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**DISAGGREGATING THE HOUSEHOLD SECTOR IN A 2004 UK
INPUT OUTPUT TABLE AND SOCIAL ACCOUNTING MATRIX
BY INCOME QUINTILES**

BY

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Disaggregating the Household Sector in a 2004 UK Input Output Table and Social Accounting Matrix by Income Quintiles

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Abstract. This paper disaggregates a UK Input-Output (IO) table for 2004 based on household income quintiles from published survey data. In addition to the Input-Output disaggregation, the household components of a UK Income Expenditure (I-E) account used to inform a Social Accounting Matrix (SAM), have also been disaggregated by household income quintile. The focus of this paper is on household expenditure on the UK energy sector.

Key Words: Disaggregated Household Expenditure, Energy Consumption, Input-Output, Income-Expenditure Accounts.

JEL Codes: Q48, Q41, Q56, J11

Differences in expenditure patterns between household groups within a country or region capture a range of measures important for the formulation of effective policy. Energy policy concerns such as

increasing fuel poverty, security of energy supply and climate change, require simultaneous and often conflicting policies in place. However, a current lack of energy expenditure data at the disaggregated household group level will slow decision makers achieving targets or goals, as well as slow research into the impact of energy policy instruments on different household groups. As well as informing energy policy and research, the provision of additional detail on household expenditure will help inform socio or welfare analyses, and provide general detail about household living standards.

Most publications only consider household income as the basis for observations regarding living standards and as the basis of policy formulation, for example the Households Below the Average Income (HBAI) series published by the Department for Work and Pensions. For energy policy in particular it is essential to have an understanding of energy demand across various household groups as it is through the demand for energy sector output (energy services) and the linkages between the energy supply and the local economy that policy will be able to target the basket of energy concerns. To capture household expenditure and to enable extensions to capture economy wide linkages, we use data from the UK Input-Output (IO) table for 2004 (produced as part of the work under the ESRC Climate Change Leadership Fellowship ESRC ref: RES-066-27-0029¹) to disaggregate household activity. Using the IO table for aggregate household expenditure data, the first section of this paper disaggregates household expenditure on goods and services from the UK production sectors based on household income quintiles using published survey data from the '*Family Spending: A report on the 2003-2004 expenditure and food survey*' (EFS)².

To extend the disaggregation, the second part of this paper then disaggregates the additional income and expenditure components which make up the complete picture of all household income and expenditure in the UK economy. The additional components of income and expenditure that we present in the form of an Income and Expenditure (I-E) account are not recorded in an IO table but are required for building a social accounting matrix (SAM). Social accounting matrices present all transactions within an economy or region including income transfers, and once disaggregated give the full picture of household trends, regarding both expenditure and sources of income. Thus again, using published survey data from the Office of National Statistics (ONS) the second part of this paper disaggregates the I-E account for UK households 2004.

With household expenditure and income disaggregated it is possible to make observations about different patterns that exist across household income groups, in particular the relationship between household income and energy expenditure. The findings here show that the higher income groups spend more on in absolute terms on energy services from the energy sector, yet it is the lowest income groups that spend a larger share of their income on energy. Where the disaggregated database in this paper can be used to feed more complex economic models (for example see Lecca

¹ To meet project objectives and to allow the user community to observe the value of the tables for pollution accounting a UK IO table for 2004 was produced under the ESRC climate change leadership fellowship with assistance from the Scottish Government IO team and the Stockholm Environmental Institute.

² Web Link to the EFS report:- <http://www.statistics.gov.uk/statbase/product.asp?vlnk=361>

et al 2010 for a CGE application of household energy efficiency improvements), it will be possible to answer policy relevant questions that can only be answered when household behaviour and price changes are taken into account³. However, ahead of more complex modelling (Lecca et al 2010), the findings here highlight the important differences that exist within UK households with respect to energy purchases.

Household expenditure disaggregation using the six sector UK input Output (IO) table 2004

Analytical Input-output (IO) tables form the basis of different types of analysis for any national or regional economy but also used as a dataset have formed the basis of this household expenditure disaggregation. The IO table used in this paper, produced as part of the work under the ESRC Climate Change Leadership Fellowship (ESRC ref: RES-066-27-0029) has been aggregated from 123 sectors (based on the UK Standard Industrial Classification of economic activities (SIC)) to 6 sectors with a special focus on the energy sector within the UK economy. As well as special focus on household energy sector expenditure, the higher level of aggregation was also due to the difficulty mapping between the sector classification used in the data from the EFS and the SIC. IO code mapping from 123 to 6 sectors is presented as **Appendix A**⁴.

