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Quantifying Expenditure Hierarchies and the Expansion of Global Consumption Diversity

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Quantifying Expenditure Hierarchies and the Expansion of Global Consumption Diversity

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Abstract

Economic growth tends to stimulate fundamental changes in consumption patterns as consumers who get rich tend to spread their spending more evenly across a wider variety of goods and services. Comparing cross sectional spending patterns across rich and poor countries, we investigate how this diversification process enables more niche patterns of spending to emerge across the global population of consumers. We use entropy measures to quantify the dispersion of household spending across goods and study how it unfolds as GDP rises. Using a gravity model to study international differences in the relative order of income elasticities, i.e. expenditure hierarchies, we show how this diversification process on the national level is correlated with cultural norms, GDP and income inequality. We find that national expenditure hierarchies are relatively similar across countries among necessities, while they are increasingly unique among luxuries. We further verify how rising affluence tends to generate more niche consumption patterns by examining how rising income is positively correlated with demand heterogeneity and income inequality is negatively correlated with market depth.

Keywords: spending diversity, income elasticity, expenditure hierarchy, niche consumption, cultural norms.

JEL classification: D12, D83, J15, O12

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1 Introduction

> *"The pursuit of novelty, or at least of variety, is so pervasive a part of human action as to lead us to reject out of hand the hypotheses that (1) long-run (static) utility functions exist (2) long-run demand functions are stable and (3) that preferences are acyclic."* –Richard Day (1985)

Between 1901 and 2003, the average US household income increased 67-fold from $\$750$ to $\$50,302$ whilst purchasing power also tripled (Chao and Utgoff, 2006). This expansion stimulated dramatic changes in the distribution of spending across goods and services as households dramatically expanded the variety of goods consumed. Looking at consumption patterns across the globe today, similar differences in expenditure patterns can be observed. Among the world's poorest, spending patterns tend to be relatively homogeneous and mainly dedicated to food, just as US household expenditure was at the turn of the 19$^{\text{th}}$ century (Lebergott, 2014; Banerjee and Duflo, 2007). The situation is quite different among rich households in more developed countries who possess greater discretionary power. The budget share dedicated to food declines (Engel's Law), households spread their spending across a wider basket of goods (Theil and Finke, 1983; Jackson, 1984; Falkinger and Zweimüller, 1996; Saviotti, 2002), buy higher quality goods (Bils and Klenow, 2001), and consume more services (Schettkat and Yocarini, 2006; Buera and Kaboski, 2012). Consequently, 'niche' markets emerged that feature customized goods to meet increasing differentiated preferences (Pine, 1993; Guerzoni, 2010; Amin, 2011). This diversification process has important implications for the economy as it can trigger the reallocation of resources across sectors (Pasinetti, 1983; Foellmi and Zweimüller, 2008; Boppart, 2014), shape international trade flows (Hallak, 2006; Matsuyama, 2019) and innovative activity (Saviotti, 2002; Foellmi and Zweimüller, 2017).

While traditional economic theory is focused on how marginal changes in income and prices influence the composition of spending, it has less to say about how household consumption patterns evolve in the long run, when growth stimulates remarkable increases in not only the household's level affluence, but also in the affluence of the wider society (Scitovsky, 1976; Frank, 1985; Witt, 2001). As Richard Day recognized in the above quote, the pursuit of novelty that drives the diversification of spending poses serious challenges to modelling long run growth as it challenges many standard macroeconomic assumptions that consumer preferences are ahistorical and exogenous in the sense that macroeconomic conditions (including GDP and income inequality) and culture do not influence consumer preferences (Day, 1985; Bowles, 1998). In fact, many empirical results of international expenditure patterns highlight that preferences significantly vary across countries (Selvanathan and Selvanathan, 1993; Carruth et al., 1999; Rathnayaka et al., 2022). In particular, the influence of cultural norms in shaping the composition of household spending

has been argued to grow as societies become more affluent (Veblen, 1899; Douglas and Isherwood, 1979; Bianchi, 2002; Yang and Wang, 2023). One prominent example of this is the concept of conspicuous spending where evidence suggests that income inequality can trigger greater demand for visible goods that enables consumer to signal their social status (Heffetz, 2011; Bertrand and Morse, 2016; Chai et al., 2019; Colson-Sihra and Bellet, 2022).

This paper has three parts. First, using World Bank data on consumption patterns from the developing world, we examine how households diversify their spending across goods and across different levels of income and economic development. We employ entropy index measures to track the dispersion of household spending across different goods, which we dub the 'spending diversity' (Theil, 1967; Clements et al., 2006; Clements and Gao, 2012). The Engel curve for spending diversity reports the relationship between spending diversity and household income. In this first section, we measure this Engel Curve across countries and decompose income-induced increases in spending diversity into two different forces: changes in the variety of goods consumed (extensive margin) and changes in the spread of spending across existing goods (intensive margin).[1]

Second, we then consider how a hierarchical preference structure can account for the observed trends in spending diversification (Maslow, 1954; Foellmi and Zweimüller, 2008; Chai and Moneta, 2012). Faced with scarce income, consumers prioritise their spending: the highest priority goods (such as food) are attended to first, and lower priority goods are consumed only when demand for high priority goods has been satiated. We analyze the order of income elasticities for goods across 90 countries. We then quantify how these 'expenditure hierarchies' differ across rich and poor countries. As first conjectured by Linder (1961), we find evidence that countries which are more similar in terms of GDP also possess similar expenditure hierarchies. Our findings show that the base of these expenditure hierarchies are relatively homogeneous across the world as the same basic necessities are found to have the lowest income elasticity across many different countries. However, the peaks of the expenditure hierarchies are more heterogeneous across countries as the order of luxuries in each country is more unique. We also find a strong link between expenditure hierarchies and income inequality: the more similar two countries are in terms of their income distribution, the more similar are their expenditure hierarchies. We also highlight how the expenditure hierarchies are path dependent in the sense that the country's history and certain cultural norms influence the character of expenditure hierarchies.

Third, we further investigate whether more unique consumption patterns emerge within

[1] In the appendix of the paper, we also decompose spending diversity into 'within' and 'between' expenditure group sources using Theil entropy measures.

economies as economic growth propels them up the expenditure hierarchy. If it is correct that the peaks of a country's expenditure hierarchies is more unique, then more disaggregated household level expenditure data should also show that the level of heterogeneity in spending patterns is positively correlated with income. We therefore track the emergence of more fragmented 'niche' consumption patterns by comparing differences in the shape of Engel curve for spending diversity across different levels of aggregation (Neiman and Vavra, 2023; Kiedaisch et al., 2018). Our results confirm that across a number of developing countries, rising household income is positively correlated with a decline in demand homogeneity and the emergence of increasingly fragmented niche consumption patterns. This has important economic implications because the increasing complexity of coordinating production activity in increasingly niche markets may generate internal diseconomies as discussed by Day (2018).

We also further examine how rising income inequality on the national level is positively correlated with more heterogeneous consumption patterns that could reduce economies of scale (Murphy et al., 1989; Bertola et al., 2014). High levels of income inequality could accentuate differences in spending patterns across a population of consumers such that marginal increases in household spending are more dispersed across a wider range of new markets, thereby limiting the emergence of mass markets and instead fostering the growth of niche markets.[2] We examine the correlation between income inequality and the depth of the market as measured by market participation rates. Our results provide evidence that high levels of income inequality accentuate differences in spending patterns such that household spending is more dispersed across a wider range of good and services, leading to a decline in average market depth.

This rest of the paper is structured as follows. Section 2 reviews some stylised facts that describe how composition of demand evolves as economies grow and households experience large, non-marginal rises in income. Section 3 presents the methodology while Section 4 discusses the data used in our empirical analysis. Section 5 describes the empirical results. Section 6 provides a discussion and concludes.

2 Background

2.1 The diversification of consumer spending

Ever since the formulation of Engel's law (Engel, 1856), much empirical evidence suggests that the composition of household spending undergoes fundamental changes as

[2]Writing about the fast pace of US growth in the 19th century, Alfred Marshall argued this was due to the homogeneity of demand among newly wealthy Americans, which created the basic conditions that enabled mass production of manufactured goods (Marshall, 1919; Rosenberg, 1972)

household income grows in the long run. This includes the following stylized facts:

1. **Food dominates spending at very low income levels:** The expenditure of the world's poorest is concentrated on food. Spending on food represented from about 50 per cent to 70 per cent of their budgets (Banerjee and Duflo, 2007), while spending on many other goods was close to zero. Figure 1 below shows the distribution of household spending across goods for the lowest incomes segment (left hand side) and the highest income segment (right hand side) across all countries in the Global Consumption Dataset.[3] In the lowest income segment, food represents large share of total spending.

2. **Engel's Law:** As income rises, the budget share dedicated to food spending declines (Houthakker, 1957; Theil and Finke, 1983; Clements et al., 2006; Clements, 2019). Figure 1 shows that the budget share of food spending declines from 46% in the lowest income segment to 15% in the higher income segment.

3. **Rise in spending diversity:** Both cross country and cross sectional studies within countries have found evidence that rising affluence increases the number variety of goods consumed and stimulate consumers to distribute their spending more evenly across a wider range of goods and services (Theil, 1967; Theil and Finke, 1983; Jackson, 1984; Clements et al., 2006; Chai and Moneta, 2012; Kiedaisch et al., 2018; Li, 2021). The right hand side panel in Figure 1 shows that among the high income segment, spending is more evenly dispersed across all possible expenditure categories.

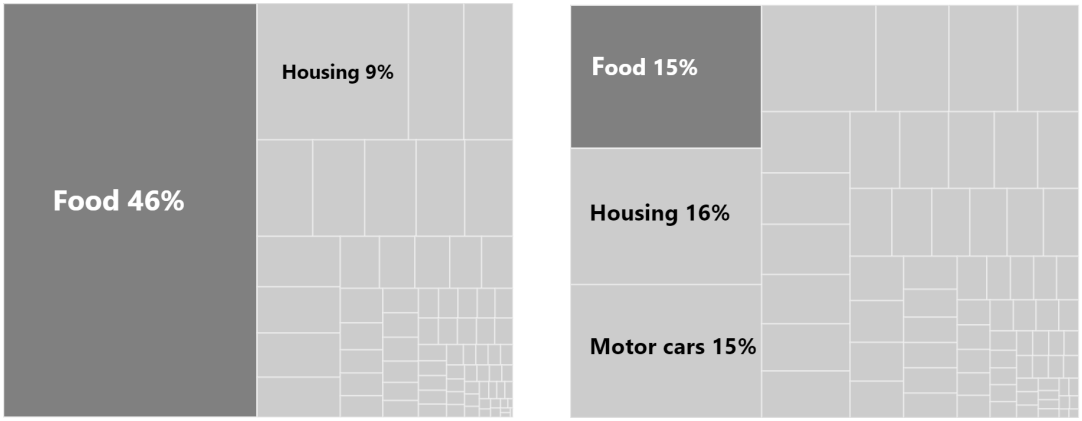
4. **Decline in homogeneity:** As income rises, the heterogeneity of spending patterns observed across a population of households tends to grow.[4] This is observed in the heteroscedasticity of Engel curves (Blundell and Stoker, 2005; Calvet and Comon, 2003; Christensen, 2014) and could be caused by rising income stimulating consumer tastes to diverge and specialize into different areas. For example, if one segment of the population of rich consumers concentrates their budget spending on recreational travel, while another segment concentrates their spending on consuming luxury food, the heterogeneity in consumption grows. Studies have used spending diversity measures to measure this growing divergence (Kiedaisch et al., 2018; Neiman and Vavra, 2023). As shown in Figure 2, the divergence in tastes lead to the Engel curve for spending diversity measured on the aggregated level to

[3] See Data Section for details.

[4] We define heterogeneity as variation in the household spending patterns that is not accounted for by observable variables and is driven by actual differences in tastes, rather than sampling and measurement error (Chai et al., 2015).

Figure 1: The diversity of global consumption patterns across rich and poor income segments

(a) *Lowest income segment* (b) *Higher income segment*



Note: The chart *on the left* reports the composition of spending among the lowest 50 per cent of the global income distribution across 90 countries. The chart *on the right* reports the composition of spending among the top 9 per cent richest consumers in the world.
Source: Global Consumption Dataset, 2011.

be positively correlated with income (top line in Figure 2), while the Engel curve for spending diversity measured at the disaggregrate (household) level tends to follow an inverted U-shape (bottom line in Figure 2).

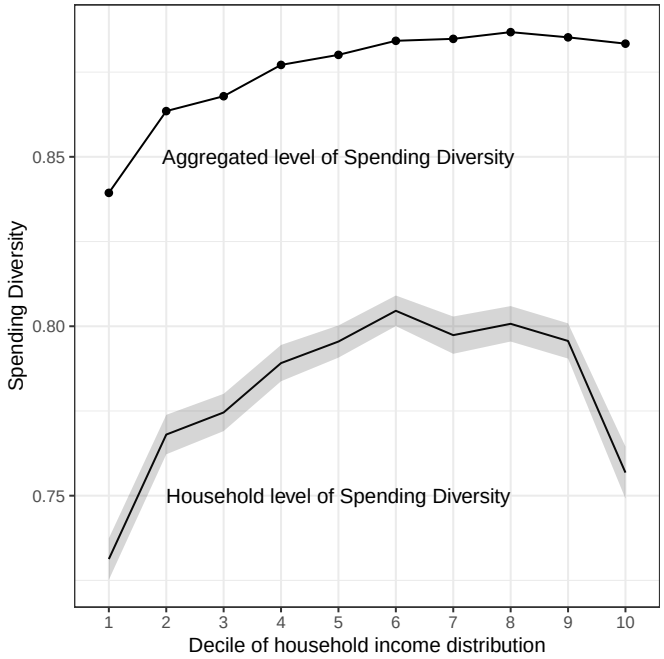
These stylized facts support the notion that there is a systematic variation in the broad categories of goods demanded at different income levels and consumers posses non-homothetic preferences. They challenge the notion that consumer preferences are similar across countries, ahistorical and exogenous in the sense that macroeconomic conditions (including GDP and income inequality) and culture do not influence consumer preferences (Day, 1985; Bowles, 1998). In fact, many empirical results have rejected the hypothesis that preferences are homogeneous across nations (Selvanathan and Selvanathan, 1993; Carruth et al., 1999; Rathnayaka et al., 2022).

3 Methodology

3.1 Spending Diversity

We measure the broad manner in which households diversify their spending across goods, across both household income levels and GDP. On the macro level, GDP is used as a proxy for the general level of affluence of the economy. On the micro level, household income is used as a measure of individual level affluence. Entropy measures are calculated to track

Figure 2: Engel Curve for Spending diversity calculated at the household and income decile level



Note: The grey area represents the 95% confidence interval around the estimated average values.
Source: The authors' calculations based on UK 2011 Living Cost and Food Survey (5,691 sample size).

the dispersion of household spending across different goods, which we dub the 'spending diversity' (Theil, 1967; Clements et al., 2006; Clements and Gao, 2012). Using the Gini-Simpson (GS) measure, spending diversity in country c is:

$$D^c = \sum_{i=1}^{N^c} s_i^c(1 - s_i^c) \tag{1}$$

where s_i is budget share of good i in total consumption expenditure and N^c is an indicator of the number of goods consumed in country c (calculated as indicated below).[5] If expenditure is spread perfectly evenly across all goods such that $s_1^c = s_2^c = ... = s_{N^c}^c$, this would correspond to maximum D^c spending diversity for a given N^c, $D_{max}^c(N^c)$. If expenditure is highly concentrated into certain goods, this corresponds to a low value for D^c, with a minimum value of 0.

Spending diversity can grow through two different channels. It can grow as the relative size of s_i becomes more even. We call this the intensive margin. Imagine a hypothetical economy where there exist only two types of goods, food and clothes, and a consumer spends their entire budget on food. In this situation, $D^c = 0$. If the consumer then

[5]Note that there exist a number of diversity measures, including the Herfindahl-Hirschman index. Chai et al. (2015) discuss the various measures and find that the choice of index has a negligible impact on results.

decides to spend equal shares on both goods, then D^c would rise to reach its maximum value. To make valid comparisons between the growth rates of spending diversity across food, goods and services, we need to take into account that number of varieties consumed within each of these sectors in each country is different. Therefore, in each country we normalize spending diversity to take into account the different in number of varieties available within food, goods and services. Formally, the intensive margin is defined as $\frac{D(N^c)}{D_{max}(N^c)}$, where $D(N^c)$ is empirically observed diversity given N^c - a number of varieties consumed, and $D_{max}(N^c)$ is maximal possible value of diversity given N^c.

