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Evaluating the Indonesian VAT Policy: Evidence from the Indonesian Household Surveys

Abstract

The VAT holds a significant role as the second largest contributor to Indonesia's tax revenue[1]. However, the government must pay attention not only to the tax revenue but also to good tax principles. The four ultimate tax collection principles are fairness, certainty, convenience, and efficiency (Smith, 1776). Fairness is the principle that will be the focus of the present analysis. A tax is considered fair and progressive or proportional when the tax payable is in line with the ability of taxpayers to pay. Unfortunately, the VAT system, as an indirect tax, does not enable the government to treat the taxpayers directly and differently. Therefore, in the VAT system, the most reliable way is to treat the commodities differently.

In achieving the fairness principle in the formulation of VAT, especially in giving appropriate VAT treatment on commodities, this thesis covers several issues on Indonesian Value Added Tax. Started from the evaluation of the regressivity of the VAT, followed by the tax exemption policy formulation based on inequality, and the analysis of the cost and benefit of new VAT policies by considering equity and efficiency. The first and second chapters use the Indonesia Family Life Survey (IFLS) conducted by RAND Corporation, and the third chapter uses SUSENAS, a household survey conducted by Statistics Indonesia.

The first chapter is titled "Evaluating the Regressivity of the Indonesian VAT Policy". The motivation of the first chapter is to assess whether the Indonesian VAT is progressive or not after having several VAT-exempt items so there is a firm basis to justify the proper treatment of commodities within the VAT system. By using Gini, Kakwani, Coefficient, and Reynold Smolensky indices, it is concluded that Indonesian VAT is quite progressive and more proportional by using expenditure as the measurement.

The second chapter is titled "Value-Added Tax Exemption Policy and Income Inequality: The Case of Indonesia". After knowing that Indonesia can be more progressive, the chapter analyses the VAT policy of exemption on food commodities and the effect on inequality, which is analysed based on the income level of households. By using unbalanced fixed effects regression, I conclude that cooking oil, sugar, beverages, and spices should be exempt and that dairy products and meat should be excluded from the VAT exemption list to have a more progressive VAT system in Indonesia.

The third chapter is titled "VAT on Food Items in Indonesia: Efficiency and Equity" and uses the Deaton model to deal with the inexistence of reliable price data in developing countries. The price estimated by using the model can be utilised to

[1] State budget realisation in 2020

estimate price and income elasticities, which in the end can analyse the cost-benefit of a proposed VAT policy. I conclude that almost all food items should be exempt from VAT except for fresh shrimp and milk because almost all food items make up a greater share of the expenditure of poorer households.

Chapter 1 Introduction

Value-Added Tax (VAT) is the most widely used tax in the world and has been subject to criticism for its potential to exacerbate income inequality. As an indirect and broad-based tax, it is intended to be imposed on almost all goods and services paid by final consumers indirectly through the enterprises that sell the goods and services (Ebrill et al., 2001). Consequently, the VAT cannot be imposed based on the ability or the wealth of the consumers. For this reason, VAT has been criticised as regressive; poor people pay a higher VAT burden as a percentage of their total income than rich people. One way to address the problem is to treat the goods and services differently instead of treating the consumers differently. Two main VAT policies are implemented regarding different treatments of goods and services: multiple rates and exemptions.

Indonesian VAT plays a significant role in Indonesian taxation; it is the second contributor to Indonesian tax revenue, following the income tax, while tax itself is the main source of state revenue. Income tax, especially personal income tax, has been designed to be progressive based on layers of income and an exemption based on a certain threshold. Indonesian VAT (VAT Act, 2009), on the other hand, is a single-rate VAT and applies exemption schemes in its design to achieve fairness, among other objectives. The government exempts commodities that are basic needs and are widely consumed by society.

The main theme of the thesis is value-added taxation and its inequality issue, with key themes: the regressivity of VAT, the impact of VAT exemption, and the effectiveness and efficiency aspects of VAT policy in Indonesia. The overall objectives of the thesis are first to quantify the VAT regressivity across different income groups in Indonesia and second to identify specific commodities that should be subject to or exempt from VAT to have fairness and a more progressive VAT.

This study delves into the regressivity and exemption issue by employing a microeconomic approach to examine household consumption patterns and the effectiveness of VAT exemption on Indonesian household data. The two most reliable data sources regarding Indonesian household data that can be used in the studies are the Indonesian Family Life Survey (IFLS) and the National Socio-Economic Household Survey, SUSENAS. In the studies, IFLS is superior to SUSENAS in providing panel data across five waves: 1993, 1997, 2000, 2007, and 2014; it has income and expenditure data, rich in household characteristics information, but did not collect price and quantity data which are significant for the expenditure analysis. I use IFLS for the first and second chapters to examine the VAT regressivity, observe household consumption patterns, the impact of the new VAT policy of exemption in 2009, and propose items to be taxed by or to be exempt from VAT.

SUSENAS, on the other hand, does not provide panel data, covers a larger amount of household samples than IFLS, and is conducted twice a year, where the first collects less data than the second. The greatest advantage of using SUSENAS is that it provides quantity and expenditure which are powerful for demand analyses. By utilising the most current household survey of SUSENAS, I can observe the recent household consumption patterns.

I want to contribute to the literature on taxation in Indonesia, especially Value-Added Taxation literature. The works or papers published are mostly focused on products which are imposed by VAT, such as tourism (Mahadevan et al., 2017), cigarette (Moertiningsih Adioetomo et al., 2005), drinking water (Rosdiana et al., 2018) and animal feed (Raymundus & Rosdiana, 2021) and are mostly conducted using a macroeconomic approach. Regarding fairness and poverty issues in exemption policy, a microeconomic approach provides a better insight into the issue. The current VAT policy formulation does not involve a microeconomic study. Therefore, the contribution of the thesis is to provide a scientific framework and a reliable basis not only for publication but also for tax policy formulation in Indonesia.

The structure of the study is as follows. Three chapters are presented in sequence. The first study is conducted to obtain an understanding of Indonesian VAT regressivity before conducting an analysis of the consumption of Indonesian households. Many indicators are calculated and compared by using both expenditure and income as the basis of measurements: Gini Index, Kakwani Index, and Reynold-Smolensky index. The chapter is titled 'Evaluating the Regressivity of the Indonesian VAT Policy'. After defining the regressivity issue in Indonesia and by using IFLS, the study examines what commodities are to be taxed and exempt based on different household income groups. The second study is titled 'Value-Added Tax Exemption Policy and Income Inequality: The Case of Indonesia'. By using the same data as in the first chapter and by considering the nature of IFLS data, the proper method of estimation is fixed-effect panel data analysis by making use of demographic information and panel data of expenditures which IFLS provides. The study has weaknesses in the absence of prices. However, in the third chapter, a full analysis of the demand system can be employed. By using SUSENAS 2019-2021. The analysis utilises the unit value data by applying Deaton's approach which is suitable for the Indonesian context.

The policy impact that I hope to make is first in the utilisation of the methodology of formulating a policy recommendation. Indonesia has data and the estimation tools and methods are available. Current policymaking processes mostly consider political components while leaving the process of finding scientific evidence as the basis for tax formulation. The second impact I hope to make is the adaptation of the results into the tax regulation. By providing a quantitative assessment of the regressive impact of VAT and the effectiveness of exemptions, the research will inform policymakers in their efforts to design a more equitable tax system.

Chapter 2 Evaluating the Regressivity of the Indonesian VAT Policy

Abstract

The analysis evaluates the Indonesian Value-Added Tax (VAT), which is commonly viewed as a regressive tax, and examines the impact of VAT reform in 2009 by using microsimulation models and by using the Indonesia Family Life Survey (IFLS). I present the analysis of the Gini index, the Kakwani index, and the Reynolds-Smolensky index to examine tax burden inequality. The results reveal that the current VAT policy is slightly progressive from a consumption perspective and regressive from an income perspective. The analysis of the impact of the VAT reform finds that it improved VAT equality slightly.

1. Introduction

A progressive tax generates revenue to finance government expenditure, such that a higher tax rate is imposed on higher-income households whilst tax exemption is granted to households with incomes below a certain level. VAT, on the other hand, is perceived as a regressive form of taxation, characterised by a greater tax burden on lower-income households.

Nevertheless, VAT has become the most common consumption tax among governments (Bird, 2005). It collects revenue faster than other taxes, has a credit mechanism that allows non-distorting businesses (Itriago, 2011) and increases tax compliance (Ebrill et al., 2001). In 1960, less than ten governments applied VAT and Indonesia adopted VAT in 1983 (VAT Act, 1983). By 2020, 170 countries adopted VAT as their consumption tax (OECD, 2020).

For most of the 40 years of implementation, the Indonesian VAT Act has not changed significantly in regulating fairness, while households' consumption patterns may have shifted in those years[1]. The Indonesian government has amended the Act three times: in 1994 (VAT Act, 1994), 2000 (VAT Act, 2000), and 2009 (VAT Act, 2009). In 2009, new commodities were added to the VAT exemption list (VAT Act, 2009), which are unprocessed meat, eggs, unprocessed milk, vegetables, and fruits[2]. The requirements for an item to be categorised as VAT-exempt are that it is a necessity and/or widely consumed by society. These items were considered to fulfil the 2009 requirements.

Tax is the main revenue source in the Indonesian government budget, exceeding 82% in 2020. Income tax (almost 40%) is the biggest contributor, followed by Value Added Tax (30%) (Table A1). The Indonesian government has committed to collect the tax while emphasising that the tax imposed must be fair. Besides protecting poor people through spending policy, it also uses strategies to reduce inequality and poverty through tax policy.

Indonesian VAT is a single-rate tax, in contrast to multiple-rate European VAT. European governments implement exemptions and multiple-rate policies to ensure the progressivity of their VAT systems. Single-rate VAT is simple yet creates a higher possibility of regressivity since there is no different treatment between different commodities. VAT needs a particular scheme to avoid regressivity, without which VAT exacerbates inequality and burdens low-income people. Therefore, along with VAT exemptions and under the VAT Act, Indonesia implements a Sales Tax on Luxury Goods (Luxury Tax) as well. The tax is intended to help VAT impose an additional indirect tax on luxury goods such as motor vehicles and electronic devices to improve fairness and control the consumption pattern of non-productive goods. The Luxury Tax can lower the regressivity effect of VAT (Shah & Whalley, 1991); however, the number of luxury goods covered by the Luxury Tax has been gradually reduced.

[1] The first VAT Act is VAT and Sales Tax on Luxury Goods (STLG) Act No. 8/1983.
[2] Processed and unprocessed food are treated differently by the tax system.

By considering the characteristics of VAT in general, the nature of Indonesian VAT, and the socioeconomic factors of Indonesia, it is important to obtain knowledge regarding the level of the regressivity of Indonesian VAT and to provide the basis for evidence-based policy-making so the tax system can be more efficient in collecting tax revenue. For that reason, the objectives of the analysis are to examine the regressivity of the current Indonesian VAT system with respect to both income and expenditure and to observe the impact of the most recent reform in 2009 in terms of the inequality aspect.

This work conducts analyses on the distributional effects of VAT to fill the literature gap by using inequality or progressivity indicators: the Gini index, the Kakwani index, and the Reynold Smolensky Index. The analysis considers both income and expenditure to obtain a more holistic picture regarding the inequality of VAT burden across different-level-of-income of households and favour the expenditure approach since the expenditure reflects the VAT better than income.

By utilising the Indonesian Family Life Survey (IFLS), the analysis finds that VAT in Indonesia is regressive from the perspective of income and slightly progressive or proportional from the perspective of expenditure. The results of the analysis contribute to the literature on tax policy and evaluate the current Indonesian VAT to improve the understanding of the mechanism of tax reform. Further, an efficient VAT may also provide a more significant revenue in the future while upholding fairness.

In line with the objectives, the research questions this work seeks to address are as follows:

1. How unequal is the current Indonesian VAT from the point of view of income and expenditure? Is it progressive, proportional[3], or regressive?
2. How does the 2009 VAT reform affect inequality between groups of income?

The paper proceeds as follows. The introduction section presents the background, hypothesis, objectives, contribution, and questions of the research. Section 2 introduces the literature on VAT regressivity and theoretical discussion regarding the basis of VAT measurements that utilise expenditure and income approaches. Section 3 presents methods utilised in the paper to analyse the VAT burden and the measurement proxies. Section 4 presents the data and results. Section 5 presents the conclusions of this work and discusses their implications.

2. Literature Studies

VAT is a tax on consumption and not necessarily on the value added. Those who pay all the tax burden are essentially the final consumers, such as households. Having said that, VAT is not a tax on business; thus, the business should not bear the tax burden at all. The VAT credit mechanism enables businesses to reclaim any tax paid by submitting all the VAT collected after deducting the amount with VAT paid. The VAT paid is called input tax and the VAT collected is output tax (Ebrill et al., 2001). The

[3] Proportional tax requires all taxpayers pay the same percentage of their income.

mechanism is called the tax credit mechanism which lets the businesses be VAT-free except when they are the final consumers themselves. The scheme involved within the VAT system shows that VAT is an indirect tax, in which tax is collected by businesses but paid by households, the consumers.

Two aspects of tax are its collection and its utilisation, which must be considered in the study of fairness. For instance, VAT is one of the tax sources collected from households, and the tax revenue collected holds a significant role in financing the public expenditures that are enjoyed by the same households. Slemrod and Musgrave mentioned three approaches to fairness in taxation in relation to economic indicators (Slemrod and Musgrave, 2010): benefit principle and *quid pro quo* (public spending), the ability to pay principle, and the least total sacrifice or maximum principle. The benefit rule is achieved through a government budget financed by tax revenue. The tax revenue must be spent on public goods for all society since it is almost impossible to identify the preferences of individuals. The ability-to-pay principle is achieved when a higher tax amount is paid by someone with a higher ability to pay. It is fair since someone who enjoys earning money enjoys protection from the government when making money. Equality in this approach should be based on the marginal utility of income and elasticities (Pigou, 1928). The least-total-sacrifice or maximum-welfare rule is achieved when the government prefer collective benefit to the individual one. In other words, the government must choose a policy that minimizes sacrifices or maximises the benefit for all. Admittedly, the tax collection could not make somebody wealthier; nevertheless, it can make it no worse (Bird & Gendron, 2007). By choosing the appropriate tax policy, the government can minimize the unfavourable impact. Even though tax fairness is considered a costly plan for the government because it needs to think economically and politically, and it certainly would lose potential revenue, it has and must commit to upholding the fairness principle.

The VAT system, as an indirect tax, cannot specifically identify the consumers based on their ability to pay, which is the main cause of the regressivity in the VAT, especially for food items with an inelastic nature where almost all people spend more or less the same amount of money on food while they have different levels of income. This means that the VAT system may lack one of the fairness principles and thus could cause regressivity. Regressivity in VAT describes a situation where the wealthier households pay less than the poorer households as a percentage of their income or expenditure.

To make the situation worse, Indonesian VAT is a single-rate VAT due to its simplicity, where the same rate is imposed on all goods and services consumed by all households regardless of their income. Theoretically, single rate VAT would possibly produce a higher regressive tax than multiple rate VAT in which certain commodities are treated differently due to the consumers' wealth level. However, there is also a possibility of the scheme of exemption to deal with the distributional impact of the uniform rate. By multiple rates and or an exemption mechanism, VAT may treat the commodities specifically based on their nature and the average consumers' ability to pay.

Studies on VAT distributional impact, whether it is regressive, progressive, or proportional, have been done in several ways and in different countries or regions. The results of the analysis heavily depend on the design of the VAT system, the consumption behaviour in each country (Gemmell & Morrissey, 2005), and the design of a particular study. Three main measurements have been utilised in these studies: lifetime income, cross-section expenditure, and cross-section income.

Most studies that utilise income as the basis of tax burden analysis conclude that VAT is a regressive tax (Alavuotunki et al., 2019; Gaarder, 2019; Leahy et al., 2011) while on the other hand, expenditure-approach studies produce a less regressive, proportional, or even progressive VAT (Bird & Smart, 2016) (Metcalf, 1994) (IFS, 2011) (IHS, 2011).

Caspersen and Metcalf (Caspersen & Metcalf, 1994) examine the possibility of adopting VAT in the USA by measuring the progressivity of VAT from the point of view of annual and lifetime income. The first measurement is calculated based on annual consumption. The second is a two-stage income calculation. First, they calculate the correlation of lifetime income and age, and second, by using the income, they analyse the consumption patterns. As a result, they found that the VAT is highly regressive from the point of view of annual income-based analysis. On the other hand, from the point of view of long-term or lifetime income, the VAT is proportional or progressive. The progressivity of VAT can be further increased by zero-rating and exemption policies. This study demonstrates that the lifetime-income approach can deal with the different saving behaviour across households at a particular time. However, this approach requires comprehensive data, or otherwise, the study must apply strict assumptions. Fullerton and Roger (Fullerton, Don; Rogers, 1993) compute the wage income by using the uniform utility function of all households and use the general equilibrium model, which includes the age of the household head, labour productivity, savings, and other taxes in the US to calculate the distribution of each current tax. The lifetime approach gives a more proportional result than an annual income-based analysis since the annual income excludes capital income.

By using microeconomic analysis and the income approach, Leahy (Leahy et al., 2011) analyses the distributional impact of Ireland's VAT. The policy paper examines household consumption and characteristics to determine the implication of multi-rate VAT. Surprisingly, even though Ireland has implemented different rates on different products, the study shows that the VAT is still regressive. This fact is supported by the OECD (OECD, 2014), which states that even with some exemptions or reduced rates, the VAT can be regressive.

Other researchers analyse the tax by using a macroeconomic approach and the ordinary least square (Alavuotunki et al., 2019). The paper observes the effect of VAT adoption in many countries and discovers that VAT does not increase inequality when using a consumption-based comparison. The same result is presented in other studies (Caspersen & Metcalf, 1994; Gemmell & Morrissey, 2005). On the other hand, when using a disposable income comparison in most developed countries, the result is quite the opposite, in which the inequality measures are shown to increase after the adoption. Meanwhile, the adoption of VAT in low-income countries does not show increasing inequality. However, the results may be due to a lack of sufficient data, which is common in low-income countries.

Thomas (Thomas, 2020) uses cross-sectional microdata from 27 countries and examines the expenditure-based approach. He finds that VAT is slightly progressive or proportional. Progressivity results from exemptions and a reduced VAT rate. However, even a proportional VAT system can increase poverty. He also conducts a similar analysis using the income approach to observe the distributional impact of VAT. The paper concludes that an income per capita ranking overstates the regressivity while expenditure per capita understates it.

The problem with the annual income-based approach is that not all income earned is consumed right away. A rich household saves some proportion of the income to be spent in the future. Saving generates no VAT; therefore, the measurement based on income does not reflect the real current expenditures taxed by VAT. Saving can be a buffer against financial shock in a later period, and the present expenditure may originate from the income of previous periods. In other words, income-based calculation involves household saving behaviour.

On the other hand, expenditure treated as an income proxy can overcome the problem in a way that reflects the real VAT, and it is clear from savings behaviour. It can be assumed that annual expenditure represents consumption patterns for all years. Current expenditure is a more reliable basis and can be used instead of using a complex lifetime income calculation. Consumption patterns tend to vary more smoothly over time than incomes, which fluctuate over time. This is because poor people borrow, or rich people save to maintain their consumption levels (Attanasio & Pistaferri, 2016). Expenditure does not involve saving behaviour, which is found to increase the regressivity found in the VAT study.

Besides avoiding the impact of the saving and borrowing behaviour, current expenditure is a better measurement than annual income because annual expenditure is the tax base of VAT. Therefore, it cannot redistribute something that is not its base. In addition, VAT is an objective tax, which means the tax depends on its object which is the expenditure itself.

The three main proxies of measurements used in the distributional studies, lifetime income, annual consumption, and annual income proxies, approach saving and borrowing differently. The choice of annual expenditure is the measurement favoured in the present work because a year-of-expenditure is better for reflecting the lifetime income and observing lifetime VAT progressivity than a year-of-income basis, which is explained further below.

Three main components of income are income from capital ownership, income from labour, and transfer from other households. After the personal income tax deduction, the net income (or the disposable income) would be consumed and/or saved. Higher-income households would save part of their income while others may not be able to save. Consequently, VAT which is imposed on consumption but measured by utilising income, would be regressive. The annual VAT burden percentage of annual income for higher-income households who save is lower. Thus, the lower the income of a household, the higher the consumption percentage and the higher the VAT burden percentage (Shah & Whalley, 1991).

Among others, the lifetime-income method is the ideal approach since it compares lifetime VAT burden to lifetime income and, in the calculation, saving and or borrowing components are no longer issues. However, a substantial and reliable dataset is needed to obtain a robust result. It is nearly impossible to conduct the lifetime approach, not to mention the lifetime approach in a developing country setting such as Indonesia. Consequently, the analysis requires another proxy that can roughly assess the lifetime estimates.

Thomas (Thomas, 2020) explains the comparison among the three methods by looking at the capability of the one-year-income and one-year-expenditure methods in estimating the lifetime income approach by assuming a lifetime as two periods of time (1 and 2). In the first period, the household receives income (y_1) and saves a portion of income (s) before consuming the remaining income ($y_1 - s$). In the second period, the household consumes both the income from the period (y_2) and the savings (s) from the previous period. The net present value of income of the first and second period Y_{npv}, or the lifetime income is the same as the net present value of lifetime consumption (C_{npv}). In Equations 1 to 9, both income and consumption are net of VAT. They can be presented as follows:

$$Y_{npv} = C_{npv} = (y_1 - s) + \frac{(y_2 + s(1+r))}{(1+r)} \tag{1}$$

where r is the interest rate of saving with the assumption no tax is applied to the saving. The net present value of consumption tax for both periods (VAT_{npv}):

$$VAT_{npv} = t(y_1 - s) + \frac{t(y_2 + s(1+r))}{(1+r)} \tag{2}$$

$$VAT_{npv} = t(y_1 + \frac{y_2}{(1+r)}) \tag{3}$$

$$\tau = \frac{VAT_{npv}}{Y_{npv}} \tag{4}$$

By using income as the measurement basis of progressivity, the net present value of the tax paid for a lifetime is the tax rate (t) multiplied by the income consumed; τ is the average tax rate of a lifetime.

On the other hand, when only one year of income data is available (for instance, y_1) and VAT_1 is the amount of tax paid in year 1, there are two options to be analysed as the measurement basis: the expenditure or the income of the year. First, when a year of income is utilised:

$$\frac{VAT_1}{y_1} = \frac{t(y_1 - s)}{y_1} \tag{5}$$

Second, when a year of expenditure (c_1) is the basis:

$$\frac{VAT_1}{c_1} = \frac{t(y_1 - s)}{(y_1 - s)} = \mathrm{t} = \tau \tag{6}$$

From these equations, a year of expenditure and a lifetime consumption provide the same average tax rate, τ. In other words, when the tax rate is fixed across the years, the annual expenditure can predict the lifetime tax rate better than the annual income.

The mathematical model can be expanded into three periods 1, 2, and 3, to reflect a developing country better, in which period 1 is the period where a householder borrows money (b) for consumption which exceeds his income since he doesn't earn enough money and period 2 is the period the household head is in the peak of their career and earning, such that he earns much more money, he is able to pay back the loan and to save money. In period 3, the household head is retired and spends the savings to be consumed along with his pension. By assuming the interest rates are fixed across years, the lifetime income is calculated as follows:

$$Y_{npv} = C_{npv} = (y_1 + b) + \frac{(y_2 - b(1+r) - s(1+r))}{(1+r)} + \frac{(y_3 + s(1+r)^2)}{(1+r)^2} \tag{7}$$

$$Y_{npv} = y_1 + \frac{y_2}{(1+r)} + \frac{y_3}{(1+r)^2} \tag{8}$$

$$\tau = \frac{VAT_{npv}}{Y_{npv}} \tag{9}$$

From a two-period lifetime or a three-period lifetime, the expenditure of a lifetime is the sum of all expenditures across periods, and it is equal to the income summed over all periods. In approaching lifetime analysis, the annual expenditure is better approaching lifetime calculation than the annual income as well. Therefore, in addition to the discussion in the previous section regarding expenditure and VAT, the calculation above shows why the analysis prefers a year of consumption as a better approach than annual income. Nevertheless, both income and expenditure are observed to examine the VAT progressivity and the distributional impact of tax exemption policy to obtain a comprehensive understanding. If all consumption items were taxed at a single rate which is fixed across five periods, the tax burden paid as a percentage of their expenditure would be the same across all households, and VAT would be proportional. With a proper scheme of exemptions in the VAT system, it is predicted that the VAT would be progressive.

In calculating the inequality and analysing the VAT progressivity, several inequality measures can be applied: the Gini Index, the VAT concentration coefficient, the Kakwani Index, and the Reynold Smolensky Index. Both Gini and concentration coefficients are measured by using the Lorenz curve. Kakwani and Reynold-Smolensky indices are commonly utilised to measure progressivity and redistribution power in income tax but are conducted here to measure VAT progressivity. The Reynold-Smolensky Index can estimate the redistributive impact of an intervention by comparing the before and after tax or before and after any intervention as well.

The definitions, formulas, and the meaning of the values of the measurements are summarised in Table 1.

Table 1. Gini, Concentration, Kakwani, and Reynold-Smolensky Indices

Indices	Gini Index (G) / Concentration Index (C)	Kakwani Index (K)	Reynold-Smolensky Index (RS)
Purpose	The Gini index measures the inequality of income, and the Concentration index measures the inequality of taxes or benefits.	Kakwani measures tax progressivity, commonly income tax	Reynold-Smolenksy Index measures the redistributive power of tax or benefit policy
The formula	Gini coefficient (G) $G = \frac{A}{A+B}$	$K = C_{VAT}^{G} - G_G$	$RS = G_G - C_N^G$
The description	G_G= Gini Index of income* C_{VAT}^{G}= Concentration index of VAT burden using income groups C_N^G= concentration index of net income using groups of income* A = an area between equal line and the inequality curve B= an area between perfect inequality and the inequality curve		
The calculation	The area between the perfect equality line (a 45^0 line) (A) and the Lorenz curve divided by the total area under the perfect line ($A + B$)	Using the index within VAT context: The difference between the VAT Burden concentration index based on income* groups and the Gini coefficient of income using the same groups	Using the index within VAT context: The difference between the Gini Index of income* and the concentration index of net income* using the income groups for both measurements
Values	Zero is perfect equality One is perfect inequality	Positive means progressivity, negative means regressivity	Positive means a decrease in inequality, Negative means an increase in inequality

Note: *Income can be in terms of income or expenditure as the income proxy.
Source: summarised by author.

The Gini index (G) or Gini coefficient is an index of inequality commonly used to measure inequality of income. The Gini index of income inequality is one minus two times the area under the Lorenz curve. A Gini index of zero means that the whole income in the economy is distributed equally amongst all households. The bigger the index, the more unequal the distribution is. The Gini index of one represents perfect inequality whereby only one person in the society has all the resources or income. This analysis uses the Gini index to measure the inequality of income and expenditure of households. The concentration index (C) or concentration coefficient is effectively the same measure as the Gini index, in which both provide a measure of how the distribution of observations departs from a uniform distribution. The C is used mostly to, but not limited to describe the VAT burden, while the Gini index is used to describe the inequality of income variable. However, in contrast to the Gini index, the C for VAT indicates greater progressivity when the index is larger.

The Kakwani index (K) is a tool to calculate tax progressivity (Kakwani, 1977) by computing the difference between the VAT concentration coefficient[4] across household groups of income or expenditure (C_{VAT}^{G}) and the Gini coefficient of gross income or gross expenditure (G_G) within the same groups. This analysis uses both income and expenditure rank in calculating the Kakwani index (K). A positive Kakwani index indicates that the tax is progressive, whilst a negative value suggests it is regressive.

$$K = C_{VAT}^{G} - G_G \tag{10}$$

The Reynold-Smolensky (1977) index (RS) is intended to calculate the redistribution capability by computing the difference between the Gini coefficient of equivalized gross expenditure (G_G) and concentration index on net expenditure grouped by gross expenditure (C_N^G).

$$RS = G_G - C_N^G \tag{11}$$

Since both the Kakwani and Reynold-Smolensky indices measure the Gini index and concentration index of VAT and net expenditure (net of VAT), consequently the indices can be related as follows:

$$RS = \frac{t}{1-t}K \tag{12}$$

where t is the average tax rate, the RS index indicates the redistributive ability of a tax system. Therefore, we can see from the formula that when the tax rate is high, the denominator is small, and the redistributive effect is high, although only with small progressivity (a positive Kakwani index).

3. Data and Methodology

3.1. Data

Data in the analysis is taken from the Indonesian Family Life Survey (IFLS), which is conducted by the RAND Organization and several institutions in Indonesia. The surveys, ethics, and procedures were reviewed and approved by Institutional Review Boards (IRBs). All individuals were fully informed about the surveys, the purpose, the confidentiality, and the rights which included the right to withdraw anytime, and were required to give their approvals before the survey began by filling the document in Figure A1. Child participants must be accompanied by their parents or other adults. All the names interviewed are anonymous. The ethical requirements were reviewed

[4] Kakwani and Reynold-Smolensky use the term concentration coefficient for tax liability spread across deciles.

at RAND in the United States and at the University of Gajah Mada (UGM) for IFLS3, IFLS4, and IFLS5, at the University of Indonesia (UI) for IFLS1 and IFLS2 in Indonesia[5].

IFLS is a panel and multi-purpose survey that collects a wide range of information and has been conducted in five waves: 1993, 1997, 2000, 2007, and 2014 (Table A2). The survey adopts a combination of both rotation and repeat methods to maintain the robustness of the representativeness of overall surveys in which the IFLS combines both new households which are split-off households and repeat households from its first wave in 1993. The IFLS applies stratified random sampling in data collection. First, it chooses 13 provinces with certain considerations. Second, the samples are taken from urban and rural areas to represent the communities in the areas. It covers 13 of 27 provinces, encompassing 83% of Indonesians, but due to safety and cost-effectiveness, the survey omitted 14 provinces, including Aceh, Irian, and East Timor.

The samples from 1993 and the additional samples in the five waves of the IFLS are presented in the table as follows:

Table 2. Household Samples

	1993 IFLS 1	1997 IFLS 2	2000 IFLS 3	2007 IFLS 4	2014 IFLS 5
Repeat samples contacted*	7,224	6,821	6,800	6,596	6,432
Rotation samps**					
- IFLS 2 split-off		877	819	769	650
- IFLS 2+ split-off			309	295	224
- IFLS 3 split-off			2,646	2,302	1,923
- IFLS 4 split-off				4,033	3,687
- IFLS 5 split-off					4,015
Total Rotation		0	3,774	7,399	10,519
Total samples	7,224	7,698	10,574	13,995	16,931

Notes: *Repeat households contacted since 1993 include those who died or recombined into other households; **Rotation samples can be repeat samples as well, in two, three or four waves, which have not been sequentially contacted for five waves since 1993.
Source: summarised from IFLS 5 (Strauss et al., 2016)

The IFLS is a comprehensive survey covering the areas of economic, social, health, and communities, among others. Since it tracked households across time and their representativeness, it provides the consumption behaviour of Indonesia, which is the focus of the study. It has been used in several studies as well, especially in public policy and social policy (Dartanto et al., 2020, 2021).

A household is defined as a person or several people in the same residence who share food[6], eat from the same kitchen, and have the same household head. Further, the household head is a person, regardless of sex, who is responsible for the daily needs of the household or who is given the status of head of household. Descriptive statistics of the per capita income (PCI), per capita expenditure (PCE) data, per capita

[5] https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html
[6] BPS (Indonesian Central Agency of Statistics) definition

net expenditure (PCNE), and Value Added Tax (VAT) paid by households are presented in Table A3.

Table 3. Number of Records of IFLS

IFLS	Survey	Households sample size	Book K*	Households interviewed	Book I**	Book II***	Book III****
IFLS1	Sep 1993 - Feb 1994	7,224	7,224	7,224	7,224	7,185	14,418
IFLS2	Aug - Dec 1997	7,698	7,637	7,620	7,566	7,600	19,910
IFLS3	Jun-Oct 2000	10,574	10,435	10,435	10,259	10,269	25,490
IFLS4	Nov 2007 - Apr 2008	13,995	13,536	13,270	12,977	12,987	29,055
IFLS5	Oct 2014 - Apr 2015	16,931	15,921	15,089	15,144	15,185	34,464

Notes: * Book K: Control Book (Household roster); ** Book I: Consumption (Food and Nonfood consumption) - households based; *** Book II: Household economy (Income sources) - household based; **** Book III: Income sources (Employment and others) - individual based

Source: summarised from the household tracking section and data of IFLS1, IFLS2, IFLS3, IFLS4, IFLS5

Table 3 displays IFLS records. Not all households in the samples were interviewed. Not all interviewees completed the interview since interviews are generally conducted over two visits; some households completed only one visit. Among these completed interviews, some householddid not finish certain books[7] within the questionnaire. Book 1 and Book 2 are the two main books used in the calculation. The strength of the data obtained from IFLS 1 to IFLS 5 is the availability of both income and expenditure data within the surveys and the panel households data provided across five waves. It enables the comparative analysis of progressivity based on both income and expenditure[8].

3.2. Estimation Strategy

Based on discussions in previous sections, the analysis uses expenditure as the main measurement to investigate the progressivity of VAT. However, the expenditure approach itself is not without problems. Expenditures across households do not fully reflect the wealth of families which is commonly represented by income. The discussion of regressivity is a discussion regarding how much wealthy families pay the tax in the first place. Therefore, this analysis examines VAT regressivity by using both annual income and annual expenditure to obtain a comprehensive analysis. On the other hand, the lifetime income approach is still too difficult to execute in the Indonesian context due to a lack of data.

In the data preparation stage, by using the STATA statistical analysis software package, I collect income and expenditure components separately from household survey books of IFLS 1, 2, 3, 4, and 5 based on the definition of income and expenditure explained in this section. Consequently, households that do not complete all books are excluded from the sample analysed in the present work. Most of the consumption data is from book 1, while income data are in several books. Several households are also excluded from the statistical analysis according to three criteria: households with

[7] Questionnaire consists of several books and books are composed of sections.

[8] Another survey available for Indonesia is the national socio-economic survey, which only provides expenditure and cross section data.

negative income, negative or zero food expenditure, or outliers of income which are more than one standard deviation from the mean income. The number of observations removed is presented in Table A4.

3.2.1. Measurement of Income

The definition of income, taken from OECD, is defined as household income in monetary values or in the form of goods or services received periodically, can be directly consumed, does not reduce the wealth of the household, in the form of cash or other assets, and does not increase liability (OECD, 2013). By using this definition, the components of income collected (Table A5) are profit from farm and nonfarm businesses, employment, rent from farm assets and nonfarm assets, rental income of other assets, non-labour income, transfer from family and nonfamily outside a household, assistances (from private or government), and income from other sources such as gift.[9] The division of income further follows the pattern in Rural Income Generating Activities (RIGA) (Carletto et al., 2007)

The questionnaires on income change from wave to wave; hence, we cannot compare the years directly, and the income sources must be reclassified. IFLS 1 has the most distinct questionnaire. For instance, book 2 and book 3 in IFLS 1 are complementary[10], whereby the interviewees answer either book 2 or book 3. Book 2 and book 3 in the rest of the waves are not complementary. Therefore, the interviewees must fill out both book 2 (household-based) and book 3 (individual-based) if there is a subsection of the questionnaire enquiring about a similar subject. Due to the incomparability, the analysis mostly uses ratios in each wave to contrast the waves.

3.2.2. Measurement of Expenditure

In contrast to the measurement of income, expenditure questionnaires do not change as much as the income questionnaire. The changes are only in certain questions, which are expanded from IFLS 1 to IFLS 5 to produce more detailed results and the changes of the recall period. The issue can be overcome by regrouping consumption items. However, the expansion of the questions can be misleading since interviewees tend to submit a larger amount of consumption when asked more detailed questions. In addition, the different recall periods can cause incomparability since the interviewees would give different responses when asked about annual or monthly consumption. Interviewees would remember monthly expenses better than annual expenses.

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[9] These sources of revenue can be categorised into three primary groups: income from capital ownership (rent), income from labour (employment, farm and nonfarm business), and transfers (transfer from family, government, and private from outside the household).

[10] Books 1 and 2 are household-based questionnaires, while Book 3 is an individual-based questionnaire. In IFLS1, I sum up all income sources from Books 2 and 3. For IFLS 2, 3, 4, and 5, I calculate income mostly from books 1 and 2. However, there are income resources in Book 3 which are not covered by Books 1 and 2. They are employment and transfer from family outside the household (Table A5).

Expenditure itself is defined as all expenses, food and non-food consumption[11], incurred in a period of time within a household. The consumption grouping follows the bigger groups in the questionnaire. Consumption in the form of transfer to entities outside the household is not expenditure since they are not consumed within the family. Five categories of expenditures collected are food, regular non-food, less regular non-food items, education, and housing (Table A5). Food and non-food consumption consist of bought and self-produced items. Housing consumption is based on rent expenses or, for homeowners, imputed rental costs.

3.3. Methodology

In the discussion of the VAT burden, the theory and the distribution of VAT incidence, it is necessary to consider the difference between the statutory incidence of VAT, relating to who pays the tax itself, and its economic incidence, which describes who ultimately bears the cost of the tax. The calculation of the VAT burden in the analysis, however, assumes that all tax is paid by the consumers, not by the producers or the distributors, who are actually the ones who render the payment to the government. Nevertheless, in reality, the tax burden is sometimes shared between the supplier and the consumers due to the imperfection of tax administration.

First, the income[12] (or its proxies) of a household is defined by y_i. All measurements are in per capita terms. Other than income, expenditure, both net-of-VAT and gross expenditure, can be used as a proxy for income.

$$y_i = y_1 + y_2 + \cdots + y_k \tag{13}$$

where index i is the index for a household and k is the number of income sources.

By assuming the consumers pay all the VAT, the amount of VAT (VAT) of a commodity can be calculated as follows:

$$VAT = \mathrm{tp}/(1 + t) \tag{14}$$

$$\mathrm{p} - VAT = \mathrm{p}/(1 + t) \tag{15}$$

where the VAT rate is t (10%), and the price after tax is p. In Indonesia, the base of VAT is the price before tax ($\mathrm{p} - VAT$).

Since the survey does not provide consumption price data, the analysis assumes the price to be the unit price. Therefore, price (p) in the formula is the volume of an item consumed that is not exempt from VAT. For exempt items, the VAT will be zero, and the consumption volume is the price without tax.

Further, the VAT burden (ω) is calculated by dividing the VAT (VAT) by the income or expenditure of a household i.

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[11] FAO definition of expenditure used in the Rural Income Generating Activities (RIGA) Project (Food and Agriculture Organization, 2008).

[12] Household income include VAT (gross income) is used.

$$\omega_i = VAT_i / y_i \tag{16}$$

To examine whether the VAT burden is equally distributed among Indonesian households, the income and the expenditure were classified into ten groups ($n = 10$) of households based on their ranks of per capita income from the least income (group 1) to the highest income (group 10). By looking at the spread of the VAT liability across these groups, inequality can be assessed by considering which group pays most of the VAT burden as a percentage of their total income and whether the VAT burden is lower for lower-income groups. The analysis produces the Concentration Index. The index of income and expenditure is subsequently compared to the Gini index.

The most common inequality measure $I(y)$ is the Gini Index or the Concentration Index. The Gini Index is calculated based on income or expenditure and the Concentration Index is calculated based on the VAT burden. The inequality measure is defined as follows:

$$I(y) = \sum_{i=1}^{h} w_i \cdot I(y_i) \tag{17}$$

where w_i is share of the income of the household i within total income y and $I(y_i)$ is the inequality measure of y_i, the income of a household.

In the Gini index calculation, the ranks of households are significant. In STATA, the commands used to obtain the Gini index are *ineqdec0, ineqdeco*[13]*,* and or other commands. The measurement of the inequality measure is given by:

$$G(y) = \sum_{i=1}^{n} \left(\frac{\text{Cov}(y_i, n)}{\text{Cov}(y, n)} \right) G(y_i) \tag{18}$$

where:

- $\text{Cov}(y_i, n)$ is the covariance between the income component Y_i and the rank n of the total income y. The rank n can be ranked by groups of income or ranked by income of each household.
- $G(y_i)$ is the Gini coefficient[14] for the income component y_i.

In the first calculation of the Gini Index, households are sorted according to income, not by group. The concentration index is computed in a similar way as the Gini by using a rank of tax amount instead of income or expenditure.

For the calculation of the Kakwani Index, the households are grouped into ten groups of income ($n = 10$). Based on these groups, both the Gini Index and the Kakwani Index are calculated and compared. Given n groups of income of households with tax burden variable values $\{\omega_1, \omega_2, \ldots, \omega_n\}$ and corresponding income ranks $\{n_1, n_2, \ldots, n_{10}\}$ where n =10.

[13] *ineqdec0* includes zero and exclude negative values while *ineqdeco* excludes both zero and negative values.

1. Compute the mean of the tax burden (μ) variable:

$$\mu = \frac{1}{n}\sum_{i=1}^{n} \omega_i \tag{19}$$

2. Compute the fractional rank for each group (F_i):

$$F_i = \frac{n_i}{n} \tag{20}$$

3. Calculate the concentration index:

$$C = \frac{2}{\mu n}\sum_{i=1}^{n} \omega_i \left(F_i - \frac{1}{2}\right) \tag{21}$$

After finding the Concentration index of VAT burden based on ten groups of income, now the Kakwani index can be calculated by using The Kakwani equation following the pattern of Equation 10, $K = C - G(y)$. Finally, the Reynold-Smolensky Index can be calculated using Equation 11.

3.3.1. VAT Reform in 2009

In 2009, the Indonesian government added several products to the VAT exemption list, as discussed earlier and presented in Table A6. They are unprocessed meat, eggs, milk, fruits, and vegetables[15]. Before 2009, in accordance with the VAT Act of 2000, only grain, rice, corn, sago, soy, and salt were exempted. The method implemented to measure the impact of the exemption is first by grouping all expenditures into three categories: those which were exempted prior to the 2009 reforms, those newly made exempt in 2009, and the aggregate taxed expenditure. Second, the Kakwani and RS indices pertaining to the expenditure of these three groups are compared before and after the 2009 reforms. The pre-reform expenditures are from the 2007 IFLS (fourth wave), and post- reform consumptions are from the 2014 IFLS (fifth wave). Since Kakwani and RS are in the indices, the Gini index, Kakwani and RS indices, we can compare both waves IFLS4 and IFLS5 directly. In addition, the comparison is reliable because questionnaires from both 2007 and 2014 are not materially different.

[15] Only unprocessed meat, skinned, cut, chilled/refrigerated, frozen, packed/not packed, salted, limed, or preserved using other methods, and/or boiled, are exempt. Others are raw eggs, cleaned eggs, salted, or packed, fresh milk which is chilled/refrigerated or heated, no added sugar or other material, packed/not packed, fresh fruits which are cleaned, sorted, peeled, sliced, graded, packed/not packed, and fresh vegetables which are washed, drained, or stored at low temperature or chopped.

4. Result and Discussion

4.1. Expenditure to Income ratio

Before calculating the VAT burden in Equation 16, the expenditure-to-income ratio can give an overview of how much expenditure compares to income across income deciles and expenditure deciles, which are presented in Table 4.

Table 4. Expenditure to income ratios 2014

PCE deciles	Exp/Inc Ratios	PCI deciles	Exp/Inc Ratios
1	4.005	1	41.910
2	1.953	2	4.347
3	4.966	3	2.603
4	4.845	4	1.982
5	3.347	5	1.759
6	11.458	6	1.413
7	4.888	7	1.263
8	6.625	8	1.151
9	6.170	9	0.934
10	9.842	10	0.714
Total	5.810	Total	5.810

Note: 15,083 households (have both consumption and income); Both expenditure and income include VAT; PCE = per capita expenditure, PCI = per capita income, Exp/Inc Ratios = Expenditure to income ratios

Source: Author's calculation

PCE deciles	Exp/Inc Ratios	PCI deciles	Exp/Inc Ratios
1	2.648	1	15.647
2	2.805	2	4.100
3	2.524	3	2.512
4	2.921	4	1.967
5	2.885	5	1.642
6	2.763	6	1.395
7	3.030	7	1.255
8	2.960	8	1.082
9	3.148	9	0.930
10	4.138	10	0.716
Total	2.982	Total	2.982

Note: 14,911 households, 172 observations removed

The table consists of two parts: the overall observations (left) and the table with the removal of several observations (right) of the year 2014, the latest wave of the survey to observe the most current situation. The observations removed from the right table are those households with a negative income (63 observations), with zero food expenditure (2 observations) and with an expenditure-to-income ratio of more than 89 (107 observations). In total, 172 observations were removed. Thomas (Thomas, 2020) used expenditure-to-income ratios, which are under four for 27 developed countries observed, while in this analysis, I use the sum of the average of expenditure to income and the standard deviation of the 15,083 observations as the limit to drop the 63 observations. The number is far higher than the data used by Thomas since the variance of data in the analysis is far larger. This is to maintain the quality of data and to avoid losing too many observations at the same time. The negative income (63), zero food expenditure (2), and the large ratios of expenditure to income (107) deletion improves mostly the observations of group 1, and afterwards, the regrouping of households refines the data distribution of all groups. Before calculating the VAT burden in Equation 16, the expenditure-to-income ratio can give an overview of how much expenditure compares to income across income deciles and expenditure deciles, which are presented in Table 4. The table reflects the movement of VAT with respect to income because VAT fluctuates in the same direction as expenditure.

In the left table, group 1 of PCE consumes more than 4 (four) times their income while group 6 of PCE consumes more than 11 times, which is the biggest ratio across all groups of PCE. On the other hand, the first PCI group spent more than 40 times its income. This is quite big compared to other income groups, which means that households consume far more than their income and borrow money. Therefore, in the table on the right, several households removed improves the data quality quite significantly in which all groups of PCE consume almost the same ratios, and the first group of PCI consumes a smaller ratio compared to the table on the right.

A survey of income and expenditure generally has the weakness of underreporting the income of the interviewees (Decoster et al., 2010). Another significant contributing factor to the high ratio in group 1 in income deciles of the left table is the negative values of income (Table A4), which causes a low average of income and, in the end, a high expenditure-to-income ratio.

The expenditure-to-income ratios based on PCI deciles in both tables show a stable decreasing trend since the basis of the ratio is income. One important issue to be highlighted is that only the wealthier families in group 9 and group 10, on average, can save from their income, which are 5,418 households after removals. Their expenditure-to-income ratio is less than one, which suggests that their income contains saving components.

The patterns of expenditure-to-income ratios represent the indirect VAT burden in terms of income since only small groups of commodities are exempt from Indonesian VAT, which are further depicted in Table A6. It can be predicted that the VAT as a consumption tax, compared to income by using income deciles, will be regressive. On the other hand, when using PCE deciles, the trend will be proportional or progressive.

4.2. VAT burden

The analysis assumes that the consumers bear all VAT when there is no exemption in VAT design with single rate VAT; the households, as the final consumers pay proportionally to the amount of consumption. In the Indonesian case, it would be 10% of the tax rate of a purchase. Because richer households spend more on their consumption, the amount of VAT they pay is higher than that of poorer households. Wealthier households tend to buy higher quality items which are generally more expensive. The analysis of VAT burden observes the percentage of total VAT amount paid compared to household income or to other income proxies (Equation 16). VAT as a percentage of income may be bigger for poorer households because the income level is lower. But when the net expenditure is used as an income proxy, the VAT burden would reflect the tax rate itself. The situation would be different when an exemption is introduced into the VAT system. The consumption patterns of households would have a significant role in determining the distribution of the burden besides the level of income.

