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DISAGGREGATION OF THE 2010 UK SOCIAL ACCOUNTING MATRIX TO REPORT HOUSEHOLD INCOME QUINTILES

BY

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Disaggregation of the 2010 UK Social Accounting Matrix to report household income quintiles

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Abstract:

Social Accounting Matrices (SAM) are used as the main data source for Computable General Equilibrium (CGE) models, which in turn can be used to simulate economic shocks and study their economy-wide impact. However, SAMs usually include highly aggregated categories of final consumers, therefore preventing the use of CGE models to study the impact of economic shocks on economic agents with specific characteristics. For this type of analysis, it is necessary to disaggregate the economic agent of interest in the SAM. This paper presents an approach by which it is possible to disaggregate the households in the UK SAM in quintiles based on their gross weekly income. The necessary steps to disaggregate the households are presented in detail, along with the supporting datasets and variables required to replicate the disaggregation approach for future SAMs.

Keywords: social accounting matrix, household disaggregation, income quintiles

JEL codes: D57, D58, E16

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1. Introduction and motivation

Input-Output (IO) tables are published by national/regional statistics authorities to report the value and flow of goods and services between the different industrial sectors in the country/region, the value of imported intermediate goods as well as the value of factor inputs. Moreover, in an IO table it is demonstrated how goods and services are distributed amongst final consumers, therefore indicating the structure of the domestic final demand and the value of exported goods, which are also considered as final demand in national/regional IO tables. The issue with IO tables is that there is no representation of the flow of funds between the different agents in the economy and to resolve this a Social Accounting Matrix (SAM) is used. For households, the type of economic agent we will focus on in this paper, a SAM provides us with information on their income from labour; self-employed ventures; transfers from other households, corporations, the government and abroad. Similarly, we can see how the available household income is spent in purchasing domestic goods and services; tax payments; savings; as well as funds transfers to other households, corporations and abroad.

As indicated by Reinert and Roland-Holst (1997), the comprehensive representation of the interrelationships of different economic actors in an economy in a SAM, makes it a suitable basis for macroeconomic modelling. In fact, SAMs are used as the main data sources to calibrate Computable General Equilibrium (CGE) models, which in turn are used to simulate economic shocks and study their macroeconomic impact. However, in the majority of the cases, economic agents in a SAM are highly aggregated, usually in a single category for each agent. In the case of households, this means that there is a single category of households as an economic agent, which includes every single household in the country/region, regardless of any potential differences in terms of for example income, size or skills. The underlying assumption is then that most households have similar income sources and expenditure, while reacting in similar ways to changes in the economic circumstances.

Despite being a rather strong assumption, for the purpose of a high level study of the economy-wide impacts of an economic shock, using aggregated categories of economic actors is an acceptable practice and reduces the amount of data required to perform economic analyses. However, a single household economic agent eliminates the option to conduct research involving exploring the effects of an economic shock on specific household groups or to simulate the macroeconomic impact driven by a demand shock in any one household group. When it is dictated then by the research topic/objectives that we focus on economic agents with specific characteristics, it is necessary then to disaggregate this agent in the SAM. In the case of households, a potential way of disaggregation, and the one we will focus on in this paper, is by their gross weekly income. This paper is intended to provide a documentary account of the dataset available to download at http://dx.doi.org/10.15129/ccbb132d-d970-4c39-bf48-5d0c1720b0a1. No analyses based on the data are reported here.

2. High level methodology/income quintiles for the UK

The methodology that will be presented below permits identification of household income groups in terms of quintiles. It has been used to disaggregate the UK SAM[1] for 2010. It is important to point out that there is no standardised approach in disaggregating a SAM. In other UK studies, De Fence and Turner (2010) had disaggregated the 2004 UK SAM while Xu and Thompson (2012) disaggregated the 2007 Scottish SAM, both by household income but using slightly different methods. The methodology that can be adopted in any one case, is heavily dependent on the data sources available. Here, also for reasons of data availability, we have employed an approach similar to the one developed by Emonts-Holley (2016) to disaggregate the 2009 Scottish SAM to distinguish different household skill groups[2].

Here, household income quintiles are derived from the deciles identified by the Office for National Statistics (ONS) in the 2011 edition of the Family Spending publication (ONS, 2012b), which reports the findings of the Living Cost and Food Survey (LCFS) of ONS. For each of the deciles reported in Family Spending 2011, there is an associated weekly

[1] The 2010 UK SAM has been developed and published by the Fraser of Allander Institute at the University of Strathclyde. The data are available at the following website: http://www.strath.ac.uk/business/economics/fraserofallanderinstitute/research/economicmodelling/

[2] A similar methodology has been used by Andrew Ross to disaggregate the 2009 Scottish by household income bands. For access to the disaggregated 2009 Scottish SAM please visit this website: http://dx.doi.org/10.15129/6e1b59eb-ad81-420d-a7ea-73f75fe25bad

gross income range that all the households included in each decile are falling within. By merging the deciles into quintiles, the associated weekly gross income ranges are adjusted as follows:

1st quintile £0-£237 per week

2nd quintile £238-£412 per week

3rd quintile £413-£650 per week

4th quintile £651-£1,014 per week

5th quintile over £1,015 per week

The remainder of this document explains the methodology applied to disaggregate the households in the 2010 UK SAM to income quintiles and provides information about the data used for the disaggregation. The methodology follows three main steps: 1) disaggregation of household final demand, 2) disaggregation of household income/expenditure and 3) balancing the 2010 UK SAM.

