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ABSTRACT

This paper develops a new approach to the analysis of how households tend to diversify their spending: the approach is to measure empirically how widely their total spending is distributed across different expenditure categories. Based on UK spending data spanning over 50 years, our results suggest that the diversification of household expenditure patterns takes place in such a way that, as household income rises, total household expenditure is distributed across different goods in an increasingly even manner. Moreover, when examining how household diversification patterns changed over time, we find evidence that there has been acceleration in the rate at which household expenditure patterns become diversified as household income rises. This represents a fascinating result, given that income inequality increased by 10 percentage points in the UK during the same period (Atkins 1997).

JEL classifications: D11, D12, D31.

Keywords: Diversity in consumption, economic inequality, living standards, Engel's Law.

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1. Introduction

As people get richer they consume not only more but also a wider variety of goods (Bils and Klenow 2001a). Indeed, long run economic growth in Western countries has led to not only rising household incomes, but also an extraordinary expansion in the variety of goods and services that ordinary households consume (Romer 1990, Barro and Sala-i-Martin 1995). Many have suggested that the growing level of diversity in household spending a sign of rising household living standards since households must no longer concentrate their spending on basic necessities and possess more freedom in making spending decisions (e.g. Houthakker 1967). This tendency for households to diversify their spending also has important practical implications for studying the economy. It has been long argued that systematic changes in household spending driven by rising household income is a source of structural change in the economy (Kuznets 1973). In trade theory, one popular explanation of intra-industry trade has been the hypothesis that countries with similar income levels possess similar preferences for goods and services (the Lindner hypothesis), which suggests that the manner in which the composition of household demand changes with rising income can significantly influence global trade patterns (Hallak 2010). These dynamics are also of great relevance in the measurement of inflation (Bils and Klenow 2001b) and assessing the welfare effects of tax policy (Banks et al. 1997).

Despite its significance, to date little empirical work has been done to measure the extent to which household becomes more diversified as household income grows, and how this tendency has evolved over time. To date, the predominant empirical approach to examining income effects has been via Engel curves which examine how expenditure on individual expenditure categories tend to vary with rising income (Lewbel 2008). This literature has yielded many results and Engel curves have subsequently been used to construct demand systems in which expenditure on a range of goods and services are modelled as function of price and income effects (Barten 1977, Deaton and Muellbauer 1980). Yet a limitation of Engel curves is that each expenditure category, however defined, tends to be considered in isolation from other types of household expenditure. Thus not many insights can be gained about how widely the *overall distribution* of household spending is dispersed across different spending categories.

Using UK household-level spending data spanning over 50 years, this paper seeks to take a small step towards developing a more realistic models of household spending but

uncovering new facts about household spending tend to become more diversified as income rises. By 'spending diversification' we refer to how widely total household expenditure is distributed across observed expenditure categories. Such new facts can be used to develop a more accurate picture of how household spending patterns systematically change as household income grows (Bertola et al. 2003). A number of earlier empirical studies on this topic have found preliminary evidence for a positive correlation between expenditure diversification and income (e.g. Falkinger and Zweimüller 1996; Clements et al. 2006). Yet these studies suffer from two major drawbacks. Firstly, the measures employed in these studies possess particular statistical properties, such as symmetry, which are not appropriate in analysing expenditure diversification (discussed below). Secondly, these studies have used highly aggregated country level data in which inferences about the relationship between income and expenditure diversification have been drawn from comparing the aggregate expenditure patterns of a rich country to those of a poor country. To date, we are not aware of any other study that has examined diversification patterns across a wide range of expenditure categories using household-level expenditure data. So far, it appears that diversification patterns within certain categories, e.g. food, have been studied (Thiele and Weiss 2003).

Our preliminary study features using UK household spending data spanning over 50 years delivers two interesting results. Firstly, in terms of how rising household income affects the diversification of consumption, they show that household expenditure tends to become diversified in such a way that total expenditure tends to be more evenly distributed across different expenditure categories. In other words, the budget shares of different categories tend to converge to a common level as household income rises. If confirmed, this addendum to Engel's law represents a new insight about the non-homothetic nature of household preferences. Secondly, the results also suggest that there appears to be convergence in the level of diversity observed in the spending patterns of rich and poor households: the level of spending diversity observed in poor households has increased over time and approached the same level observed in rich households. Given that income inequality has substantially increased in over the same period, this represents a fascinating result: while differences in the incomes of rich and poor have increased, differences in the extent to which they diversify their spending has narrowed.