IO tables show the flows of all inputs and outputs throughout the economy over the period of a single year and can be used as a valuable accounting or modelling tool. Where linkages between local production and the final demand groups can be quantified, it is possible to calculate output multipliers (and multipliers relating to key economic performance indicators) which relate final demand to the output of local production (both directly and indirectly from the linkages between the sectors)⁵. The IO framework links household energy demand to the energy sector and therefore energy sector output, which is closely linked to all production sectors and the performance of the economy. Where household demand for energy is a derived demand through the use of services which require energy as an input, any change to energy demand will trigger a multiplier effect throughout the economy that will stimulate all sectors that the energy sector has linkages with, which will include stimulating the energy sector itself through own sector purchases.

This disaggregation can be considered a first step in providing the necessary database for a whole host of analyses (for example, applications using IO models or CGE). As a first step the following section identifies the absolute values and percentage shares of household energy expenditure from the UK IO table for 2004.

³ Lecca et al 2010, forthcoming in the Strathclyde Discussion Paper Series, available at: <http://www.strath.ac.uk/economics/research/discussionpapers/>

⁴ In the absence of an analytical UK IO table for 2004 and to meet ESRC CCLF project objectives, the IO table for 2004 used in this study was produced under the ESRC CCLF with assistance from the Scottish Government IO team and the Stockholm Environment Institute (SEI). Available to download at: <http://www.strath.ac.uk/fraser/research/2004ukindustry-byindustryanalyticalinput-outputtables/>

⁵ Multipliers for Scotland generated by the Scottish Government IO team are available from: <http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output>. For an impact study using IO multipliers for Scotland see Allan et al 2006, available to download from the Strathclyde Discussion Paper Series, http://www.strath.ac.uk/media/departments/economics/researchdiscussionpapers/2006/media_34009_en.pdf.

Household Expenditure Disaggregation

Disaggregation of the household expenditure from the 2004 IO table is based on the '*Family Spending: A report on the 2003-2004 expenditure and food survey*' (EFS) which presents information on household incomes and household expenditure published by the Office of National Statistics (ONS). The EFS report is the only official source of expenditure data for UK households and is an amalgamation of the Family Expenditure and National Food surveys (FES and NFS). The EFS report was primarily the source of spending pattern data for the retail price index and is today used as a source of information for government and the wider community as it charts changes in household expenditure and food patterns.

For the financial year 2003-2004, 7048 households took part in the survey with a 58% (from the 7048 households) response rate. Although the sample size is small, the EFS report breaks out household expenditure by income decile groups over a range of commodities and services, which include a section titled '*other items recorded*', which takes into consideration household payments to capital and investment. The use of survey data as the basis of any household expenditure disaggregation is an approach that has been used by many other studies such as Druckman and Jackson (2008), who use survey data to disaggregate households based on geographical location.

The data presented in the EFS splits households into income deciles based on gross weekly income per week. The deciles in the EFS have been aggregated into income quintiles presented in **Table 1** below.

Table 1- Gross weekly income for five income groups in the UK 2004

HH1	0 > £220
HH2	£221 > £350
HH3	£351 > £505
HH4	£506 > £732
HH5	£733 > £971 and over

The remainder of this paper is based on the income quintiles identified in **Table 1** above.

The range of commodities and services in the EFS is based on the Classification of Individual Consumption by Purpose (COICOP) which is the coding frame used for the EFS. The COICOP is the classification system used on Household Budget Surveys (HBS) and across the EU to update the weights in the basket of goods and services used in consumer price indices. Where the classification system used in this paper is based on the 6 aggregated sectors from the IO table (**Appendix A**), a commodity/service mapping between the EFS report and the IO was required and presented as **Appendix C**.

Using the mapping between the EFS and the IO, the total spend in each sector was summed and the share spent by each household income group calculated. The shares calculated were then used to split out the single household column of sector expenditure in the IO table into five columns of expenditure based on household income group. The results from the calculations are presented in **Table 2** below.

There are two limitations with the current data and methodology, firstly where the majority of the EFS sectors mapped to the six IO sectors, not all 123 IO sectors within each of the aggregated 6 sectors were represented by EFS data. Secondly, for the 'Agriculture, Forestry and Fishing' no data was available from the EFS. For this sector the average expenditure for each of the household income groups was applied to disaggregate this sector.

Table 2 below presents the results from the expenditure disaggregation in absolute values.

