Searching for the 'poor' and 'middle class' in Malaysia

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Summary

- Current approaches to classifying the poor or the middle class through income or expenditure patterns utilize a predetermined standard of living to arrive at demarcation lines in the household income distribution, either in absolute or relative terms.

- This paper presents an alternative by developing an Expenditure-Space model to generate demarcations based on actual expenditure patterns. Our prognosis is that the relatedness of products consumed reveals household classifications from 'poor' to 'middle/aspirational' class through their revealed preferences.

- By characterizing expenditure from 'common' to 'complex' items and leveraging path dependence, we trace households' consumption growth from necessities to complex goods and services.

- Applying this model to Malaysia, we find significant deviations from existing policy classifications—Bottom 40 (B40), Middle 40 (M40), and Top 20 (T20). Our findings propose new demarcations: B20, M50, and T30, with only the T30 group reflecting the middle class's standard of living.

1. Introduction

Creating a robust middle-class has long been a priority for governments due to their pivotal role in driving economic development[1]. A strong middle-class can shift aggregate demand from basic to high-end goods and services, and contributing significantly to poverty reduction[2]. In addition to personal utility, the presence of a strong and growing middle-class underpins strong demand, entrepreneurial activity and innovation, laying the foundation for sustained economic growth[3]. Politically, the creation of a middle class can enhance perceptions of upward social mobility, offering hope to those in poverty.

Developing countries grapple with the dual challenge of crafting policies to create and nurture the middle class, while eradicating absolute poverty. In Malaysia, though policies for supporting the poor are generally developed at the local level to account for the heterogeneity of prevailing circumstances, the allocation of funding for these initiatives would necessitate ballpark figures to be estimated and administered at the national/federal level[4]. Hence, the accurate classification of households into poor or middle-class categories is crucial for effective government planning and resource allocation.

This paper introduces an innovative Expenditure-Space model, following Hausmann and Klinger (2006), Hidalgo et al. (2007), and Hidalgo and Hausmann (2009). The model is designed to generate demarcations based on actual expenditure patterns, revealing the underlying structure of household expenditure, from basic needs to complex goods and services. By applying this model to Malaysia, we identify significant deviations from the existing Bottom 40 (B40), Middle 40 (M40), and Top 20 (T20) classifications, thus offering a new perspective on economic stratification.

The objective of this paper is to apply the Expenditure-Space model to the context of Malaysia, critically examining the existing B40, M40 and T20 classifications, and proposing new demarcations based on our findings. Our analysis reveals that the current classification does not accurately represent true economic stratification of Malaysian households.

This paper is structured as follows: Section 2 provides a literature review on the traditional approaches to household classification and the importance of a robust middle class. Section 3 details the methodology of the Expenditure-Space model, including data sources and analytical techniques. Section 4 presents the findings from the application of the model to Malaysian households, highlighting the differences between our proposed demarcations and the existing classifications. Finally, section 5 discusses the policy implications of our findings and suggests avenues for future work in this area.

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[1] Easterly (2001)

[2] Acemoglu and Zilibotti (1997); Murphy, Shleifer, and Vishny (1989); Doepke and Zilibotti (2005); Ravallion (2009)

[3] Erickson and Ettlinger (2013)

[4] EPU (Various years)

2. Literature Review: Understanding the Demarcations of Households – Between Lines and Meanings

2.1. The measurement of the poor and the middle class: Lines

The notion that society can be classified into working, middle, and upper classes stems from the history of social thought, more specifically, European history, where questions of social hierarchy have been central to their political history Himmelfarb (1987). For example, the distinction between the bourgeois/ ruling class and the proletariat/ working class sought to emphasize not only economic disparities but social status. These social barriers were seen as 'rigid' and could not be transcended easily even if one possessed the financial means. Pedigree, more so than economics, determines one's standing in society. These cultural and historical vocabularies underpin discussions about class in Western societies.

Economists, on the other hand, depict class structure based on analyses of the least and most well-off members of society through the lens of the households' incomes and expenditure patterns, where income, expenditure, or the combination of both can signify material well-being. However, this approach is only indicative of the larger societal class conditions, which warrants further investigations through other means of inquiry or fields (namely sociological and anthropological). In this frame, the determination of the economically poor, middle-class or high-income is typically deduced within absolute and relative approaches.

During his 1972 and 1973 addresses to the World Bank's Board of Governors, the former president of the World Bank—Robert McNamara—brought up the plight of the B40[5], a group of households at the bottom of the income distribution that is living at absolute poverty "degraded by disease, illiteracy, malnutrition, and squalor"[6]. In World Bank and the International Monetary Fund's (IMF) joint Global Monitoring Report 2015/16, the B40 group was reviewed to measure its progress in achieving the United Nation's Millennium Development Goals (MDGs). This report identified the B40 as a non-static subgroup, with varied composition between countries. The statement is significant as it highlights the successes in assisting those in need, as the B40 previously encompassed only those living in absolute poverty[7]. To prove this, the report grouped the wealthiest person in each country's B40—the 40th percentile person—by their economic status. The 40th percentile persons in Brunei and Singapore are considered middle class and rich (earning more than $10 per day); vulnerable (earning between $4 and $10 per day) in Malaysia and Thailand; and moderate poor in Cambodia, Indonesia, Laos, the Philippines, and Vietnam.

Absolute approaches to household well-being rest on fundamental assumptions about what constitutes a basic standard of living. Historically, these methods are contingent on the Food Energy Intake (FEI) approach[8], and the Cost of Basic Needs (CBN)[9]. Central to these methodologies is the Poverty Line Index (PLI), an example of the CBN approach. The PLI estimates

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[5] According to Anand (1977), Robert McNamara popularized B40 in his 1972 address.

[6] McNamara (1973) pages 6 to 7

[7] World Bank's definition of the B40 now includes developed countries.

[8] Dandekar and Rath (1971)

[9] Ravallion (1994); (1998); Ravallion and Sen (1996)

the minimum income required per individual in a household to meet a predefined standard of living, which is often delineated by the food poverty line — a basket of food consumption indicative of basic nutritional needs. This is typically augmented by a non-food poverty line, accounting for an essential non-food consumption bundle. Together, they represent a composite view of the necessities for maintaining a minimum acceptable quality of life. These methodologies, particularly the PLI, aim to quantify the absolute essentials of survival and well-being, providing a clear benchmark to measure poverty.

In complementing traditional income-based class analyses, Alkire & Foster (2011) proposed the Multidimensional Poverty Index (MPI). The MPI identifies households as poor when they experience deprivations in multiple dimensions - covering areas such as health, education, and living standards. The approach captures the multi-faceted nature of poverty by examining a range of indicators within these broad dimensions, thus providing a more qualitative assessment of poverty than income-based measures alone.

Banerjee & Duflo (2008) characterizes the middle class as those who earn between USD 2-10 per day on the basis that they do not fall under the World Bank's Poverty Line Income (PLI) threshold while not being wealthy at the same time. They also suggest that the middle class is in relatively secure salaried jobs and can spend on amongst others, education and health. Kharas (2010) defines the developing world's middle class as those who earn between USD10-100 per day at 2005 Purchasing Power Parity (PPP). Others developed absolute approaches that could be compared to other countries, for example Milanovic & Yitzhaki (2002) defines it as the group of households whose income distributions are between the mean incomes of Brazil and Italy.

In contrast, the relative approach establishes demarcations within the middle range of the income distribution. For example, Thurow (1987) demarcates the middle-class within 75% to 125% of the median household income. Easterly (2001) demarcates it at the 20th to 80th percentile whereas Palma (2006) puts it at the 60th to 90th percentile. The Organisation for Economic Co-operation and Development (OECD) economic surveys suggest that for the more affluent countries where absolute poverty has been eradicated, measurements should consider the prevalence of relative poverty[10]. Relative poverty refers to those earning 60% less than the median national income. This indicator simply means comparing the living standards of the less well-off relative to the standard of living of the majority in each country.

