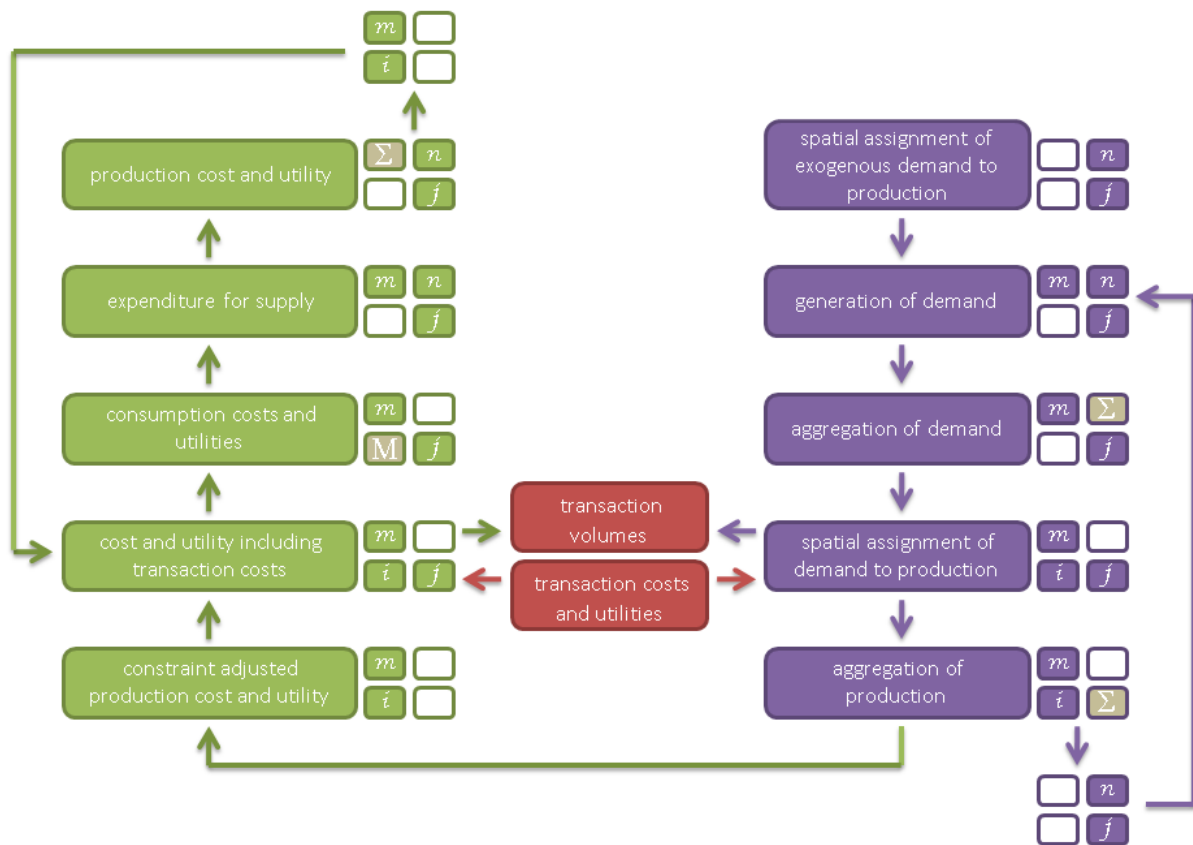


Figure 1 – Abstract flowchart. The indices in the right side of the process boxes represent input factor (1,1)³, output factor (1,2), production zone (2,1) and consumption zone (2,2). Σ and M represent aggregation and composition respectively.

2. Emergence of costs and disutilities

The total production of a factor in a specific production zone is equal to the sum of demands for this factor from each consumption zone. Total production is subject to production constraints. In order to match demand to supply, cost ‘at gate’ and utility ‘at gate’ for each factor and zone are adjusted based on the calculated production and the production constraints. When the estimated production is higher than the maximum constraint, the prices (or utilities) are raised and a positive rental (i.e. profit) is generated. Accordingly, when production is lower than a minimum constraint, a negative rental (i.e. loss⁴) is generated. The causal chain is iterated until no further changes in utilities and costs occur and the system reaches equilibrium.

The consumption cost of a factor in a consumption zone is calculated as the weighted mean of the cost of production from a production zone plus the cost of transport from this zone to the consumption zone plus any part of the disutility of production and/or disutility of transport that the producer may pass to the consumer as cost (Equation 3).

³ (r,c) represent cell position (row, column) in the 2 x 2 matrix at the right side of each process box.