Table 2- Disaggregated household expenditure across the six sector IO table (expressed as £million and in absolute values)

IO sectors	HH1	HH2	HH3	HH4	HH5	Total Expenditure by all households
Energy	5480	7123	7866	8347	9851	38666
Extraction, Quarrying etc	1379	1557	1645	1535	1645	7760
Agg and Fishing	662	1170	1747	2389	3451	9420
Manufacturing	5879	9220	12991	15834	20980	64904
Retail Distribution and Transport	14610	28734	45378	65008	94180	247910
Other Services	12476	23734	37153	52932	80808	207104
Total HH expenditure across IO sectors	40486	71539	106780	146045	210914	575764

The row totals in **Table 2** represent total household expenditure across each of the sectors in the six sector IO table, where the entry 575764 (£ million) represents total household expenditure across all sectors in the UK economy. Column totals represent the total expenditure by each of the household income groups across all of the six IO sectors.

Where the absolute values are important to form the basis of datasets for economic analysis, to make observations about household income group expenditure it is necessary to calculate the percentage shares of sector expenditure allocated to each household group. As well as the shares of overall sector expenditure from each income group it is indicative to calculate the proportion of income, as a percentage share, that is spent on each sector. Both **Table 3** and **Table 4** are based on the absolute values presented in **Table 2**.

Table 3- Share of household expenditure across the six IO sector (from total household income group expenditure).

	HH1	HH2	HH3	HH4	HH5
Energy	13.54%	9.96%	7.37%	5.72%	4.67%
Extraction, Quarrying etc	3.41%	2.18%	1.54%	1.05%	0.78%
Agg and Fishing	1.64%	1.64%	1.64%	1.64%	1.64%
Manufacturing	14.52%	12.89%	12.17%	10.84%	9.95%
Retail Distribution and Transp	36.09%	40.17%	42.50%	44.51%	44.65%
Other Services	30.81%	33.18%	34.79%	36.24%	38.31%
	100%	100%	100%	100%	100%

Table 3 shows the shares of income spent on each of the IO sectors by each income group. Note that the lower household income groups spend a larger share of income on energy services (heating and lighting in the home) and manufacturing (food and clothing is included in the manufacturing sector), whereas the higher income groups spend a larger share of income on 'luxury' spends within the 'Retail Distribution and Transport' and the 'Other services' sectors (which include air travel and hotel expenditure).

To look at the contribution of each household group to overall household sector expenditure, the share of each household income groups expenditure out of total expenditure is given in **Table 4** below.

Table 4- Household Income Group Expenditure as a share of total household expenditure.

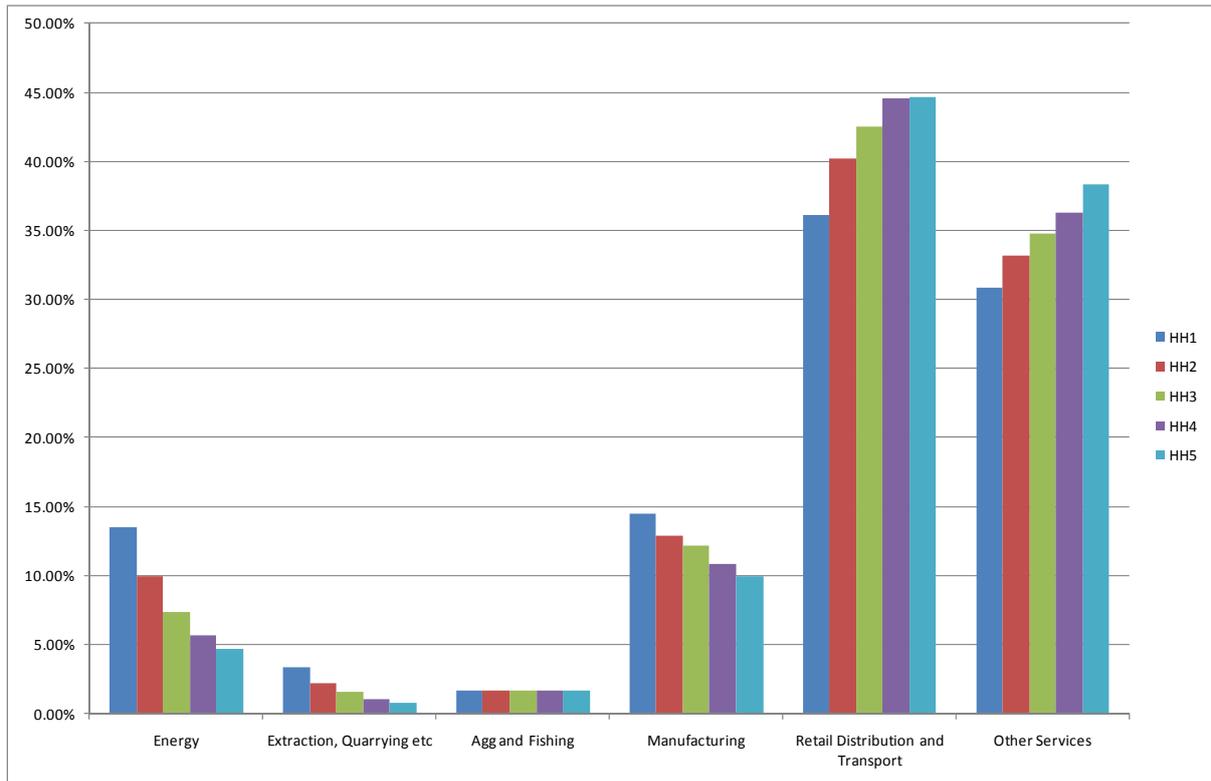
	HH1	HH2	HH3	HH4	HH5	Total Expenditure by all households
Energy	14.17%	18.42%	20.34%	21.59%	25.48%	100%
Extraction, Quarrying etc	17.77%	20.06%	21.20%	19.78%	21.20%	100%
Agg and Fishing	7.03%	12.43%	18.55%	25.37%	36.63%	100%
Manufacturing	9.06%	14.21%	20.02%	24.40%	32.32%	100%
Retail Distribution and Transp	5.89%	11.59%	18.30%	26.22%	37.99%	100%
Other Services	6.02%	11.46%	17.94%	25.56%	39.02%	100%