Figure 1 presents the average VAT payment of household groups as a percentage of expenditure or net expenditure or income across PCE, PCNE, and PCI deciles in nine combinations. Figure 1(a), (b), and (c) presents the VAT burden as a percentage of expenditure in three different groupings: PCE, PCNE, and PCI deciles. Figure 1(d), (e), and (f) display VAT divided by net expenditure in deciles of PCE, PCNE, and PCI. The lowest row, Figure 1(g), (h), and (i), show the VAT as the percentage of total income in the deciles of PCE, PCNE, and PCI. The nine diagrams present the close similarity between PCE and PCNE deciles, while PCI deciles show a contrast depiction of VAT as a percentage of income in Figure 1(i). The similarity between the PCE and PCNE deciles is due to the small number of exemptions in Indonesia. The exemption causes only a small gap between both groups.

The average VAT as a percentage of consumption across consumption deciles in Figure 1(a) and Figure 1(b) displays quite similar patterns that from 1993 to 2014, there is a general trend for the VAT burden to slightly increase at higher PCE or PCNE decile groups. The percentages across groups and waves are slightly different, but the range is only 5.77% to 7.69%. The tendency indicates that Indonesian VAT is slightly progressive, largely due to the small group of food items which are exempt from VAT (Table A6).

Figure 1(c) shows the VAT burden with respect to expenditure within PCI deciles. The overall tendency for all waves here is progressive, in which the richer groups, in terms of income per capita, on average pay more in VAT as a percentage of their expenditure. The exception is only for the poorest groups in 1993, 2007, and 2014; these groups show a slightly higher burden as a percentage of expenditure since several households in these groups are zero-income households. They might fail to report their real income. Therefore, their income is zero, and they are in the poorest deciles, while based on expenditure, they spend on taxed commodities. For instance, in the first wave of 1993, 244 of 728 families in the poorest group have zero income. These zero-income observations have zero income reported. In the previous section, all negative-income households (52 households for 1993) have been removed from the calculation.

Figure 1(d), Figure 1(e), and Figure 1(f) present the VAT burden based on net expenditure. The patterns are similar to those in the VAT burden based on the (gross) expenditure in Figure 1(a), Figure 1(b) and Figure 1(c). The difference is only the percentages. Net expenditure VAT burden analysis produces a bigger burden since net expenditures are smaller than gross expenditures.

Figure 1(g) and Figure 1(h) display VAT burden analysis on income within the PCE and PCNE deciles. When using a different base of measurement and group, in this case, the percentage of income in expenditure deciles, the trend is not as obvious as in the previous part but is mostly proportional. The VAT burden does not change significantly between expenditures from deciles 1 to 6 but does increase with increasing expenditure from deciles 6 to 10 for the years of 2007, from deciles 9 to 10 for the years of 1997, 2000, and 2014, and decreases with increasing expenditure from decile 7 to 10 for the year of 1993.

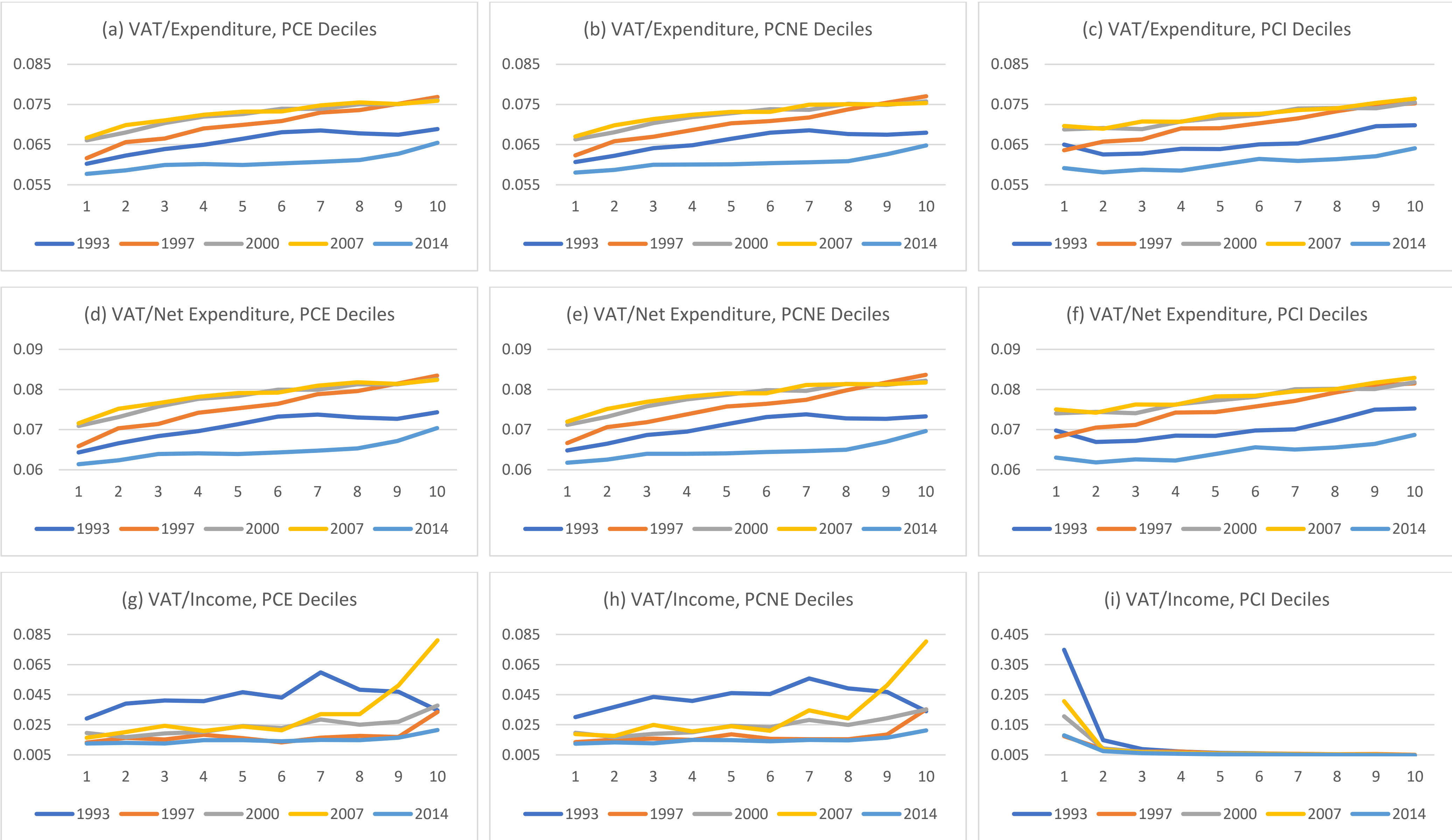

Figure 1. VAT burden across PCE, PCNE, and PCI deciles

Notes: VAT is value-added tax, PCE is per capita expenditure, PCI is per capita income, PCNE is per capita net expenditur

Figure 1(i) indicates the VAT burden in terms of income. VAT as a percentage of income across income deciles depicts similar shapes from 1993 to 2014; all are in an "L" shape, showing the lowest income group pays the highest percentage among all groups. From the first to the second decile, there is a sharp decline in the VAT burden. As stated above, 33% of households in the first group reported zero income. From the second group to the tenth group, the average VAT burden shows a declining trend even though the trend is not as distinct as the decrease from decile 1 to 2. The higher the income, the less a household bears the burden as a percentage of its income. In conclusion, VAT as a percentage of income ranked by income deciles indicates that VAT is a regressive tax.

In all nine graphs, 2014 has the lowest tax burden across all categories, while 2007 has the highest tax burden when expenditure is the income proxy. When income is the basis of VAT burden analysis, 1993 is the highest tax burden due to the lowest income of Indonesian households in 1993. The clear regressivity is only shown in Figure 1(i), and progressivity is shown when expenditure is the basis of the VAT burden analysis.

4.3. Progressivity Index

The VAT burden in Figure 1 presents the pattern of distribution of the VAT burden of groups of income and its proxies across five waves. Furthermore, the inequality of the burden can be calculated more accurately by inequality indices.

4.3.1. Gini Index

Table 5. Gini index

Year	PCE	PCNE	PCI	VAT
1993	0.4312	0.4300	0.7161	0.4631
1997	0.5011	0.4910	0.5603	0.5344
2000	0.4378	0.4363	0.6073	0.4632
2007	0.4058	0.4044	0.5665	0.4310
2014	0.4150	0.4137	0.5637	0.4496

Notes: All in per capita terms. Gini index calculations contain zero values. Negative PCIs are removed. Other calculations of the Gini index have been done by excluding negative and zero values as well, and the results are robust. VAT is value-added tax, PCE is per capita expenditure, PCI is per capita income, PCNE is per capita net expenditure

Source: Author's calculation

The Gini indices of per capita expenditure, net expenditure, income, and VAT in five waves are presented in Table 5. The calculation of the index excludes negative values but contains zero values of income, while all expenditures and VAT are positive. When both negative and zero values are omitted, the inequality is slightly lower. The ranks used in the calculation are the rank of variables, expenditure, net expenditure, income, and VAT of each household. No grouping has been utilised so far.

Since the questions of income components change quite considerably from wave to wave and only small differences in the components of consumption questions, the comparison between waves is more reliable for PCE, PCNE, and VAT, which basically have almost similar ranks.

Expenditure Gini indices exhibit a smaller amount compared to income Gini indices from year to year because of the existence of a saving component within the income of a small percentage of households, while the expenditure Gini indices, the amount of expenditure is the actual consumption, free from saving issues. The fact that VAT displays the biggest Gini followed by expenditure and the lowest Gini net expenditure shows that the VAT is progressive. VAT indices are bigger than expenditure and net expenditure Gini indices; in other words, VAT improves inequality by having net expenditure Gini indices smaller than gross expenditure Gini indices.

The income-based Gini index decreases from 1993 to 1997. First, from 1993 to 1996, Indonesia experienced due to economic growth[16]. However, in July 1997, the Asian Financial Crisis hit the economy. The survey of the second wave was conducted from August to December 1997 (Table A2) to collect data on food consumption from the week before the interview and non-food consumption from the month or year preceding the interview. It also collected data on income for the year preceding the interview, which was 1996. Consequently, the table indicates the crisis affected consumption inequality faster than income inequality. Further, in 2000, the impact of the crisis was still captured in the income inequality, while expenditure inequality was already decreasing.

VAT-based Gini indices found in the VAT payment show a similar pattern to those calculated from the expenditure and net expenditure since the base of VAT is the expenditure itself, and only a small part of food consumption is exempt. The VAT-based Gini index shows that the higher the index compared to the expenditure- or income-based Gini indices, the more progressive it would be. The VAT Gini indices of 1993 to 2014 show larger numbers than the expenditure Gini indices, which is commonly translated as showing VAT to be progressive. Briefly, VAT shows an improvement in progressivity between 1993 and 1997, which may be due to the increase in expenditure on the Gini index. Compared to the income Gini index, the VAT indicates a clear regressivity in which inequality of income is far higher than the VAT payment itself. Progressivity will be discussed further in the subsequent section.

The Gini index of income displays an increase, but other indices depict a decrease. For example, from 2007 to 2014, the Gini index of income decreased moderately while the expenditure, net expenditure, and VAT Gini indices increased. This indicates that income inequality and VAT do not have a direct correlation, as discussed earlier, while the three other indicators, expenditure, net expenditure, and VAT, do.

The comparisons between the Gini indices of income, expenditure, net expenditure, and VAT are simple and easy to understand. However, the weakness of

[16] https://data.worldbank.org/indicator/

the approach is each variable of VAT, PCE, PCNE, and PCI is a national-level calculation and has its own groups, which are different from one another. Consequently, the results of the analysis of the VAT Gini index cannot be translated directly into effect on poorer or richer households to be compared. Therefore, the analysis of the VAT Gini index will be discussed further using the Kakwani and RS indices, which rank the households in the same groups.

4.3.2. Kakwani Index

The Kakwani index describes the inequality paid by different income groups of households, which is reflected in the concentration index to measure the progressivity of VAT. Unlike the VAT Gini index discussed before, the groups used by the concentration curve are the same as the groups used by the Gini index of income or expenditure. Since the calculations of the Kakwani index in Equation 10 are rank-dependent operations, I use the *conindex* (O'Donnell et al., 2016) command of STATA to compute the inequalities of the concentration indices of the VAT, Gini, and Kakwani. The results are presented in Table 6.

The inequality of income or expenditure of households is reflected in the Gini coefficients within groups of PCE and PCI. Table 6 contains three main parts: the calculation of both Concentration and Gini indices based on PCE deciles in the first column, based on PCNE deciles in the second column, and based on PCI deciles in the third column. The Gini indices here are different from those in Table 5 since, in Table 6, ten groups of PCE, PCNE, and PCI are used consistently across the calculation, while in Table 5, the observations were ranked separately by household.

Table 6. Gini, Concentration, and Kakwani Indices

Year	Index (based on PCE)			Index (based on PCNE)			Index (based on PCI)		
	Concentration	Gini	Kakwani	Concentration	Gini	Kakwani	Concentration	Gini	Kakwani
1993	0.4411	0.4235	0.0175	0.4394	0.4223	0.0171	0.2370	0.6915	-0.4545
1997	0.4996	0.4866	0.0130	0.5131	0.4781	0.0350	0.3235	0.5493	-0.2258
2000	0.4482	0.4296	0.0186	0.4474	0.4281	0.0193	0.2525	0.5895	-0.3370
2007	0.4165	0.3992	0.0174	0.4153	0.3978	0.0175	0.2344	0.5538	-0.3194
2014	0.4276	0.4076	0.0200	0.4259	0.4062	0.0197	0.2604	0.5511	-0.2908

Notes: Concentration is the concentration index of VAT; Gini is the Gini Index of PCE, PCNE, or PCI, which is used as the grouping basis for calculating; VAT is value-added tax, PCE is per capita expenditure, PCI is per capita income, PCNE is per capita net expenditure; Kakwani is the progressivity measure, which is the gap between the Gini and concentration index.
Source: IFLS 1, 2, 3, 4, and 5

In the calculation, progressive is indicated by a bigger inequality of VAT than the inequality of income; the rich pay more as a percentage of their income than the poor do. In other words, the Concentration index is bigger than the Gini index. In contrast, VAT is regressive when poorer households pay more than the richer compared to (as a percentage of) their income. Proportional means both inequality measures are equal in which the richest and the poorest pay the same proportion of VAT. Theoretically, VAT would be proportional when goods and services are all perfectly taxed by a single rate of VAT[17]. A proportional tax is achieved when the concentration index of VAT is equal to the Gini index, which is always in the case of expenditure. However, the objective of a VAT system with an exemption policy is to formulate a progressive VAT. In terms of these indices, a positive Kakwani index indicates progressivity, a negative shows regressivity, and zero means proportional.

Two significant events that might have affected the indices in the table were the Asian financial crisis, which started in 1997 and in which prices of consumption goods increased, and the VAT reform in 2009 when the government added several goods and services (Table A6) to the VAT exemption list. The items that became exempt in 2009 are meat, eggs, milk, fruits, and vegetables.

The first main observation that may be made is that the fluctuation of the concentration index in the first, fourth, and seventh columns of Table 6 is the same as the fluctuation of the VAT burden in the third column of Table 5. Although the ranks used in both tables are different, the movements are similar because both indices are based on expenditure. Thus, identical variation is also found in the PCE and PCNE Gini. This similar pattern is not found in the PCI Gini in Table 5 and Table 6, but the PCI Gini in these tables shows the same pattern as the others. In conclusion, VAT burden inequality moves in the same direction as any other expenditure-based indicator.

The second main result of this analysis is the measurement of the progressivity of the Kakwani index. When PCE or PCNE is used as the rank basis of VAT, in all waves, the Kakwani index indicates progressivity even though the values of the index are all small, approaching zero, being less than or equal to 0.02 across all surveys, indicating only weak progressivity that approaches proportionality. In contrast, when PCI is the basis of measurement, Kakwani indices show a clear regressivity in all waves.

Using PCE, the Kakwani index decreased from 1993 to 1997, which means the VAT became less progressive or more proportional. Afterwards, it shows improvement in progressivity from 1997 to 2000, little change from 2000 to 2007, then increasing in 2014. In 1997, the expenditure of certain households was affected tremendously by the crisis. The expenditure percentage of the poorer households became bigger in amount, while the richer households could maintain their expenditures at the beginning of the crisis by consuming their savings. Thus, the inequality of expenditure (Gini) is larger, but in later waves, the gaps became smaller again. The situation is captured in the PCE Gini and concentration indices, as explained in the previous section. Further, in the last period from 2007 to 2014, all inequality indices (Concentration, Gini, and Kakwani indices) except the income Gini index presented an increasing trend. This is accompanied by economic growth in Indonesia, in which GDP grew around 5%-6.3% from 2007 to 2014, except for 2009, which grew at a level of 4.6%.

Using PCI, the fluctuation of the Kakwani index follows the pattern of the PCI Gini Index's movement. From Table 6, we can observe that when the numbers of the PCI

[17] This is true if the basis of progressivity measurement is expenditure where no saving component and no VAT exemption.

Gini index are large and far larger than the concentration indices, the Kakwani index goes along the PCI Gini index automatically. As discussed before, the main reason behind it is that there is a saving component in the income of richer households, which is not spent. The lower household groups of income have smaller incomes and spend big VAT amounts compared to their income, and the higher income families spend smaller VAT amounts compared to their income and save some of the income which does not have any VAT in the current period of saving; hence the difference of VAT burden across groups is smaller and of course, the concentration index is lower as well.

The third main result, as discussed earlier in 2014, is an increase in both PCE, PCNE, and PCI concentration indices accompanied by a more progressive VAT indicated by increasing Kakwani indices in the three classifications. This issue will lead us to the discussion in the section on the impact of the VAT reform in 2009.

All in all, the conclusion of the Kakwani index analysis is that VAT is proportional or slightly progressive when per capita expenditure (both net of VAT or not) is utilised as the rank and expenditure as the basis of the VAT inequality. In addition, as predicted, VAT presents a sharp regressivity when compared to income by using PCI deciles.

4.3.3. VAT concentration curve

Before discussing the RS index, it is important to explore the VAT concentration index more closely. The VAT concentration index represents the amount of VAT paid on all commodities as a percentage of income or its proxy according to the existing law. However, there is a further preference to define the VAT concentration index, which excludes the "other" category. The category covers the purchase of cars, houses, television sets, handphones, beds, and the like, which are treated as long-term expenditures. In income measurement, by knowing that income is a long-term source of expenditure, it is fair to include the "other" category (VAT) in the computation, whereas in expenditure measurement, expenditure and VAT1 (without the "other" category) are compared. VAT1 is the right comparison to the expenditure because both represent a current situation or a short-term period.

From the point of view of the Lorenz and concentration curves, when Lorenz curves of income and expenditure are further from the perfect equality line (the 45-degree line), it means the inequality of income or expenditure is worse in inequality or higher inequality index. On the other hand, the further the VAT concentration curve from the equality line, the better it is from the point of view of tax progressivity. When the VAT concentration curve is further from the equality line than the income or expenditure Lorenz curve is, the VAT can be concluded as progressive.

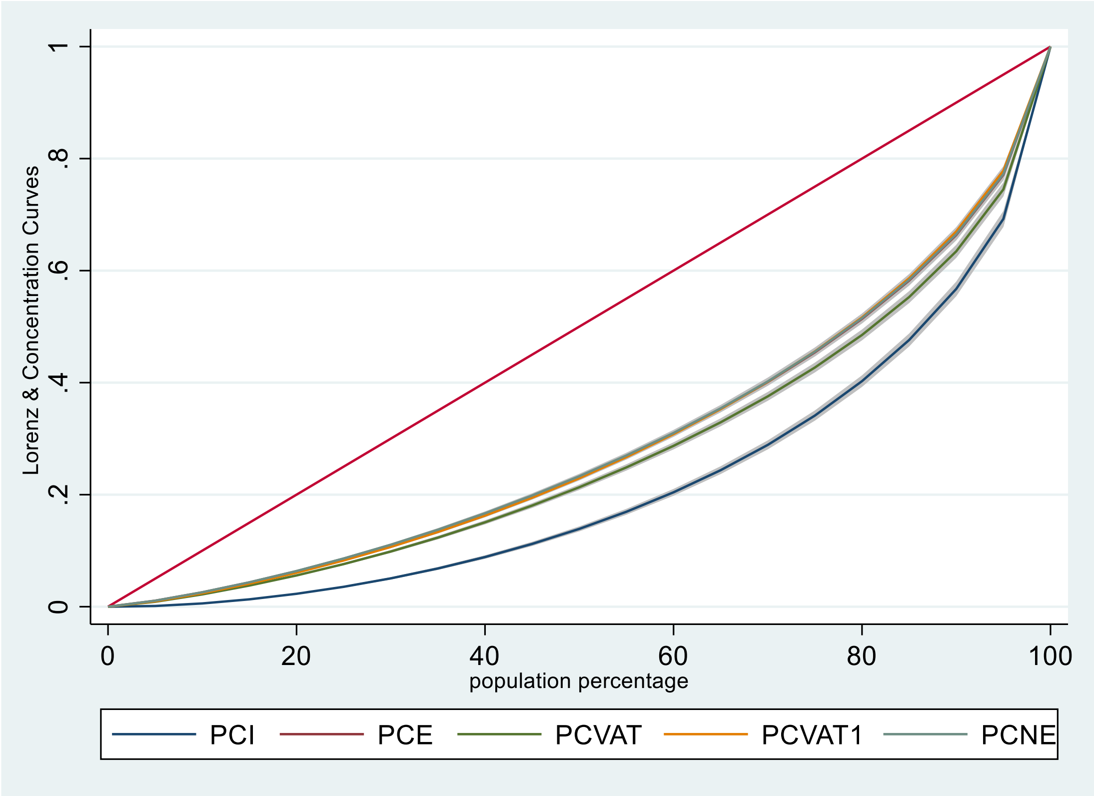

Figure 2. Lorenz and Concentration Curves 2014

Notes: All in per capita (PC), VAT1 is VAT without the "other" category; each curve is ranked separately. VAT is value-added tax, PCE is per capita expenditure, PCI is per capita income, PCNE is per capita net expenditure

Source: IFLS 5

By plotting income, expenditure, net expenditure, VAT and VAT1 data in 2014 to Lorenz and concentration curves in Figure 2, we can observe five curves by using their own grouping: three Lorenz curves of PCI, PCE, and PCNE, and two concentration curves of PCVAT and PCVAT1. The outer line, the blue line, is the PCI inequality line, which is the furthest from the equality line. The index of income inequality is the largest (more or equal to 0.55) among all inequality indices, as can be seen in Table 5, Table 6, and Table 7. The second furthest from the equality line is a green line, which is PCVAT (PCVAT inequality: 0.4275). From Table 7, it is clear that the biggest inequality index after the PCI inequality index is the VAT inequality index. The other three indices, PCVAT1 (without “other” category), PCE and PCNE, which all have almost the same indices (PCVAT1: 0.39586, PCE: 0.40755, PCNE: 0.40622), overlap with each other in the figure because the values are close.

From the point of view of the concentration curve of PCVAT (green line), it is regressive compared to PCI (blue line) because the PCVAT inequality index is closer to the equality line. In this situation, richer families pay VAT less as a percentage of their income. However, compared to the PCE Lorenz curve, the PCVAT is farther from the equality line than the PCE curve, which means that the VAT is progressive in this case.

Table 7. VAT with and without “other” category

IFLS 5 (2014)	Index (based on PCE)			Index (based on PCNE)			Index (based on PCI)		
	Concentration	Gini	Kakwani	Concentration	Gini	Kakwani	Concentration	Gini	Kakwani
VAT	0.42760	0.40755	0.02005	0.42595	0.40622	0.01973	0.26036	0.55112	-0.29076
VAT1	0.39586	0.40755	-0.01169	0.38795	0.40622	-0.01827	0.23116	0.55112	-0.31995

Notes: VAT is value-added tax, PCE is per capita expenditure, PCI is per capita income, PCNE is per capita net expenditure
Source: Author's calculation

On the other hand, the PCVAT1 (yellow line) which is closer to the equality line than PCVAT, shows that PCVAT1 is more regressive than VAT on all consumption items. However, since the figure cannot show the movement of the curves in detail, closer observations can be done by looking at the numbers. For higher levels of income, starting from 75% of the population, the PCVAT1 becomes further than PCE and PCNE from the equality line. It indicates that for the higher-level income population, the VAT is progressive, but in total, the VAT without the “other” category is regressive, as can be observed in Table 7. VAT without the “other” category in total is regressive from all points of view; all negative Kakwani Indices can be found in PCE, PCNE, and PCI.

In conclusion, in all categories, the VAT system is seen to become more regressive by excluding the “other” category (VAT1). The “other” category is consumed mostly by higher-income groups. Accordingly, it also means that the purchase of taxed and expensive commodities helps the VAT to become more progressive. This observation is supported by the reality. If rich people consume long-term assets that are costly by paying a higher VAT on them, the VAT amount paid by this affluent society would increase their VAT burden, hence improving the progressivity of VAT.

4.3.4. Reynolds-Smolensky index

The RS index is the measurement of redistribution power, in this case, redistribution of a VAT design. A positive value means the policy can improve progressivity/equality and vice versa. By using Equation 11, the RS index can be obtained by observing the difference between the Gini index of gross expenditure (Gini (G)) within gross expenditure deciles (G_G) and the net expenditure (net of VAT) concentration index (C_N^G).

Table 8. Kakwani and Reynolds-Smolensky

Year	Index (based on PCE)				Index (based on PCI)			
	Gini (G)	Kakwani	CGN (N)	RS	Gini (G)	Kakwani	CGN (N)	RS
1993	0.42354	0.01752	0.42228	0.00126	0.69145	-0.45450	0.22264	0.46881
1997	0.48661	0.01302	0.46328	0.02333	0.54929	-0.22585	0.29748	0.25181
2000	0.42959	0.01860	0.42810	0.00149	0.58947	-0.33700	0.24062	0.34884
2007	0.39918	0.01736	0.39779	0.00139	0.55375	-0.31827	0.22054	0.33321
2014	0.40757	0.02002	0.40623	0.00135	0.55112	-0.29076	0.24129	0.30982

Notes: CGN is net consumption grouped by gross consumption
Source: Author's calculation

After observing Kakwani and RS indices of all waves, VAT in terms of expenditure shows a progressive nature with a very small redistributive capacity, except in 1997, there is a bigger capacity to redistribute. In 1997, the effect of the Asian Financial crisis on consumption was captured in expenditure, as discussed in the earlier section; thus, the inequality indices of expenditure, of both net-of-VAT and gross expenditure, increased significantly. Thus, the power to redistribute is seen to be improved in the situation.

From 2007 to 2014, Indonesia experienced a high inequality (Gini (G)), and Indonesian VAT was exempt from only a few food items. The food is indeed consumed mostly by poorer households in terms of percentage of the expenditure, but the inequality is not deeply affected. The progressivity in Kakwani shows an improvement but is lower in terms of the power of redistribution. However, by utilising PCI deciles, the redistribution shows a positive and quite high power to affect the inequality since the inequality within VAT based on income (Kakwani index) is already large. This is mainly due to the fact that the Gini index of income is high, and the concentration index of net expenditure is lower than those within PCE deciles. Therefore, the RS index is positive and powerful in reducing regressivity.

4.4. The Impact of VAT Reform in 2009

The VAT Reform of 2009 added unprocessed meat, eggs, unprocessed milk, vegetables, and fruits to the VAT exemption list, along with other changes in the VAT law. The commodities that were exempted before 2009 were rice, paddy, corn, sago, soybean, and salt. The exemption is given to necessities and widely consumed commodities to achieve a more progressive VAT[18]. This section examines whether the expected progressivity is achieved and who got the benefit.

The consumptions from these five waves of survey are combined and plotted into a graph in Figure 3 to present an overview of the effect of the tax reform. The red-striped vertical line is for the point where a new exemption is introduced and the dot vertical lines are the waves of IFLS. The zero point is for the 1993 wave, and the endpoint is for the 2014 wave. The graph shows the mean values of three categories of commodities across waves: the VAT-ed items group, the exempt items group, which is exempt in all waves of the survey, and the newly exempt items in the 2009 group. In the figure, the increase of consumption of taxed items increases from 1993 to 1997 and after 2000 when the economy grows with 6.5% - 8% GDP growth (year on year) from 1993 to 1997 and 3.6% to 6.3% after 2000 to 2014. The consumption of exempted items in 2009 and the other exempted items before 2009 increased slightly from 1993 to 1997 and 2007 to 2014. All consumption decreases from 1997 to 2000 due to the Asian Financial Crisis.

The VAT-ed items are mostly nonfood products, and it is not a reliable comparison for newly exempt items, which are all food. Therefore, the exempt items

[18] Academic manuscript of legal drafting of Indonesian VAT Act (2016)

group consumption pattern is used to compare the consumption of newly exempt items.

For the 2009 exempt items group, I calculated the net cost by deducting 10% of the VAT from the cost of goods in 1993-2007 and combined it with the 2014 consumption of the group, which is exempt from VAT. From the graph in Figure 3, we observe no significant difference between the consumptions of these two exempted groups. There are increases in total expenditure and total income across surveys, with an average GDP growth of 5.75% from 2007 to 2014. However, the increase is spent more on the VAT-ed groups because the exempted goods are all food items which are mostly inelastic to changes in income. The change in VAT burden between 2007 and 2014 is discussed further within groups.

By assuming the implication of VAT reform is perfectly implemented, by observing the change in inequality indices, and by only considering the amendment of the VAT Act in the change in Table 8 within PCE deciles, the difference of the Kakwani indices between pre-2009 and past-2009 systems is 0.00266 (0.02002-0.01736). The positive sign of the difference indicates that there is an improvement in progressivity from 2007 to 2014; thus, the tax reform in which commodities were added into the exemption improves equality. However, the differences are not significant, nor is the difference in the RS index. RS indices themselves indicate a tiny decrease of 0.00004 (0.00135-0.00139) or almost no change because there is still large inequality in Indonesia with a bigger Gini index of expenditure. The Gini index itself increased by 0.00839 from 0.39918 in 2007 to 0.40757 in 2014. The fact is also supported by Alastair Thomas (Thomas, 2023) that the exemption in VAT is considered an ineffective distributional tool in tax policy.

Kakwani, with respect to PCI deciles, indicates regressivity in which both years have negative indices, which is common when using income as the basis of progressivity measurement, but there is an improvement toward less regressive in 2014. RS index within PCI deciles shows decreasing power to redistribute in 2014 - 0.02103 (0.31005- 0.33108). However, the amount of the RS and inequality indices shows that the capacity has quite a large potential to affect inequality. Overall, both PCE and PCI deciles analysis show improvements in progressivity but worse redistribution capacities from 2007 to 2014[19].

[19] The observation on PCNE deciles cannot be done, because the comparison for RS index is between the gross expenditure (PCE) and the net expenditure (PCNE) itself. PCNE cannot be compared to itself.

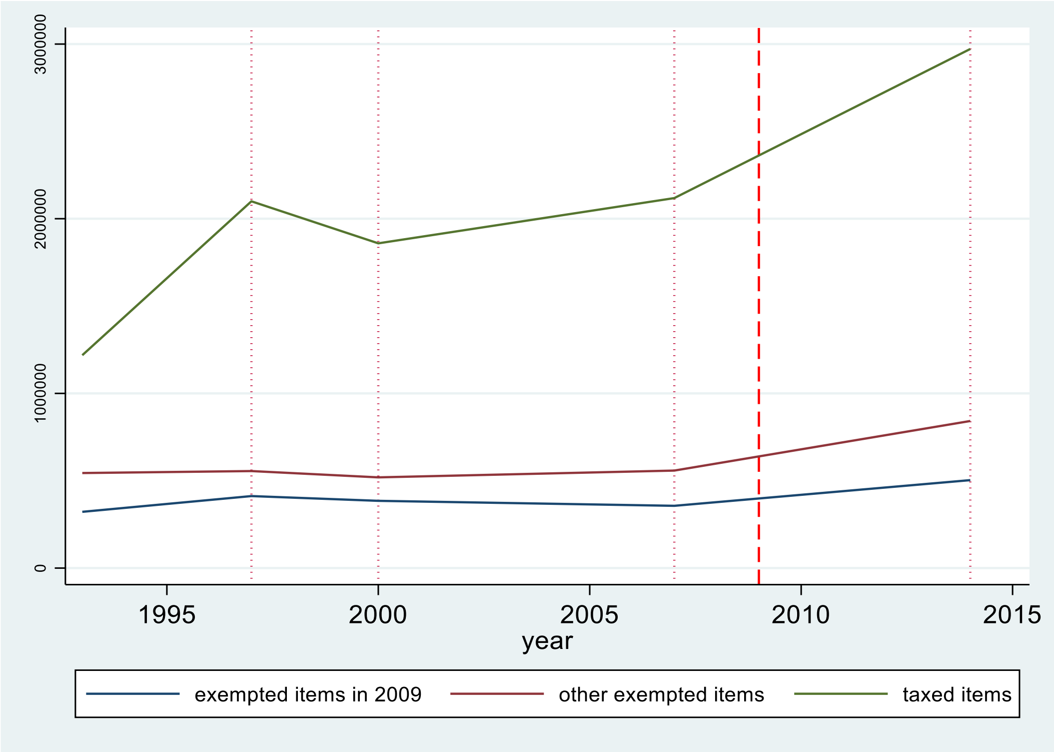

Figure 3. Average in consumption (Constant 2014 Rupiahs)
Note: constant values (2014=100)
Source: IFLS 1, 2, 3, 4, and 5

Table 9. Consumption of newly exempt goods before- and after VAT reform (in Rupiahs 2014=100)

PCE Decile	2007		2014		Difference	
	exempted09	%	exempted09	%	exempted09	%
1	150,559	12.23%	213,253	12.16%	62,694	-0.08%
2	227,746	13.19%	315,851	13.23%	88,104	0.04%
3	278,132	13.97%	380,036	13.42%	101,904	-0.56%
4	332,474	14.07%	451,984	13.78%	119,510	-0.29%
5	390,873	14.08%	531,048	14.09%	140,175	0.00%
6	458,069	14.63%	614,827	14.05%	156,758	-0.59%
7	528,428	14.58%	691,147	13.67%	162,719	-0.91%
8	650,231	14.13%	864,901	13.85%	214,670	-0.29%
9	761,872	13.16%	915,216	11.89%	153,344	-1.27%
10	1,130,735	10.95%	1,219,952	8.57%	89,217	-2.38%

Note: consumption per capita; at a constant price (2014=100); in Rupiahs; % = percentage of total expenditure
Source: IFLS 4 & IFLS 5

One way to observe who gets the most benefit from the reform is by looking at the biggest consumers of the newly VAT-exempted commodities shown in Table 9. It presents the PCE ten groups of households so we can roughly observe which group got the biggest advantage of the tax reform in 2009. In 2007 and 2014, from a cash point of view, the richest household groups spent the biggest amount of money on average but the smallest percentage of total expenditure. When VAT exemption is given, the highest decile of income would save the largest amount of money but be smaller as a percentage of the total expenditure. Furthermore, the groups who consumed the biggest proportion of newly exempt items as a percentage of their expenditure are middle-income households: deciles 4, 5, 6, and 7. They were the biggest consumers before- and after the new exemptions applied. Households in these groups received the greatest benefit as a percentage of their total expenditure.

After comparing before and after the policy introduction, all groups except the second and fifth groups experienced a decrease in the percentage of total expenditure, and all went through an increase in the amount of cash spent. This is due to the increase in household income in Indonesia as a whole. The second and fifth deciles do not benefit from the reform as much as other groups as a percentage of total expenditure. The tenth group has the greatest decrease in the consumption of these commodities as a percentage of total expenditure, followed by the ninth, seventh, sixth and third groups. The change in total expenditure and comparison with the VAT burden can be observed in Table 10.

Table 10 presents the change in total VAT burden, not only the newly exempt commodities, before and after VAT reform in constant value of money (2014=100) and as a percentage of total expenditure/income to give a comprehensive comparison. The table enables us to observe the increase or decrease in the VAT burden and whether there are changes in terms of VAT burden from expenditure, net expenditure, and income points of view.

First, in 2007, before the new exemption policy was introduced, and in 2014, after the policy was implemented, the VAT burden showed progressive patterns in all classes by having an increasing mean of VAT burden across deciles in the groups. Second, the difference between before and after the VAT reform shows that in income (in Rupiahs), the richest deciles enjoy the highest benefit. In terms of the percentage of expenditure using PCE and PCNE deciles, both net of VAT or not, the eighth and seventh deciles enjoy the biggest decrease in VAT burden, and the poorest group enjoys the least. In terms of the percentage of income using PCI deciles, the difference between before and after, the most benefited groups are the first and the second deciles which are the poorest groups.

All in all, first, the biggest and the smallest consumers of the 2019 exempted items. The analysis shows that the richest groups are the biggest consumers of the exempted items in monetary terms and middle-income groups are the biggest consumers as a percentage of total expenditure. On the other hand, the poorest group is the smallest consumer of these items in terms of money and the third smallest consumer in terms of percentage after the ninth group. Further, the second poorest group even increased the percentage of its consumption of these items.

Second is the decrease or increase in VAT burden analysis after the exemption policy is introduced in terms of expenditure, net expenditure, and income. When expenditure and net expenditure are used as the basis of analysis, the groups enjoying the decrease of VAT burden, the eighth and seventh groups benefit the most in the percentage of total expenditure. When income is used as the basis of analysis, the group of income that benefit the most in terms of percentage of income is the poorest group, followed by the second and third groups. Since expenditure is the preferred measurement in the analysis, the analysis uses expenditure as the main conclusion, which states that poor groups are not the groups who get the benefit of the 2019 exemption.

Table 10. VAT burden before- and after VAT reform

PCE	2007				2014				Difference			
Deciles	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc	VAT/nexp	VAT
1	6.67%	1.64%	7.16%	81,739	5.77%	1.25%	6.14%	100,423	0.90%	0.39%	1.02%	-18,684
2	6.99%	2.01%	7.52%	121,891	5.86%	1.30%	6.24%	138,797	1.13%	0.71%	1.29%	-16,906
3	7.11%	2.43%	7.66%	141,633	6.00%	1.26%	6.39%	168,932	1.11%	1.17%	1.27%	-27,299
4	7.24%	2.09%	7.82%	172,203	6.01%	1.48%	6.41%	193,923	1.23%	0.61%	1.41%	-21,720
5	7.32%	2.38%	7.91%	204,885	5.99%	1.48%	6.39%	226,108	1.33%	0.90%	1.52%	-21,223
6	7.33%	2.13%	7.92%	231,603	6.03%	1.40%	6.43%	263,174	1.30%	0.73%	1.49%	-31,571
7	7.48%	3.21%	8.10%	274,018	6.07%	1.49%	6.48%	306,374	1.41%	1.72%	1.62%	-32,356
8	7.55%	3.21%	8.18%	341,374	6.12%	1.48%	6.54%	374,986	1.43%	1.73%	1.65%	-33,612
9	7.51%	5.11%	8.14%	424,972	6.27%	1.64%	6.72%	482,048	1.24%	3.47%	1.42%	-57,076
10	7.59%	8.11%	8.24%	826,986	6.55%	2.15%	7.04%	1,047,186	1.04%	5.96%	1.20%	-220,200

PCNE	2007				2014				Difference			
Deciles	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc	VAT/nexp	VAT
1	6.70%	1.87%	7.20%	82,297	5.80%	1.24%	6.18%	101,167	0.90%	0.63%	1.02%	-18,870
2	6.98%	1.76%	7.52%	122,386	5.87%	1.33%	6.25%	140,571	1.11%	0.43%	1.26%	-18,185
3	7.14%	2.49%	7.69%	142,674	6.00%	1.27%	6.40%	167,502	1.14%	1.22%	1.30%	-24,828
4	7.25%	2.05%	7.82%	170,699	6.00%	1.49%	6.40%	194,906	1.24%	0.56%	1.42%	-24,207
5	7.31%	2.40%	7.90%	205,039	6.01%	1.47%	6.41%	226,028	1.31%	0.92%	1.50%	-20,989
6	7.32%	2.11%	7.91%	232,214	6.04%	1.40%	6.44%	263,171	1.28%	0.71%	1.47%	-30,957
7	7.49%	3.46%	8.11%	278,870	6.06%	1.49%	6.47%	307,548	1.43%	1.97%	1.65%	-28,678
8	7.51%	2.92%	8.13%	334,525	6.09%	1.46%	6.50%	373,399	1.42%	1.47%	1.63%	-38,874
9	7.51%	5.12%	8.14%	423,279	6.26%	1.64%	6.70%	479,162	1.25%	3.48%	1.43%	-55,883
10	7.54%	8.04%	8.18%	822,721	6.48%	2.12%	6.97%	1,037,924	1.06%	5.91%	1.21%	-215,203

PCI	2007				2014				Difference			
Deciles	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc	VAT/nexp	VAT	VAT/exp	VAT/inc		VAT
1	6.96%	18.33%	7.50%	170,072	5.91%	6.98%	6.30%	177,344	1.05%	11.35%	1.20%	-7,272
2	6.90%	2.29%	7.42%	157,181	5.81%	1.76%	6.18%	183,512	1.09%	0.53%	1.24%	-26,331
3	7.08%	1.41%	7.63%	168,279	5.88%	1.11%	6.26%	195,344	1.20%	0.30%	1.37%	-27,065
4	7.07%	1.07%	7.62%	172,888	5.85%	0.87%	6.23%	206,129	1.22%	0.20%	1.39%	-33,241
5	7.25%	0.93%	7.83%	201,960	6.00%	0.73%	6.40%	241,139	1.25%	0.20%	1.43%	-39,179
6	7.26%	0.83%	7.85%	230,980	6.14%	0.64%	6.56%	255,303	1.12%	0.19%	1.29%	-24,323
7	7.36%	0.71%	7.96%	252,122	6.09%	0.57%	6.51%	293,059	1.27%	0.14%	1.45%	-40,937
8	7.40%	0.63%	8.01%	298,045	6.14%	0.50%	6.56%	338,222	1.26%	0.13%	1.45%	-40,177
9	7.54%	0.55%	8.17%	347,276	6.21%	0.42%	6.64%	397,628	1.33%	0.13%	1.52%	-50,352
10	7.64%	0.39%	8.29%	495,420	6.41%	0.35%	6.87%	680,742	1.23%	0.04%	1.42%	-185,322

Notes: exp = expenditure; inc = income; nexp=net expenditure, VAT=value-added value
Source: Author's calculation, IFLS4 & IFLS5

The lower part of the table shows the income (PCI) point of view. The approach indicates that the poorest groups are the biggest bearers of the VAT burden for the 2007 survey. Therefore, the decrease in the VAT burden percentage is within the first group. However, it does not change the fact that the poorest group is still the biggest bearer. The decrease also comes from the increase in the income of the first group.

Before and after the enforcement of the new law, the newly added items were consumed mostly by middle-income groups in

Table 9 shows that they benefited the most. The fact is supported by data presented in Table 10 from a PCE point of view. On the other hand, the poorest benefited the least among all the other groups. Meanwhile, from a PCI deciles point of view, the poorest benefited from the greatest decrease as a percentage of the VAT burden; however, this is also due to the high percentage of the VAT burden in 2007 of the group and the increase of income of the group from 2007 to 2014.

5. Conclusions and Recommendation

VAT is commonly viewed as a regressive tax in which the rich families benefit the most as a percentage of their income; however, VAT also enables an automatic filter whereby the consumers would buy commodities based on their ability to pay and thus, only higher-income families would buy more expensive goods. Therefore, by using income and expenditure data from five waves of IFLS, the paper investigates the nature of Indonesian VAT, which is a single rate tax that exempts only a small number of food commodities.

The choice of measurement basis for calculation and grouping is an important factor in the analysis. Different basis provides different results. The income approach defines Indonesian VAT as regressive, whereas, in contrast, expenditure gives a slightly progressive or almost proportional analysis of the VAT system. The paper favours the expenditure approach because the expenditure reflects the lifetime VAT burden analysis better than income.

The expenditure-to-income ratio gives us a broad description of the data and the expected result of the analysis since VAT is based on expenditure data, and comparing expenditure to income shows the pattern of the VAT burden itself. The ratio shows us that analysis based on PCE deciles would result in a progressive VAT, while analysis based on PCI deciles would result in a highly regressive VAT.

Three analyses of progressivity have been conducted to answer the first research question in the paper: VAT burden, inequality indices, and the Reynold Smolensky index. VAT burden analysis compares four possibilities of measurement calculation basis and ranks the VAT burden as a percentage of expenditure in both PCE and PCI deciles and the VAT burden as the percentage of income in both PCE and PCI deciles. Three analyses indicate a slightly progressive or proportional VAT, but one analysis indicates the opposite. The analysis using income as the measurement basis and PCI deciles as the grouping basis suggests a highly regressive VAT.

The inequality indicators, Gini, concentration, and Kakwani indices provide indicators to quantify the inequality of the system and give the same result as the VAT burden analysis. In the analysis, two approaches were utilised, expenditure (PCE) or income (PCI), as the basis of both calculation and ranks. The approach using expenditure results in a progressive or almost proportional VAT. The income approach gives a highly regressive VAT.

The RS index, as an indicator of redistribution capacity, is shown using PCE deciles analysis to be positive but insignificant, which indicates that VAT does have the power to redistribute but only to a limited extent. In PCI deciles, however, the RS index has positive and significant values, which suggests that VAT has the redistribution capacity to influence income inequality in Indonesia.

The analysis utilises two waves of surveys, 2007 and 2014, to answer the second question of the paper. The reform of VAT in 2009 improved the progressivity of the VAT burden insignificantly within PCE and PCI deciles but demonstrated a slightly lower but still positive redistribution capacity considering the RS index. The groups who stand to benefit the most from reform from a percentage of income point of view are the middle-income groups based on expenditure and the poorest group within PCI deciles. The group that benefited the most from a money point of view is the richest group by using both PCI and PCE deciles.

By using the expenditure approach in PCE deciles mentioned above, Indonesian VAT is proportional or slightly progressive, with few items exempt. However, Indonesian VAT has a low capability for redistribution, and the reform in 2009 did not increase the capability to deal with inequality. Therefore, careful consideration must be given to the matters of the proposed policy by the government in the future. Increasing the VAT rate can be done to intensify the distribution impact, but only when the VAT is progressive and powerful enough to have an impact on inequality. Further, the government should consider other policies, such as spending policies regarding redistribution of income, because the VAT exemption policy is currently not as effective in achieving greater equality.

The analysis does not consider other indirect taxes with different rates in the calculation, such as luxury tax and excise tax, and adopts a strict assumption that VAT is fully transferred to the final consumers. Therefore, future studies can also include other taxes and consider the possibility of multiple rates of VAT.