The second channel through which spending diversity can also grow is via a change in the number of goods consumed. We label this the extensive margin and study it on the economy level using the indicator of the number of varieties. The indicator for a variety in a country is 1 if country's consumption expenditure exceeds 1% of maximum budget share observed across the world (Falkinger and Zweimüller, 1996). For example, in the case of cereals, the maximal budget share is 59% (observed in Ethiopia). In 172 of the 180 ICP countries the budget share of cereals exceeds 0.59%. For each good and each country the indicator of variety consumption is then:

$$N_i^c = \begin{cases} 1 & if \quad s_i^c > 0.01 \; max_c(s_i^c) \\ 0 & else \end{cases}$$

The measure of the extensive margin in an economy is then:

$$N^c = \sum_{i=1}^{107} N_i^c$$

107 represents the number expenditure categories available in the ICP data.[6]

3.2 Expenditure Hierarchies

To further account for the stylised facts listed above, many conjecture that consumption patterns evolve according to a hierarchy of wants (Engel, 1856; Maslow, 1954; Witt, 2001; Foellmi and Zweimüller, 2008; Bertola et al., 2014). According to this view, the sequence in which new goods enter the consumption basket and the manner in which consumers diversify their spending is not random. Rather, there is an order that reflects consumer's priorities or wants. Faced with scarce income, consumers prioritise their spending, where the highest priority good are attended to first, and lower priority goods enter the consumption basket only when demand for high priority goods has been satiated at a given

[6]The ICP data is used in this instance to capture a wider range of countries distributed across the global income distribution. In the appendix of the paper, we also decompose spending diversity into 'within' and 'between' expenditure group sources using Theil entropy measures.

consumption level Chai and Moneta (2012).

Following Foellmi and Zweimüller (2008), consider a situation where goods and services are ranked by an index *i*. Low i goods correspond to those that enter the consumption basket first, i.e. goods of the higher priority, such as food. We have utility function (assuming infinitely many goods and services):

$$u(c(i)) = \int_0^\infty \xi(i)v(c(i))di \tag{2}$$

where $v(c(i))$ is a subutility function for good i in quantity c and $\xi(i)$ is the hierarchy function that is monotonically decreasing in i ($\xi'(i) < 0$), so that low order goods get a higher weight than higher order goods.[7] It is important to note that this model does not assume that the income elasticity is constant. Rather, assuming that $-\frac{v'(c)}{v''(c)(c)}$ (a quantity which is proportional to the income elasticity) decreases in c, the income elasticity for a given good i falls when income rises Bertola et al. (2014, page 308). This matches stylized fact 1 above that the Engel curve for i can approach (in a nonlinear fashion) the saturation level of expenditure (Pasinetti, 1983; Metcalfe et al., 2006; Moneta and Chai, 2014), (Bertola et al., 2014). Moreover, this model predicts that the income elasticity is larger for higher order goods.

This suggest we are able to directly infer the hierarchy from the income elasticity of goods.[8] The existence of a hierarchy of goods helps to explain why the budget share dedicated to food dominates among the poorest (stylized fact 1 above). Food is a basic necessity which is critical for biological survival (Ravallion, 1998). The concept of hierarchy also helps explain why Engel's law and spending diversification takes place (stylized fact 2 and 3 above). Given sufficient income growth, spending on food satiates and consumers re-direct their spending to other (higher order) priorities (Witt, 2001; Metcalfe et al., 2006). As rising income propels consumers up the expenditure hierarchy, history and culture take a more prominent role in shaping the hierarchy (Cordes, 2009; Lades, 2013; Cordes, 2019). The concept of the expenditure hierarchy may also explain why the homogeneity of demand declines at high income levels (stylized fact 4 above). As economies grow and consumer spending shifts from necessities to high luxuries, it is likely that culture will stimulate differences in the expenditure hierarchy observed across counties.[9]

We examine the expenditure hierarchy on the national level by examining the order of income elasticities of different goods and services (e_i^c) across countries. This done for the

[7]The baseline utility $v(c(i))$ satisfies the usual assumption that $v' > 0$ and $v'' < 0$.

[8]Other studies have estimated the hierarchy by studying the acquisition order of goods (Paroush, 1965; Deutsch and Silber, 2008).

[9]It also likely that cultural diversity found within countries as discussed in Gören (2013) will also influence the heterogeneity of household spending patterns.

ten aggregate groups of expenditure (see next section).[10] The hierarchy of expenditure in a given country is constructed following the procedure below. If in a country c income elasticity of expenditure group j is higher than of group i, $e_j^c > e_i^c$, then expenditure group j ranks higher than group i in the expenditure hierarchy in country c, $g_j \succ g_i$. In other words, for each country c, income elasticities impose a total order on the expenditure groups, i.e. $\langle g_1, g_2, \ldots \rangle$. We denote with H^c, the function which maps a set of expenditure elasticities $e_1^c, e_2^c, \ldots$ on a total order $\langle g_1, g_2, \ldots \rangle$.

This approach enables us to study both the relative rank of a good across the expenditure hierarchies of different countries, as well as cross country differences in expenditure hierarchies. Concerning the former, comparing the relative rank of good in the expenditure hierarchy is quite different from comparing the income elasticities of goods across countries. For example, even though there may be strong cross country differences in the value of income elasticities for certain goods, the extent to which the good is a luxury relative to other goods may be stable. For example, even though e_i^c for automobiles may fluctuate across countries (see Table 4), the rank of automobiles as the premier luxury good in the expenditure hierarchy of countries may be stable. We define stability as the condition in which the average cross-countries elasticity of expenditure group j is higher than of group i, $\overline{e_j} > \overline{e_i}$, (i.e., $j < i$, and in matrix terms it is lower left matrix triangle) then $e_j^c \geq e_i^c$ in the majority of countries.

Cross country differences in expenditure hierarchies are then calculated. For any pair of countries (c_i, c_j) we calculate the Euclidean distance $d(g_i, g_j)$. This is a measure of dissimilarity: the greater is the distance, the more different are expenditure hierarchies of c_i and c_j. Figure 14 in the Appendix reports the distribution of the distance between expenditure hierarchies. There is a total of $N = 2830$ pairwise comparisons of expenditure hierarchies.[11] We then employ a gravity model (Eaton and Kortum, 2002; Anderson and Van Wincoop, 2003) to regress the observed distance between expenditure hierarchies, $d(g_i, g_j)$ on the difference in GDP and proxies for similarities in national institutions and culture. Note that this model includes countries fixed effects to isolate the specific effects of variables of interest on distance between expenditure hierarchies, while holding constant the country-specific factors. (Anderson and Van Wincoop, 2003).

Concerning the influence of GDP on expenditure hierarchies, a premise of the famous Linder Hypothesis is that countries of similar income have similar consumption patterns and consume goods of similar quality Linder (1961); Hallak (2006).[12] We therefore in-

[10] Appendix provides results using 107 consumption categories showing that our conclusions are robust to disaggregation.

[11] The largest distances are observed between the expenditure hierarchies of rich and poor countries (e.g. distance between Romania and Togo or Latvia and Rwanda). An example of a country pair with relatively low distance between expenditure hierarchies is Malawi and Uganda.

[12] The Linder Hypothesis states that two countries with similar preference structures will engage in more

clude differences in income levels measured by logarithm of GDP per capita ($|ln(y_i) - ln(y_j)|$). This is expected to be negatively correlated to $d(g_i, g_j)$.

We also examine how cross country differences in income inequality level may account for $d(g_i, g_j)$. Income inequality can negatively impact demand homogeneity. Income inequality tends to rise as economies grow in a way that the skewness of the distribution increases: a small segment of individuals become (very) wealthy, while the income of others remains relatively stable (Chotikapanich et al., 1998). Given hierarchical preferences, this tends to lead to wider spread of the population of consumers across the spending hierarchy. Marginal increases in spending by the population of consumers would therefore be distributed across a wide range of necessities and luxuries. On the other hand, If the entire population of consumers possess the same income level, increases in spending would be more focused on a narrower set of goods and services at the relevant point of the spending hierarchy. As such, income inequality and limit the realization of economies of scale which requires market depth (Marshall, 1920; Murphy et al., 1989).[13] On the other hand, high levels of income inequality generate low volumes of demand can limit the degree to which firms specialize in production (Bresnahan and Gambardella, 1998). To date, only a few studies have considered the theoretical impact of income inequality on the composition of household demand (Ibragimov et al., 2017). In the literature on visible spending, evidence has also been found that rising income inequality can stimulate households to spend more on visible goods such as cars, jewellery and clothes (Charles et al., 2009; Heffetz, 2011; Brown et al., 2011; Chai et al., 2019) and less on necessities (Colson-Sihra and Bellet, 2022).

To investigate path dependence, we consider how trade and social institutions may account for $d(c_i, c_j)$. Previous studies suggest that a shared colonial history and the movement of trade across countries can be used as proxies for institutional similarities (Acemoglu et al., 2005, 2001). We therefore employ the distance between two countries as proxy for the former, which is calculated using the bilateral distances between the biggest cities of those two countries, with those distances being weighted by the share of the city in the overall country's population (Mayer and Zignago, 2011). For colonizer relationships, there are 16 countries in the dataset that were former colonies of France, and 19 countries were former colonies of the UK. We also include religion, language and

trade.

[13]This idea was extended by Rosenstein-Rodan (1943) and Murphy et al. (1989) in the context of understanding the conditions for economic industrialisation and the takeoff of the manufacturing sector. An important ingredient for the emergence of a manufacturing sector is the presence of mass markets, i.e. large, geographically concentrated population with homogeneous tastes help create large markets for manufactured goods, such as bicycles and home electronics (Rosenstein-Rodan, 1943; Rosenberg, 1972; Matsuyama, 2002). Many empirical studies have found evidences that the most important source of growth in sectoral output is the size of the market (e.g. Chenery et al., 1975, 1986; Haraguchi and Rezonja, 2011).

a proxy to capture the recent (post 1945) fragmentation of countries.[14]

We also consider the cultural roots of expenditure hierarchies. A popular approach to studying the impact of cultural values is Hofstede's six dimensional model of national culture (Hofstede et al., 2010; De Mooij and Hofstede, 2011). Previous research has demonstrated that cultural dimensions play a role in explaining consumer behavior, bargaining behavior and economic activity (Petrakis, 2014; De Mooij and Hofstede, 2011; Beugelsdijk and Welzel, 2018). We examine the extent to which cultural differences across countries may account for differences in their expenditure hierarchies. We test whether more similar cultural norms between countries tends to lower $d(c_i, c_j)$. These dimensions include:

1. The uncertainty avoidance index measures the extent to which a society feels threatened by uncertainty and tries to avoid these situations by providing greater job stability and establishing more formal institutions. This may result in higher demand for health, and professional services, such as insurance services, as well as lower demand for highly complex and innovative goods, such as electronic goods.

2. The long-term orientation index captures how orientated cultures are towards planning for the future and their orientation towards improving intergenerational welfare. Societies that score high in this dimension have been associated with a higher tendency to invest in large scale infrastructure projects, such as construction of broadband internet infrastructure.

3. The power distance index captures the extent to which less powerful members of a society accept and expect that power is distributed unequally. De Mooij and Hofstede (2011) notes the link between this dimension and status signalling behavior, since in power cultures, one's social status must be visible so that others can show proper respect.

4. The individualism index captures the extent to which people possess a individualist mindset and are self reliant or are more collectivist in their thinking and approach to care of themselves and their families. Societies that score high in this dimension may have lower demand for social welfare support and have higher demand for private housing and private education.

5. The person-orientation index captures the extent to which the dominant values in society are 'masculine' i.e. assertive, ego-orientated and materialistic, with a lower emphasis on the welfare for others.

[14] A number of countries fragmented in recent history due to civil unrest or other reasons. Examples include Bangladesh becoming independent from Pakistan in 1972, Namibia becoming independent from South Africa in 1990, and the dissolution of the USSR in 1991.

6. The indulgence index captures attitudes toward entertainment and pleasure-seeking. This may result in higher demand for cultural goods, recreational services and transport services associated with recreational travel.

3.3 Niche consumption

To further study the decline of homogeneity of spending patterns and the rise of niche consumption patterns using household level data (see stylized fact 4), we quantify demand heterogeneity by measuring differences in the shape of the Engel curves for spending diversity at different levels of aggregation Neiman and Vavra (2023); Kiedaisch et al. (2018).[15] Equation 1 is used to measure the diversity of spending of representative households on a more aggregate level using household level expenditure data from various countries sampled across the developed and developing world (Malawi, Sri Lanka, Bangladesh, South Africa and the UK). Aggregating household level spending and income data into deciles level, the diversity of spending for each decile is calculated. We denote as D_a the diversity of spending that is observed on the aggregate level of a decile, and as D_{hh} - the diversity of spending that is observed on the household level hh belonging to a decile:

$$D_a - \overline{D_{hh}} \quad where \quad hh \in a$$

It is worth noting that the divergence in observed spending diversity patterns on the household level and the aggregate level is an emergent property.[16] This emergent property suggests that there is an important second dimension in which rising income has an endogenous impact on consumer preferences. Not only does rising income impact the composition of demand (non-homothetic preferences), it also impacts the homogeneity of demand, i.e. how similar or different spending patterns are across a population of consumers Houthakker (1992).[17] Whereas among low i goods at the base of the hierarchy, consumers preferences evolve in a relatively homogeneous manner, the direction in which each spending patterns evolve among high i goods is more heterogeneous as the

[15] Neiman and Vavra (2023) examine the differences between individual and aggregate level spending patterns using scanner data on US non-service retail spending over time from 2004 - 2016. They find that individual spending diversity fell over time while spending diversity on the aggregate level rose, and that these movements can be explained by households increasingly concentrated their spending on fewer goods and increasingly purchased different products from each other.

[16] This emergent property indicates that results on spending diversity at the highly aggregated level should be treated with some caution when considering spending patterns of affluent consumers in developed countries. Studying emergent properties in aggregated data and its implication for representative agent models was a focus of Richard Day's earlier work (Day, 1963).

[17] Houthakker (1992) went on to argue that the heterogeneity of demand can be thought of as an indicator of economic freedom.

expenditure hierarchy for each consumer becomes more unique. In this sense, income rises induce the emergence of differences expenditure hierarchies across the population of consumers.

4 Data

One of our main data sources is the World Bank's Global Consumption Database (GCD). The GCD provides 2011 data that covers 90 countries that are predominantly from the Least Developed and Developing world (78% of the sample). The GCD covers 107 expenditure categories, 32 of which are food and beverages, 41 are services, and the remaining 34 are goods (See Table 4).[18] These 107 expenditure categories are also aggregated into ten larger groups: food, clothing, health, electricity, passenger transport, housing, means of communication, education, recreation, personal transport. These aggregate categories represent goods and services that are functionally similar. For example, automobiles and motorcycles both serve as means of personal transport. The GCD also provides data on participation rates: the percentage of households out of total number of households surveyed in each income segment who consume a particular good. We us this to analyze the market depth of a good in a country.

The GCD provides spending data and participation rates on the sub-national level for four income segments within each country. The segments are uniform across countries and are based on global income distribution, which ranks the global population by income per capita. The *lowest income segment* corresponds to the bottom half of the global distribution (below US$\$1084.05$ per capita total annual expenditure); the *low income segment* to the 51th-75th percentiles (US$\$1084.05$ to US$\$3080.6$); the *middle income segment* to the 76th to 90th percentiles (US$\$3080.6$ to US$\$8405.95$); and the *high income segment* for the 91st percentile and above (greater than US$\$8405.95$). For each income segment within each country, the GCD provides annualized estimates of the average household per person spending on an expenditure category.[19] The data is treated to take into account imputed rents, durable goods, outliers and purchasing power parity (PPP) conversion factors.[20] Because the income segments are homogeneous across all countries in the data, it is possible to compare spending by income segment across different categories and countries.

[18] Due to measurement issues, the following 5 goods and services are excluded: gambling, tobacco, narcotics, prostitution, rent.

[19] This is the estimated annualized total household expenditure on a good divided by the size of the household. It is not the total expenditure by the segment divided by the total number of household in each segment.

[20] For more details, see `http://datatopics.worldbank.org/consumption/detail`

A basic view of how household expenditure changes with income is provided by examining the income elasticity of goods and their participation rates. We begin on the sub-national level by first calculating the budget share income elasticity of a good i observed across the four income segments b within each country c, $e_i^{c,b}$.[21] The country level income elasticity e_i^c is then calculated as the weighted average of $e_i^{c,b}$, where the population share of b within each country are used as weights. This helps to ensure that e_i^c is reflective of the national income distribution. Among Least Developed Countries (LDC) that have a large share of the population in the lowest income segment, e_i^c will predominantly reflect $e_i^{c,b}$ observed among the poorest part of national income distribution. Similarly, $p_i^{c,b}$ is the income elasticity of the participation rate at the income segment level and p_i^c is the country level weighted average of $p_i^{c,b}$.