⁴ Note that a negative rental (loss) must always be smaller than the production cost of the factor; i.e. producers will never pay to supply their product.

$${}^N p_j^m = \sum_i b_{ij}^n \times ({}^M p_i^m + a_{1,m} \times {}^M u_i^m / \mu^m + {}^T c_{ij}^m + a_{2,m} \times {}^T u_{ij}^m / \mu^m) \quad (3)$$

Where ${}^N p_j^m$ represents the consumption cost of a unit of factor m in zone j , b_{ij}^n is defined in Equation 1, ${}^T u_{ij}^m$ is the transport disutility, ${}^M u_i^m$ is the production disutility, ${}^M p_i^m$ and ${}^T c_{ij}^m$ are the production and transport costs, μ^m is the marginal utility of money and $a_{1,m}$, $a_{2,m}$ control how additional costs are generated from disutilities; i.e. how disutilities of production and transport are passed to the consumer as monetary costs. Accordingly, the consumption disutility ${}^N d_j^m$ of a factor m in a consumption zone j is given, in the case of the logit model, by Equation 4.

$${}^N d_j^m = -\frac{1}{\lambda^m} \times \log \sum_i s_i^m \times \exp(-\lambda^m \times (\mu^m \times {}^M p_i^m + {}^M u_i^m + {}^T u_{ij}^m + {}^T z_{ij}^m)) \quad (4)$$

By multiplying the consumption cost of an input factor m by the demand coefficient a^{mn}_j of a consuming factor n for m in zone j we calculate the expenditure of n for m . Respectively, by multiplying the proportion of consumption disutility that is passed to the consumer by the consumption disutility of m by the demand coefficient of n for m we calculate the amount of disutility passed to the production of n from consumption of m . By summing expenditure for all inputs of n we get the basic production cost of n ; by summing all disutilities passed on by all inputs we get the endogenous production disutility. As mentioned, these values are adjusted by adding cost and disutility rentals and exogenous costs and disutilities to get the consumption cost at the location of production.

Figure 2 illustrates the complete sequence of processes for the case of persons in employment. Demand is generated from top to bottom, starting from the exogenous factors, while prices and disutilities are emerging from bottom to top and are affected by exogenous charges and production constraints. Spatial assignment of demand to production zones generates flows which, subject to network constraints, generate trade costs and disutilities.

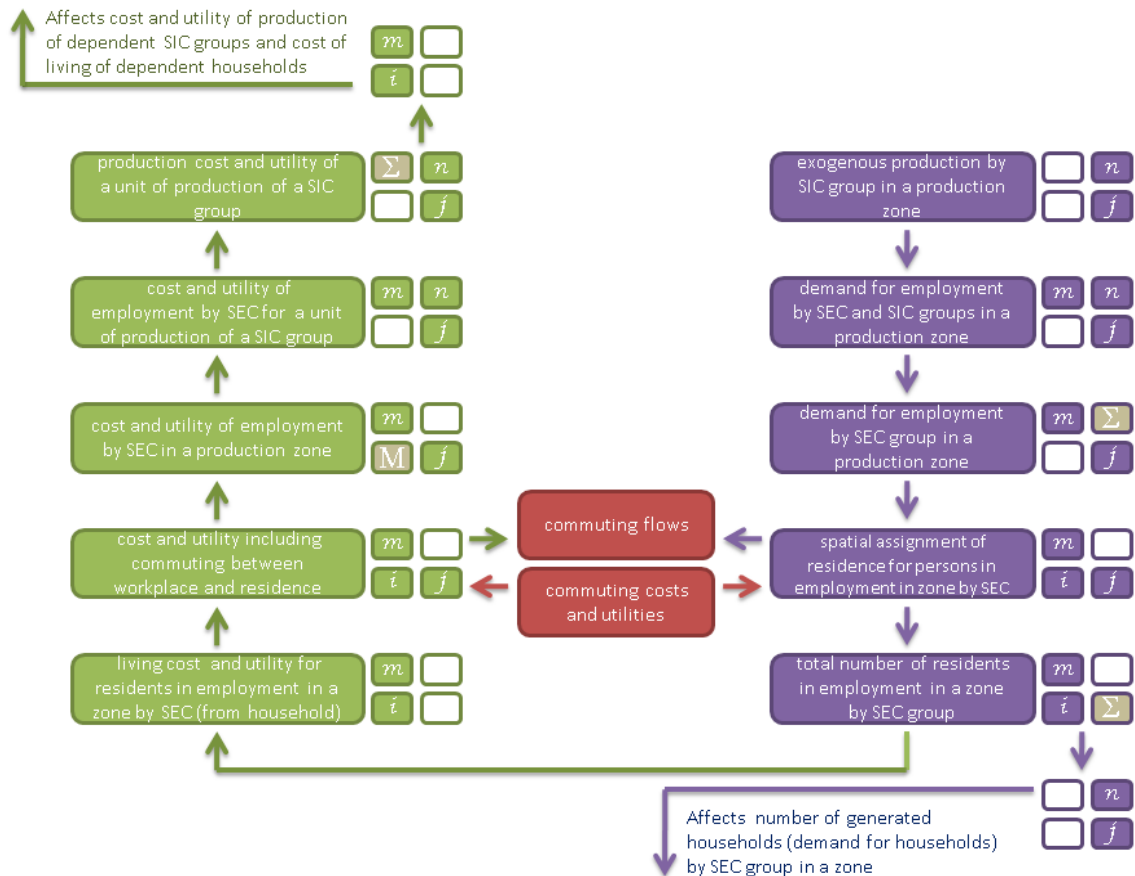


Figure 2 – An example of the process sequence in the case of persons in employment. Note the top-down direction of demand and the bottom-up emergence of costs and disutilities⁵.