2.2. The measurement of the poor and the middle class: Meanings

Some scholars advocate for a more detailed understanding of social class by incorporating assets, moving beyond indications premised on income and expenditure only. For example, Heilbroner and Thurow (1998) divided American households into five equal groups. The bottom 20% (group 1) households are the most socially and economically vulnerable in society. The next 40% (groups 2 and 3) would normally be the working class. In this context, the working class possess assets that do not generate any returns. Invariably, the assets owned are modest; homes and cars equivalent to the "net value". Th[11]ese 'assets' do not contribute towards generating more income

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or wealth. The next 20% (group 4) would be the middle class. This is when assets can generate incomes or returns. The idea of having money for leisure comes into play. The remaining top 20% (group 5) is the so-called upper class. This is when households do not just generate wealth through their income but also from assets, for example, investments in stocks and real estate.

Asset indices have been utilized in the African context for 37 countries[12] in absolute terms as complementing the trajectories of defining the classifications. Burger & McAravey (2014) combined the sociological approach (class attached to work categories – Nzimande (1990); Southall (2004) with the asset-based method for their analysis in South Africa. But here they have included a behavioural construct of 'empowerment' by drawing upon Sen's (1989) theory of capabilities. In this sense, behavioural characteristics of the middle class emerged in the discussion.

Empowerment is derived from a combination of material assets (e.g. stove and refrigerator), essential services (e.g. electricity, water and sanitation), access to media information, being employed or living in a household with an employed member and having at least 7 years of education[13]. The 'material assets' here differ from assets that generate more income as Heilbroner and Thurow (1998) constructed, where the former acts as proxies for empowerment in a developing country where such items would be deemed basic necessities in more developed economies. This highlights the importance of contextual analysis within consumption patterns as not all countries have similar economic development and well-being levels.

Jayadev et al. (2015) and Currid-Halkett (2017) denote the middle class by their aspirational traits in consumption. The aspirational class demonstrates the capabilities to insulate themselves from adverse risk events (e.g. buying insurance), to outsource tasks (e.g. domestic servants, security services and the like)-freeing time to perform other leisure functions and possessing the commodities that signal 'class' and a sense of exclusivity.

3. Methodology

3.1. Data

The study utilises the Household Income & Basic Amenities Survey (HIS/BA) 2014 and Household Expenditure Survey (HES) at the 6-digit Classification of Individual Consumption by Purpose (COICOP) aggregation level, for the year 2014 (HIES 2014) published by the Department of Statistics, Malaysia (DOSM). DOSM's survey consists of a sample size of 48,697 households selected through two-stage stratified survey design; the first is at the level of the 13 states and 3 Federal Territories in Malaysia, and the second for the urban and rural strata within each state. Post-stratification weights were applied to ensure the sample was representative at both stratification levels.

The 2014 datasets were used as the pilot testbed for our new methodology. We then replicated the same methodology on similar datasets compiled by DOSM for the years 2009, 2016, 2019,

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[12] Shimeles and Ncube (2016)

[13] Ibid., 10

albeit at a higher 4-digit aggregation level. This was done to test the model's veracity through 4 datasets from 2009-2019.

3.2. Methodology

Households in the income distribution were lined-up from the lowest 'poor' to the highest 'rich' income (HIES 2014, DOSM). A parallel line-up is warranted for expenditure at the national level. In order to characterize expenditure from 'common' to 'complex' consumption items, we draw upon the product space methodology of Hausmann and Klinger (2006), Hidalgo et al. (2007), and Hidalgo and Hausmann (2009). The principle of relatedness as developed by these authors in the analysis of international trade has been applied in several fields as a tool for understanding a variety of phenomena such as knowledge diffusion[14], industry agglomeration[15], research patents[16] and survival of pioneering firms[17].

It was further elaborated by Hidalgo et al. (2018) that the high level of reproducibility for different economic activities, institutional contexts and spatial scales illustrates the empirical strength of the method. The underlying assumption behind the use of relatedness is path dependence. The prognosis is that we can utilize path dependence to uncover the 'growth trajectory' of households from consuming necessities (which are 'common' goods and services consumed by households of all incomes), to more 'complex' consumption items (consumed only by selected households). We proposed that many of the 'complex' items satisfy the criterion of middle-class consumption based on the literature in the previous section.

Following the 'product-space' methodology by Hidalgo et al. (2007), we produce the 'Expenditure-space' by generating a bi-partite Household – Product matrix using the definition of Revealed Comparative Advantage (RCA) introduced by Balassa (1965).

The mathematical definition of RCA takes on the functional form of a concentration ratio. For instance, let $X_{h,p}$ be defined by the expenditure of household h, in product p. Then RCA is formally defined as follows:

$$RCA_{h,p} = \frac{r}{R} = \frac{X_{h,p} \big/ \sum_h X_{h,p}}{\sum_p X_{h,p} \big/ \sum_{h,p} X_{h,p}}$$

In the context of household expenditure,

> **r** = household h's share of expenditure on product p relative to the household's total expenditure.

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[14] Todo, Matous, and Inoue (2016)

[15] Jara-Figueroa et al. (2018)

[16] Guevara et al. (2016)

[17] Muneepeerakul et al. (2013)

R = ratio of Malaysia's total expenditure on product p relative to Malaysia's total expenditure

For example, say that a certain 'poor' household spends RM800 a month. RM360 is spent on food ($r = \frac{360}{800} = 0.45$). Let's further hypothesise that Malaysian households spend a total of RM20 mil on food and that total Malaysian household expenditure stands at RM200 mil ($R = \frac{20}{200} = 0.1$). RCA for the expenditure of food in this household would be ($R = \frac{0.45}{0.1} = 4.5$) which means that this 'poor' household spends 4.5 times more in relation to the Malaysian household fair share on food, indicating a relatively higher degree of concentration in food expenditure.

RCA is subsequently used to generate the bi-partite Household – Product matrix:

$$M_{H,P} = \begin{bmatrix} \cdot & \cdot & \cdots \\ \cdot & \vdots & \cdots \\ \vdots & \vdots & \ddots \end{bmatrix}$$

Where $M_{H,P}$ is a discrete variable with two states, $M_{H,P} \in \{0,1\}$.

$$M_{H,P} = \begin{cases} 1, & RCA_{H,P} \geq 1 \\ 0, & otherwise \end{cases}$$

Matrix $M_{H,P}$ is employed to compute, for all i^th – j^th product pairs, a proximity value defined as follows:

$$\phi_{ij} = \min\{P(RCA_i | RCA_j) | P(RCA_j | RCA_i)\}$$

More precisely:

$$\phi_{i,j} = \min \left\{ \frac{\sum_H M_{H,i} M_{H,j}}{\sum_H M_{H,i}} \Big| \frac{\sum_H M_{H,i} M_{H,j}}{\sum_H M_{H,j}} \right\}$$

To illustrate the mathematical functions, consider the following toy example with six households, each with different expenditure concentrations on bread, coffee and toasters. The proximity between coffee and toasters ($\phi_{coffee,toasters}$) is calculated as an example:

$$\phi_{coffee,\, toaster}$$
$$= min\left\{\frac{1}{4} \middle| \frac{1}{2}\right\}$$
$$= 0.25$$
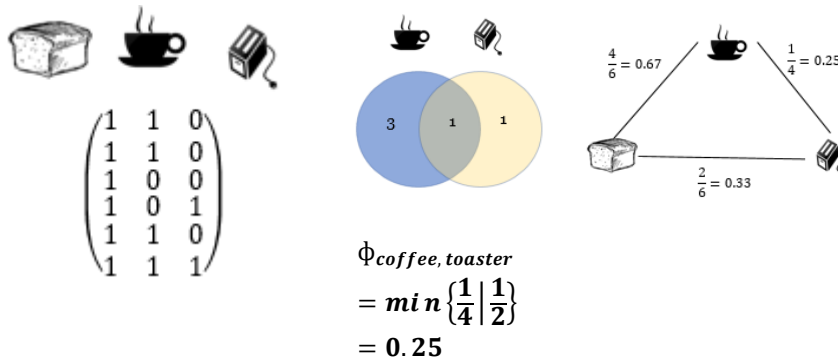
ϕ_{ij} computes the minimum of two probabilities for a symmetric matrix. This is done to ensure a symmetric adjacency matrix and as a more stringent measure that minimises false positives. Essentially, the proximity function described above measures the extent to which products are related to one another. When products are co-consumed by households, information on product relatedness is codified in the proximity measure, and its structure described as the expenditure space.