3. Disaggregation of household final demand

In national/regional IO frameworks, and therefore SAMs which are derived using the IO, the output of each sector is distributed to other sectors, exports and final consumers. Depending on the IO table there may be a varying number of final consumers, including but not limited to households; the government; corporations; capital formation and exported demand. The first step required to disaggregate the 2010 UK SAM is to allocate to each of the quintiles the appropriate share of the total household final demand, the portion of each UK sector's production that is directly consumed by UK households to meet their needs, as reported in the 2010 UK Industry by Industry (IxI) Input Output table[3]. As has been already noted, the approach used to disaggregate the household final demand is based on the methodology that has been applied to disaggregate the Scottish SAM (Emonts-Holley, 2016).

3.1 Data sources

In order to disaggregate the household final demand, we use two publically available datasets. The first one is the Household Final Consumption Expenditure (HHFCe) matrix, which is published by ONS as part of the Supply and Use Tables. For the purposes of our study we use the October 2015 edition. In the October 2015 edition the HHFCe table includes 104 products[4], grouped into 36 categories of household final consumption[5]. Thus, the matrices that are presented in the following section may not be directly applicable in the future and may require to be reviewed to match the current HHFCe table.

The second dataset is the Living Cost and Food Survey (LCFS) conducted by ONS every year[6]. The LCFS, collects data on income and expenditure of UK households, including, but not limited to, spending for commodities and services. In the LCFS, commodities and services are grouped into 12 categories. It is therefore necessary to match the categories of household final consumption in the HHFCe with the categories of household spending in LCFS. This will be the main body of the final consumption disaggregation step that will be presented in the following section.

To ensure the robustness of the data and to avoid any potential bias due to the use of a single year, a 3-year average for both the share of each household quintile of the total household final consumption and also the share of each quintile of the total household income/expenditure is used. Therefore, the process requires the HHFCe tables for 2009-2011 (the 2015 edition of the Supply and Use table includes the tables from 1997-2013) and the LCFS data for 2009-2011 (ONS 2011, 2012a, 2013). Also please note that the sample size and the household income fluctuates and

[3] The IxI table is not published directly by ONS. It has been constructed by FAI using the 2010 input output tables published by ONS and can be found at the same web address as the SAM.

[4] In the 2015 edition of the Supply and Use Tables

[5] Please note that different editions of Supply and Use tables might have small reporting differences, as ONS occasionally alters the way that they report industrial sectors and/or product categories

[6] This data are publicly available without the need for any special permission (although subscription to the UK Data Service is necessary)

therefore it is necessary to adjust the quintiles following the reporting of ONS in the associated Family Spending publication.

3.2 Methodology

As discussed in the previous section a significant portion of the method used to disaggregate household final demand involves matching the product categories of HHFCe to the spending categories of LCFS. To achieve that, the first requirement is to create an aggregation matrix which will map the HHFCe categories to the LCFS categories, matrix A1[7] (the 2010 versions of the majority of the matrices that are listed in this section are included in Appendix A, for Matrix A1 see Table A.2 in Appendix A).

Post-multiplying this matrix to the HHFCe matrix (that is extracted from the HHFCe table) gives us the matrix LA (see Appendix A, Table A.3), which shows how the 104 products of the HHFCe table are mapped to the 12 household spending categories of LCFS. In equation format:

$$LA = HHFCe \times A1 \quad [1]$$

Each column of matrix LA corresponds to a household spending category, as grouped in LCFS, while the elements of each column indicate the value of the household consumption of commodities and services that are included in each spending category. However, as indicated in the combined use matrices of the Supply and Use Tables, ONS reports 106 industrial sectors. Therefore, it is necessary to match products consumed by households to the 106 industrial sectors. To this end, the 106x104 aggregation matrix A2 is used. For the majority of sectors each product matches to a single industrial sector. The two products reported in HHFCe that need to be disaggregated are 'Electrical equipment, machinery and equipment n.e.c.' and 'Postal and courier services & Accommodation services'. In order to disaggregate them the household final demand for each of the different products reported as part of the Supply and Use Tables is used. Multiplying then matrix A2 with matrix LA gives us matrix M:

$$M = A2 \times LA \quad [2]$$

Matrix M is a 106x12 matrix the elements of which show the total value of output of each industrial sector that is allocated in each of the 12 categories of household spending in LCFS. The last step is to calculate the share of the household spending that is allocated to each industrial sector's outputs which form each spending category. These shares are presented in matrix form, namely matrix B (see Appendix A, Table A.4). To calculate matrix B a 12x12 aggregation matrix A3 is needed. This is a diagonal matrix that includes the column totals of matrix M, which is post-multiplied to matrix M:

$$B = M \times A3 \quad [3]$$

The next step is to create what is called the K matrix. K matrix is a 12x5 matrix derived from LCFS data that shows how the household spending of each quintile is allocated to each of the 12 LCFS household spending categories (see Appendix A, Table A.1). The data come from the dvhh_ukanon[8] dataset, which includes anonymised derived variables for each of the households of the sample. To identify the quintiles it is necessary to sort the dataset based on the reported weekly income of each household, i.e. variable p344p, and make the distinction between the quintiles using the income rates that are listed in section 1 as lower and upper boundaries[9]. The total spending of each household to each of the 12 household spending categories is reported using a specific derived variable (see

[7] In the interest of continuity we are using the similar matrix names as the ones used by Andrew Ross in disaggregating the 2009 Scottish SAM

[8] This is the name of the dataset of LCFS, as named by the UK Data Service. The dataset includes a number of variables for the each household of the sample as a whole (and therefore not for each member of the household) derived from the raw variables that form the main body of the LCFS questionnaire.