Beyond delivering new empirical facts about how consumption patterns tend to evolve with rising household income, these results may shed light on the longstanding hypothesis that there exists hierarchy in consumer wants in that some types of expenditure are

of a higher priority than other types of expenditure (Engel 1986; Lancaster 1971, Ironmonger 1972, Jackson 1984). The outcome of this hierarchy is that low income households will concentrate on high-priority goods. As income grows demand for these goods will satiate at some level and the household will begin to diversify its consumption set to include goods of a lower priority. Our results suggest there exists only a hierarchy to the extent that spending on food predominates over other wants at low income levels. At higher income levels, the increasingly even distribution of spending suggest that no type of spending clearly predominates other types of spending, once the need for food has been satiated.

This paper is structured as follows. Section 2 discusses different approaches to measuring spending diversification in consumer theory, while Section 3 discusses the various statistical measures available for calculating spending diversity and outlines the data. Section 4 presents the results of the study. Section 5 provides a discussion of their implications for notion of a hierarchy in consumer wants.

2 .Spending diversification and non-homothetic preferences

Within consumer theory, there currently exist two possible opposing explanations about how household spending becomes increasing diversified. The first posits that household preferences are non-homothetic and that demand for variety is linked to increased in income, while the second argues that household preferences are homothetic and that demand for variety is unrelated to income levels (Dixit and Stiglitz 1977). The former is widely supported by empirical research which shows that the shares of household budget dedicated to various goods tends to vary with household income, when controlling other factors (Deaton and Muellbauer 1980).

A class of models has subsequently been developed to model non-homothetic preferences that can account for how expenditure on a particular good varies with household income. In particular, it has been posited that there exists a hierarchy of wants in that some types of expenditure are of a higher priority than other types of expenditure (Lancaster 1971, Ironmonger 1972, Jackson 1984). Hence low-income households will concentrate on high-priority goods. As income grows demand for these goods will satiate at some level and the household will begin to diversify its consumption set to include goods of a lower priority. Following Bertola et al. (2006), this can be modelled using the following utility function:

Where is an indicator for the utility derived from consuming good in quantity . The baseline utility satisfies the assumption and . The hierarchy function is monotonically decreasing, as , hence low goods get a higher weight than high goods. The form of the sub-utility function determines whether the income elasticity of the goods may be different from one. Non-homothetic preferences implies that the elasticity of substitution −—— is not constant and varies with . This causes the substitution rate between two goods to fall which leads to relative satiation: Having already consumed much of a particular good a household is increasingly less willing to consume more of that good in exchange for a reduction of consumption of another good.

The advantage of this model for analysing diversification is that one can consider the situation in which some goods may not be consumed because the household can not afford them, such that the non-negativity constraints may become binding. This requires that marginal utility for consuming good in quantity zero, , is finite for all . The non-negativity constraint is incompatible with the notion of homothetic preferences which would imply that the budget share dedicated to good , , does not vary as household income grows, achieved by a constant —— and . In this case, households consume all goods available in positive amounts at all levels of income. The difference between homothetic preferences and non homothetic preferences can be seen in the Figure 1.

Insert Figure 1 here

Consequently, varying household income will have *no effec*t on how total expenditure is distributed across different goods. Thus homothetic preferences suggest that the diversification of spending will be even across all household income levels. In contrast, non-homothetic preferences predict that total household expenditure will *become increasingly diversified* as household income grows since growing income leads to relative satiation in high priority goods and enables household to begin consuming low priority goods. To assess the merits of these contending approaches, the following section will measure whether the distribution of total expenditure varies with household income levels.