Figure 1 below describes the distribution of edge weights, ϕ_{ij} , and their associated Expenditure Space network representation and adjacency matrices. It is noteworthy that the proximity values were quite skewed, with most being close to 0.

Figure 1: Scale Effects of varying φi,j

Network Representation					
Adjacency Matrix					
Threshold	0	0.017	0.10	0.20	0.50
#Products	1213	1195	604	341	44
Edges (%)	100%	37.28%	7.8%	2.83%	0.03%

To count a proximity value as 'relevant', we contrast matrix ϕ_{ij}, against a null model, in which co-consumption probabilities are wired at random. Figure 2 depicts the histogram of values obtained from the null model, against DOSM's 2014th HIES.

Figure 2: Histogram of log (ϕ_{ij})

| Null Model	2014ᵗʰ HIES
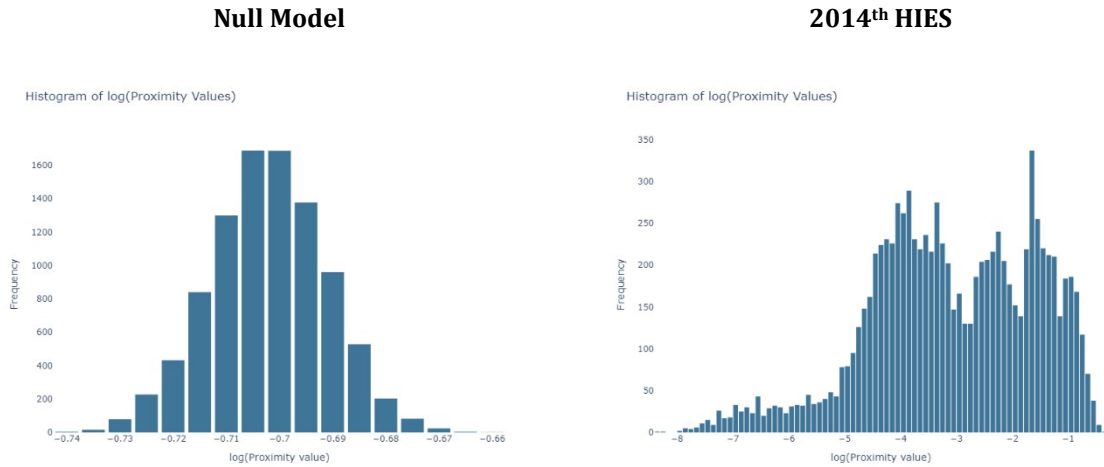
As anticipated, on one extreme, when co-consumption probabilities are totally random, the distribution of proximity values are normally distributed. On the other hand, when co-consumption probabilities are driven by the characteristics and functions of each good or service against one another, proximities exhibit a bi-modal structure[18].

We interpret bi-modality as a composition of both 'signal' and 'noise'. The former represents product relatedness as a result of household revealed preferences while the latter is an outcome of randomness, where most proximity values tend towards 0. Distinguishing 'signal' and 'noise' proves to be not so straightforward. To ensure that the Expenditure Space encapsulates 'signals', while minimizing noise, we first construct the backbone of the Expenditure Space using the Maximum Spanning Tree (MST) algorithm. MST is used to keep the entire network connected, in a way that preserves only the strongest link between product i and j. Subsequently, we combine the backbone with proximity values that are above the midpoint between the two modes in the histogram. On the one hand, MST ensures that all nodes are connected, while the midpoint threshold ensures that strong links are represented in the network.

Figure 4 describes the results of the trimming of $\phi_{i,j}$ in what is termed the 'Expenditure Space'. The Expenditure Space is a network representation that is comprised of 1,213 products contained in the classification of individual consumption by purpose (COICOP), and the relatedness measure – $\phi_{i,j}$ representing the degree to which two products are co-consumed.

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[18] Appendix A outlines the histogram of each year. Bi-modal structure is observed in each year.

Figure 3: The Expenditure Space
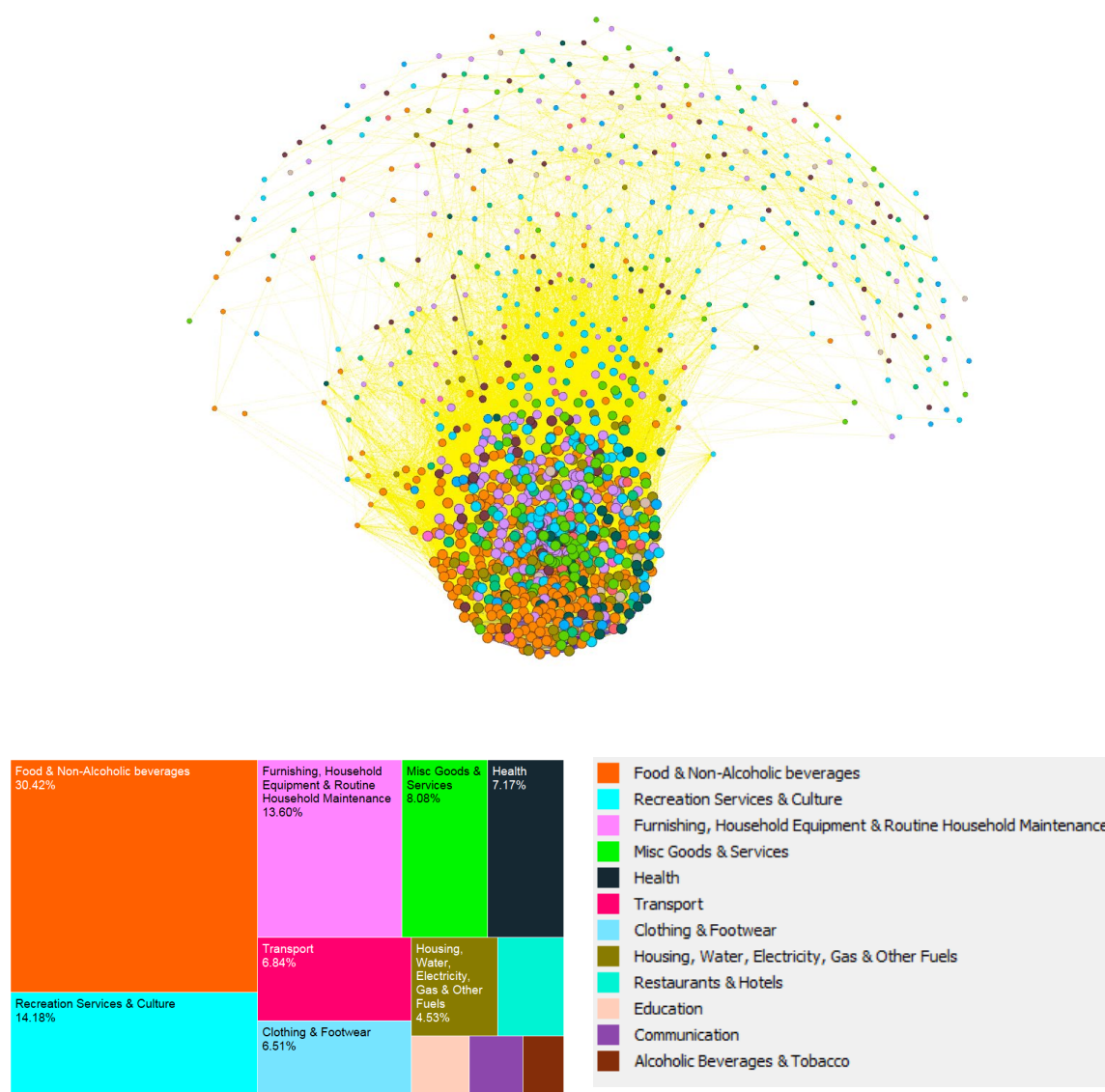
The expenditure space network is visualised using Fruchterman-Reingold Algorithm, a force-directed algorithm which applies a spring-like attractive force to attract pairs of nodes toward each other while simultaneously applying a repulsive force to ensure all nodes are separated. It can be seen that the expenditure space has organized itself into a clear core-periphery structure.