[9] Please keep in mind that the boundaries vary for each year of the survey so make sure that the appropriate boundaries are used. This ensures that each income group will have the same number of households.

Appendix B for the matching between spending categories and LCFS variables, Table B.1). Thus, each element of matrix K is the sum of the corresponding variable for all the households of each quintile.

Moving forward matrices B and K are multiplied to get matrix hhT:

$$hhT = B \times K \quad [4]$$

hhT is a 106x5 matrix which shows how the total spending of each quintile in the LCFS sample is distributed across the 106 industrial sectors. Pre-multiplying matrix hhT with an appropriate matrix A4, which is a diagonal 106x106 matrix with the row sums of hhT, we get matrix hhF(see Appendix A, Table A.5).

$$hhF = A4 \times hhT \quad [5]$$

The elements of hhF are the shares of each industrial sector's total household final demand that is allocated to each of the quintiles. hhF is a 106x5 matrix. As discussed above, the 3-year average of the corresponding elements of the hhF matrices for the years 2009-2011 (i.e. matrix hhF_{3ya}) is calculated. As noted above, the IxI table has been constructed by FAI using data published by ONS. As such it doesn't include the same number of industrial sectors as the ones reported in the ONS' Supply and Use Tables[10]. For this reason it is necessary to bring matrix hhF_{3ya} to the same level of aggregation compared to the IxI table. To do so it is once again necessary to use an appropriate aggregation matrix A5, a 103x106 matrix, which aggregates the sectors in the ONS Supply and Use Tables into the sectors of the IxI.

$$hhF_{3ya}^{103} = A5 \times hhF_{3ya} \quad [6]$$

The methodology in [1]-[6] has enabled us to create a 103x5 matrix, hhF_{3ya}^{103}, that indicates what percentage of the total household final demand for the output of each of the 103 sectors of FAI's IxI table, are allocated to each of the income quintiles. This is done by rearranging the total household final demand into a diagonal matrix, IxI_{HH}, and multiplying it with hhF_{3ya}^{103}. In practice, the total household final demand is multiplied by the share of each income quintile to determine each household quintile's spending for the output of each sector. The spending of each quintile is arranged in the 103x5 matrix HH (see Appendix A, Table A.6).

$$HH = IxI_{HH} \times hhF_{3ya}^{103} \quad [7]$$

Finally, the HH matrix is aggregated to match the aggregation level used in the CGE model that will be used. For example, if the CGE model is calibrated on a 30x30 aggregated SAM, a 30x103 aggregation matrix, A6, is needed to convert the 103x5 HH matrix to the 30x5 HH_{CGE} matrix. We call this matrix HH_{CGE}.

$$HH_{CGE} = A6 \times HH \quad [8]$$

4. Disaggregation of household income/expenditure

The 2010 UK SAM, which is has been disaggregated by household income using the presented methodology, includes a number of different household income sources and expenditures. Therefore, when we disaggregate the households sector in the SAM it is necessary to disaggregate the income and expenditure. In this section we demonstrate how the income and expenditure have been disaggregated.

4.1 Disaggregation of household income

In the 2010 UK SAM the households are receiving income from a number of different sources. They include 'Labour', 'Gross Operating Surplus', other 'Households', 'Corporations', the 'UK Government' and 'Transfers from the Rest Of the World (ROW)'[11].

To disaggregate the household income in the SAM data from the LCFS are used. In the previous section the only dataset needed from the LCFS is dvhh_ukanon. For the disaggregation of income the dvper_ukanon is also required.

[10] There are 103 sectors in FAI's IxI tables rather than 106 in the ONS Supply and Use Tables.

[11] These are not the only potential sources of income but in the 2010 UK SAM the aforementioned sources are the only ones with non-zero entries.

This includes derived household members variables. An important procedure involves sorting the data of this dataset (dvper_ukanon) in a way that the individuals are allocated in the appropriate quintile, as identified above. To this end the 'case' variable needs to be used. Each value of the 'case' variable corresponds to one of the households in the LCFS (5263 in the 2010 survey). Using the ranking of the households based on weekly income as a sorting order, it is possible to sort the data of dvper_ukanon in the appropriate order (where the first data entries are members of households in the first quintile moving down to the fifth quintile).

Once the individual household members in the dvper_ukanon dataset have been sorted, as described above, to match the appropriate quintile, the remaining procedure is straightforward. The appropriate variables (see Appendix B, Table B.2 for a list of the variables) are then used to calculate the total income of each quintile for each of the aforementioned income sources. Dividing the total income of each of the quintiles from each source with the total household (in the sample) income from this source, the share of the total household income allocated to each of the quintiles is obtained. Multiplying the obtained shares with the total household income from each source in the SAM, the disaggregated income from all sources for each of the quintiles is calculated. Please note that in a similar way to the disaggregation of household final consumption, 3-year averages of the income shares are used to disaggregate household income.

4.2 Disaggregation of household expenditure

In the case of the 2010 UK SAM, household expenditure includes Net Indirect Taxes', transfers/payments to other 'Households', payments to 'Corporations', payments to 'Government', 'Capital Formation' and 'Purchases of goods and services from the Rest of the World (ROW)'. The procedure followed to disaggregate these expenditures is essentially the same as the one followed to disaggregate the household income. The dvhh_ukanon dataset is required with the addition to the IxI table as well as some data acquired by the disaggregation of household final consumption.