Observing the different direction in results between **Table 3** and **4**, we see the key observations from this expenditure disaggregation. In **Table 3** energy expenditure is highest among the low income households as a proportion of their income, but in **Table 4** we see that as a share of total household expenditure it is the high earning income group that contribute the largest amount. For energy policy that directly impacts household expenditure (either through improvements to energy efficiency in the home or through increases in the cost to use energy), the impact and corresponding change in expenditure may, based on this observation, lead to a difference in response between household income groups (for example, Lecca et al 2010, find larger rebound effects in energy consumption are triggered in low income households due to the larger share of income impacted when the implicit price of energy is lowered). This observation does not apply solely to the energy sector, as other sectors such as 'manufacturing' which contain the food and drink sectors show the same trend. The 'other

services' and 'retail, distribution and transport' sectors show results in the opposite direction, with the lowest earning groups devoting the least amount and share of their income (but the highest income groups still contribute the largest share out of total expenditure).

To capture these results in more detail **Figures 1** and **2** chart the data presented in **Table 3** and **4**.

Figure 1- Shares of household expenditure as a percentage of total income group expenditure (data taken from Table 3).

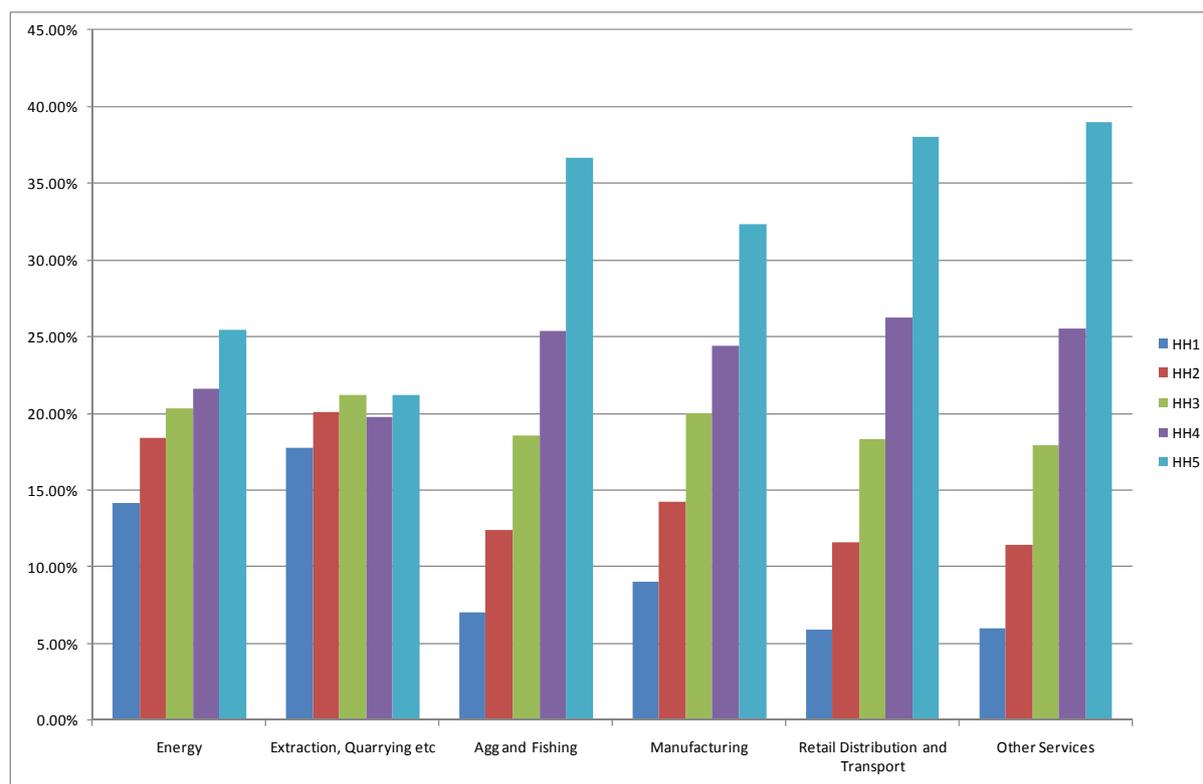


* Sector shares sum to total household income group expenditure.

** Lack of expenditure data on the agriculture and fishing sector means that this is no representative of actual household expenditure on this sector.

What we can see from **Figure 1** are the differences in expenditure when we consider how each household quintile spends its *own* income across the six UK IO sectors. Taking the same data from an alternative perspective, we can see in **Figure 2** the shares of total sector expenditure across the same six sectors, but this time considering household contributions from total sector expenditure as opposed to the share devoted from each groups total income.

Figure 2- Share of total expenditure in each sector by each household income group (data taken from Table 4).



*Shares sum to household expenditure from total sector expenditure.

Disaggregation of the Household Sector within the Income- Expenditure Account for the UK SAM 2004