In line with the consumption of 'basic needs' for households, the core is composed mostly of food, housing and clothing items. The items in the core form strong relatedness with one another as illustrated in the top left of the matrix above. On the other end of the spectrum, goods and services which reflected more complex consumption characteristics are in the periphery of the network. These items form a relatively stronger relatedness with one another, while having weaker relatedness with those in the core.

3.3. Communities in the expenditure space

In the context of the expenditure space, a product is related to another product based on how they are co-consumed by households. Hence, the measure of how connected certain products are to one another, and how dense such connections are, is a representation of the varying expenditure patterns which commensurate to a certain level of standard of living. Community analysis is a method in network analysis to categorise and group nodes according to how they are structured in a network. The present COICOP classification represents a way to categorise products according to the individual purpose of consumption. Applying the methods of Blondel et al. (2008), we recategorize the 1,213 products according to their hierarchy of common to complex consumption as an emergent result of household revealed preferences.

Figure 4 below documents the mapping between the COICOP classification, and the bundles obtained from the community analysis.

Figure 4: COICOP – Community Analysis mapping
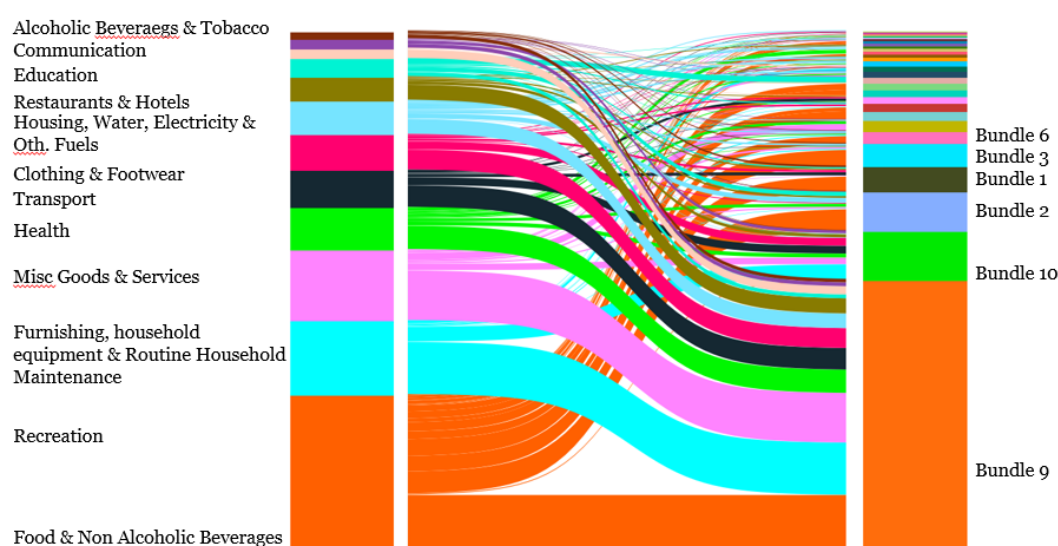
Community analysis provides 30 alternative bundles of goods and services. However, our analysis only focuses on the top 10 bundles which account for 1,056 goods and services, or 87% of the goods and services listed under the COICOP classification. For each bundle, the cumulative frequency distribution was computed to describe whether it is expenditure consumed at the bottom, middle or the top of household equivalised[19] income distribution.

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[19] Income equivalence scales were utilized based on the Working-Lesser model (Working (1943)) to incorporate the effects of resource sharing and economies of scale arising from varying household sizes. However, similar rankings were observed of households regardless of whether equivalence scales were derived from the Working-Lesser model (Hawati and Nur Aseken (2019)) or through the application of a square-root scale.

The remaining bundles represent consumption characteristics that are specific to certain household attributes, such as having children. These include expenses like schooling costs (e.g. school bus fares, stationery, exercise books, reference books), baby related items (e.g. baby garments, diapers, feeding bottles, talcum powder, toys) and personal care items (toothbrush, shaver, perfume, face powder, deodorant) amongst others.

After recategorizing goods and services into bundles according to the 'common' or basic needs to 'complex' or high-end consumption, the next step is to empirically examine the dynamics of household expenditure within the expenditure space. In order to continue with this step, households' income deciles are computed based on the equivalised income distribution. This means that inter-decile comparisons would have already adjusted for the effects of household size, composition and stratum.

Next, each product in the expenditure space is classified as being consumed (or not) by a certain decile based on RCA. Fundamentally, the exact same steps are taken as in the computation in RCA, the only difference being that Matrix $M_{H,P}$ is now aggregated by deciles to obtain:

$$M_{D,P} = \begin{bmatrix} \cdot & \cdot & \cdots \\ \cdot & \cdot & \cdots \\ \vdots & \vdots & \ddots \end{bmatrix}$$

$$M_{D,P} = \begin{cases} 1 \,, & RCA_{D,P} \geq 1 \\ 0 \,, & otherwise \end{cases}$$

To interpret this, product p is said to be a common feature of decile d if the decile consumes more than its fair share of the product. For example, say that in the matrix, a total of 2.7 million households consume instant coffee. There are 10 deciles by construction, and each decile has a theoretical fair-share value of 0.27 million. A decile is said to consume more than its fair share of instant coffee if there are more than 0.27 million households consuming instant coffee in that decile.

Essentially, this section seeks to unbundle the dynamics of expenditure and income to examine if there exist patterns of expenditure that allow for the identification of 'poorer' households versus the 'richer', and locating these households in the income distribution.

Figure 5: Dynamics of household expenditure, by equivalised income
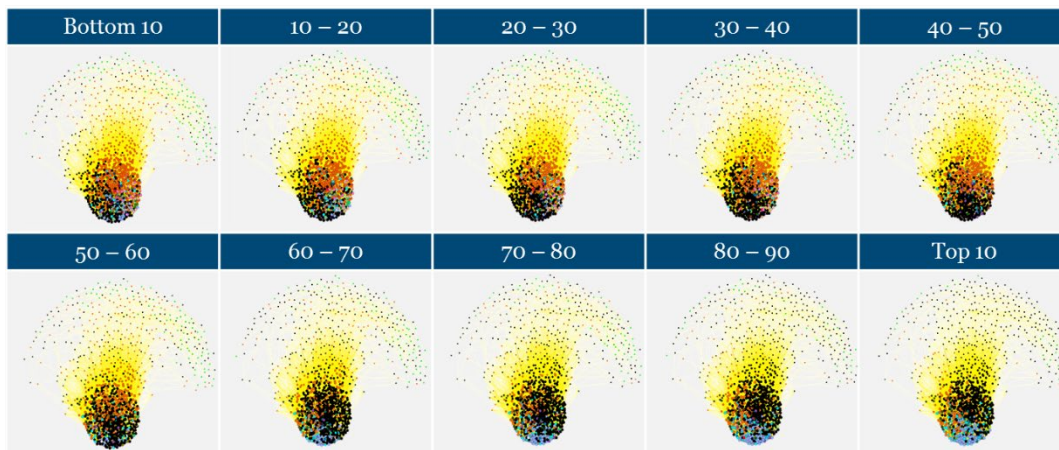
In Figure 5, each black-coloured node represents goods and services that are consumed in greater proportion than the population average, as explained above. The two main observations are as follows:

- The number of black nodes increases from decile 1 to 10; depicting a clear pattern of households spending on more items as income rises.
- The black nodes occupy different positions in the expenditure space from decile 1 to 10; meaning households are spending on more diverse set of goods and services as opposed to buying more of the same thing.

The diffusion steps in the earlier deciles (1st to 6th or 7th decile) tend to revolve around goods and services situated at the core section of the expenditure space. However, starting at the 7th decile, households begin to spend on most of the goods and services located both in the core and the peripheral regions of the expenditure space. This denotes the preliminary evidence that the aspirational income group is situated above the 7th or 8th decile. The results from Figure 5 provide a basis for differentiating goods and services along the lines of basic necessities versus more aspirational products. It describes which goods and services are consumed for basic needs and those of aspirational traits.

## 3.4. Finding the 'Lines'- Basic needs vs aspirational consumption

This section seeks to demonstrate an application of the Expenditure Space as a decision filter to generate various sets of demarcations based upon different standard of living that emerge from actual expenditure patterns. This section starts with coarse-graining matrix $M_{H,P}$, based on the product communities obtained from above. The result of which is a household- product community matrix, $M_{H,C}$ as described in Figure 6 below. Matrix $M_{H,C}$ is normalised and sorted by household equivalised income for ease of comparison.