3. Elasticity of demand

The model is capable of representing elasticity of demand due to cost and disutility shifts, and of capturing the development of substitution effects via the use of appropriate production functions.

In the case of household expenditure patterns, the fundamental assumption is that households of a specific socio-economic classification (SEC) group n will enjoy a fixed level of utility U^n regardless of the amount and type of consumed input factors to attain it. For any zone the distribution of spending will be such that households of a specific SEC group will reach their desired utility level by minimising expenditure costs. Typically this is modelled by using a Cobb-Douglas production function and the condition of Equation 5. Therefore, by assuming fixed utility U^n , Equation 6 calculates the demand coefficients that minimise the cost of living for the household of SEC group n .

⁵ SIC is Standard Industrial Classification and SEC is Socio-Economic Classification. For example, an employment sector SIC demands employees by SEC and these employees will produce households of type SEC.

$$U^n = \prod_m (a_i^{mn} - a_{\min}^{mn})^{a^{mn}}, \text{ for } c_i^n = \min \left[\sum_m a_i^{mn} \times p_i^m \right], \sum_m a^{mn} = 1 \quad (5)$$

$$a_i^{mn} = a_{\min}^{mn} + U^n \times \left(\frac{a^{mn}}{p_i^m} \right) / \prod_{m'} \left(\frac{a^{m'n}}{p_i^{m'}} \right)^{a^{m'n}} \quad (6)$$

Where, a_i^{mn} is the demand coefficient in zone i , a_{\min}^{mn} is the minimum demanded amount of m , a^{mn} is the typical fraction of expenditure for m , c_i^n is the minimum expenditure needed to reach the expected utility, and p_i^m is the cost/disutility element that reflects the substitution process.

This suggests that if the value of land in zone i is increasing, households will be inclined to consume less land in this area and compensate by consuming larger quantities of other consumables that contribute to their utility U^n .

Moreover, assuming prices of other products remain constant, the cost of living in zone i will increase, and either the size of households in i will increase (elastic coefficient of demand of persons in employment for households), or the cost of production of persons in employment for zone i will go up, affect the spatial assignment of persons in employment and, eventually, the number of households in i .

Similar approaches are used to model technological shifts, substitution effects and price elasticities for the production functions of other factors. For example, in the case of industrial production, demand coefficients for alternative factors of production (land, labour and capital) will be model as mutually substitutional using Cobb-Douglas or similar functions, and the demand coefficients for intra-industrial inputs (intermediate production demands) will either be handled similarly, or treated as independently elastic to price.

4. Calibration: A Social Accounting Framework

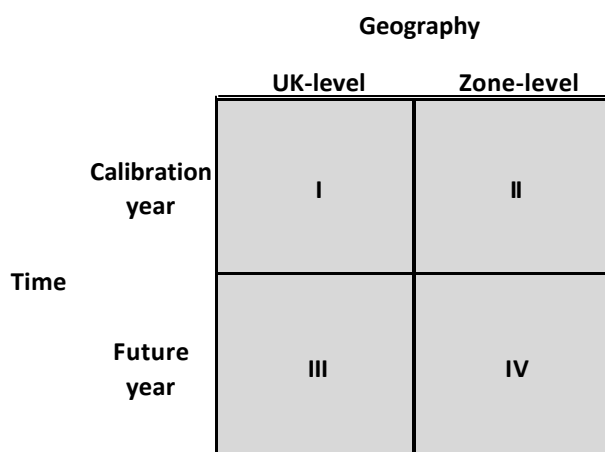
The presented modelling platform is being used to develop, calibrate and run the Greater South East (GSE) land use and infrastructure model. The model is based on 192 spatial zones covering the whole of the UK plus two external zones (Europe and rest of the world). For the GSE regions such as London, the East of England, and the South East each local authority district corresponds to a zone. For regions that share borders with the WSE (the East Midlands, the West Midlands and the South West) each county corresponds to a zone. Each of the remaining regions and countries correspond to a zone.

The model is integrated with an extended input-output framework (or social accounting framework) to represent inter-industry linkages, final consumption by households and the government sector, investment and international trade. For calibration we choose 2001, a latest Census year. As a starting point we use a symmetric industry-by-industry (I_XI) input-output (I-O) table, produced by the Organisation for Economic Co-operation and Development (OECD) for the UK for the year 2000 (Yamano and Ahmad, 2006). The OECD table is derived from the respective UK supply and use tables and based on the fixed product sales structure assumption, implying that each product has its own particular sales structure,

irrespective of the industry where it is produced. It is assumed that the proportion of a given domestically produced product bought by “Industry 1” from “Industry 2” is proportional to “Industry’s 2” share of the total domestic production of this product.

In the calibration context, the use of the IxI format for I-O tables looks more advantageous compared to that of the product-by-product specification. It is often argued that the IxI representation of I-O tables best reflects the actual picture of inter-industry relationships in the economy, which our model depends on to be robustly calibrated (Yamano and Ahmad, 2006). Another important point is that within the IxI format the value added and its components such as labour inputs, profits and production taxes remain exactly the same as those published in official statistics. This makes it easier to link our I-O framework to a wide range of complementary data sources which are required to perform disaggregation, regionalisation and projection extensions of I-O tables.