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Appendix

Table A1. Indonesian State Revenue (in trillion Rupiahs)

Description		2019		2020	
		Revenue	% of Total	Revenue	% of Total
Domestic Income		1,955	99.72%	1,699	99.92%
Tax Revenue		1,546	78.86%	1,405	82.62%
Domestic Tax Revenue		1,505	76.77%	1,371	80.65%
	Income Tax	772	39.39%	670	39.44%
	VAT	532	27.11%	508	29.85%
	Land and Building Tax	21	1.08%	13	0.79%
	Excise	172	8.79%	172	10.13%
	Other Taxes	8	0.39%	8	0.44%
International Tax Revenue		41	2.09%	34	1.97%
Non-Tax Revenue		409	20.86%	294	17.31%
	Natural Resource Income	155	7.90%	79	4.65%
	Revenue from State Assets	81	4.12%	65	3.82%
	Other Non-Tax Revenue	125	6.35%	100	5.89%
	Public Service Agency	49	2.49%	50	2.94%
Grant		6	0.28%	1	0.08%
Total of State Revenue		**1,961**	**100.00%**	**1,700**	**100.00%**

Source: Indonesian State Budget and Financial Notes 2019 and 2020

Table A2. Periods of IFLS

IFLS	Survey	Description	Households sample size
IFLS1	Sep 1993 - Feb 1994	-	7,224
IFLS2	Aug - Dec 1997	with long-distance tracking until March 1998	7,698
IFLS3	Jun-Oct 2000	with long-distance tracking until December 2000	10,574
IFLS4	Nov 2007 - Apr 2008	with long-distance tracking until December 2008	13,995
IFLS5	Oct 2014 - Apr 2015	with long-distance tracking until December 2015	16,931

Source: summarised from IFLS1, IFLS2, IFLS3, IFLS4, IFLS5

Table A3. Descriptive Statistics of Per Capita Expenditure (PCE), Per Capita Income (PCI), Per Capita Net Expenditure (PCNE), Value Added Tax (VAT) in a month (in Rupiahs)

PCE	Obs	Weight	Mean	Std. dev.	Min	Max
pce93	7,043	7,047	59,221	74,687	3,972	1,811,817
pce97	7,476	7,478	133,210	257,512	6,615	7,583,584
pce00	10,151	10,251	264,827	329,725	7,828	10,300,000
pce07	12,669	12,799	601,730	691,250	27,740	23,500,000
pce14	14,911	14,799	1,319,612	1,769,484	72,486	63,400,000
PCI	Obs	Weight	Mean	Std. dev.	Min	Max
pci93	7,043	7,047	57,833	292,593	0	16,600,000
pci97	7,476	7,478	84,476	130,060	0	4,139,445
pci00	10,151	10,251	263,102	990,637	0	58,300,000
pci07	12,669	12,799	527,483	1,011,210	0	33,800,000
pci14	14,911	14,799	1,191,737	1,972,649	0	40,000,000
PCNE	Obs	Weight	Mean	Std. dev.	Min	Max
pcne93	7,043	7,047	55,185	69,425	3,624	1,658,658
pcne97	7,476	7,478	104,836	191,634	4,093	4,830,068
pcne00	10,151	10,251	245,023	303,775	7,197	9,369,145
pcne07	12,669	12,799	556,494	635,586	26,239	21,400,000
pcne14	14,911	14,799	1,235,706	1,653,851	70,423	62,700,000
VAT	Obs	Weight	Mean	Std. dev.	Min	Max
vat93	7,043	7,047	16,428	22,884	602	655,286
vat97	7,476	7,478	39,196	84,858	1,080	3,123,278
vat00	10,151	10,251	69,677	86,139	1,347	1,872,252
vat07	12,669	12,799	140,030	172,219	4,894	6,393,264
vat14	14,911	14,799	254,830	343,292	4,742	13,300,000

Notes: weighted by household weights
Source: Authors calculation from IFLS1, IFLS2, IFLS3, IFLS4, and IFLS5

Table A4. Observations in the analysis

Year	Sample	Income Data	Expenditure Data	Income and Expenditure not matched: from Income	Income and Expenditure not matched: from Expenditure	Matched	Deletions: pci<0	Deletions: food<=0	Deletions: exptoinc> (mean+std.dev)	Deletions: Total	Analysis
1993	7,224	7,184	7,211	2	29	7,182	52	58	29	139	7,043
1997	7,698	7,560	7,560	0	0	7,560	0	9	75	84	7,476
2000	10,574	10,255	10,255	0	0	10,255	78	5	20	103	10,151
2007	13,995	12,700	12,956	0	256	12,700	22	4	5	31	12,669
2014	16,931	15,252	15,083	169	0	15,083	63	2	107	172	14,911

Notes: exptoinc is expenditure to income ratio
Source: summarised by author.

Table A5. Expenditure and Income components

Consumption elements	IFLS1			IFLS2			IFLS3			IFLS4			IFLS5		
	Source	Code	Period	Source	Code	Period	Source	Code	Period	Source	Code	Period	Source	Code	Period
Food Items	Book 1	KS02 KS03	past week	Book 1	KS02 KS03	last week	Book 1	KS02 KS03	past week	Book 1	KS02 KS03	last week	Book 1	KS02 KS03	last week
Non-food items (regular)	Book 1	KS06	past month	Book 1	KS06 KS07a	a month ago	Book 1	KS06 KS07a	past month	Book 1	KS06 KS07a	past month	Book 1	KS06 KS07a	past month
Non-food items (irregular)	Book 1	KS08	past year	Book 1	KS08 KS09	last year	Book 1	KS08 KS09	past year	Book 1	KS08 KS09	past year	Book 1	KS08 KS09	past year
Education	Book 1	KS10X KS11X KS12X	monthly, past year, past month	Book 1	KS10aX KS11aX KS12aX KS12bB	past year	Book 1	KS10aX KS11aX KS12aX KS12bB	past year	Book 1	KS10aX KS11aX KS12aX KS12bB	past year	Book 1	KS10aX KS11aX KS12aX KS12bB	past year
Housing	Book 1	KR04/KR05	monthly	Book 2	KR04/KR05	monthly	Book 2	KR04/KR05	monthly	Book 2	KR04a/KR05a	monthly/yearly	Book 2	KR04a/KR05a	monthly/yearly

Income Components	IFLS1			IFLS2			IFLS3			IFLS4			IFLS5		
	Source	Code	Period	Source	Code	Period	Source	Code	Period	Source	Code	Period	Source	Code	Period
Farm Income	BOOK 2	UT07 UT08 UT09	12 months	BOOK 2	UT07 UT08 UT09	12 months	BOOK 2	UT07 UT08 UT09	12 months	BOOK 2	UT07 UT08 UT09	12 months	BOOK 2	UT07 UT08 UT09	12 months
Farm Rent	BOOK 2	UT14	12 months	BOOK 2	UT14	12 months	BOOK 2	UT14	12 months	BOOK 2	UT14	12 months	BOOK 2	UT14	12 months
Nonfarm Income	BOOK 2	NT07 NT08 NT09	12 months	BOOK 2	NT07 NT08 NT09	12 months	BOOK 2	NT07 NT08 NT09	12 months	BOOK 2	NT07 NT08 NT09	12 months	BOOK 2	NT07 NT08 NT09	12 months
Nonfarm Rent	BOOK 2	NT14	12 months	BOOK 2	NT14	12 months	BOOK 2	NT26	12 months	BOOK 2	NT26	12 months	BOOK 2	NT26	12 months
Rent Income	BOOK 2	HR05	12 months	BOOK 2/3A	HR05	12 months	BOOK 2/3A	HR05	12 months	BOOK 2/3A	HR05	12 months	BOOK 2/3A	HR05	12 months
Employment	BOOK 3	TK25 TK26	month/year	BOOK 3A	TK25 TK26	month/year	BOOK 3A	TK25 TK26	month/year	BOOK 3A	TK25 TK26	month/year	BOOK 3A	TK25 TK26	month/year
Non-Labor	BOOK 2	PH07 PH09	12 months												
Transfer (from)															
a. Noncorresident parents	BOOK 3	BA22 BA26	12 months	BOOK 3P	BA22	12 months	BOOK 3B	BA22	12 months	BOOK 3B	BA22	12 months	BOOK 3B	BA22	12 months
b. Noncorresident siblings	BOOK 3	BA51 BA57	12 months	BOOK3B/3P	BA57	12 months	BOOK 3B	BA57	12 months	BOOK 3B	BA57	12 months	BOOK 3B	BA57	12 months
c. Noncorresident children	BOOK 3	BA90 BA96	12 months	BOOK3B/3P/4	BA90	12 months	BOOK 3B	BA90	12 months	BOOK 3B/4	BA90	12 months	BOOK 3B/4	BA90	12 months
d. Nonfamily	BOOK 3	TF05 TF09	12 months				BOOK 3B	TF05	12 months	BOOK 3B	TF06	12 months	BOOK 3B	TF06	12 months
e. adopted child							BOOK 4	BX90	12 months	BOOK 4	BX90	12 months	BOOK 4	BX90	12 months
Government Assistance	BOOK 1						BOOK 1	KSR10	12 months	BOOK 1	KSR21/23	12 months	BOOK 1	KSR21/23	12 months
Other rent	BOOK 3	HI06	12 months												
Other sources	BOOK 3	HI14	12 months	BOOK 2/3A	HI14		BOOK 2/3A	HI14		BOOK 2/3A	HI14	12 months	BOOK 2/3A	HI14	12 months

Source: summarised by author from IFLS1, IFLS2, IFLS3, IFLS4, IFLS5.

Table A6. Exempted Commodities in 2009

	Transfer of goods		**Rendering of services**
1	Products of mining and drilling taken directly from the source	1	Healthcare
2	Daily necessities needed by the public*	2	Social welfare
3	Food and beverages served in hotels, restaurants, and others	3	Postal delivery
4	Money, gold, and valuable documents	4	Banking, insurance, and financial leasing
		5	Religious services
		6	Education
		7	A culture performance
		8	Entertainment (imposed by entertainment tax)
		9	Broadcasting (exclude advertising)
		10	Shipping and inland public transportation on land and sea
		11	Activities related to human resource
		12	Hotels
		13	Rendering of governmental services
	Added to point no 1 in 2009		**Additional services in 2009**
	Minerals: fuller earth, alum, halite, etc.	1	Other financial services
	Added to point no 2 in 2009	2	Parking lot
	Meat, eggs, milk, fruits, vegetables	3	Public coin telephone
	Added to point no 3 in 2009	4	Sending money by money orders
	Takeaway foods and beverages	5	Catering

Exempted Food Consumption

	Before 2009		**After 2009 (additional)**
1	Rice	1	Milk
2	Grain	2	Eggs
3	Salt	3	Meat
4	Corn	4	Vegetables
5	Sago	5	Fruits
6	Soy		

Note: *Basic needs are rice, paddy, corn, sago, soybean, salt
Source: Value-Added Tax and Sales Tax on Luxury Goods law 42/2009

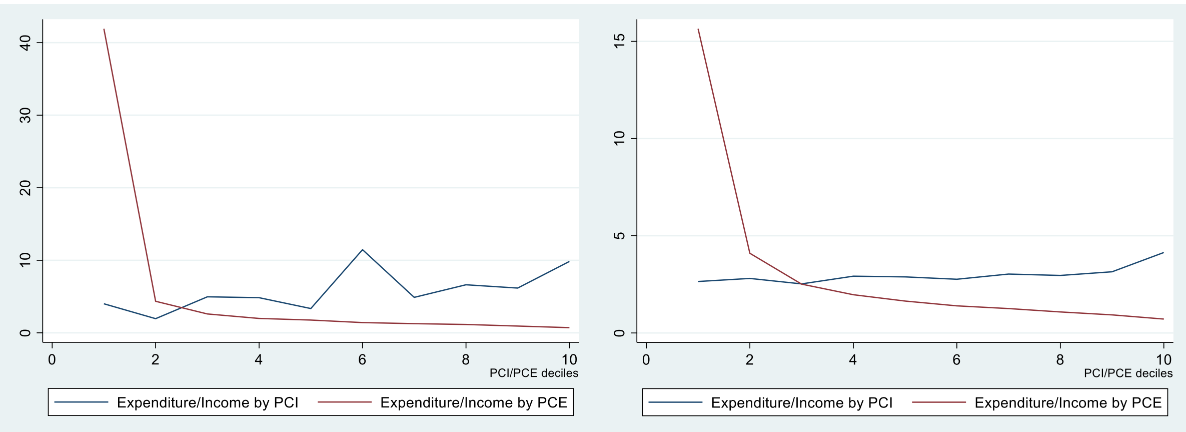

Figure A1. Expenditure to income ratio (by PCE and PCI deciles, before and after removals)
Source: Author's calculation

INTERVIEWER: ______________ └─┴─┴─┘ **CONFIDENTIAL** HHID : └─┴─┴─┘ └─┴─┘ └─┴─┘ └─┴─┘

INDONESIA FAMILY LIFE SURVEY 2014

BOOK K

(CONTROL BOOK)

SECTIONS: SC, AR, KRK, IK, CP

Respondent is a HH Member 18 Years or Older who is Knowledgeable About Characteristics of Household Members

RESVIS.	HOUSEHOLD INTERVIEWED ?	1. Yes 3. No→ C1

BK_COV BOOK K - 1 IFLS5

INTERVIEWER : └─┴─┴─┘ **HHID :** └─┴─┴─┘ └─┴─┘ └─┴─┘ └─┴─┘ **PID** └─┴─┘

Informed Consent (to be read to each individual the first time the individual is interviewed):

Good morning/afternoon/evening,

My name is _____________ and my colleague here is ______________. We are both from SurveyMeter, an independent research organization based in Yogyakarta. We are currently conducting the fieldwork for Sakerti 5, a survey project conducted with collaboration with RAND Corporation. We will start by reading the informed consent form and ask whether you would be willing to participate in the survey. You can ask about anything that is not clear at any time. Please do discuss with your family members before deciding to participate in the survey.

The IFLS is a longitudinal survey that was first fielded in 1993, and again in 1997, 2000, and 2007. You may remember that we visited your households to interview you or your household members in 2007 or in an earlier round. Your household was interviewed since it was one of the households or part of the households that were randomly chosen to participate since the beginning of the survey in 1993. This year, we will visit the same households again to conduct the interview and to see whether there have been some changes since the last time we visited you.

If you choose to participate in the study, our interviewer will first ask you about your basic demographics, family information, health status, health care and insurance, work, retirement and pensions, household and individual income, expenditure, and assets, etc. Then the interviewer will give you a physical examination to better understand your true health conditions. The measurements include height, weight, waist circumference, blood pressure, peak meter flow lung capacity, grip strength, balance, timed walk, and timed sit to stand. We will also do a finger prick to measure your blood hemoglobin level [and to collect blood spot on a filter paper which we will store and use in the lab for analysis of C-reactive Protein that can be used to measure inflammation and the risk to cardiovascular diseases and HbA1c that can be used to measure risk of diabetes].

This survey will take some time to complete, but we will be doing it at your convenience. If you need to take a break or run some errands, please let us know so we can stop the interview and continue later in the day or the next day.

Generally, the study will pose no health risk. The blood drawing procedure will not transmit diseases to you, because the syringe and needle are new and disinfected. The small amount of blood drawn has no harm to your health. There maybe discomfort or very mild pain, we will help you deal with it.

If you agree to participate in the survey, the physical examination and test results related to your health will be feed back to you directly. And the information you provided can be used to help make health, retirement and social security policies suitable for Indonesia, which will benefit you and other people just like you.

The interview is completely voluntary and all survey information will be kept confidential. With your consent, we also will take picture of you and the front of your house solely for the purpose of confirming your identity and your address in the follow up survey. The photos and all your personal records including, questionnaires, and physical examination and test results are confidential; we will not tell others, include your family, friends, local hospitals, etc. Your personal information, including name, address, phone number, and other information which can be used to identify you will not be disclosed. You are identified by a number in the questionnaires and test records, which will be stored safely in IFLS5 project office. You may withdraw from the study any time, which will not impact any of your benefits. The researcher will keep your information confidentially until it is destroyed, and your information will not be used or disclosed during this period.

If you agree to participate in this study, all the interviews, physical examination, tests and counseling are provided to you for free. You do not need to pay anything.

If you agree to participate in this study, you will get Rp ________________ as a token gift of appreciation for the time you spend with us.

If you have any questions about this study, you may contact Bondan Sikoki at SurveyMETER at email address: sm@surveymeter.org atau telpon 62-274-4477464 dan fax: 62-274-4477004

Interviewer's Statement

"I have informed the respondent about the background, goals, procedure, risks and benefits of the survey, given him/her enough time to read the informed consent and discuss with others, and answered all questions related to the survey; I have informed the respondent that he/she can contact the SurveyMETER, when having problems about the surveand provided the accurate contact information. I have informed the respondent that he/she can withdraw from the survey anytime. I have informed the potential respondent that he/she can get a copy of this informed consent with signatures of mine."

□ Signed by interviewer. Interviewer name: ______________ day/month/year

Respondent's statement:

"I have been read the informed consent and I agree to participate in": □ **questionnaire survey**

BK_COV BOOK K - 2 IFLS5

Figure A2. Ethical document for Indonesia Family Life Survey 2014
Source: IFLS 5

Chapter 3 Value-Added Tax Exemption Policy and Income Inequality: The Case of Indonesia

Abstract

This paper examines and evaluates the VAT policy of exemption on food commodities and the effect on inequality, which is analysed based on the income level of households and using the Indonesia Family Life Survey (IFLS) conducted by the RAND Corporation. I utilised graphical analysis and unbalanced fixed effect panel regressions to examine the consumption patterns and income elasticities to capture the shift of household food consumption and propose that the commodities be VAT-exempt. The results suggest that cooking oil, sugar, spices, and fish should be exempt and that dairy and meat should be excluded from the VAT exemption list to have a more progressive VAT system in Indonesia.

1. Introduction

The VAT holds a significant role as the second largest contributor to Indonesia's tax revenue[1] among all taxes. However, the government must pay attention not only to the tax revenue but also to good tax principles. The four ultimate tax collection principles are fairness, certainty, convenience, and efficiency (Smith, 1776). Fairness is the principle that will be the focus of the present analysis. A tax is considered fair and progressive or proportional when the tax payable is in line with the ability of taxpayers to pay. Unfortunately, the VAT system, as an indirect tax, does not enable the government to treat the taxpayers directly and differently. Therefore, in the VAT system, the most reliable way is to treat the commodities differently.

Two main policies applied by governments around the globe to mitigate the problem are exemptions (zero rating) and multiple rates (or luxury tax) on goods. European countries utilise multiple-rate VAT based on the characteristics of the goods, while the Indonesian government applies a single-rate VAT with an exemption policy due to its simplicity. The Indonesian VAT Act (VAT Act, 2009) Article 4A states two characteristics of goods to be exempt from the VAT: those that are necessities and those consumed by a wide range of society. Most goods exempt from VAT are food items.

VAT is a broad-based tax that covers almost all goods and services and people. A single-rate VAT, like in Indonesia, causes poor-income families to pay more as a percentage of their income than richer families, which is called regressive. A study using the Indonesian Family Life Survey (IFLS) data finds that the Indonesian VAT itself is regressive from the point of view of income but proportional or slightly progressive from the point of view of expenditure and there is redistribution capacity in exemption even though it is small (Bukit, 2023). Therefore, a careful strategy is needed to devise a list of exempt goods to decrease the regressivity level or to increase the progressivity level.

The objective of the study is to observe the consumption patterns of households in Indonesia, examine the current VAT-exempt goods and propose an updated list of exempt items by using five waves of IFLS of 1993, 1997, 2000, 2007, and 2014, which provide panel data of households' consumption of goods. I utilise graphical analysis and fixed effect regression analysis on panel data.

The null hypothesis of the panel study is that taxed items have positive income elasticities whereby the increase in income of a household leads them to increase their consumption of these commodities. The analysis confirms that certain goods or services are to be excluded from VAT to design a less regressive VAT system. The result of the work would contribute to the formulation of tax regulations and enrich the literature on VAT and its distributional impact.

The work conducts a graphical analysis of the current distribution of the VAT burden across different levels of income in 2007. Further, fixed effect unbalanced panel data analyses are conducted on food commodities because they are necessities

[1] State budget realisation in 2020

and have the widest consumer base. In the graphical analysis, the households are categorised based on per capita expenditure (PCE) calculated from the surveys. Thus, the order of PCE determines the thresholds of being in the poorer or richer group.

The analyses contribute by providing a literature of scientific approach to the issue of VAT distributional impact and regulation-making using a microeconomics approach. Most studies on VAT in Indonesia focus on products such as tourism (Mahadevan et al., 2017), cigarette (Moertiningsih Adioetomo et al., 2005), drinking water (Rosdiana et al., 2018) and animal feed (Raymundus & Rosdiana, 2021) and are mostly conducted using a macroeconomic approach.

In line with the objectives, the research questions in this paper are as follows:

- How do different income groups in Indonesia spend their income?
- Based on household income levels, what commodities should be exempt to achieve a more progressive VAT system?

The paper proceeds as follows. The introduction section presents the background, hypothesis, objectives, contribution, and questions of the research. Section two summarises studies that have approached similar topics and several methodologies utilised. The third part briefly presents the exemption regulation in Indonesian VAT. The fourth section discusses data and descriptive statistics of income and expenditure in five waves of IFLS. The fifth section discusses the methodology performed in the research. The sixth examines the consumption pattern and results analysis. The last part concludes and summarises the paper.

2. Literature Review

2.1. Demand Analysis and VAT Exempt Formulation

The distributional studies of VAT focus on how to design a progressive or less regressive VAT. The regressivity exists when the lower-income households spend a higher share of their income or expenditure on certain taxed items. This is true when the items are income- and price-inelastic necessities such as food items, and the poorer households would not change their consumption patterns much due to a shift in price or income. Hence, demand analysis, which enables both price and income elasticities, becomes significant when examining these items.

The demand system itself has been developed since the first mathematical equation of demand was formulated. The very traditional approach of the Marshallian demand function was depicted in the demand curve reflecting the relationship between the quantity demanded of an item and its price. The curve was transformed into a demand function in quantity, which depends on its price. Given the prices of all other goods, the demand for an item depends also on the prices of all other goods. Thus, in the development of demand estimation, many scholars formulated methodologies where all consumption equations are estimated in a system started by Stone's Linear Expenditure System (LES) in 1954 (Stone, 1954) instead of merely an equation. In 1980, Deaton & Muellbauer designed a demand system, the Almost Ideal Demand System (AIDS) (Deaton & Muellbauer, 1980), which could overcome problems found in its predecessors in models of Rotterdam Models (Theil, 1965) and Translog model besides LES. It can satisfy additive and homogenous tests simultaneously. It is simple and linear in logarithm of total expenditure. Further, in 1997, the QUAIDS (Banks et al., 1997) model was introduced to overcome the limitation of AIDS in the estimation of the shift of income. The demand systems are utilised mostly in microeconomic approaches to examine consumption patterns and find the best candidates to be VAT-exempt in different countries.

3. Literature Studies on Exemption and Distributional Effects of VAT

Studies on VAT and its distributional implications have been done in several ways and in different countries or regions to formulate the exemption list. The results of the analysis heavily depend on the design of VAT, consumption patterns in each country (Gemmell and Morrissey, 2005) and the design of a particular study. There is no one-size-fits-all approach in VAT design; however, the studies conducted in several countries on the distributional aspect of VAT provide the framework and principles utilised in the current work of analysis.

In 2001, Creedy (Creedy, 2001) analysed several approaches to tax modelling and the impact of the exemption on VAT distribution by observing characteristics of households taken from household surveys. By utilising the Linear Expenditure System and equivalent variations analysis, he obtained the elasticities of items and found that both the exemption and the lower tax rate can improve the VAT regressivity.

By using microeconomic analysis, Leahy (Leahy et al., 2011) studies the distributional effects of Ireland's VAT. The policy paper examines household consumption and characteristics to determine the implication of multi-rate VAT. Surprisingly, even though Ireland has implemented different rates on different products, the study shows that their VAT system is still regressive. This fact is supported by the OECD study (OECD, 2014), which states that even with some exemptions or reduced rates, VAT can be regressive. The policy paper discusses many scenarios by introducing a flat rate on food items, children's clothing, and shoes. A higher but flat rate would hurt poor households, while a lower and flat rate would give benefits to all groups.

By using AIDS, (Strauss et al., 2016) examined the change in the VAT rate from 10% to 12% in Lebanon and found that lower-income groups would not be affected by the shift because food items and butane, which were mostly used by poor people, were exempted. The change will have a big impact on middle-income households. Nevertheless, poverty in Lebanon would increase by 5% of the population from 30% to 35% by the new policy.

Caspersen and Metcalf (1994) observed the possibility of imposing VAT in the US and mentioned that food, housing, and medical care are supposed to be under the zero-rating category because it would contribute to better progressivity and all households would get benefit significantly. Australia, a country with a similar level of economic development, has proposed to reduce tax rates on food and domestic fuel to have the same impact (Creedy, 2001). In 2016, a study on food expenditure and goods and services tax (GST) in New Zealand (Ball et al., 2016) found that basically, food exemption is not a good distributional measure.

The usage of the Quadratic Almost Ideal Demand System (QUAIDS) as the methodology to observe the imposition of VAT from the behavioural point of view and welfare analysis is used by several studies (Cseres-Gergely et al., 2017; Gcabo et al., 2019; Thomas, 2022; van Oordt, 2018). (Thomas, 2022) utilises the QUAIDS to examine who would be hit the hardest when New Zealand implements exemption and multi-rate GST. The analysis uses income, price indices, and several demographic variables to find the consumption patterns of commodities, and it found that single-rate VAT is still more effective. By using the same methodology, (van Oordt, 2018), (Gcabo et al., 2019) in South Africa and (Cseres-Gergely et al., 2017) in Hungary found that income transfers or cash transfers would be better targeted than multiple rates or exemptions. In relation to certain food commodities, a study uses QUAIDS on different proposed treatments of meat tax in Germany (Roosen et al., 2022) from a welfare and inequality point of view. It argues that taxes should be imposed in the form of excise rather than VAT since it would affect low-income and old families more as a percentage of income. Another research in food study is regarding certain food items such as alcohol and cigarettes in Russia (Herzfeld et al., 2014). It examines the most vulnerable group and estimates the price and income elasticities to show the severity of diet variance in the group.

The formulation of the exemption policy is unique to each country. It depends on the consumption patterns of the households within the country. The commodities consumed mostly by poor families usually have the most potential to be VAT-exempt items. Regarding the choice of exempt goods, a study in Romania shows that the exemption of commodities such as food and non-alcoholic drinks utilised mostly by the poor is effective in reducing the regressivity concerning the income of the household (Cuceu, 2016). Commodities with negative elasticity of income, whereby they are consumed by the poor but not used by the wealthy in large quantities, are identified in the studies to reduce inequality by using the exemption policy. First and foremost are necessities such as staple food, which are most clearly categorised in the group of these items (Gaarder, 2019). Second is kerosene, which is found to be the exact product in poor developing countries to be excluded because kerosene is utilised by low-income households as fuel but is not commonly used by other groups (Gemmell and Morrissey, 2005). Moreover, other potential goods and services that could be zero-rated are products related to health and education (Mussa, 2014). However, at the same time, the exclusion of these goods, like necessities or fuel, can distort the businesses that produce them as final products since the VAT system does not allow the producers to credit their input tax whenever they deliver an excluded good.

Aside from exemption, the International Monetary Fund (IMF) encourages imposing different rates on alcohol, tobacco and sugar because they damage health. Additionally, they are not necessities and are consumed only by certain people (Coady, 2018). Nevertheless, multiple rates for developing countries can increase administrative and compliance costs.

Another fiscal policy that is always compared to the VAT system's exemption policy is the cash transfer policy. The cash transfer policy is targeted at poor people; therefore, it is assumed to be more effective. However, research using panel data from developed and developing countries finds that the impact of tax policies on the redistribution of income is not necessarily less profound than public expenditure spent directly on health or education or others (Martinez-Vazquez et al., 2012).

4. VAT Exemption in Indonesia

Under VAT regulations in Indonesia[2], there are two possible mechanisms to provide VAT relief: exclusion and exemption of goods or services. The VAT exclusion scheme is given to VAT-free products or activities that are provided as a temporary incentive. These generally cover limited purposes, areas, or industries that are bonded areas to promote exports, particular health needs, national security, religious objectives, public housing, public transportation, and trade agreements.

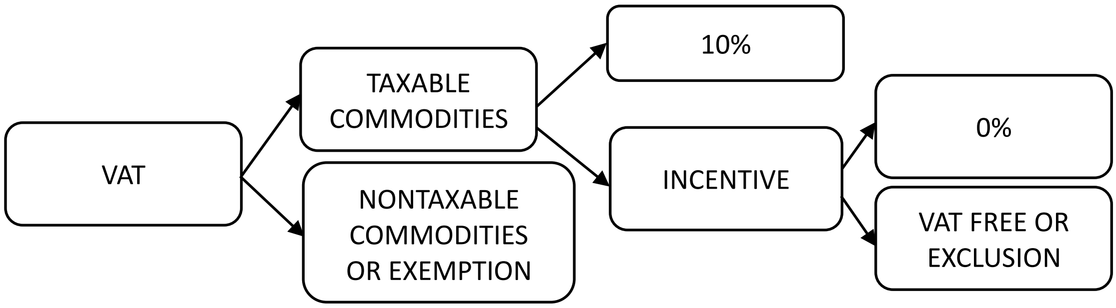

Figure 1. Commodity Classification
Source: Value-Added Tax and Sales Tax on Luxury Goods law 42/2009 (VAT Act 42/2009)

The exemption scheme, generally a permanent scheme, is given to non-taxable commodities, which are totally excluded from VAT administration and imposition. The definition of the VAT exemption in this study is the non-taxable commodities, the latter mechanism of exclusion. The overall treatment of goods and services in Indonesian VAT is presented in Figure 1. Detailed goods and services that fall into the non-taxable category are shown in Table 1 and detailed exempted food items are in Table 2.

One caveat of the mechanism of VAT incentives in Indonesia is that some products probably get one or two incentives for a period or another incentive for another period. Thus, the impact of an incentive cannot be measured and separated perfectly from another incentive that might have been applied to a product. In the current analysis, the work uses only tax incentives mentioned in the VAT Act in Indonesia.

[2] The Indonesian Value-Added Tax Act No.42/2009, 2009

Table 1. VAT-exempt commodities in 2009

Transfer of goods	Rendering of services
1 Products of mining and drilling taken directly from the source	1 Healthcare
2 Daily necessities needed by the public*	2 Social welfare
3 Food and beverages served in hotels, restaurants, and others	3 Postal delivery
4 Money, gold, and valuable documents	4 Banking, insurance, and financial leasing
	5 Religious services
	6 Education
	7 A culture performance
	8 Entertainment (imposed by entertainment tax)
	9 Broadcasting (exclude advertising)
	10 Shipping and inland public transportation on land and sea
	11 Activities related to human resource
	12 Hotels
	13 Rendering of governmental services
Added to point no 1 in 2009	**Additional services in 2009**
Minerals: fullers earth, alum, halite, etc.	1 Other financial services
Added to point no 2 in 2009	2 Parking lot
Meat, eggs, milk, fruits, vegetables	3 Public coin telephone
Added to point no 3 in 2009	4 Sending money by money orders
Takeaway foods and beverages	5 Catering

Note: *Basic needs are rice, paddy, corn, sago, soybean, salt before 2009
Source: VAT Act 42/2009

Table 1 presents the exempt goods, both food and non-food items in the VAT Act. The first exempt goods are products of mining and drilling, such as oil and gas, which are limited to those taken directly from the earth. The second exempt group is daily necessities which is the focus of the analysis of the paper. Two main characteristics of items that can be proposed to be non-taxable in the VAT Act as daily necessities are first, basic needs and second, consumed widely by society. The third group is food and beverages served in a restaurant to avoid double taxation by the regional governments. The fourth group is money, gold, and securities. These are common products to be exempted from VAT globally.

The negative list principle of the Indonesian VAT Act indicates that all consumption items are imposed by VAT unless it is stated to be exempt. In addition, for simplicity, the list is kept short and easy to apply. Table 2 displays the list of exempted food items and the details of the goods. The list shows that the exemption is very limited; only food commodities that fulfil the details mentioned in Table 2 are exempt, and the derivations of these products are not exempt. For instance, cheese is levied by VAT even though it is a derivation of milk. Another example is the cornflower. It is not corn which is exempt because the form of the corn flower has been altered.

Table 2. Exempted Food Items in The VAT Act in Indonesia

No	Commodity	Detail
1	Rice	
2	Grain	Unhulled rice
3	Corn	
4	Sago	
5	Soybean	
6	Salt	Iodized or not
7	Meats	unprocessed fresh meats but have undergone the slaughtering process, skinned, cut, cooled, frozen, packaged or unpackaged, salted, limed, pickled, preserved in other ways, and/or boiled
8	Eggs	unprocessed eggs, including cleaned eggs, salted, or packed
9	Milk	dairy milk, whether having undergone a colling process or heated, not containing sugar additives or other ingredients and/or packaged or unpackaged
10	Fruits	fresh fruits that have been harvested, whether having undergone the washing process, sorted, peeled, cut, sliced, graded, and/or packaged or unpackaged
11	Vegetables	fresh vegetables that have been harvested, washed, drained, and/or stored at a low temperature, including chopped fresh vegetables.

Source: VAT Act 42/2009

5. Data and descriptive statistics

IFLS is a longitudinal survey in Indonesia that was conducted in five waves: 1993/1994, 1997, 2000, 2007/2008, and 2014/2015. Also, there is IFLS 2+, which was conducted right after the Asian financial crisis. In IFLS1 (1993/1994), the sample is representative of 83% of the Indonesian population. In IFLS1, 7,224 households were successfully interviewed, and 22,000 individual samples were collected. The survey's sampling procedure is a two-stage stratified sampling based on province and urban/rural location. The samples are representative of the population from 13 provinces of Indonesia (Java, Sumatra, Bali, West Nusa Tenggara, Kalimantan, and Sulawesi Islands). The number of households interviewed increased from IFLS1 to IFLS5. Table 3 presents the summary of the interviews.

Table 3. IFLS report period

IFLS	Survey	Description	Households sample size
IFLS1	Sep 1993 - Feb 1994	-	7,224
IFLS2	Aug - Dec 1997	with long-distance tracking until March 1998	7,698
IFLS3	Jun-Oct 2000	with long-distance tracking until December 2000	10,574
IFLS4	Nov 2007 - Apr 2008	with long-distance tracking until December 2008	13,995
IFLS5	Oct 2014 - Apr 2015	with long-distance tracking until December 2015	16,931

Source: summarised from IFLS1, IFLS2, IFLS3, IFLS4, IFLS5

The goal of IFLS is to provide data on individuals, households, and communities by observing behaviour. It collects information about economic and non-economic indicators: consumption, income, assets, education, migration, labour, marriage, fertility and many more. The households and individuals contacted were fully informed and required to provide their approvals before being interviewed. The procedures and ethics of the consent request and approval are reviewed by the Institutional Review Board (IRBs). The interviewees were given the right to withdraw at any time. A child must be accompanied by an adult, whether he or she is a parent or another adult. The ethical procedures were reviewed and have been approved for all waves of IFLS. The form of household consent[3] (Strauss et al., 2016) is presented in Figure A1.

The surveys targeted the IFLS household samples to be repeat households over five waves; however, not all households can be contacted. Several households moved to another region, which can or cannot be contacted. New households were split-off samples from the 1993 samples. These new families are included in rotation samples. The analysis uses economic and demographic information from household surveys.

The weakness of the household surveys is that the questionnaires have been expanded over time, especially for income components; therefore, income comparisons cannot be directly made between waves. Both measurements, expenditure and income aggregates, are discussed and described below, but only expenditure is used in the analysis later.

5.1. Expenditure Aggregates

A family life survey enables us to observe the consumption patterns in a certain period, annually, monthly or weekly. The definition of consumption is all costs incurred within a household, which can be in the form of food or non-food and arise periodically. Most consumption elements are collected on a monthly basis and in terms of household. Per capita expenditure (PCE) is calculated by dividing the household expenditure by household size. Table 4 presents the classifications of consumption items.

Table 4. Consumption items and classifications

Consumption elements	Categories (in 2014)
1. Food Items	Staple food, vegetables, dried foods, meat and fish, other dishes, milk/eggs, beverages, and other drinks/consumer products
2. Non-food items (regular)	Electricity, water, fuel, telephone, personal toiletries, household items, domestic services and servant wages, recreation and entertainment, transportation, sweepstakes, and the like, and self-produced non-food items.
3. Non-food items (irregular)	Clothing for children and adults, household supplies and furniture, medical costs, ritual ceremonies, charities and gifts, taxes and other expenditures
4. Education	Tuition, contribution to parent-teacher association (PTA), school, laboratory, registration, exam, uniform, school supplies, transportation, pocket money, specialised courses associated
5. Housing	Actual or imputed rent

Note: *IFLS 5 is chosen since it is the latest and the most extensive questionnaire
Source: summarised from IFLS 5

[3] BOOK K, BK_COV, IFLS5

Food consumption covers both food bought, and food obtained from the household's own production within a week. The same principle applies to non-food expenditures. Further, transfers to parties outside the household are excluded from expenditure calculation due to the definition of the consumption itself. An instance of such a transfer is tuition fee payment for those living outside the household.

Housing consumption comprises either rent expenses or for households that own their home, the imputed rent. In case a household buys a house, the cost is included in the "other" category with infrequent non-food items, not as rent expense nor allocated as rent expenses.

Five classifications of expenditure: food, regular non-food, infrequent non-food, education, and housing, comprise smaller groups. The smaller groups are slightly different between waves. In 1993, food was defined as staples, vegetables, dried food, meat, fish, dairy, oil, spices, beverages, alcohol-tobacco and snacks. Utilities, personal goods, household goods, recreation, transportation and lottery are categorised as regular items. Infrequent items cover clothes, furniture, medical, ceremony, tax, and others. Education had two categories in 1993: tuition and others. Extensions in the questionnaire were conducted starting in 1997. The "other" item in education is broken down into uniform and education-related transportation. The other-side-dishes group is broken into two: canned meat and tofu-tempeh, and "prepared food bought from the outside household and consumed away from home" (foodout) was added to the survey. In 2007, the utility grouping was divided into four categories: electricity, water, fuel, and telephone. The latest survey covers a more extensive range of commodities than the four previous surveys. The household would answer all questionnaires, and this tends to result in a higher number of expenditures reported in individual items purchased or consumed. For instance, in 1993, the survey excluded non-food items that are own-produced (KS09a-Book1) by the household, but since 1997, these items have been included in the questionnaire.

The recall period utilised in a survey is sometimes slightly different from those used in subsequent surveys. For example, in the first IFLS, tuition (KS10-Book1) and boarding/room rent (KS12) are defined on a monthly basis, whereas in the second IFLS, they are defined on a yearly basis, which can lead to a decrease in measured consumption. The difference, to some extent, can cause misunderstanding or error while filling out the questionnaire and, hence, data incomparability between waves.

The descriptive statistics of per capita expenditure (PCE) per decile of PCE are given in Table A1. The values are all weighted and at their current prices. Table 5 presents per capita expenditure in ten groups (PCE deciles). The monthly PCE data presented here is in constant 1993 Rupiahs. The expenditures across the groups do not display significant differences as much as in per capita income across per capita income deciles (PCI deciles) in Table 8. Expenditure exhibits smoother fluctuations over time compared to income. A weakness of household surveys is the underreporting of income by households (Decoster et al., 2010) but not in expenditure. The average per capita income in several groups is lower than per capita expenditure. This is one of the reasons why expenditure is a better measurement of household resources rather than income. In the summary in Table 5, the expenditure data has been cleaned from outliers, missing values have been imputed, and the data is weighted by using the household weight of each wave to match the population of Indonesia. For the analysis, observations with zero consumption and zero food consumption are omitted.

Table 5. Monthly Per Capita Expenditure (PCE) (in Rupiahs 1993=100)

PCE deciles	1993	1997	2000	2007	2014
1	14,280	19,281	21,714	29,840	42,260
2	21,960	30,565	33,039	43,959	62,749
3	27,958	38,756	41,825	55,332	78,646
4	33,916	46,709	50,975	66,945	94,744
5	40,742	56,596	61,041	79,735	111,988
6	49,130	68,627	73,103	95,734	133,674
7	59,981	84,622	88,871	115,994	162,117
8	75,619	107,728	113,629	148,242	204,173
9	105,010	153,898	159,839	201,736	282,594
10	236,432	474,833	367,074	426,677	674,317
Total	59,280	101,598	97,568	118,846	176,026
CPI	100	136	270	507	763

Notes: Index 1993=100, the PCE data is weighted using the household weight of each wave[4]
Source: Author's calculation from IFLS 1, 2, 3, 4, and 5

Table 6 further displays the average number of categories of household consumption, both food and non-food. There are several caveats regarding the categories of food items that would be analysed. First, the data provides different levels of food categorisation from what is mentioned in the VAT Act. The food commodities in the IFLS are categorised into 37 categories under eight big groups: staple foods, vegetables, dried foods, meat and fish, other dishes (and like), milk/eggs, and spices. These categories cannot be used directly to match the VAT exemption list stated in the VAT Act. However, the categories in the data can be re-categorised to resemble the categories of VAT-exempt food items. The re-categorisation is shown in Table A6. An instance of re-categorisation is soybean. The soybean category is basically VAT-exempt; however, the category is merged with peanut, mung bean, and the like. Soybean is then re-categorised as vegetables along with other nuts. Second, the own-produced food items are basically not taxed because the households do not buy them from the market. However, the values of own-produced goods are treated as taxed goods in the analysis because the goods contain input tax anyway when the households buy the raw materials of the goods. This input tax cannot be credited by the households through the credit mechanism in VAT because they are the final consumers and are not taxable enterprises registered in the VAT administration. Consequently, the input tax becomes the additional cost which in the analysis is treated similarly to the output tax.

[4] IFLS1=hwt93, IFLS2=hwt97x, IFLS3=hwt00xa, IFLS4=hwt07xa, IFLS5=hwt14xa

Another note on the food items is the presence of other incentives on agricultural products, such as fishery products. The incentive enables businesses not to collect VAT upon the sale of the products. However, the incentive does not allow the businesses to credit the VAT input either. This indicates there would be an additional cost of input VAT within the cost of the products; thus, these categories are treated as taxed in the analysis, the same as the own-produce consumption items previously discussed.

Table 6. Percentage of Expenditure Per Category

Items Category	IFLS				
	1993	1997	2000	2007	2014
staple food	14.59	14.78	12.81	12.03	9.94
vegetable	7.66	6.79	6.59	5.03	4.83
dried food	1.52	3.42	3.96	4.17	3.16
meat	4.74	5.59	5.52	4.74	4.33
fish	3.87	4.07	4.32	3.53	3.10
dairy	2.75	2.90	3.31	3.35	3.30
oil	2.06	2.52	2.06	2.58	1.72
spices	3.06	3.54	3.62	3.23	3.22
sugar	3.05	2.74	2.55	1.98	1.56
beverages	1.68	2.03	1.98	2.01	2.34
alcohol tobacco	4.37	4.33	5.69	5.63	5.88
snack	6.36	2.65	4.35	4.79	4.87
salt	0.37	0.34	0.40	0.22	0.22
food from outside	1.15	1.20	2.38	2.60	2.68
utility	4.60	4.48	3.92	7.78	5.84
personal	1.28	1.28	1.80	1.60	1.97
domestic good*	n.a.	0.58	0.46	0.59	0.63
household good	1.61	1.30	1.52	1.38	1.28
recreation	0.64	0.54	0.77	0.64	1.02
transportation	3.65	2.89	3.35	4.55	5.57
lottery	0.93	0.03	0.05	0.06	0.02
clothing	3.59	3.39	3.39	2.60	2.78
furniture	0.89	0.74	0.72	0.47	0.54
medical	2.11	1.85	1.94	2.00	2.24
ceremony	2.41	2.51	2.63	2.62	3.69
tax	0.55	0.38	0.28	0.45	0.68
other	1.41	1.98	1.98	2.16	2.86
education	6.58	4.89	4.60	5.04	6.40
housing	12.53	14.52	11.68	11.23	12.25
inonfood**	n.a.	1.71	1.38	0.93	1.08

Notes: n.a. is not available separately; *Domestic goods were not a different category in 1993; **inonfood category covers own-produced non-food items (or given by other parties), which were combined with other non-food categories in 1993.
Source: Author's calculation from IFLS1-IFLS5

Two non-food consumption items in Table 6 of domestic goods and inonfood categories were not asked separately in 1993; thus, the amount of the consumption of these categories in the table is not available (n.a.). Regarding the domestic goods category, in 1997, the questionnaire broke down the household goods category into two categories: household items, which cover the goods, and domestic goods, which cover the services such as those provided by an assistant or a driver. On the other hand, the inonfood category consists of goods or services that are own-produced by the household itself to fulfil their needs, such as own-produced clothing. In 1993, these own-produced goods were asked to the household along with the purchased goods.

On the national level, the biggest expenditure components of Indonesian households are staple food and housing across all waves. However, in 2014, staple food was replaced by housing as the largest expenditure for the first time, with education as the third biggest consumption group. The percentage of expenditure on education increased from 1997 to 2014 either because of higher awareness of education, higher cost of education or both.

The vegetable category presents a decreasing pattern from 1993 to 2014. It was the third biggest expense from 1993-2000, but in 2007 and 2014 it became less significant. Other items that experienced a decreasing trend are sugar and staple foods. On the other hand, dairy, ceremony, “other” category, alcohol and tobacco show an increasing pattern of consumption. In 2007, the utility items were broken down into four categories (electricity, water, fuel, and telephone), which was followed by a significant increase in the aggregate utility expenditure. These shifts display the change in household consumption patterns, which are the focus of the observation in this section. However, it is important to break down the categories into ten groups of expenditure to investigate what the poorest groups consume, keep consuming or stop consuming. The information is presented in Table A2. Let us see the poorest group (first group) in terms of PCE consumption percentage over five waves. The biggest categories consumed are housing (24%), staples (23,8%), vegetables (6%), education (4.2%), and fish (4%). Staple consumption seems to fluctuate while fish and vegetables show a decreasing trend. Education becomes more significant for the three last waves of these households, and utility displays the same trend, but not as much as education. Alcohol tobacco, which held 3.4% of the total expenditure of the group in 1993, experienced an increasing trend to 5.92%. By noting that the per capita expenditure of all PCE deciles grew over time in real values, the increase in alcohol-tobacco in the poorest group is quite large. The topic will be further observed in the later section of the analysis.

5.2. Income Aggregates

The quantitative analysis in this work utilises expenditure as an income proxy because it reflects lifetime consumption and, hence, a better proxy of the lifetime VAT whilst also being separated from saving behaviour (Bukit, 2023). However, presenting the income components and descriptive information provides insight into Indonesian household characteristics and gives background information on the utilisation of expenditure as an income proxy instead of using per capita income.

Income data collection has a bigger problem than expenditure data because the respondents tend to underreport their receipts (Deaton, 1997). Despite the problems, the income components are identified by following definitions taken from the OECD.

The income of a household is defined as household revenue in monetary terms or in the form of goods or services received annually or more often, can be directly consumed, does not reduce the wealth of the household and does not increase liability (OECD, 2013). Thus, inheritance for example, does not fall into the household income category in this analysis because it is not regularly received. OECD classifies the source of revenue into employment, self-employment, income for ownership, income from production, and transfers.

The categories of income following the OECD classification are presented in Table 7. Income from employment is the result of working for a paid job or working for other family members. Self-employment means income from profit (loss) from non-agricultural business, which can be in the form of profit sharing or as the result of a partnership or not. Revenue from the production done by the household also includes services for its own consumption. Agricultural rent and livestock income are property income that arises from the use of assets owned by the household. A transfer is an income given by other parties without asking for something in return.