Figure 6: Matrix $M_{H,C}$ (Normalised)
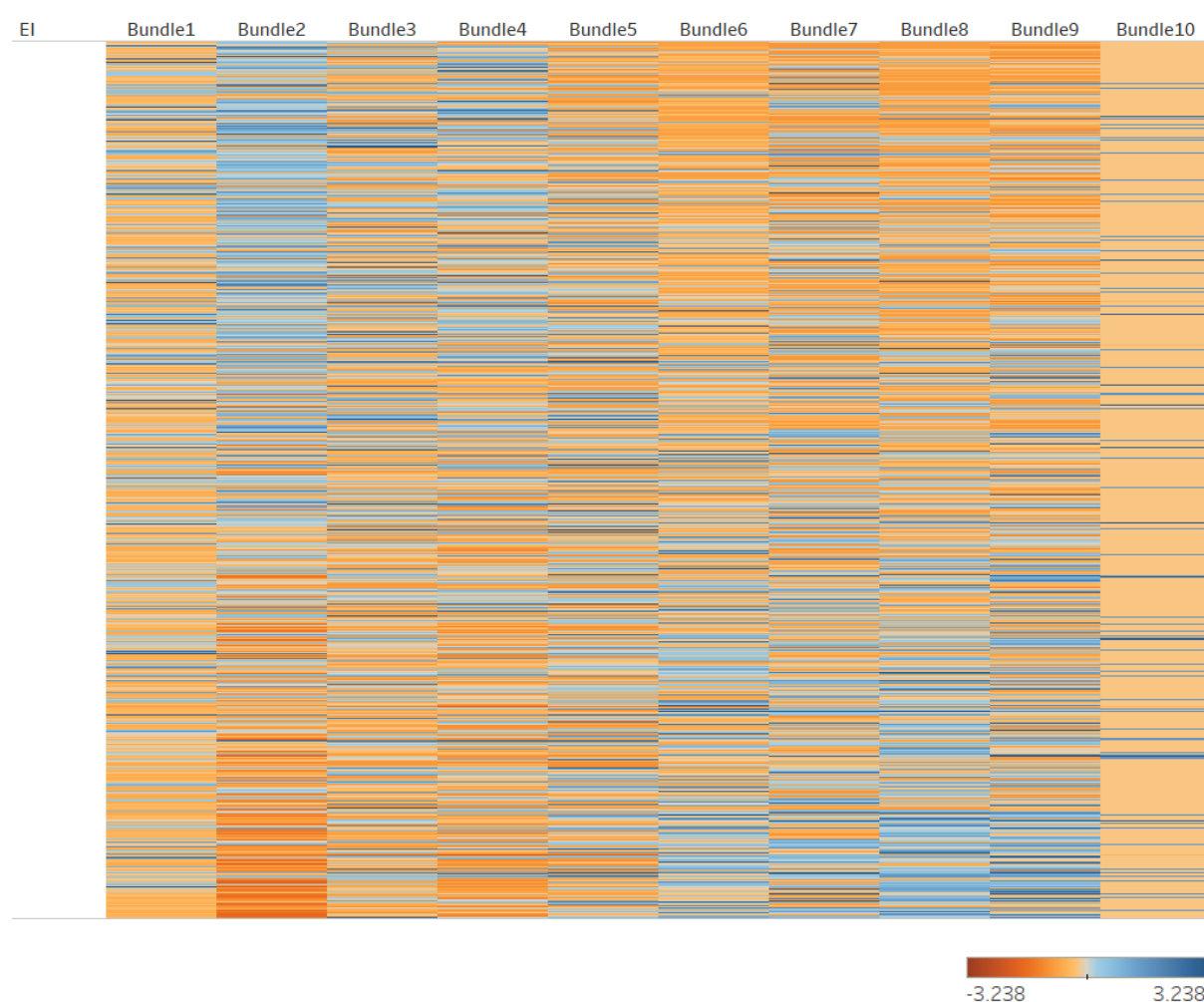
Households that reside in the lower deciles have higher concentration in Bundles 1 through 5 (Group 1), while households residing in higher deciles exhibit higher concentration in Bundles 8 through 10 (Group 3). These groups and bundles provide a basis for identifying which goods and services represent which aspect of household revealed preferences. For each item within each community, a box-whisker plot is constructed to describe the distribution of equivalised income between 5% to 95%. The box-whisker plot represents the distribution of equivalised income for households that purchase the said good or service. These boxplots provide income ranges at which households purchase these goods and services.

Figure 7: Boxplot ranges
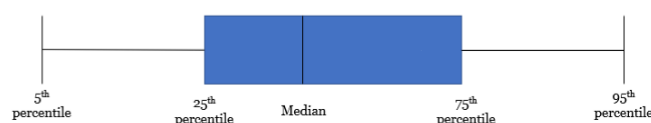
The figures below provide an overview of some of the distributions that exist in the network.

Group 1 – Bundles 1 and 2 – contain goods and services such as local rice (5% and 10% broken), *nasi lemak* rice dish, spinach, and prepaid mobile cards. Moreover, the cumulative frequency of this group indicates that these bundles represent goods and services that are purchased by households at the bottom. As households grow richer, these items no longer constitute a significant portion of household expenditure.