We reformatted the original 48-industry OECD input-output table for 2000 to the 21-industry level, keeping energy and transport related sectors separate where possible (Annex 1). The consequent extensions of this basic input-output table are performed in different geographical and temporal dimensions and can be schematically presented using a two-by-two matrix, with its axes denoting geography and time references respectively of input-output extensions (Graph1).



Graph 1 - Extended Input-Output Framework Dimensions

In relation to the calibration Quadrant 1 of Graph 1, we estimate demand coefficients for domestic and imported intermediates combined as well as labour input coefficients (Annex 2). We also extend our basic input-output framework by disaggregating households’ final consumption by socio-economic type of households. The type of households is defined by the socio-economic class of the household reference person (HRP)⁶. We distinguish between economically active and economically inactive households. Within the economically active category we identify five types of households such as those where the HRP belongs to (1) senior managerial staff and professionals, (2) lower managerial staff and professionals, (3) intermediate occupations, small employers and lower supervisory staff, (4) semi-routine and

⁶ According to the Office for National Statistics, the Household Reference Person is “the person responsible for owning or renting or who is otherwise responsible for the accommodation. In the case of joint householders, the person with the highest income takes precedence and becomes the HRP. Where incomes are equal, the older is taken as the HRP”
<http://www.ons.gov.uk/about-statistics/classifications/current/ns-sec/household-level/index.html>

routine occupations and (5) the unemployed. These five types reflect broad groups of the National Statistics Socio-Economic Classification (NS-SEC). The key criterion behind NS-SEC is occupation in combination with details on whether a given person is an employer, self-employed or employee; whether he or she performs supervisory functions; whether he or she is employed in a large organisation.

These broad socio-economic groups are inevitably facing different income level constraints and are expected to have specific patterns of consumption. To identify these patterns for the calibration year, we used information from the Expenditure and Food Survey (EFS). In this survey the items of household expenditure are broken down according to the Classification of Individual Consumption by Purpose (COICOP). To make them consistent with our I-O framework we allocated each of the COICOP codes to the respective industries. The derived matrix of consumption by household type and industry was then updated via the RAS procedure (Miller and Blair, 2009) to make it possible to incorporate it into the initial I-O table. Annex 3 specifies this I-O extension.

As far as the calibration Quadrant II is concerned, we make an assumption that demand coefficients for intermediates are industry specific and do not vary significantly across geographical areas. In relation to labour demand coefficients again we assume that in monetary terms there is no significant variation in sector-level labour productivity across zones. At the same time, we allow physical labour inputs and wages to vary across geographies.

We extend our basic input-output framework to estimate and spatialise industry demand for different socio-economic types of labour. Zone-level data used for this stage of calibration were specifically commissioned from the 2001 Census team at the Office for National Statistics (ONS). In addition to the socio-economic types (1) - (4) described in the household consumption paragraph above, we were able to add employed and self-employed full-time students as a separate analytical category⁷. Annex 4 illustrates this extension of an I-O table, by contrasting the respective data for Cambridge and the UK as a whole.

5. Calibration: Household formation coefficients

Having identified the socio-economic composition of labour input for each industry in each of the zones, we then estimate household formation coefficients. These indicate demand for different socio-economic type of households by each of the five socio-economic groups of labour. The household formation coefficients were calibrated using the household based sample of anonymised records from 2001 Census (Household SARs). The UK-wide distributions of persons by NS-SEC to household by NS-SEC of HRP (Annex 5) were transformed to localised demand coefficients by using the district level household by NS-SEC and person by NS-SEC and economic activity tables as generation constraints (Census 2001 – Tables ST044 and CS043 respectively).

The unspecified economic activity of the household HRP led to generation of demand coefficients that included inactive households in each of the household classes. This was partially addressed by correcting the household constraints by excluding households formed exclusively by pensioners using table ST044 (NS-SEC of HRP by household composition -

⁷ It was impossible, however, to have employed and self-employed full-time students as a separate category for patterns of consumption by household type due to statistically unrepresentative sample of this category in EFS.

Census 2001). To completely address the issue a custom table has been commissioned from the ONS Census team; persons by economic activity and NS-SeC by economic activity and NS-SEC of HRP by local authority.

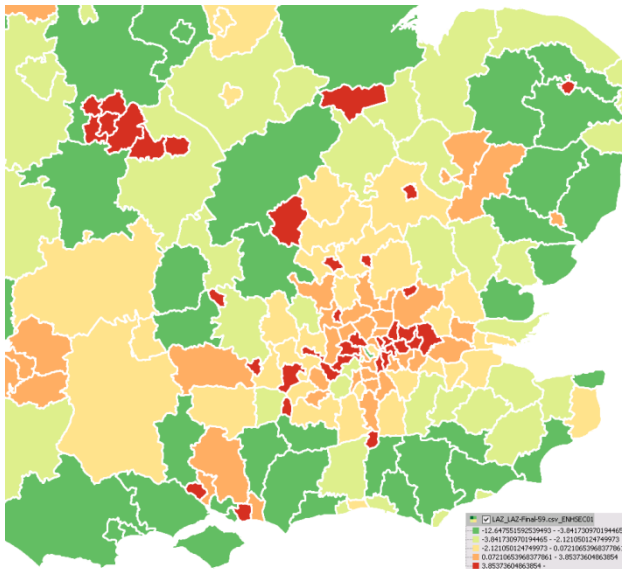


Figure 3 - Implicit Exogenous disutility for households - SEC01 h/hold reference person: higher managerial and professional