The starting point is to calculate the expenditure of the households in the LCFS survey sample. The majority of the expenditures are calculated using the LCFS data. As in the case of household income, the data from dvhh_ukanon dataset sorted by weekly income (variable p344p) are used, focusing on specific variables (see Appendix B, Table B.3) that reflect the expenditure of the households in each quintile that fall in each expenditure category. The only two exceptions are 'Net Indirect Taxes' and 'Purchases of goods and services from ROW'. To calculate these household expenditures we use the data from the IxI table. For the 'Net Indirect Taxes' we use the 'Taxes less subsidies on products' entry of the IxI table and for 'Purchases of goods and services from ROW' we use 'Imports', both of them for the households as a type of final consumer. To allocate the appropriate amount to each of the quintiles, the share of the total household consumption for each of the quintiles is calculated. Multiplying these shares with the data from the IxI table, it is possible to estimate the expenditure of each quintile to 'Net Indirect Taxes' and 'Purchases of goods and services from ROW'. Please note that only an IxI table for 2010 is available and so these data will have to be used to estimate the household expenditure for all the years 2009-2010. The shares of each quintile are different for each of the years and so will be the total estimated expenditure amount, but the base data to estimate the expenditure for each year are the same.

When the total expenditure of the households in the LCFS sample have been calculated for all expenditure categories, the same approach as in the disaggregation of household income is used. A 3-year average share of the total expenditure that is allocated to each of the quintile is calculated and then the disaggregated expenditure for each quintile is obtained by multiplying the shares with the data from.

5. Balancing the SAM

The last step is to balance the SAM. As pointed out by Hosoe et al (2010) the total revenue must be equal to the total expenditure for each sector and each economic agent and therefore for the household quintiles that have been identified here. Even though household total income and expenditure are balanced in the original SAM, this does not necessarily mean that the income and expenditure of each quintile will automatically be balanced once the disaggregation is completed. This implies that each quintile has to be balanced as well. To that end the difference between expenditure and income for each of the quintiles is calculated. The difference is then subtracted from the household expenditure to 'Capital formation'. The reasoning is that payments for 'Capital formation' reflect

household savings to financial institutions. Although we realise that this could alter the actual level of savings, this approach allows to keep intact the original level of spending reported in the national accounts. The resulting dataset can be found at http://dx.doi.org/10.15129/ccbb132d-d970-4c39-bf48-5d0c1720b0a1 with results for matrices *K*, *A1*, *LA*, *B*, *hhF*, *HH* found in appendix A of this paper.

6. Conclusion

The purpose of this paper has been to document the process used to disaggregate the household income and expenditure in the 2010 UK SAM published at http://www.strath.ac.uk/business/economics/fraserofallanderinstitute/research/economicmodelling by the Fraser of Allander Institute. Our extended version of this database (i.e. that resulting from the work reported in this paper) can be found at http://dx.doi.org/10.15129/ccbb132d-d970-4c39-bf48-5d0c1720b0a1. An example of a CGE modelling analysis based on use of this new database can be found in Figus et al (2016).

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Appendices

Appendix A: 2010 version of matrices throughout document

__Table A.1__: K Matrix (2010). Household Consumption per Spending Category and Quintile (in £)

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Food & non-alcoholic drinks	32358.08	48130.26	57367.00	64558.71	79786.96	282201.00
Alcoholic drink, tobacco & narcotics	7917.63	10593.68	13100.14	13767.76	16995.49	62374.69
Clothing & footwear	7746.34	14184.00	22286.54	29118.09	46803.02	120138.00
Housing (net), fuel & power	45318.79	57029.86	62556.50	66902.81	72096.00	303903.96
Household goods & services	16136.79	23753.62	29840.13	37820.61	60937.99	168489.13
Health	2152.40	3824.98	5251.14	5485.15	9978.97	26692.64
Transport	19253.02	41244.36	59610.21	86002.19	134635.03	340744.81
Communication	7444.73	10678.20	12826.42	15841.13	19850.97	66641.45
Recreation & culture	24032.00	40428.05	60748.97	71284.13	116399.67	312892.82
Education	2461.47	4522.90	5149.26	6707.11	28037.58	46878.31
Restaurants & hotels	11882.75	22282.72	34926.71	50547.98	82122.32	201762.48
Miscellaneous goods & services	13675.02	23856.26	37656.53	44619.75	70300.13	190107.70
Total	190379.01	300528.88	401319.54	492655.41	737944.14	