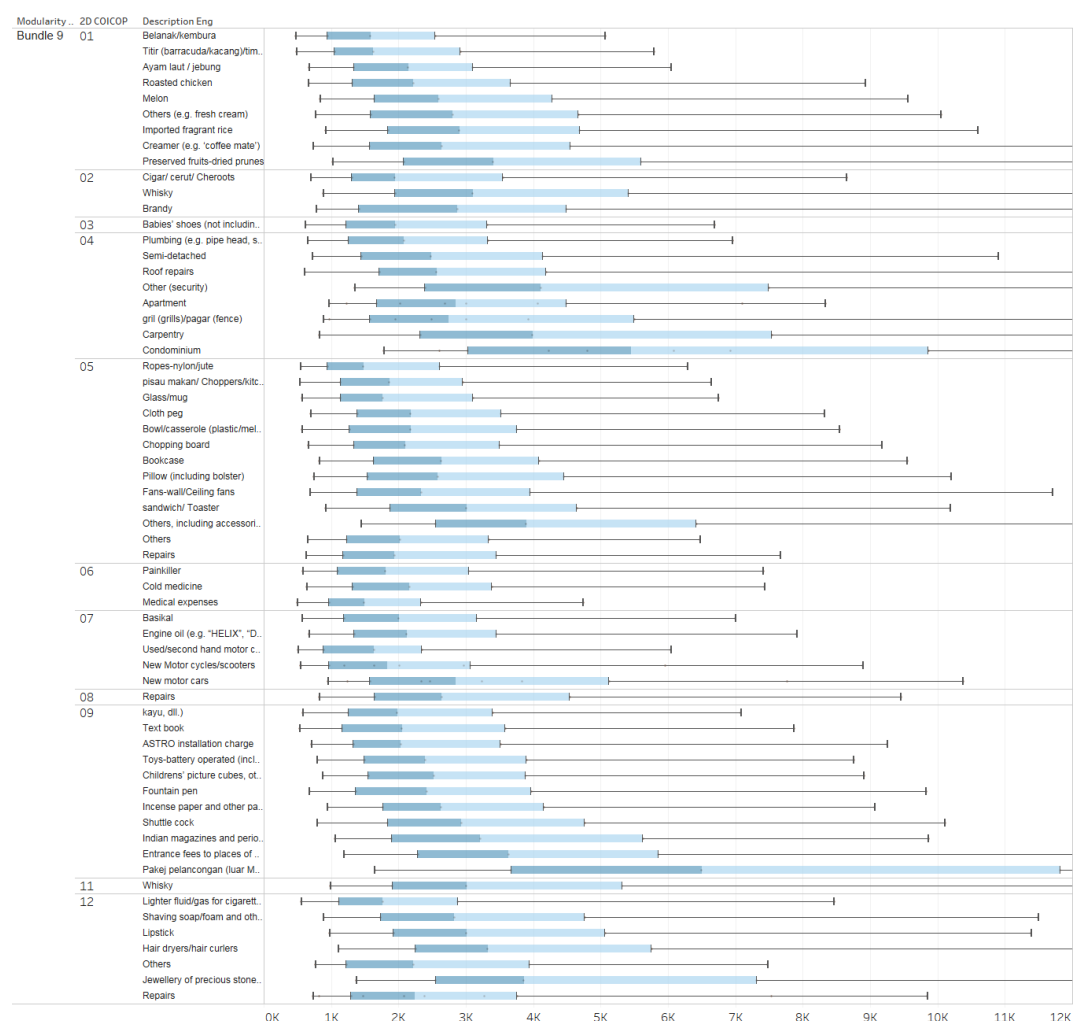**Bundle 1: Box-whisker plot of distribution of equivalised income**
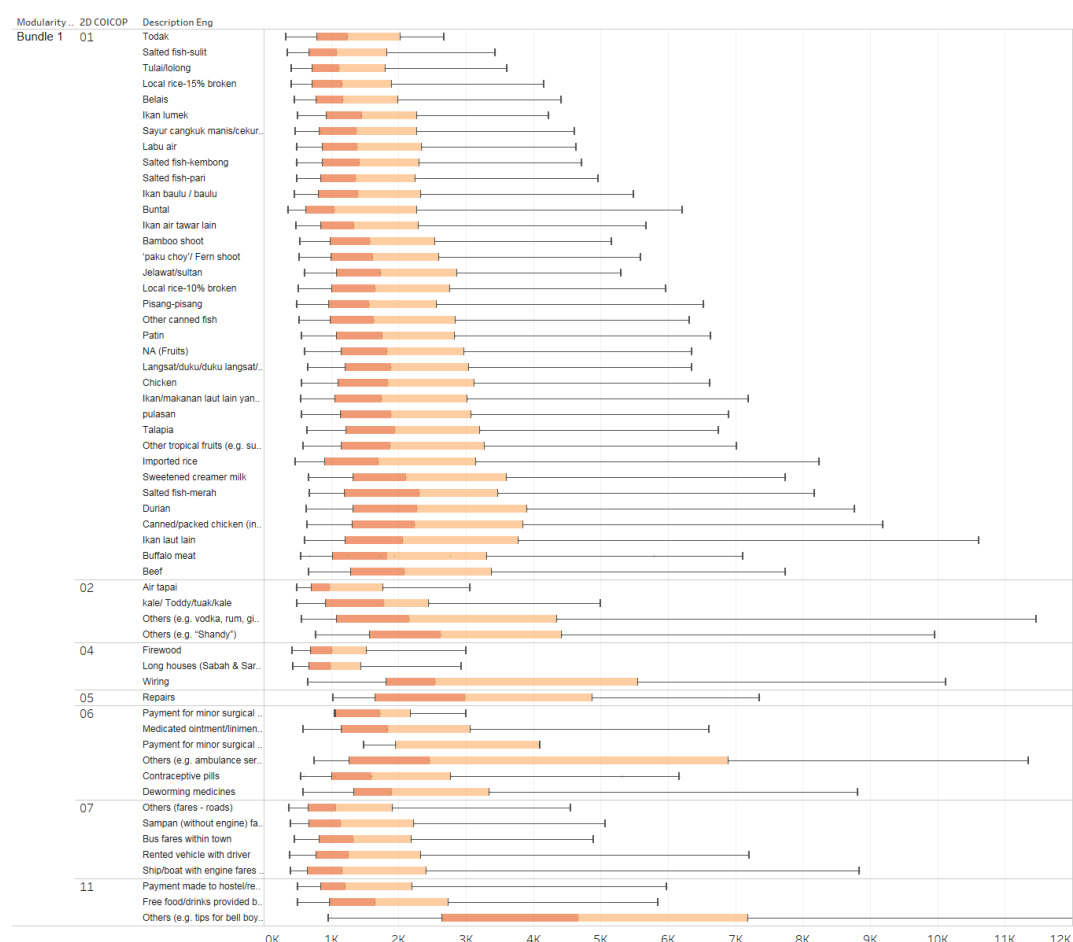
Group 1: Box-whisker plot of distribution of equivalised income

It is observed that Bundles 1 and 2 have median values for an equivalised income of RM1,720 to RM1,821. Taking the 1st quartile to the 3rd quartile, equivalised income values fall between RM1,061 to RM2,963, representing 50% of households who spend significantly on these products.

On the other hand, Group 2 – Bundles 9 and 10 – represent more aspirational products corresponding to known traits of the aspirational income group. These bundles are observed to be consumed more as households become richer.

Bundle 9: Box-whisker plot of distribution of equivalised income

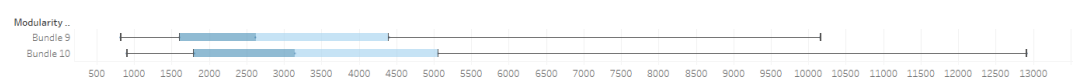**Group 2: Box-whisker plot of distribution of equivalised income**

It is observed that Bundles 9 and 10 have median values for equivalised incomes of RM2,623 and RM3,148 respectively. Taking the 1st quartile to the 3rd quartile, equivalised income values fall between RM1,608 to RM5,058, representing 50% of households who spend significantly on these products.

Since groups 1 and 2 represent the set of expenditure items that is consumed at the bottom and at the top of the income distribution, they define the lower and upper boundaries in the set of items which we consider in generating household demarcations.

Table 1: Definitions of living standards

Living Standards as reflected by Expenditure Patterns	Measure Definition
Households that satisfy basic needs	<u>**Contains only:**</u> Items in Group 1 Food, Clothing and Housing $M_{D,P} = 1$ for lower deciles AND $M_{D,P} = 0$ for upper deciles
Households that experience a spectrum of Tradeoffs/Wellbeing	<u>**Contains only:**</u> Items in Group 1 Non-Food, Non-Clothing and Non-Housing $M_{D,P} = 1$ for lower deciles AND $M_{D,P} = 0$ for upper deciles
Households that are Middle-class/Aspirational	<u>**Contains only:**</u> Items in Group 2 $M_{D,P} = 0$ for lower deciles AND $M_{D,P} = 1$ for upper deciles

The rationale behind Table 1's classifications is based on the observed expenditure patterns and the literature on household well-being. The classifications aim to capture the diversity in household consumption and its implications for living standards.

- **Households that Satisfy Basic Needs:** This category includes households that spend predominantly on essential items such as food, clothing, and housing. These items are fundamental for survival and indicate a household's focus on meeting basic needs. Higher than structural expenditure on these items suggests limited disposable income for other goods and services.
- **Households that Experience a Spectrum of Tradeoffs/Wellbeing:** This category captures households that have higher than structural expenditure on non-food, non-clothing, and non-housing items, which are still essential but still indicate a slightly higher standard of living. These households make trade-offs to afford a broader range of basic necessities, reflecting a transitionary phase in their economic status.
- **Households that are Middle-class/Aspirational:** This category includes households with diversified expenditures, indicating greater disposable income and the ability to spend on aspirational items. These households do not face the same constraints as those in the lower deciles, reflecting a higher standard of living and economic stability.

By using these classifications, we can better understand the expenditure patterns that signify different living standards and identify households that may require targeted policy interventions. The methodology provides a robust framework for analyzing household consumption and its implications for socio-economic stratification. A policymaker in a different country may adopt different parameterizations of $M_{D,P}$ depending on the results of their analysis and their choice of absolute definitions with regards to standard of living.

3.5. Case Study: Malaysia's Policy Context

In Malaysia, policies targeting the B40 group aim to uplift the economic status of the poorest 40% of households. However, the use of the B40 demarcation as a single relative indicator for poverty-focused policies can lead to issues such as too wide an eligibility criterion, resulting in inefficient use of federal funds, or too narrow a criterion if more than 40% of households fall below a certain standard of living. The Expenditure Space can be employed to investigate the differences between B40 households and non-B40 households.