The top panel of Figure 3 shows the budget share Engel curves for shoes and recreational & sporting services in Brazil as an example. It shows that the budget share for shoes declines with income, while it rises for recreational services. The e_i^c for shoes is -0.11 which is a weighted average of the three $e_i^{c,b}$ (values are reported in the note below the Figure). In the case of recreational services, while the slope of the Engel curve is positive and steep, the e_i^c is 0.89. This relatively low value is due to Brazil's population being located at the bottom two income segments. The $e_i^{c,b}$ for these segments (0.26) receives a relatively large weighting in e_i^c. In a similar fashion, we calculate the income elasticity of participation rates (see bottom panel of Figure3). A relatively large percent of the Brazil population consumes shoes ($p_i^c = 0.06$). The participation rate of recreational services is low among the poor, but rises quickly among richer b. This is reflected in $p_i^c = 1.29$ for recreational services. In general, low values for p_i^c indicate that a good is widely consumed across all b, while high values indicate that a good is only among richer income segments in the country.

Averaging e_i^c and p_i^c across all countries, Table 4 in the Appendix reports the estimated global income elasticities of expenditure budget shares (e_i) and participation rates (p_i). These are ranked by their estimated global income elasticity. It shows that starchy foods (cereal and potatoes) possess the lowest e_i^c among all goods, while motor cars have the highest e_i^c. The estimated global income elasticities are consistent with existing empirical studies that show that food categories posses relatively low e_i, while service cate-

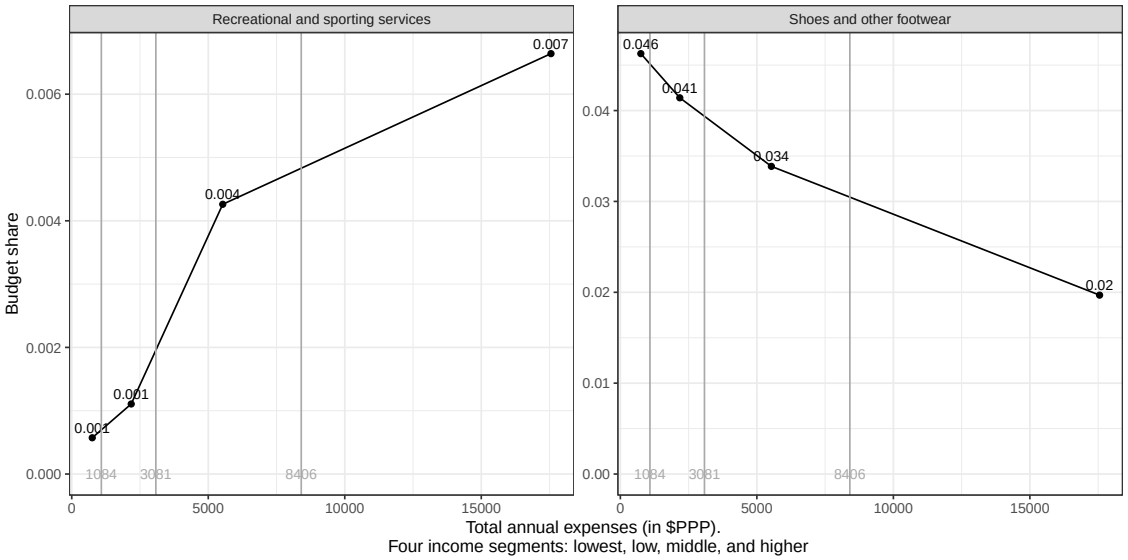
[21] This is the percent change in budget share of i, s_i, divided by the percent change in total expenditure, E. For example, $e_i^{b=low}$ and $e_i^{b=high}$ will be:

$$e_i^{b=low} = \frac{\frac{s_i^{b=low} - s_i^{b=lowest}}{s_i^{b=lowest}}}{\frac{E_i^{b=low} - E_i^{b=lowest}}{E_i^{b=lowest}}} \qquad e_i^{b=high} = \frac{\frac{s_i^{b=high} - s_i^{b=middle}}{s_i^{b=middle}}}{\frac{E_i^{b=high} - E_i^{b=middle}}{E_i^{b=middle}}}$$

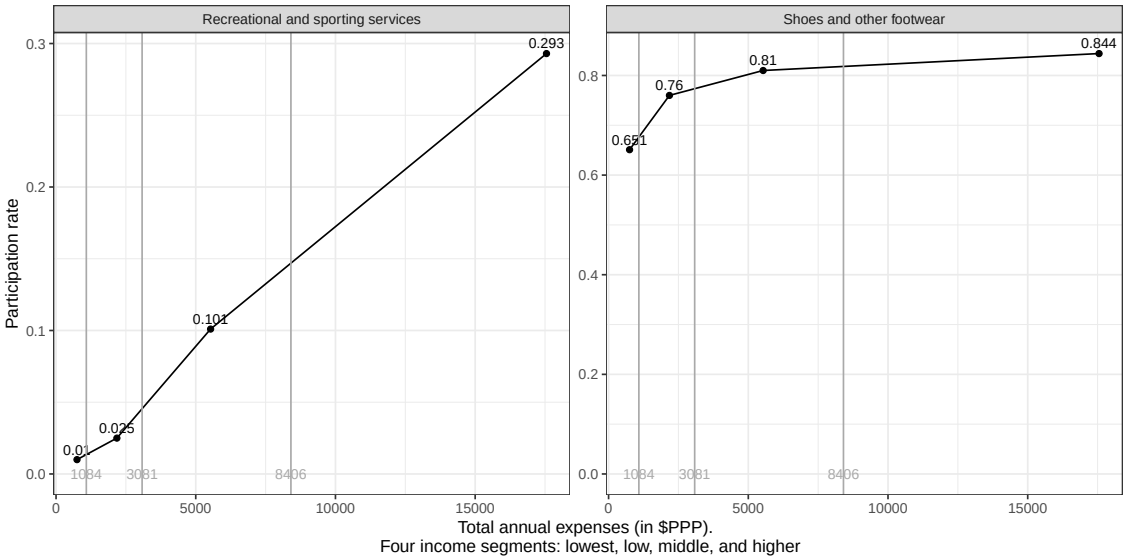
gories possess relatively high e_i (Lebergott, 2014; Clements et al., 2006; Chai and Moneta, 2012). The Table shows that p_i are relatively low for low e_i, similar to the case of shoes in Brazil. This is because a large share of the lowest income segment consumes basic necessities that possess a low e_i. p_i are large among luxuries e_i, suggesting that these are goods entering the consumption basket among higher income segments. This confirms the basic tendency for the basket of goods consumed to expand as household grow rich and begin to consume luxury goods.

Figure 3: Budget share Engel curves for recreational service and shoes in Brazil

(a) Budget shares



(b) Participation rates



Note: The e_i^c for recreational services in Brazil is $e_i^c = 0.89$, which is the weighted average of the three income elasticities calculated in the four segments: $0.49, 1.85, 0.26$. The income elasticity of the participation rate for recreational services in Brazil is $p_i^c = 1.29$, which is the weighted average of $0.78, 1.97, 0.87$. The e_i^c for Shoes is $e_i^c = -0.11$, which is the weighted average of $-0.055, -0.12, -0.19$. The income elasticity of the participation rate for Shoes is $p_i^c = 0.06$, which is the weighted average of $0.09, 0.04, 0.02$ The vertical gray lines indicate b. The points report the average annualized per capita budget share household expenditure for each b.

To calculate spending diversity for a larger set of countries, we also employ data sourced from the World Bank 2011 International Comparison Program (ICP). It covers 180 countries and contains country level expenditure on the same 107 expenditure categories used in the GCD.[22] The sample of countries in the ICP contains a larger number of developed countries, compared to the GCD that is more focused on developing countries. The average log GDP per capita in the GCD sample is 7.7, while it is 9.7 for countries present in ICP and missing in GCD. To show robustness of our results on more recent data, we also employ last available ICP 2017.

Data for Hofstede's cultural dimensions is available for a large set of countries of the least developed and developing world: four of the dimensions are available for 37 countries and two are available for 54 countries of our GCD.[23] The values reflecting cultural differences have been grouped into the following six dimensions listed in the previous section.

Country level statistics on GDP per capita, inequality, urbanization rates, size and population was sourced from the World Bank. The CEPII gravity dataset was used to source data on geographical distance between countries, colony-colonizer relationships (Mayer et al., 2014).

For the analysis of niche markets (section 5.3), we use household level data sources from five countries: UK, Sri Lanka, Bangladesh, Malawi and South Africa (see Table 1). The data are sourced from national household surveys, which collect information for a group of households representative of the entire country typically through a combinations of surveys and diaries. The sample size is listed in 1. These countries were chosen in order to compare household level spending patterns from different parts of the global income distribution as the UK is a developed economy (GDP per capita around US$42,000 in 2011 and a Gini coefficient of 33%). Malawi is among LDC (GDP per capita around US$500 and Gini coefficient of 45%). South Africa represents one of the affluent developing economies and the most unequal ones (GDP per capita around US$8,000 and Gini coefficient of 63%). In terms of four income segments used in the GCD, more than 90% of UK population belongs to the high income segment, while in Malawi, on the opposite, more than 90% of population belongs to the lowest income segment, and in South Africa 40% belong to the lowest income segment and 21% to the high income segment.

[22] We do not report in the Tables on 5 goods: Games of chance, Tobacco, Narcotics, Prostitution, Rent

[23] The six-dimension data matrix available at https://geerthofstede.com/research-and-vsm/dimension-data-matrix/.

Table 1: Household level data from selected countries.

	UK	South Africa	Malawi	Sri Lanka	Bangladesh
Survey	Living Cost and Food Survey	Income and Expenditure Survey	Third Integrated Household Survey	Household Income and Expenditure Survey	Household Expenditure Survey
Sample size	5,691	25,328	12,271	18,043	6,503
# Categories	12	752	35	94	68
Year	2011	2013	2011	2006	2011

5 Results

5.1 Spending Diversity

We begin by studying trends in spending diversity across economies. Figure 4 shows the Engel Curve for spending diversity. There is an overall positive correlation between log GDP per capita and spending diversity. Spending diversity appears to grow quickly as countries grow rich at low levels of GDP. Among relatively poor countries in which a large share of the population is located in the lowest income segment, household expenditure remains relatively concentrated on food (e.g. Burundi and Ethiopia). In countries that possess a relatively larger middle class population (e.g. Kenya, Zambia and Vietnam) further increases in log per GDP per capita tend to deliver relatively smaller rises in total spending diversity.

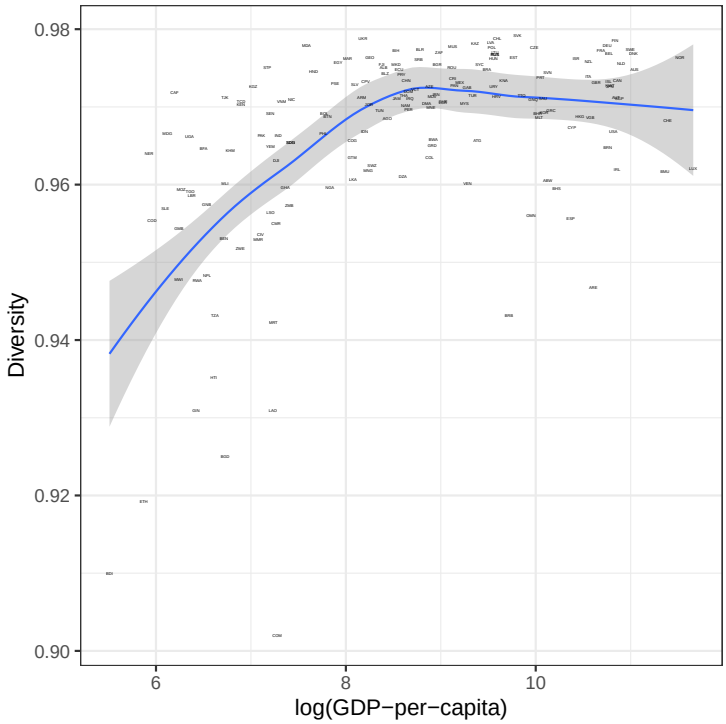
There is some evidence that the relationship between spending diversity and GDP is nonlinear at higher levels of GDP. While the curve appears to flatten out at high income levels, this should be treated with caution as a handful of relatively affluent countries with unusually low levels of spending diversity impact this result. These countries include Barbados (BRB), Oman (OMN), Emirates (ARE) and Spain (ESP).[24] In the case of Barbados and Spain, the average budget share dedicated to catering services and accommodation services (including restaurants, cafes etc) is above 20%, which is relatively high.

This increase in spending diversity reflects fundamental shifts in the composition of demand. The bottom panel of Figure 5 indicates that spending diversity grows as income rises via a decline in the budget share of spending dedicated to food (Engel's law) and an increase in the budget share dedicated to both goods and services. This is consistent with the observation that expenditure on services is rapidly rising among developed economies (Buera and Kaboski, 2012; Boppart, 2014). This indicates that rising GDP has a tendency to stimulate a decline in the income elasticity of food and a rise in the income elasticity of services.

Figure 5 shows how changes in the extensive margin (N^c) and intensive margin growth

[24]Spending on motor cars in Oman and Emirates appears to be unusually high. In both countries, the average per capita household budget share dedicated to motor cars is more than 14%, while the cross-countries average in the ICP dataset is 3%.

Figure 4: Spending Diversity and GDP per capita



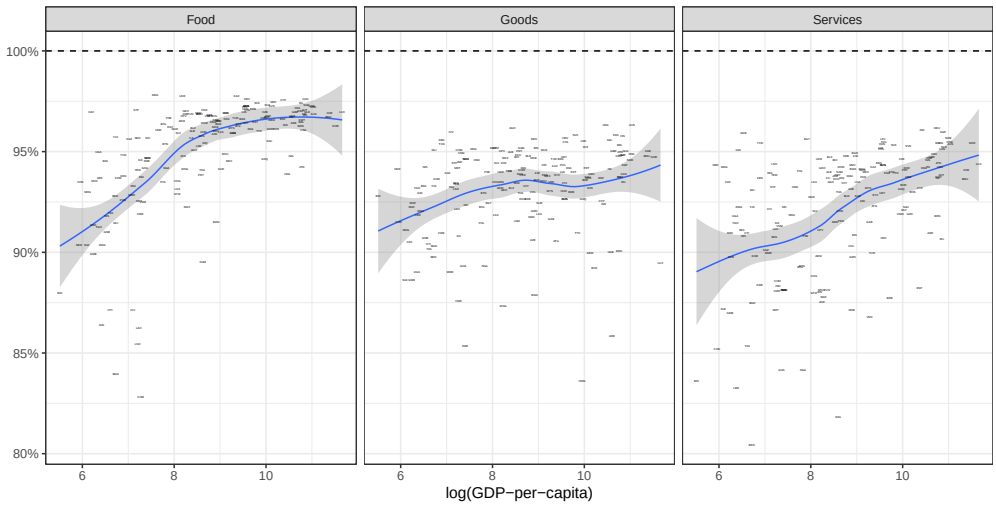
Note: The grey area represents the 95% confidence interval around the kernel regression. Figure 11 in the appendix confirms A similar shape using ICP 2017 data.

contribute to spending diversity. While both tend to increase with GDP, it is worth noting that among LDCs, spending diversity mainly grows via an increase in the intensive margin of food expenditure. In other words, rising income does not lead to major increases in the varieties of goods consumed (N^c). Rather, it leads households to spread their income more evenly across different types of goods and services that are already part of the consumption basket. In particular, Figure 5 (top left panel) shows that the intensive margin of food is very responsive to rising levels of income. This is consistent with studies of variety demand in food (Clements and Si, 2018) and suggests that even though the overall budget share of food declines as consumers become affluent, the budget share related to luxury foods, such as wine, cheese, honey (see their income elasticities in Table 4) increases relative to other food categories. Low income households still do consume small amounts of these goods (Banerjee and Duflo, 2007), which is why diversity grows due to the an expansion in the intensive margin.

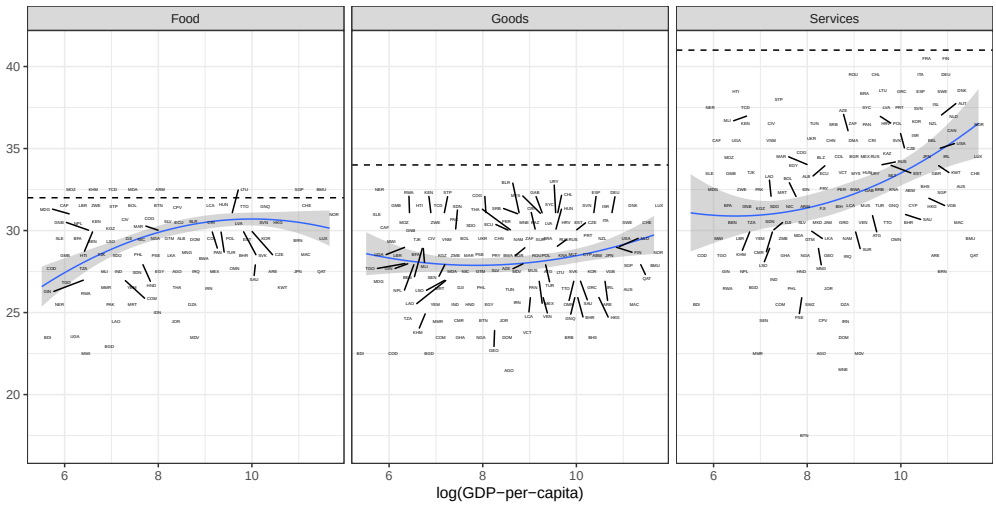
The middle panel of Figure 5 compares variety demand, N^c, across food, goods and services. The dotted line represents the maximum number of varieties in each category (32 in food, 34 in goods, 41 in services). Regression results in Table 5 in the appendix confirm that income is positively and significantly correlated with the extensive margin.