Table 7. Income components description

Income Component	Definition
1. Crop income	The net profit generated by the farm business
2. Employment	Salary or profit from working for other parties
3. Livestock	Income from rent/lease/profit sharing from livestock/poultry/fish and hard stem plants (coconut, coffee, and so on)
4. Agricultural Rent	Rent of agricultural assets other than livestock category
5. Self-employed	The net profit generated by a nonfarm business
6. Transfer	Transfer income (cash, scholarship/tuition, health care cost, foodstuff, or other goods) from 1. Government assistance, private assistance, other than family transfer such as friends and neighbour 2. Non-resident family (parents, siblings, children)
7. Other	Other sources such as a pension, gift, lottery, insurance claim, and rent of other assets (non-agricultural assets and livestock)

Source: summarised from IFLS 5

One of the problems in income comparison is inconsistent questionnaires from year to year; hence, the available income components are not similar. Nevertheless, they can be re-categorised according to their characteristics and definitions. In five surveys, all income sources are classified into seven groups: crop income, employment, livestock, agricultural rent, self-employment, transfers, and others.[5] The 1993 income sources are spread over six books, books K, 1, 2, 3, 4 and 5. Books K, 1, and 2 are collected at a household level, whereas others are at the individual level. In 2000, a more detailed questionnaire was introduced, and the questionnaire and its

[5] The components follow the Rural Income Generating Activities (RIGA) Project (Food and Agriculture Organization, 2008)

components were expanded, with book three divided into books 3A, 3B, and 3P[6]. In 2007, the questionnaire was again redesigned to become simpler and more compact.

There is a significant change in the questionnaire from 1997 to 2000, and likewise, to 2007. The questionnaire is once again shifted into a more compact form. Questionnaires from 2007 and 2014 have small differences; therefore, we can directly compare the two periods. For that reason, the aggregate data in the respective survey is also interesting to observe. On the other hand, the books on expenditures did not change as much. There is consistency in the main categories from year to year, and there are almost no differences except in details such as snacks, education, and utility. The change of questions is to accommodate the need for more detailed data and additional items, such as the self-produced non-food category in 1997, that have not been asked in 1993 separately.

The interviewers visited households once or twice to fill out all the books in the questionnaire, and several families could not finish the interviews; thus, incomplete interviews are excluded from the analysis of this paper. Table 8 presents a summary of the per capita income per decile of PCI of households who completed books of income. Several families in group 1 have negative income. From Table A3**,** we know that these negative numbers came from crop income and nonfarm business income under the self-employment category. The negative values are due to the calculation of sales reduced by expenses or, if not known, in net profit/loss. The concept of net loss was introduced since IFLS 3 in 2000. Hence, in 2000, more net loss was reported than in previous surveys.

In the preparation or cleaning stage of the income data summarised in Table 8, missing values have been imputed and outliers have been cleaned. It is possible to have zero or negative income for a year.

Table 8. Monthly Per Capita Income (PCI) Per Decile (in Rupiahs 1993=100)

PCI deciles	1993	1997	2000	2007	2014
1	-1,120	2,513	-8,357	4,723	5,739
2	3,384	9,006	12,186	17,632	25,133
3	7,610	15,403	20,650	28,543	42,122
4	12,792	22,795	29,731	40,158	59,441
5	19,137	32,004	40,744	53,618	79,873
6	27,847	43,504	54,672	69,753	104,792
7	40,043	58,594	73,825	92,069	137,834
8	58,653	81,044	102,010	125,252	188,434
9	95,421	118,252	150,159	185,344	274,656
10	417,961	275,041	484,617	489,780	714,968
Total	57,516	60,912	93,903	103,724	154,298
CPI	100	136	270	507	763

Note: Index 1993=100

Source: Author's calculation from IFLS 1, 2, 3, 4, and 5

[6] Some modules (parts of a book) appear in more than one individual book, such as employment (TK), in order to collect the data more efficiently. Thus, both books are summarised to get household-level data. For instance, a woman who is married and under 50 fills out questionnaires in book four while others answer the marriage questionnaire in book 3A. Further, if modules appear in both household books and individual books, I use only the household-level book (page 8 *DRU-2238/1-NIA/NICHD*).

Table 9 displays the categories of income sources of Indonesian households. We can see that employment is the largest earning source in all waves, and the change in employment income would affect the employment incomes of all groups, especially the highest income groups (Table A3). The 1997 income per decile shows that in 1997 there was a fluctuation in employment. The situation is an effect of the Asian Financial Crisis, which started in August 1997 and lasted until mid-1998. The survey of IFLS2 was conducted from August until December 1997, which covers half of the crisis. Indonesia, as one of the countries hardest hit by the crisis, experienced massive layoffs in 1997 and afterwards. Many employees lost their jobs and were given compensation. This fact is supported by Table 9, in which in 1997, the employment category displays a decrease due to the situation. The second highest income source is employment, followed by others in all surveys. Income from livestock across the other four years is the lowest income source.

The most recent survey of 2014 shows that the largest sources of income are employment, self-employment, others, and agricultural rent. The "other" category covers pension, insurance claims, lottery, or gifts from friends and charities, in which pension holds the biggest percentage. The agricultural rent shows a significant increase from 2007 to 2014. The group covers the rent of agricultural assets which are not animals and/or plants.

The "transfers" category represents transfers from family and nonfamily. The category shows a decrease in 1997 in response to the decrease in the employment category. In Indonesia, there is a custom to transfer some part of the salary to other family members. Due to the Asian financial crisis, big layoffs happened, and people lost their jobs and, hence, lost their ability to send money to their relatives. Transfers from nonfamily are usually in the form of government assistance and scholarships. The government started to assist in 1998 nationwide after the financial crisis in 1997 – 1998. Thus, the 2000, 2007, and 2014 surveys include transfers from the government.

Table 9. Monthly Per Capita Income (PCI) Per Category (in Rupiahs 1993=100)

Income	1993	1997	2000	2007	2014
Crop Income	374,224	579,446	603,576	752,713	753,551
Employment	3,366,015	2,461,504	2,639,977	2,800,789	4,272,608
Livestock	217,020	299,474	296,794	519,876	593,208
Others	696,775	1,282,584	1,422,554	1,089,620	2,228,047
Agricultural rent	476,120	670,359	802,005	588,632	1,302,294
Self-Employment	1,137,311	1,657,838	1,704,173	2,287,968	2,726,081
Transfers	534,347	398,335	420,944	527,758	773,087
CPI	100	136	270	507	763

Notes: Index 1993=100

Source: Author's calculation from IFLS 1, 2, 3, 4, and 5

From the point of view of ten groups (deciles) and categories of income (Table A3), in 1993, the poorest group in terms of per capita income had the largest income in employment and agricultural rent while having negative income in crop income and self-employment. These two categories are the contributors to the negative income values of group 1 in Table 8. The richer groups have greater earnings from employment and self-employment. All groups received the largest share of their income from employment. Again, the situation changed a bit during the crisis; the highest and lowest income groups experienced a decrease in employment.

In 2000, the survey introduced the concept of profit and loss. The poorest have a negative crop income and self-employment income. Almost all income groups in 2000 and 2007 earned money from employment and self-employment except the poorest and second poorest groups in 2000. The poorest earn their income from employment and others the most, and the second poorest earn the money from employment and crop income.

The 2007 crop income in the poorest group remains negative. However, now, the poorest group enjoys more income from employment and self-employment. In 2014, the poorest group got the highest income from agricultural rent and employment while having negative crop income. Employment is still the largest source of income for higher-income families. The second poorest group has employment and self-employment as the biggest sources of income.

In addition to the monetary value of the income above, the observations of the numbers of households earning income from these seven categories show that the transfers category is one of the two most frequent income sources besides employment. In 1993, 2000, and 2007, the number of households receiving transfers was higher than those earning income from employment. From the number of households, the striking shift across time in income is in crop income. Crop income indicates that it was a prevalent source of income in groups 1, 2, and 3 in 1993. Afterwards, crop income became less significant in 2014 than in employment and transfers.

5.3. Household Characteristics

The survey sampling is based on regional considerations. Thus, regional information is provided in the surveys. Besides regions, the surveys collect demographic data: household size, sex of household head, marital status, age of household members, education level of members and religion and others. The analysis uses the information in the estimation for food consumption. Important family characteristics that determine the consumption and lifestyle in Indonesia are typically region of residence, household size, the sex of household head, age of members and marital status.

The average household size in Indonesia decreased from 1993 to 2014, going from 4.58 in 1993 to 4.45 in 1997, 4.18 in 2000, 3.75 in 2007 and 3.68 in 2014. In 2014, Statistics Indonesia reported that 3.9 was the average household size. More than seventy per cent of household heads are men (86.2%), and most females who lead the household are widows. In 2014, Statistics Indonesia reported that 85.27% male and 14.73% female. The age of household members and the number of income earners are apparent factors in shaping life patterns (Eshghi and Lesch, 1993), and they are all relevant to social behaviour in Indonesia. Education, marital status, and family unity are essential; however, the impact must be considered further in the estimation of consumption patterns.

Table 10 provides a big picture of the household characteristics of the samples. The urban and rural compositions indicate the oversampling of urban areas. The sampling rate for urban areas is around 50%, while the real urban population of Indonesia does not reach 50%. The average urban population of Indonesia in 1990 (as the basis for 1993 IFLS), for instance, only DKI Jakarta Province has more than 50% of the urban population because DKI Jakarta is the capital city of Indonesia, consisting of 100% urban area. The second largest percentages of urban were found in DI Yogyakarta and West Kalimantan, with 48% in each province.

The household weights utilised in the IFLS correct the oversampling of urban and smaller provinces, so the distribution of samples reflects the distribution of rural-urban and provinces in Indonesia. The estimation of households is calculated by dividing the population by the average of household size in each enumeration area (EAs). The study utilises the attrition-weight to correct the uncontacted targeted households provided by the IFLS surveys. The weights are to reflect the Indonesian population in 13 provinces in 1993. Two components of the household longitudinal weights are first, the sample design of 1993 IFLS and second, the attrition between 1993 and 2014 IFLS.

Further, in Table A4, we have information regarding the education level of householder of families in Indonesia from samples. Fewer householders were unschooled from 1993 to 2014, and more percentage of university graduates were unschooled. In addition, Table A5 categorises the householders based on their ages. Most household heads are 31-50 years old, followed by an age category of 51-70, which represents the age of household heads in Indonesia.

Table 10. Household characteristics (sex, region, and marital status) of IFLS Sampling

Year	Sex of Household Head				Urban/Rural				Marital Status										Total
	M (1)		F (0)		Urban (1)		Rural (2)		Unmarried (1)		Married (2)		Separated (3)		Divorce (4)		Widow/er (5)		
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
1993	6,060	83.9%	1,164	16.1%	3,436	47.6%	3,788	52.4%	219	3.0%	5,981	82.8%	54	0.7%	148	2.0%	822	11.4%	7,224
1997	6,284	82.5%	1,336	17.5%	3,486	45.7%	4,134	54.3%	251	3.3%	6,167	80.9%	61	0.8%	151	2.0%	990	13.0%	7,620
2000	8,607	82.5%	1,828	17.5%	5,025	48.2%	5,410	51.8%	649	6.2%	8,309	79.6%	72	0.7%	211	2.0%	1,194	11.4%	10,435
2007	11,007	82.9%	2,500	18.8%	7,386	55.7%	6,150	46.3%	1,016	7.7%	10,649	80.2%	88	0.7%	305	2.3%	1,449	10.9%	13,270
2014	13,005	86.2%	2,876	19.1%	9,033	59.9%	6,056	40.1%	1,170	7.8%	12,610	83.6%	97	0.6%	418	2.8%	1,599	10.6%	15,089

Source: Summarized from IFLS 1, 2, 3, 4, and 5

6. Methodology

6.1. Estimation stages

The estimation stages are summarised in a chart as follows:

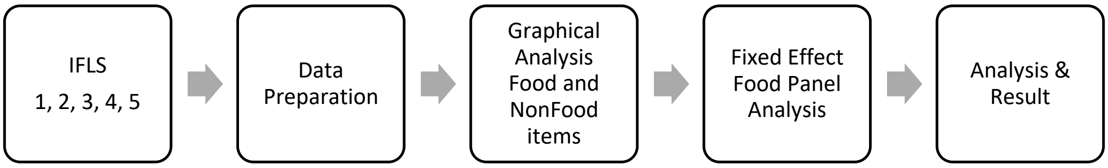

Figure 2. Estimation stages

In the data preparation stage, in the data cleaning process, I identify and treat the outliers and missing expenditure values. Observations with zero consumption or zero food consumption are omitted in the analysis because they do not reflect reality. After data cleaning, I aggregated the values and converted the values into the same recall periods, which are monthly for all expenditure items within a wave or across waves. Before analysis, all expenditure items, especially food items, must be recategorised to follow the categories mentioned in the VAT Act in Indonesia. The re-categorisation of consumption items follows Table A6.

The first analysis is a graphical analysis in which I collect the data from books of IFLS4, the most recent survey before the exemption in 2009 was introduced, containing expenditure components of the household survey. Three main steps are conducted. First, I identify the expenditure components which are in book 1 or 2, compute household expenditure and per capita expenditure, and classify the households into ten groups or deciles based on the ranks of the per capita expenditure from the lowest (group 1) to the highest expenditure (group 10). Second, I break the households up based on deciles and categories of expenditure from step one, and I analyse the consumption pattern. The analysis tools utilised are simple graphical analyses for food and non-food items for easier observation. The objective of the graphical analysis is to visually present the consumption pattern of items consumed in relation to the income of households in 2007. After observing the patterns, I categorise the items into three groups: the increasing pattern, the decreasing pattern, and the unclear pattern to determine the proper VAT exempt list. The result can be compared to the 2009 VAT exempt list.

In the second analysis, which is fixed effect unbalanced panel data regressions, we assume that the consumption tax is entirely paid by the final consumer. Therefore, in the case of Indonesia, when a product is levied by VAT, the price increases by as much as 10%. Let the VAT rate be t, and the price after tax is p, then the price before tax is $\frac{p}{1+t}$ and hence the amount of tax can be calculated by $p - \frac{p}{1+t}$.

6.2. Panel Data Estimation Modelling

The literature review section discusses the works that apply the demand approach to estimate the income elasticities of several food items. Data required to analyse a full demand system are expenditure, prices, and the amount spent on each consumption of goods or quantity/unit consumed. However, the IFLS surveys provide expenditure of a range of goods that households consume and do not provide complete data on prices[7] and quantity purchased required to apply the demand system such as AIDS or QUAIDS to observe the consumption patterns. On the other hand, IFLS is rich in household characteristics and provides panel observations of Indonesian households across five waves, which provide insight into Indonesian households and their consumption patterns. Household characteristics are significant in determining consumption patterns (Deaton, 1990). Therefore, the equation developed in the second analysis is an unbalanced fixed effects model to estimate household consumption patterns, including household-specific effects (α_0) and other control variables that increase the credibility of the estimation. The dependent variable is the budget share of an item consumed (s_{it}), which is defined as expenditure on a good divided by the total expenditure of a household. Budget share is the most common dependent variable in a demand estimation for factors such as AIDS and QUAIDS.

In relation to the distributional study of VAT burden, the consumption share is the focus of the analysis. Share of consumption is the best proxy of consumption that can provide normalised data across households and periods in longitudinal studies. It can capture household behaviour toward consumption shifts and enable reliable comparisons across years. Since the estimations are conducted on food items to observe the consumption patterns and the behaviour of households in dealing with a change of VAT policy, the share enables an observation of what food item a household buys or keeps when the income is higher or lower and what other consumptions are sacrificed or in the opposite.

The budget share is assumed to have a linear relationship to the natural logarithm of per capita expenditure and household characteristics, the presence of shift in VAT burden and time dummies. A positive relationship between budget share and logarithm natural of PCE means that a household increases the consumption of a certain good in the percentage of its total budget when it has a higher PCE while lowering the consumption bundle of one or more other items. The work adopts and applies approaches applied by Deaton (Deaton, 1997) and the framework of the work of Thomas (Thomas, 2022).

I choose fixed effect models because IFLS provides panel data and fixed effect panel data analysis enables us to assume there is unobserved heterogeneity among individuals captured by α_0. There are variables that determine the percentage of

[7] Price indices provided by Board of Indonesian Statistics since 1993 have been collected and are limited in variability and cannot be included in the analysis. Limited because they cover only big regions and big groups of items.

consumption that we do not know or that we have from the surveys and include in the model but are typically the same across time. The fixed effects model recovers the intercept α_0 by using variations across time. In addition, the model excludes between-unit variables and calculates only within-unit variables, which consequently results in an estimated average effect of independent variables on dependent variables over time within each unit or household.[8] The analysis seeks to estimate the within-household variables to represent the consumption patterns.

The fixed effects model enables us to have a correlation between α_0 and other regressors. Random effects analysis, as an alternative method, is to be used when I believe no individual variables could affect the regressors. Therefore, it is best to use the fixed effect model. I conducted the Hausman test to observe the significance of differences between both analyses and found that the fixed effect is more appropriate for most of the results. Furthermore, the pooled ordinary least square (OLS) model[9], another alternative, would give the possibility of using the time-variant model, but the panel analysis is proven superior in dealing with current data because it provides the analysis of change of behaviour within household consumption across five waves, from 1993 to 2014. The fixed effect method I use is an unbalanced panel study whereby I analyse all households in five waves of surveys which have two or more observations. The unbalanced panel method is preferred because it can analyse more observations than the balanced panel method.

Two main equations of demand estimation are applied to analyse the consumption patterns when the VAT burden is not considered (on all consumption items) and when it is considered (on three categories which were newly exempt in 2009):

$$s_{it} = \alpha_0^1 + \alpha_1^1 \ln y_{it} + \alpha_2^1 d_t + \alpha_3^1 z_{it} + \mu_{it}^1 \tag{1}$$

$$s_{it} = \alpha_0^2 + \alpha_1^2 \ln y_{it} + \alpha_2^2 d_t + \alpha_3^2 z_{it} + \alpha_4^2 \ln svat_{it} + \mu_{it}^2 \tag{2}$$

where s_{it} is a food item share of expenditure as a percentage of total expenditure by household i in time t, y_{it} is per capita expenditure of household i in time t, μ_{it}^1 is the error term overtime over the household for the first estimation and μ_{it}^2 for the second estimation. For the wave or time dummies, the estimation covers wave dummies (d_t) because the intervals between waves are quite large and there is a possibility the shift in consumption is due to major events outside the household and/or the VAT policy. In the analysis, I utilise the time dummy of 1993 as the base year to avoid a dummy trap. α_0 is the entity-specific intercept which allows the uniqueness of a household that cannot be captured by the equations. The superscript of the parameters indicates whether they are from the first or the second estimation; for instance, α_0^1 is the entity-specific intercept for the first estimation and α_0^2 is the entity-specific intercept for the

[8] The fact that the fixed effects estimator is only used within variation is sometimes considered a weakness of the model.

[9] Pooled OLS has been analysed and it is proven less fit than panel analysis, both fixed and random effects.

second estimation. The household demographic characteristics, z_{it}, are the data on household head age, household head education, marital status, and education level, as well as the data on household member age groups.

The first equation reflects the consumption pattern without considering the VAT burden at all. Later, the VAT burden is captured in the second equation, which is the natural logarithm of total VAT paid by a household as a percentage of household expenditure ($ln\ svat_{it}$). The VAT burden is at the same term as the independent variable.

Based on the Indonesian VAT Act (2009), the characteristics of goods exempt are basic needs and widely consumed commodities. In addition, the exemption policy has been formulated to benefit poorer households. In this case, food items fulfil the requirements; therefore, the analysis focuses on food items and the VAT-exempt list.

The null hypothesis to be examined is that the taxed items have positive logarithm of per capita expenditure coefficients (α_1) in which the higher a household earns per capita expenditure, the more the household consumes the items. In other words, the coefficients (α_1) of per capita expenditure reflect the nature of goods consumed by families in Indonesia. The commodities are supposed to be taxed when the elasticity is positive and considered to be VAT. Therefore, the alternative hypothesis is that there are still food items untaxed while having a positive coefficient to propose a VAT-exempt list.

6.3. Variables and Categories

The control variables in Equation (1) and Equation (2) are chosen based on the data availability in all waves of IFLS and based on its applicability in the within-variation fixed effect panel data analysis, which drops all time-invariant variables within households, such as religion, race, and region of residence. The variability within households which affects the dependent variable would be captured by the coefficient of alpha null (α_0). It represents differences in time-constant variables caused by urban-rural and religious variances. For that reason, I run two separate unbalanced fixed effects panel regressions on rural and urban areas to observe the differences in consumption patterns between both areas.

The variables or regressors in the equation under fixed effect panel data analysis can be classified as time-variant regressors, such as the natural logarithm of per capita expenditure, which alters across time; time-related variables that must change with time, such as age; and time-invariant regressors, such as the sex of the householder (headsex), the education of the householder (headeduc), and household size (hhsize), in which, to some extent, the variables are constant for all surveys. However, it does not mean that the time-invariant variables are fixed for all time periods. For example, the headsex variable can change when the household head dies, or the highest education of the householder can become higher over some time. I omitted time-invariant regressors, which are almost perfectly fixed over time, such as religion, rural/urban categorisation and race[10]. The fourth category of variable is the individual-invariant variable, whereby all households have the same number of regressors. Dummy variables of wave or time from one to five (one for 1993 IFLS, two for 1997 IFLS, three for 2000 IFLS, four for 2007 IFLS, and five for 2014) are individual-invariant regressors in Equation (1) and (2). The first wave dummy of 1993 is dropped to avoid a dummy trap in the estimation of regressions.

The time-invariant regressors are expected to have a bigger variation which would be more pervasive among families, such as headsex, headeduc, headage and household size. On the other hand, individual-invariant regressors, such as time or wave dummies, have no variation across households.

Equations utilise food item share of expenditure as a dependent variable, the natural logarithm of per capita expenditure as an independent variable, and other variables which are calculated as follows.

1. Food items share of expenditure (s_{it})

   Food items shares are the amount of money spent on a food item as a percentage of the total expenditure on food and non-food items. Fourteen food categories: staple, salt, vegetables, dried food, meat, fish, dairy, beverages, spices, alcohol-tobacco, snack, food-out, cooking oil, and sugar are regressed separately. In addition, these are analysed in three larger groups: exempt goods, newly exempt goods in 2009 and taxed items. Finally, the food category is examined using Equation (1).

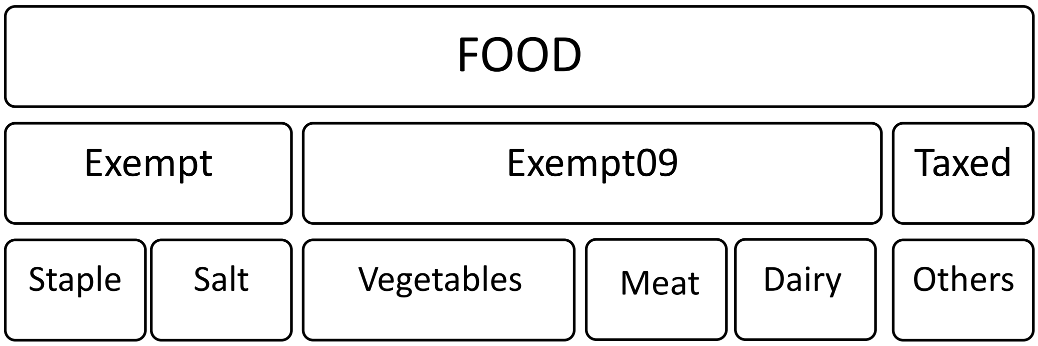

Figure 3. Classification of food items in VAT

   Figure 3 depicts the classification of the food categories within three groups and as a group. The exempt group covers staples and salt, which have been exempt before 2009. Exempt09 consists of goods that have been exempt since 2009 when the third amendment of VAT law was implemented. The taxed groups (VAT-ed) category covers the rest of food commodities that have been levied by VAT from 1984 until now.

   In the calculation using Equation (2), only items under Exempt09 are analysed: vegetables, meat, and dairy.

[10] Another example of time-invariant is the place of birth. ID or household identity is a good example of a perfect time-invariant, while time is a variable with perfect variation.

2. The analysis uses expenditure in terms of per capita to reflect the weight of household members. The usage of natural logarithms is due to the characteristics of the survey data, which are highly right-skewed, and using the logarithm helps create more normally distributed data to be analysed.[11]
3. Household characteristics variables
   a. Characters of household head
      Variables of headage, headsex, and headeduc indicate the householder age, sex, and the highest level of education achieved by a household head, respectively. The age of the household head is a time-related variable that naturally increases each year. Besides, as a result of ageing, the age can change or decrease due to death and hence the replacement of the household head. A time-related variable has higher between-variation than within-variation.
      For the sex of the household head, the analysis wants to observe whether it has an impact on food consumption. The sex variable is less clear than the age variable in consumption behaviours in Indonesia. From the survey, the male householders represent more than 80% of the total households interviewed. In most regions of Indonesia, culturally, male households are considered to be the household head (patrilineal). Typically, a female becomes a household head if she is single, married but separated, divorced, or widowed.
      The last characteristic is the education of the household head (Table A4). Households with a higher education level are likely to have higher incomes, which would have a big impact on food consumption and all expenditures. As expected, the education level of household heads gets better from the first to fifth wave by comparing the decreasing percentage of unschooled households. The 'other' category covers informal education or religious education, which are mostly assumed to be equivalent (or less) to primary school. In 1993, almost 70% of householders had no more than a primary school education. By 2014, this number had decreased significantly. Over this period, the proportion of householders with a higher level of education, such as a university-level education, increased.
   b. Age of household member
      The age of household members is divided into six categories to capture different consumption of food items. The baby category, from zero to two years old, represents the distinct needs of the breast-fed or bottle-fed baby, which is the need for dairy such as milk. The second category is kids between three and five years old to show the consumption of milk before primary

[11] The natural logarithm of per capita expenditure in a fixed effect analysis gives higher within-variability. Similarly, the dependent variable-consumption of food-generally shows higher variability within a household. Therefore, the fixed effect model is appropriate to estimate the impact of per capita expenditure on the consumption of food commodities. The fact is supported by the Hausman test which is conducted for each category equation.

school, in which milk is not necessarily an essential food anymore. The third category is for primary school students between 6 and 12 years old; the fourth category is for secondary and high school between 13 and 16; and the fifth category is for productive workers from 17 to 59 years old. Lastly is the pension age category. Productive age is dropped and is the base category.

c. Household size

   Household covers all members who share the same domicile and food, use the same kitchen and have one household head[12]. The average household size of data analysed is 4.6, with a range of 1 to 39 members across households.

d. Wave or time dummies

   The wave dummies capture the impact of any significant events that took place around the surveys in 1993, 1997, 2000, 2007, and 2014. The events may affect the consumption of food items. The time dummies later become a significant comparison of two regression analyses, which consider both without and with tax burden as an independent variable in the model.

e. Other characteristics

   The survey contains other household data such as the location of residence and religion. These variables do not change at all or not change significantly from year to year; therefore, they must be excluded in a fixed effect panel analysis. On the other hand, the surveys provide information on the number of earners in a household or whether the householder is employed. However, these variables are not available in all surveys; thus, they are excluded from the analysis. Economic-shock variables such as death, sickness and natural disaster[13] are available across waves and have been analysed separately. They are insignificantly related to almost all of the consumption of food items.

7. Consumption Patterns and Results Analysis

7.1. Graphical Analysis

The graphical analysis gives a visual description of consumption patterns of Indonesian households as a percentage of total expenditure without any control variables. Food expenditure and non-food expenditure of the 2007 household survey, the most recent surveys before the exemption in 2009, are displayed graphically in Figure 4 to observe the patterns of household consumption across deciles of per capita expenditure. Table A1 gives the details of the graphs.

It can be seen in Figure 4 that the biggest expenditure group for the lower eight deciles is staple food. Snacks and spices, in 2007, were the biggest components of the two richest groups. Richer groups, the eighth, ninth, and tenth deciles, show different

[12] Definition from Indonesian Statistics Agency

[13] Financial fragile household variables

patterns than other groups; these two groups spent the most on housing in 2007. Housing data in the surveys indicate that the estimated or imputed rent is, on average, higher than the rent paid. Typically, a household that owns a house estimates the rent by using the monthly mortgage payments on the house[14]. The central bank interest was quite high before the Asian financial crisis hit the economy in 1997 (Quigley, 2001; Trinugroho et al., 2014); consequently, we can observe a high increase from 1993 to 1997 in housing expenditure in Table 6 and Table A2. The middle- and higher-income groups experienced the most significant increase in housing costs as a percentage of their total expenditures. In 2000, after the crisis, the housing expense as a proportion of total expenditure decreased in all groups and thus nationally.

Housing was the biggest spending in 1997 onward, compared to staples, which became less significant. However, the poorest group in 2014 spent on staples the most, followed by housing and education, while the richest group consumed non-food items, most of which are other, housing, and transportation. Likewise, the second richest group consumes non-food items the most: housing, transportation, and education.

By observing the general patterns, we can conclude that food is a bigger part of poorer households in all surveys. The richer groups consumed staple food the most in 1993, and the percentage of consumption decreased over time. In the focus on inequality issues in tax policy, generally speaking, we can say that taxing food items would hurt poor people and eventually worsen inequality.

[14] The property market experienced a bubble before the Asian financial crisis in mid-1997 (Quigley, 2001)

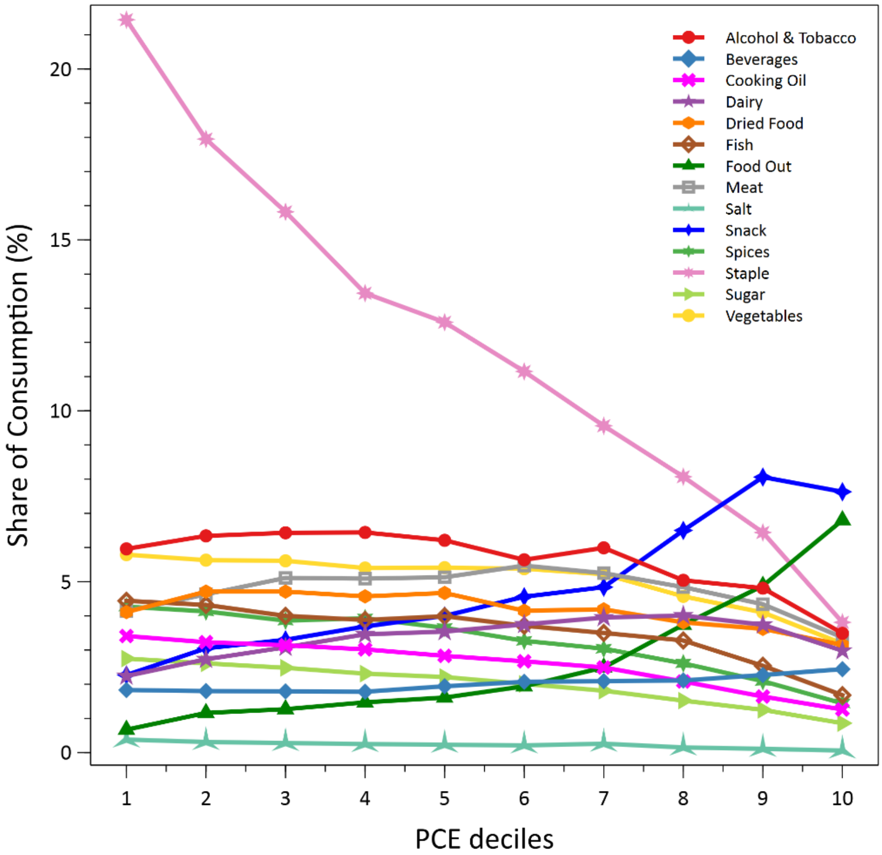

Figure 4. Food expenditure
Source: IFLS 4, 2007

Figure 4 shows that among these food items, staples display the most obvious pattern, which is that the richer a household, the less it is consumed as a percentage of expenditure by the household. Other food products with clear decreasing patterns are spices, sugar, vegetables, cooking oil, salt, and fish. By considering merely the patterns, these commodities are the best candidates to be made exempt. The exemption would automatically decrease the VAT burden if there was a VAT burden. However, from Table 1 we know that some of these items are exempt. Salt and staple food have been exempted since before 1993.

Food commodities which show a more subtle trend of decreasing consumption as a percentage of expenditure across deciles, from the poorest to the richest, are alcohol and tobacco (altb) and dried food. These commodities have the potential to be exempt from VAT. On the other hand, dairy and meat indicate a subtle trend of increasing consumption or more like an inverted U-shape whereby the middle-income groups are the biggest consumers of the product, followed by the poorer groups and richer groups. Taxing these commodities would increase the burden mostly on the middle class.

Food out (fdout) is prepared food purchased and consumed by household members in a restaurant or other places outside the residence of the household. At the same time, the snacks category covers food bought and consumed at the residence of a household. Food out shows a striking increasing pattern whereby the richer a household becomes, the more it consumes food out. The snack group shows an increasing pattern as well, except for the richest group. However, the share of consumption for richer groups is still far above the lower-income groups. Beverages also display very similar behaviour, in which the consumption increases with the wealth of the group. Hence, foodout, beverages, and snacks are the clearest candidates for a consumption tax to increase the progressivity of the taxation system.

An important note for food consumption is the consistency of the patterns. Due to the inelastic nature of food items, the tendency we observed in Figure 4 for 2007 is more-or-less the same as the food consumption patterns in 2014. However, for non-food expenditure, there is more variation in the consumption of these items across time.

Figure 5 displays the non-food expenditure in categories and as a percentage of total expenditure across households in different groups of income. In total, higher-income families consume more non-food items. Therefore, the observation from Figure 5 may result in more potential items to be taxed to increase the progressivity of the VAT system.

Household goods (hhgoods) and clothing present a clear trend of declining consumption as a percentage of expenditure which means that the goods are the potential candidates to be VAT-exempt.

A clear increasing trend can be observed for three items: the 'others' category, domestic goods, medical, furniture, and recreation. These items show the most potential to be taxed at a higher rate, if possible, in a multi-rate VAT scheme. Other potential items to be taxed are ceremony, transport, and housing. They display an increasing trend as well. Inonfood and tax, however, display a subtle trend of increasing while personal and lottery show an unclear tendency. Regardless of the tendency, taxes must be excluded from being taxed because they cannot be taxed.

The utility category, which is the second biggest non-food expenditure after housing across all income groups, exhibits an inverted U-shaped curve, which indicates that lower and higher-income families pay less as a percentage of their total expenditure than middle-income groups. On the contrary, the education category shows a U-shaped curve trend.

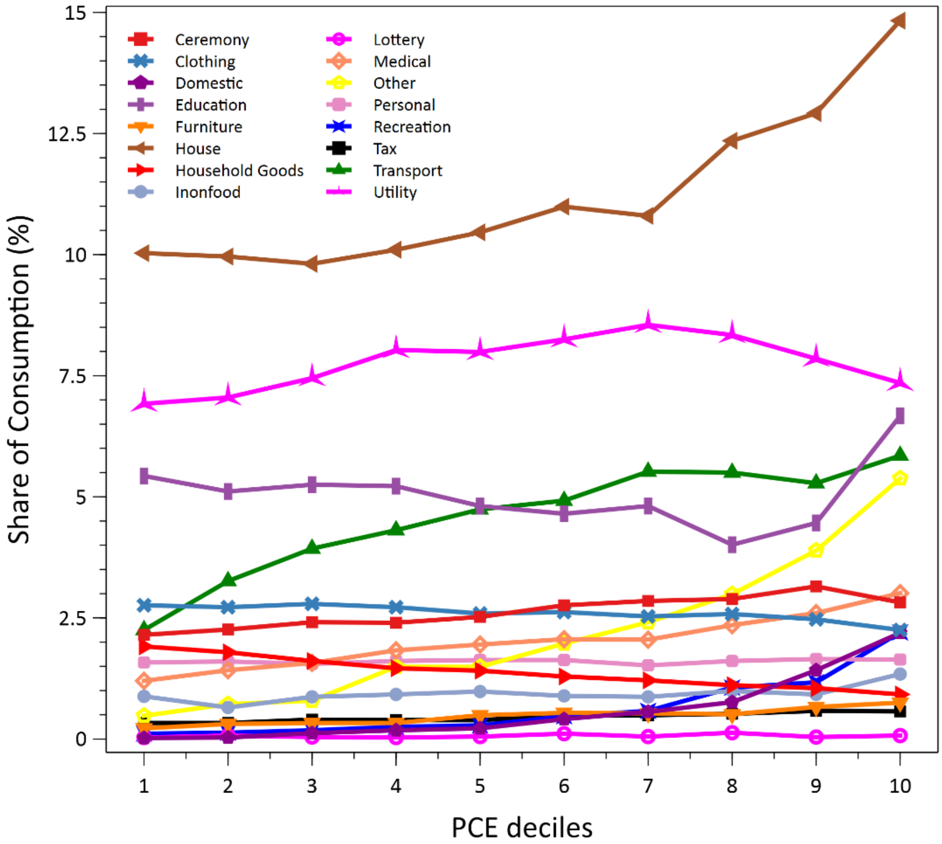

Figure 5. Non-food expenditure

Source: IFLS 4, 2007

Consumption pattern as a percentage of total expenditure across PCE deciles observed in this section can be summarised as follows:

Table 11. Summary of Consumption Patterns in 2007

Decreasing pattern	Increasing pattern	Unclear pattern
Food items		
staple	food out	alcohol & tobacco
spices	snack	dairy
sugar	beverages	meat
salt		dried food
cooking oil		
fish		
vegetables		
Nonfood items		
household goods	"others" category	personal
clothing	domestic goods	education
	recreation	utility
	medical	lottery
	ceremony	
	transport	
	housing	
	furniture	

Source: summarised from the graphical analysis

Table 11 indicates that staple, spices, sugar, salt, cooking oil, fish, and vegetables are potential candidates to be on the VAT exemption list for food items and this requires further examination. On the other hand, foodout, snacks, and beverages are supposed to be taxed which is exactly what the VAT regulation states. Based on the lists in Table 11, only vegetables show a clear decreasing pattern, and it is appropriate to be exempt. Both meat and dairy do not present any clear patterns. We need to analyse the consumption patterns more deeply.

I have observed the 2014 consumption patterns graphical analysis as well and found that the food consumption patterns do not change significantly from 2007 to 2014 by only observing the graphical and table of food consumption per decile per category. As expected, food items are generally inelastic in price and income; thus, the consumption patterns tend to be static. Therefore, for the subsequent panel data analysis as the first analysis, I keep on using the five waves analysis instead of separating before and after the 2009 exemption to observe and answer the first question of the research: what the consumption patterns of these food items are. Afterwards, in the second analysis, I added the vat burden (vat burden as a percentage of total expenditure) variable in the linear regressions of vegetable, meat, and dairy, the three food commodities which were newly exempt in 2009. Based on both analyses, I will compare the two regressions of three categories of exempted09 and propose the exemption list.

7.2. Panel Fixed Effects Analysis

Unbalanced fixed effects analysis is the most appropriate analysis to capture the change of consumption patterns within a household by using IFLS panel data, which is based on the individuality of the household. Even though time-invariant variables must be excluded, the unique features of the individual can still be observed. The variances within households are not distinct over time, but they are significant in analysing the change in consumption within households.

For the fixed effects analysis for the whole of Indonesia, the descriptive statistics of the data utilised can be found in Table A7. First analysis, the estimation of Equation (1) is conducted on all food items and the results are presented in Table 12 and Table 13. All coefficients of the natural logarithm of per capita income are statistically significant. Second, the result of the estimation of Equation (2) is conducted on only newly exempted items in 2009 and is presented in Table 14.

Table 12. Consumption pattern analysis for staple, salt, vegetables, dried food, meat, fish, dairy, beverages, spices, and alcohol/tobacco

Explanatory variables	staple	salt	vegetables	dried	meat	fish	dairy	beverages	spices	alcohol tobacco
logarithm of percapita exp	-3.881 **	-0.134 **	-0.174 **	0.218 **	0.655 **	-0.673 **	0.255 **	-0.140 **	-0.598 **	-0.339 **
	[-0.081]	[-0.005]	[-0.043]	[-0.029]	[-0.045]	[-0.03]	[-0.031]	[-0.018]	[-0.023]	[-0.048]
household size	-0.085 **	-0.016 **	0.034 *	0.022 *	0.129 **	-0.024 *	0.031 **	-0.059 **	-0.050 **	0.054 **
	[-0.029]	[-0.002]	[-0.015]	[-0.01]	[-0.016]	[-0.011]	[-0.011]	[-0.006]	[-0.008]	[-0.017]
household head education	-0.116	-0.007	-0.156 **	-0.054 *	-0.150 **	-0.006	-0.036	0.050 **	-0.050 *	-0.259 **
	[-0.07]	[-0.004]	[-0.037]	[-0.025]	[-0.039]	[-0.026]	[-0.027]	[-0.015]	[-0.02]	[-0.042]
household head age	0.072 **	0.001 **	-0.004	-0.014 **	0.024 **	0.012 **	-0.003	0.001	0.012 **	-0.027 **
	[-0.005]	[0]	[-0.003]	[-0.002]	[-0.003]	[-0.002]	[-0.002]	[-0.001]	[-0.001]	[-0.003]
household head sex	-1.143 **	-0.049 **	-0.890 **	-0.364 **	-0.473 **	-0.262 **	-0.263 **	0.199 **	-0.444 **	3.852 **
	[-0.194]	[-0.011]	[-0.103]	[-0.068]	[-0.107]	[-0.073]	[-0.073]	[-0.042]	[-0.056]	[-0.116]
household member age 0-2	-0.315	-0.100 **	0.167	1.559 **	0.885 **	-0.492 **	7.453 **	-0.686 **	-0.743 **	-1.751 **
	[-0.504]	[-0.03]	[-0.267]	[-0.177]	[-0.278]	[-0.188]	[-0.19]	[-0.109]	[-0.144]	[-0.3]
household member age 3-5	0.243	-0.057 *	0.766 **	2.649 **	1.354 **	0.243	4.035 **	-0.270 **	-0.107	-2.507 **
	[-0.468]	[-0.027]	[-0.249]	[-0.165]	[-0.259]	[-0.175]	[-0.177]	[-0.101]	[-0.134]	[-0.279]
household member age 6-12	0.344	-0.093 **	-0.406 *	1.129 **	0.570 **	-0.156	0.617 **	-0.514 **	-0.567 **	-3.702 **
	[-0.316]	[-0.019]	[-0.168]	[-0.111]	[-0.174]	[-0.118]	[-0.119]	[-0.068]	[-0.09]	[-0.188]
household member age 13-18	0.665 *	-0.051 **	-1.118 **	0.671 **	0.046	-0.650 **	-0.533 **	-0.569 **	-0.626 **	-3.598 **
	[-0.309]	[-0.018]	[0]	[-0.109]	[-0.171]	[-0.116]	[-0.117]	[-0.067]	[-0.089]	[-0.184]
household member age 60 and over	0.492	0.087 **	0.545 **	0.587 **	0.069	-0.332 **	0.085	-0.198 **	0.118	-1.543 **
	[-0.289]	[-0.017]	[-0.153]	[-0.102]	[-0.159]	[-0.108]	[-0.109]	[-0.063]	[-0.083]	[-0.172]
marital status of household head	1.096 **	0.030 **	0.778 **	0.226 **	1.077 **	0.643 **	0.414 **	-0.005	0.593 **	-1.194 **
	[-0.192]	[-0.011]	[-0.102]	[-0.068]	[-0.106]	[-0.072]	[-0.072]	[-0.042]	[-0.055]	[-0.114]
Wave dummies										
2	1.208 **	0	-0.897 **	1.927 **	0.771 **	0.596 **	0.310 **	0.404 **	0.577 **	0.273 **
	[-0.119]	[-0.007]	[-0.063]	[-0.042]	[-0.066]	[-0.045]	[-0.045]	[-0.026]	[-0.034]	[-0.071]
3	-0.324 **	0.076 **	-0.639 **	2.470 **	0.849 **	0.919 **	0.679 **	0.229 **	0.947 **	1.590 **
	[-0.12]	[-0.007]	[-0.064]	[-0.042]	[-0.066]	[-0.045]	[-0.045]	[-0.026]	[-0.034]	[-0.071]
4	0.261	-0.054 **	-2.328 **	2.838 **	-0.018	0.197 **	0.698 **	0.321 **	0.666 **	1.274 **
	[-0.139]	[-0.008]	[0]	[-0.049]	[-0.077]	[-0.052]	[-0.053]	[-0.03]	[-0.04]	[-0.083]
5	-1.271 **	-0.039 **	-2.395 **	1.633 **	-0.473 **	-0.044	0.661 **	0.594 **	0.692 **	1.889 **
	[-0.147]	[-0.009]	[-0.078]	[-0.052]	[-0.081]	[-0.055]	[-0.056]	[-0.032]	[-0.042]	[-0.088]
Intercept	54.669 **	1.917 **	10.020 **	-0.577	-4.203 **	10.204 **	-1.008 **	3.322 **	9.531 **	8.812 **
	[-0.984]	[-0.058]	[-0.523]	[-0.347]	[-0.543]	[-0.368]	[-0.371]	[-0.213]	[-0.282]	[-0.587]
Number of observations	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754
F statistic	385.64	152.5	203.53	406.86	68.58	131.84	206.62	58.88	112.71	212.7
R-squared for within model	0.1	0.04	0.06	0.1	0.02	0.04	0.06	0.02	0.03	0.06
R-squared for between model	0.42	0.15	0.01	0.02	0.02	0.02	0.03	0	0.15	0.07
R-squared for overall model	0.21	0.07	0.05	0.08	0.02	0.03	0.05	0.01	0.07	0.06
Model test p-value	0	0	0	0	0	0	0	0	0	0

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05., exp = expenditure

Source: Author's calculation

Table 13. Consumption pattern analysis for snack, foodout, oil, sugar, exempted, exempted items in 2009, VAT, and food