3. Empirical Approach

A new class of statistical measures has recently emerged that enables the study of the distribution of household expenditure (Theil 1967; Theil and Finke 1983; Falkinger and Zweimüller 1996; Clements et al. 2006). These initial studies have found preliminary evidence for a positive correlation between expenditure diversification and income. Yet these studies suffer from two major drawbacks. Firstly, the measures employed in these studies possess particular statistical properties, such as symmetry, which are not appropriate in analysing expenditure diversification. These have employed indices that were mainly developed to study changes in income distribution, such as the Herfindahl index (Falkinger and Zweimüller 1996). The indices are usually designed to meet properties such as (i) symmetry, (ii) scale invariance or zero degree homogeneity, (iii) Pigou-Dalton transfer principle, (iv) population replication, (v) decomposability and (vi) diminishing transfers. Information on these axioms can be found in Sen (1973) and Cowell and Kuga (1981a, b). Several of these axioms may require modification when applied to diversity measurement (including the important Pigou-Dalton condition).

In the this study, we measure spending diversification via the Gini coefficient, which is a measure of the inequality of a distribution, a value of 0 expressing total equality and a value of 1 maximal inequality. As with the above-mentioned studies, this measure of inequality was originally designed to measure income inequality. Adapting Deaton's (1997) formula:

Where is the set of consumption expenditures, is the mean budget share of the set, and is the budget share rank of expenditure *i* with budget share

Concerning the data, we use data from five years in the UK Family Expenditure Survey that spans over five decades: 1961, 1970, 1980, 1990 and 2000. These years were chosen for two reasons: First, we sought to cover a long time span in order to ensure that any results are not a consequence of conditions specific to any one particular sample year. To ensure consistency in classification schema over time, we proceeded to re-categorize spending data into new categories (see table 1 in appendix). In the reclassification exercise, some spending data had to be dropped for the analysis, due to the fact that for some

expenditure categories, e.g. `other household goods', we lacked enough information to properly allocate the expenditure category within the chosen classification scheme. Furthermore, to avoid the complications arising from differences in household size, we focus on three person households since these have the largest number of observations relative to other household sizes.[1]

Following standard procedure, we use total expenditure as a proxy for household income. Table 2 below reports the summary of income statistics. Average income has risen considerably between 1960 and 2000, and the changes in the standard deviation of income indicate that there were also substantial changes in the income distribution of households.

Insert Table 2 here

4. Results

The budget shares for these expenditure grouping were then calculated for ten income deciles for each year included in the sample. These were used to derive the Gini coefficients (described above) for each income decile, as found in Table 3. The results confirm the findings of previous studies (Clemente et al. 2006) that the extent to which household diversify their spending is positively correlated to their income level in that low income households consistently possess relatively less diversified spending patterns in comparison to high income households (see Figure 2 below, the lower the coefficient, the more diversified is spending for that household decile).

In addition, the results also reveal what appears to be evidence for general regularity describing how consumption expenditure becomes more diversified as households become more affluent. As household income grows, not only is there a decline the budget share dedicate to nourishment, but household expenditure is distributed across consumption expenditure categories in a more even fashion. This is reflected in the fact that, across all of the observed years, the Gini coefficient for the highest decile is lower than the Gini coefficient for the lowest income decile. This indicates the total expenditure is distributed more evenly across expenditure categories at high income levels than it is at low income levels. In other words, the budget shares of various expenditure categories exhibit a tendency to converge to a common level, as household income increases. This implies that

[1] We have aggregated across all household sizes and found similar results to those reported below, results are available upon request.

diversification of household expenditure does not take place in such a way that any one particular non-food expenditure category tends to dominate other non-food expenditure categories. Rather, it appears that diversification takes in such a way that additional income is distributed in increasingly equal proportions across non-food expenditure categories.

Insert Table 3 here

It should be noted that this finding is not encapsulated in Engel's law which relates to the how the budget share of household expenditure on food declines in response to an increase in household income. While Engel's law does imply that the budget share of non-food expenditure will rise, it has no implications for how consumption expenditure will be distributed across non-food categories. The above finding suggests that as the food budget share declines, the budget shares of all other non-food expenditure categories will tend to converge. This result is also different from Prais (1953) statement that as income rises, a greater number of goods will enter the household consumption basket (see Jackson 1986). The fact that a greater number of goods enter the consumption basket does not imply that there will be a more even distribution across expenditure categories. It is a possible that the number of items found in the household consumption basket increases, without affecting the distribution of total expenditure across expenditure categories.