Figure 5: The intensive and extensive margin for food, good and services.

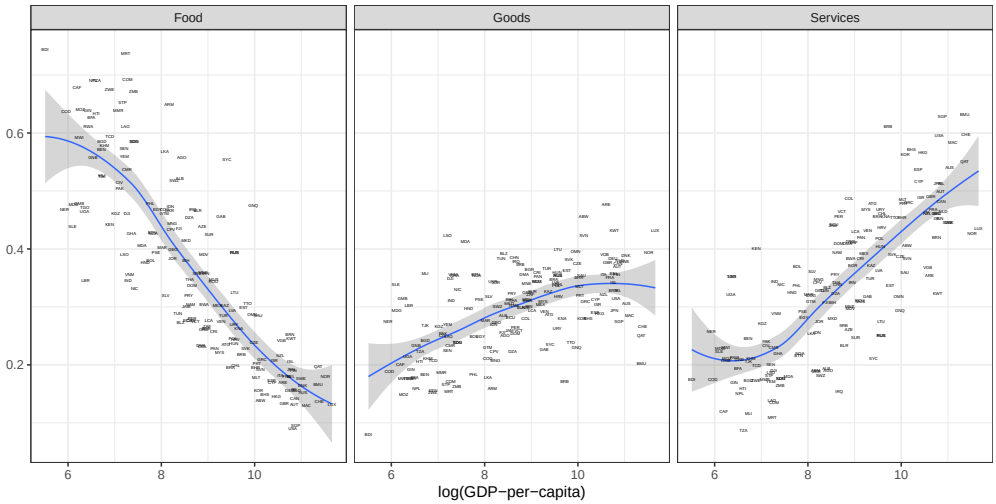
(a) Intensive margin for food, goods and services



(b) N^c (Extensive margin) for food, goods and services



(c) Budget shares for food, goods and services



Note: The source is ICP 2011 data. The grey area represents the 95% confidence interval around the kernel regression. The dotted line in the middle panel for N^c is $D_{max}(N^c)$. The Figure 12 in the appendix confirms the result for ICP 2017 data

The parameter estimate of 2.3 (regression 1) suggests that a 1% increase in log GDP per capita is associated with an increase in N^c by 2.3 varieties consumed.[25] The N^c for services does appear to be relatively more responsive to income increases (see regression 4 in Table 5). These results suggest that many types of services are not consumed at low levels of GDP per capita, but only enter the basket at higher levels of GDP per capita. One reason for this trend is that some services rely on the provision of public infrastructure, which is usually positively correlated with GDP.[26] For example, the consumption of telephone services and public transport services (trains and buses) depends on the state provision of telecommunication and road infrastructure. Culture is another factor important drives the extensive margin grows in services. For example, one prominent type of service that affluent consumer diversify into is cultural services. This includes subscriptions to cable, satellite and other program distribution services, visits to cinemas, theaters, museums, zoos, libraries. Several studies suggest that cultural values influence the composition of spending, especially in more affluent societies (Veblen, 1899; Douglas and Isherwood, 1979; Bianchi, 2002; Yang and Wang, 2023). In the next section, we further examine how cultural values influence expenditure hierarchies.

5.2 Expenditure Hierarchies

We now turn to examine similarities and differences in the expenditure hierarchies across countries. Considering the expenditure hierarchy in each country, each cell in Figure 6 reports the frequency that the income elasticity of the good estimated at the country level (e_i^c) listed in the column is ranked above or equal to income elasticity of the good listed in the row (e_j^c). Goods are ordered according to their global income elasticity, $\overline{e}$. A matrix element $\{i, j\}$ is the percentage of cases across all countries when the income elasticity of good j is higher than (or equal to) good i, $e_j^c \geq e_i^c$.[27] The matrix is symmetric and the sum of elements $\{i, j\}$ and $\{j, i\}$ is 1.[28] For example, across all countries in our sample, the income elasticity of food (bottom row) is lower than the income elasticity of personal transport (first column). The matrix shows that in 90% of countries, the income elasticity value of electricity (column 7) is higher than of food. Consequently, electricity ranks above food in the expenditure hierarchy in 90% of the countries.

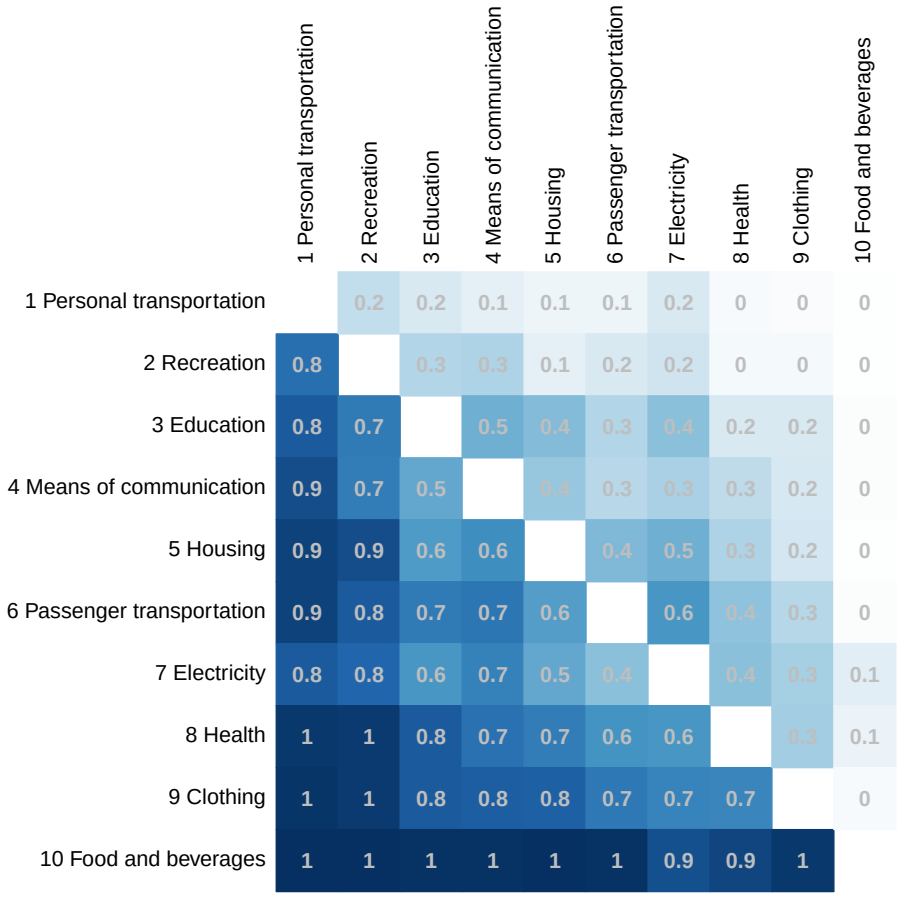
[25] However, the magnitude of this effect varies significantly across food, good and services. The extensive margin of food and goods appear to be relatively less responsive to rising income as a large number of varieties of both food and goods are already consumed at low levels of log GDP per capita (see regressions 2 and 3 in Table 5). For goods, some of the types of goods that account for an increase in N^c include: furniture, recreational equipment and pet expenditure. Regression results in Table 6 confirm the results using 2017 ICP dataset.

[26] A pattern which is usually referred to as Wagner's law (Lamartina and Zaghini, 2011).

[27] We drop instances where either country has missing data on consumption of either good j or i.

[28] The colour of the matrix elements reflect the magnitude of reported frequency.

Figure 6: Similarities in Expenditure hierarchies across countries



Note: Rows/columns of the matrix represent expenditure groups in the increasing order of average cross-countries elasticity: for example, row/column 1 is *personal transportation* and row/column 10 is *food*. It implies that $\overline{e_1} > \overline{e_{10}}$. A matrix element $\{i, j\}$ is the percentage of cases across all countries when expenditure group i and j are reported and expenditure group j has elasticity higher than (or equal to) group i, $e_j^c \geq e_i^c$. *Source:* GCD data.

The results indicate that there exists a remarkable level of stability in the expenditure hierarchies observed across countries. The values of cells located around the perimeter of the matrix are close to either boundary value of zero (top right triangle) or one (bottom right). On the other hand, the values of cells located closer to the middle of the matrix tend to be closer to 0.5. This result shows that there is relative homogeneity in the base of the expenditure hierarchy across countries as food consistently possesses lower income elasticity, relative to personal transport. This support the notion that certain basic wants are universally shared across consumers (Maslow, 1954; Witt, 2001; Chai and Moneta, 2012).[29]

[29]In terms of robustness, we report in the appendix similar results using 107 expenditure categories (see Figure 13).

The lower values around the centre of the matrix indicate that cross-country differences in expenditure hierarchies are relatively larger among luxuries, high i goods. For example, in the case of education (row 3) and housing (column 5), the income elasticity of housing is greater than education in 40% of countries. This variation is likely to reflect institutional differences in the public provision of physical infrastructure and social services. For example, in countries where the public provision of health services is high, it is likely that this will crowd out private expenditure and the income elasticity for health services will be relatively lower. In countries where government provision of health care service is low, it is likely that affluent consumers will spend more on these services. The overall results suggest that cross country differences in consumption patterns grow as economies develop and consumer spending moves to the high i order of goods.[30]

Further evidence of cross-country spending patterns becoming more unique among higher order i goods can also be found by examining the cross-country standard deviation of global income elasticities (as reported in Table 4). Figure 7 ranks goods by e_i^c (left hand figure) and p_i^c (right hand figure) on the horizontal axis. Both Figures depict heteroscedasticity in the sense that the standard deviation of global income elasticities is positively correlated with their rank in e_i^c and p_i^c. Among necessities (such as potatoes), the cross-country variation in e_i^c is close to zero. Among luxuries like motor cycles, the standard deviation e_i^c is much larger. In Section 5.3 we further investigate what drives the emergence of this heterogeneity using household level for a subset of countries.

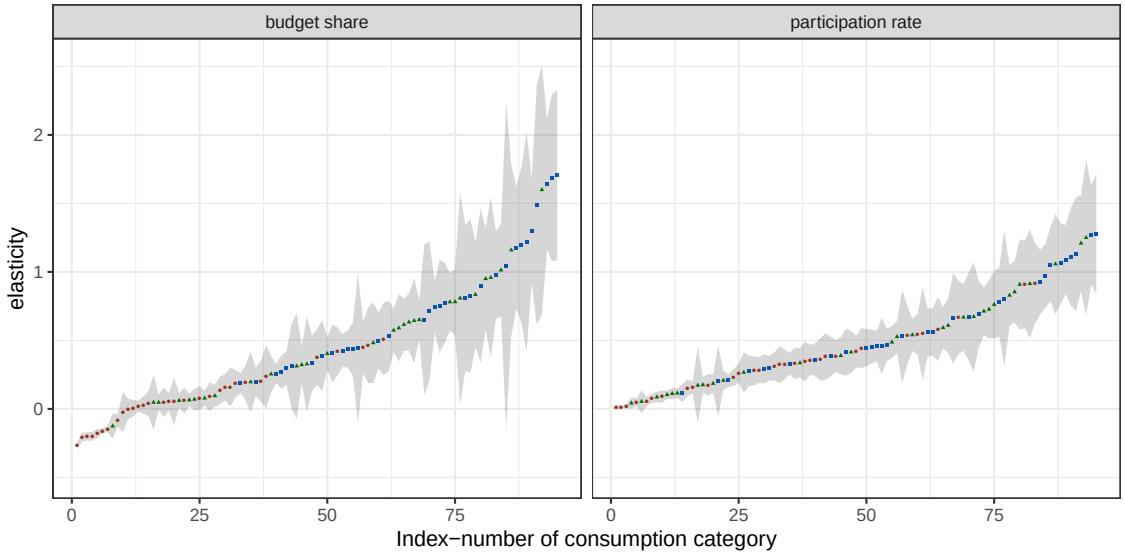
Table 2 reports the results from the analysis of pairwise distances in expenditure hierarchies between countries, $d(c_i, c_j)$. Column (1) represents the main result of the study, while columns (2) to (8) introduce cultural variables into the analysis for a smaller subsample of countries. The number of observations decline from $2,830$ in (1) to 433 in (2) due to limited data on cultural values. In terms of how macroeconomic conditions impact expenditure hierarchies, the results show that the GDP difference between the two countries is positively correlated with $d(c_i, c_j)$. This provides some confirmation that countries with similar income levels have similar preferences.[31] In addition to GDP, differences in income inequality is found to be positively correlated with $d(c_i, c_j)$, as seen in column (1).[32] Controlling for the influence of GDP on expenditure hierarchies, countries with

[30]In terms of how stable expenditure hierarchies are over time, Figure 15 examines the stability of expenditure hierarchies over time of Sri Lanka. Over a period of 6 years, the vast majority of e_i^c exhibited relatively small changes in value. An exception included: goods that feature major technological innovations, such as telephones as well as visible goods such as jewellery. See Moneta and Chai (2014) for a detailed discussion.

[31]This is an underlying premise of the Linder Hypothesis. Here it is worth noting that the standard approach to studying the Linder Hypothesis is to proxy differences in demand structure between countries using countries' differences in GDP (Hallak, 2006). Our results provide a much richer view of demand structure that show the similarities between expenditure hierarchy of countries is not only related to differences in GDP, but other observable characteristics, such as the income distribution.

[32]While inequality if not significant in (2) to (6) and (8), it should be noted that the number of obser-

Figure 7: Global Income elasticities and their standard deviation, GCD data



Note: The shaded area represents the standard deviation of the global income elasticity. Goods are ranked on the horizontal axis by the value of e_i^c (values are indicated in Appendix Table 4). The figure omits the top four highest ranked goods: Cars, Domestic services, Package holidays, Air travel to improve overall visibility.

similar levels of income inequality tend to possess relatively similar expenditure hierarchies. In other words, countries with high levels of income inequality tend to possess similar expenditure hierarchies and, at the same time, countries with less income inequality tends to possess more similar expenditure hierarchies. There could be multiple ways how income inequality influences the composition of expenditure patterns, and one of them is due to income inequality stimulating heterogeneous spending patterns that limits economies of scale. This will be explored further in the next section 5.4.[33]

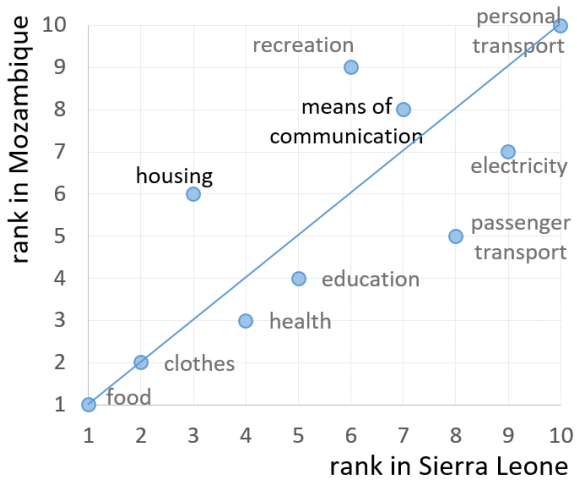
To illustrate the impact of income inequality on expenditure hierarchies, Figure 8 compares the expenditure hierarchies for two developing countries with similar levels of GDP and relatively different levels of income inequality. Mozambique has one of the worlds highest levels of income inequality, with a Gini coefficient of 54 (Y axis) and Sierra Leone has a relatively lower level of income inequality with a Gini coefficient of 34 (X axis). If a category appears on the 45 degree line, it means that this expenditure category has the same rank in both countries. For example, both food and clothes are ranked lowest in the hierarchies of both countries. Among luxuries, the rankings begin

vations significantly decline from $2,830$ to below $1,000$. Income inequality is significant in (7) where the number of observations is substantially higher.

[33]Note that the interaction terms between differences in income inequality and GDP is negative. This implies that if there are large differences in GDP between countries, the influence of income inequality on $d(c_i, c_j)$ is smaller.

to differ, although personal transport (which includes cars) possess the highest income elasticity in both countries. Interestingly, in the country with higher income inequality (Mozambique), recreation (which includes cultural goods such as theatre and movie visits), means of communication (which includes mobile phones) and housing are ranked relatively higher in the expenditure hierarchy relative to their position in the expenditure hierarchy in the country with lower income inequality (Sierra Leone). This illustrative example highlights the potential role that culture and visible spending play in shaping expenditure hierarchies. This is consistent with other studies that have found demand for certain visible goods such as jewelery is higher in countries where income inequality is higher Charles et al. (2009); Heffetz (2011); Bertrand and Morse (2016); Chai et al. (2019); Colson-Sihra and Bellet (2022). This hypothesis will be explored further in Section 5.4.