Table 2: Definitions of living standards (with emphasis on B40)

Living Standards as reflected by Expenditure Patterns	Measure Definition
Households that satisfy basic needs	<u>**Contains only:**</u> Items in Group 1 Food, Clothing and Housing $M_{D,P} = 1$ for lower deciles AND $M_{D,P} = 0$ for upper deciles
Households that experience a spectrum of Tradeoffs/Wellbeing	<u>**Contains only:**</u> Items in Group 1 Non-Food, Non-Clothing and Non-Housing $M_{D,P} = 1$ for lower deciles AND $M_{D,P} = 0$ for upper deciles
Non B40 households	<u>**Contains only:**</u> $M_{D,P} = 0$ for B40 AND $M_{D,P} = 1$ starting at the 5th or 6th decile
Households that are Middle-class/Aspirational	<u>**Contains only:**</u> Items in Group 3 $M_{D,P} = 0$ for lower deciles AND $M_{D,P} = 1$ for upper deciles

Given the heavy use of the B40, M40, and T20 demarcations in Malaysia's policy context over the period of this study, it is essential to understand how these classifications align with actual expenditure patterns. The characteristic "households that experience a spectrum of trade-offs/wellbeing" is particularly relevant. Expenditure-wise, the non-B40, non-aspirational group consists of households that eat out more, send their children for tuition classes, and begin purchasing more household furniture. The non-B40, non-aspirational group, often referred to as the 'sandwich class,' experiences unique challenges and opportunities, necessitating tailored policy interventions.

Additionally, our analysis indicates that households in the Bottom 20% (B20) are distinct from other households in that they mostly only fulfil basic needs. By extension, our analysis also indicates that a typical household in the 30th percentile has more similarities with households in the 60th percentile than with households in the 10th percentile. Understanding the distribution of 'standard of living' allows for better planning of poverty-focused policies and social protection for households based on their different standards of living.

4. Discussion of Findings

In the Expenditure Space, nodes symbolise goods and services consumed by households, while the links indicate the degree of co-consumption between two goods or services. The size of a node corresponds to the extent of its connection with other nodes; larger nodes represent a higher number and stronger links with other nodes. The colour of the links signifies the relatedness between goods and services.

Additionally, we applied Community Analysis to examine the connections between various products (nodes) and the density of these connections. This analysis provides insights into the diverse standard of living among households that consume these products, identifying patterns ranging from basic needs to aspirational consumption among households. Community Analysis, derived from network science and graph theory, enables the clustering and categorization of specific nodes (representing goods and services) into groups based on their network configuration. The outcome of this analysis is reflected in clusters of goods and services each distinguished by node colours.

The Expenditure Space is structured in a well-defined core-periphery structure, a typical organization in network models. This structure exhibits two distinct characteristics:

- **Core -** This contains nodes that have numerous connections to other nodes within the network.
- **Periphery -** This refers to the region outside the core where nodes are generally less interconnected.

Notably, goods and services located in the core tend towards a higher average degree, as represented by the size of the nodes within the core. This suggests that they are co-consumed by a more substantial proportion of households. Jointly, these two traits (being in the core and having relatively larger average degrees) imply that these goods are purchased by most households, regardless of their income level or household size. This strongly indicates that these particular goods and services are essential or basic needs all households require.

The core of the Expenditure Space is primarily associated with the consumption of basic needs such as food, clothing and housing-related expenses. For example, food items like rice and bread, clothing items such as garments and footwear, and housing and utilities items such as rental and electricity bills fall into this core category. Table 3 shows the example of items from the community classes within the Core category.

Table 3: Example of items from the Core category community classes @ Basic needs consumption

Expenditure category	Examples of items
Food	Rice, eggs, fresh meat, fresh seafood, fresh vegetables, potatoes, spices, sugar, coffee, tea, cocoa, honey, bread, butter, milk and other dairy products, chocolates, and sweets
Clothing	Garments, clothing accessories, shoes and other footwear
Housing related expenses	Imputed rent/actual rental paid, utilities (gas, electricity, water supply), non-durable household goods
Transport	Petrol, passenger transport by road e.g. train, bus, taxi
Miscellaneous	Hairdressing and personal grooming

Note: Goods and services listed here is not exhaustive.

Conversely, goods and services in the periphery tend to display the opposite pattern. They are usually consumed by specific households, and their lower degree of interconnectedness suggests that they are non-essential items. These goods and services are more indicative of a "better well-being" or represent aspirational items due to their exclusivity.

The findings reveal that the periphery category primarily comprises goods and services mainly related to recreation, health, education and household equipment. For example, recreational services such as sports equipment and cultural items; health services including private healthcare services; education encompassing private and tertiary education; and the purchase of significant household equipment like washing machines and air-conditioners. Table 4 shows the example of items from the community classes within the Periphery category.

Table 4: Example of items from the Periphery category community classes @ Aspirational consumption

Expenditure category	Examples of items
Food/alcohol	Fresh milk, butter, sundry goods, wine, spirits and liquors, cigarettes, food away from home
Housing related expenses	Maintenance and repair of dwelling, carpets and floor coverings, furniture and furnishings, cooking appliances, air-conditioning, washing machines, refrigerators and freezers, household appliances, domestic services
Transport	Petrol, motor cars, motorcycles, maintenance of personal transport equipment
Health	Public and private healthcare services, medical products, dental services
Education	Secondary and tertiary education
Recreation, sports and culture	Sport equipment, cultural services, packaged tours, television, photography equipment, musical instruments, gardening items, pet related products, lottery
Miscellaneous	Jewellery, insurance, social protection

Note: Goods and services listed here is not exhaustive.

This community class exhibits the characteristics of aspirational consumption. It encompasses a diverse range of expenditure categories, primarily recreational spending, followed by acquiring various household equipment and healthcare services. Additionally, miscellaneous items such as jewellery and social protection expenses are notable within this community class. This pattern signifies consumption trends among households in the top income deciles, who possess the financial capacity to afford such goods and services.

Households falling within 'the middle' income range (Deciles 3 to 7) diversified their food consumption, expanding their range to include a wider variety of food items (e.g. preserved vegetables). Cigarettes and tobacco are notable expenses within this group. Moreover, they began allocating budgets for housing maintenance and acquiring a more extensive variety of household utensils, including carpet floorings, cooking appliances and household textiles.

Regarding health expenses, the transition to private healthcare, dental services, and pharmaceutical/medical products began to emerge from Decile 6 onwards, reflecting an increasing focus on health-related aspects. Their higher income supports this shift compared to lower income deciles. Additionally, starting from Decile 5, households reported purchasing motorcycles and cars for transportation.

On the other hand, households within the top 30% income bracket (Deciles 8 – 10) exhibited a diverse spending pattern throughout the decade, characterised by what can be termed "aspirational consumption". These households consistently desired higher-quality and often more luxurious goods and services, reflecting their greater economic capacity and preferences for an enhanced quality of life. Notably, their expenses on food decreased in dominance, while their spending on clothing remained relatively modest. These households favoured clothing cleaning services including laundry services and the rental of clothing items.

Housing-related expenditures also experienced an increase, with more funds allocated for maintenance and repair, reflecting the additional costs associated with homeownership. A substantial portion of their budget was dedicated to household equipment and utensils, including items like air conditioning, washing machines, furniture, furnishings, and the acquisition of domestic help services. Healthcare expenses among this group saw a noticeable increase, covering dental care, pharmaceutical/medical products, private healthcare, and paramedical services. Transportation expenses expanded to include motor vehicles, including the cost of repair and the use of flights, suggesting an ability to afford air travel.

Recreation-related expenditures are most prominent among the top 30% of income earners. This included entertainment, television, photography equipment and repair expenditures, musical instruments, sports gear, gardening, cultural activities, gambling, and packaged tours. The inclusion of packaged tours and flights in their spending habits indicates that these households had the financial means to enjoy vacations and travel extensively. Furthermore, educational expenses were notable, particularly in tertiary education. Dining out, miscellaneous items such as jewellery and watches, and investments in insurance and social protection also formed essential components of their expenditure profile, underscoring their commitment to a well-rounded and secure lifestyle.

The findings raise an important question on the validity of the current household demarcation of B40, M40 and T20 adopted by the government of Malaysia. Malaysia has consistently followed the World Bank's demarcation of B40/M40/T20 from the Ninth Malaysia Plan (9MP) to the Eleventh Malaysia Plan (11MP) for almost 15 years from 2006-2020. Most policies equate B40 to poor households and the M40 to middle-class households. These demarcations might not be as accurate since the groups of households within the allotted ranges do not possess similar characteristics of consumption.