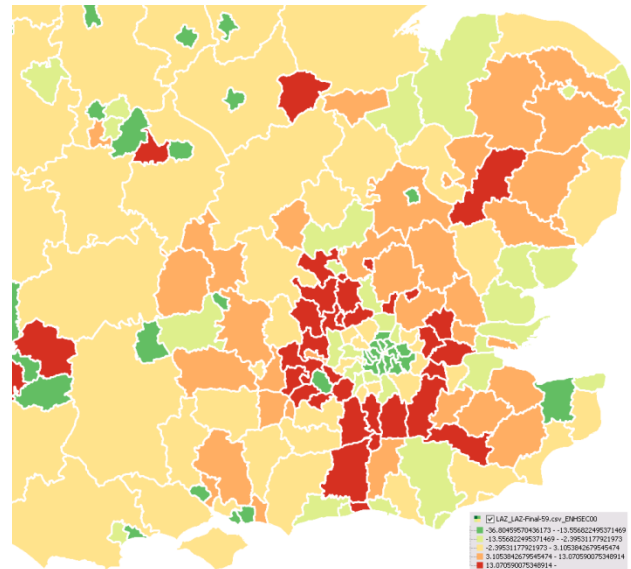


Figure 4 - Implicit Exogenous disutility for households - SEC00 h/hold reference person: student in full time education

6. Calibration: assignment of location of residence and generation of exogenous production disutility

In order to calibrate the spatial assignment of persons in employment, a doubly constraint model of persons in employment by SEC and workplace and households by SEC and residential location was developed. All employment was exogenously input using a commissioned table of persons in employment by NS-SEC and workplace. Transport costs by person in employment by SEC and workplace, residential location pairs were exogenously input. Housing costs and other living expenses by household SEC and residential location were also exogenous.

The household formation coefficients were used to generate households based on production of persons in employment by SEC in each zone. Production of households by SEC was constrained using table ST044 from the 2001 census. To match demand and supply, the exogenous implicit disutility of production of households by NS-SEC group was adjusted until the system reached equilibrium.

The resulting exogenous disutilities of production of households by SEC represent the relative attractiveness of each spatial zone for production (assignment) of households of this SEC (Figures 3 and 4). Note, however, that these disutilities include the effect of tenure conditions on attractiveness; i.e. housing density is one of the components that form the attractor. This becomes apparent, following observance of the pattern in Figure 3 (households of SEC01 – Higher managerial and professional).

Socio-Economic Classification	Average distance travelled
SEC01 Higher managerial and professional	15.76
SEC02 Lower managerial and professional	12.92
SEC03 Intermediate; small employers and lower supervisory	12.27
SEC04 Semi-routine and routine	10.91
TOTAL	12.52

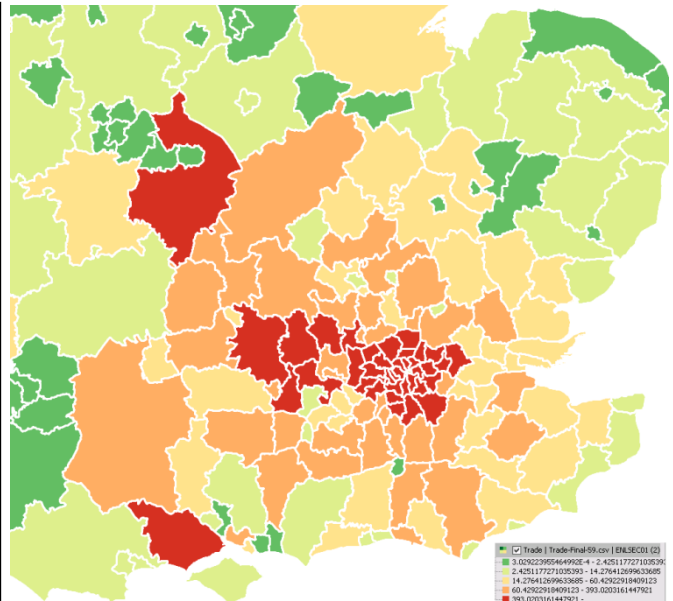


Figure 5 – a. Volume of flows of SEC01 persons in employment from location of residence to workplace (workplace: Borough of Westminster) – b. Average travelled distance to workplace by SEC group.

Figure 5b illustrates the generated trade volumes between locations of residence and the Borough of Westminster (workplace zone) for persons of SEC01. The generated average travelled distance for journeys to work by SEC (Figure 5a) follow the expected trend (less specialised SEC groups tend to have shorter average journeys to work), but the average journey length for SEC01 and SEC02 are slightly underestimated (LASER Enhancement Project, ME&P 2002). This is expected to be corrected once the exogenous transport costs become more accurate and the spatial distribution model is fully calibrated.