***Table A.2**: A1 Matrix. Aggregation matrix HHFCe 36 Product categories to 12 LCFS spending categories*

	Food & non-alcoholic drinks	Alcoholic drink, tobacco & narcotics	Clothing & footwear	Housing (net), fuel & power	Household goods & services	Health	Transport	Communication	Recreation & culture	Education	Restaurants & hotels	Miscellaneous goods & services
Food	1	0	0	0	0	0	0	0	0	0	0	0
Non-alcoholic beverages	1	0	0	0	0	0	0	0	0	0	0	0
Alcoholic beverages	0	1	0	0	0	0	0	0	0	0	0	0
Tobacco	0	1	0	0	0	0	0	0	0	0	0	0
Narcotics	0	1	0	0	0	0	0	0	0	0	0	0
Clothing	0	0	1	0	0	0	0	0	0	0	0	0
Footwear	0	0	1	0	0	0	0	0	0	0	0	0
Actual rentals for households	0	0	0	1	0	0	0	0	0	0	0	0
Imputed rentals for households	0	0	0	1	0	0	0	0	0	0	0	0
Maintenance and repair of the dwelling	0	0	0	1	0	0	0	0	0	0	0	0
Water supply and miscellaneous dwelling services	0	0	0	1	0	0	0	0	0	0	0	0
Electricity, gas and other fuels	0	0	0	1	0	0	0	0	0	0	0	0
Furniture, furnishings, carpets etc	0	0	0	0	1	0	0	0	0	0	0	0
Household textiles	0	0	0	0	1	0	0	0	0	0	0	0
Household appliances	0	0	0	0	1	0	0	0	0	0	0	0
Glassware, tableware and household utensils	0	0	0	0	1	0	0	0	0	0	0	0
Tools and equipment for house and garden	0	0	0	0	1	0	0	0	0	0	0	0
Goods and services for household maintenance	0	0	0	0	1	0	0	0	0	0	0	0
Medical products, appliances and equipment	0	0	0	0	0	1	0	0	0	0	0	0
Out-patient services	0	0	0	0	0	1	0	0	0	0	0	0
Hospital services	0	0	0	0	0	1	0	0	0	0	0	0
Purchase of vehicles	0	0	0	0	0	0	1	0	0	0	0	0
Operation of personal transport equipment	0	0	0	0	0	0	1	0	0	0	0	0
Transport services	0	0	0	0	0	0	1	0	0	0	0	0
Postal services	0	0	0	0	0	0	0	1	0	0	0	0
Telephone and telefax equipment	0	0	0	0	0	0	0	1	0	0	0	0
Telephone and telefax services	0	0	0	0	0	0	0	1	0	0	0	0
Audio-visual, photo and info processing equipment	0	0	0	0	0	0	0	0	1	0	0	0
Other major durables for recreation and culture	0	0	0	0	0	0	0	0	1	0	0	0
Other recreational equipment etc	0	0	0	0	0	0	0	0	1	0	0	0
Recreational and cultural services	0	0	0	0	0	0	0	0	1	0	0	0
Newspapers, books and stationery	0	0	0	0	0	0	0	0	1	0	0	0
Package holidays	0	0	0	0	0	0	0	0	1	0	0	0
Education	0	0	0	0	0	0	0	0	0	1	0	0
Restaurants and hotels	0	0	0	0	0	0	0	0	0	0	1	0
Miscellaneous goods and services	0	0	0	0	0	0	0	0	0	0	0	1

***Table A.3**: LA Matrix. Products by Spending Category (in £)*

		Food & non-alcoholic drinks	Alcoholic drink, tobacco & narcotics	Clothing & footwear	Housing (net), fuel & power	Household goods & services	Health	Transport	Communication	Recreation & culture	Education	Restaurants & hotels	Miscellaneous goods & services
01	Products of agriculture, hunting and related services	13665	0	0	0	0	0	0	0	3006	0	0	0
02	Products of forestry, logging and related services	0	0	0	31	0	0	0	0	216	0	0	0
03	Fish and other fishing products; aquaculture products; support services to fishing	414	0	0	0	0	0	0	0	0	0	0	0
05	Coal and lignite	0	0	0	244	0	0	0	0	0	0	0	0
06 & 07	Extraction Of Crude Petroleum And Natural Gas & Mining of Metal Ores	0	0	0	0	0	0	0	0	0	0	0	0
08	Other mining and quarrying products	0	0	0	0	0	0	0	0	34	0	0	42
09	Mining support services	0	0	0	0	0	0	0	0	0	0	0	0
10.1	Preserved meat and meat products	16259	0	0	0	0	0	0	0	0	0	0	0
10.2-3	Processed and preserved fish, crustaceans, molluscs, fruit and vegetables	12262	0	0	0	0	0	0	0	0	0	0	0
10.4	Vegetable and animal oils and fats	1156	0	0	0	0	0	0	0	0	0	0	0
10.5	Dairy products	11057	0	0	0	0	0	0	0	0	0	0	0
10.6	Grain mill products, starches and starch products	2613	0	0	0	0	0	0	0	0	0	0	0
10.7	Bakery and farinaceous products	7190	0	0	0	0	0	0	0	0	0	0	0
10.8	Other food products	13649	0	0	0	0	0	0	0	0	0	0	0
10.9	Prepared animal feeds	0	0	0	0	0	0	0	0	2692	0	0	0
11.01-6	Alcoholic beverages	0	15393	0	0	0	0	0	0	0	0	0	0
11.07	Soft drinks	5296	0	0	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
87 & 88	Residential Care & Social Work Activities	0	0	0	0	0	0	0	0	0	0	0	7604
90	Creative, arts and entertainment services	0	0	0	0	0	0	0	0	4757	0	0	0
91	Libraries, archives, museums and other cultural services	0	0	0	0	0	0	0	0	2450	0	0	0
92	Gambling and betting services	0	0	0	0	0	0	0	0	8337	0	0	0
93	Sports services and amusement and recreation services	0	0	0	0	0	0	0	0	7307	0	0	0
94	Services furnished by membership organisations	0	0	0	0	0	0	492	0	0	0	0	624
95	Repair services of computers and personal and household goods	0	0	251	0	509	0	0	0	197	0	0	905
96	Other personal services	0	0	780	0	22	0	0	0	0	0	0	18225
97	Services of households as employers of domestic personnel	0	0	0	0	6157	0	0	0	0	0	0	0