Income- Expenditure (I-E) accounts give the additional data components necessary to build a social accounting matrix (SAM) from an IO table. That is, they record total household income which is not limited to the income from employment that is recorded in the IO table. All expenditures are also included, and therefore not limited to the expenditure on goods and services in the IO table. For information on I-E accounts see Chapter 5, Turner (2002), where the transition from IO to SAM and the components of I-E accounts are discussed in detail. For this paper it is important to note that the household section in the I-E account presents the additional components of income and expenditure that are not present in the IO table. Additional components show all the income and expenditure transactions that take place within a national or regional economy. This gives a full picture of the relationships between each household income group and other groups within the economy (government, corporations, savings and payments/income to/from abroad).

Data on sources of household income are inconsistent between the published reports such as the EFS, the HBAI and ONS publications. For consistency with the expenditure disaggregation, the EFS report is the primary source of data for disaggregating the household components in the I-E account here. Additional data were used from a report from the ONS (see Economic Trends No.620) titled 'The effects of taxes and benefits on household income, 2003.'. This report filled gaps in the data from

the EFS and shows how taxes and benefits redistribute income between various groups of UK households. The Economic Trend report shows how Government intervention through taxes and benefits alters the income of households. Data in this report enabled disaggregation of *payments to households* from the government and also *payments to the government* from each household group.

It is important to note that this disaggregation does not split out the row of imports in the IO table which would be necessary for a complete representation of household expenditure across all goods and services. For import disaggregation based on the same household income quintiles, see Lecca et al 2010.

There are two points to note about this part of the work, firstly the aim of the household I-E disaggregation is to give a fuller descriptive picture and to fulfil the database requirements for more complex economic modelling. Limited published data has meant that assumptions were necessary in mapping between data sources and the I-E accounts, which may require revision when or if further data become available. Secondly, although the I-E account presents information on payments from abroad (interest payments from foreign accounts or shares) and payments to abroad (payments for overseas services which is not tourist expenditure), where data on foreign transfers is limited and to allow internally consistent accounts these sections are used as balancing entries in the aggregated and disaggregated I-E accounts.

Household Income in the IE Account

Sources of household income are broken down into six categories in the I-E account. Of these six headings the corresponding mapping to the ONS report and EFS data are given, along with definitions, in **Table 5** below.

Table 5- Sources of household income in the IE account with mapping to ONS/EFS report data, plus definitions.