7. Next steps

The next calibration stage involves removing the household production constraints and using land use constraints (Generalised Land Use Database, 2005). This exercise is also related to the calibration of the household expenditure model and the calculation of the fixed utility levels of households by NS-SEC. This calibration of the expenditure model using EFS will allow the use of the Cobb-Douglas production function and thus, the calculation of the implicit exogenous disutilities of production with no embedded tenure preferences.

Once the model is calibrated and verified for the calibration year, it will be run forward to produce forecast for 2010, making it possible to compare the model performance against relevant available data. To project an I-O table, we intended to use the EURO method (Eurostat 2008).

The basic idea behind this method is to arrive at input-output tables, which are consistent with official macroeconomic forecast for sector-level GVA, final demand components and imports, but to avoid arbitrary changes of important input-output coefficients to ensure consistency of supply and demand. The iterative updating procedure covers all the elements of an input-output table, with household consumption and other final demand components are being treated like any other production sector. The method makes it sure that sectors that are expected to grow gain in relative importance in all input-output activities, while sectors that are expected to decline lose in importance across the table. As a result, individual coefficients

do not change against the trend of technology and market forces. Figure 6 presents further details of the EURO method approach.

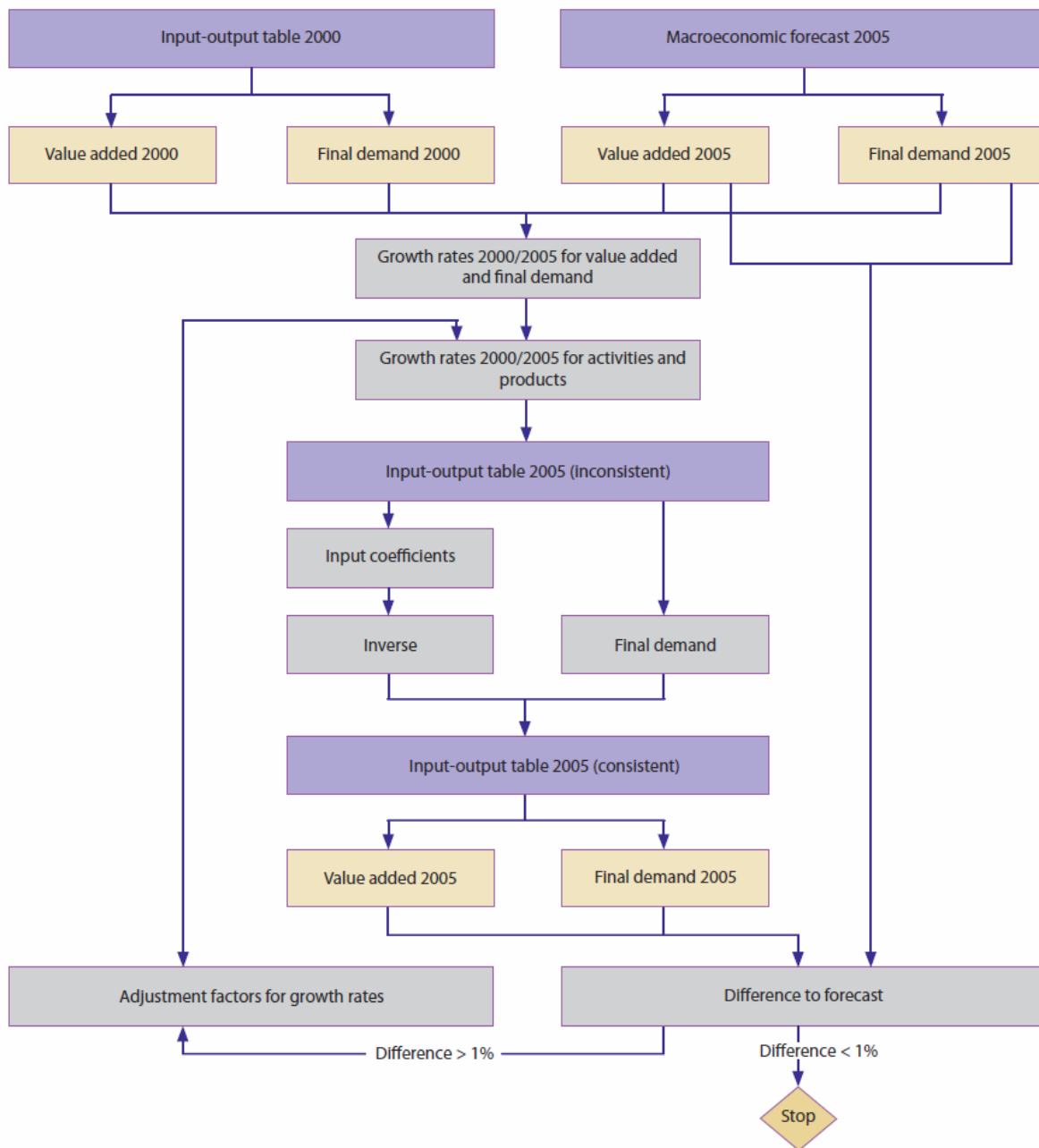


Figure 6 - EURO method for projecting input-output tables.
Source: Eurostat (2008)

To validate this method we used symmetric IxI I-O tables produced by OECD for the UK for 2000 and 2005. The results of the validation exercise are presented by Annex 6.