***Table A.4**: B Matrix. Share of output of each sector included in each spending category*

		Food & non-alcoholic drinks	Alcoholic drink, tobacco & narcotics	Clothing & footwear	Housing (net), fuel & power	Household goods & services	Health	Transport	Communication	Recreation & culture	Education	Restaurants & hotels	Miscellaneous goods & services
01	Crop And Animal Production, Hunting And Related Service Activities	0.1635	0	0	0	0	0	0	0	0.0296	0	0	0
02	Forestry And Logging	0	0	0	0.0001	0	0	0	0	0.0021	0	0	0
03	Fishing And Aquaculture	0.0050	0	0	0	0	0	0	0	0	0	0	0
05	Mining Of Coal And Lignite	0	0	0	0.001	0	0	0	0	0	0	0	0
06 & 07	Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores	0	0	0	0	0	0	0	0	0	0	0	0
08	Other Mining And Quarrying	0	0	0	0	0	0	0	0	0.0003	0	0	0.0003
09	Mining Support Service Activities	0	0	0	0	0	0	0	0	0	0	0	0
10.1	Processing and preserving of meat and production of meat products	0.1946	0	0	0	0	0	0	0	0	0	0	0
10.2-3	Processing and preserving of fish, crustaceans, molluscs, fruit and vegetables	0.1467	0	0	0	0	0	0	0	0	0	0	0
10.4	Manufacture of vegetable and animal oils and fats	0.0138	0	0	0	0	0	0	0	0	0	0	0
10.5	Manufacture of dairy products	0.1323	0	0	0	0	0	0	0	0	0	0	0
10.6	Manufacture of grain mill products, starches and starch products	0.0313	0	0	0	0	0	0	0	0	0	0	0
10.7	Manufacture of bakery and farinaceous products	0.086	0	0	0	0	0	0	0	0	0	0	0
10.8	Manufacture of other food products	0.1633	0	0	0	0	0	0	0	0	0	0	0
10.9	Manufacture of prepared animal feeds	0	0	0	0	0	0	0	0	0.0265	0	0	0
11.01-6	Manufacture of alcoholic beverages	0	0.3935	0	0	0	0	0	0	0	0	0	0
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	0.0634	0	0	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
87 & 88	Residential Care & Social Work Activities	0	0	0	0	0	0	0	0	0	0	0	0.0626
90	Creative, Arts And Entertainment Activities	0	0	0	0	0	0	0	0	0.0469	0	0	0
91	Libraries, Archives, Museums And Other Cultural Activities	0	0	0	0	0	0	0	0	0.0241	0	0	0
92	Gambling And Betting Activities	0	0	0	0	0	0	0	0	0.0822	0	0	0
93	Sports Activities And Amusement And Recreation Activities	0	0	0	0	0	0	0	0	0.072	0	0	0
94	Activities Of Membership Organisations	0	0	0	0	0	0	0.0038	0	0	0	0	0.0051
95	Repair Of Computers And Personal And Household Goods	0	0	0.0049	0	0.011	0	0	0	0.0019	0	0	0.0074
96	Other Personal Service Activities	0	0	0.0152	0	0.0005	0	0	0	0	0	0	0.1500
97	Activities Of Households As Employers Of Domestic Personnel	0	0	0	0	0.1335	0	0	0	0	0	0	0

***Table A.5**: hhF Matrix. Share of household final demand allocated to each quintile*

		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
01	Crop And Animal Production, Hunting And Related Service Activities	0.108	0.164	0.202	0.229	0.298
02	Forestry And Logging	0.081	0.132	0.195	0.227	0.364
03	Fishing And Aquaculture	0.115	0.171	0.203	0.229	0.283
05	Mining Of Coal And Lignite	0.149	0.188	0.206	0.220	0.237
06 & 07	Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores	0	0	0	0	0
08	Other Mining And Quarrying	0.075	0.128	0.196	0.230	0.371
09	Mining Support Service Activities	0	0	0	0	0
10.1	Processing and preserving of meat and production of meat products	0.115	0.171	0.203	0.229	0.283
10.2-3	Processing and preserving of fish, crustaceans, molluscs, fruit and vegetables	0.115	0.171	0.203	0.229	0.283
10.4	Manufacture of vegetable and animal oils and fats	0.115	0.171	0.203	0.229	0.283
10.5	Manufacture of dairy products	0.115	0.171	0.203	0.229	0.283
10.6	Manufacture of grain mill products, starches and starch products	0.115	0.171	0.203	0.229	0.283
10.7	Manufacture of bakery and farinaceous products	0.115	0.171	0.203	0.229	0.283
10.8	Manufacture of other food products	0.115	0.171	0.203	0.229	0.283
10.9	Manufacture of prepared animal feeds	0.077	0.129	0.194	0.228	0.372
11.01-6	Manufacture of alcoholic beverages	0.127	0.170	0.210	0.221	0.272
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	0.115	0.171	0.203	0.229	0.283
	⋮	⋮	⋮	⋮	⋮	⋮
87 & 88	Residential Care & Social Work Activities	0.072	0.125	0.198	0.235	0.370
90	Creative, Arts And Entertainment Activities	0.077	0.129	0.194	0.228	0.372
91	Libraries, Archives, Museums And Other Cultural Activities	0.077	0.129	0.194	0.228	0.372
92	Gambling And Betting Activities	0.077	0.129	0.194	0.228	0.372
93	Sports Activities And Amusement And Recreation Activities	0.077	0.129	0.194	0.228	0.372
94	Activities Of Membership Organisations	0.063	0.123	0.185	0.245	0.384
95	Repair Of Computers And Personal And Household Goods	0.082	0.131	0.187	0.231	0.369
96	Other Personal Service Activities	0.072	0.125	0.197	0.235	0.371
97	Activities Of Households As Employers Of Domestic Personnel	0.096	0.141	0.177	0.224	0.362