Figure 8: Expenditure Hierarchies for Mozambique and Sierra Leone



Note: The chart reports the hierarchy in Sierra Leone (X axis) and Mozambique (Y axis) that are low income countries in our dataset. The placement on the 45-degree blue line means that ranks coincide in both countries, being above this line means that good ranks higher in high inequality country compared to low inequality country, and the opposite is true for being below this line. According to the World Bank 2011 data, *log* GDP per capita in Sierre Leone is 6.1 and it has a Gini coefficient 34. In Mozambique *log* GDP per capita is 6.27. the Gini coefficient 54, which is relatively higher than in Sierra Leone.
Source: GCD data.

Beyond the impact of macroeconomic conditions on expenditure hierarchies, there is also much evidence to suggest expenditure hierarchies exhibit path dependence in the sense that social institutions and cross border flows of people, capital and goods can influence the order of income elasticities. The results show a positive and significant correlation between $d(c_i, c_j)$ and geographical distance: the further away two countries are located, the more dissimilar are their expenditure hierarchies. At the same time, this suggests that the closer two countries are, the greater the propensity of countries to engage in exchange of goods, capital and labour, which can stimulate institutional change (Ace-

moglu et al., 2005). Such flows also increase the supply of variety (on the supply side) and stimulate changes in consumer preferences.[34] This result is consistent with previous studies that show consumption patterns tend to converge in highly integrated economic regions, such as within the European Union (Michail, 2020).

Other results that provide more support for the hypothesis that expenditure hierarchies are path dependent include the significance of a common language: countries with the same languages possess more similar expenditure hierarchies. Differences in expenditure hierarchies are also smaller among countries that were historically colonised by the same country. Colonisation influences social institutions (Acemoglu et al., 2001) and consumption patterns (Howes et al., 1996; Oktay and Sadıkoğlu, 2018). Moreover, the results on political fragmentation show that countries that recently shared a common parent country also possess more similar expenditure hierarchies. Taken together, these results indicate the presence of high degree of hysteresis in the evolution of expenditure hierarchies.

Regression results in columns (2) to (8) in Table 2 further investigates the relationship between differences in cultural norms on $d(c_i, c_j)$. For two out of the six cultural traits, our results suggest that those countries who are more similar in terms of these cultural norms also possess relatively more similar expenditure hierarchies. Concerning the results on uncertainty avoidance (column 5), inspection of e_i^c for countries that score strongly in this dimension show that the e_i^c for health services is high relative to the global average, which could reflect a higher propensity to spend additional income on health services. Also consistent with De Mooij and Hofstede (2011) these countries also possess a relatively lower e_i^c for passenger transport and electrical goods, relative to the global average.[35] With regard to long term orientation (column 6), this cultural norm reflects a greater concern for intergenerational welfare and higher willingness to invest in future generations. For these countries, the e_i^c for countries that score strongly in this dimension show that the e_i^c for education, housing and health all tend to be higher than the global average.[36] Taken together, these results are consistent with De Mooij and Hofstede (2011) and suggest these two specifc cultural norms do play some role in systematically influencing expenditure hierarchies observed across countries. At the same time, most of the social norms were found to have no significant impact on $d(c_i, c_j)$.

[34]Richard Day also considered how the spatial diffusion of new goods was influenced by geographical proximity (Day, 1970)

[35]Uncertainty avoidance is linked to a lower demand for innovative and complex goods (such as computers and electrical equipment) as well as a lower tendency to travel. Some countries that score highly in uncertainty avoidance include Serbia, Russia, Peru, Turkey and Mexico. Countries that score low on this dimension include Jamaica, India, Philippines and Vietnam.

[36]Countries that score highly in this dimension include China, Ukraine, Russia, Monetenegro, Belarus, Lithuania, Mongolia. Countries that score low on this dimension include Senegal, Togo, Liberia and Egypt.

Table 2: Results for cross country differences in expenditure hierarchies ($d(c_i, c_j)$)

Dependent variable: Logarithm of the distance between expenditure hierarchies of a pair of countries, $log(d(c_i, c_j))$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log GDP difference	0.0716***	0.0900***	0.0909***	0.0885***	0.0819***	0.110***	0.110***	0.0782***
	(0.00776)	(0.0178)	(0.0181)	(0.0177)	(0.0176)	(0.0153)	(0.0149)	(0.0191)
log inequality difference	0.0135***	0.00285	0.00253	0.00303	0.000747	0.0310***	0.0220**	-0.00221
	(0.00485)	(0.0126)	(0.0126)	(0.0125)	(0.0124)	(0.00952)	(0.00944)	(0.0124)
log GDP difference x log inequality difference	-0.00162***	-0.000617	-0.000594	-0.000650	-0.000331	-0.00325***	-0.00225*	0.000256
	(0.000615)	(0.00157)	(0.00157)	(0.00156)	(0.00154)	(0.00118)	(0.00117)	(0.00157)
log Geographical distance	0.0637***	0.0270	0.0264	0.0206	0.0176	0.0742***	0.106***	0.00188
	(0.00818)	(0.0190)	(0.0188)	(0.0193)	(0.0189)	(0.0166)	(0.0165)	(0.0255)
Historical differences:								
Common official language	-0.0392**							
	(0.0196)							
Common colonizer	-0.0670***							
	(0.0195)							
Political Fragmentation	-0.224*							
	(0.121)							
Differences in Hofstede's cultural dimensions:								
power distance index		-0.131						-0.0854
		(0.173)						(0.214)
individualism index			-0.0676					-0.0162
			(0.133)					(0.157)
person-orientation index				0.241				0.166
				(0.232)				(0.263)
uncertainty avoidance index					0.416***			0.383**
					(0.147)			(0.164)
long term orientation index						0.158***		0.177*
						(0.0551)		(0.0950)
indulgence index							-0.0709	-0.0674
							(0.0528)	(0.0785)
Observations	2,830	433	433	433	433	981	982	376
R^2	0.454	0.570	0.570	0.572	0.582	0.518	0.512	0.580

Fixed effects of countries included. Column (1) represents the main result of the study, while columns (2) to (8) introduce cultural variables into the analysis The number of observations decline from $2,830$ in (1) to 433 in (2) due to limited data on cultural values. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses. The full regression, including control variables is given in the appendix (Table 9)

5.3 Niche consumption

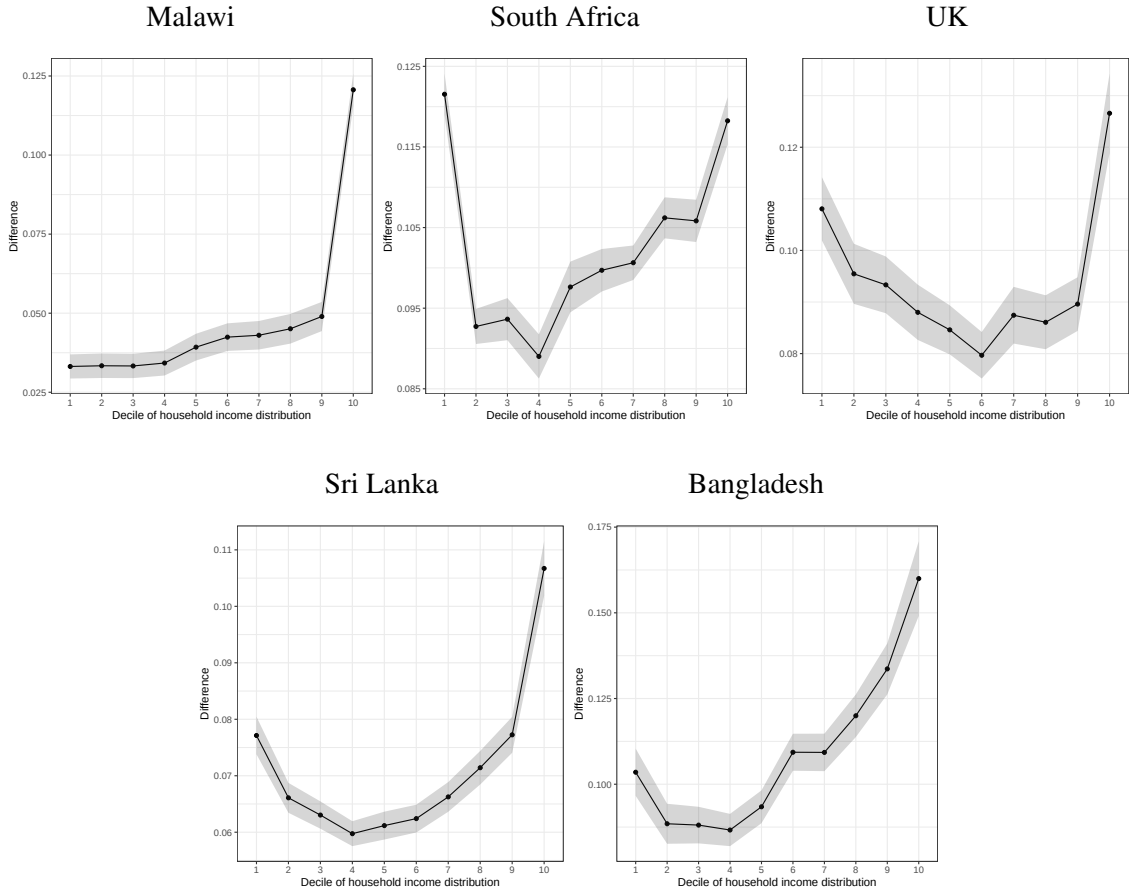
A key finding in the previous section was that national expenditure hierarchies around the world are more similar at their base which relates to necessities, but are more unique in their peaks, which relates to luxury consumption. If this is correct, household level data should also reveal a general tendency for consumption patterns to become more heterogeneous as income rises on the household level (as per stylized fact 4). Here we seek to find more evidence from the developing world for this general tendency by studying the relationship between demand heterogeneity and household income on the household level. We do so by measuring differences in the diversity of spending on the aggregate level D_a and the household level D_{hh}. Figure 16 reports the relationship between $D_a - \overline{D_{hh}}$ and the household income in Malawi, South Africa, the UK, Sri Lanka and Bangladesh. These countries are sourced from different parts of the global income distribution.

In spite of vast differences in GDP per capita across countries, the figure shows that among the affluent household in each country there is a tendency for the $D_a - \overline{D_{hh}}$ to rise with household income. This result is consistent with Neiman and Vavra (2023) and Kiedaisch et al. (2018) and reflects a tendency for affluent consumers to concentrate their spending into different niche areas of consumption. This leads to both D_{hh} withi income to fall while D_a rises with rising income.[37] The expenditure categories in which $D_a - \overline{D_{hh}}$ grows significantly include recreational services and package holidays, which are luxuries (see Table 4).

With the exception of Malawi (the poorest country in the sample), a notable feature of results is that $D_a - \overline{D_{hh}}$ appear to decline at low income levels. This is consistent with Chai et al. (2015) and indicates that spending patterns are more homogeneous among middle income households, compared to low income households. This phenomenon is connected to the food choices among the poorest and the expansion of the intensive margin. Among the poorest, $D_a - \overline{D_{hh}}$ is large in some countries as food spending is concentrated on staple foods such as potatoes, rice or cereal. The type of staple food consumed by the poor is heterogeneous in South Africa, while the choice of staple food in Malawi (maize) is relatively more homogeneous (Andersson, 2011). $D_a - \overline{D_{hh}}$ declines as the intensive margin of food expands as consumer diversify their spending more evenly across food varieties (See results in 5.1). The tendency for $D_a - \overline{D_{hh}}$ to remain flat in Malawi at low income levels may also be due to 85% of its population being located in rural areas, which increases the transaction cost associated with variety consumption (Li, 2021)

[37] Note that cross country differences in the slope of the curve are to some extent influenced by differences in the number of expenditure categories. Kiedaisch et al. (2018) use the UK data show that results are robust when the number of expenditure categories used in the analysis are varied. A robustness test is conducted in the Appendix, see Figure 16.

Figure 9: Estimated differences between the diversity of spending on the aggregate level (D_a) and the household level (D_{hh}).



Note: The grey area represents the 95% confidence interval around the estimated average values. The number of expenditure categories varies as follows: Malawi (35 categories), South Africa (752 categories), UK (12 categories), Sri lanka (94 categories) Bangladesh (68 categories).
Source: The authors' calculations based on multiple national household expenditure surveys (see Data section for details).

5.4 Income inequality and market depth

Another key finding is that cross-country differences in income inequality can account for cross-country differences in expenditure hierarchies. It is likely that this is due to rising income inequality having a negative impact on demand homogeneity. We measure demand homogeneity by examining the depth of markets via participation rates, i.e. percentage of a population consuming a good. As discussed in the previous section, if income inequality increases the heterogeneity of consumption and thereby decreases economies of scale, it should be negatively correlated with the market depth for luxuries.

Table 3 reports the results on market depth across all available goods and services. p_i^c

is found to be positively and significantly correlated with GDP per capita: the average market depth is higher among richer countries. On the other hand, the Gini coefficient is negatively and significantly correlated with market depth. This supports the hypothesis that rising income inequality tends to reduce the depth of markets. Market depth is also inversely correlated to the global income elasticity of a good (e_i, reported in Table 4). The average market depth found within a country is relatively lower among luxuries (high order i), while necessities (low order i) possess relatively greater market depth. The interaction term between the Gini coefficient and e_i is positively and significantly correlated with p_i^c, indicating that inequality moderates the overall impact of e_i on p_i^c. The relative decline in market depth among luxuries is lower among countries experiencing high levels of income inequality. This suggests that higher income inequality generates a large share of affluent consumer that begin to consume luxuries.[38]

Previous studies find a positive relationship between income inequality and the demand for visible goods (Charles et al., 2009; Heffetz, 2011).[39] Our results show that Jewelry, watches and cars possess relatively lower market depth, which is consistent with other luxuries. It is worth noting that coefficient estimate of -40.261 in (3) is much bigger than -16.02 in (2) which shows that market dept for this set of visible luxuries is relatively lower than average. The interaction term in (3) between income inequality and luxuries also shows that there is a tendency for market depth for visible luxuries to be higher in countries with greater income inequality. This result is consistent with the idea that rising income inequality increases demand for visible goods (Charles et al., 2009; Brown et al., 2011; Chai et al., 2019; Colson-Sihra and Bellet, 2022).[40]

[38]Consider some examples: When e_i is 1, the effect of a 1% increase in inequality is a decrease in p_i^c by 0.51 (-0.664+0.154 $\times$ 1 = -0.51). When e_i is 2, the effect of a 1% increase in the Gini coefficient is the decrease in p_i^c by 0.36 (-0.664+0.154 $\times$ 2 = -0.36).

[39]A key challenge faced in these studies is that most rely on index measures like the Gini coefficient to proxy the impact of the change of the income distribution on visible consumption. However, this effectively assumes household are perfectly informed about the shape of the entire income distribution, which seems unrealistic. A different approach that relies on household only observing local change in the income distribution is discussed by Chai et al. (2019). In this paper we adopt the traditional index measure approach.

[40]Table 7 in the appendix presents further interaction terms for goods and services, where similar effects are found. Table 8 in the appendix shows that results are robust if alternative weighting procedure is applied.

Table 3: Regression results for market depth (p_i^c)

	(1)	(2)	(3)
log GDP per capita	6.121***	6.121***	6.121***
	(0.448)	(0.448)	(0.467)
Inequality	**-0.562*** **	**-0.664*** **	**-0.573*** **
	(0.0468)	(0.0590)	(0.049)
e_i	-10.02***	-16.02***	
	(0.415)	(2.270)	
Interaction term: Inequality $\times$ e_i		**0.154*** **	
		(0.0554)	
Jewelry watches and cars			-40.261***
			(11.261)
Interaction term: Inequality $\times$ **Jewelry watches and cars**			0.569**
			(0.284)

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable is the share of the population in each country that consumes a particular good.
Source: GCD data. The full regression, including control variables is given in the appendix (Table 7).

6 Conclusion

Using cross sectional household spending data sourced from across the developing world, this paper has analyzed how the composition of household spending tends to evolve in fundamental ways as economies grow. Our results have broadly shown how household spending patterns do not evolve in a completely random and unpredictable manner, nor are they ahistorical and exogenous. Rather, the growth and expansion of household spending tends to follow a set of stylized facts that highlight how consumer preferences are both non-homothetic in nature and also become more differentiated as incomes rises in the long run. Furthermore, household spending patterns are correlated with macroeconomic conditions, including GDP and income inequality, while also being path dependent in the sense that certain cultural norms and the exchange of trade, capital and labour can influence their character. Taken together, these results help to highlight how the growth process triggers endogenous changes in household consumption patterns. (Day, 1985).