To attain an increasingly even distribution across these expenditure categories, there must be an additional regularity at work that relates to how expenditure is distributed in *increasingly equal proportions* across different expenditure categories. In this respect, we claim this result to be an additional insight into understanding the manner in which the composition of household expenditure changes as household income grows. We leave it for future work to test whether this results is holds with different household expenditure data and differing expenditure classification schemas. Of course, it is likely that this result will not hold if expenditure is highly aggregated into two or three categories, such as `food' and `non-food', or food, goods and services.

We speculate that the finding holds if at least four different expenditure categories are specified. Regarding how sensitive these results are to demographic factors, we found that these results were robust when comparing ECs for households of different sizes (two and three person households).

Insert Figure 2 here

To attain an impression of what factors are driving these results, Tables 4 and 5 below reports the budget shares for the different expenditure categories for the lowest and highest income decile observed for each sample year. In relation to the lowest income decile, the most salient feature of these results is the surprising consistency of the budget shares across the four decades. Between 1960 and 1980 none of the budget shares change by more that 2 per cent: the budget share of expenditure dedicated to nourishment drops marginally from 62 to 60 per cent, whilst the budget share of expenditure dedicated to clothing rises slightly from 8 to 10 per cent. Other small changes occur in the budget share of expenditure on intellectual goods and heating and lighting. This stability in the household budget shares of expenditure occurs in spite of a more than seven-fold increase in the average real income of three-person households in the lowest income decile: the weekly average real income rose from 7.27 pounds in 1960 to 64.98 pounds in 2000. After 1980, expenditure on nourishment declines significantly, whilst housing expenditure increases significantly. We note that the trend in housing expenditure budget shares reflects the substantial increase in house prices since the 1980, reductions in the government provision of housing subsidies to low income households, as well as other well known measurement changes related to the manner in which housing expenditure was recorded in the UK Family Expenditure Survey (Tanner 1999).

Insert Table 4 and Table 5 here

Table 5 reveals that there is much more volatility in the budget shares of high income households. While nourishment is still the most dominant expenditure category, there is much more variability in the budget share of household expenditure on tools, housing, and clothing. Compared with the highest income level observed by Engel, the budget expenditure on nourishment has more than halved, from 62.42 per cent in 1856 to 30.65 per cent in 1960. Considerable increases can be found in the budget share related to shelter, tools and `all other'.

5. Towards a wants-based analysis of spending patterns

Beyond delivering new empirical facts about how consumption patterns tend to evolve with rising household income, these results may shed light on the longstanding hypothesis that there exists hierarchy in consumer wants in that some types of expenditure are of a higher priority than other types of expenditure (Engel 1986; Lancaster 1971, Ironmonger 1972, Jackson 1984). The outcome of this hierarchy is that low income households will concentrate on high-priority goods. As income grows demand for these goods will satiate at some level

and the household will begin to diversify its consumption set to include goods of a lower priority.

A major contribution to this literature was made by Ernst Engel. Writing some seventy years before income was systematically analyzed in economic theory (Stigler 1954:102), the theoretical starting point for Engel's inquiry was to analyze the wants which motivate consumption and how their influence changes as household income rises. A key facet of his work was to understand why a change in the income levels of households affects the composition of consumption expenditure - i.e. to explain why preferences are non-homothetic. He did this by developing a classification scheme for studying spending patterns in which goods were classified according to the wants they served (see table 1). This classification method is based on prior reasoning about the types of wants consumers possess, as well as how particular types of goods and services were used to satisfy these wants.

A main conclusion of Engel's work was an observation about how the expenditure patterns of low income household tended to tended to reflect a ranking amongst wants. Engel explicitly claims that his results showed that wants are not of equal importance to household, but rather that a hierarchy existed amongst wants: "Wants are not of the same rank. At the top stand those wants whose satisfaction is key to physical sustenance: nourishment, clothing, housing, heating and lighting and health. Of a second order follow: intellectual and spiritual care, legal protection and public safety, public provisions and assistance." (Engel 1895:8).