Explanatory variables	snack	foodout	oil	sugar	exempted	exempted09	vat	food
logarithm of per capita exp	0.603 **	0.827 **	-0.501 **	-0.413 **	-4.015 **	0.737 **	-1.280 **	-0.046 **
	[-0.054]	[-0.038]	[-0.019]	[-0.019]	[0]	[-0.073]	[-0.095]	[-0.001]
household size	-0.202 **	-0.119 **	-0.054 **	-0.043 **	-0.101 **	0.195 **	-0.489 **	-0.004 **
	[-0.019]	[-0.014]	[-0.007]	[-0.007]	[0]	[-0.026]	[-0.034]	[0]
household head education	0.149 **	0.182 **	-0.034 *	-0.072 **	0	-0.343 **	-0.062	-0.005 **
	[-0.047]	[-0.033]	[-0.016]	[-0.017]	[-0.071]	[-0.063]	[-0.082]	[-0.001]
household head age	-0.062 **	-0.031 **	0.006 **	0.014 **	0.073 **	0.017 **	-0.093 **	0
	[-0.003]	[-0.002]	[-0.001]	[-0.001]	[0]	[-0.005]	[-0.006]	[0]
household head sex	1.416 **	1.206 **	-0.428 **	-0.298 **	-1.192 **	-1.625 **	4.873 **	0.021 **
	[-0.13]	[-0.092]	[-0.045]	[-0.047]	[0]	[-0.174]	[-0.227]	[-0.003]
household member age 0-2	-0.059	-1.356 **	-0.532 **	-0.788 **	0	8.506 **	-5.000 **	0.031 **
	[-0.338]	[-0.237]	[-0.117]	[-0.121]	[-1]	[-0.451]	[-0.588]	[-0.008]
household member age 3-5	1.657 **	-1.660 **	-0.220 *	-0.395 **	0	6.155 **	-0.399	0.059 **
	[-0.314]	[-0.221]	[-0.109]	[-0.113]	[0]	[-0.419]	[-0.547]	[-0.007]
household member age 6-12	0.003	-0.952 **	-0.162 *	-0.724 **	0.251	0.782 **	-5.650 **	-0.046 **
	[-0.212]	[-0.149]	[-0.073]	[-0.076]	[-0.316]	[-0.283]	[-0.369]	[-0.005]
household member age 13-18	-0.659 **	-0.805 **	-0.391 **	-0.583 **	0.615 *	-1.606 **	-7.204 **	-0.082 **
	[-0.207]	[-0.146]	[-0.072]	[-0.074]	[-0.31]	[-0.277]	[-0.361]	[-0.005]
household member age 60 and over	1.224 **	-0.934 **	0.316 **	0.231 **	0.578 *	0.699 **	-0.336	0.009 *
	[-0.193]	[-0.136]	[-0.067]	[-0.069]	[-0.289]	[-0.258]	[-0.337]	[-0.004]
marital status of household head	-3.340 **	-1.708 **	0.466 **	0.417 **	1.126 **	2.269 **	-3.906 **	-0.005
	[-0.129]	[-0.09]	[-0.044]	[-0.046]	[-0.192]	[-0.172]	[-0.224]	[-0.003]
Wave dummies								
2	-4.079 **	-0.597 **	0.652 **	-0.233 **	1.208 **	0.183	0.848 **	0.022 **
	[-0.08]	[-0.056]	[-0.028]	[-0.029]	[-0.12]	[-0.107]	[-0.14]	[-0.002]
3	-2.911 **	-0.092	0.249 **	-0.321 **	-0.248 *	0.889 **	4.403 **	0.050 **
	[-0.08]	[-0.056]	[-0.028]	[-0.029]	[-0.12]	[-0.107]	[-0.14]	[-0.002]
4	-2.885 **	-0.216 **	1.025 **	-0.723 **	0.207	-1.648 **	3.903 **	0.025 **
	[-0.093]	[-0.066]	[-0.032]	[-0.033]	[-0.14]	[-0.125]	[-0.163]	[-0.002]
5	-3.123 **	-0.301 **	0.193 **	-1.113 **	-1.310 **	-2.206 **	1.889 **	-0.016 **
	[-0.099]	[-0.069]	[-0.034]	[-0.035]	[-0.147]	[-0.132]	[-0.172]	[-0.002]
Intercept	4.835 **	-5.082 **	7.583 **	7.417 **	56.585 **	4.810 **	47.716 **	1.091 **
	[-0.66]	[-0.463]	[-0.228]	[-0.237]	[-0.986]	[-0.882]	[-1.15]	[-0.015]
Number of observations	65754	65754	65754	65754	65754	65754	65754	65754
F statistic	321.07	167.84	178.14	296.15	407.03	150.28	225.66	374.35
R-squared for within model	0.08	0.05	0.05	0.08	0.1	0.04	0.06	0.1
R-squared for between model	0.06	0.1	0.13	0.17	0.43	0.01	0.05	0.3
R-squared for overall model	0.08	0.08	0.07	0.11	0.22	0.03	0.06	0.16
Model test p-value	0	0	0	0	0	0	0	0

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05. exp = expenditure
Source: Author's calculation

Table 14. Consumption pattern analysis for newly exempted commodities in 2009

Explanatory variables	Vegetables	Meat	Dairy	Exempted 2009***
logarithm of percapita exp	-0.091 *	0.730 **	0.296 **	0.935 **
	[-0.043]	[-0.044]	[-0.03]	[-0.071]
household size	0.066 **	0.158 **	0.047 **	0.272 **
	[-0.015]	[-0.016]	[-0.011]	[-0.025]
household head education	-0.182 **	-0.174 **	-0.049	-0.405 **
	[-0.037]	[-0.039]	[-0.026]	[-0.062]
household head age	0.001	0.029 **	0	0.030 **
	[-0.003]	[-0.003]	[-0.002]	[-0.004]
household head sex	-1.012 **	-0.584 **	-0.325 **	-1.921 **
	[-0.102]	[-0.107]	[-0.073]	[-0.171]
household member age 0-2	0.37	1.069 **	7.555 **	8.994 **
	[-0.265]	[-0.276]	[-0.189]	[-0.442]
household member age 3-5	0.692 **	1.286 **	3.998 **	5.976 **
	[-0.246]	[-0.257]	[-0.176]	[-0.411]
household member age 6-12	-0.419 *	0.558 **	0.610 **	0.749 **
	[-0.166]	[-0.173]	[-0.118]	[-0.277]
household member age 13-18	-0.969 **	0.181	-0.459 **	-1.248 **
	[-0.163]	[-0.169]	[-0.116]	[-0.271]
household member age 60 and over	0.625 **	0.142	0.125	0.893 **
	[-0.152]	[-0.158]	[-0.108]	[-0.253]
marital status of household head	0.917 **	1.203 **	0.484 **	2.604 **
	[-0.101]	[-0.105]	[-0.072]	[-0.168]
logarithm of percentage VAT_burden of hhexp	2.821 **	2.559 **	1.414 **	6.794 **
	[-0.086]	[-0.089]	[-0.061]	[-0.143]
Wave dummies				
2	-1.134 **	0.555 **	0.190 **	-0.389 **
	[-0.063]	[-0.066]	[-0.045]	[-0.105]
3	-0.981 **	0.538 **	0.507 **	0.064
	[-0.064]	[-0.066]	[-0.046]	[-0.106]
4	-2.519 **	-0.191 *	0.603 **	-2.107 **
	[-0.073]	[-0.077]	[-0.052]	[-0.123]
5	-1.924 **	-0.046	0.897 **	-1.072 **
	[-0.079]	[-0.082]	[-0.056]	[-0.131]
Intercept	16.924 **	2.059 **	2.454 **	21.437 **
	[-0.558]	[-0.582]	[-0.399]	[-0.931]
Number of observations	65754	65754	65754	65754
F statistic	262.34	116.49	228.98	287.83
R-squared for within model	0.07	0.03	0.07	0.08
R-squared for between model	0.03	0.02	0.04	0.03
R-squared for overall model	0.07	0.03	0.06	0.07
Model test p-value	0	0	0	0
Hausman Test				
chi^2	2053.59	-1320.37	495.72	-67247.51
Prob > chi^2	0		0	
Breusch and Pagan LM				
$chibar^2$	551.77	1366.53	553.89	1604.32
Prob > $chibar^2$	0	0	0	0
alpha fixed effect hat				
alphafehat	2.531352	2.894341	1.990687	4.814827

Notes: Robust standard errors in square brackets; *** Newly exempted items in 2009 as a category; ** p < 0.01, * p < 0.05. ex p= expenditure, hhexp = household expenditure
Source: Author's calculation

7.2.1. First Analysis Results: Consumption Patterns

The first analysis was conducted using Equation (1). The conclusions that need to be highlighted are first, the analyses have been done to observe consumption patterns, not only by using fixed effect and random effect panel analyses, but also by using pooled ordinary least squares (Table A11 and Table A12) to identify the most efficient model. These three approaches apply the same explanatory variables. Second, most of the consumption regressions are best conducted using fixed effect panel analysis, which is measured by the Hausman test (Table A10). In some cases, the random effect is more efficient based on the test; therefore, the results of both analyses are presented in Table A8 for meat, fish, and alcohol-tobacco. However, there is no significant difference between these two models in terms of interpretation of the results. The motivation behind the calculation is to estimate the consumption patterns within households, not across households; therefore, the results of fixed effect analysis are discussed in the section. Third, the results of the analyses indicate that the parameters of PCE in natural logarithms are all statistically significant. The summary of the estimations of the eighteenth categories and the details of each category are presented in Table 15.

Table 15. Coefficients of PCE natural logarithm of the first estimation

No	Categories	Details	α_0^1	Sign of ln PCE coefficient
1	Staple food	rice, corn, sago/flour, cassava, tapioca, dried cassava, potatoes, yams, and other staple foods	-3.88	Negative
2	Salt	salt	-0.13	Negative
3	Vegetables	vegetables such as spinach and tomatoes, beans and fruits	-0.17	Negative
4	Dried*	noodles, rice noodles, macaroni, shrimp chips, other chips, and the like	0.218	Positive
5	Meat*	beef, mutton, water buffalo meat, chicken, duck, tofu tempeh jerky	0.655	Positive
6	Fish	all kind of fish: fresh, salted or smoked fish	-0.67	Negative
7	Dairy*	liquid milk, powder milk, baby powder milk, other milk, eggs	0.255	Positive
8	Beverages**	drinking water, coffee, tea, cocoa and soft drinks like Fanta, Sprite	-0.14	Negative
9	Spices	of sweet and salty soy sauce, shrimp paste, chilli sauce, tomato sauce and the like, shallot, garlic, chilli, candle nuts, coriander, MSG and other kinds of spices.	-0.6	Negative
10	Alcohol tobacco	alcoholic beverages like beer, palm wine, rice wine, betel nut (for chewing, traditional drugs), cigarettes and tobacco	-0.34	Negative
11	Snack	prepared food bought from outside of the household and eaten at home	0.603	Positive
12	Foodout	prepared food bought and eaten away from home	0.827	Positive
13	Cooking oil	cooking oil made of (palm oil, sunflower), butter	-0.5	Negative
14	Sugar	javanese brown sugar and granulated sugar	-0.41	Negative
15	Exempted	salt, staple food	-4.02	negative
16	Exempted09	vegetables, meat, and dairy	0.737	Positive
17	Vat	dried, fish, beverages, spices, alcohol tobacco, snack, foodout, cooking oil, sugar	-1.28	Negative
18	Food	all food items	-0.05	Negative

Notes: *graphical analysis cannot capture the positive correlation, pooled OLS can detect it and gives the similar correlation as fixed-effect panel data analysis; **both graphical analysis and pooled OLS cannot identify the negative correlation; α_0^1 is the parameter of logarithmic natural of PCE
Source: summarised by author

Positive coefficients of the natural logarithm of PCE are found in categories of dried, meat, dairy, snack, foodout, and exempted09. Several analyses have been conducted. The graphical analysis observes that dried, meat, and dairy do not present clear patterns, while the pooled ordinary least square also gives positive coefficients to these three categories. Beverages show a positive parameter of PCE in natural logarithmic in both graphical analysis and pooled OLS regression. On the other hand, fixed-effect panel analysis produces a negative parameter which indicates that the negative correlation is basically produced by panel data analysis which is conducted over time. The random-effect panel analysis gives the same negative correlation as in the fixed-effect analysis.

The regression analysis results are discussed further based on the explanatory variables used to estimate the consumption patterns of each food item as follows.

a. Natural logarithm of per capita expenditure

   As the main independent variable for the analysis, I observe the sign and the amount of the coefficients. Most consumptions of food items have a negative correlation with the natural logarithm of per capita expenditure in which the more income a household earns, the less food consumption share (as a percentage of the income) it consumes. Food items have an income-inelastic nature; thus, the consumption amount is stable over time. When the income is increased, the percentage/share itself decreases automatically.

   As expected, most of the commodities have negative coefficients of the natural logarithm of per capita expenditure. These food commodities are staple, salt, vegetables, fish, beverages, spices, alcohol-tobacco, oil, and sugar (9 commodities). On the other hand, dried food, meat, dairy, snacks, and foodout have positive coefficients of PCE in logarithm natural. The results indicate that, for instance, when per capita expenditure is increased by 10%, by holding other variables constant, the staple consumption decreases by 0.388%. Another example is when PCE increases by 10%, by holding other variables constant, the dairy consumption increases by 0.026%. The positive sign of PCE in the natural logarithm means that when PCE increases, a household consumes more of the goods as a percentage of total expenditure or in amount. For this reason, dairy, meat, snacks, and dried food are the potential items to be taxed.

b. Household size

   The independent variable of household size is statistically significant and positive in vegetables, dried food, meat, dairy, and alcohol tobacco. It means that when household size increases, holding other variables constant, the consumption of these items increases as well. However, there are also statistically significant and negative coefficients for food commodities: staple, salt, fish, beverages, spices, snacks, foodout, oil, and sugar. These commodities are mostly shared commodities in a household when consumed; therefore, there is no need to increase the consumption when the size of the household increases. For example, a household does not necessarily need more cooking oil or salt when there is an addition member in the household.

c. Household head education

   Not all regression analyses of food consumption produce a statistically significant household head education variable. Positive and statistically significant household head education variables can be found in the regression of beverages, snacks, and foodout. This means that the higher education the householder achieves, the more the household consumes the food item as a percentage of total expenditure. On the other hand, vegetables, dried food, meat, spices, alcohol-tobacco, cooking oil, and sugar are those with negative and statistically significant coefficients of household head education variable. For the share of staple, salt, fish, and dairy consumption, there are no statistically significant correlations with the variable of householder education.

d. Household head age

Positive and statistically significant coefficients of householder age variable can be found in staple, cooking oil, sugar, salt, dried food, meat, and fish. The older a household head is, the higher the share of consumption of a food item in a household is. On the other hand, negative and statistically insignificant coefficients can be found in dried food, alcohol/tobacco, snacks, and foodout. The older the household head is, the less the household consumes prepared food and alcohol-tobacco as a percentage of total expenditure. The snack category covers prepared food bought from outside of the household and eaten at home, while prepared food covers food items bought and eaten away from home. Older householders tend to lead the households to decrease their consumption share of dried food, alcohol/tobacco, snacks, and foodout.

e. Household head sex

The gender of the household head is statistically significant across all food items analysed. The male householder variable has a positive correlation with the share of food item consumption in only four categories: beverages, alcohol-tobacco, snacks, and foodout, while the rest of the food items all indicate negative correlations. This is as expected; alcohol-tobacco in the Indonesian context, for instance, is an item consumed more by males than females.

f. Household member age

The household member age variable is categorised into six categories: baby, kid, primary school age, high school age, productive age, and pension. In the analysis, the base is the productive age (19-59 years old). The number of babies has a positive and statistically significant correlation with the share of consumption of items (compared to the productive age): dried food, meat, and dairy, in which dairy indicates the highest coefficient (7.453) among all. Positive relation means the increase in the number of babies within a family increases the share of dairy consumption. The negative correlation, on the other hand, can be found in the consumption share of salt, fish, beverages, spices, alcohol-tobacco, foodout, oil, and sugar. These items are mostly food that babies cannot consume.

For other groups of age, the kid group from 3-5 years old, the highest coefficient of food item consumption is for dairy (4.035). This is because kids under the age category still drink milk.

g. Marital status

The variable is statistically significant in almost all regressions except in the regression of beverages. Marital status is most impactful on the consumption of snacks and alcohol-tobacco. The coefficient is -3.340, which means the status shift from unmarried to married decreases the consumption of snacks as a percentage of total consumption. It is common in Indonesia after being married, food consumption shifted from consuming process food to consuming homemade cooking.

h. Wave dummies

The dummies indicate the impact of any events that happened in 1993, 1997, 2000, 2007, and 2014. The two big events that happened in 1997 and 2009 were the Asian Financial Crisis and the new VAT policy that exempted vegetables, meat, and dairy. The time dummies reflect many events at the same time; therefore, they cannot be assigned directly and separately to these two big events only. However, I use the coefficients of time dummies to compare the two coefficients in the two regressions before and after the VAT burden variable is included in the analysis.

7.2.2. First Analysis Results: Consumption Patterns: Urban and Rural Areas

The comparisons between consumption patterns in rural and urban areas provide insight into Indonesian households across regions. The information for urban areas can be found in Table A13 for demographic information, Table A14 and Table A15 for the fixed-effect analysis results and for rural areas, the data can be found in Table A16 for demographic information, Table A17 and Table A18 for the fixed-effect analysis results.

The demographic information provides the differences between the population who live in the urban and rural areas. The PCE is higher for the urban population. The household size of families in the cities is slightly higher than in the villages. The education of the householders, on average, is far higher in the city than in the rural areas, as expected, because education is easier to access in the cities. On the other hand, householders in villages are older on average, and a lower percentage of people of productive age live in rural areas. Householders in both urban and rural areas are mostly married.

The average consumption as a percentage of the total expenditure of food items indicates that families in the urban areas consume more of these categories: dried, meat, dairy, beverages, snacks, foodout while families in the rural areas consume more staple, vegetables, fish, spices, alcohol-tobacco, salt, cooking oil, and sugar. By observing the bigger categories of food, exempted, exempted09, and vat, the average consumption as a percentage of total expenditure shows that rural families enjoy exempted food items, staple and salt more than urban families. On the other hand, urban households enjoy the exempted09 and vat groups. By merely using the average amount of food consumed, it is expected that the new VAT exemption policy will benefit urban households more.

By looking at the results of urban and rural fixed effect analyses, most of the correlations between PCE in natural logarithm and the share of consumption of each food category are the same as the national level results except for vegetables, dried, and dairy. The vegetable category presents a statistically insignificant correlation, while it is significant and negative for urban areas. The reason is that vegetables in rural areas are widely available; therefore, the consumption level does not depend on the income level of the households. Another case is dairy which covers liquid milk, powder milk, baby powder milk, other milk, and eggs. These products are widely available and used more in urban areas; therefore, the correlation between the PCE natural logarithm and the share of dairy consumption is not statistically significant in urban areas. This indicates that regardless of the level of income an urban household has, it does not affect the level of dairy consumption in urban areas.

The category of dried food shows a positive sign in the correlation parameter for rural areas, while it is a negative sign for urban areas. The dried food category covers a wide range of food items, such as noodles, rice noodles, macaroni, shrimp chips, other chips, and the like which can be obtained more easily in the cities. In addition, in rural areas, households with higher incomes would consume these food items. Urban populations consume dried food more than those in rural.

7.2.3. Second analysis results: The impact of the VAT burden

The consumption patterns analysed in the second equation are the consumption patterns of vegetables, dairy, and meat, which are items under the exempted09 category (Table 14 and Table A9). The variables in Equation (2) are completely the same as in Equation (2) except for the vat burden variable. The VAT burden variable is defined by the total VAT paid by a household divided by total expenditure. In the fixed effect panel analysis, the variable reflects the shift of VAT burden within a household to observe the behavioural change in consuming these food items.

The overall result of the second analysis shows us that the natural logarithm of the VAT burden of household expenditure variables have positive and statistically significant coefficients. The biggest correlation is for vegetables, followed by meat and dairy. This means that the decrease in VAT burden in 2009 has decreased the share of the consumption of the products, which is a rather straightforward conclusion since the amount of expenditure spent is smaller now.

The interesting part of the analysis is the impact of the inclusion of VAT burden in the regression. Since the introduction of the VAT burden variable increases the R-squared within the overall model for vegetables, meat, and dairy, I can say that the variable brings more explanation to the equations; hence, the coefficient of PCE in logarithmic natural is better now. First, the logarithm natural of PCE now becomes 'weaker' with a smaller coefficient for vegetables (from -0.174 to -0.091) but becomes 'stronger' with a higher coefficient for meat and dairy (meat from 0.655 to 0.730, dairy from 0.255 to 0.296). Meat and dairy are both more elastic to income, while vegetables display an almost perfect income-inelastic nature. By merely observing the coefficients, meat and dairy are basically not suitable to be on the VAT-exempt list.

The main objective of the second analysis is to observe the impact of the introduction of the new exempt policy. I also compare the fifth-wave dummies before and after the inclusion of the VAT burden variable. For vegetables, the fifth dummy coefficient is from -2.395 to -1.924. Before the inclusion of the variable, the impact of new VAT regulation is captured by the dummy coefficient along with the impact of other events, and after the inclusion of the VAT burden, the impact is assumed to be carried separately by the VAT burden variable. The coefficient is now less impactful, which means that the VAT burden would have had a negative impact on consumption if it had been calculated and included as a dummy variable. When the exemption of vegetables was introduced due to their inelastic characteristics, the decrease in the price would not increase consumption significantly. However, the impact on the share of consumption of total expenditure decreased due to the less money that must be spent on vegetables; therefore, the parameter of vat burden as the percentage of expenditure shows a positive sign while the fifth wave dummy shows a negative sign.

Meat consumption also indicates a less impactful and less significant fifth-wave dummy after the exemption of meat (from -0.473 statistically significant to -0.046 statistically insignificant), which means the new policy might have had a significant and negative impact on meat consumption as a percentage of total expenditure. The explanation is that when the exemption was introduced, the meat expenditure was reduced and the total expenditure available to consume more is not used to buy more meat or buy more expensive meat.

Dairy shows different cases but has the same meaning. The dairy category presents more impactful and positive parameters of the fifth wave dummy (from 0.661 to 0.897, both statistically significant). It can be said that the contribution of the introduction of exemption included in the dummy parameters was negative as well.

In conclusion, the introduction of new VAT-exempt commodities, vegetables, dairy and meat, which is indicated by the VAT burden variables, shows a positive correlation between the variable and the share of this item consumption, both as percentages of total expenditure. The introduction of the exemption decreases the price of the item, hence the share of consumption. In other words, the less VAT burden a household must pay in these three categories, the less share of consumption of these categories would be. The conclusion is also supported by the observations on the fifth wave dummy coefficients before and after the inclusion of the vat burden variable in the estimation.

8. Conclusion

The graphical analysis observes patterns across groups of household income, while fixed effect panel analysis examines patterns within a household over time and the change of consumption patterns based on the change in income, which in the analysis is represented by per capita expenditure. The results of the panel analysis are robust and provide more detailed information on the patterns[15].

Based on the consumption patterns in 2007, graphical analysis shows that foodout, snacks, and beverages are the potential items to be imposed by VAT, which is exactly stated in the VAT regulation.

In answering the first research question, the commodities that would be increased in their shares of consumption as a percentage of total expenditure are died, meat, dairy, snacks, and foodout. Different consumption patterns are found in urban and rural areas. The average consumption as a percentage of the total expenditure of food items indicates that families in the urban areas consume more of these categories: dried, meat, dairy, beverages, snacks, foodout while families in the rural areas consume more staple, vegetables, fish, spices, alcohol-tobacco, salt, cooking oil, and sugar.

In answering the second research question, the results of fixed-effect panel analysis can be used. Based on the panel analysis of three big categories, the null hypothesis, which states that the positive coefficient of per capita expenditure in natural logarithm must be taxed, cannot be rejected in which the exempt group before and after 2009 has negative coefficients and the VAT-ed group has a negative coefficient. However, after separating the items, the null hypothesis can be rejected in several estimations of food category demand.

Based on the null hypothesis, the analysis proposes that food commodities should be imposed by tax: dried food, meat, dairy, snacks, and food bought and consumed away from home (foodout). VAT exemption should also be considered to exempt staple food, salt, vegetables, fish, beverages, spices, alcohol-tobacco, cooking oil, and sugar. However, by considering the level of income elasticities, staple, spices, fish, and cooking oil are the priorities to be on the list. These are commodities that have the highest negative coefficients of PCE in the natural logarithm.

The weakness of fixed effect panel regression used in the analysis is that too many variables which may affect consumption must be excluded because the variables do not change over time. The rural-urban variable is dropped from the national level of regression, but separate regressions are done to observe the differences between these two areas.

The second weakness in the estimation is the absence of price, not to mention the quality of the goods consumed. Due to this weakness, a complete demand system cannot be analysed, and the substitution effect due to changes in price cannot be included in the calculations. Therefore, a future direction of study can be to elaborate on the existence of price data by using other data available in household surveys in Indonesia.

[15] The pooled OLS and random effects were conducted and produced almost similar patterns in estimation of the coefficients of logarithm of per capita income.

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Appendix

Table A1. Per Capita Expenditure summary per PCE decile (in Rupiahs)

decile93	Obs	Weight	Mean	Std. dev.	Min	Max
1	688	819	14,280	3,398	3,972	18,858
2	685	785	21,960	1,786	18,860	25,097
3	703	794	27,958	1,610	25,104	30,606
4	686	728	33,916	1,912	30,608	37,108
5	690	706	40,742	2,083	37,172	44,502
6	693	696	49,130	2,721	44,539	54,079
7	700	665	59,981	3,593	54,108	67,036
8	692	626	75,619	5,692	67,067	86,994
9	692	578	105,010	11,953	87,033	132,006
10	693	522	236,432	179,972	132,021	1,811,817

decile97	Obs	Weight	Mean	Std. dev.	Min	Max
1	747	827	26,222	6,739	6,615	35,628
2	746	797	41,568	3,375	35,644	47,170
3	742	792	52,708	3,177	47,183	58,025
4	751	804	63,524	3,429	58,028	69,730
5	744	760	76,970	4,325	69,733	84,800
6	747	748	93,332	5,316	84,842	103,433
7	747	712	115,086	7,173	103,442	127,962
8	742	697	146,510	11,566	127,967	168,560
9	738	645	209,301	28,055	168,560	268,200
10	730	674	645,773	863,928	269,100	15,100,000

decile00	Obs	Weight	Mean	Std. dev.	Min	Max
1	1,015	1,089	58,629	13,773	7,828	76,771
2	1,022	1,077	89,205	6,975	76,788	100,973
3	1,012	1,073	112,929	6,970	100,978	124,817
4	1,016	1,031	137,633	7,125	124,839	150,383
5	1,009	1,007	164,810	8,368	150,400	179,854
6	1,006	1,011	197,378	10,975	179,883	217,567
7	1,008	1,018	239,952	13,423	217,579	265,958
8	1,008	1,004	306,799	26,152	265,972	355,077
9	998	941	431,565	51,265	355,267	532,600
10	998	948	991,101	674,838	533,263	10,300,000

decile07	Obs	Weight	Mean	Std. dev.	Min	Max
1	1,296	1,437	151,289	32,090	27,740	194,025
2	1,295	1,421	222,871	16,803	194,047	251,922
3	1,295	1,400	280,534	16,481	251,958	308,722
4	1,296	1,366	339,413	18,364	308,754	370,833
5	1,294	1,328	404,259	21,103	370,889	441,788
6	1,296	1,302	485,372	24,880	441,885	529,747
7	1,295	1,285	588,087	36,391	529,794	654,990
8	1,295	1,229	751,586	58,919	655,050	859,772
9	1,295	1,179	1,022,800	114,333	859,825	1,254,667
10	1,295	1,124	2,163,254	1,467,166	1,254,867	23,500,000

decile14	Obs	Weight	Mean	Std. dev.	Min	Max
1	1,509	1,645	322,442	68,821	72,486	415,203
2	1,508	1,585	478,777	35,834	415,360	539,250
3	1,508	1,555	600,073	36,084	539,260	662,067
4	1,508	1,519	722,896	35,419	662,167	786,000
5	1,508	1,514	854,470	40,000	786,042	930,278
6	1,508	1,490	1,019,933	53,664	930,350	1,114,542
7	1,508	1,478	1,236,952	75,041	1,114,592	1,376,167
8	1,508	1,446	1,557,842	114,607	1,376,356	1,777,750
9	1,508	1,399	2,156,194	254,593	1,778,750	2,667,072
10	1,508	1,335	5,145,042	6,716,097	2,667,229	150,000,000

Source: Author's calculation

Table A2. Expenditure per category per decile (as a percentage of total expenditure)

decile 93	staple	vege	dried	meat	fish	dairy	oil	spices	sugar	beve	altb	snack	salt	fdout	utility	personal	hhgood	recreat	transp	lottery	cloth	furn	medical	cerem	tax	oth	educ	house
1	23.81	5.59	0.68	2.26	4.00	1.04	2.33	3.07	3.50	1.64	3.61	3.23	0.65	0.46	3.76	1.13	1.45	0.08	1.20	0.24	3.31	0.39	1.19	2.24	0.50	0.38	4.23	24.04
2	21.34	6.94	0.99	3.28	4.04	1.50	2.53	3.85	3.68	1.64	4.33	4.47	0.61	0.80	4.13	1.22	1.50	0.11	1.65	0.34	3.60	0.52	1.52	2.49	0.44	0.48	4.75	17.26
3	18.75	7.19	1.18	4.05	4.41	2.16	2.55	3.55	3.65	1.72	4.73	5.15	0.49	0.70	4.21	1.26	1.40	0.17	2.19	0.49	3.46	0.68	1.38	2.54	0.57	0.66	5.78	14.93
4	18.10	7.71	1.46	4.07	4.38	2.40	2.39	3.41	3.61	1.64	4.50	5.67	0.45	0.76	4.52	1.32	1.47	0.24	2.89	0.51	3.62	0.72	1.94	2.75	0.41	0.78	5.11	13.17
5	15.34	8.13	1.74	5.18	4.71	2.71	2.23	3.45	3.37	1.76	5.09	5.98	0.38	1.04	4.59	1.19	1.38	0.28	2.85	0.90	3.34	0.82	1.82	2.39	0.46	1.25	6.26	11.36
6	12.96	8.54	1.77	5.40	4.25	3.31	2.15	3.30	3.21	1.64	4.97	6.55	0.30	1.09	4.92	1.26	1.39	0.47	3.89	1.22	3.71	0.99	1.98	2.42	0.40	1.13	6.24	10.53
7	11.95	8.24	1.92	5.94	4.00	3.48	2.07	3.01	2.97	1.66	4.74	7.13	0.28	1.48	5.04	1.32	1.54	0.56	4.02	1.16	3.60	1.09	2.29	2.38	0.51	1.25	6.79	9.59
8	10.22	8.67	1.75	5.65	3.66	3.70	1.75	2.81	2.60	1.56	4.47	7.40	0.24	1.45	5.51	1.28	1.40	0.76	4.90	1.37	3.66	0.98	2.44	2.36	0.59	1.49	7.78	9.54
9	7.95	8.30	1.97	6.13	3.15	3.63	1.53	2.40	2.27	1.69	3.88	8.34	0.17	1.38	4.83	1.34	1.82	1.43	5.92	1.24	3.83	1.13	3.26	2.09	0.57	2.33	9.34	8.10
10	5.51	7.28	1.77	5.41	2.09	3.55	1.09	1.79	1.59	1.83	3.36	9.67	0.10	2.36	4.50	1.47	2.77	2.30	6.95	1.80	3.77	1.57	3.33	2.49	1.01	4.39	9.50	6.75

decile 97	staple	vege	dried	meat	fish	dairy	oil	spices	sugar	beve	altb	snack	salt	fdout	utility	personal	hhgood	recreat	transp	lottery	cloth	furn	medical	cerem	tax	oth	educ	house
1	25.05	6.21	2.60	3.59	5.38	1.39	3.13	4.06	3.76	2.12	4.40	1.33	0.66	0.33	3.56	1.31	0.01	1.56	0.06	0.96	0.00	3.87	0.34	1.08	2.40	0.33	0.28	3.96
2	21.18	6.82	3.12	4.88	4.93	2.14	3.06	4.41	3.49	2.04	5.01	2.04	0.56	0.46	3.95	1.32	0.08	1.60	0.13	1.45	0.01	3.51	0.51	1.27	2.44	0.28	0.44	4.73
3	20.15	6.78	3.38	5.35	4.89	2.46	2.97	4.36	3.29	2.20	5.15	2.04	0.45	0.46	3.93	1.30	0.04	1.44	0.24	1.51	0.02	3.57	0.58	1.28	2.29	0.30	0.79	4.52
4	16.97	7.36	3.58	5.87	4.61	2.87	2.86	3.97	3.04	2.10	4.84	2.32	0.35	0.70	4.41	1.32	0.08	1.43	0.19	2.33	0.02	3.52	0.71	1.35	2.61	0.31	0.91	5.20
5	15.39	7.37	3.69	5.93	4.44	3.00	2.79	3.91	2.88	2.07	5.42	2.60	0.34	0.89	4.36	1.37	0.14	1.41	0.23	2.81	0.03	3.64	0.69	1.57	2.58	0.35	1.00	5.03
6	14.26	7.50	3.72	5.99	4.23	3.45	2.48	3.64	2.74	2.00	4.52	2.55	0.35	1.10	4.36	1.27	0.20	1.34	0.37	3.20	0.00	3.56	0.87	1.71	2.79	0.45	1.78	4.97
7	11.61	6.89	3.59	6.45	3.97	3.49	2.35	3.43	2.48	1.91	4.54	2.99	0.27	1.53	4.85	1.33	0.40	1.23	0.63	3.94	0.06	3.46	0.85	2.14	2.74	0.35	1.85	4.97
8	10.09	7.21	3.79	6.71	3.70	3.75	2.23	3.26	2.25	1.95	3.98	2.88	0.23	1.34	5.23	1.29	0.91	1.17	0.74	3.72	0.07	3.40	0.93	2.72	2.34	0.42	2.57	5.07
9	7.80	7.11	3.77	6.42	2.82	3.58	1.82	2.60	1.93	2.05	3.19	3.81	0.16	2.03	5.48	1.19	1.32	1.00	1.13	4.34	0.05	3.08	0.89	2.78	2.46	0.42	3.83	5.32
10	5.25	4.69	2.93	4.73	1.74	2.87	1.52	1.76	1.58	1.82	2.29	3.97	0.08	3.12	4.65	1.14	2.62	0.81	1.72	4.65	0.07	2.35	0.98	2.64	2.41	0.56	6.39	5.18

decile 00	staple	vege	dried	meat	fish	dairy	oil	spices	sugar	beve	altb	snack	salt	fdout	utility	personal	hhgood	recreat	transp	lottery	cloth	furn	medical	cerem	tax	oth	educ	house
1	21.15	6.91	3.31	4.25	4.62	2.03	2.79	4.69	3.27	1.80	5.83	2.50	0.72	0.84	3.58	1.91	0.03	2.01	0.10	1.48	0.01	3.33	0.36	1.33	2.39	0.22	0.43	4.72
2	18.83	6.90	3.67	4.77	4.89	2.74	2.60	4.40	3.24	1.97	6.36	3.02	0.62	1.13	3.70	1.84	0.07	1.81	0.21	2.06	0.05	3.62	0.41	1.19	2.59	0.21	0.56	4.44
3	16.65	7.50	4.16	5.55	5.13	3.07	2.53	4.47	3.15	1.97	6.81	3.16	0.50	1.29	3.51	1.77	0.05	1.72	0.33	2.15	0.03	3.52	0.55	1.43	2.43	0.22	0.78	4.35
4	14.69	7.13	3.98	5.57	5.21	3.50	2.29	4.25	2.93	1.93	6.56	3.75	0.50	1.13	3.62	1.77	0.09	1.71	0.35	2.97	0.04	3.61	0.62	1.68	2.34	0.22	0.88	4.71
5	13.51	6.97	4.11	6.00	5.08	3.51	2.17	3.99	2.82	1.95	6.42	4.07	0.42	1.73	3.64	1.79	0.16	1.54	0.51	3.34	0.03	3.56	0.71	1.66	2.60	0.29	1.20	4.63
6	11.83	6.96	4.15	5.88	4.77	3.96	2.08	3.71	2.76	1.99	6.54	4.06	0.34	2.18	3.82	1.77	0.26	1.60	0.63	3.56	0.06	3.52	0.77	1.91	2.82	0.28	1.51	4.04
7	10.52	6.91	4.43	6.21	4.69	3.73	1.85	3.39	2.40	2.00	5.72	4.97	0.32	2.20	3.98	1.83	0.43	1.40	0.78	3.76	0.07	3.53	0.82	2.21	2.92	0.27	1.60	4.63
8	9.13	6.43	4.28	6.25	3.86	4.07	1.73	3.13	2.11	2.02	5.24	5.27	0.27	3.00	4.46	1.75	0.66	1.40	1.02	4.12	0.08	3.35	0.96	2.22	2.81	0.28	2.30	4.44
9	7.11	5.95	3.98	5.65	3.00	3.63	1.48	2.49	1.66	2.12	4.34	6.75	0.18	4.31	4.39	1.91	0.99	1.14	1.66	5.18	0.08	2.97	0.86	2.61	2.60	0.37	3.45	4.83
10	4.70	4.30	3.53	5.03	1.92	2.88	1.08	1.66	1.18	2.05	3.11	5.96	0.11	6.01	4.56	1.63	1.85	0.85	2.14	4.88	0.05	2.85	1.11	3.15	2.79	0.42	7.09	5.21

decile 07	staple	vege	dried	meat	fish	dairy	oil	spices	sugar	beve	altb	snack	salt	fdout	utility	personal	hhgood	recreat	transp	lottery	cloth	furn	medical	cerem	tax	oth	educ	House
1	21.44	5.79	4.11	4.14	4.44	2.24	3.41	4.27	2.75	1.83	5.96	2.27	0.38	0.67	6.92	1.58	0.02	1.91	0.11	2.25	0.03	2.76	0.22	1.20	2.15	0.33	0.48	5.43
2	17.95	5.63	4.71	4.63	4.32	2.73	3.23	4.13	2.61	1.80	6.34	3.05	0.31	1.16	7.05	1.60	0.03	1.79	0.13	3.26	0.07	2.72	0.31	1.42	2.26	0.33	0.72	5.11
3	15.82	5.61	4.71	5.11	4.00	3.08	3.14	3.86	2.48	1.79	6.43	3.30	0.28	1.27	7.45	1.55	0.12	1.61	0.18	3.93	0.04	2.79	0.33	1.57	2.41	0.40	0.79	5.25
4	13.44	5.40	4.57	5.09	3.88	3.46	3.02	3.93	2.31	1.78	6.44	3.69	0.25	1.47	8.03	1.61	0.18	1.46	0.25	4.31	0.03	2.72	0.33	1.83	2.40	0.39	1.49	5.22
5	12.59	5.41	4.67	5.13	3.99	3.54	2.83	3.65	2.21	1.94	6.21	4.00	0.23	1.61	7.99	1.63	0.22	1.41	0.28	4.74	0.05	2.59	0.49	1.95	2.52	0.39	1.49	4.81
6	11.15	5.38	4.15	5.47	3.71	3.75	2.67	3.27	2.01	2.07	5.64	4.56	0.21	1.94	8.25	1.63	0.41	1.29	0.47	4.92	0.11	2.62	0.54	2.06	2.76	0.48	1.97	4.65
7	9.56	5.22	4.19	5.25	3.50	3.95	2.49	3.04	1.81	2.09	5.99	4.84	0.26	2.49	8.55	1.52	0.56	1.21	0.58	5.52	0.05	2.53	0.53	2.05	2.85	0.49	2.41	4.81
8	8.07	4.57	3.81	4.84	3.28	4.01	2.08	2.61	1.52	2.11	5.04	6.50	0.15	3.74	8.34	1.61	0.76	1.11	1.06	5.50	0.13	2.58	0.51	2.35	2.89	0.52	2.99	4.01
9	6.44	4.10	3.62	4.34	2.54	3.74	1.64	2.09	1.25	2.27	4.81	8.06	0.11	4.88	7.85	1.65	1.42	1.05	1.17	5.28	0.04	2.47	0.66	2.60	3.15	0.58	3.89	4.46
10	3.81	3.19	3.15	3.37	1.68	2.98	1.26	1.44	0.86	2.44	3.49	7.63	0.06	6.80	7.35	1.64	2.19	0.92	2.20	5.85	0.07	2.25	0.75	3.01	2.82	0.57	5.38	6.67

decile 14	staple	vege	dried	meat	fish	dairy	oil	spices	sugar	beve	altb	snack	salt	fdout	utility	personal	hhgood	recreat	transp	lottery	cloth	furn	medical	cerem	tax	oth	educ	house
1	16.41	5.15	3.02	4.26	3.27	2.66	2.36	4.22	2.36	2.00	5.92	2.57	0.41	0.71	6.48	1.91	0.06	1.66	0.14	4.36	0.01	2.89	0.24	1.72	3.31	0.60	0.51	6.83
2	14.40	5.18	3.30	4.52	3.63	3.13	2.23	4.07	2.10	2.09	6.49	3.75	0.33	1.05	5.97	1.88	0.14	1.54	0.28	4.71	0.00	3.10	0.27	1.66	3.23	0.57	0.90	6.68
3	12.43	5.06	3.39	4.57	3.50	3.46	2.08	3.96	1.83	2.18	7.18	3.67	0.27	1.45	6.04	1.94	0.16	1.46	0.30	5.17	0.01	2.88	0.41	1.81	3.17	0.62	1.41	6.87
4	11.54	5.16	3.39	4.79	3.58	3.59	1.99	3.74	1.83	2.22	6.87	3.99	0.25	1.40	6.19	1.99	0.21	1.39	0.43	5.53	0.00	2.72	0.47	2.00	3.22	0.64	1.61	6.78
5	10.69	5.30	3.38	4.72	3.55	3.77	1.95	3.69	1.80	2.31	6.72	4.33	0.23	1.73	5.98	1.95	0.27	1.35	0.64	5.52	0.04	2.79	0.55	2.07	3.56	0.64	1.97	6.26
6	9.58	5.11	3.34	4.91	3.21	3.77	1.71	3.28	1.51	2.35	6.05	4.68	0.19	2.50	5.89	1.99	0.38	1.26	0.77	5.84	0.03	2.77	0.62	2.31	3.70	0.64	2.37	6.56
7	8.54	4.93	3.40	4.59	3.24	3.68	1.54	3.05	1.38	2.45	5.72	5.34	0.18	2.70	5.98	2.03	0.62	1.18	0.93	6.33	0.01	2.87	0.60	2.46	4.02	0.70	2.70	6.21
8	7.37	4.99	3.21	4.51	2.88	3.61	1.50	2.83	1.30	2.62	5.22	6.26	0.14	3.70	5.81	2.07	0.91	1.15	1.40	5.91	0.01	2.62	0.71	2.50	3.70	0.72	3.07	5.91
9	5.43	4.24	2.86	3.78	2.50	3.18	1.14	2.11	0.95	2.65	4.84	7.60	0.11	5.09	5.43	2.00	1.48	1.07	1.89	6.26	0.05	2.69	0.59	2.83	4.02	0.80	4.40	5.76
10	2.98	3.18	2.30	2.63	1.63	2.19	0.72	1.28	0.56	2.53	3.80	6.55	0.06	6.44	4.63	1.88	2.10	0.75	3.46	6.09	0.01	2.47	0.90	3.06	4.96	0.92	9.63	6.14

Notes: vege = vegetables, beve = beverages, altb = alcohol-tobacco, fdout = foodout, hhgood=household good, recreat = recreation, furn = furniture, cerem = ceremony, oth = other, educ = education, house = housing

Source: Author’s calculation

Table A3. Income per category per decile (in Rupiahs 1993=100)

1993

decile 93	cropincome	employment	livestock	other	rentagric	selfemp	transfers
1	-68,048	301,520	90,000	50,683	206,932	-984,879	30,971
2	87,817	163,017	30,788	84,371	46,580	106,377	60,413
3	172,345	327,791	93,769	118,792	88,272	185,247	96,505
4	239,543	578,104	207,064	217,042	124,302	294,712	115,749
5	321,141	861,338	194,269	218,235	200,509	438,737	155,202
6	374,881	1,201,749	341,031	382,712	313,298	594,533	206,150
7	538,973	1,733,929	134,144	568,892	333,208	754,405	303,968
8	543,681	2,449,285	485,870	694,002	426,053	1,161,702	379,702
9	907,417	3,897,989	35,000	1,102,144	856,258	1,832,702	674,007
10	1,522,666	18,800,000	558,728	2,538,026	1,498,846	4,247,682	4,317,655
Total	374,224	3,366,015	217,020	696,775	476,120	1,137,311	534,347

1997

decile 97	cropincome	employment	livestock	other	rentagric	selfemp	transfers
1	79,848	176,699	106,301	81,677	107,518	64,904	65,583
2	204,615	438,978	84,610	135,553	122,987	210,961	125,688
3	301,294	765,007	139,292	253,294	175,538	391,437	159,724
4	418,841	1,119,028	202,236	346,902	379,221	517,743	203,828
5	459,128	1,552,682	250,037	411,003	464,941	602,636	252,490
6	632,284	2,015,196	322,977	673,400	583,121	817,946	300,739
7	622,762	2,753,780	304,159	846,139	521,622	1,106,496	370,141
8	676,441	3,452,125	320,713	1,099,282	582,155	1,555,607	516,785
9	815,678	4,801,708	354,533	1,740,489	650,668	2,130,203	700,562
10	1,791,674	8,088,235	717,172	4,565,200	2,104,517	4,083,421	1,470,090
Total	579,446	2,461,504	299,474	1,282,584	670,359	1,657,838	398,335

2000

decile 00	cropincome	employment	livestock	other	rentagric	selfemp	transfers
1	-127,898	471,985	62,888	274,021	151,349	-3,632,480	131,622
2	193,051	462,689	251,852	167,883	184,214	73,456	145,873
3	265,655	746,543	135,991	144,626	195,411	311,510	186,478
4	331,049	1,079,752	224,019	315,060	280,188	474,127	231,859
5	477,544	1,482,836	189,637	349,330	316,188	607,497	285,001
6	556,813	1,919,469	430,337	497,924	388,033	761,710	323,963
7	714,424	2,344,996	292,395	820,237	500,689	1,024,715	381,335
8	869,999	2,980,397	535,397	1,366,410	644,927	1,478,611	520,720
9	1,328,491	4,037,037	239,164	1,766,773	572,981	2,061,834	726,087
10	2,480,584	10,222,222	952,758	3,740,741	3,013,803	7,777,778	1,321,444
Total	603,576	2,639,977	296,794	1,422,554	802,005	1,704,173	420,944

2007

decile 07	cropincome	employment	livestock	other	rentagric	selfemp	transfers
1	-80,812	259,974	48,146	107,140	164,962	179,883	123,341
2	189,848	583,709	127,941	270,755	169,769	344,301	210,772
3	354,357	933,202	215,570	142,366	197,408	535,098	269,760
4	506,276	1,281,779	205,955	554,828	303,037	707,445	319,856
5	582,811	1,675,570	283,024	291,097	281,260	891,089	384,916
6	774,465	2,169,625	542,822	477,331	309,197	1,150,033	444,545
7	976,597	2,741,617	482,584	535,513	475,967	1,530,906	519,239
8	1,262,488	3,550,296	835,772	675,356	537,113	2,011,834	682,158
9	1,714,707	4,595,661	1,366,982	837,993	825,003	2,603,550	781,313
10	2,899,408	9,921,105	2,642,998	2,603,550	1,710,758	8,165,680	1,838,732
Total	752,713	2,800,789	519,876	1,089,620	588,632	2,287,968	527,758

2014

decile 14	cropincome	employment	livestock	other	rentagric	selfemp	transfers
1	-362,827	358,861	118,460	177,997	633,271	209,418	165,504
2	245,129	783,919	175,361	259,061	272,718	423,367	322,154
3	385,826	1,363,041	254,035	489,754	228,454	643,305	453,720
4	466,257	1,926,606	362,439	584,932	372,111	810,525	524,653
5	672,313	2,673,657	323,616	684,139	503,380	1,083,451	605,242
6	814,239	3,237,221	473,417	921,326	556,427	1,349,934	707,769
7	1,068,225	4,141,547	938,689	1,323,722	707,309	1,847,969	806,110
8	1,467,890	5,347,313	777,441	1,546,527	1,068,722	2,411,533	963,034
9	1,939,712	7,142,857	966,059	2,542,595	1,277,001	3,197,903	1,135,548
10	2,044,561	15,072,084	1,224,546	5,347,313	4,377,457	10,039,318	2,411,533
Total	753,551	4,272,608	593,208	2,228,047	1,302,294	2,726,081	773,087