***Table A.6**: HH Matrix. Disaggregated household final consumption in 2010 UK SAM (in £ millions)*

		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
01	Crop And Animal Production, Hunting And Related Service Activities	742	1153	1427	1613	2069
02	Forestry And Logging	38	67	98	118	184
03	Fishing And Aquaculture	28	42	51	57	69
05	Mining Of Coal And Lignite	40	55	60	61	66
06 & 07	Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores	133	220	293	355	521
08	Other Mining And Quarrying	28	49	72	87	141
09	Mining Support Service Activities	23	38	51	61	90
10.1	Processing and preserving of meat and production of meat products	700	1063	1274	1419	1730
10.2-3	Processing and preserving of fish, crustaceans, molluscs, fruit and vegetables	131	198	238	265	323
10.4	Manufacture of vegetable and animal oils and fats	8	12	15	16	20
10.5	Manufacture of dairy products	337	512	614	684	833
10.6	Manufacture of grain mill products, starches and starch products	122	185	221	247	301
10.7	Manufacture of bakery and farinaceous products	507	770	923	1028	1253
10.8	Manufacture of other food products	421	638	765	852	1039
10.9	Manufacture of prepared animal feeds	76	139	207	252	400
11.01-6	Manufacture of alcoholic beverages	62	84	110	117	139
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	233	353	424	472	575
12	Manufacture Of Tobacco Products	181	245	320	342	405
13	Manufacture Of Textiles	57	99	130	165	246
14	Manufacture Of Wearing Apparel	58	109	160	198	325
15	Manufacture Of Leather And Related Products	7	13	18	23	37
16	Manufacture Of Wood & Products Of Wood & Cork, Except Furniture; Manuf. Of Articles Of Straw	33	56	81	97	154
17	Manufacture Of Paper And Paper Products	127	213	301	361	575
18	Printing And Reproduction Of Recorded Media	126	229	342	417	661
19	Manufacture Of Coke And Refined Petroleum Products	364	799	1174	1680	2539
20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	16	23	25	26	29
20.4	Manufacture of soap & detergents, cleaning & polishing, perfumes & toilet preparations	52	88	120	148	232
20.5	Manufacture of other chemical products	14	25	38	46	74
20A	Manufacture of industrial gases, inorganics and fertilisers (inorganic chemicals) - 20.11/13/15	13	24	36	44	70
20B	Manufacture of petrochemicals - 20.14/16/17/60	19	32	42	51	75
20C	Manufacture of dyestuffs, agro-chemicals - 20.12/20	11	21	31	38	60
21	Manufacture Of Basic Pharmaceutical Products And Pharmaceutical Preparations	28	41	56	62	82
22	Manufacture Of Rubber And Plastic Products	23	42	58	75	112
23.5-6	Manufacture of cement, lime, plaster and articles of concrete, cement and plaster	23	31	34	34	37
23OTHER	Manufacture of glass, refractory, clay, porcelain, ceramic, stone products - 23.1-4/7-9	10	17	22	28	42
24.1-3	Manufacture of basic iron and steel	11	19	25	31	45
24.4-5	Manufacture of other basic metals and casting	22	30	33	33	36
25.4	Manufacture of weapons and ammunition	5	10	14	18	28
25OTHER	Manufacture of fabricated metal products, excluding weapons & ammunition - 25.1-3/5-9	54	91	120	151	226
26	Manufacture Of Computer, Electronic And Optical Products	81	145	214	259	406
27	Manufacture Of Electrical Equipment	37	64	87	109	164
28	Manufacture Of Machinery And Equipment N.E.C.	61	104	141	177	267
29	Manufacture Of Motor Vehicles, Trailers And Semi-Trailers	286	627	930	1318	2013