In terms of quantifying the spending diversification process, our results show how the growth in spending diversity unfolds: among low levels of GDP per capita, one important channel through which spending diversity grows is the intensive margin of food as consumers diversify their food diet by increasing their share of spending on food types that are already part of the consumption set. At higher levels of GDP per capita, the extensive margin plays a more prominent role in growing spending diversity as consumer expands the range of goods and services consumed. Across developing countries, a one per cent increase in log GDP is estimated to lead to an additional 2.3 varieties being consumed

by households. These results suggest that greater consideration should be given to how the observation of zero expenditures (corner solutions) are correlated with macroeconmic conditions (Heien and Wesseils, 1990; Fry et al., 2000). While a censored regression approach can be used to correct for zero expenditures, these studies typically omit macroeconomic variables, such as levels of GDP and income inequality.

Second, our analysis of expenditure hierarchies across countries also shows that there is a tendency for spending patterns in each country to become more unique as the focus of spending shifts away from meeting basic needs that are universally shared and homogeneous. We found that most expenditure hierarchies observed around the world share a common base in the sense that the income elasticity of food is consistently ranked below the income elasticities of all other goods and services. Among higher order goods, expenditure hierarchies become more unique as cross country differences emerge in the order of income elasticities of luxury goods. This is consistent with empirical findings that expenditure patterns across countries are significantly different (Carruth et al., 1999; Rathnayaka et al., 2022). This tendency for consumption patterns to become unique as income rises was also confirmed by our analysis of niche consumption patterns that used household level data across a number of developing countries. This analysis confirms that results found in the US by Neiman and Vavra (2023) and in the UK by Kiedaisch et al. (2018) can in fact be found across a number of developing countries, including Malawi, South Africa, Sri Lanka and Bangladesh. These results support the hypothesis that there exists a general tendency for household spending patterns to diverge as household income rises. They highlight the existence of emergent properties in household spending patterns that suggests there is growing need to move away from using representative agent models which make inferences about the welfare impact of economic policy based on population averages (Kiedaisch et al., 2018).

Comparing pairwise cross-country differences in expenditure hierarchies, we also show that the expenditure hierarchy in a country exhibits path dependent properties. Our results showed that shared language, similar GDP levels, strong trading relationships that impact supply conditions, a shared history and similar cultural norms - all tend to contribute to countries possessing more similar expenditure hierarchies. These results help to shed light on why spending patterns in highly integrated countries tend to converge (Michail, 2020). They also confirm the premise of the Linder Hypothesis that countries with similar GDPs tends to have more similar expenditure hierarchies (Linder, 1961).

Beyond differences in GDP, we also find that differences in income inequality play a role in cross country differences in consumption patterns. This may be due to two particular reasons. Firstly, we find consistent evidence that higher income inequality tends to generate more demand for visible goods. In particular,our results show that the market

depth for jewelry, watches and cars tends to be higher in countries with higher levels of income inequality. This is consistent with the hypothesis that consumers who are exposed to inequality will demand more visible luxuries (Heffetz, 2011; Colson-Sihra and Bellet, 2022). It is worth noting here that no significant relationship was found between clothes and income inequality, which have also been found to be linked to change in income inequality by some studies (Heffetz, 2011; Charles et al., 2009). This can be attributed to the likelihood that the specific goods used for conspicuous consumption may vary among different national cultures. For example, in rural China, Brown et al. (2011) found evidence that funeral expenses are used to signal status. We note that our studies build on these previous studies in the sense that these have mainly focused on how income inequality has impacted the level of demand for visible goods. Our results shown that income inequality also impact the overall share of the population consuming visible goods.

The second important link between income inequality and expenditure hierarchies relates to how inequality limit economies of scale. Our results show that income inequality is negatively and significantly correlated with average market depth: the average share of households consuming a particular good tends to fall as income inequality increases. These results confirm the conjecture that high level of income inequality can inhibit the realisation of economies of scale (Murphy et al., 1989; Ibragimov et al., 2017; Foellmi and Zweimüller, 2017).

As Richard Day recognized, a key force driving macroeconomic evolution is the emergence of internal diseconomies (Day, 2018). Production within a given economy must eventually exhibit diminishing returns because of increasing complexity of planning, communicating, and coordinating production activity as the economy grows. Our results highlight that one source of internal diseconomies is the demand side. As the economy grows, the homogeneity of demand declines due to rising income inequality on the macro level and the rise of niche of consumption on the micro level. This stimulates the emergence of new approaches to production that are better suited to cater to differentiated preferences via the emergence of small scale 'niche' goods and services. From this perspective, the broad transformation of household spending driven by rising income can be viewed as an entropic process through which economic growth stimulates the emergence of diversity and more complex structures in markets (Georgescu-Roegen, 1971; Raine et al., 2006). In terms of future research direction, it would be useful to consider how a dynamic general equilibrium framework may be used to further study the underlying mechanism of consumption evolution in the long run.

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7 APPENDIX

7.1 Decomposition of Spending Diversity

In order to decompose entropy, we use the Theil entropy measure to examine within and between sources of spending diversity (Theil, 1967; Theil and Finizza, 1971; Theil and Finke, 1983):

$$T_c = -\sum_{j=1}^{k} s_{jc} log(s_{jc}) \tag{3}$$

The range of T_c is between 0 and $log(1/k)$ where k is the total number of consumption categories. For each country, c, we divide the k goods & services into $g = \{1, 2, 3\}$ product groups (food, manufactured goods and services), to be denoted by G_1, G_2 and G_3. The budget share for group g is $S_g = \sum_{m \in G_g} s_m$. We can then express the spending diversity for each country as:

$$T_c = \sum_{g=1}^{G} S_g log(S_g) + \sum_{g=1}^{G} S_g T_g \tag{4}$$

where

$$T_g = \sum_{m \in G_g} \frac{s_m}{S_g} log(\frac{s_m}{S_g}) \tag{5}$$

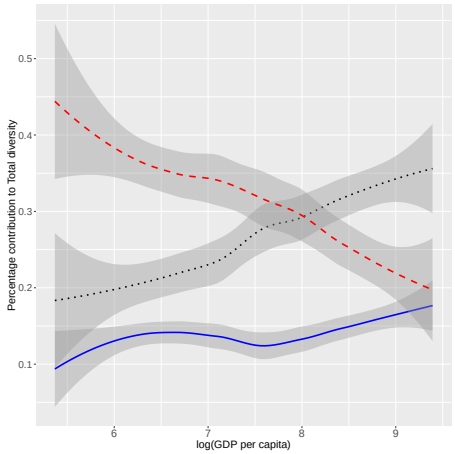
Equation (4) states that the diversity of the entire basket can be decomposed into the sum of the between-group diversity (first term) and a weighted average of the g within-group diversities (second term), where the weights are the group budget shares. Equation (5) is the within-group diversity, which deals with the conditional, or within product group, budget shares $\frac{s_m}{S_g}$. For each g, the term on the right hand side indicates how much spending diversification within g contributes to total spending diversity. A large value indicates that the diversification within the group makes a relatively strong contribution toward overall spending diversity. A low value indicated that the overall contribution to the product diversity is low. Note that low values do not necessarily indicate that consumers are not diversifying within that group - it only indicates that this within group diversity makes a relatively small contribution to overall spending diversity.

Figure 10 reports the results of the decomposition exercise. The grey areas represent 95% confidence intervals. Looking at within diversity dynamics (left hand side), this shows that while the contribution of spending diversity within food (dashed line) is large at low levels of GDP per capita, this begins to fall rapidly as income rises. At the same time, the contribution of spending diversity within services (dotted line) and manufac-

tured goods (smooth line) tends to rise as income grows. The within group diversity of services tends to rise slightly faster than the one of manufactured goods. The figure on the right hand reports between group diversity. The dotted line shows the between-groups diversity between food and non-food (the sum of manufactured goods and services). It has a downward slope suggesting that while at low income levels, the diversification of spending from food to manufactured goods and services makes a large contribution to spending diversity, this tends tends to become less significant at high income levels. This finding is consistent with the observation that that the food budget share is large at low income levels and falls as households rapidly switch away from food as they get rich (as per Engel's law). The solid line represents between group diversity for food and manufactured goods. This tends to rise with income, suggesting that the tendency for households to diversify between manufactured goods and services is an increasingly important driver of spending diversity at high income levels, in addition to within group spending diversification in services and manufactured goods (as seen on the left hand side). As such, these results suggest it can not be assumed that spending diversity rises in a homogeneous fashion across food, manufactured goods and services. Rather the type of spending diversity is both heterogeneous across the three broad expenditure groups. In addition, the drivers of spending diversity in terms of within group and between group contributions to spending diversity also tends to change over different levels of income.

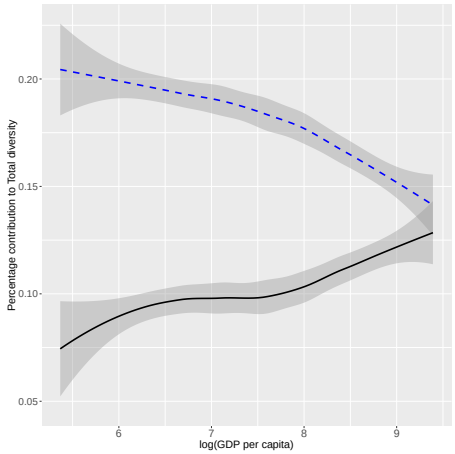
Figure 10: Decomposition of spending diversity

(a) *WITHIN groups diversity*



solid line = manufactured goods,
dotted line = services,
dashed line = food

(b) *BETWEEN groups diversity*



solid line = diversity between services and manufactured goods,
dashed line = diversity between food and non-food

Note: output of Local Polynomial Regression Fitting with tri-cube weight function, bandwidth 0.75 and degree 2. Shaded area indicates 95% confidence levels. Source: GCD 2011

Table 4: Global Income elasticities of consumption budget shares and participation rates

Consumption category, i	Sector	Index-Number for Elasticity	Average e_i	St.deviation	Index-Number for Participation rate	Average p_i	St.deviation
Other cereals, flour and other products	food	1	-0.269	0.116	1	0.012	0.076
Fresh or chilled potatoes	food	2	-0.207	0.15	8	0.077	0.152
Sugar	food	3	-0.201	0.142	7	0.055	0.147
Rice	food	4	-0.2	0.154	10	0.09	0.205
Other Edible Oil and Fats	food	5	-0.179	0.16	5	0.048	0.129
Fresh or chilled vegetables other than potatoes	food	6	-0.161	0.09	2	0.014	0.046
Food Products n.e.c.	food	7	-0.147	0.107	3	0.019	0.071
Other fuels	products	8	-0.126	0.423	6	0.054	0.378
Coffee, tea and cocoa	food	9	-0.082	0.216	15	0.152	0.283
Vegetables and Vegetable-based Product	food	10	-0.023	0.699	19	0.176	0.351
Preserved or processed fish and seafood	food	11	0	0.355	28	0.279	0.476
Other bakery products	food	12	0.006	0.273	24	0.23	0.276
Fresh or chilled fruit	food	13	0.02	0.193	16	0.16	0.209
Poultry	food	14	0.027	0.297	29	0.284	0.44
Bread	food	15	0.039	0.433	32	0.31	0.46
Non-durable household goods	products	16	0.047	0.932	4	0.042	0.187
Pharmaceuticals Products	products	17	0.048	0.267	11	0.103	0.137
Fresh milk	food	18	0.048	0.503	38	0.346	0.681
Other meats and meat preparations	food	19	0.052	0.301	25	0.261	0.315
Pasta products	food	20	0.052	0.761	61	0.549	1.41
Shoes and other footwear	products	21	0.061	0.245	13	0.115	0.16
Fruit and Fruit-based Product	food	22	0.062	0.436	41	0.362	0.698
Appliances for personal care	products	23	0.065	0.218	9	0.087	0.181
Small tools and miscellaneous accessories	products	24	0.07	0.315	20	0.185	0.269
Fresh, chilled or frozen fish and seafood	food	25	0.076	0.416	36	0.333	0.535
Garments	products	26	0.078	0.262	12	0.112	0.197
Eggs and egg-based products	food	27	0.089	0.489	39	0.358	0.505
Clothing Material and Clothing Accessories	products	28	0.095	0.367	18	0.176	0.262
Spirits	food	29	0.134	0.453	33	0.323	0.597
Preserved milk and other milk products	food	30	0.158	0.456	49	0.444	0.679
Lamb, mutton and goat	food	31	0.16	0.645	34	0.326	0.486
Beef and veal	food	32	0.184	0.49	48	0.418	0.539
Repair and hire of footwear	service	33	0.188	0.297	62	0.558	0.693
Confectionery, chocolate and ice cream	food	34	0.191	0.559	44	0.386	0.498
Glassware, tableware and household utensils	products	35	0.197	0.977	22	0.208	0.306
Passenger transport by road	service	36	0.198	0.507	23	0.208	0.218
Pork	food	37	0.201	0.65	42	0.38	0.729

Global Income elasticities of consumption budget shares and participation rates

Consumption category, i	Sector	Index-Number for Elasticity	Average e_i	St.deviation	Index-Number for Participation rate	Average p_i	St.deviation
Butter and margarine	food	38	0.236	1.069	64	0.584	1.048
Newspapers, books and stationery	products	39	0.254	0.638	26	0.267	0.688
Hairdressing salons and personal grooming establishments	service	40	0.258	0.314	35	0.33	0.351
Paramedical services	service	41	0.268	0.553	43	0.383	0.653
Water Utility	service	42	0.298	0.552	70	0.673	1.443
Other Purchase Transport Services	service	43	0.312	1.3	31	0.296	0.372
Animal drawn vehicles	products	44	0.312	0.727	17	0.172	0.619
Household textiles	products	45	0.322	0.604	45	0.389	0.608
Other medical products	products	46	0.328	1.42	37	0.336	0.432
Medical Services	service	47	0.332	0.954	40	0.359	0.558
Wine	food	48	0.379	0.887	58	0.54	0.928
Passenger transport by sea and inland waterway	service	49	0.388	0.986	27	0.276	0.441
Other personal effects	products	50	0.403	0.517	55	0.487	0.499
Veterinary and other services for pets	service	51	0.405	0.562	57	0.529	0.876
Mineral waters, soft drinks, fruit and vegetable juices	food	52	0.419	0.839	60	0.547	0.69
Other Services n.e.c.	service	53	0.426	0.519	52	0.458	0.488
Dental services	service	54	0.436	0.562	54	0.469	0.498
Hospital services	service	55	0.437	0.909	30	0.293	0.493
Maintenance and repair of other major durables for recreation	service	56	0.444	0.814	21	0.205	0.464
Jams, marmalades and honey	food	57	0.448	0.84	83	0.916	1.245
Beer	food	58	0.464	1.246	68	0.667	1.196
Electricity	products	59	0.483	1.373	82	0.914	1.829
Repair of Audio/Visual/Photo/Information Process Equipment	service	60	0.499	0.604	77	0.805	1.525
Cheese	food	61	0.51	1.207	81	0.909	1.428
Cleaning, repair and hire of clothing	service	62	0.532	1.155	63	0.561	0.769
Other recreational items and equipment	products	63	0.574	0.674	65	0.592	0.625
Gas	products	64	0.59	1.093	87	1.058	1.616
Small electric household appliances	products	65	0.615	0.769	93	1.25	2.284
Carpets and other floor coverings	products	66	0.634	0.855	75	0.762	0.987
Telephone and telefax equipment	products	67	0.644	1.286	78	0.829	0.908
Jewellery, clocks and watches	products	68	0.651	0.646	59	0.54	0.523
Combined passenger transport	service	69	0.652	1.473	46	0.414	0.502