I-E Account Heading	Corresponding heading from ONS report	Definition	Notes
Income from Employment	Wages and Salaries	Take home pay from main employment, including NI contributions	Income from employment usually includes all income earned from employment including employment earned overseas. This is not included in the FES definition and employment earned overseas is included in other income.
Profit Income	Self Employment	Income from business or profession including subsidiary self employment.	Information gathered for the FES is on a current basis except for income from self employment and investment which are estimated over a twelve month basis.
Income from Corporations	Investments	Interest payments from banks, dividends, shares, ISA's. Other unearned income.	
Income from Corporations	Annuities and Pensions	Annuities and income from trusts, private pensions.	
Income from Government	Direct Benefits *	Benefits from Government	
transfers from ROW	Other sources	Income from allowances, benefits from trade unions, earnings from casual work, loans and scholarships. Other income.	Income left from the control totals has been used to split out this to be used in Transfers from ROW.

Data from the ONS report and the EFS were used to calculate the proportion of household income earned from each component given in **Table 5**. With the shares, the aggregate data from the UK 2004 household account in the IE was disaggregated. The absolute values of income can be presented as percentage shares in **Table 6** below.

Table 6- Percentage shares of household income from each household income group.

	HH1	HH2	HH3	HH4	HH5
Income					
Income from employment	22.32%	40.45%	55.99%	64.03%	67.21%
Profit income (OVA)	4.14%	4.37%	3.31%	6.58%	9.82%
Income from corporations	22.00%	25.28%	24.96%	21.32%	20.08%
Income from government	44.38%	25.00%	11.23%	4.93%	1.50%
Transfers from ROW	7.17%	4.90%	4.51%	3.13%	2.47%
	100%	100%	100%	100%	100%

The direction of the results in **Table 6** illustrates differences which exist between the income groups. Namely, for the low income groups the percentage transferred from the Government in comparison to the higher income groups.

Out of the aggregated components of household income we can see the shares that are attributable to each of the household groups. Here we can see that the largest share of household income is the

contribution from the higher earning income groups, and the largest government expenditure to fund income is on the lower household income groups.

Table 7- Percentage shares of income sources from aggregate household income sources.

Household Income	HH1	HH2	HH3	HH4	HH5	
Income						
Income from employment	2.24%	7.42%	16.34%	26.30%	47.70%	100%
Profit income (OVA)	3.50%	6.76%	8.14%	22.81%	58.79%	100%
Income from corporations	5.94%	12.48%	19.62%	23.59%	38.37%	100%
Income from government	28.88%	29.76%	21.29%	13.16%	6.91%	100%
Transfers from ROW	12.02%	15.03%	22.04%	21.54%	29.36%	100%

Household Expenditure

As with the income components from the IE account, the expenditure components of the IE table have also been disaggregated by income quintile.

There are four components as identified by Turner (2002)(excluding payments to the external sector) of household expenditure which have been calculated based on data available. These are given below.

- IO expenditure (goods and services) - calculated directly from the IO expenditure disaggregation above.
- Payments to the Government - calculated using tax information presented in the ONS report (Economic Trends No.620) titled 'The effects of taxes and benefits on household income, 2003-04'.
- Payments to corporations and capital- calculated using data from the EFS 2003-2004. Within the detailed household expenditure by gross income decile group section 14 titled 'Other items recorded' gives information on household savings and investments. Data from this table was used to split out two sections due to limitations in the data.
- Payments to the external sector – balancing identity within each account.

The expenditure component 'Payments to the external sector' was used as a balancing identity within each of the household accounts as no data was available for this component. Where other sections in these accounts have been calculated based on limited data, the payments to external section is the residual to balance the five household accounts.

Table 8 shows the percentage contribution each household makes to overall household expenditure in the UK economy. IO expenditure corresponds to the consumption of goods and services in the UK economy which was disaggregated in section 1 of this paper. The remaining components of the expenditure account relate to direct and indirect tax payments to the Government, payments to private corporations and any savings or investments. As with **Table 7** above, the quantitative value of each entry may be revised in the future with more transparent data sources. However, the direction of the results show that the highest earning group expend the highest amount across the UK economy

as a whole and this would not be expected to change. This is not just on goods and services for consumption, with this group having a much higher rate of saving, as well as contributing the most in terms of tax contributions included in payments to the Government. According to the quantitative results in this paper, there exist large differences between the higher income groups over payments to capital (savings and investments).

Table 8- Percentage share of household expenditure as a share of total household expenditure.