Our findings show households in the Bottom 20% (B20) can only fulfil their basic needs. These households spend most of their money on food, housing and clothing. On the other hand, households who could purchase vast items in the Expenditure Space and demonstrate aspirational consumption or 'middle-class' consumption are concentrated in the Top 30% (T30) of the household population.

The consumption pattern of those between the B20 and the T30, what we can termed as the M50, appears to be relatively homogenous, and are still experiencing trade-offs in well-being and living standards. These households demonstrated minor differences such as some households could eat out, and some started to send their children for tuition classes or could spend more on household furniture. This middle M50 is not the middle class and is still vulnerable. Consequently, it would be more accurate to claim that only 30% of the total households are in the aspirational class rather than the original misconception of 60%.

4.1. The universality of the model

Previously, the cost of basic needs (CBN) approach (ILO 1976) measured absolute consumption poverty based on what people require to live. Subsequent, more sophisticated methods moved beyond the provision of specific goods and services to encapsulate broader social achievements such as nutrition and health, literacy and longevity[20]. Absolute measures such as these require the policymaker to define the 'acceptable' standard of living associated with 'basic needs' or the various dimensions of deprivations faced.

In complexity theory, one approach is to search for the best statistical fit with no clear deterministic solution but to follow the iterative processes that 'fit data'[21], and relying upon on-going literature on consumption of 'poor' and the 'middle-class' to find indicative meaning of expenditure patterns[22]. The Expenditure Space describe the extent of diversity in goods and services consumed in its entirety within the operational backdrop of government transfers and welfare services. A household's capacity (limited by income levels and the availability of products) to afford diverse and ubiquitous/exclusive goods and services is expressed as a function of 'well-being' or living standards. In this sense, our analysis looks at the diversity of products spent as well as developing a criterion on items purchased to live (basic needs) and for 'well-being' based on households' revealed preferences.

Most studies would utilize pre-determined signal items[23] to represent and analyse distinct consumption or expenditure patterns. Conversely, our method considers all household expenditure items and can generate different signal items, while locating it geographically and intertemporally, reflecting different sets of preferences bounded by location (the operating environment) and the time period (it is quick to capture 'trendy' signal items within a given time frame). In addition, the Expenditure Space can be used to measure the gap between actual expenditure patterns and predetermined poverty line estimates. It can detect the trade-offs made and spur more research into understanding consumption and expenditure patterns of the poor.

This method describes and captures the phenomenon of path dependency of items consumed (i.e. items that are co-consumed as incomes go higher) and the evolution of trade-offs between items (what are consumed less) concurrently. This dynamism of consumption cannot be captured through linear relationships or Engel curves.

It is important to caveat expenditure patterns are also contingent on the extent of government expenditure on welfare provisions in any given country. The expenditure for basic needs will be lower in countries where the provision of government services is extensive and sufficient to cover households' basic amenities. Examples would include universal healthcare, free formal education,

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[20] Alkire and Foster (2011)

[21] Colander (2009)

[22] We are cognisant of the difference between consumption and consumer expenditure Attanasio and Pistaferri (2016) and the limitations of utilising HES in deriving consumption patterns. Therefore, we have used the terms expenditure, purchase. Co-consume is only used in the context of modelling product-relatedness.

[23] As defined by Currid-Halkett (2017); signal items are items consumed to signify as belonging to a higher-ranked group (or class); or for upward social mobility

subsidised childcare and subsidised mass transportation systems. Households' expenditure will even be lower when targeted assistance is also given, for example, tax credits to families with children or shelter through public housing. The inclusion of government-led social programmes will have a positive impact on consumption expenditure, where basic needs of health services, education and shelter are no longer evident in the expenditure patterns of the poor.

5. Conclusions

This empirical study introduces a novel model, the Expenditure Space, to enhance our understanding of household demarcations by analysing actual expenditure patterns. By applying this model, we identified significant deviations from the existing traditional B40, M40, and T20 classifications used in Malaysia, revealing new insights into economic stratification.

Our findings indicate that the current demarcations may not accurately reflect the true consumption behaviours and living standards of households. Specifically, we found that households in the Bottom 20% (B20) primarily fulfill their basic needs, spending most of their income on food, housing, and clothing. In contrast, households in the Top 30% (T30) exhibit aspirational consumption patterns, spending on higher-quality and luxury goods and services. The middle 50% (M50) of households, often assumed to be the middle class, show relatively homogeneous consumption patterns, still experiencing trade-offs in well-being and living standards, indicating vulnerability rather than economic stability.

The Expenditure Space model's ability to map consumption patterns and identify core and peripheral goods and services provides a nuanced understanding of household economic behavior. This method captures the dynamic nature of consumption, highlighting path dependency and the evolution of trade-offs between items as incomes rise. Such insights are crucial for policymakers aiming to design targeted interventions that address the specific needs of different household groups.

Moreover, the universality of the Expenditure Space model allows it to be applied across different contexts, reflecting varying sets of preferences and consumption patterns. Future research should explore how the model can be augmented to include the role of household wealth and assets, particularly how assets generate income for the middle class, complementing expenditure studies to provide a comprehensive view of economic well-being.

In conclusion, our study underscores the importance of revisiting and refining household demarcations to better capture the realities of economic stratification. By adopting the Expenditure Space model, policymakers can gain a deeper understanding of household consumption behaviours, leading to more effective and equitable policy measures. Further studies integrating wealth and asset data will enhance our understanding of the economic landscape, ultimately contributing to more accurate and meaningful classifications of households.
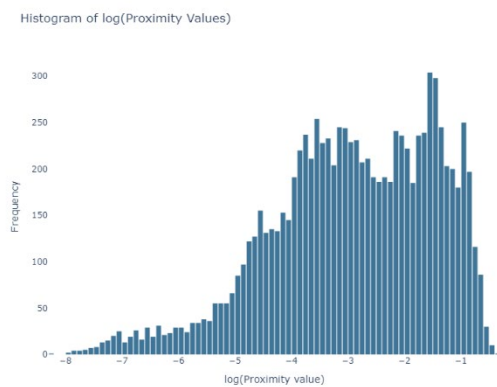
Appendix A: Histogram of $\log(\phi_{ij})$
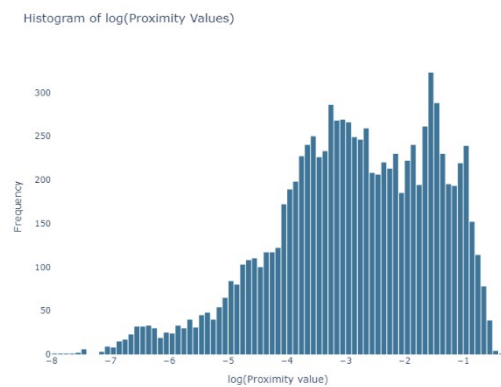
2009th HIS + HES
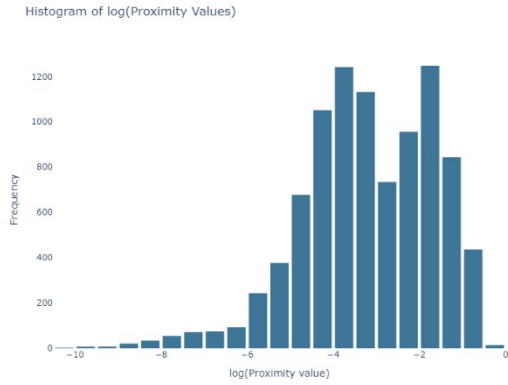
2014th HIES
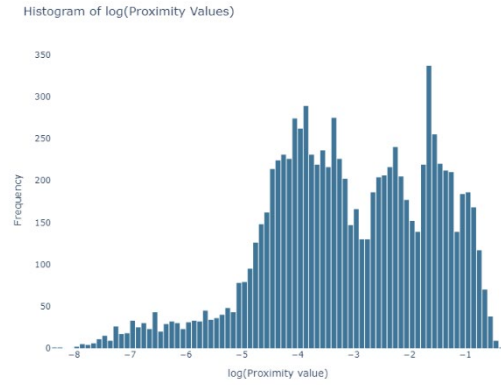
2016th HIES

2019th HIES

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