Acknowledgements

We would like to thank Professor Marcial Echenique and Dr Tony Hargreaves for their help on central aspects of the process and for their comments on this draft.

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Annex 1 - Sectors covered by the ReVISIONS model

1	Agriculture etc & non-energy mining
2	Energy mining and quarrying
3	Manufacturing
4	Coke, refined petroleum products and nuclear fuel
5	Electricity, gas, stea and hot water supply
6	Collection, purification and distribution of water
7	Construction
8	Wholesale & retail trade; repairs
9	Hotels & restaurants
10	Land transport; transport via pipelines
11	Water transport
12	Air transport
13	Supporting and auxiliary transport activities; activities of travel agencie
14	Post & telecommunications
15	Finance & Insurance
16	Computer & related activities & R&D
17	Other services
18	Public admin. & defence; compulsory social security
19	Education
20	Health & social work & other social services
21	Private households with employed persons & extra-territorial organisations & bodies

Annex 2 - Demand coefficients for intermediate inputs and labour

Country United Kingdom
Year 2000 - 5 sector
Valuation Basic price
Type Industry-by-industry symmetric, total
Currency Mill. Pound
Source OECD

Industry	Agr, mining	Mfg	EGW	Construction	Services	Total intermediate	H/h FC	Gov FC and investmn	Exports	Total FC	Total use
1 Agriculture and mining	3374	16021	6559	444	2349	28747	9106	666	16682	26454	55201
2 Manufacturing	3724	79789	1459	13358	62204	160533	98016	24632	131921	254569	415102
3 EGW	701	7027	16706	394	7787	32614	15798	587	211	16596	49210
4 Construction	834	1328	575	27933	18726	49396	2787	64457	225	67470	116866
5 Services	9118	87069	3977	20254	378194	498612	336324	228208	91489	656021	1154633
Total domestic	17751	191234	29276	62382	469260	769903	462031	318550	240528	1021109	1791012
1 Agriculture and mining	1496	6458	2118	1875	698	12645	2366	1268		3634	16280
2 Manufacturing	1910	61191	931	5169	37577	106777	64594	36332		100926	207704
3 EGW	5	58	153	2	53	272	123	2		125	397
4 Construction	0	1	0.3	15	10	26	1	35		36	62
5 Services	359	3562	179	781	22300	27179	11111	2170		13281	40460
Total imports	3770	71270	3382	7841	60638	146900	78195	39808		118003	264903
Net taxes on products	907	6658	1098	3026	24011	35701	56181	8404	11785	76370	112071
Value Added	32760	145935	15454	43617	600724	838490					838490
<i>of which compensation of employees</i>	838	8113	43	775	21346	31115					31115
Industry Output	55188	415097	49210	116866	1154633	1790993	596408	366762	252312	1215482	3006476

demand coefficients

Industry	Agriculture etc & non-energy mining	Manufacturing	EGW	Construction	Services
1 Agriculture and mining	0.088	0.054	0.176	0.020	0.003
2 Manufacturing	0.102	0.340	0.049	0.159	0.086
3 EGW	0.013	0.017	0.343	0.003	0.007
4 Construction	0.015	0.003	0.012	0.239	0.016
5 Services	0.172	0.218	0.084	0.180	0.347
Total	0.390	0.632	0.664	0.601	0.459
Net taxes on products	0.016	0.016	0.022	0.026	0.021
Value Added	0.594	0.352	0.314	0.373	0.520
<i>compensation of employees</i>	0.015	0.020	0.001	0.007	0.018
Industry Output	1.000	1.000	1.000	1.000	1.000

Annex 3 - Final Consumption of Households by Socio-Economic Type of HRP

Country United Kingdom
Year 2000 - 5
Currency Mill. Pound
Source Authors' Calculations based on EFS and OECD

Industry	Higher managerial and professionals	Lower managerial and professionals	Intermediate, small employers and lower supervisory	Semi-routine and routine	unemployed	economically inactive	Total
1 Agriculture and mining	1576	1725	2348	1187	75	2196	9106
2 Manufacturing	15844	24206	20067	12691	547	24662	98016
3 EGW	2005	3144	2903	2117	181	5448	15798
4 Construction	467	491	486	482	357	503	2787
5 Services	62870	82183	68486	43817	5931	73036	336324
Total domestic	82763	111750	94290	60293	7092	105844	462031
1 Agriculture and mining	429	442	620	316	21	538	2366
2 Manufacturing	11100	15600	13321	8732	883	14958	64594
3 EGW	17	24	23	17	2	40	123
4 Construction	0.2	0.2	0.2	0.2	0.2	0.2	1
5 Services	2463	2845	1994	1135	293	2380	11111
Total imports	14009	18912	15958	10200	1199	17917	78195
Net taxes on products	10064	13588	11465	7331	862	12871	56181
Total	106836	144250	121713	77824	9153	136632	596408