Global Income elasticities of consumption budget shares and participation rates

Consumption category, i	Sector	Index-Number for Elasticity	Average e_i	St.deviation	Index-Number for Participation rate	Average p_i	St.deviation
Catering Service	service	70	0.713	2.407	50	0.446	0.631
Maintenance and repair of the dwelling	service	71	0.745	0.855	51	0.455	0.563
Miscellaneous services relating to the dwelling	service	72	0.749	1.328	97	1.354	2.402
Postal services	service	73	0.775	1.284	85	0.969	1.023
Furniture and furnishings	products	74	0.781	0.96	66	0.609	0.889
Therapeutic appliances and equipment	products	75	0.781	1.036	73	0.713	0.752
Major tools and equipment	products	76	0.808	2.794	47	0.415	0.552
Education	service	77	0.812	2.501	14	0.116	0.304
Telephone and telefax services	service	78	0.824	2.611	72	0.689	1.099
Audio/visual/photo/information processing equipment	products	79	0.835	1.749	56	0.527	0.53
Social protection	service	80	0.9	1.633	67	0.661	0.941
Recording media	products	81	0.95	1.275	92	1.21	1.186
Bicycles	products	82	0.959	2.555	71	0.673	1.725
Cultural services	service	83	0.976	1.502	88	1.061	1.373
Major household appliances whether electric or not	products	84	1.014	1.503	79	0.854	0.991
Passenger transport by railway	service	85	1.045	4.602	53	0.461	0.805
Major durables for outdoor and indoor recreation	products	86	1.16	2.214	69	0.669	0.847
Household services	service	87	1.176	1.811	90	1.111	1.414
Repair of furniture, furnishings and floor coverings	service	88	1.197	2.109	76	0.78	0.967
Repair of household appliances	service	89	1.217	3.192	84	0.925	0.94
Recreational and sporting services	service	90	1.297	1.711	94	1.268	1.632
Other Financial Services n.e.c.	service	91	1.488	2.876	91	1.128	1.378
Motor cycles	products	92	1.6	3.764	80	0.909	1.347
Accommodation services	service	93	1.641	1.819	96	1.279	1.091
Insurance	service	94	1.688	2.573	98	1.435	1.777
Maintenance and Repair of Personal Transport Equipment	service	95	1.706	2.836	89	1.09	1.141
Garden and pets	products	96	1.807	9.103	74	0.727	0.766
Fuels and lubricants for personal transport equipment	products	97	2.021	2.735	99	1.473	1.596
Other services in respect of personal transport equipment	products	98	2.334	4.253	100	1.772	1.794
Passenger transport by air	service	99	3.131	6.198	95	1.278	1.941
Package holidays	service	100	4.151	15.835	86	1.054	0.949
Domestic services	service	101	4.805	6.775	102	3.075	3.03
Motor cars	products	102	8.041	17.915	101	2.828	3.897

Table 5: Impact of inequality on Extensive margin of diversity, ICP 2011 data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: Extensive margin	Total	Total	Total	Food	Goods	Services	**Total**	Food	Goods	Services
log GDPpc	2.383***		2.279***	0.486***	0.199	0.813***	5.254***	0.957*	1.298**	2.673***
	(0.540)		(0.578)	(0.151)	(0.181)	(0.295)	(1.606)	(0.529)	(0.529)	(0.779)
Inequality		-0.114**	-0.0641	0.0294	-0.0183	-0.0800**	**0.651***	0.143	0.246**	0.367**
		(0.057)	(0.0576)	(0.0178)	(0.0162)	(0.0310)	(0.361)	(0.124)	(0.121)	(0.178)
Interaction term: Inequality × *log* GDPpc							**-0.0796****	-0.0126	-0.0294**	-0.0498***
							(0.0377)	(0.0130)	(0.0129)	(0.0186)
log Population	-0.961**	-1.043**	-1.018**	-0.551***	-0.237	-0.121	-0.917*	-0.535***	-0.199	-0.0578
	(0.472)	(0.524)	(0.487)	(0.137)	(0.145)	(0.247)	(0.485)	(0.139)	(0.143)	(0.247)
log Size	0.937**	0.728*	0.935**	0.263**	0.282***	0.358**	0.811**	0.243**	0.236**	0.280
	(0.375)	(0.395)	(0.379)	(0.110)	(0.107)	(0.177)	(0.392)	(0.114)	(0.110)	(0.185)
Urbanization rate	0.059	11.833***	0.355	0.803	0.309	1.169	0.831	0.878	0.485	1.467
	(3.179)	(2.500)	(3.281)	(1.029)	(1.103)	(1.804)	(3.315)	(1.044)	(1.097)	(1.813)
Constant	73.905***	96.044***	78.09***	29.67***	27.54***	25.64***	50.69***	25.33***	17.42***	8.516
	(6.389)	(6.082)	(8.223)	(2.186)	(2.229)	(4.246)	(17.13)	(5.325)	(5.350)	(8.503)
Observations	165	163	163	163	163	163	163	163	163	163
R^2	0.250	0.178	0.254	0.255	0.072	0.201	0.271	0.259	0.100	0.225
Variance inflation factor (VIF)	2.9	2.01	2.52							

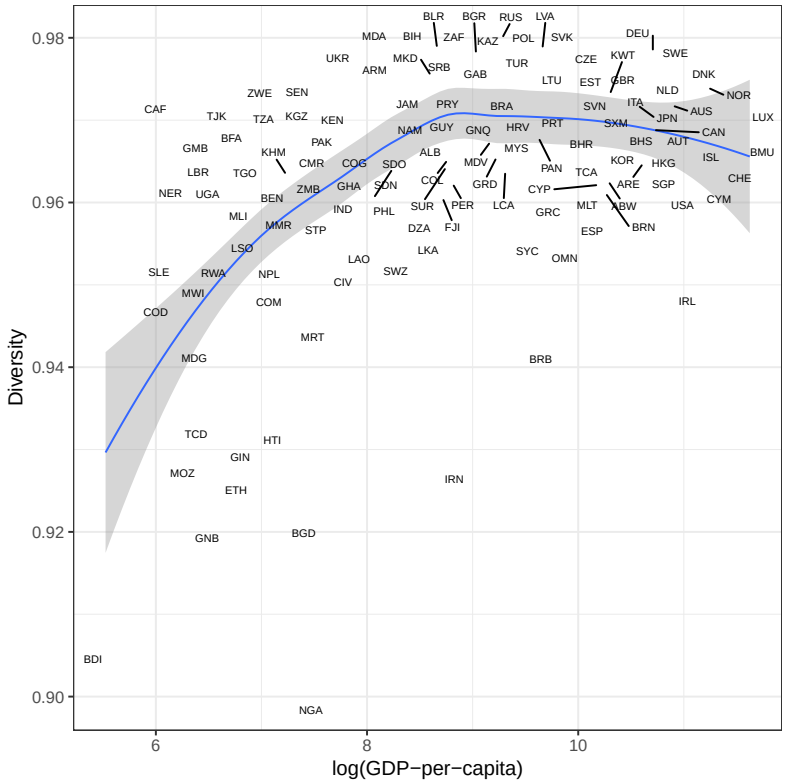
Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Impact of inequality on Extensive margin of diversity, ICP 2017 data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Extensive margin	Total	Food	Goods	Services	**Total**	Food	Goods	services
log GDP per capita	3.312***	0.730***	0.614***	1.087***	6.831***	1.185**	1.847***	2.294***
	(0.519)	(0.154)	(0.189)	(0.297)	(1.368)	(0.570)	(0.458)	(0.831)
Inequality	-0.0580	0.0275	-0.00646	-0.0910***	**0.797****	0.138	0.293***	0.202
	(0.0633)	(0.0184)	(0.0188)	(0.0323)	(0.318)	(0.141)	(0.107)	(0.198)
Interaction term: Inequality × *log* GDP per capita					**-0.0945*****	-0.0122	-0.0331***	-0.0324
					(0.0336)	(0.0148)	(0.0113)	(0.0210)
log Population	-0.552	-0.582***	0.0801	0.149	-0.385	-0.560***	0.139	0.206
	(0.499)	(0.167)	(0.142)	(0.260)	(0.493)	(0.172)	(0.138)	(0.263)
log Size	0.744*	0.271**	0.176	0.212	0.536	0.244*	0.103	0.141
	(0.386)	(0.125)	(0.116)	(0.200)	(0.393)	(0.136)	(0.115)	(0.212)
Urbanization rate	-1.157	1.090	-1.255	0.509	-0.536	1.171	-1.037	0.722
	(3.091)	(0.897)	(1.263)	(1.911)	(3.090)	(0.898)	(1.249)	(1.930)
Constant	62.58***	27.64***	20.19***	21.39***	29.90**	23.41***	8.747*	10.19
	(7.562)	(2.406)	(2.386)	(3.946)	(14.44)	(5.716)	(4.822)	(8.480)
Observations	168	168	168	168	168	168	168	168
R^2	0.335	0.330	0.115	0.234	0.354	0.333	0.142	0.243

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

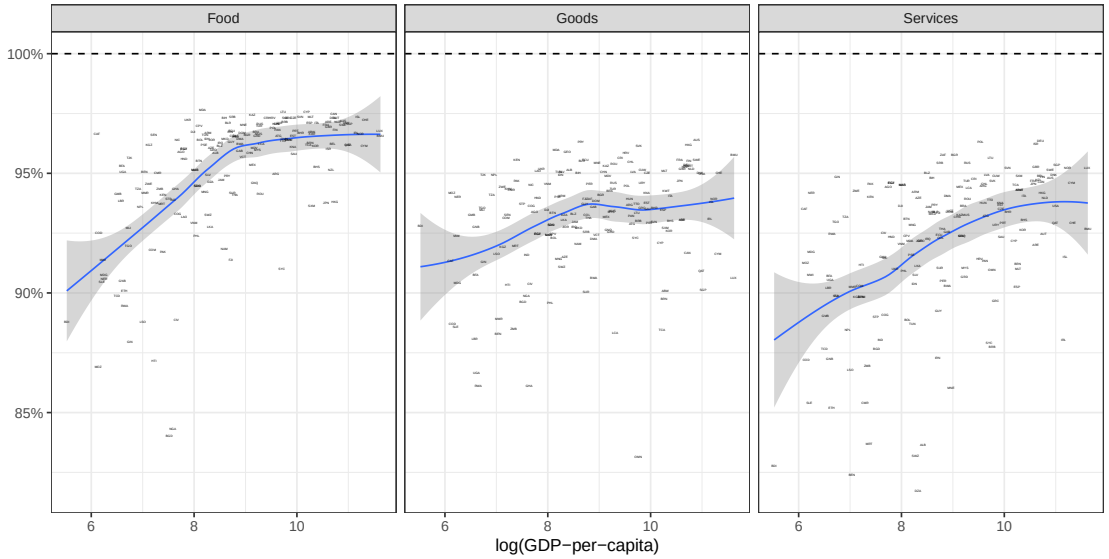
Figure 11: Diversity of consumption *vs* per capita income, ICP 2017 data



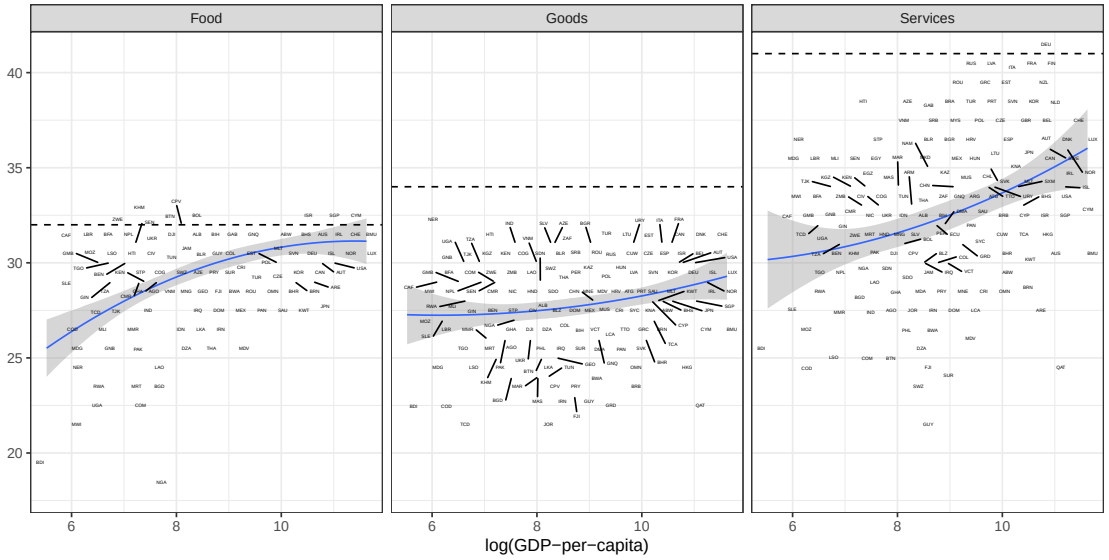
Note: The grey area represents the 95% confidence interval around the kernel regression.

Figure 12: The intensive and extensive margin using ICP 2017 data

(a) Intensive margin for food, goods and services



(b) N^c (Extensive margin) for food, goods and services



(c) Budget shares for food, goods and services

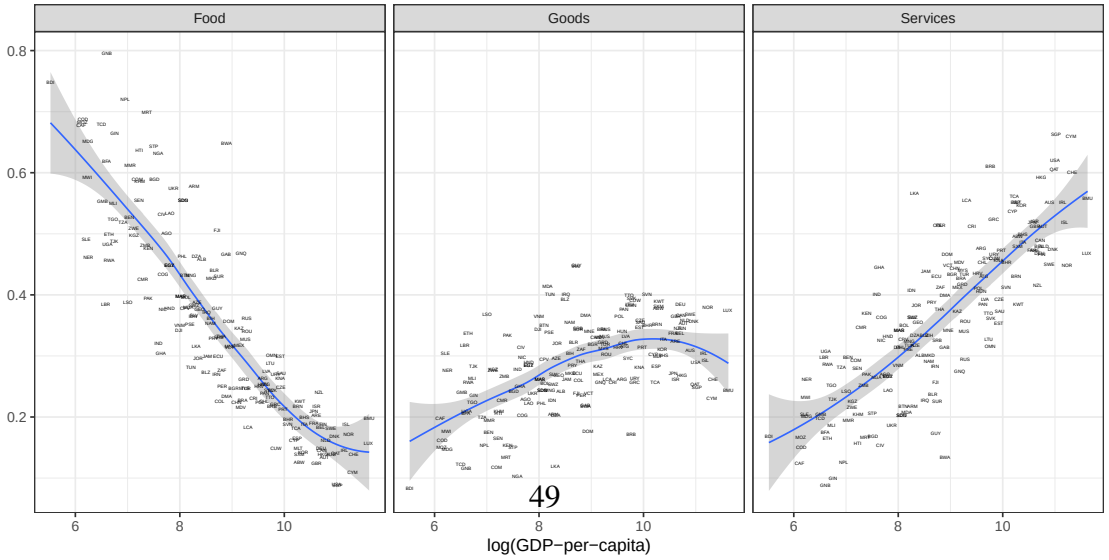


Table 7: Regression results for market depth (p_i^c)

Dependent variable: participation rate$_i^c$	(1)	(2)	(3)	(4)
log GDP per capita	6.121***	6.121***	6.121***	6.158***
	(0.448)	(0.448)	(0.467)	(0.442)
Inequality	-0.562***	-0.664***	-0.573***	-1.051***
	(0.0468)	(0.0590)	(0.0488)	(0.0834)
e_i	-10.02***	-16.02***		
	(0.415)	(2.270)		
Interaction term: Inequality $\times$ e_i		0.154***		
		(0.0554)		
Jewelry watches and cars			-40.26***	
			(11.26)	
Interaction term: Inequality $\times$ **Jewelry watches and cars**			0.569**	
			(0.284)	
Food				(reference category)
Goods				-45.88***
				(4.770)
Services				-58.90***
				(4.414)
Interaction term: Inequality $\times$ **Goods**				0.639***
				(0.119)
Interaction term: Inequality $\times$ **Services**				0.724***
				(0.111)
log Population	1.374***	1.374***	1.374***	1.386***
	(0.375)	(0.375)	(0.390)	(0.380)
log Size	0.160	0.160	0.160	0.140
	(0.319)	(0.318)	(0.332)	(0.319)
Urbanization rate	-1.973	-1.973	-1.973	-1.166
	(2.500)	(2.498)	(2.602)	(2.487)
Constant	-7.584	-3.613	-13.45**	22.25***
	(5.104)	(5.301)	(5.256)	(5.841)
N	9434	9434	9434	9078
R^2	0.133	0.135	0.051	0.176