Household Expenditure	HH1	HH2	HH3	HH4	HH5	
IO expenditure	7.03%	12.43%	18.55%	25.37%	36.63%	100.00%
Payments to corporations	1.74%	4.29%	11.33%	21.13%	61.51%	100.00%
Payments to government	3.02%	6.67%	14.21%	24.50%	51.60%	100.00%
Payments to capital	1.69%	4.16%	10.98%	23.56%	59.62%	100.00%
Payments to ROW	12.26%	21.13%	25.17%	10.57%	30.88%	100.00%

Table 9 presents the percentage share of household expenditure from each of the household income groups total expenditure.

Table 9- Percentage shares of household expenditure from total household income group expenditure.

Household Expenditure	HH1	HH2	HH3	HH4	HH5
IO expenditure	78.06%	75.41%	70.70%	68.73%	57.44%
Payments to corporations	1.94%	2.62%	4.34%	5.76%	9.70%
Payments to government	10.12%	12.23%	16.37%	20.05%	24.44%
Payments to capital	1.06%	1.42%	2.36%	3.60%	5.27%
Payments to ROW	8.82%	8.31%	6.22%	1.86%	3.14%
	100%	100%	100%	100%	100%

The results show that as a proportion of household income group expenditure, the lowest income group spend the largest share of their income (but from **Table 3** this equates to the lower share of total sector expenditure out of the household groups) on goods and services in the UK IO table. IO expenditure includes payments for housing, which indicates that after payments for essential goods and services (energy services and food and drink in the manufacturing sector earlier identified) and payments for housing, the lower income groups have less income available to allocate to other expenditure components⁶. Moreover, they contribute the lowest in terms of taxes to the Government. The highest income group contribute the largest share, relative to the other income groups, to all the components in the expenditure account but as a group they allocate the lowest share of their own income to goods and services in the IO table. (**Table 8** showed that overall the highest income group represent the largest share of economy wide expenditure on produced goods and services in the UK).

Appendix B presents the disaggregated household components in the I-E account.

⁶ Confirmation of this would require further analysis of household behaviours to make a more accurate assumption regarding low income group expenditure. The observation here is based on the disaggregated data.

Conclusions

Based on the disaggregated data applied and presented in this paper, it is possible to make observations regarding household expenditure disaggregated by income in relation to UK production sectors and also in terms of economic contributions (from the I-E account). The purpose of this paper was twofold: firstly to make observations regarding household expenditure patterns at a disaggregated level from published IO data; and secondly to disaggregate the household data to fulfil the data requirements needed for more complex economic modelling such as IO analysis or CGE modelling. Further modelling using the household dataset has already been performed in Lecca et al 2010, where an analysis of household energy efficiency improvements is presented.

As a tool for observation, the disaggregation showed that key to the formulation of energy policy (where several goals have to be reached at the same time) is to identify the differences exist between household groups. Low income households spend more of their income on energy services yet contribute the lowest amount at the economy wide level. On the other hand, the highest earning income group spend the smallest proportion of their income but contribute the most in absolute terms. This raises interesting questions for the formulation of energy policy, and for addressing energy concerns such as fuel poverty.

Where the observation relating to energy service expenditure and income may not be surprising, the second purpose of this paper will allow economic models to analyse this relationship further. Therefore, where the disaggregation exercise in this paper was extended to include the additional components of data in an IE account for the creation of a SAM, the results will hopefully be used to feed into other economic analyses that attempt to answer policy relevant questions relating to households and energy.

References

1. Allan, G., McGregor, P., Swales, J.K. and Turner, K. (2006) The impact of alternative electricity generation technologies on the Scottish economy: an illustrative Input-Output analysis, **Strathclyde Discussion Papers in Economics**, No 06-02, available to download at:
http://www.strath.ac.uk/media/departments/economics/researchdiscussionpapers/2006/media_34009_en.pdf
2. Druckman, A. and Jackson, T. (2008) 'Household energy consumption in the UK: a highly geographically and socio-economically disaggregated model', *Energy Policy*, Vol. 36, pp1-19.
3. Jones, F. (2005) 'The effects of taxes and benefits on household income, 2003-04', *Economic Trends*, no.620, July, pp.15-60. Published by the Office of National Statistics.
4. Lecca, P., Swales, J.K. and Turner, K. (2010) Rebound effects from an increase in efficiency in the use of energy by UK households, forthcoming in **Strathclyde Discussion Papers in Economics**, will be available at
<http://www.strath.ac.uk/economics/research/discussionpapers/>
5. Office of National Statistics (ONS) Family Spending: A report on the 2003-2004 expenditure and food survey. Available for download at:
http://www.statistics.gov.uk/downloads/theme_social/Family_Spending_2003-04/FamilySpending2003-04.pdf
6. Office of National Statistics (ONS),
<http://darp.lse.ac.uk/Resources/Data/UK/EconomicTrends/TaxBenefits2003-04.pdf>
7. Turner K. (2002), 'Modelling the Impact of Policy and Other Disturbances on Sustainability Policy Indicators in Jersey: an Economic-Environmental Regional Computable General Equilibrium Analysis', Chapter 5, Ph.D. thesis, University of Strathclyde.
8. UK 2004 Input Output Table, description and download available from-
<http://www.strath.ac.uk/fraser/research/2004ukindustry-byindustryanalyticalinput-outputtables/>