Annex 4 - Composition of labour by socio-economic group and industry: Cambridge v UK, 2001

	Agriculture etc & non-energy mining		Manufacturing		EGW		Construction		Services	
	UK	Cambridge	UK	Cambridge	UK	Cambridge	UK	Cambridge	UK	Cambridge
Higher managerial and professionals	0.06	0.22	0.14	0.25	0.20	0.18	0.06	0.07	0.12	0.23
Lower managerial and professionals	0.10	0.18	0.18	0.30	0.23	0.22	0.13	0.16	0.29	0.30
Intermediate, small employers and lower supervisory	0.61	0.44	0.32	0.26	0.44	0.47	0.56	0.52	0.29	0.24
Semi-routine and routine	0.21	0.13	0.35	0.16	0.11	0.13	0.24	0.23	0.25	0.17
Employed students	0.01	0.03	0.01	0.02	0.02	0.01	0.01	0.01	0.04	0.06

Source: 2001 Census commissioned data

Annex 5 - Allocation of labour to households, 2001

		Household reference person					
		Higher managerial and professionals	Lower managerial and professionals	Intermediate, small employers and lower supervisory	Semi-routine and routine	Employed FT students	Other
labor	Higher managerial and professionals	0.66	0.04	0.02	0.01	0.01	0.06
	Lower managerial and professionals	0.14	0.71	0.09	0.07	0.02	0.18
	Intermediate, small employers and lower supervisory	0.11	0.13	0.72	0.12	0.01	0.32
	Semi-routine and routine	0.07	0.09	0.13	0.77	0.02	0.37
	Employed full-time students	0.03	0.03	0.03	0.03	0.94	0.07

Source: Household SARs

Annex 6 - EURO Method Validation Exercise

Country United Kingdom
Year 2005 - 5 sector
Valuation Basic price
Type Industry-by-industry symmetric, total
Currency Mill. Pound
Source OECD

Industry	Agriculture etc & non-energy mining	Manufacturing	EGW	Construction	Services	Total intermediate	HHFC	Other FC	Exports	Total	Total use
1 Agriculture and mining	3171	16044	9413	1754	2685	33067	9445	967	16186	26597	59664
2 Manufacturing	4109	78418	1546	17590	57124	158785	106554	24611	136309	267474	426259
3 EGW	1220	9694	15044	568	9574	36100	22785	510	414	23708	59808
4 Construction	915	1364	888	48173	21590	72930	6868	99363	802	107032	179962
5 Services	9240	81591	5061	27653	468341	591886	453509	347114	139559	940182	1532068
Total domestic	18654	187111	31952	95737	559314	892768	599159	472565	293269	1364993	2257761
1 Agriculture and mining	1962	10160	7407	1185	694	21408	3545	443		3988	25396
2 Manufacturing	1966	66720	1175	6096	46181	122139	86008	29013		115021	237160
3 EGW	9	84	165	3	88	348	127	0		127	475
4 Construction	7	10	7	392	169	586	50	0		50	636
5 Services	557	4184	384	1381	38409	44916	30020	0		30020	74935
Total imports	4502	81158	9137	9057	85542	189397	119750	29456	0	149206	338603
Net taxes on products	1525	9879	2034	5300	40211	58948	65231	10744	2487	78462	137410
Value Added	34983	148111	16685	69868	847001	1116648					1116648
Industry Output	59664	426259	59808	179962	1532068	2257761	784140	512765	295756	1592661	3850422

Year		2005 EURO method Forecast									
Industry	Agriculture etc & non-energy mining	Manufacturing	EGW	Construction	Services	Total intermediate	HHFC	Other FC	Exports	Total	Total use
1 Agriculture and mining	3608	17043	7259	580	2836	31326	10800	807	18567	30174	61499
2 Manufacturing	3808	81026	1543	16869	72392	175638	111910	28760	140981	281651	457289
3 EGW	732	7294	18050	505	9220	35801	18363	698	229	19290	55091
4 Construction	1150	1841	826	44714	28068	76599	4130	97192	317	101640	178238
5 Services	11719	112184	5312	30614	533375	693204	468193	323592	120676	912461	1605665
Total domestic	21017	219388	32989	93282	645891	1012567	613396	451049	280771	1345216	2357783
1 Agriculture and mining	1755	7564	2577	2633	911	15440	3040	1662	0	4702	20141
2 Manufacturing	2179	69660	1101	7106	47903	127949	81031	46518	0	127549	255499
3 EGW	6	69	188	2	69	334	159	3	0	162	496
4 Construction	1	1	0	26	16	44	2	57	0	58	102
5 Services	494	4929	256	1248	33372	40298	16440	3266	0	19707	60005
Total imports	4434	82223	4122	11016	82271	184066	100671	51506	0	152178	336244
Net taxes on products	1022	7481	1283	4120	30290	44195	69718	10647	13763	94128	138323
Value Added	35026	148197	16697	69821	847214	1116955					1116955
Industry Output	61499	457289	55091	178238	1605665	2357783	783785	513202	294534	1591521	3949304