Notes: Rentagric = rental of agricultural assets, selfemp = self-employment

Source: Author's calculation

Table A4. Education of Household Head

Year	Unschooled		Other		Primary School		Secondary School		High School		College		University	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1993	1,387	19.20%	12	0.17%	3,566	49.36%	846	11.71%	1,001	13.86%	113	1.56%	299	4.14%
1997	1,282	16.82%	17	0.22%	3,764	49.40%	908	11.92%	1,165	15.29%	181	2.38%	303	3.98%
2000	1,296	12.42%	119	1.14%	4,684	44.89%	1,412	13.53%	1,956	18.74%	378	3.62%	590	5.65%
2007	1,069	8.06%	115	0.87%	5,324	40.12%	1,967	14.82%	3,219	24.26%	496	3.74%	1,080	8.14%
2014	760	5.04%	136	0.90%	5,261	34.87%	2,598	17.22%	4,271	28.31%	484	3.21%	1,579	10.46%

Source: summarised from IFLS 1, 2, 3, 4, and 5

Table A5. Age of Household Head

Householder age	1993	1997	2000	2007	2014
<30	1,141	826	1,897	2,814	2,717
31-50	3,477	3,821	4,982	6,117	7,492
51-70	2,233	2,496	2,885	3,557	4,007
71-90	355	459	648	770	857
>91	18	18	23	12	16
Total	7,224	7,620	10,435	13,270	15,089

Source: summarised from IFLS 1, 2, 3, 4, and 5

Table A6. Consumption Items

No	TYPE IN SURVEYS	CATEGORY IN SURVEYS	CODE IN THE SURVEYS	CATEGORY OF THE ANALYSIS	VAT EXEMPT FOOD ITEMS
1	Staple foods	hulled, uncooked rice	A	STAPLE	Rice
		corn	B		Grain
		Sago/flour	C		Corn
		Cassava, tapioca, dried cassava	D		Sago
		Other staple foods, like sweet potatoes, potatoes, yams	E		Soybean, Vegetables
2	Vegetables	Kangkung, cucumber, spinach, mustard greens, tomatoes, cabbage, katuk, green beans, string beans and the like.	F	VEGE	Vegetables
		Beans like mung-beans, peanuts, soya-beans, and the like.	G		Soybean
		Fruits like papaya, mango, banana and the like.	H		Fruits
3	Dried foods	Noodles, rice noodles, macaroni, shrimp chips, other chips, and the like	I	DRIED	
		Cookies, breads, crackers	J		
4	Meat and fish	Beef, mutton, water buffalo meat and the like	K	MEAT	Meat
		Chicken, duck and the like	L		
		Fresh fish, oysters, shrimp, squid and the like.	M	FISH	
		Salted fish, smoked fish	N		
5	Other dishes, like	Jerky, shredded beef, canned meat, sardines and the like	OA	MEAT	Meat
		Tofu, tempeh, other side dishes	OB		
6	Milk/eggs	eggs	P	DAIRY	Eggs
		fresh milk, canned milk, powdered milk and the like	Q		Milk
7	Spices	sweet and salty soy sauce	R	SPICES	
		salt	S	SALT	Salt
		shrimp paste	T	SPICES	
		chilli sauce, tomato sauce, and the like	U		
		shallot, garlic, chilli, candle nuts, coriander, MSG and the like	V		
		Javanese (brown) sugar	W	SUGAR	
		butter	X	OIL	
		cooking oil like coconut oil, peanut oil, corn oil, palm oil and the like	Y		
8	Beverages and other drinks/consumer products	drinking water	Z	BEVE	
		granulated sugar	AA	SUGAR	
		coffee	BA	BEVE	
		tea	CA		
		cocoa	DA		
		soft drinks like Fanta, Sprite, etc	EA		
		alcoholic beverages like beer, palm wine, rice wine, etc	FA	ALTB	
		betel nut (for chewing traditional drugs, others)	GA		
		cigarettes, tobacco	HA		
		prepared food (eaten at home)	IA	SNACK	
		prepared food (away from home)	IB	FDOUT	

Source: Summarised by author

Table A7. Descriptive Statistics of Panel Data Analysis

Variable		Mean	Std. dev.	Min	Max	Observations
id	overall	6817.928	3908.725	1	13591	N = 65754
	between		3923.528	1	13591	n = 13591
	within		0	6817.928	6817.928	T-bar = 4.83805
t	overall	3.020485	1.414737	1	5	N = 65754
	between		0.169732	2.5	4.5	n = 13591
	within		1.407656	0.6871521	5.353819	T-bar = 4.83805
sstaple	overall	13.73389	11.32859	0	91.56004	N = 65754
	between		7.348693	0	52.52819	n = 13591
	within		8.644509	-28.98912	78.65287	T-bar = 4.83805
svege	overall	6.243634	5.145169	0	84.19488	N = 65754
	between		2.576144	0	24.10508	n = 13591
	within		4.458321	-16.03272	68.75948	T-bar = 4.83805
sdried	overall	3.259083	3.470027	0	87.81411	N = 65754
	between		1.738579	0	24.4366	n = 13591
	within		3.01177	-17.96647	69.72771	T-bar = 4.83805
smeat	overall	5.094418	5.442037	0	72.43396	N = 65754
	between		2.938758	0	26.27863	n = 13591
	within		4.586572	-19.35148	61.52397	T-bar = 4.83805
sfish	overall	4.020157	4.580424	0	64.36037	N = 65754
	between		3.109027	0	22.76055	n = 13591
	within		3.36475	-14.44202	48.06545	T-bar = 4.83805
sdairy	overall	3.075283	3.869488	0	72.26794	N = 65754
	between		2.037508	0	19.62027	n = 13591
	within		3.296831	-15.06722	57.47133	T-bar = 4.83805
sbeve	overall	1.973427	2.219453	0	51.63512	N = 65754
	between		1.193005	0	14.75626	n = 13591
	within		1.878705	-9.555393	42.75468	T-bar = 4.83805
sspices	overall	3.476386	2.831149	0	80.86854	N = 65754
	between		1.625914	0	18.52053	n = 13591
	within		2.322775	-13.66503	65.8244	T-bar = 4.83805
saltb	overall	5.386685	6.639639	0	84.12664	N = 65754
	between		4.153306	0	36.49257	n = 13591
	within		5.199104	-21.90547	61.90664	T-bar = 4.83805
ssalt	overall	0.316113	0.6466103	0	39.73915	N = 65754
	between		0.3465664	0	11.48391	n = 13591
	within		0.5451477	-11.1678	28.64208	T-bar = 4.83805
ssnack	overall	4.006902	6.831893	0	96.18496	N = 65754
	between		3.706911	0	46.15572	n = 13591
	within		5.77561	-42.14882	79.92007	T-bar = 4.83805
soil	overall	2.251188	2.236026	0	74.05657	N = 65754
	between		1.181261	0	25.64201	n = 13591
	within		1.900806	-23.39083	60.12116	T-bar = 4.83805
ssugar	overall	2.447967	2.493892	0	65.21606	N = 65754
	between		1.460074	0	23.13824	n = 13591
	within		2.023223	-19.28178	50.62252	T-bar = 4.83805

sfdout	overall	1.626723	4.87529	0	89.54734	N = 65754
	between		2.49649	0	58.16128	n = 13591
	within		4.231379	-30.29825	73.2646	T-bar = 4.83805
sxempted	overall	14.05	11.44703	0	91.56004	N = 65754
	between		7.480519	0	52.9025	n = 13591
	within		8.688016	-28.83747	78.61428	T-bar = 4.83805
sxempted09	overall	14.41333	8.998283	0	86.22571	N = 65754
	between		4.912098	0	41.17453	n = 13591
	within		7.554584	-22.63807	74.36712	T-bar = 4.83805
sxvat	overall	28.22478	12.48286	0	97.15958	N = 65754
	between		7.416216	5.74659	80.32658	n = 13591
	within		10.09174	-15.65169	93.89724	T-bar = 4.83805
lnpce	overall	11.15457	0.8240449	7.972182	16.79692	N = 65754
	between		0.5524334	9.47207	13.91682	n = 13591
	within		0.6153432	8.56708	15.76968	T-bar = 4.83805
hhsize	overall	5.074976	2.441686	1	39	N = 65754
	between		1.601982	1	17.8	n = 13591
	within		1.847306	-8.925024	29.47498	T-bar = 4.83805
headeduc	overall	2.66291	1.250185	1	6	N = 65754
	between		1.035692	1	6	n = 13591
	within		0.710901	-1.33709	6.66291	T-bar = 4.83805
headage	overall	45.91304	13.3675	10	105	N = 65754
	between		9.517105	19.25	86.2	n = 13591
	within		9.415784	-2.28696	99.91304	T-bar = 4.83805
headsex	overall	0.8540013	0.3531076	0	1	N = 65754
	between		0.2467045	0	1	n = 13591
	within		0.2536404	0.0540013	1.654001	T-bar = 4.83805
age2	overall	0.0516862	0.0974869	0	0.6666667	N = 65754
	between		0.0459387	0	0.3	n = 13591
	within		0.0862139	-0.1983138	0.5564481	T-bar = 4.83805
age35	overall	0.054128	0.1001575	0	0.6666667	N = 65754
	between		0.0466675	0	0.2916667	n = 13591
	within		0.088815	-0.195872	0.5874613	T-bar = 4.83805
age612	overall	0.1375703	0.1561524	0	1	N = 65754
	between		0.0742334	0	0.4469697	n = 13591
	within		0.1376268	-0.2614773	0.804237	T-bar = 4.83805
age1318	overall	0.1228532	0.1564755	0	1	N = 65754
	between		0.0686605	0	0.5	n = 13591
	within		0.1410473	-0.3771468	0.9228532	T-bar = 4.83805
age60	overall	0.0818292	0.1795938	0	1	N = 65754
	between		0.1241209	0	1	n = 13591
	within		0.129812	-0.7181708	0.8818292	T-bar = 4.83805
marital	overall	0.8500319	0.3570428	0	1	N = 65754
	between		0.2424417	0	1	n = 13591
	within		0.2628158	0.0500319	1.650032	T-bar = 4.83805

Notes: sstaple = share of staple consumption as a percentage of total expenditure
Source: Author's calculations

Table A8. Fixed vs Random Effect Panel Regression (first analysis)

Explanatory Variables	Meat		Fish		Alcohol Tobacco	
	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	0.655 **	0.635 **	-0.673 **	-0.718 **	-0.339 **	-0.431 **
	[-0.045]	[-0.035]	[-0.03]	[-0.028]	[-0.048]	[-0.042]
household size	0.129 **	0.051 **	-0.024 *	0.032 **	0.054 **	0.066 **
	[-0.016]	[-0.011]	[-0.011]	[-0.009]	[-0.017]	[-0.013]
household head education	-0.150 **	0.004	-0.006	-0.073 **	-0.259 **	-0.693 **
	[-0.039]	[-0.022]	[-0.026]	[-0.019]	[-0.042]	[-0.027]
household head age	0.024 **	0.039 **	0.012 **	0.007 **	-0.027 **	-0.047 **
	[-0.003]	[-0.002]	[-0.002]	[-0.002]	[-0.003]	[-0.003]
household head sex	-0.473 **	-0.863 **	-0.262 **	-0.128	3.852 **	4.025 **
	[-0.107]	[-0.088]	[-0.073]	[-0.07]	[-0.116]	[-0.104]
household member age 0-2	0.885 **	0.803 **	-0.492 **	-0.097	-1.751 **	-1.064 **
	[-0.278]	[-0.244]	[-0.188]	[-0.187]	[-0.3]	[-0.281]
household member age 3-5	1.354 **	1.010 **	0.243	0.800 **	-2.507 **	-1.963 **
	[-0.259]	[-0.232]	[-0.175]	[-0.177]	[-0.279]	[-0.266]
household member age 6-12	0.570 **	0.478 **	-0.156	0.261 *	-3.702 **	-3.304 **
	[-0.174]	[-0.154]	[-0.118]	[-0.118]	[-0.188]	[-0.176]
household member age 13-18	0.046	-0.440 **	-0.650 **	-0.423 **	-3.598 **	-3.535 **
	[-0.171]	[-0.152]	[-0.116]	[-0.116]	[-0.184]	[-0.174]
household member age 60 and over	0.069	-0.013	-0.332 **	-0.332 **	-1.543 **	-1.921 **
	[-0.159]	[-0.152]	[-0.108]	[-0.119]	[-0.172]	[-0.177]
marital status of household head	1.077 **	1.406 **	0.643 **	0.492 **	-1.194 **	-1.341 **
	[-0.106]	[-0.088]	[-0.072]	[-0.069]	[-0.114]	[-0.103]
Wave dummies						
2	0.771 **	0.693 **	0.596 **	0.507 **	0.273 **	0.430 **
	[-0.066]	[-0.065]	[-0.045]	[-0.047]	[-0.071]	[-0.072]
3	0.849 **	0.822 **	0.919 **	0.990 **	1.590 **	1.922 **
	[-0.066]	[-0.065]	[-0.045]	[-0.047]	[-0.071]	[-0.072]
4	-0.018	-0.200 **	0.197 **	0.164 **	1.274 **	1.693 **
	[-0.077]	[-0.071]	[-0.052]	[-0.053]	[-0.083]	[-0.08]
5	-0.473 **	-0.837 **	-0.044	0.024	1.889 **	2.403 **
	[-0.081]	[-0.073]	[-0.055]	[-0.056]	[-0.088]	[-0.084]
Intercept	-4.203 **	-4.713 **	10.204 **	11.118 **	8.812 **	11.447 **
	[-0.543]	[-0.408]	[-0.368]	[-0.335]	[-0.587]	[-0.488]
Number of observations	65754	65754	65754	65754	65754	65754
F statistic	68.58		131.84		212.7	
R-squared for within model	0.02	0.02	0.04	0.04	0.06	0.06
R-squared for between model	0.02	0.03	0.02	0.03	0.07	0.09
R-squared for overall model	0.02	0.03	0.03	0.03	0.06	0.07
Model test p-value	0	0	0	0	0	0
Hausman Test						
chi²	-81757.1		-64.19		-106.17	
Prob > chi²						
Breusch and Pagan LM						
chibar²	1320.41				5840.21	
Prob > chibar²	1				1	
alpha fixed effect hat						
alphafehat	2.902962		3.084411		3.994204	

Notes: Robust standard errors in square brackets; FE = Fixed Effect, RE = Random Effect; ** p < 0.01, * p < 0.05., exp = expenditure
Source: Author's calculation

Table A9. Fixed vs Random Effect Panel Regression (second analysis)

Explanatory Variables	Vegetables		Meat		Dairy		Exempted 2009	
	FE	RE	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	-0.091 *	-0.266 **	0.730 **	0.665 **	0.296 **	0.502 **	0.935 **	0.874 **
	[-0.043]	[-0.032]	[-0.044]	[-0.035]	[-0.03]	[-0.024]	[-0.071]	[-0.057]
household size	0.066 **	-0.014	0.158 **	0.073 **	0.047 **	0.031 **	0.272 **	0.099 **
	[-0.015]	[-0.01]	[-0.016]	[-0.011]	[-0.011]	[-0.007]	[-0.025]	[-0.018]
household head education	-0.182 **	-0.097 **	-0.174 **	-0.007	-0.049	0.313 **	-0.405 **	0.195 **
	[-0.037]	[-0.02]	[-0.039]	[-0.022]	[-0.026]	[-0.015]	[-0.062]	[-0.035]
household head age	0.001	0.013 **	0.029 **	0.043 **	0	0.018 **	0.030 **	0.073 **
	[-0.003]	[-0.002]	[-0.003]	[-0.002]	[-0.002]	[-0.002]	[-0.004]	[-0.004]
household head sex	-1.012 **	-0.950 **	-0.584 **	-0.969 **	-0.325 **	-0.570 **	-1.921 **	-2.487 **
	[-0.102]	[-0.082]	[-0.107]	[-0.088]	[-0.073]	[-0.061]	[-0.171]	[-0.142]
household member age 0-2	0.37	0.211	1.069 **	0.901 **	7.555 **	7.658 **	8.994 **	8.874 **
	[-0.265]	[-0.227]	[-0.276]	[-0.243]	[-0.189]	[-0.17]	[-0.442]	[-0.392]
household member age 3-5	0.692 **	0.699 **	1.286 **	0.921 **	3.998 **	3.526 **	5.976 **	5.213 **
	[-0.246]	[-0.216]	[-0.257]	[-0.23]	[-0.176]	[-0.161]	[-0.411]	[-0.372]
household member age 6-12	-0.419 *	-0.400 **	0.558 **	0.473 **	0.610 **	0.281 **	0.749 **	0.399
	[-0.166]	[-0.143]	[-0.173]	[-0.153]	[-0.118]	[-0.107]	[-0.277]	[-0.246]
household member age 13-18	-0.969 **	-0.665 **	0.181	-0.257	-0.459 **	-0.681 **	-1.248 **	-1.569 **
	[-0.163]	[-0.142]	[-0.169]	[-0.152]	[-0.116]	[-0.106]	[-0.271]	[-0.245]
household member age 60 and over	0.625 **	0.322 *	0.142	0.059	0.125	-0.017	0.893 **	0.429
	[-0.152]	[-0.14]	[-0.158]	[-0.151]	[-0.108]	[-0.105]	[-0.253]	[-0.244]
marital status of household head	0.917 **	1.086 **	1.203 **	1.538 **	0.484 **	0.552 **	2.604 **	3.166 **
	[-0.101]	[-0.082]	[-0.105]	[-0.088]	[-0.072]	[-0.061]	[-0.168]	[-0.142]
logarithm of percentage VAT_burden of hhexp	2.821 **	2.810 **	2.559 **	2.361 **	1.414 **	1.370 **	6.794 **	6.532 **
	[-0.086]	[-0.076]	[-0.089]	[-0.081]	[-0.061]	[-0.056]	[-0.143]	[-0.13]
Wave dummies								
2	-1.134 **	-0.955 **	0.555 **	0.457 **	0.190 **	0.013	-0.389 **	-0.468 **
	[-0.063]	[-0.061]	[-0.066]	[-0.065]	[-0.045]	[-0.046]	[-0.105]	[-0.104]
3	-0.981 **	-1.209 **	0.538 **	0.500 **	0.507 **	0.260 **	0.064	-0.427 **
	[-0.064]	[-0.062]	[-0.066]	[-0.065]	[-0.046]	[-0.046]	[-0.106]	[-0.105]
4	-2.519 **	-2.517 **	-0.191 *	-0.397 **	0.603 **	0.151 **	-2.107 **	-2.734 **
	[-0.073]	[-0.067]	[-0.077]	[-0.071]	[-0.052]	[-0.05]	[-0.123]	[-0.114]
5	-1.924 **	-2.044 **	-0.046	-0.486 **	0.897 **	0.201 **	-1.072 **	-2.272 **
	[-0.079]	[-0.069]	[-0.082]	[-0.074]	[-0.056]	[-0.052]	[-0.131]	[-0.119]
Intercept	16.924 **	18.350 **	2.059 **	1.504 **	2.454 **	-1.044 **	21.437 **	19.093 **
	[-0.558]	[-0.424]	[-0.582]	[-0.458]	[-0.399]	[-0.317]	[-0.931]	[-0.742]
Number of observations	65754	65754	65754	65754	65754	65754	65754	65754
F statistic	262.34		116.49		228.98		287.83	
R-squared for within model	0.07	0.08	0.03	0.04	0.07	0.06	0.08	0.08
R-squared for between model	0.03	0.04	0.02	0.04	0.04	0.12	0.03	0.07
R-squared for overall model	0.07	0.07	0.03	0.04	0.06	0.08	0.07	0.08
Model test p-value	0	0	0	0	0	0	0	0
Hausman Test								
chi²	2053.59		-1320.37		495.72		-67247.51	
Prob > chi²	0				0			
Breusch and Pagan LM								
chibar²	551.77		1366.53		553.89		1604.32	
Prob > chibar²	0		0		0		0	
Alpha fixed effect hat								
alphafehat	2.531352		2.894341		1.990687		4.814827	

Notes: Robust standard errors in square brackets; FE = Fixed Effect, RE = Random Effect; ** $p < 0.01$, * $p < 0.05$., hhexp = household expenditure, exp = expenditure

Source: Author's calculation

Table A10. Hausman test for each category of items

staple	(b) Fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-3.881097	-5.247035	1.365938	0.0485955
hhsize	-0.0847504	-0.1519893	0.067239	0.0204159
headeduc	-0.1158738	-1.198847	1.082973	0.0575071
headage	0.0723157	0.0328268	0.0394889	0.0029274
headsex	-1.142979	-0.4718541	-0.6711245	0.1058754
age2	-0.3148382	-0.7546339	0.4397957	0.229721
age35	0.2427402	-0.0162616	0.2590019	0.197351
age612	0.3444245	1.230303	-0.8858788	0.1422457
age1318	0.6653562	1.118609	-0.4532526	0.1325181
age60	0.4915783	0.8835796	-0.3920012	0.0727255
marital	1.095905	0.9219732	0.1739322	0.1017265
t				
2	1.208276	1.875794	-0.6675182	0.0198934
3	-0.3238563	0.6592331	-0.9830894	0.02111
4	0.2605218	1.834913	-1.574391	0.0523816
5	-1.270936	1.279861	-2.550797	0.060845

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 534.4
Prob > chi^2 = 0

salt	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.1343445	-0.1658252	0.0314807	0.0025133
hhsize	-0.0159083	-0.0192631	0.0033548	0.0011214
headeduc	-0.0069395	-0.0387329	0.0317935	0.0033125
headage	0.0007711	0.0001662	0.0006049	0.0001465
headsex	-0.0492677	-0.0096851	-0.0395826	0.0050393
age2	-0.1000654	-0.0585047	-0.0415607	0.0077718
age35	-0.0567097	-0.0327872	-0.0239224	0.0048225
age612	-0.0933663	-0.0160617	-0.0773046	0.0046872
age1318	-0.0508015	-0.0595531	0.0087515	0.0033956
age60	0.0865572	0.1145723	-0.0280151	.
marital	0.0300322	0.0197165	0.0103157	0.0046816
t				
2	-0.0003976	0.0331517	-0.0335493	.
3	0.0757485	0.1065228	-0.0307743	.
4	-0.053814	0.0012547	-0.0550687	.
5	-0.0386888	0.0274922	-0.0661809	0.0009382

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 324.8
Prob > chi^2 = 0

vege	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.1735317	-0.2959545	0.1224228	0.0282028
hhsize	0.0344242	-0.0392652	0.0736894	0.0113958
headeduc	-0.1556936	-0.0857189	-0.0699747	0.0316701
headage	-0.0040997	0.0076317	-0.0117314	0.0017065
headsex	-0.8896657	-0.821428	-0.0682378	0.0621579
age2	0.1674701	0.1140695	0.0534007	0.1370526
age35	0.7659175	0.8204946	-0.0545771	0.1198538
age612	0	-0.3858424	-0.0199861	0.0852118
age1318	-1.118111	-0.8787298	-0.2393813	0.0796674
age60	0.5449342	0.2391859	0.3057483	0.057951
marital	1	0.9273074	-0.1488605	0.0598566
t				
2	-0.8968123	-0.6753409	-0.2214713	0.0152617
3	-0.6387772	-0.8270893	0.1883121	0.0158845
4	-2.328499	-2.284437	-0.0440627	0.0314233
5	-2.394655	-2.463131	0.0684762	0.0364036

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 1858.88
Prob > chi^2 = 0

dried	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	0.2178637	0.1203344	0.0975293	0.018692
hhsize	0.0218034	-0.0078797	0.0296832	0.0075576
headeduc	-0.0537337	-0.0248368	-0.0288968	0.0209888
headage	-0.0144564	-0.012054	-0.0024024	0.0011317
headsex	-0.3644073	-0.4923789	0.1279716	0.0412486
age2	1.558653	1.404561	0.154092	0.0913494
age35	2.648594	2.38113	0.2674645	0.0799871
age612	1.129151	0.998137	0.1310138	0.0567959
age1318	0.6712966	0.4832753	0.1880213	0.0531957
age60	0.5866846	0.4369585	0.149726	0.038574
marital	0.2263315	0.1955424	0.0307891	0.0397437
t				
2	1.92684	1.95169	-0.0248502	0.010758
3	2.470288	2.466607	0.0036804	0.0111368
4	2.83838	2.752567	0.0858128	0.0211466
5	1.633191	1.586282	0.0469093	0.0243789

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 198.29
Prob > chi^2 = 0

meat	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	0.6551225	0.6352785	0.019844	0.0277981
hhsize	0.1292441	0.0510259	0.0782181	0.0114917
headeduc	-0.1504613	0.004175	-0.1546363	0.0322191
headage	0.024009	0.039005	-0.014996	0.0016775
headsex	-0.4726354	-0.8629968	0.3903614	0.0608161
age2	0.8852284	0.8027962	0.0824322	0.1326478
age35	1.353589	1.00965	0.3439385	0.1147855
age612	0.5702972	0.4777256	0.0925716	0.0822852
age1318	0.0458809	-0.4402059	0.4860869	0.0767299
age60	0.0691867	-0.0134706	0.0826573	0.0485084
marital	1.077051	1.406342	-0.3292918	0.0584714
t				
2	0.7705981	0.6930609	0.0775372	0.0127433
3	0.8486078	0.8221303	0.0264775	0.0134167
4	-0.0177289	-0.2	0.182	0.0303
5	-0.4729883	-0.8365165	0.3635282	0.0351834

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = -81757.1

fish	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.6726533	-0.7178904	0.0452372	0.0105871
hhsize	-0.0236771	0.032087	-0.0557641	0.0061439
headeduc	-0.0064192	-0.0729607	0.0665415	0.0182112
headage	0.0116061	0.0065649	0.0050413	0.0005895
headsex	-0.2620254	-0.128305	-0.1337204	0.0198182
age2	-0.4918427	-0.0966887	-0.395154	0.0228607
age35	0.2433008	0.7998786	-0.5565779	.
age612	-0.1557687	0.2606836	-0.4164523	0.0094609
age1318	-0.65028	-0.4234916	-0.2267885	.
age60	-0.3318324	-0.3322296	0.0003971	.
marital	0.6428432	0.4922414	0.1506018	0.018363
t				
2	0.5955823	0.506602	0.0889803	.
3	0.9185432	0.9898867	-0.0713435	.
4	0.1965489	0.1640551	0.0324938	.
5	-0.043718	0.0235089	-0.0672269	.

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = -64.19

dairy	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	0.2550835	0.4861416	-0.2310581	0.0187382
hhsize	0.0314492	0.018772	0.0126772	0.0077913
headeduc	-0.0364004	0.3184541	-0.3548544	0.0220688
headage	-0.0028224	0.015597	-0.0184195	0.0011235
headsex	-0.2631843	-0.5076692	0.2444849	0.0403764
age2	7.453175	7.612217	-0.159042	0.0839102
age35	4.035499	3.586113	0.4493865	0.0711099
age612	0.6171033	0.2883557	0.3287476	0.0519756
age1318	-0.533334	-0.7842886	0.2509546	0.047481
age60	0.0851502	-0.0562264	0.1413766	0.0273964
marital	0.41397	0.4745601	-0.0605901	0.038585
t				
2	0.3095488	0.1492931	0.1602557	.
3	0.6788294	0.4464591	0.2323703	.
4	0.6983182	0.2655042	0.432814	0.0171687
5	0.6613841	-0.0020755	0.6634596	0.0212216

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 528.8
Prob > chi^2 = 0

beverages	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.1395435	-0.0243497	-0.1151938	0.0100656
hhsize	-0.0592787	-0.0374656	-0.0218131	0.0043158
headeduc	0.0502151	-0.0553863	0.1056014	0.012369
headage	0.0009399	-0.0030884	0.0040283	0.0006003
headsex	0.1990049	0.3456229	-0.146618	0.0213858
age2	-0.6858358	-0.57657	-0.1092658	0.0430555
age35	-0.2701062	-0.236977	-0.0331292	0.0354916
age612	-0.5137137	-0.4554344	-0.0582793	0.0265469
age1318	-0.569379	-0.6051352	0.0357562	0.0239522
age60	-0.197772	-0.0950989	-0.1026731	0.005678
marital	-0.0048967	-0.2461888	0.2412921	0.0203567
t				
2	0.4035894	0.3783985	0.0251909	.
3	0.2287161	0.2675416	-0.0388255	.
4	0.3205454	0.2953946	0.0251508	0.008341
5	0.5938902	0.6118471	-0.0179569	0.0106691

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 428.63
Prob > chi^2 = 0

spices	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.5981934	-0.7620062	0.1638128	0.0150222
hhsize	-0.0498244	-0.0694113	0.0195869	0.0061076
headeduc	-0.0503279	-0.2360134	0.1856855	0.0169056
headage	0.0115894	0.0065705	0.0050188	0.000912
headsex	-0.444166	-0.4535518	0.0093858	0.0333535
age2	-0.7426128	-0.5128985	-0.2297143	0.0754152
age35	-0.1069826	0.071355	-0.1783376	0.0663745
age612	-0.5666891	-0.2772593	-0.2894298	0.0468756
age1318	-0.625979	-0.3712612	-0.2547178	0.0442688
age60	0.1176421	0.1044765	0.0131656	0.0313199
marital	0.5925258	0.669548	-0.0770221	0.0322274
t				
2	0.5772606	0.771581	-0.1943203	0.0107831
3	0.9466758	0.9986519	-0.0519761	0.0109917
4	0.6659237	0.937482	-0.2715583	0.0181879
5	0.6915488	1.060653	-0.3691047	0.0205237

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

chi^2(15) = 514.27
Prob > chi^2 = 0

alcohol tobacco	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.3391636	-0.4306747	0.0915111	0.0244231
hhsize	0.0540797	0.0662543	-0.0121746	0.0111843
headeduc	-0.2585759	-0.6932718	0.4346959	0.0321394
headage	-0.0267574	-0.0466092	0.0198518	0.0014514
headsex	3.851882	4.024862	-0.1729796	0.0517532
age2	-1.751106	-1.064287	-0.6868188	0.1064164
age35	-2.506922	-1.963133	-0.5437895	0.0858004
age612	-3.70206	-3.304407	-0.3976535	0.0649829
age1318	-3.597697	-3.53507	-0.0626277	0.0595473
age60	-1.542702	-1.921468	0.3787663	.
marital	-1.193849	-1.341449	0.1476	0.0494569
t				
2	0.2733169	0.4302394	-0.1569226	.
3	1.589687	1.921771	-0.3320844	.
4	1.273624	1.69267	-0.4190461	0.0224491
5	1.889425	2.402573	-0.5131481	0.0266355

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

chi^2(15) = -106.17

snack	(b)	(B)	(b-B)	sqrt(diag(V(b)-V(B)))
	fixed	random	Difference	Std. err.
lnpce	0.6029265	0.8080211	-0.2050946	0.0334919
hhsize	-0.2023911	-0.1551804	-0.0472107	0.0138953
headeduc	0.1492063	0.0420968	0.1071095	0.0389547
headage	-0.0624774	-0.0667845	0.0043071	0.0020217
headsex	1.415993	1.241378	0.174615	0.0733328
age2	-0.0587563	-0.4828269	0.4240706	0.1606285
age35	1.656514	0.9904656	0.6660488	0.1390535
age612	0.0029026	-0.2870491	0.2899516	0.0996119
age1318	-0.6587345	-0.5221411	-0.1365934	0.0930686
age60	1.224458	1.252621	-0.0281623	0.0575004
marital	-3.339875	-3.193315	-0.1465604	0.070546
t				
2	-4.07859	-4.25843	0.1798395	0.0165401
3	-2.911036	-3.316814	0.4057785	0.0172614
4	-2.884641	-2.869793	-0.0148486	0.0370352
5	-3.123222	-3.185268	0.062046	0.0427923

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 494.31
Prob > chi^2 = 0

foodout	(b)	(B)	(b-B)	sqrt(diag(V(b)-V(B)))
	fixed	random	Difference	Std. err.
lnpce	0.8273009	0.8859459	-0.058645	0.0232977
hhsize	-0.1192585	-0.1037127	-0.0155458	0.0097009
headeduc	0.1815241	0.0963547	0.0851694	0.0275743
headage	-0.0305019	-0.042016	0.011514	0.0013932
headsex	1.206037	1.554954	-0.348917	0.0499044
age2	-1.355904	-1.846254	0.4903501	0.1014726
age35	-1.659868	-1.746137	0.0862682	0.0851297
age612	-0.9523524	-1.230317	0.2779643	0.0628134
age1318	-0.8051493	-1.006638	0.2014884	0.0567846
age60	-0.9337751	-0.688436	-0.2453391	0.0314309
marital	-1.70798	-2.35513	0.6471501	0.0475714
t				
2	-0.5973518	-0.6337791	0.0364273	.
3	-0.0917388	-0.0513135	-0.0404253	.
4	-0.2161025	-0.0350251	-0.1810773	0.0194178
5	-0.3013599	-0.1227624	-0.1785976	0.0249709

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 485.48
Prob > chi^2 = 0

psnack	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	0.0143023	0.0168327	-0.0025304	0.0003894
hhsize	-0.0032165	-0.0026492	-0.0005673	0.0001647
headeduc	0.0033073	0.0014765	0.0018308	0.0004667
headage	-0.0009298	-0.0010878	0.000158	0.0000234
headsex	0.0262203	0.0280401	-0.0018198	0.000842
age2	-0.0141466	-0.023972	0.0098254	0.0017899
age35	-0.0000335	-0.008351	0.0083175	0.0015214
age612	-0.0094945	-0.0153609	0.0058664	0.001107
age1318	-0.0146388	-0.0155267	0.0008878	0.0010231
age60	0.0029068	0.0049242	-0.0020173	0.0004966
marital	-0.0504785	-0.0557091	0.0052306	0.0008069
t				
2	-0.0467594	-0.0489444	0.002185	0.0000477
3	-0.0300277	-0.0337202	0.0036925	0.0000756
4	-0.0310074	-0.0290594	-0.001948	0.0003935
5	-0.0342458	-0.0331662	-0.0010796	0.0004666

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = -724.99

oil	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-0.5009988	-0.5363605	0.0353616	0.0125625
hhsize	-0.0536906	-0.0658071	0.0121165	0.0050348
headeduc	-0.0343321	-0.1020326	0.0677005	0.0139024
headage	0.0059561	0.0065174	-0.0005613	0.0007624
headsex	-0.4277368	-0.4017662	-0.0259706	0.027882
age2	-0.5320077	-0.3212616	-0.210746	0.0625501
age35	-0.2195864	0.0385628	-0.2581492	0.0551244
age612	-0.162198	0.0514408	-0.2136387	0.0389239
age1318	-0.3907723	-0.2179729	-0.1727994	0.0366162
age60	0.3156538	0.1704375	0.1452163	0.0276425
marital	0.4656151	0.4724746	-0.0068595	0.0269134
t				
2	0.652031	0.6339821	0.0180489	0.0083533
3	0.2488362	0.2530227	-0.0041865	0.0085686
4	1.025278	1.074021	-0.0487429	0.0147517
5	0.1925966	0.2486282	-0.0560316	0.016837

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 139.1
Prob > chi^2 = 0

sugar	(b)	(B)	(b-B)	sqrt(diag(V(b)-V(B)))
	fixed	random	Difference	Std. err.
lnpce	-0.4126386	-0.6141207	0.2014821	0.0119905
hhsize	-0.0428178	-0.0699737	0.027156	0.0049792
headeduc	-0.071756	-0.1257438	0.0539878	0.0138869
headage	0.0138583	0.0159253	-0.002067	0.0007259
headsex	-0.2977496	-0.2389163	-0.0588332	0.0264487
age2	-0.7875309	-0.7394041	-0.0481268	0.0592029
age35	-0.3950649	-0.2209392	-0.1741258	0.0516269
age612	-0.72385	-0.4909043	-0.2329457	0.0367208
age1318	-0.5833029	-0.5997944	0.0164915	0.0345959
age60	0.2314119	0.4407108	-0.2092989	0.021629
marital	0.4166017	0.3984748	0.0181269	0.0255218
t				
2	-0.2328022	-0.1591879	-0.0736142	0.0077794
3	-0.321254	-0.214368	-0.106886	0.0079492
4	-0.723038	-0.5195667	-0.2034713	0.0141654
5	-1.112644	-0.8822708	-0.2303728	0.0160263

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 745.88
Prob > chi^2 = 0

exempted	(b)	(B)	(b-B)	sqrt(diag(V(b)-V(B)))
	fixed	random	Difference	Std. err.
lnpce	-4.015442	-5	1.378864	0.048415
hhsize	-0.1006586	0	0.0693095	0.0203932
headeduc	-0.1228133	-1.233174	1.11036	0.0574774
headage	0.0730868	0.0332157	0.039871	0.0029159
headsex	-1.192246	-0.4893602	-0.702886	0.1054271
age2	-0.4149035	-0.8096016	0.3946981	0.2286435
age35	0.1860305	-0.0513696	0.2374001	0.196215
age612	0.2510582	1.207572	-0.956514	0.1415358
age1318	0.6145546	1.05273	-0.4381754	0.1318569
age60	0.5781355	0.987622	-0.4094865	0.0703972
marital	1.125938	0.9471766	0.1787611	0.1012915
t				
2	1.207879	1.902123	-0.694244	0.0195675
3	-0.2481078	0.757956	-1.006064	0.0207751
4	0.2067078	1.819054	-1.612346	0.0521565
5	-1.309625	1.284566	-2.594191	0.0605517

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 557.39
Prob > chi^2 = 0

exempted09	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	0.7366744	0.7894949	-0.0528206	0.0442702
hhsize	0.1951175	0.0369211	0.1581965	0.0184524
headeduc	-0.3425552	0.227526	-0.5700812	0.0518993
headage	0.0170869	0.0609604	-0.0438735	0.002668
headsex	-1.625486	-2.19218	0.5666948	0.0965447
age2	8.505874	8.593978	-0.0881047	0.2093342
age35	6.155005	5.452149	0.7028564	0.1802695
age612	0.7815719	0.4065827	0.3749892	0.1297328
age1318	-1.605564	-2.074202	0.4686376	0.1207584
age60	0.6992711	0.2229836	0.4762875	0.0712144
marital	2.269467	2.801085	-0.5316181	0.0927496
t				
2	0.1833346	0.1848766	-0.001542	0.0179121
3	0.88866	0.4638473	0.4248127	0.0190974
4	-1.64791	-2.187522	0.5396118	0.0474677
5	-2.206259	-3.240435	1.034175	0.0553483

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 2004.62
Prob > chi^2 = 0

vat	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V(b)-V(B))) Std. err.
lnpce	-1.280266	-1.462433	0.1821671	0.0530229
hhsize	-0.4894427	-0.3950572	-0.0943855	0.0230189
headeduc	-0.061616	-1.122571	1.060955	0.0653939
headage	-0.0925359	-0.1389906	0.0464548	0.00318
headsex	4.87283	5.518747	-0.6459164	0.1144117
age2	-4.99995	-4.382088	-0.617862	0.244279
age35	-0.3994981	0.2205231	-0.6200212	0.2059453
age612	-5.650486	-4.603327	-1.04716	0.1506023
age1318	-7.203571	-6.72669	-0.4768812	0.1397109
age60	-0.3359999	-0.6533923	0.3173924	0.0369654
marital	-3.906278	-5.059853	1.153575	0.1097343
t				
2	0.8479713	0.8412105	0.0067608	0.009902
3	4.403068	4.544918	-0.1418493	0.0121728
4	3.903441	4.746166	-0.8427245	0.0547798
5	1.889234	3.103075	-1.213841	0.0638826

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic

$chi^2(15)$ = 261.48
Prob > chi^2 = 0

food	(b)	(B)	(b-B)	sqrt(diag(V(b)-V(B)))
	fixed	random	Difference	Std. err.
lnpce	-0.0456034	-0.0603883	0.0147849	0.0007228
hhsize	-0.0039506	-0.005106	0.0011554	0.0003061
headeduc	-0.0052698	-0.0216917	0.0164219	0.0008637
headage	-0.0000237	-0.0004642	0.0004405	0.0000435
headsex	0.0205544	0.0286549	-0.0081004	0.0015721
age2	0.0309071	0.0359711	-0.005064	0.0034056
age35	0.0593895	0.0579425	0.001447	0.0029158
age612	-0.0462006	-0.0287183	-0.0174823	0.0021068
age1318	-0.0819418	-0.0763234	-0.0056184	0.0019626
age60	0.0094124	0.0060581	0.0033543	0.0009834
marital	-0.0051079	-0.0133969	0.0082891	0.0015103
t				
2	0.0223896	0.0293404	-0.0069507	0.0002825
3	0.0504414	0.057846	-0.0074046	0.0003005
4	0.0246311	0.0439067	-0.0192756	0.0007771
5	-0.0162536	0.0119507	-0.0282043	0.0009014

b = Consistent under H_0 and H_a; obtained from xtreg.

B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.