30.1	Building of ships and boats	8	14	21	26	41
30.3	Manufacture of air and spacecraft and related machinery	31	56	83	101	160
30OTHER	Manufacture of other transport equipment - 30.2/4/9	56	112	166	221	342
31	Manufacture Of Furniture	97	165	214	272	399
32	Other Manufacturing	23	42	61	74	117
33.15	Repair and maintenance of ships and boats	5	8	10	12	18
33.16	Repair and maintenance of aircraft and spacecraft	8	13	17	21	31
33OTHER	Rest of repair; Installation - 33.11-14/17/19/20	54	91	129	156	256
35.1	Electric power generation, transmission and distribution	2901	3976	4356	4421	4818
35.2-3	Manufacture of gas; distribution of gaseous fuels through mains; steam and aircon supply	1330	1823	1997	2027	2209
36	Water Collection, Treatment And Supply	641	879	963	977	1065
37	Sewerage	617	846	927	941	1026
38	Waste Collection, Treatment And Disposal Activities; Materials Recovery	361	495	542	550	600
39	Remediation Activities And Other Waste Management Services	0	0	0	1	1
41, 42 & 43	Construction	423	579	635	644	702
45	Wholesale And Retail Trade And Repair Of Motor Vehicles And Motorcycles	809	1825	2709	3914	5950
46	Wholesale Trade, and Motor Vehicles And Motorcycles	12399	20581	27367	33147	48705
49.1-2	Rail transport	430	970	1439	2079	3161
49.3-5	Land transport services and transport services via pipelines, excluding rail transport	666	1502	2229	3221	4897
50	Water Transport	239	540	801	1158	1760
51	Air Transport	605	1365	2025	2926	4449
52	Warehousing And Support Activities For Transportation	83	182	270	384	586
53	Postal And Courier Activities	86	162	253	330	542
55	Accommodation	884	1679	2621	3416	5609
56	Food And Beverage Service Activities	2388	4667	7450	9788	16369
58	Publishing Activities	491	894	1335	1627	2579
59 & 60	Motion Picture, Video & TV Programme Production, Sound Recording & Music Publishing Activities & Programming And Broadcasting Activities	607	1106	1651	2012	3190
61	Telecommunications	1867	2803	3437	4034	4945
62	Computer Programming, Consultancy And Related Activities	482	800	1140	1378	2266
63	Information Service Activities	177	294	391	473	695
64	Financial Service Activities, Except Insurance And Pension Funding	2650	4402	6274	7584	12468
65.1-2 & 65.3	Insurance and reinsurance, except compulsory social security & Pension funding	2244	3728	5312	6421	10557
66	Activities Auxiliary To Financial Services And Insurance Activities	228	379	539	652	1072
68.1-2	Buying and selling, renting and operating of own or leased real estate, excluding imputed rent	5527	7600	8364	8526	9382
68.3	Real estate activities on a fee or contract basis	10452	17366	24749	29914	49180
69.1	Legal activities	40	67	96	116	190
69.2	Accounting, bookkeeping and auditing activities; tax consultancy	165	275	392	474	779
70	Activities Of Head Offices; Management Consultancy Activities	22	49	73	106	161
71	Architectural And Engineering Activities; Technical Testing And Analysis	179	393	582	830	1269
72	Scientific Research And Development	60	100	132	160	236
73	Advertising And Market Research	428	712	1014	1226	2015
74	Other Professional, Scientific And Technical Activities	71	129	193	236	373
75	Veterinary Activities	158	288	430	524	831
77	Rental And Leasing Activities	331	721	1070	1510	2309
78	Employment Activities	22	36	51	62	101
79	Travel Agency, Tour Operator And Other Reservation Service And Related Activities	59	133	197	284	432
80	Security And Investigation Activities	13	21	30	36	59
81	Services To Buildings And Landscape Activities	143	242	313	398	582

82	Office Administrative, Office Support And Other Business Support Activities	87	146	203	248	397
84	Public Administration And Defence; Compulsory Social Security	344	630	878	1134	1675
85	Education	2093	3848	3466	5004	19127
86	Human Health Activities	995	1697	2510	2912	4595
87 & 88	Residential Care & Social Work Activities	1085	1803	2569	3106	5106
90	Creative, Arts And Entertainment Activities	176	321	479	584	926
91	Libraries, Archives, Museums And Other Cultural Activities	92	168	251	305	484
92	Gambling And Betting Activities	563	1026	1531	1866	2958
93	Sports Activities And Amusement And Recreation Activities	451	822	1227	1496	2371
94	Activities Of Membership Organisations	410	794	1157	1549	2433
95	Repair Of Computers And Personal And Household Goods	66	114	158	196	306
96	Other Personal Service Activities	668	1117	1595	1930	3172

Appendix B: LCFS variables used for disaggregation of households in 2010 UK SAM

***Table B.1**: LCFS variables corresponding to household spending categories*

	Variable code
Weekly income variable	p344p
Food & non-alcoholic drinks	P601t
Alcoholic drink, tobacco & narcotics	P602t
Clothing & footwear	P603t
Housing (net), fuel & power	P604t
Household goods & services	P605t
Health	P606t
Transport	P607t
Communication	P608t
Recreation & culture	P609t
Education	P610t
Restaurants & hotels	P611t
Miscellaneous goods & services	P612t

***Table B.2**: LCFS variables associated with household income sources*

	Variable(s) code	Dataset
Weekly income variable	p344p	dvhh_ukanon
Labour	P300p	dvhh_ukanon
Gross operating surplus	P320p	dvhh_ukanon
Households	P340	dvhh_ukanon
Corporation	P328	dvhh_ukanon
	B501	dvper_ukanon
Government	P328	dvhh_ukanon
	P340	dvhh_ukanon
Transfers from ROW	B351a	dvper_ukanon

***Table B.3**: LCFS variables associated with household expenditure categories*

	Variable(s) code	Dataset
Weekly income variable	p344p	dvhh_ukanon
Households	P340	dvhh_ukanon
Corporation	B196	dvhh_ukanon
	B197	dvhh_ukanon
	B198	dvhh_ukanon
	B199	dvhh_ukanon
	B205	dvhh_ukanon
	B206	dvhh_ukanon
	B228	dvhh_ukanon
	CC5111c	dvhh_ukanon
	CC5312c	dvhh_ukanon
	CC5511c	dvhh_ukanon
	CK5116t	dvhh_ukanon
	P071h	dvhh_ukanon
Government	B179	dvhh_ukanon
	B187	dvhh_ukanon
	CK5411c	dvhh_ukanon
	CK5412c	dvhh_ukanon
	CK3111t	dvhh_ukanon
	CK3112t	dvhh_ukanon
	B387hp	dvhh_ukanon
	B391hp	dvhh_ukanon
	P392p	dvhh_ukanon
	P388p	dvhh_ukanon
	P029hp	dvhh_ukanon
	P073hp	dvhh_ukanon
	P068h	dvhh_ukanon
Capital formation	CK2111t	dvhh_ukanon
	CK5111t	dvhh_ukanon
	CK5113t	dvhh_ukanon