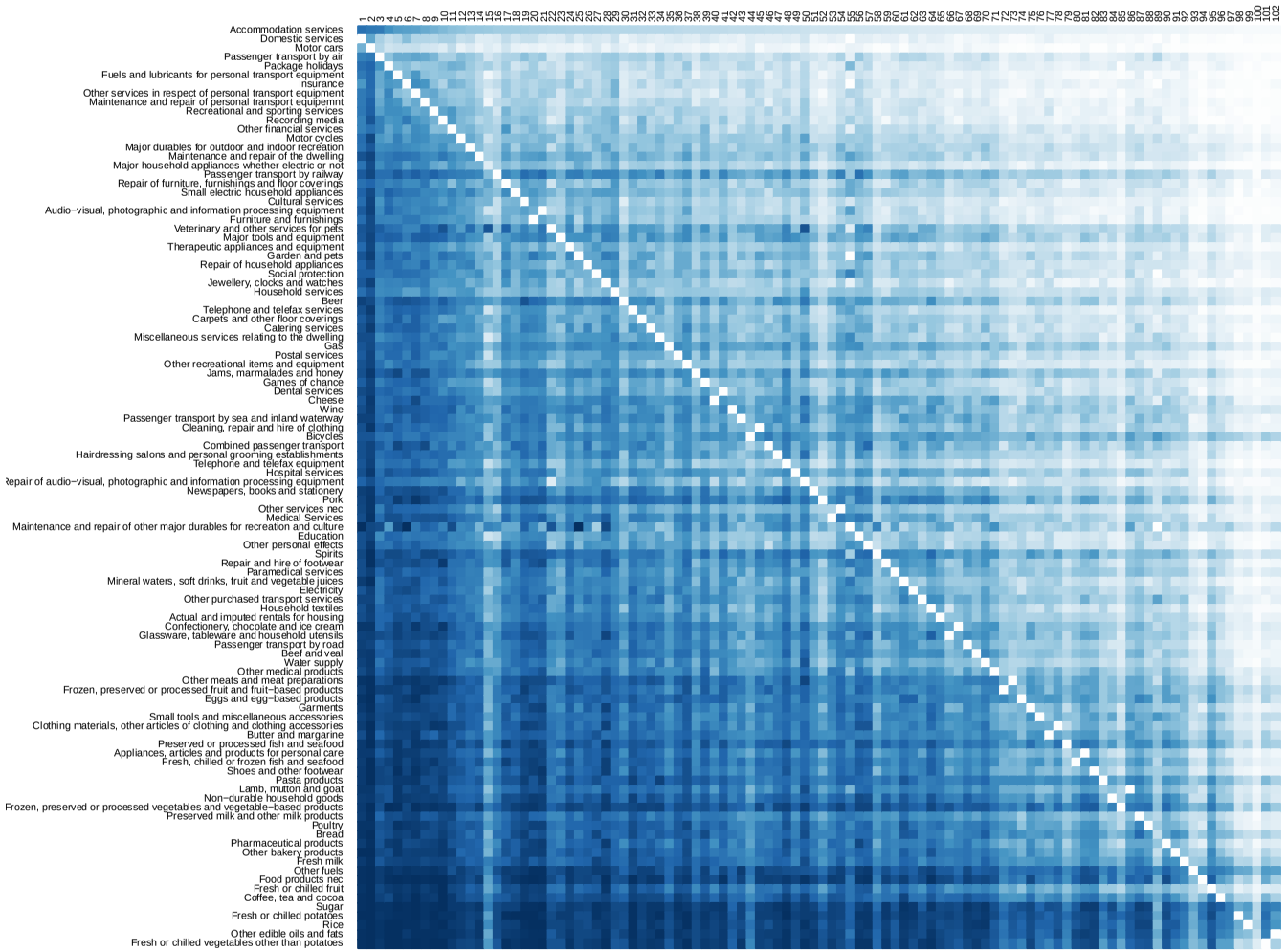
The source is GCD data. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable is the share of the population in each country that consumes a particular good or service.
Column (4) shows that the participation rate for goods and services is lower than the participation rate of food (the reference category).
and that income inequality has an overall negative impact on participation rates, although the impact is lower for goods and services compared to food.
This is reflected in the coefficients of interaction terms of inequality with dummy variables of goods and services.

Table 8: Weighted regression results for market depth (p_i^c)

Dependent variable: participation rate$_i^c$	(1)	(2)	(3)	(4)
log GDP per capita	7.295***	7.304***	7.208***	8.079***
	(0.557)	(0.557)	(0.575)	(0.550)
Inequality	-0.642***	-0.736***	-0.649***	-1.121***
	(0.0546)	(0.0651)	(0.0567)	(0.0896)
e_i	-8.160***	-13.12***		
	(0.420)	(2.269)		
Interaction term: Inequality $\times$ e_i	0.127**			
		(0.0545)		
Jewelry watches and cars			-44.86***	
			(11.32)	
Interaction term: Inequality $\times$ **Jewelry watches and cars**			0.549**	
			(0.276)	
Food				(reference category)
Goods				-49.46***
				(5.183)
Services				-63.79***
				(5.198)
Interaction term: Inequality $\times$ **Goods**				0.726***
				(0.129)
Interaction term: Inequality $\times$ **Services**				0.850***
				(0.129)
log Population	0.251	0.256	0.182	0.108
	(0.456)	(0.455)	(0.468)	(0.467)
log Size	0.604	0.601	0.658*	0.642*
	(0.383)	(0.382)	(0.396)	(0.384)
Urbanization rate	-7.897**	-7.952**	-6.815**	-6.946**
	(3.224)	(3.222)	(3.313)	(3.248)
Constant	2.682	6.267	-1.845	25.64***
	(6.218)	(6.397)	(6.376)	(6.958)
N	9116	9116	9116	8772
R^2	0.140	0.142	0.065	0.181

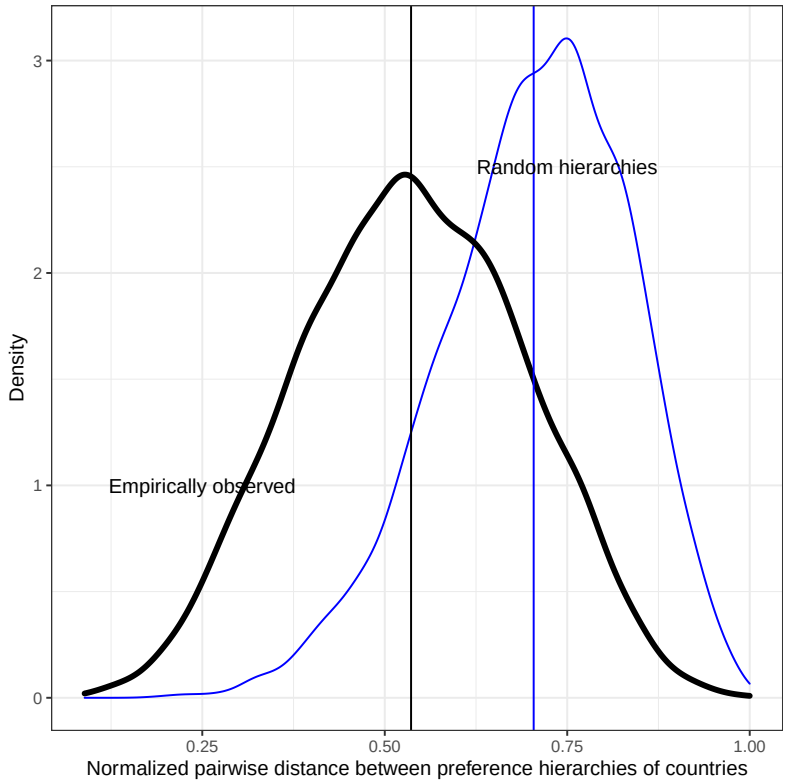
Source: GCD data. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable is the share of the population in each country that consumes a particular good or service (p_i^c)
The average price of good from the ICP 2011 is normalized on a country level and is used to weight p_i^c.

Figure 13: Stability of preference hierarchies across countries



Note: Rows and columns of the matrix represent expenditure categories in the increasing order of average cross-countries elasticity. A matrix element $\{i, j\}$ is the percentage of cases across all countries when expenditure category i and j are reported and expenditure category j has elasticity higher(or equal) than category i, $e_j^c \geq e_i^c$. Cells are shaded according to these values, where a dark shading reflects large values.

Figure 14: Distribution of normalized countries' pairwise distance between hierarchies, empirical *vs* randomly generated



Note: The distance is normalized to the (0,1) interval by dividing over the maximum. The black line shows the distribution of the pairwise distance between national expenditure hierarchies. The blue line shows the distribution of the distance between randomly generated hierarchies. The vertical lines show the average value of each distribution. Country pairs that are geographically close to each other (e.g. India and Nepal, Malawi and Uganda) have similar expenditure hierarchies and are located on the left of the distribution. Countries with very different expenditure hierarchies on the right of the distribution include Rwanda and Latvia, Togo and Romania

Table 9: Determinants of differences between preference hierarchies across countries

Dependent variable: Logarithm of the distance between preference hierarchies of a pair of countries, $log(d(c_i, c_j))$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log GDP difference	0.0716***	0.0900***	0.0909***	0.0885***	0.0819***	0.110***	0.110***	0.0782***
	(0.00776)	(0.0178)	(0.0181)	(0.0177)	(0.0176)	(0.0153)	(0.0149)	(0.0191)
log inequality difference	0.0135***	0.00285	0.00253	0.00303	0.000747	0.0310***	0.0220**	-0.00221
	(0.00485)	(0.0126)	(0.0126)	(0.0125)	(0.0124)	(0.00952)	(0.00944)	(0.0124)
log GDP difference x log inequality difference	-0.00162***	-0.000617	-0.000594	-0.000650	-0.000331	-0.00325***	-0.00225*	0.000256
	(0.000615)	(0.00157)	(0.00157)	(0.00156)	(0.00154)	(0.00118)	(0.00117)	(0.00157)
Urbanization rate difference	0.0986**	0.0154	0.0145	0.0187	-0.0550	0.248***	0.135*	-0.000381
	(0.0448)	(0.113)	(0.112)	(0.112)	(0.109)	(0.0829)	(0.0813)	(0.119)
log Population difference	0.0118**	0.0500***	0.0487***	0.0484***	0.0482***	0.0142	0.00807	0.0601***
	(0.00506)	(0.0148)	(0.0152)	(0.0150)	(0.0149)	(0.00992)	(0.00896)	(0.0163)
log Size difference	-0.00275	-0.00489	-0.00476	-0.00470	-0.00576	0.00484	0.00164	-0.00656
	(0.00434)	(0.0114)	(0.0113)	(0.0114)	(0.0115)	(0.00858)	(0.00853)	(0.0131)
log Geographical distance	0.0637***	0.0270	0.0264	0.0206	0.0176	0.0742***	0.106***	0.00188
	(0.00818)	(0.0190)	(0.0188)	(0.0193)	(0.0189)	(0.0166)	(0.0165)	(0.0255)
Historical differences:								
Common official language	-0.0392**							
	(0.0196)							
Common colonizer	-0.0670***							
	(0.0195)							
Political Fragmentation	-0.224*							
	(0.121)							
Differences in Hofstede's cultural dimensions:								
power distance index		-0.131						-0.0854
		(0.173)						(0.214)
individualism index			-0.0676					-0.0162
			(0.133)					(0.157)
person-orientation index				0.241				0.166
				(0.232)				(0.263)
uncertainty avoidance index					0.416***			0.383**
					(0.147)			(0.164)
long term orientation index						0.158***		0.177*
						(0.0551)		(0.0950)
indulgence index							-0.0709	-0.0674
							(0.0528)	(0.0785)
Observations	2,830	433	433	433	433	981	982	376
R^2	0.454	0.570	0.570	0.572	0.582	0.518	0.512	0.580

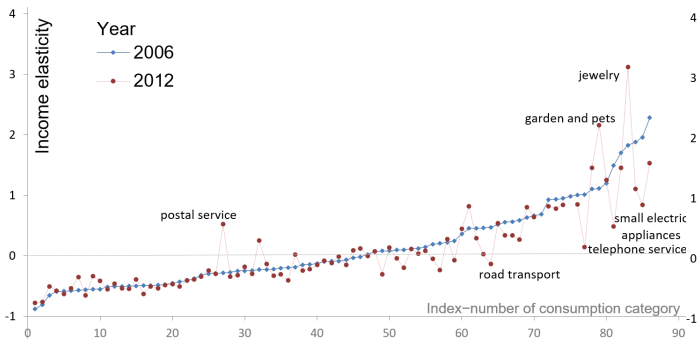
Fixed effects of countries included.

Robust standard errors in parentheses

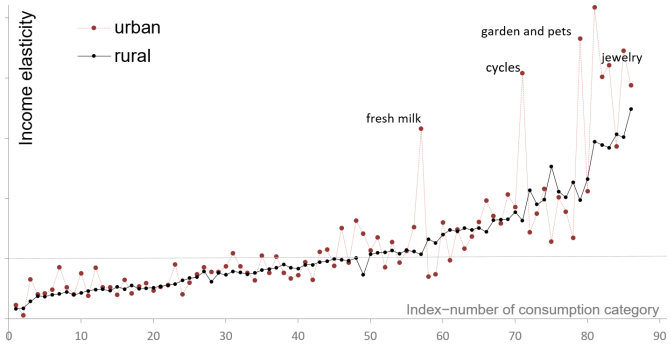
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 15: Stability of income elasticities over time and space in Sri Lanka

(a) *changes between 2006 and 2012*



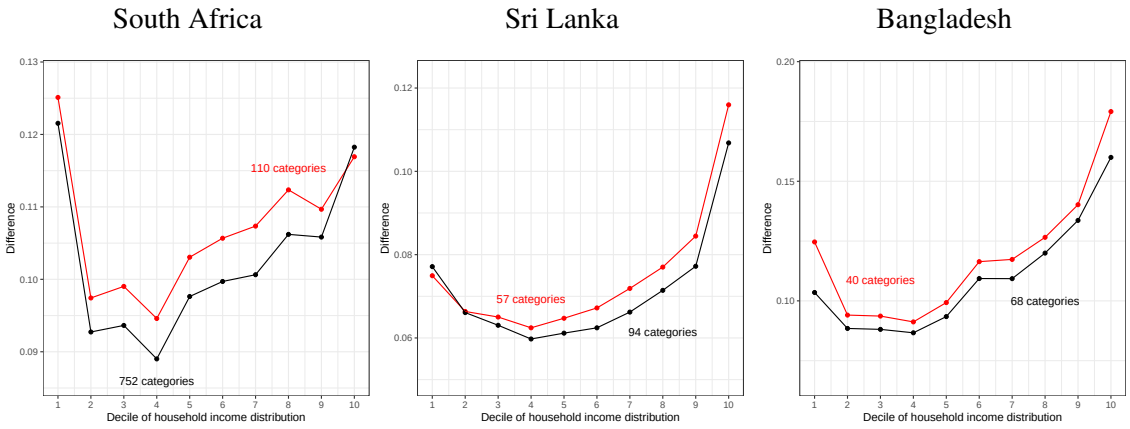
(b) *urban and rural households, 2006*



Note: The data is sourced from the 2006 and 2012 Sri Lankan household expenditure survey. In both charts, goods are ranked based on the average values of income elasticity in Sri Lanka in 2006. Over the following six years, most goods experienced minor changes in income elasticities. The income elasticity for some goods, such as jewelry, books, and telephone services did jump signficantly (as left figure). Regarding urban-rural differences (see right figure), we observe relatively income elasticities across urban (red line) and rural areas (blue line). Interestingly, certain goods exhibit higher elasticities for urban households compared to rural households, such as gardens and pets and jewelery). The weighted average change in elasticity over time and space in both cases is less than 1 per cent (weighted by the average budget shares at the country level).

Figure 16: Robustness tests for estimated differences between the diversity of spending on the aggregate level (D_a) and the household level (D_{hh}).

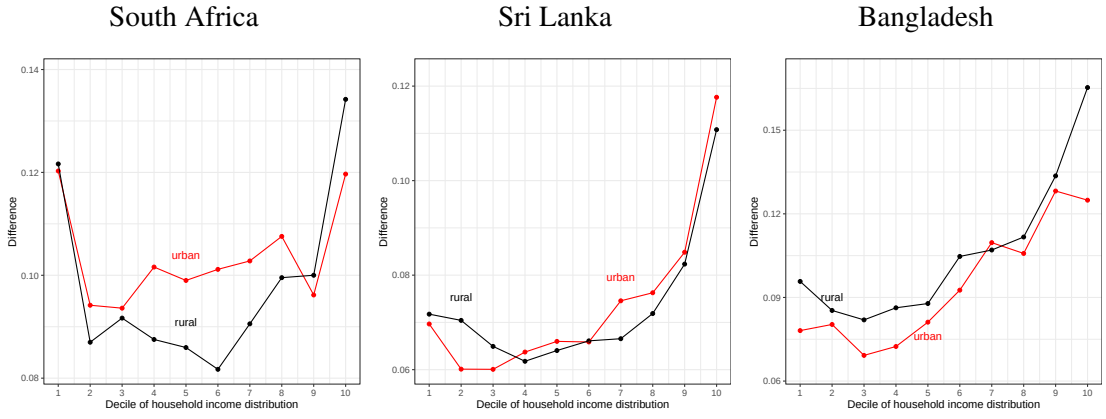
(a) Aggregating Expenditure categories



Note: The number of expenditure categories varies across countries. South Africa has 752 expenditure categories, Sri Lanka has 94 and Bangladesh has 68. To check the robustness of results we vary the number of expenditure categories in each country. The Figure shows that differences between spending diversity (D_a) and the household level (D_{hh}) grow as income rises, irrespective of change to the number of expenditure categories used. For South Africa, expenditure categories were aggregated from a 8-digit classification of COICOP consumption categories to a 4-digit classification. In Sri Lanka and Bangladesh, food was aggregated into a single category. The same process was used for medical and transport servces. This reduced the number of expenditure categories by 40 per cent. These reductions of categories do not have an impact on shapes of observed patterns.

Source: see Data section for details.

(b) Difference between urban and rural areas



Note: This Figure examines shows that differences between spending diversity (D_a) and the household level (D_{hh}) grow as income rises, across both urban and rural population. In South Africa the share of the urban population is 64%, in Sri Lanka it is 24%, in Bangladesh it is 9%.

Source: See Data section for details.