Test of H_0: Difference in coefficients not systematic

$chi^2(15) =$ 1064.95

Prob > $chi^2 =$ 0

Table A11. Pooled Ordinary Least Square Regressions (part 1)

Explanatory Variables	staple		salt		vegetables		dried		meat		fish		dairy		beverages		spices	
	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT
lnpce	-5.401 **	-5.934 **	-0.170 **	-0.171 **	-0.737 **	-0.634 **	0.353 **	0.442 **	0.441 **	0.536 **	-0.673 **	-0.588 **	0.505 **	0.554 **	0.102 **	0.138 **	-0.615 **	-0.575 **
	[-0.059]	[-0.053]	[-0.004]	[-0.004]	[-0.03]	[-0.03]	[-0.02]	[-0.02]	[-0.032]	[-0.032]	[-0.027]	[-0.026]	[0]	[-0.022]	[-0.013]	[-0.013]	[-0.016]	[-0.016]
household size	-0.132 **	-0.171 **	-0.022 **	-0.022 **	-0.082 **	-0.074 **	0.041 **	0.048 **	0.034 **	0.041 **	0.068 **	0.074 **	0.024 **	0.027 **	-0.039 **	-0.037 **	-0.073 **	-0.071 **
	[-0.018]	[-0.017]	[-0.001]	[-0.001]	[-0.009]	[-0.009]	[-0.006]	[-0.006]	[-0.01]	[-0.01]	[-0.008]	[-0.008]	[-0.007]	[-0.007]	[-0.004]	[-0.004]	[-0.005]	[-0.005]
household head education	-1.267 **	-1.294 **	-0.040 **	-0.040 **	-0.120 **	-0.115 **	-0.037 **	-0.033 *	-0.009	-0.004	-0.122 **	-0.118 **	0.328 **	0.331 **	-0.074 **	-0.072 **	-0.252 **	-0.250 **
	[-0.037]	[-0.034]	[-0.002]	[-0.002]	[-0.019]	[-0.019]	[-0.013]	[-0.013]	[-0.02]	[-0.02]	[-0.017]	[-0.017]	[-0.014]	[-0.014]	[-0.008]	[-0.008]	[-0.01]	[-0.01]
household head age	0.028 **	-0.002	0	0	0.011 **	0.017 **	-0.012 **	-0.007 **	0.042 **	0.047 **	0.004 *	0.009 **	0.017 **	0.019 **	-0.002 **	0	0.006 **	0.009 **
	[-0.004]	[-0.004]	[0]	[0]	[-0.002]	[-0.002]	[-0.001]	[-0.001]	[-0.002]	[-0.002]	[-0.002]	[-0.002]	[-0.002]	[-0.002]	[-0.001]	[-0.001]	[-0.001]	[-0.001]
household head sex	-0.480 **	0.224	-0.002	-0.001	-0.661 **	-0.796 **	-0.604 **	-0.722 **	-0.863 **	-0.989 **	0.024	-0.089	-0.523 **	-0.589 **	0.349 **	0.302 **	-0.486 **	-0.539 **
	[-0.16]	[-0.146]	[-0.01]	[-0.01]	[-0.082]	[-0.081]	[-0.056]	[-0.054]	[-0.087]	[-0.086]	[-0.073]	[-0.072]	[-0.06]	[-0.06]	[-0.036]	[-0.035]	[-0.044]	[-0.044]
household member age 0-2	-1.383 **	-2.988 **	-0.044	-0.046	0.503 *	0.812 **	0.589 **	0.858 **	0.523 *	0.811 **	0.371	0.627 **	7.359 **	7.508 **	-0.464 **	-0.356 **	-0.583 **	-0.464 **
	[-0.451]	[-0.41]	[-0.028]	[0]	[-0.231]	[-0.228]	[-0.157]	[-0.153]	[-0.245]	[-0.243]	[-0.205]	[-0.203]	[-0.169]	[-0.169]	[-0.1]	[-0.099]	[-0.124]	[-0.124]
household member age 3-5	-0.41	-0.821 *	-0.026	-0.026	1.338 **	1.417 **	1.465 **	1.534 **	0.784 **	0.858 **	1.229 **	1.295 **	3.335 **	3.374 **	-0.123	-0.095	-0.088	-0.057
	[-0.429]	[-0.389]	[-0.027]	[-0.027]	[-0.219]	[-0.217]	[-0.149]	[-0.146]	[-0.233]	[-0.231]	[-0.194]	[-0.192]	[-0.161]	[-0.16]	[-0.095]	[-0.094]	[-0.118]	[-0.117]
household member age 6-12	0.727 **	0.166	-0.003	0	0.435 **	0.542 **	0.031	0.125	0.551 **	0.651 **	0.683 **	0.772 **	0.109	0.161	-0.407 **	-0.369 **	-0.468 **	-0.427 **
	[-0.279]	[-0.254]	[-0.018]	[-0.018]	[-0.143]	[-0.141]	[-0.097]	[-0.095]	[-0.152]	[-0.15]	[-0.127]	[-0.125]	[-0.105]	[-0.104]	[-0.062]	[-0.061]	[-0.077]	[-0.076]
household member age 13-18	0.613 *	-0.142	-0.036 *	-0.037 *	0.285 *	0.430 **	-0.209 *	-0.083	-0.04	0.095	0.186	0.307 *	-0.838 **	-0.768 **	-0.643 **	-0.592 **	-0.552 **	-0.496 **
	[-0.278]	[-0.253]	[-0.017]	[0]	[-0.142]	[-0.141]	[-0.097]	[-0.095]	[-0.151]	[-0.15]	[-0.126]	[-0.125]	[-0.104]	[-0.104]	[-0.062]	[-0.061]	[-0.077]	[-0.076]
household member age 60 and over	1.022 **	-0.04	0.124 **	0.123 **	0.055	0.26	0.234 *	0.412 **	-0.235	-0.045	-0.353 **	-0.184	-0.186	-0.087	-0.003	0.068	0.115	0.194 *
	[-0.277]	[-0.252]	[-0.017]	[-0.017]	[-0.142]	[-0.14]	[-0.096]	[-0.094]	[-0.151]	[-0.149]	[-0.126]	[-0.125]	[-0.104]	[-0.104]	[-0.062]	[-0.061]	[-0.076]	[-0.076]
marital status of household head	0.915 **	-0.013	0.019	0.018	0.911 **	1.089 **	0.205 **	0.361 **	1.465 **	1.631 **	0.264 **	0.412 **	0.470 **	0.557 **	-0.236 **	-0.173 **	0.687 **	0.756 **
	[-0.161]	[-0.147]	[-0.01]	[-0.01]	[-0.083]	[-0.082]	[-0.056]	[-0.055]	[-0.088]	[-0.087]	[-0.073]	[-0.073]	[-0.061]	[-0.06]	[-0.036]	[-0.036]	[-0.044]	[-0.044]
natural disaster	-0.178	-0.085	-0.025	-0.025	-0.328 **	-0.346 **	0.603 **	0.587 **	-0.712 **	-0.729 **	-0.082	-0.097	0.142	0.134	0.155 **	0.149 **	-0.021	-0.028
	[-0.248]	[-0.225]	[-0.016]	[-0.016]	[-0.127]	[-0.125]	[-0.086]	[-0.084]	[-0.135]	[-0.134]	[-0.113]	[-0.111]	[-0.093]	[-0.093]	[-0.055]	[-0.055]	[-0.068]	[-0.068]
death of household member/s	1.038 **	0.619 **	0.042 **	0.042 **	0.215	0.295 **	-0.128	-0.058	0.323 **	0.398 **	0.540 **	0.607 **	-0.064	-0.025	0.079	0.107 *	-0.009	0.022
	[-0.223]	[-0.203]	[-0.014]	[-0.014]	[-0.114]	[-0.113]	[-0.077]	[-0.076]	[-0.121]	[-0.12]	[-0.101]	[-0.1]	[-0.084]	[-0.083]	[-0.05]	[-0.049]	[-0.061]	[-0.061]
sickness of household member/s	-1.621 **	-2.117 **	0.011	0.011	0.149	0.244 **	-0.022	0.061	-0.197 *	-0.108	-0.383 **	-0.304 **	0.079	0.125	-0.117 **	-0.084 *	-0.185 **	-0.148 **
	[-0.171]	[-0.156]	[-0.011]	[-0.011]	[-0.088]	[-0.087]	[-0.059]	[-0.058]	[-0.093]	[-0.092]	[-0.078]	[-0.077]	[-0.064]	[-0.064]	[-0.038]	[-0.038]	[-0.047]	[-0.047]
lnvatburden		-15.147 **		-0.019 *		2.912 **		2.534 **		2.710 **		2.415 **		1.408 **		1.017 **		1.121 **
		[-0.129]		[-0.009]		[-0.072]		[-0.048]		[-0.076]		[-0.064]		[-0.053]		[-0.031]		[-0.039]
Intercept	76.262 **	40.780 **	2.396 **	2.351 **	14.282 **	21.102 **	0.008	5.943 **	-2.515 **	3.833 **	10.922 **	16.578 **	-4.729 **	-1.432 **	1.404 **	3.787 **	11.086 **	13.712 **
	[-0.701]	[-0.705]	[-0.044]	[-0.049]	[-0.359]	[-0.392]	[-0.243]	[-0.264]	[-0.381]	[-0.417]	[-0.318]	[-0.348]	[-0.263]	[-0.29]	[-0.156]	[-0.171]	[-0.193]	[-0.212]
Number of observations	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754
F statistic	1405.55	2514.33	338.17	315.95	108.3	214.11	60.34	243.84	73.34	154.23	147.71	237.25	355.57	382.78	49.48	117.86	329.77	367.63
R-squared	0.23	0.36	0.07	0.07	0.02	0.05	0.01	0.05	0.02	0.03	0.03	0.05	0.07	0.08	0.01	0.03	0.07	0.08
Adjusted R-squared	0.23	0.36	0.07	0.07	0.02	0.05	0.01	0.05	0.02	0.03	0.03	0.05	0.07	0.08	0.01	0.03	0.07	0.08

Notes: Robust standard errors in square brackets; ** $p < 0.01$, * $p < 0.05$.
Source: Author's calculation

Table A12. Pooled Ordinary Least Square Regressions (part 2)

Explanatory Variables	alcohol tobacco		snack		foodout		oil		sugar		exempted		exempted09		vat		food	
	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT	No VAT	VAT
lnpce	-0.053	0.098 **	0.486 **	0.635 **	0.889 **	0.565 **	-0.472 **	-0.445 **	-0.808 **	-0.769 **	-5.571 **	-6.104 **	0.209 **	0.456 **	-0.753 **	-0.068	-0.061 **	-0.057 **
	[-0.038]	[-0.038]	[-0.039]	[-0.039]	[-0.028]	[-0.052]	[-0.013]	[-0.013]	[-0.014]	[-0.014]	[-0.059]	[-0.054]	[-0.052]	[-0.051]	[-0.071]	[-0.064]	[-0.001]	[-0.001]
household size	0.068 **	0.079 **	-0.121 **	-0.111 **	-0.091 **	-0.059 **	-0.025 **	-0.023 **	-0.076 **	-0.073 **	-0.155 **	-0.193 **	-0.024	0	-0.239 **	-0.190 **	-0.004 **	-0.004 **
	[-0.012]	[-0.012]	[-0.012]	[-0.012]	[-0.009]	[-0.017]	[-0.004]	[-0.004]	[-0.004]	[-0.004]	[-0.019]	[-0.017]	[-0.017]	[-0.016]	[-0.023]	[-0.02]	[0]	[0]
household head education	-0.727 **	-0.719 **	0.028	0.035	0.099 **	-0.440 **	-0.115 **	-0.114 **	-0.143 **	-0.141 **	-1.307 **	-1.334 **	0.199 **	0.212 **	-1.324 **	-1.290 **	-0.024 **	-0.024 **
	[-0.024]	[-0.024]	[-0.025]	[-0.025]	[-0.018]	[-0.03]	[-0.008]	[-0.008]	[-0.009]	[-0.009]	[-0.037]	[-0.034]	[-0.033]	[0]	[-0.045]	[-0.041]	[-0.001]	[-0.001]
household head age	-0.049 **	-0.040 **	-0.073 **	-0.065 **	-0.043 **	-0.025 **	0.004 **	0.006 **	0.016 **	0.019 **	0.029 **	-0.002	0.070 **	0.084 **	-0.149 **	-0.110 **	-0.001 **	-0.000 **
	[-0.003]	[-0.003]	[-0.003]	[-0.003]	[-0.002]	[-0.004]	[-0.001]	[-0.001]	[-0.001]	[-0.001]	[-0.004]	[-0.004]	[-0.004]	[-0.004]	[-0.005]	[-0.004]	[0]	[0]
household head sex	3.934 **	3.734 **	1.272 **	1.074 **	1.533 **	1.422 **	-0.445 **	-0.481 **	-0.172 **	-0.223 **	-0.482 **	0.223	-2.048 **	-2.374 **	5.402 **	4.497 **	0.029 **	0.023 **
	[-0.104]	[-0.102]	[-0.108]	[-0.106]	[-0.075]	[-0.129]	[-0.035]	[-0.035]	[-0.038]	[-0.038]	[-0.161]	[-0.147]	[-0.144]	[-0.14]	[-0.195]	[-0.175]	[-0.002]	[-0.002]
household member age 0-2	-0.769 **	-0.313	-0.048	0.402	-1.800 **	-0.882 *	-0.792 **	-0.710 **	-0.789 **	-0.672 **	-1.427 **	-3.034 **	8.386 **	9.131 **	-4.652 **	-2.588 **	0.023 **	0.035 **
	[-0.293]	[-0.288]	[-0.303]	[-0.298]	[-0.212]	[-0.39]	[-0.099]	[-0.099]	[-0.107]	[-0.106]	[-0.453]	[-0.412]	[-0.404]	[-0.395]	[-0.549]	[-0.493]	[-0.007]	[-0.007]
household member age 3-5	-1.850 **	-1.733 **	1.307 **	1.422 **	-1.764 **	-1.922 **	-0.383 **	-0.362 **	-0.239 *	-0.209 *	-0.436	-0.848 *	5.458 **	5.648 **	-0.623	-0.095	0.044 **	0.047 **
	[-0.278]	[-0.274]	[-0.288]	[-0.283]	[-0.202]	[-0.368]	[-0.094]	[-0.094]	[-0.102]	[-0.101]	[-0.431]	[-0.392]	[-0.384]	[-0.375]	[-0.522]	[-0.468]	[-0.007]	[-0.006]
household member age 6-12	-3.468 **	-3.308 **	0.13	0.288	-1.307 **	-0.774 **	-0.385 **	-0.356 **	-0.341 **	-0.300 **	0.725 **	0.163	1.095 **	1.355 **	-5.784 **	-5.062 **	-0.040 **	-0.035 **
	[-0.181]	[-0.178]	[-0.187]	[-0.184]	[-0.131]	[-0.249]	[-0.061]	[-0.061]	[-0.066]	[-0.066]	[-0.28]	[-0.255]	[-0.25]	[-0.244]	[-0.34]	[-0.305]	[-0.004]	[-0.004]
household member age 13-18	-3.977 **	-3.763 **	-0.35	-0.139	-1.125 **	-0.354	-0.586 **	-0.547 **	-0.345 **	-0.290 **	0.577 *	-0.179	-0.593 *	-0.243	-7.907 **	-6.937 **	-0.079 **	-0.074 **
	[-0.181]	[-0.178]	[-0.187]	[-0.184]	[-0.131]	[-0.235]	[-0.061]	[-0.061]	[-0.066]	[-0.066]	[-0.28]	[-0.254]	[-0.249]	[-0.243]	[-0.339]	[-0.304]	[-0.004]	[-0.004]
household member age 60 and over	-1.742 **	-1.440 **	1.273 **	1.571 **	-0.601 **	-0.328	0.061	0.115	0.415 **	0.492 **	1.146 **	0.083	-0.366	0.127	-0.571	0.795 **	0.002	0.010 *
	[-0.18]	[-0.177]	[-0.186]	[-0.183]	[-0.13]	[-0.276]	[-0.061]	[-0.061]	[-0.066]	[-0.065]	[-0.279]	[-0.254]	[-0.248]	[-0.243]	[-0.338]	[-0.303]	[-0.004]	[-0.004]
marital status of household head	-1.355 **	-1.091 **	-3.251 **	-2.991 **	-2.363 **	-1.816 **	0.461 **	0.508 **	0.389 **	0.457 **	0.935 **	0.005	2.846 **	3.276 **	-5.216 **	-4.022 **	-0.014 **	-0.007 **
	[-0.105]	[-0.103]	[-0.108]	[-0.107]	[-0.076]	[-0.127]	[-0.035]	[-0.035]	[-0.038]	[-0.038]	[-0.162]	[-0.148]	[-0.145]	[-0.141]	[-0.197]	[-0.177]	[-0.002]	[-0.002]
natural disaster	0.285	0.258	0.578 **	0.552 **	-0.022	-0.358	0.209 **	0.204 **	0.175 **	0.169 **	-0.203	-0.11	-0.898 **	-0.941 **	2.027 **	1.908 **	0.009 *	0.009 *
	[-0.161]	[-0.158]	[-0.167]	[-0.164]	[-0.117]	[-0.211]	[-0.054]	[-0.054]	[-0.059]	[-0.058]	[0]	[-0.227]	[-0.222]	[-0.217]	[-0.302]	[-0.271]	[-0.004]	[-0.004]
death of household member/s	-0.267	-0.148	-1.472 **	-1.354 **	-0.521 **	0.228	-0.077	-0.056	0.154 **	0.184 **	1.081 **	0.661 **	0.474 *	0.668 **	-1.746 **	-1.208 **	-0.002	0.001
	[-0.145]	[-0.142]	[-0.15]	[-0.147]	[-0.105]	[-0.21]	[-0.049]	[-0.049]	[-0.053]	[-0.052]	[-0.224]	[-0.204]	[-0.2]	[-0.195]	[-0.271]	[-0.244]	[-0.003]	[-0.003]
sickness of household member/s	-0.365 **	-0.224 *	-0.056	0.083	-0.154	0.092	-0.242 **	-0.216 **	-0.166 **	-0.130 **	-1.610 **	-2.107 **	0.031	0.261	-1.654 **	-1.016 **	-0.032 **	-0.029 **
	[-0.111]	[-0.109]	[-0.115]	[-0.113]	[-0.081]	[-0.156]	[-0.038]	[-0.037]	[-0.041]	[-0.04]	[-0.172]	[-0.157]	[-0.153]	[-0.15]	[-0.208]	[-0.187]	[-0.003]	[-0.003]
lnvatburden		4.304 **		4.249 **				0.771 **		1.100 **		-15.166 **		7.029 **		19.476 **		0.113 **
		[-0.09]		[-0.094]				[-0.031]		[-0.033]		[-0.129]		[-0.124]		[-0.155]		[-0.002]
Intercept	8.869 **	18.951 **	4.052 **	14.005 **	-4.812 **	33.119 **	7.929 **	9.735 **	11.399 **	13.976 **	78.658 **	43.131 **	7.037 **	23.504 **	50.208 **	95.832 **	1.359 **	1.625 **
	[-0.455]	[-0.495]	[-0.471]	[-0.513]	[-0.33]	[-0.654]	[-0.154]	[-0.169]	[-0.166]	[-0.183]	[-0.705]	[-0.709]	[-0.628]	[-0.678]	[-0.854]	[-0.847]	[-0.011]	[-0.012]
Number of observations	65754	65754	65754	65754	65754	19802	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754	65754
F statistic	277.93	419.84	226.47	355.55	411.97	2032.84	235.92	263.7	554.73	599.1	1474.83	2582.38	101.05	314.07	303.2	1409.65	935.24	1100.73
R-squared	0.06	0.09	0.05	0.08	0.08	0.61	0.05	0.06	0.11	0.12	0.24	0.37	0.02	0.07	0.06	0.24	0.17	0.2
Adjusted R-squared	0.06	0.09	0.05	0.07	0.08	0.61	0.05	0.06	0.11	0.12	0.24	0.37	0.02	0.07	0.06	0.24	0.17	0.2

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05. foodout = prepared food eaten away from home, exempted = salt and staple, exempted09 = exempted since 2009, vegetables, meat and dairy, vat = taxed goods.
Source: Author's calculation

Table A13. Descriptive Statistics (Urban)

Variable		Mean	Std. dev.	Min	Max	Observations
id	overall	4440.613	2526.071	1	8941	N = 31485
	between		2581.189	1	8941	n = 8941
	within		0	4440.613	4440.613	T-bar = 3.52142
t	overall	3.188153	1.440244	1	5	N = 31485
	between		0.8832764	1	5	n = 8941
	within		1.303761	0.8548198	5.521486	T-bar = 3.52142
sstaple	overall	10.16784	9.394927	0	91.56004	N = 31485
	between		7.001918	0	70.7483	n = 8941
	within		6.954439	-29.29972	75.08682	T-bar = 3.52142
svege	overall	5.985797	5.201335	0	70.93107	N = 31485
	between		3.25279	0	40.30541	n = 8941
	within		4.333857	-14.15929	60.02916	T-bar = 3.52142
sdried	overall	3.317426	3.364553	0	56.81933	N = 31485
	between		2.246064	0	33.21976	n = 8941
	within		2.770889	-17.2291	38.45745	T-bar = 3.52142
smeat	overall	5.096863	5.264346	0	70.65706	N = 31485
	between		3.560991	0	43.51707	n = 8941
	within		4.229979	-19.93352	56.29845	T-bar = 3.52142
sfish	overall	3.431183	4.381995	0	64.36037	N = 31485
	between		3.538996	0	45.29241	n = 8941
	within		2.950175	-18.02774	46.96792	T-bar = 3.52142
sdairy	overall	3.503138	4.141147	0	72.26794	N = 31485
	between		2.804171	0	72.26794	n = 8941
	within		3.390298	-29.48369	52.63424	T-bar = 3.52142
sbeve	overall	2.025356	2.281201	0	51.63512	N = 31485
	between		1.625278	0	33.62101	n = 8941
	within		1.82465	-9.503464	42.80661	T-bar = 3.52142
sspices	overall	2.980313	2.598189	0	43.39314	N = 31485
	between		1.944029	0	24.44264	n = 8941
	within		1.991426	-15.97018	34.65668	T-bar = 3.52142
saltb	overall	5.049887	6.626428	0	68.92959	N = 31485
	between		5.358763	0	50.46074	n = 8941
	within		4.75239	-17.6758	52.81793	T-bar = 3.52142
ssalt	overall	0.2092995	0.4457959	0	23.36099	N = 31485
	between		0.2995661	0	10.98979	n = 8941
	within		0.3632647	-4.725311	18.68411	T-bar = 3.52142
ssnack	overall	4.930692	7.716565	0	92.38203	N = 31485
	between		6.005039	0	72.10472	n = 8941
	within		6.025947	-36.93052	66.44006	T-bar = 3.52142
soil	overall	1.902947	2.052583	0	62.401	N = 31485
	between		1.375519	0	36.96385	n = 8941
	within		1.666588	-20.40139	48.61898	T-bar = 3.52142
ssugar	overall	1.977227	2.275985	0	65.21606	N = 31485
	between		1.580535	0	23.83135	n = 8941
	within		1.766037	-19.75252	50.15178	T-bar = 3.52142

sfdout	overall	2.112405	5.677014	0	89.54734	N = 31485
	between		4.66381	0	66.3072	n = 8941
	within		4.42561	-34.66456	73.75028	T-bar = 3.52142
xempted	overall	10.37714	9.47497	0	91.56004	N = 31485
	between		7.088454	0	70.7483	n = 8941
	within		6.981722	-29.07317	74.94142	T-bar = 3.52142
xemp~09	overall	14.5858	9.089676	0	80.35193	N = 31485
	between		6.185328	0	72.91032	n = 8941
	within		7.300228	-22.46561	68.13724	T-bar = 3.52142
svat	overall	27.53017	12.99981	0	94.22967	N = 31485
	between		10.13407	0	90.75581	n = 8941
	within		9.580066	-16.3463	79.79752	T-bar = 3.52142
lnpce	overall	11.41318	0.8140848	8.626047	16.79692	N = 31485
	between		0.6482055	9.315701	15.42348	n = 8941
	within		0.5493106	8.749187	16.02829	T-bar = 3.52142
hhsize	overall	5.119422	2.572596	1	25	N = 31485
	between		1.953778	1	16	n = 8941
	within		1.842433	-5.480578	15.31942	T-bar = 3.52142
headeduc	overall	3.059743	1.328525	1	6	N = 31485
	between		1.17616	1	6	n = 8941
	within		0.6997869	-0.9402573	7.059743	T-bar = 3.52142
headage	overall	45.55788	13.1969	12	101	N = 31485
	between		11.36311	14	92	n = 8941
	within		8.515487	-0.4421153	89.15788	T-bar = 3.52142
headsex	overall	0.8453549	0.3615717	0	1	N = 31485
	between		0.2891529	0	1	n = 8941
	within		0.24513	0.0453549	1.645355	T-bar = 3.52142
age2	overall	0.0500852	0.0971309	0	0.6666667	N = 31485
	between		0.0681477	0	0.6	n = 8941
	within		0.080832	-0.2832482	0.4500852	T-bar = 3.52142
age35	overall	0.0503392	0.0972818	0	0.6666667	N = 31485
	between		0.06654	0	0.5	n = 8941
	within		0.0814988	-0.1996608	0.5404907	T-bar = 3.52142
age612	overall	0.1229463	0.1490602	0	1	N = 31485
	between		0.0945327	0	0.6666667	n = 8941
	within		0.125526	-0.2675299	0.789613	T-bar = 3.52142
age1318	overall	0.1210397	0.158244	0	1	N = 31485
	between		0.1092997	0	1	n = 8941
	within		0.1331765	-0.3789603	0.9210397	T-bar = 3.52142
age60	overall	0.0743921	0.1682181	0	1	N = 31485
	between		0.1388229	0	1	n = 8941
	within		0.116525	-0.7256079	0.8743921	T-bar = 3.52142
marital	overall	0.8306813	0.3750391	0	1	N = 31485
	between		0.3079962	0	1	n = 8941
	within		0.2582706	0.0306813	1.630681	T-bar = 3.52142

Notes: sstaple = share of staple consumption (as a percentage of total expenditure)
Source: Author's calculation

Table A14. Fixed vs Random Effect Panel Regression (Urban) [part 1]

Explanatory Variables	staple		salt		vegetables		dried		meat		fish		dairy		beverages		spices		alcohol tobacco	
	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	-2.758 **	-4.149 **	-0.084 **	-0.119 **	-0.696 **	-0.505 **	-0.144 **	-0.189 **	0.054	0.163 **	-0.623 **	-0.720 **	-0.043	0.113 **	-0.167 **	0	-0.578 **	-0.758 **	-0.566 **	-0.626 **
	[-0.107]	[-0.079]	[-0.005]	[-0.004]	[-0.066]	[-0.045]	[-0.043]	[-0.03]	[-0.066]	[-0.048]	[-0.041]	[-0.039]	[-0.053]	[-0.037]	[-0.028]	[-0.021]	[-0.031]	[-0.024]	[-0.073]	[-0.06]
household size	-0.02	-0.075 **	-0.005 **	-0.010 **	0.024	-0.070 **	-0.012	-0.025 **	0.118 **	0.065 **	-0.004	0.045 **	0.033	-0.005	-0.076 **	-0.044 **	-0.037 **	-0.032 **	0.014	0.028
	[-0.034]	[-0.024]	[-0.002]	[-0.001]	[-0.021]	[-0.014]	[-0.014]	[-0.009]	[-0.021]	[-0.015]	[-0.013]	[-0.012]	[-0.017]	[-0.011]	[-0.009]	[-0.006]	[-0.01]	[-0.007]	[-0.023]	[-0.018]
household head education	-0.449 **	-0.921 **	0.002	-0.024 **	-0.115 *	-0.055 *	-0.023	-0.025	-0.049	0.051	0.021	-0.041	0.018	0.283 **	0.094 **	-0.087 **	0.015	-0.187 **	-0.197 **	-0.795 **
	[-0.085]	[-0.046]	[-0.004]	[-0.002]	[-0.052]	[-0.025]	[-0.034]	[-0.017]	[-0.052]	[-0.028]	[-0.033]	[-0.024]	[-0.042]	[-0.021]	[-0.023]	[-0.012]	[-0.025]	[-0.014]	[-0.058]	[-0.037]
household head age	0.050 **	0.031 **	0.001 **	0	0.005	0.014 **	-0.013 **	-0.013 **	0.036 **	0.047 **	0.016 **	0.011 **	-0.008 *	0.018 **	0.001	-0.009 **	0.018 **	0.010 **	-0.020 **	-0.050 **
	[-0.007]	[-0.005]	[0]	[0]	[-0.004]	[-0.003]	[-0.003]	[-0.002]	[-0.004]	[-0.003]	[-0.003]	[-0.003]	[-0.004]	[-0.002]	[-0.002]	[-0.001]	[-0.002]	[-0.002]	[-0.005]	[-0.004]
household head sex	-1.040 **	-0.761 **	-0.056 **	-0.032 **	-0.969 **	-1.132 **	-0.365 **	-0.529 **	-0.786 **	-1.032 **	-0.341 **	-0.233 *	-0.485 **	-0.623 **	0.278 **	0.520 **	-0.441 **	-0.469 **	3.326 **	3.928 **
	[-0.256]	[-0.196]	[-0.012]	[-0.01]	[-0.158]	[-0.114]	[-0.102]	[-0.075]	[-0.158]	[-0.12]	[-0.099]	[-0.094]	[-0.128]	[-0.092]	[-0.068]	[-0.052]	[-0.074]	[-0.058]	[-0.175]	[-0.146]
household member age 0-2	0.243	-1.626 **	-0.01	-0.054	0.088	0.25	1.345 **	1.535 **	1.100 **	1.388 **	-0.567 *	0.171	10.562 **	10.236 **	-0.517 **	-0.603 **	-1.013 **	-0.610 **	-1.183 **	-0.621
	[-0.64]	[-0.548]	[-0.031]	[-0.028]	[-0.394]	[-0.326]	[-0.256]	[-0.212]	[-0.395]	[-0.338]	[-0.248]	[-0.252]	[-0.32]	[-0.26]	[-0.17]	[-0.146]	[-0.185]	[-0.16]	[-0.437]	[-0.395]
household member age 3-5	0.176	-0.827	-0.037	-0.012	0.916 *	0.759 *	2.928 **	2.557 **	1.359 **	1.266 **	0.187	0.673 **	5.487 **	5.017 **	-0.096	-0.254	0.145	0.223	-2.187 **	-2.088 **
	[-0.609]	[-0.532]	[-0.029]	[-0.027]	[-0.375]	[-0.317]	[-0.243]	[-0.206]	[-0.376]	[-0.328]	[-0.236]	[-0.243]	[-0.304]	[-0.253]	[-0.162]	[-0.142]	[-0.176]	[-0.155]	[-0.416]	[-0.382]
household member age 6-12	-0.788	-0.376	-0.032	-0.025	-0.504 *	-0.187	0.970 **	0.954 **	0.974 **	0.577 **	-0.085	0.298	0.762 **	0.669 **	-0.350 **	-0.519 **	-0.369 **	-0.189	-2.395 **	-2.624 **
	[-0.404]	[-0.354]	[-0.019]	[-0.018]	[-0.249]	[-0.211]	[-0.162]	[-0.137]	[-0.249]	[-0.218]	[-0.157]	[-0.162]	[-0.202]	[-0.168]	[-0.107]	[-0.094]	[-0.117]	[-0.103]	[-0.276]	[-0.255]
household member age 13-18	0.729	1.184 **	-0.069 **	-0.067 **	-1.416 **	-1.197 **	0.606 **	0.585 **	-0.015	-0.489 *	-0.483 **	-0.054	-0.566 **	-0.738 **	-0.543 **	-0.632 **	-0.351 **	-0.138	-3.331 **	-3.259 **
	[-0.388]	[-0.338]	[-0.019]	[-0.017]	[-0.239]	[-0.202]	[-0.155]	[-0.131]	[-0.239]	[-0.209]	[-0.15]	[-0.155]	[-0.194]	[-0.161]	[-0.103]	[-0.09]	[-0.112]	[-0.099]	[-0.265]	[-0.243]
household member age 60 and over	0.273	1.323 **	0.027	0.090 **	0.435	0.057	0.107	0.383 **	0.002	-0.057	-0.400 **	-0.305	0.072	-0.112	-0.481 **	-0.136	-0.045	0.189	-1.770 **	-2.235 **
	[-0.399]	[-0.359]	[-0.019]	[-0.018]	[-0.246]	[-0.211]	[-0.16]	[-0.138]	[-0.246]	[-0.221]	[-0.155]	[-0.168]	[-0.199]	[-0.17]	[-0.106]	[-0.096]	[-0.115]	[-0.105]	[-0.272]	[-0.263]
marital status of household head	1.290 **	1.172 **	0.030 *	0.009	0.614 **	1.137 **	0.209 *	0.168 *	1.222 **	1.538 **	0.629 **	0.655 **	0.483 **	0.552 **	-0.217 **	-0.410 **	0.652 **	0.735 **	-1.144 **	-1.257 **
	[-0.244]	[-0.192]	[-0.012]	[-0.01]	[-0.15]	[-0.112]	[-0.098]	[-0.074]	[-0.151]	[-0.118]	[-0.095]	[-0.091]	[-0.122]	[-0.091]	[-0.065]	[-0.051]	[-0.071]	[-0.056]	[-0.167]	[-0.142]
Wave dummies																				
2	[-0.158]	[-0.155]	[-0.008]	[-0.008]	[-0.097]	[-0.096]	[-0.063]	[-0.06]	[-0.097]	[-0.096]	[-0.061]	[-0.067]	[-0.079]	[-0.074]	[-0.042]	[-0.041]	[-0.046]	[-0.044]	[-0.108]	[-0.106]
	1.571 **	1.976 **	0.028 **	0.019 *	-1.625 **	-1.409 **	1.819 **	1.884 **	0.301 **	0.531 **	0.322 **	0.221 **	0.115	0.117	0.461 **	0.394 **	0.506 **	0.666 **	0.013	0.219 *
3	[-0.158]	[-0.154]	[-0.008]	[-0.008]	[-0.097]	[-0.095]	[-0.063]	[-0.06]	[-0.097]	[-0.095]	[-0.061]	[-0.067]	[-0.079]	[-0.074]	[-0.042]	[-0.041]	[-0.046]	[-0.044]	[-0.108]	[-0.106]
	0.864 **	1.110 **	0.073 **	0.087 **	-2.041 **	-2.083 **	2.409 **	2.486 **	0.17	0.399 **	0.865 **	1.072 **	0.400 **	0.378 **	0.224 **	0.261 **	0.780 **	0.883 **	1.201 **	1.609 **
4	[-0.177]	[-0.16]	[-0.009]	[-0.008]	[-0.109]	[-0.098]	[-0.071]	[-0.062]	[-0.109]	[-0.099]	[-0.068]	[-0.072]	[-0.088]	[-0.077]	[-0.047]	[-0.043]	[-0.051]	[-0.046]	[-0.121]	[-0.113]
	1.119 **	2.147 **	-0.014	0.008	-3.745 **	-3.498 **	2.492 **	2.591 **	-0.968 **	-0.604 **	0.149 *	-0.075	0.440 **	0.232 **	0.499 **	0.469 **	0.304 **	0.652 **	1.285 **	1.708 **
5	[-0.189]	[-0.161]	[-0.009]	[-0.008]	[-0.116]	[-0.097]	[-0.076]	[-0.063]	[-0.117]	[-0.1]	[-0.073]	[-0.074]	[-0.094]	[-0.077]	[-0.05]	[-0.043]	[-0.055]	[-0.047]	[-0.129]	[-0.116]
	0.263	2.022 **	0.001	0.033 **	-3.282 **	-3.447 **	1.455 **	1.514 **	-1.232 **	-1.049 **	-0.016	-0.092	0.363 **	-0.11	0.824 **	0.832 **	0.401 **	0.887 **	1.547 **	2.336 **
Intercept	[-1.323]	[-0.937]	[-0.064]	[-0.047]	[-0.816]	[-0.532]	[-0.529]	[-0.357]	[-0.817]	[-0.57]	[-0.513]	[-0.465]	[-0.661]	[-0.439]	[-0.352]	[-0.252]	[-0.383]	[-0.279]	[-0.903]	[-0.718]
Number of observations	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485
F statistic	103.63		46.82		181.38		150.25		46.51		56.3		133.29		44.18		66.27		69.61	
R-squared for within model	0.06	0.07	0.03	0.03	0.11	0.1	0.09	0.09	0.03	0.03	0.04	0.05	0.08	0.08	0.03	0.03	0.04	0.05	0.04	0.05
R-squared for between model	0.29	0.32	0.1	0.12	0.07	0.07	0.05	0.06	0.04	0.05	0.06	0.07	0.06	0.08	0.03	0.06	0.12	0.16	0.1	0.13
R-squared for overall model	0.19	0.2	0.06	0.07	0.08	0.09	0.08	0.08	0.03	0.03	0.04	0.05	0.07	0.08	0.02	0.03	0.08	0.1	0.07	0.08
Model test p-value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hausman Test																				
chi²		6322.64		381.67		-610.72		86.18		-2240.52		-75.47		229.59		1427.33		776.55		-314.06
Prob > chi²		0		0				0						0		0		0		
Breusch and Pagan LM																				
chibar²		511.8		117.02		210.62		207.52		583.99		6918.69		209.71		471.41		708.62		2534.11
Prob > chibar²		0		0		0		0		0		0		0		0		0		0
alpha fixed effect hat																				
alphafehat		5.319198		0.2449407		2.822105		1.865123		3.096108		3.188778		2.352145		1.370252		1.572036		4.426604

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05.
Source: Author's calculation

Table A15. Fixed vs Random Effect Panel Regression (Urban) [part 2]

Explanatory Variables	foodout		snack		oil		sugar		exempted		exempted09		vat		food	
	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	0.741 **	0.973 **	0.011 **	0.014 **	-0.434 **	-0.468 **	-0.408 **	-0.603 **	-2.843 **	-4.258 **	-0.685 **	-0.254 **	-2.038 **	-2.056 **	-0.056 **	-0.065 **
	[-0.069]	[-0.053]	[-0.001]	[-0.001]	[-0.027]	[-0.018]	[-0.027]	[-0.02]	[-0.107]	[-0.08]	[-0.112]	[-0.082]	[-0.146]	[-0.117]	[-0.002]	[-0.001]
household size	-0.185 **	-0.147 **	-0.004 **	-0.004 **	-0.049 **	-0.045 **	-0.048 **	-0.061 **	-0.025	-0.085 **	0.176 **	0.002	-0.643 **	-0.494 **	-0.005 **	-0.005 **
	[-0.022]	[-0.016]	[0]	[0]	[-0.009]	[-0.006]	[-0.009]	[-0.006]	[-0.034]	[-0.024]	[-0.036]	[-0.025]	[-0.047]	[-0.035]	[-0.001]	[0]
household head education	0.246 **	0.058	0.004 **	0	-0.02	-0.079 **	-0.071 **	-0.098 **	-0.447 **	-0.943 **	-0.146	0.275 **	0.257 *	-1.318 **	-0.003 *	-0.021 **
	[-0.055]	[-0.031]	[-0.001]	[-0.001]	[-0.022]	[-0.01]	[-0.022]	[-0.011]	[-0.085]	[-0.046]	[-0.089]	[-0.047]	[-0.116]	[-0.07]	[-0.001]	[-0.001]
household head age	-0.037 **	-0.061 **	-0.001 **	-0.002 **	0.014 **	0.011 **	0.013 **	0.015 **	0.051 **	0.031 **	0.033 **	0.079 **	-0.108 **	-0.187 **	0	-0.001 **
	[-0.005]	[-0.003]	[0]	[0]	[-0.002]	[-0.001]	[-0.002]	[-0.001]	[-0.007]	[-0.005]	[-0.007]	[-0.005]	[-0.01]	[-0.008]	[0]	[0]
household head sex	1.464 **	2.111 **	0.034 **	0.037 **	-0.431 **	-0.456 **	-0.319 **	-0.295 **	-1.096 **	-0.796 **	-2.240 **	-2.748 **	5.151 **	6.195 **	0.018 **	0.028 **
	[-0.166]	[-0.128]	[-0.003]	[-0.002]	[-0.065]	[-0.046]	[-0.065]	[-0.049]	[-0.256]	[-0.197]	[-0.267]	[-0.202]	[-0.349]	[-0.283]	[-0.004]	[-0.003]
household member age 0-2	-2.390 **	-3.572 **	-0.047 **	-0.060 **	-0.409 *	-0.168	-0.466 **	-0.570 **	0.233	-1.674 **	11.750 **	11.891 **	-7.650 **	-6.672 **	0.043 **	0.040 **
	[-0.414]	[-0.349]	[-0.007]	[-0.006]	[-0.162]	[-0.13]	[-0.163]	[-0.139]	[-0.641]	[-0.55]	[-0.669]	[-0.568]	[-0.872]	[-0.773]	[-0.011]	[-0.01]
household member age 3-5	-2.462 **	-3.710 **	-0.033 **	-0.046 **	0.158	0.362 **	-0.388 *	-0.247	0.139	-0.836	7.761 **	7.100 **	-2.377 **	-3.243 **	0.055 **	0.034 **
	[-0.394]	[-0.338]	[-0.007]	[-0.006]	[-0.155]	[-0.126]	[-0.156]	[-0.134]	[-0.61]	[-0.533]	[-0.637]	[-0.551]	[-0.83]	[-0.748]	[-0.011]	[-0.009]
household member age 6-12	-1.236 **	-2.137 **	-0.023 **	-0.031 **	-0.01	0.218 **	-0.630 **	-0.501 **	-0.820 *	-0.4	1.231 **	1.014 **	-5.190 **	-5.448 **	-0.048 **	-0.046 **
	[-0.261]	[-0.226]	[-0.004]	[-0.004]	[-0.103]	[-0.084]	[-0.103]	[-0.09]	[-0.405]	[-0.356]	[-0.422]	[-0.367]	[-0.551]	[-0.499]	[-0.007]	[-0.006]
household member age 13-18	-1.423 **	-1.941 **	-0.033 **	-0.036 **	-0.315 **	-0.078	-0.457 **	-0.437 **	0.66	1.114 **	-1.998 **	-2.371 **	-8.278 **	-7.518 **	-0.096 **	-0.085 **
	[-0.251]	[-0.215]	[-0.004]	[-0.004]	[-0.098]	[-0.08]	[-0.099]	[-0.086]	[-0.389]	[-0.34]	[-0.405]	[-0.351]	[-0.528]	[-0.476]	[-0.007]	[-0.006]
household member age 60 and over	-1.445 **	-1.305 **	0.003	0	-0.119	0.082	0.151	0.482 **	0.3	1.404 **	0.509	-0.069	-2.197 **	-1.504 **	-0.014 *	-0.001
	[-0.258]	[-0.231]	[-0.004]	[-0.004]	[-0.101]	[-0.084]	[-0.102]	[-0.091]	[-0.4]	[-0.361]	[-0.417]	[-0.371]	[-0.544]	[-0.512]	[-0.007]	[-0.006]
marital status of household head	-2.287 **	-3.022 **	-0.064 **	-0.068 **	0.554 **	0.513 **	0.484 **	0.387 **	1.320 **	1.183 **	2.319 **	3.179 **	-5.248 **	-5.960 **	-0.016 **	-0.018 **
	[-0.158]	[-0.124]	[-0.003]	[-0.002]	[-0.062]	[-0.045]	[-0.062]	[-0.048]	[-0.245]	[-0.193]	[-0.255]	[-0.198]	[-0.333]	[-0.276]	[-0.004]	[-0.003]
Wave dummies																
2	[-0.102]	[-0.095]	[-0.002]	[-0.002]	[-0.04]	[-0.037]	[-0.04]	[-0.039]	[-0.158]	[-0.155]	[-0.165]	[-0.161]	[-0.215]	[-0.211]	[-0.003]	[-0.003]
	-0.032	-0.391 **	-0.048 **	-0.049 **	0.493 **	0.510 **	-0.352 **	-0.249 **	1.599 **	1.992 **	-1.209 **	-0.754 **	-0.257	-0.133	0.001	0.011 **
3	[-0.102]	[-0.095]	[-0.002]	[-0.002]	[-0.04]	[-0.037]	[-0.04]	[-0.039]	[-0.158]	[-0.154]	[-0.165]	[-0.16]	[-0.215]	[-0.21]	[-0.003]	[-0.003]
	0.598 **	0.264 **	-0.025 **	-0.030 **	0.172 **	0.165 **	-0.435 **	-0.335 **	0.937 **	1.193 **	-1.471 **	-1.289 **	3.948 **	4.292 **	0.034 **	0.043 **
4	[-0.114]	[-0.1]	[-0.002]	[-0.002]	[-0.045]	[-0.038]	[-0.045]	[-0.041]	[-0.177]	[-0.161]	[-0.185]	[-0.167]	[-0.241]	[-0.222]	[-0.003]	[-0.003]
	0.636 **	0.460 **	-0.022 **	-0.021 **	0.747 **	0.786 **	-0.717 **	-0.577 **	1.105 **	2.146 **	-4.273 **	-3.870 **	3.821 **	4.624 **	0.007 *	0.029 **
5	[-0.122]	[-0.102]	[-0.002]	[-0.002]	[-0.048]	[-0.038]	[-0.048]	[-0.041]	[-0.189]	[-0.162]	[-0.197]	[-0.167]	[-0.258]	[-0.227]	[-0.003]	[-0.003]
	0.340 **	0.301 **	-0.027 **	-0.026 **	0.053	0.131 **	-1.088 **	-0.892 **	0.263	2.042 **	-4.151 **	-4.577 **	1.847 **	3.296 **	-0.020 **	0.008 **
Intercept	[-0.856]	[-0.623]	[-0.014]	[-0.01]	[-0.336]	[-0.216]	[-0.338]	[-0.235]	[-1.327]	[-0.941]	[-1.384]	[-0.963]	[-1.805]	[-1.381]	[-0.023]	[-0.017]
Number of observations	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485	31485
F statistic	82.69		189.74		69.79		129.27		108.56		160.42		136.26		184.17	
R-squared for within model	0.05	0.09	0.11	0.13	0.04	0.05	0.08	0.08	0.07	0.07	0.1	0.09	0.08	0.08	0.11	0.09
R-squared for between model	0.18	0.19	0.24	0.25	0.11	0.11	0.18	0.19	0.3	0.32	0.08	0.1	0.11	0.17	0.19	0.24
R-squared for overall model	0.11	0.11	0.15	0.16	0.07	0.07	0.12	0.12	0.19	0.21	0.07	0.08	0.09	0.12	0.16	0.18
Model test p-value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hausman Test																
chi²		397.05		430.02		70.09		486.76		38.23		5561.16		-1668.51		96.7
Prob > chi²		0		0		0		0		0		0				0
Breusch and Pagan LM																
chibar²		116.05		742.51		178.09		1004.15		550.22		690.57		1742.53		1158.52
Prob > chibar²		0		0		0		0		0		0		0		0
alpha fixed effect hat																
alphafehat		3.285636		0.058294		1.133518		1.316593		5.372359		5.344742		8.400273		0.0982317

Notes: Robust standard errors in square brackets; ** $p < 0.01$, * $p < 0.05$.
Source: Author's calculation

Table A16. Descriptive Statistics (Rural)

Variable		Mean	Std. dev.	Min	Max	Observations
id	overall	4408.735	2483.134	1	8715	N = 34269
	between		2515.948	1	8715	n = 8715
	within		0	4408.735	4408.735	T-bar = 3.93219
t	overall	2.866439	1.37298	1	5	N = 34269
	between		0.6644972	1	5	n = 8715
	within		1.288306	0.5331057	5.199772	T-bar = 3.93219
sstaple	overall	17.01023	11.94733	0	85.77673	N = 34269
	between		8.037977	0	59.67958	n = 8715
	within		9.179152	-25.71278	77.65531	T-bar = 3.93219
svege	overall	6.480525	5.081577	0	84.19488	N = 34269
	between		3.059847	0	33.45339	n = 8715
	within		4.223537	-22.9667	68.99637	T-bar = 3.93219
sdried	overall	3.205479	3.563389	0	87.81411	N = 34269
	between		2.10712	0	27.53427	n = 8715
	within		2.990519	-21.69767	64.57753	T-bar = 3.93219
smeat	overall	5.092171	5.600401	0	72.43396	N = 34269
	between		3.39086	0	29.36352	n = 8715
	within		4.563378	-19.35373	61.52172	T-bar = 3.93219
sfish	overall	4.561283	4.690765	0	48.79947	N = 34269
	between		3.386789	0	46.45153	n = 8715
	within		3.413215	-13.89371	39.98518	T-bar = 3.93219
sdairy	overall	2.682186	3.556864	0	63.51079	N = 34269
	between		2.515586	0	60.2477	n = 8715
	within		2.857805	-16.69189	50.68733	T-bar = 3.93219
sbeve	overall	1.925717	2.1601	0	39.51368	N = 34269
	between		1.379879	0	22.38774	n = 8715
	within		1.754513	-8.92628	32.38666	T-bar = 3.93219
sspices	overall	3.932158	2.957003	0	80.86854	N = 34269
	between		1.829035	0	22.80588	n = 8715
	within		2.406248	-16.62964	61.99482	T-bar = 3.93219
saltb	overall	5.696122	6.636802	0	84.12664	N = 34269
	between		4.655	0	44.6921	n = 8715
	within		5.038663	-21.59603	62.21608	T-bar = 3.93219
ssalt	overall	0.414249	0.7743077	0	39.73915	N = 34269
	between		0.4060011	0	11.48391	n = 8715
	within		0.6506545	-11.06967	28.74022	T-bar = 3.93219
ssnack	overall	3.158161	5.774658	0	96.18496	N = 34269
	between		3.855527	0	72.37636	n = 8715
	within		4.74974	-42.99756	69.29489	T-bar = 3.93219
soil	overall	2.571138	2.347117	0	74.05657	N = 34269
	between		1.350636	0	25.64201	n = 8715
	within		1.963006	-23.07088	60.44111	T-bar = 3.93219
ssugar	overall	2.880464	2.604605	0	37.39662	N = 34269
	between		1.662098	0	18.73567	n = 8715
	within		2.080091	-6.575062	30.16319	T-bar = 3.93219
sfdout	overall	1.180498	3.947222	0	83.98223	N = 34269
	between		2.747838	0	71.22926	n = 8715
	within		3.303058	-30.01845	68.36628	T-bar = 3.93219

xempted	overall	17.42448	12.0484	0	85.9272	N = 34269
	between		8.146904	0	59.83526	n = 8715
	within		9.221516	-25.463	78.06742	T-bar = 3.93219
xemp~09	overall	14.25488	8.910681	0	86.22571	N = 34269
	between		5.766923	0	67.85242	n = 8715
	within		7.125564	-16.91386	74.20867	T-bar = 3.93219
svat	overall	28.86297	11.95294	0	97.15958	N = 34269
	between		7.973796	1.49985	84.96336	n = 8715
	within		9.489094	-14.51511	83.45886	T-bar = 3.93219
lnpce	overall	10.91696	0.7590463	7.972182	16.22178	N = 34269
	between		0.5500863	8.956854	14.74829	n = 8715
	within		0.5727035	8.052038	14.98568	T-bar = 3.93219
hhsize	overall	5.034142	2.314181	1	39	N = 34269
	between		1.789631	1	17.8	n = 8715
	within		1.596139	-8.965858	29.43414	T-bar = 3.93219
headeduc	overall	2.298316	1.048705	1	6	N = 34269
	between		0.9857653	1	6	n = 8715
	within		0.5661158	-1.501684	6.298316	T-bar = 3.93219
headage	overall	46.23934	13.51432	10	105	N = 34269
	between		10.66909	14	88.33333	n = 8715
	within		8.783384	-7.510658	98.98934	T-bar = 3.93219
headsex	overall	0.8619452	0.3449625	0	1	N = 34269
	between		0.2713021	0	1	n = 8715
	within		0.227284	0.0619452	1.661945	T-bar = 3.93219
age2	overall	0.0531572	0.0977911	0	0.6666667	N = 34269
	between		0.0618949	0	0.5	n = 8715
	within		0.0825003	-0.2357317	0.5579191	T-bar = 3.93219
age35	overall	0.057609	0.1026068	0	0.6666667	N = 34269
	between		0.0608384	0	0.5	n = 8715
	within		0.087485	-0.2201688	0.5909424	T-bar = 3.93219
age612	overall	0.1510063	0.1612329	0	0.75	N = 34269
	between		0.0976711	0	0.75	n = 8715
	within		0.1350218	-0.2712159	0.7135063	T-bar = 3.93219
age1318	overall	0.1245194	0.1548165	0	1	N = 34269
	between		0.0923168	0	1	n = 8715
	within		0.1323687	-0.3754806	0.9245194	T-bar = 3.93219
age60	overall	0.088662	0.1891892	0	1	N = 34269
	between		0.1400096	0	1	n = 8715
	within		0.1274791	-0.711338	0.888662	T-bar = 3.93219
marital	overall	0.8678106	0.3387016	0	1	N = 34269
	between		0.2613072	0	1	n = 8715
	within		0.2269403	0.0678106	1.667811	T-bar = 3.93219

Notes: sstaple = share of staple consumption (as a percentage of total expenditure)
Source: Author's calculation

Table A17. Fixed vs Random Effect Panel Regression (Rural) [part 1]