Since Engel's time, there has been an ongoing debate in both psychology and economics about what type of wants consumer possess, whether they are universally shared, and the validity of linking wants to certain goods, given subjective differences in what consumers know and how they perceive goods (Maslow 1950, Deci and Ryan 1975, Max-Neef 1991, Jackson and Marks 1999). These obstacles to a want-based analysis of household expenditure are large and deserve further attention in future research.

Concerning the results of this study, we would make the observation that ***if*** one accepts if Engel's expenditure categories are an accurate reflection of how wants relate to goods and services, then the actual hierarchy of wants appears to have a very different character to those proposed by social scientists such as Maslow (1950). Rather than there being a clear order amongst several wants, it appears that there exists only an order to the extent that the want for food predominates over other wants at low income levels, but no

other wants clearly predominate each other at higher income levels, once the want for food has been satiated.

6. Conclusion.

This paper has conducted a preliminary investigation into how households tend to diversify their spending as they become more affluent. Results show that there is a positive correlation between household income and the extent to which household spending is diversified across different expenditure categories. It further appears that this diversification takes place in such a way that household expenditure is distributes across expenditure categories in an increasingly even manner – which suggest that there is a tendency for the budget shares of different spending categories to converge to a common level as household income rises. Over time, it appears that differences between rich and poor household in the extent to which they diversify appear to be narrowing.

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Appendix

Figure 1: Homothetic Pretences (Left) versus Non-homothetic Preferences (Right)

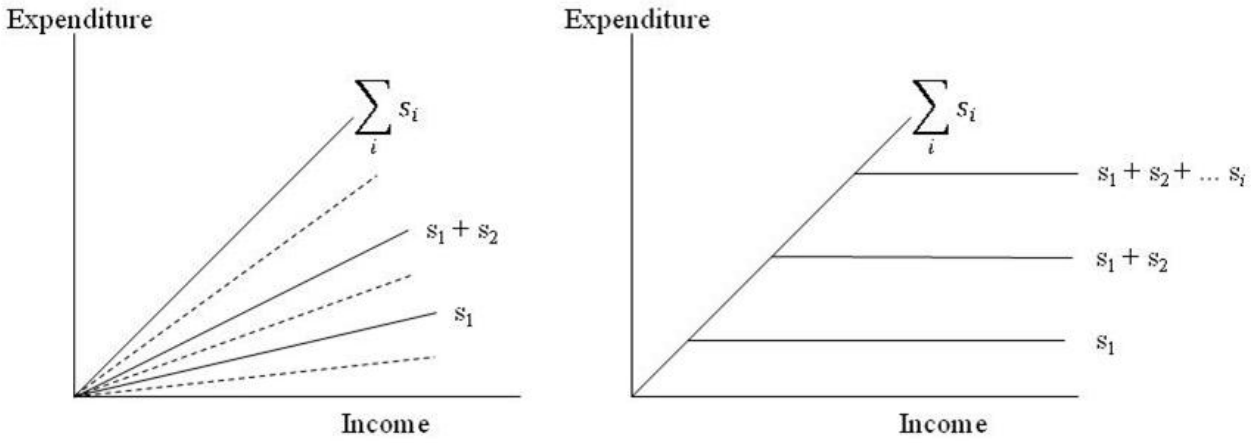

Table 1

Table 1: Engel's Expenditure Categories

Wants (*Bedürfnisse*)	Relevant Expenditures
1. **Nourishment** (*Nahrung*)	Daily nourishment from meals and beverages, spices, stimulants (e.g. alcohol, coffee), tobacco, occasional dining out, etc.
2. **Clothing** (*Kleidung*)	Clothing and shoes of all kinds; underwear, jewelry and toiletries; clothing accessories.
3. **Housing** (*Wohnung*)	Shelter, furniture, household appliances; beds and bedding; insurance for housing and furniture.
4. **Heating and Lighting** (*Heizung*)	Wood, coal and gas heating; lighting via candles, oil and gas.
5. **Tools for Work** (*Geräthe*)	Tools, machines, mechanical instruments; crockery and vessels etc.; all kinds of metal, earths, stones, glass, porcelain, leather, pulp, rubber etc.; wagons, boats, saddles and equipment etc.; means of communications etc.
6. **Intellectual Education** (*Erziehung*)	Education, tuition; church; tools for education, tuition and worship; scientific equipment, literary and artistic production; intellectual rejuvenation and educations, music, theater etc.; musical instruments .
7. **Public Safety** (*öffentliche Sicherheit*)	Legal protection; administration; police; state defence; care for the poor etc.
8. **Health and Recreation** (*Gesundheitspflege*)	Medical treatment and pharmaceutical expenses, bathing; outdoor recreation, play, recreational travel.- Life insurance.
9. **Personal Service** (*Dienstleistungen*)	Personal services attained from use of domestic servants of all kinds.