Appendix- A

	6 Sectors	From 123 Sectors (IOC)	From 25 sectors to 6
1	Energy	4, 35, 85,86,	21,22,23,24
2	Extraction, Quarrying, Construction and Water Supply	5, 6,7,87,88	5,6, 13,14
3	Agriculture and Fishing	1,2,3	1,2,3,4
4	Manufacturing	8-34, 36-84	7,8,9,10,11,12
5	Retail, Distribution and Transport	89-99	15,16,
6	Other Services	100-123	17,18,19,20

Appendix B

£million			
Households 1		Households	
Income	65,737	Expenditure	65,737
Income from employment	14,673	IO expenditure	51,312
Profit income (OVA)	2,722	Payments to corporations	1,278
Income from corporations	14,459	Payments to government	6,652
Income from government	29,173	Payments to capital	694
Transfers from ROW	4,711	Payments to ROW	5,801
Total Household Income (Balancing T	65,737	Total Expenditure	65,737
£million			
Households 2		Households	
Income	120,232	Expenditure	120,232
Income from employment	48,634	IO expenditure	90,669
Profit income (OVA)	5,253	Payments to corporations	3,148
Income from corporations	30,397	Payments to government	14,708
Income from government	30,058	Payments to capital	1,710
Transfers from ROW	5,889	Payments to ROW	9,997
Total Household Income (Balancing T	120,232	Total Expenditure	120,232
£million			
Households 3		Households	
Income	191,411	Expenditure	191,412
Income from employment	107,164	IO expenditure	135,333
Profit income (OVA)	6,326	Payments to corporations	8,316
Income from corporations	47,781	Payments to government	31,335
Income from government	21,503	Payments to capital	4,518
Transfers from ROW	8,637	Payments to ROW	11,910
Total Household Income (Balancing T	191,411	Total Expenditure	191,412
£million			
Households 4		Households	
Income	269,320	Expenditure	269,320
Income from employment	172,436	IO expenditure	185,098
Profit income (OVA)	17,723	Payments to corporations	15,515
Income from corporations	57,432	Payments to government	54,012
Income from government	13,289	Payments to capital	9,694
Transfers from ROW	8,440	Payments to ROW	5,000
Total Household Income (Balancing T	269,320	Total Expenditure	269,320
£million			
Households 5		Households	
Income	465,361	Expenditure	465,361
Income from employment	312,767	IO expenditure	267,314
Profit income (OVA)	45,685	Payments to corporations	45,155
Income from corporations	93,426	Payments to government	113,753
Income from government	6,981	Payments to capital	24,530
Transfers from ROW	11,503	Payments to ROW	14,610
Total Household Income (Balancing T	465,361	Total Expenditure	465,361

Appendix C- Mapping the IO sectors to the COICOP sections in the EFS 2003-2004

	IO Aggregated Sector	Section (s) Classifications based on the COICOP from the EFS 2003-2004	Section and sub-section Names
1	Energy	4.4	Electricity, Gas and Other fuels
		4.4.1	Electricity
		4.4.2	Gas
		4.4.3	Other Fuels
2	Extraction, Quarrying, Constructon and Water Supply	4.3	Water supply and miscellaneous services relating to the dwelling
3	Agriculture, Forestry and Fishing	<i>See note below</i>	
4	Manufacturing	1	Food and non-alcoholic drinks
		2	Alcoholic drinks and tobacco
		3	Clothing and footwear
		5	Household goods and services
		9.1	Audio Visual and information processing equipment
		9.2	Other major durables for recreation and culture
		9.3	Other recreational items and equipment, gardens and pets
5	Retail Distribution and Transpo	7	Transport
		11	Restaurants and hotels
		8	Communication
6	Other Services	6	Health
		9.4	Recreational and cultural services
		10	education
		12.4	Insurance
		12.5	Other Services
		13	Other Expenditure Items