Source: Engel (1857: 5-6).

Table 2: Descriptive Statistics of dataset

	1960	1970	1980	1990	2000
Observations	642	1218	1208	1106	990
Mean Real weekly income	£33	£101	£126	£165	£246
Standard deviation	£21	£115	£112	£109	£155
Lowest observed income	£9	£20	£15	£11	£23
Highest observed income	£272	£3,297	£2,006	£1,335	£1,995

Note: measured in pounds, where 2006 is the base year. The Retail price (RPI - all items percentage change over 12 months (UK statistics series CZBI)) was used to derive real values. Income is proxied by total expenditure.

Table 3: The Gini coefficient over time

	1960	1970	1980	1990	2000
Lowest income decile	0.74	0.75	0.76	0.61	0.61
Middle income decile	0.69	0.66	0.68	0.60	0.56
Highest income decile	0.53	0.52	0.54	0.48	0.54

Figure 2: Evolution of the expenditure diversification in the UK, 1960-2000

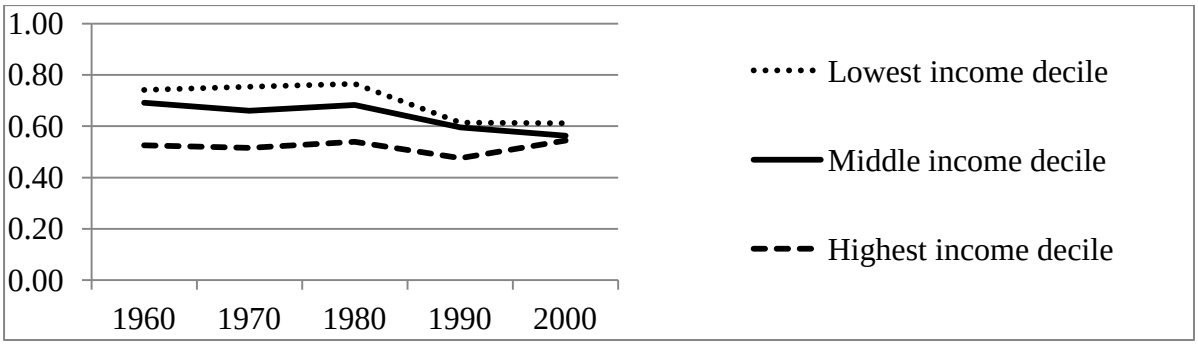

Table 4: Budget share for the lowest income decile, 1960-2000

Want	1960	1970	1980	1990	2000
1. Nourishment	62	60	60	40	38
2. Clothing	8	9	10	9	9
3. Shelter	1	1	1	13	17
4. Heating and lighting	6	5	4	6	9
5. Tools	7	7	7	7	6
6. Intellectual Education	3	3	5	3	6
7. Public safety	1	0	1	0	0
8. Health and recreation	3	4	3	6	3
9. Personal Services	2	2	1	1	0
10 All other	7	9	8	15	11

figures represent per cent of total expenditure.

Table 5: Budget share for the highest income decile, 1960-2000

	1960	1970	1980	1990	2000
1. Nourishment	54	47	48	32	26
2. Clothing	11	13	14	11	9
3. Shelter	3	4	3	18	24
4. Heating and lighting	5	4	2	1	4
5. Tools	9	9	12	13	10
6. Intellectual	2	4	5	3	5
7. Public safety	1	1	1	1	0
8. Health and recreation	4	6	5	6	4
9. Domestic Services	2	1	1	1	1
10 All other	8	12	10	13	17

figures represent per cent of total expenditure.