Explanatory Variables	staple		salt		vegetables		dried		meat		fish		dairy		beverages		spices		alcohol tobacco	
	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	-4.232 **	-5.685 **	-0.156 **	-0.193 **	0.077	-0.125 **	0.429 **	0.393 **	1.049 **	1.095 **	-0.664 **	-0.548 **	0.399 **	0.674 **	-0.149 **	-0.066 **	-0.564 **	-0.663 **	-0.247 **	-0.220 **
	[-0.125]	[-0.1]	[-0.008]	[-0.007]	[-0.063]	[-0.046]	[-0.042]	[-0.031]	[-0.066]	[-0.051]	[-0.046]	[-0.042]	[-0.04]	[-0.033]	[-0.024]	[-0.02]	[-0.036]	[-0.027]	[-0.069]	[-0.059]
household size	-0.103 *	-0.038	-0.023 **	-0.024 **	0.017	-0.040 **	0.035 *	-0.004	0.076 **	0.004	-0.052 **	0.052 **	0.023	0.015	-0.034 **	-0.022 **	-0.072 **	-0.095 **	0.082 **	0.116 **
	[-0.048]	[-0.032]	[-0.003]	[-0.002]	[-0.024]	[-0.015]	[-0.016]	[-0.01]	[-0.025]	[-0.016]	[-0.018]	[-0.014]	[-0.015]	[-0.01]	[-0.009]	[-0.006]	[-0.014]	[-0.009]	[-0.026]	[-0.019]
household head education	0.085	-1.099 **	-0.013	-0.047 **	-0.096	-0.047	-0.077	0.011	-0.046	0.086 *	0.005	-0.001	-0.04	0.338 **	-0.007	-0.054 **	-0.024	-0.186 **	-0.161 *	-0.483 **
	[-0.123]	[-0.067]	[-0.008]	[-0.004]	[-0.062]	[-0.031]	[-0.041]	[-0.021]	[-0.065]	[-0.034]	[-0.045]	[-0.031]	[-0.039]	[-0.023]	[-0.024]	[-0.014]	[-0.035]	[-0.018]	[-0.068]	[-0.042]
household head age	0.062 **	0.030 **	0	0	-0.013 **	0.003	-0.015 **	-0.010 **	0.019 **	0.033 **	0.008 **	0.001	0	0.012 **	0.004 *	0.003 *	0.005 *	0.003 *	-0.022 **	-0.040 **
	[-0.008]	[-0.006]	[0]	[0]	[-0.004]	[-0.003]	[-0.003]	[-0.002]	[-0.004]	[-0.003]	[-0.003]	[-0.003]	[-0.002]	[-0.002]	[-0.002]	[-0.001]	[-0.002]	[-0.002]	[-0.004]	[-0.004]
household head sex	-1.014 **	-0.37	-0.050 *	0.018	-0.812 **	-0.472 **	-0.371 **	-0.434 **	-0.191	-0.626 **	-0.187	0.047	-0.084	-0.319 **	0.038	0.106 *	-0.328 **	-0.385 **	3.582 **	3.903 **
	[-0.309]	[-0.252]	[-0.02]	[-0.017]	[-0.155]	[-0.117]	[-0.103]	[-0.079]	[-0.164]	[-0.128]	[-0.114]	[-0.106]	[-0.099]	[-0.082]	[-0.061]	[-0.05]	[-0.089]	[-0.067]	[-0.171]	[-0.149]
household member age 0-2	-0.59	-0.957	-0.194 **	-0.079	0.062	0.103	1.717 **	1.313 **	0.966 *	0.188	-0.601 *	-0.466	5.547 **	5.313 **	-0.747 **	-0.548 **	-0.884 **	-0.564 **	-2.049 **	-1.536 **
	[-0.79]	[-0.691]	[-0.05]	[-0.048]	[-0.397]	[-0.323]	[-0.264]	[-0.218]	[-0.418]	[-0.352]	[-0.291]	[-0.28]	[-0.252]	[-0.22]	[-0.155]	[-0.137]	[-0.227]	[-0.185]	[-0.437]	[-0.398]
household member age 3-5	0.102	-0.343	-0.088	-0.068	0.593	1.020 **	2.709 **	2.275 **	1.535 **	0.683 *	0.157	0.826 **	2.912 **	2.457 **	-0.301 *	-0.189	-0.388	-0.217	-2.882 **	-2.022 **
	[-0.729]	[-0.644]	[-0.046]	[-0.045]	[-0.366]	[-0.3]	[-0.243]	[-0.203]	[-0.386]	[-0.328]	[-0.269]	[-0.261]	[-0.233]	[-0.205]	[-0.143]	[-0.128]	[-0.21]	[-0.172]	[-0.403]	[-0.371]
household member age 6-12	0.319	1.084 *	-0.158 **	-0.041	-0.41	-0.456 *	1.291 **	1.110 **	0.461	0.37	-0.277	0.055	0.469 **	0.139	-0.508 **	-0.403 **	-0.878 **	-0.503 **	-4.341 **	-3.987 **
	[-0.5]	[-0.429]	[-0.032]	[-0.03]	[-0.251]	[-0.2]	[-0.167]	[-0.135]	[-0.265]	[-0.218]	[-0.184]	[-0.175]	[-0.16]	[-0.137]	[-0.098]	[-0.085]	[-0.144]	[-0.115]	[-0.277]	[-0.248]
household member age 13-18	0.701	0.937 *	-0.061 *	-0.043	-1.037 **	-0.772 **	0.795 **	0.320 *	-0.057	-0.625 **	-0.882 **	-0.915 **	-0.495 **	-0.903 **	-0.520 **	-0.529 **	-0.989 **	-0.681 **	-3.959 **	-3.958 **
	[-0.495]	[-0.438]	[-0.031]	[-0.031]	[-0.248]	[-0.205]	[-0.165]	[-0.138]	[-0.262]	[-0.223]	[-0.182]	[-0.176]	[-0.158]	[-0.139]	[-0.097]	[-0.087]	[-0.142]	[-0.117]	[-0.273]	[-0.251]
household member age 60 and over	0.608	0.57	0.093 **	0.144 **	0.654 **	0.265	0.522 **	0.398 **	-0.245	-0.16	-0.319 *	-0.488 **	-0.12	-0.073	-0.069	-0.042	0.194	-0.084	-1.257 **	-1.786 **
	[-0.441]	[-0.408]	[-0.028]	[-0.028]	[-0.221]	[-0.19]	[-0.147]	[-0.128]	[-0.233]	[-0.208]	[-0.162]	[-0.169]	[-0.141]	[-0.132]	[-0.087]	[-0.082]	[-0.127]	[-0.109]	[-0.244]	[-0.239]
marital status of household head	0.667 *	0.366	0.035	0.017	0.766 **	0.573 **	0.329 **	0.164 *	0.653 **	1.034 **	0.495 **	0.084	0.255 *	0.293 **	0.263 **	0.023	0.415 **	0.435 **	-0.907 **	-1.324 **
	[-0.312]	[-0.259]	[-0.02]	[-0.018]	[-0.157]	[-0.12]	[-0.104]	[-0.081]	[-0.165]	[-0.132]	[-0.115]	[-0.108]	[-0.1]	[-0.084]	[-0.061]	[-0.052]	[-0.09]	[-0.069]	[-0.172]	[-0.153]
Wave dummies																				
2	[-0.173]	[-0.174]	[-0.011]	[-0.013]	[-0.087]	[-0.082]	[-0.058]	[-0.055]	[-0.092]	[-0.089]	[-0.064]	[-0.067]	[-0.055]	[-0.054]	[-0.034]	[-0.034]	[-0.05]	[-0.047]	[-0.096]	[-0.096]
	0.991 **	1.604 **	-0.013	0.039 **	-0.560 **	-0.127	1.968 **	1.977 **	0.983 **	0.759 **	0.702 **	0.655 **	0.373 **	0.185 **	0.374 **	0.375 **	0.616 **	0.808 **	0.365 **	0.564 **
3	[-0.177]	[-0.176]	[-0.011]	[-0.013]	[-0.089]	[-0.083]	[-0.059]	[-0.056]	[-0.094]	[-0.09]	[-0.065]	[-0.068]	[-0.057]	[-0.055]	[-0.035]	[-0.035]	[-0.051]	[-0.047]	[-0.098]	[-0.097]
	-0.815 **	0.229	0.083 **	0.121 **	-0.002	0.084	2.460 **	2.386 **	1.125 **	1.014 **	0.880 **	0.858 **	0.789 **	0.482 **	0.245 **	0.292 **	1.038 **	1.036 **	1.736 **	2.102 **
4	[-0.218]	[-0.202]	[-0.014]	[-0.014]	[-0.109]	[-0.095]	[-0.073]	[-0.064]	[-0.115]	[-0.103]	[-0.08]	[-0.08]	[-0.07]	[-0.064]	[-0.043]	[-0.04]	[-0.063]	[-0.054]	[-0.12]	[-0.114]
	-0.087	1.256 **	-0.074 **	-0.008	-1.635 **	-1.287 **	2.992 **	2.841 **	0.480 **	0.039	0.240 **	0.243 **	0.775 **	0.307 **	0.194 **	0.146 **	0.888 **	1.119 **	1.194 **	1.553 **
5	[-0.237]	[-0.216]	[-0.015]	[-0.015]	[-0.119]	[-0.101]	[-0.079]	[-0.068]	[-0.126]	[-0.11]	[-0.087]	[-0.086]	[-0.076]	[-0.068]	[-0.047]	[-0.043]	[-0.068]	[-0.058]	[-0.131]	[-0.123]
	-2.212 **	0.716 **	-0.070 **	0.033 *	-2.007 **	-1.695 **	1.752 **	1.594 **	-0.241	-0.795 **	0.02	0.108	0.758 **	0.106	0.395 **	0.362 **	0.837 **	1.206 **	1.997 **	2.396 **
Intercept	[-1.504]	[-1.157]	[-0.095]	[-0.079]	[-0.755]	[-0.536]	[-0.502]	[-0.363]	[-0.796]	[-0.587]	[-0.554]	[-0.492]	[-0.48]	[-0.377]	[-0.295]	[-0.232]	[-0.433]	[-0.309]	[-0.831]	[-0.691]
Number of observations	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269
F statistic	184.97		78.69		58.3		234.85		43.53		48.07		83.31		18.27		45.94		106.88	
R-squared for within model	0.1	0.09	0.04	0.03	0.03	0.03	0.12	0.12	0.02	0.02	0.03	0.02	0.05	0.04	0.01	0.01	0.03	0.03	0.06	0.06
R-squared for between model	0.29	0.33	0.09	0.11	0.02	0.03	0.04	0.05	0.03	0.05	0	0.01	0.05	0.12	0.01	0.01	0.06	0.08	0.06	0.07
R-squared for overall model	0.16	0.18	0.05	0.05	0.02	0.02	0.09	0.09	0.03	0.03	0.01	0.01	0.05	0.07	0.01	0.01	0.04	0.04	0.06	0.06
Model test p-value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hausman Test																				
chi²		113.75		301.53		441.34		376.25		-3008.52		907.72		425.56		-100.06		406.2		260.94
Prob > chi²		0		0		0		0				0		0				0		0
Breusch and Pagan LM																				
chibar²		900.8		0		315.67		321.97		690.86		4792.04		252.88		699.33		697.74		2666.95
Prob > chibar²		0		0		0		0		0		0		0		0		0		0
alpha fixed effect hat																				
alphafehat		6.697678		0.4030752		2.806821		1.906068		3.176999		3.24002		2.069264		1.257235		1.672286		4.201424

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05.
Source: Author's calculation

Table A18. Fixed vs Random Effect Panel Regression (Rural) [part 2]

Explanatory Variables	fsnack		foodout		snack		oil		sugar		exempted		exempted09		vat		food	
	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE
logarithm of percapita exp	0.658 **	0.829 **	0.723 **	0.722 **	0.014 **	0.015 **	-0.517 **	-0.525 **	-0.394 **	-0.552 **	-4.389 **	-5.858 **	1.525 **	1.635 **	-1.066 **	-0.819 **	-0.039 **	-0.049 **
	[-0.069]	[-0.052]	[-0.047]	[-0.037]	[-0.001]	[-0.001]	[-0.028]	[-0.021]	[-0.03]	[-0.023]	[-0.125]	[-0.101]	[-0.103]	[-0.081]	[-0.134]	[-0.109]	[-0.002]	[-0.001]
household size	-0.101 **	-0.111 **	-0.021	-0.055 **	-0.001 **	-0.002 **	-0.071 **	-0.081 **	-0.039 **	-0.061 **	-0.125 **	-0.062	0.116 **	-0.013	-0.297 **	-0.223 **	-0.003 **	-0.003 **
	[-0.026]	[-0.017]	[-0.018]	[-0.012]	[0]	[0]	[-0.011]	[-0.007]	[-0.011]	[-0.007]	[-0.048]	[-0.032]	[-0.04]	[-0.026]	[-0.052]	[-0.035]	[-0.001]	[0]
household head education	0.055	-0.027	-0.015	0.060 *	0	0	-0.011	-0.054 **	-0.065 *	-0.072 **	0.071	-1.144 **	-0.182	0.388 **	-0.245	-0.774 **	-0.004 *	-0.016 **
	[-0.068]	[-0.036]	[-0.046]	[-0.025]	[-0.001]	[0]	[-0.028]	[-0.014]	[-0.029]	[-0.016]	[-0.123]	[-0.068]	[-0.102]	[-0.055]	[-0.133]	[-0.076]	[-0.002]	[-0.001]
household head age	-0.033 **	-0.037 **	-0.023 **	-0.021 **	-0.001 **	-0.001 **	0	0.002	0.012 **	0.017 **	0.062 **	0.030 **	0.006	0.047 **	-0.065 **	-0.085 **	0	0
	[-0.004]	[-0.003]	[-0.003]	[-0.002]	[0]	[0]	[-0.002]	[-0.001]	[-0.002]	[-0.001]	[-0.008]	[-0.006]	[-0.006]	[-0.005]	[-0.008]	[-0.007]	[0]	[0]
household head sex	0.737 **	0.659 **	0.771 **	0.774 **	0.015 **	0.014 **	-0.366 **	-0.316 **	-0.270 **	-0.192 **	-1.064 **	-0.364	-1.087 **	-1.432 **	3.574 **	4.237 **	0.014 **	0.025 **
	[-0.171]	[-0.132]	[-0.116]	[-0.093]	[-0.002]	[-0.002]	[-0.069]	[-0.053]	[-0.074]	[-0.059]	[-0.31]	[-0.253]	[-0.257]	[-0.204]	[-0.333]	[-0.274]	[-0.004]	[-0.004]
household member age 0-2	1.899 **	1.656 **	-0.014	-0.058	0.019 **	0.016 **	-0.696 **	-0.521 **	-1.214 **	-1.056 **	-0.784	-1.041	6.575 **	5.558 **	-2.836 **	-2.074 **	0.030 **	0.027 **
	[-0.437]	[-0.356]	[-0.297]	[-0.252]	[-0.005]	[-0.004]	[-0.177]	[-0.147]	[-0.189]	[-0.159]	[-0.791]	[-0.693]	[-0.656]	[-0.556]	[-0.851]	[-0.739]	[-0.011]	[-0.01]
household member age 3-5	3.533 **	3.127 **	-0.445	0.119	0.031 **	0.032 **	-0.491 **	-0.332 *	-0.644 **	-0.358 *	0.014	-0.413	5.040 **	4.069 **	1.535	3.519 **	0.066 **	0.074 **
	[-0.403]	[-0.331]	[-0.274]	[-0.234]	[-0.005]	[-0.004]	[-0.163]	[-0.137]	[-0.174]	[-0.148]	[-0.73]	[-0.646]	[-0.606]	[-0.517]	[-0.786]	[-0.688]	[-0.01]	[-0.009]
household member age 6-12	1.173 **	0.931 **	-0.103	-0.199	0.011 **	0.007 **	-0.372 **	-0.187 *	-0.996 **	-0.673 **	0.16	1.035 *	0.52	-0.002	-5.013 **	-3.690 **	-0.043 **	-0.025 **
	[-0.277]	[-0.221]	[-0.188]	[-0.156]	[-0.003]	[-0.003]	[-0.112]	[-0.091]	[-0.119]	[-0.099]	[-0.501]	[-0.43]	[-0.415]	[-0.345]	[-0.539]	[-0.46]	[-0.007]	[-0.006]
household member age 13-18	0.454	0.859 **	0.146	0.164	0.006	0.010 **	-0.602 **	-0.421 **	-0.768 **	-0.855 **	0.64	0.885 *	-1.590 **	-2.318 **	-6.309 **	-5.940 **	-0.073 **	-0.072 **
	[-0.273]	[-0.225]	[-0.186]	[-0.159]	[-0.003]	[-0.003]	[-0.111]	[-0.093]	[-0.118]	[-0.101]	[-0.495]	[-0.439]	[-0.411]	[-0.352]	[-0.533]	[-0.467]	[-0.007]	[-0.006]
household member age 60 and over	1.392 **	1.540 **	-0.442 **	-0.152	0.009 **	0.014 **	0.429 **	0.143	0.229 *	0.361 **	0.7	0.704	0.289	0.027	0.93	0.02	0.019 **	0.007
	[-0.244]	[-0.212]	[-0.166]	[-0.15]	[-0.003]	[-0.003]	[-0.099]	[-0.086]	[-0.105]	[-0.095]	[-0.441]	[-0.41]	[-0.366]	[-0.33]	[-0.475]	[-0.441]	[-0.006]	[-0.006]
marital status of household head	-2.290 **	-2.032 **	-0.934 **	-1.253 **	-0.032 **	-0.033 **	0.310 **	0.311 **	0.350 **	0.326 **	0.701 *	0.395	1.674 **	1.874 **	-1.919 **	-3.446 **	0.005	-0.012 **
	[-0.172]	[-0.135]	[-0.117]	[-0.095]	[-0.002]	[-0.002]	[-0.07]	[-0.054]	[-0.074]	[-0.06]	[-0.312]	[-0.26]	[-0.259]	[-0.21]	[-0.336]	[-0.281]	[-0.004]	[-0.004]
Wave dummies																		
2	[-0.096]	[-0.087]	[-0.065]	[-0.062]	[-0.001]	[-0.001]	[-0.039]	[-0.038]	[-0.041]	[-0.04]	[-0.174]	[-0.174]	[-0.144]	[-0.138]	[-0.187]	[-0.181]	[-0.002]	[-0.002]
	-3.794 **	-3.946 **	-0.796 **	-0.770 **	-0.046 **	-0.047 **	0.727 **	0.697 **	-0.190 **	-0.127 **	0.978 **	1.636 **	0.796 **	0.825 **	1.336 **	1.484 **	0.031 **	0.039 **
3	[-0.098]	[-0.088]	[-0.067]	[-0.063]	[-0.001]	[-0.001]	[-0.04]	[-0.038]	[-0.042]	[-0.04]	[-0.177]	[-0.176]	[-0.147]	[-0.14]	[-0.191]	[-0.184]	[-0.003]	[-0.002]
	-2.925 **	-3.265 **	-0.338 **	-0.226 **	-0.033 **	-0.035 **	0.292 **	0.286 **	-0.262 **	-0.160 **	-0.732 **	0.342	1.913 **	1.581 **	4.505 **	4.574 **	0.057 **	0.064 **
4	[-0.12]	[-0.103]	[-0.082]	[-0.073]	[-0.001]	[-0.001]	[-0.049]	[-0.044]	[-0.052]	[-0.046]	[-0.218]	[-0.203]	[-0.181]	[-0.162]	[-0.235]	[-0.214]	[-0.003]	[-0.003]
	-3.076 **	-3.023 **	-0.569 **	-0.368 **	-0.036 **	-0.034 **	1.212 **	1.289 **	-0.730 **	-0.549 **	-0.161	1.229 **	-0.380 *	-0.939 **	3.812 **	4.546 **	0.033 **	0.048 **
5	[-0.131]	[-0.11]	[-0.089]	[-0.078]	[-0.002]	[-0.001]	[-0.053]	[-0.046]	[-0.057]	[-0.049]	[-0.238]	[-0.216]	[-0.197]	[-0.173]	[-0.256]	[-0.229]	[-0.003]	[-0.003]
	-3.101 **	-3.392 **	-0.433 **	-0.491 **	-0.035 **	-0.039 **	0.246 **	0.328 **	-1.176 **	-0.924 **	-2.282 **	0.718 **	-1.490 **	-2.351 **	2.089 **	2.618 **	-0.017 **	0.009 **
Intercept	[-0.831]	[-0.608]	[-0.565]	[-0.427]	[-0.01]	[-0.008]	[-0.337]	[-0.24]	[-0.359]	[-0.269]	[-1.506]	[-1.162]	[-1.248]	[-0.94]	[-1.62]	[-1.264]	[-0.021]	[-0.016]
Number of observations	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269	34269
F statistic	157.14		43.6		161.14		91.02		115.79		196.14		58.62		80.41		154.82	
R-squared for within model	0.08	0.1	0.02	0.03	0.09	0.1	0.05	0.05	0.06	0.07	0.1	0.1	0.03	0.03	0.05	0.05	0.08	0.08
R-squared for between model	0.04	0.04	0.08	0.09	0.09	0.09	0.07	0.07	0.08	0.09	0.3	0.34	0.05	0.07	0.04	0.06	0.12	0.15
R-squared for overall model	0.08	0.08	0.03	0.04	0.09	0.09	0.05	0.05	0.07	0.07	0.17	0.19	0.03	0.04	0.04	0.05	0.09	0.1
Model test p-value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hausman Test																		
chi²		205.91		399.78		252.51		97.45		739.07		136.77		906.64		248.87		-147.37
Prob > chi²		0		0		0		0		0		0		0		0		
Breusch and Pagan LM																		
chibar²		337.58		10.31		318.39		369.42		1227.4		953.62		829.79		1312.96		866.88
Prob > chibar²		0		0		0		0		0		0		0		0		0
alpha fixed effect hat																		
alphafehat		3.216737		2.10342		0.039856		1.250379		1.509314		6.760387		5.223722		7.185938		0.0902169

Notes: Robust standard errors in square brackets; ** p < 0.01, * p < 0.05.
Source: Author's calculation

INTERVIEWER: ______________ └─┴─┴─┘ **CONFIDENTIAL** HHID : └─┴─┴─┘ └─┴─┘ └─┴─┘ └─┴─┘

INDONESIA FAMILY LIFE SURVEY 2014

BOOK K

(CONTROL BOOK)

SECTIONS: SC, AR, KRK, IK, CP

Respondent is a HH Member 18 Years or Older who is Knowledgeable About Characteristics of Household Members

RESVIS.	HOUSEHOLD INTERVIEWED ?	1. Yes 3. No→ C1

BK_COV BOOK K - 1 IFLS5

INTERVIEWER : └─┴─┴─┘ **HHID :** └─┴─┴─┘ └─┴─┘ └─┴─┘ └─┴─┘ **PID** └─┴─┘

Informed Consent (to be read to each individual the first time the individual is interviewed):

Good morning/afternoon/evening,

My name is _____________ and my colleague here is ______________. We are both from SurveyMeter, an independent research organization based in Yogyakarta. We are currently conducting the fieldwork for Sakerti 5, a survey project conducted with collaboration with RAND Corporation. We will start by reading the informed consent form and ask whether you would be willing to participate in the survey. You can ask about anything that is not clear at any time. Please do discuss with your family members before deciding to participate in the survey.

The IFLS is a longitudinal survey that was first fielded in 1993, and again in 1997, 2000, and 2007. You may remember that we visited your households to interview you or your household members in 2007 or in an earlier round. Your household was interviewed since it was one of the households or part of the households that were randomly chosen to participate since the beginning of the survey in 1993. This year, we will visit the same households again to conduct the interview and to see whether there have been some changes since the last time we visited you.

If you choose to participate in the study, our interviewer will first ask you about your basic demographics, family information, health status, health care and insurance, work, retirement and pensions, household and individual income, expenditure, and assets, etc. Then the interviewer will give you a physical examination to better understand your true health conditions. The measurements include height, weight, waist circumference, blood pressure, peak meter flow lung capacity, grip strength, balance, timed walk, and timed sit to stand. We will also do a finger prick to measure your blood hemoglobin level [and to collect blood spot on a filter paper which we will store and use in the lab for analysis of C-reactive Protein that can be used to measure inflammation and the risk to cardiovascular diseases and HbA1c that can be used to measure risk of diabetes].

This survey will take some time to complete, but we will be doing it at your convenience. If you need to take a break or run some errands, please let us know so we can stop the interview and continue later in the day or the next day.

Generally, the study will pose no health risk. The blood drawing procedure will not transmit diseases to you, because the syringe and needle are new and disinfected. The small amount of blood drawn has no harm to your health. There maybe discomfort or very mild pain, we will help you deal with it.

If you agree to participate in the survey, the physical examination and test results related to your health will be feed back to you directly. And the information you provided can be used to help make health, retirement and social security policies suitable for Indonesia, which will benefit you and other people just like you.

The interview is completely voluntary and all survey information will be kept confidential. With your consent, we also will take picture of you and the front of your house solely for the purpose of confirming your identity and your address in the follow up survey. The photos and all your personal records including, questionnaires, and physical examination and test results are confidential; we will not tell others, include your family, friends, local hospitals, etc. Your personal information, including name, address, phone number, and other information which can be used to identify you will not be disclosed. You are identified by a number in the questionnaires and test records, which will be stored safely in IFLS5 project office. You may withdraw from the study any time, which will not impact any of your benefits. The researcher will keep your information confidentially until it is destroyed, and your information will not be used or disclosed during this period.

If you agree to participate in this study, all the interviews, physical examination, tests and counseling are provided to you for free. You do not need to pay anything.

If you agree to participate in this study, you will get Rp _________________ as a token gift of appreciation for the time you spend with us.

If you have any questions about this study, you may contact Bondan Sikoki at SurveyMETER at email address: sm@surveymeter.org atau telpon 62-274-4477464 dan fax: 62-274-4477004

Interviewer's Statement

"*I have informed the respondent about the background, goals, procedure, risks and benefits of the survey, given him/her enough time to read the informed consent and discuss with others, and answered all questions related to the survey; I have informed the respondent that he/she can contact the SurveyMETER, when having problems about the surveand provided the accurate contact information. I have informed the respondent that he/she can withdraw from the survey anytime. I have informed the potential respondent that he/she can get a copy of this informed consent with signatures of mine.*"

□ Signed by interviewer. Interviewer name: _______________ day/month/year

Respondent's statement:

"*I have been read the informed consent and I agree to participate in*": □ **questionnaire survey**

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Figure A1. Ethical document for Indonesia Family Life Survey 2014.
Source: IFLS 2014

Chapter 4 VAT on Food Items in Indonesia: Efficiency and Equity

Abstract

This paper investigates the cost-benefit of VAT policies in Indonesia regarding the application of a new tax rate on food items and the proposed policy of taxing the food items that are currently exempt. In analysing the impact of these policies, the analysis first estimates Indonesian households' consumption patterns and how households respond to the changes in price by using a cross-section study on the Household Survey (SUSENAS) from 2019 – 2021. These are three years of surveys before the increase of the VAT rate from 10% to 11%, which was applied on April 1, 2022. The estimation is conducted by utilising Deaton's demand model (Deaton, 1987, 1997). The analysis estimates the costs and benefits of the implementation of these policies on each food item, considering the efficiency and equity aspects by utilising price elasticities. The results show significant cross-price elasticities between rice, tubers, other food categories, and the rest of the food commodities. To achieve the most equitable system, I conclude that almost all food items should be exempt from VAT except for fresh shrimp and milk because almost all food items make up a greater share of the expenditure of poorer households. And the result applies to both VAT policies observed. In considering the 1% increase in VAT, from an efficiency point of view, chicken eggs, salt, fresh chicken, and tofu tempeh are potential candidates for taxation. By considering both equity and efficiency points of view, it is only beneficial to tax the fresh chicken. In the analysis of the imposition of VAT on all food items, only tuber, fresh chicken, and chicken eggs are the potential items to be taxed from both an equity and efficiency point of view.

1. Introduction

In 2021, the Indonesian government needed to increase its revenue due to the impact of Covid-19. In 2020, the government must spend its resources to overcome the emergency situation and lose potential fiscal revenue due to the slowing down of businesses and economic activities due to the pandemic. It increased the VAT rate from 10% to 11% on 1 April 2022 (Harmonization of Tax Regulations, 2021), and subsequently, in the future, it plans to tax all food commodities, some of which are currently exempt from VAT. The Indonesian VAT Act (VAT Act, 2009) itself defines two criteria for food product exemption: the commodity must be a necessity and widely consumed. The criteria can be analysed by utilising the price and income elasticities of each commodity, which indicate how individuals or households react to changes in price due to the new VAT policies. By knowing the patterns, the cost-benefit of the new VAT policies can be assessed. Therefore, the objective of the paper is to analyse the cost and benefit of the policies by using household surveys (SUSENAS) OF 2019 – 2021 and following a stripped-down model of demand developed by Deaton. The two aspects of efficiency in tax collection and equity in the distributional impact of the new policies are considered and measured by using price and income elasticities.

The paper answers the following questions:

1. How do households in rural areas, urban areas, and Indonesia as a whole spend their budget on food items?
2. To achieve the most efficient and equitable VAT system, which food products should be included in the list of VAT-exempt products?
3. How does the increase of the VAT rate and the imposition of the VAT on all food items affect the efficiency and equity aspects of the system?

By answering these questions, the paper contributes to the scarce literature on Indonesian VAT and proposes how to formulate a VAT regulation that can provide an up-to-date framework in the discussion. Studies of Indonesian taxation are mostly conducted on income tax and tax administration, with VAT regulations mostly formulated based on benchmarks of VAT design from other countries, which do not reflect the uniqueness of Indonesian society.

This research finds that when the price of a commodity is increased due to a new tax rate, it affects the demand for other food commodities significantly. Rice, tubers, and items in the 'other' categories present significant impacts across the groups. For both policies discussed, the increase of VAT rate and the imposition of VAT on all food, from an equity point of view, almost all food items are proposed to be taxed except fresh shrimp and milk. Combined with the efficiency point of view, the analysis of the increase in the rate of VAT leads to the proposal that fresh chicken be taxed, while analysis of the imposition of VAT on all food products leads us to propose that tuber, fresh chicken, and chicken eggs are candidates to be taxed.

The paper proceeds as follows: section two discusses the study of demand and elasticity estimations that have been done in Indonesia, the methodology chosen in the paper, and the steps to analyse the household survey data. Section three presents the data and the result of estimations: quality elasticity, price elasticity, income elasticity, and the cost and benefit of implementing several scenarios of tax policies by considering equity and efficiency factors. The last section presents the conclusion for this analysis.

2. Literature Review

2.1. Literature Review on Demand System

Budiono (Boediono, 1978) estimated a complete elasticity matrix for food and nonfood consumption in Indonesia by utilising the Frisch Method, which is one of the Linear Expenditure System (LES) variants that assumes a direct additive utility function in the estimation. By using household surveys, Susenas, in 1969/70 and in 1976, Boediono could obtain the elasticity of income and prices of Indonesian households' consumption.

In 1987, Teklu and Johnson (Teklu & Johnson, 1987) estimated the elasticity by using the Almost Ideal Demand System (AIDS) and Multinomial Linear Logit Model (MLLM), comparing the results with other countries in Asia: Thailand, India, and Bangladesh. Their analysis recommends that food policy focuses more on rice policy since it would have a big impact on helping low-income households.

A 2016 study (Widarjono & Rucbha, 2016), using the household survey of 2011, compares elasticities based on income groups and on geographical location, especially in urban areas in Java and urban areas in islands outside Java. The analysis uses a Quadratic Almost Ideal Demand System (QUAIDS), which is the successor of AIDS, by applying a two-stage budgeting approach and applying a weak-separability assumption. The paper finds that higher-income households became less elastic to price changes. Urban households in Java are more responsive to price changes than those outside Java. QUAIDS is the most prominent method utilised by the authors recently regarding the demand and elasticities of food items in Indonesia. Other papers have been published on Indonesian elasticities of food demand using other methodologies such as LA-AIDS (Linear Approximate-AIDS) (Jensen & Manrique, 1998; Moeis, 2003), which compares different income groups of households and observes the impact of the economic crisis in 1997 and the LinQuad or incomplete demand system (Fabiosa et al., 2005) which has been used to identify the consumption patterns of food items.

Deaton has been applying an approach to adapt to the situation in developing countries such as Cote d'Ivoire, Indonesia, Pakistan, and India (Deaton, 1987, 1990; Deaton et al., 1994; Deaton & Grimard, 1992) in which no comprehensive price data is available for all areas. The method is very useful in dealing with the inexistence of market prices in small areas, especially rural areas, to estimate the parameters of demand. It utilises estimated price variation across areas extensively, which is more significant in Indonesia than the variation across time in observing changes in consumption patterns due to price reform. Furthermore, the method enables an analysis of the inexistence of quantity information (hence unit value, which will be discussed further below) of nonfood items to obtain the whole story of household consumption[1].

In relation to tax reform, Deaton has analysed the impact of tax reform on prices in developing countries such as India and Pakistan by using his flexible approach from the point of view of efficiency and equity (Deaton, 1997; Deaton et al., 1994; Deaton & Grimard, 1992).

Deaton (Deaton, 1990) conducted a study on Indonesian survey data to measure own and cross-price elasticities only. Since there is no study on Indonesian VAT reform, especially on the recent tax rate reform, the paper examines the household surveys of Indonesia using Deaton's approach.

2.2. Deaton's Approach to Demand and Tax Policy

The methodology utilised in the paper follows Deaton's approach. He developed the model following the consumer behaviour mode, which states that households choose an item with a certain quality or characteristics and price. Therefore, Deaton formulated a choice function of quantity and quality as functions of household income, household characteristics, and prices, in which prices are a factor that will affect the quantity and qualities chosen. Two conditions must be fulfilled by the data used in the analysis: first, there is physical quantity information, and second, there are clusters. Household surveys apply clustering to save survey costs, as the interviewers visit households that live close to each other. In the function, clusters can be used to cluster markets as well. The assumption made is that households in a cluster face the same market prices.

2.2.1. Demand Estimation

The basic model of the equation of Deaton's approach is as follows:

$$w_{Ghc} = \alpha_G^0 + \beta_G^0 \ln x_{hc} + \gamma_G^0 z_{hc} + \sum_{H=1}^{M} \theta_{GJ} \ln p_{Jc} + (f_{Gc} + u_{Ghc}^0) \tag{1}$$

$$\ln v_{Ghc} = \alpha_G^1 + \beta_G^1 \ln x_{hc} + \gamma_G^1 z_{hc} + \sum_{H=1}^{M} \psi_{GJ} \ln p_{Jc} + u_{Ghc}^1 \tag{2}$$

The budget share of good G of household h in cluster c (w_{Ghc}) is calculated by dividing the consumption of good G by the total expenditure x_{hc} of the household h. Index G capital is used instead of index i to indicate a group of goods, not merely one good i. The budget share is assumed to be linear with total expenditure in natural logarithm; therefore, it is regressed to expenditure (x_{hc}), household characteristics

[1] However, the theoretical restrictions are the determinants of the estimates of elasticity between nonfood price on foods, not the data itself.

(z_{hc}), prices (p_{Jc}) of all goods (J), fixed effects of the cluster (f_{Gc}), and u_{Ghc}^{0} the idiosyncratic variable.

The unit value of G (v_{Ghc}) in Equation 2 is calculated by dividing the expenditure on good G by the quantity purchased. The logarithmic natural of the unit value $\ln v_{Ghc}$ is regressed to the same variables as in the demand or budget share (w_{Ghc}) equation, excluding the cluster fixed effect (f_{Gc}). In both calculations, the values used are demeaned values[2], which remove the fixed effects (f_{Gc}) in the first regression since, within a cluster, the fixed effects would be the same and remove the price (p) based on the assumption of fixed prices within a cluster[3].

Both equations utilise the similar variables except f_{Gc} which is present only in the first equation. Deaton assumes that the unit value is a function of quality and price; thus, if there is no quality issue, the unit value will be a function of price and other characteristics (z_{hc}) that appear in both equations. Household characteristic, z_{hc}, is one of the factors that impacts a choice of a good. Although it is not realistic to exclude the cluster fixed effect in the unit value equation, the model states that the price is given and not measured, so the link between price and unit value must be direct without the distraction of the cluster fixed effect. Regarding price p_{Jc}, there is no index h since all households in a cluster face the same prices.

The first equation is for all observations, while the second is only for those households with at least one purchase. Households without purchase have zero expenditure on certain items. However, the zero-purchase households must be included in the first equation to show the different preferences across all households, which is significant in policy making.

β_G^0 in the first equation is a parameter that reflects the elasticity of quantity while β_G^1 in the second equation is a parameter that reflects the quality. $\beta_G^1 = \frac{\partial \ln v_G}{\partial lnx}$ and unit price is a product of price and quality. If the first equation is differentiated to ∂lnx, the quantity demand elasticity and the logarithm of a budget is the logarithm of quality added by the logarithm of quantity, then:

$$\frac{\partial \ln w_G}{\partial lnx} = \frac{\beta_G^0}{w_G} = \epsilon_G + \beta_G^1 - 1 \tag{3}$$

where w_G is budget share of good G. Rearranging the formula to be total expenditure elasticity ϵ_G (of quantity G):

$$\epsilon_G = (1 - \beta_G^1) + \frac{\beta_G^0}{w_G} \tag{4}$$

[2] STATA commands used in the script to demean data are *areg* and *absorb(cluster)*

[3] The assumption is applicable mostly in rural areas where there is mostly only one market for a cluster/a village while households in urban areas live closer to one another, they usually have only one to two markets as well with more integrated transportation, therefore the assumption of fixed price within clusters are applicable in both urban and rural areas. However, the assumption is still better applied in the rural areas than in urban ones.

ψ_{GJ} is the price elasticity of the unit values consisting of both own and cross-price elasticities. When there is no quality impact, then ψ_{GJ} is an identity matrix. The elasticity of quality with respect to price is $\psi_{GJ} - \delta_{GJ}$ where δ_{GJ} is Kronecker delta. If ϵ_{GJ} is a matrix of both own- and cross-price elasticities of quantities, then the first equation can be differentiated:

$$\frac{\partial \ln w_G}{\partial ln p_J} = \epsilon_{GJ} + \psi_{GJ} = \frac{\beta_G^0}{w_G} \tag{5}$$

where p_J is the price of all goods. Rearranging

$$\epsilon_{GJ} = \psi_{GJ} + \frac{\theta_{GJ}}{w_G} \tag{6}$$

where θ_{GJ} is the coefficient of the price of the first equation. Both ϵ_{GJ}, the quantity price (own- and cross-price) elasticities and ϵ_G and the (quantity) expenditure elasticity are the focus of the analysis further. Deaton utilises sample means of the data when dealing with variances across households as samples in the analysis. In addition, Deaton stated that prices are not observed and given. The assumption of separability is applied[4]. Deaton (Deaton, 1988) showed:

$$\psi_{GJ} = \delta_{GJ} + \beta_G^1 \frac{\epsilon_{GJ}}{\epsilon_G} \tag{7}$$

Cross quality effect between goods exists only when there is ϵ_{GJ}, the cross-price quantity. $\frac{\boldsymbol{\beta_G^1}}{\boldsymbol{\epsilon_G}}$ is the elasticity of quality of good G with respect to total expenditure on G. Further, Deaton formulates a matrix by assuming that Equation 7 is at the sample means. It can be substituted for ϵ_{GJ} and ϵ_G by using Equation 4 and Equation 6, which results in:

$$\psi_{GJ} = \delta_{GJ} + \beta_G^1 \frac{\frac{\theta_{GJ}}{w_G} - \psi_{GJ}}{(1 - \beta_G^1) + \frac{\beta_G^0}{w_G}} \tag{8}$$

If a new vector is generated (ξ):

$$\xi_G = \frac{\beta_G^1}{\{(1 - \beta_G^1)\}\{w_G + \beta_G^0\}} \tag{9}$$

Then, the matrix notation of ψ_{GJ} Equation 8 can be put to be:

$$\Psi = I + D(\xi)\theta - D(\xi)D(W)\Psi \tag{10}$$

where D(ξ) means a diagonal matrix of ξ.

[4] Refer to Deaton's works especially the book of "The analysis of household surveys" (Deaton, 1997)

2.2.2. The method of estimation of Deaton's approach

Deaton assumes that the role of individuals/households is replaced by the role of clusters in the survey. The time series observations are replaced by the individual households within each cluster, which mostly are around 6-15 households. The consistent estimator is cluster size, and the increasing estimator is the size of clusters. Equation 1 assumes there is a fixed effect in the demand equation that reflects similar preferences across households in a cluster. Fixed effect allows correlation between income and exogenous variables. However, in Equation 2, no fixed effect is allowed to give the price information. But errors of u^0 and u^1 are random and can include cluster effects. Two stages of estimation are applied: first for within-cluster estimation and second for between-clusters estimation to estimate the population estimators.

1. Several equations to be estimated
   a. Equation 1 and Equation 2 are run by ordinary least squares with cluster means subtracted from all data. The process produces fixed effects of the first equation and cluster invariant prices in both equations.
      Result: "within" estimation: $\widetilde{\beta_G^0}$, $\widetilde{\gamma_G^0}$, $\widetilde{\beta_G^1}$, $\widetilde{\gamma_G^1}$
   b. Equation 4 and Equation 9, the estimates of the total expenditure elasticities of quantity and quality, parameters ξ, they are only for first stage. Other result: e^0_{Ghc} and e^0_{Ghc}, residuals from the two regressions.
      Requirements:
      1) adding -up condition: all budget shares add to unity,
      2) vector $\widetilde{\beta^0}$ and $\widetilde{\gamma^0}$ add to zero
   c. These all can be used to generate variances and covariances ($\tilde{\sigma}_{GJ}, \tilde{\omega}_{GJ}, \tilde{\chi}_{GJ}$) of the residuals ($e$) of Equation 1 and Equation 2:

$$\tilde{\sigma}_{GJ} = (n - C - k)^{-1} \sum_{c} \sum_{h \epsilon c} e^0_{Ghc}\, e^0_{Jhc} \tag{11}$$

$$\tilde{\omega}_{GJ} = (n_G^+ - C - k)^{-1} \sum_{c} \sum_{h \epsilon c} e^1_{Ghc}\, e^1_{Jhc} \tag{12}$$

$$\tilde{\chi}_{GJ} = (n_G^+ - C - k)^{-1} \sum_{c} \sum_{h \epsilon c} e^1_{Ghc}\, e^0_{Jhc} \tag{13}$$

   Where n_G^+ is the sum of n_{cG}^+ over clusters and n is the total households in a cluster. Equation 12 and Equation 13 use households that reported unit values, while Equation 11 is applied to all households. Equation 12 and Equation 13 estimate variance and covariance within goods and covariances of the residuals between goods which are assumed to be nil, both within the unit value equation and between the two equations.

2. For clusters, using the results of the first stage to construct the cluster shares $\tilde{y}^0_{Gc}$ and unit value $\tilde{y}^1_{Gc}$.

$$\tilde{y}^0_{Gc} = w_{Ghc} - \tilde{\beta}^0_G ln x_c - \tilde{\gamma}^0_G z_c = w_{Gc} - x_c . \widetilde{\pi^0_G} \tag{14}$$

$$\tilde{y}_{Gc}^{1} = \ln v_{Gc} - \tilde{\beta}_{G}^{1} ln x_{c} - \tilde{\gamma}_{G}^{1} z_{c} = \ln v_{Gc} - x_{c}.\widetilde{\pi_{G}^{1}} \quad (15)$$

Where x_c is the vector of explanatory variables at the first stage. π_G^0 and π_G^1 are the parameters for these two new equations of clusters.

Generate:

a. matrix Q, the variance-covariance matrix between clusters, y_{Gc}^0 using true parameters β^0 and γ^0 calculated by $q_{GJ} = \mathrm{cov}(y_{Gc}^0, y_{Jc}^0)$
b. matrix S, the corresponding matrix for y_{Gc}^1
c. matrix R, the covariance matrix

$$s_{GJ} = \mathrm{cov}(y_{Gc}^1, y_{Jc}^1) \quad (16)$$

$$r_{GJ} = \mathrm{cov}(y_{Gc}^0, y_{Jc}^1) \quad (17)$$

For population, in regard to Equation 11, Equation 12, and Equation 13, generate matrices for the residual variances and covariances, Σ, Ω, Γ. The last two matrices are diagonal matrices.

From Equation 14 and Equation 15 and taking probability limits over all clusters, we got two matrices, S and R

$$S = \Psi M \Psi' + \Omega N_{+}^{-1} \quad (18)$$

$$R = \Psi M \Theta' + \Gamma N^{-1} \quad (19)$$

M is the variances covariance matrix of the unobservable price vector, $N_{+}^{-1} = plim C^{-1} \sum_c D\,(n_c^{+})^{-1}$ where $D(n_c^{+})$ a diagonal matrix from the elements of n_c^{+} and N^{-1}, the corresponding matrix for the n_c's.

Using results from the second step estimations. If the multivariate ordinary least squares regressions were run, the results would be given by:

$$\mathrm{B}_{\mathrm{OLS}} = \tilde{\mathrm{S}}^{-1}\tilde{\mathrm{T}} \quad (20)$$

For population, the coefficient of $\mathrm{B}_{\mathrm{OLS}}$ matrix of regression of $\hat{\mathrm{y}}_{\mathrm{Gc}}^{1}$ and $\hat{\mathrm{y}}_{\mathrm{G}}^{1}$ can be estimated. And the estimator can be corrected based on the error terms to be:

$$\tilde{B} = (\tilde{S} - \tilde{\Omega} T_{+}^{-1})^{-1}(\tilde{R} - \tilde{\Gamma} T_{A}^{-1}) \quad (21)$$

T_A and T_+ are the N and N_+ of the population. They can be calculated by using the equations: $T_A^{-1} = C^{-1} \sum_c \{D(n_c)\}^{-1}$ and $T_+^{-1} = C^{-1} \sum_c \{D(n_c^{+})\}^{-1}$. C is the number of clusters of the sample. The matrix $\tilde{B}$ is an estimator with measurement errors of the variance-covariance and covariance of the explanatory variables which have been corrected. Here, the own- and cross-price elasticities (Θ) are not estimated yet, but the matrix ($(\Psi')^{-1}\Theta'$) is, in which Ψ is the matrix of the response of the logarithm of unit value to prices.

When sample size increases while cluster size is fixed, $\tilde{B}$ is approaching the true B for population:

$$plim\,\tilde{B} = B = (\Psi')^{-1}\Theta' \tag{22}$$

$\tilde{B}$ cannot be directly taken from Ψ and Θ. Therefore, Θ can be taken from:

$$\Theta = B'\Psi = B'\{I - D(\xi)B' + D(\xi)D(w)\}^{-1} \tag{23}$$

Substituting Equation 6 into Equation 23 will give us the matrix price elasticities E:

$$E = \{D(w)^{-1}B' - I\}\{I - D(\xi)B' + D(\xi)D(w)\}^{-1} \tag{24}$$

where I is the identity matrix and matrix $D(w)$ is the diagonalised average budget share, w is the sample mean budget share.

2.2.3. Additional residual group

In the further analysis, Deaton added a method to include a residual group, such as adding a nonfood category to the analysis of food items so it can cover the overall expenditure. Before the matrix of the calculation is MxM matrix Θ in Equation 23. By adding one category, the complete system has Θ^x, a (M+1)x(M+1) matrix, adding one to the column and one to the row. The restrictions imposed are symmetry, homogeneity, and adding-up restrictions. The restrictions can be used to provide information on this one additional category. Homogeneity and adding up restrictions can be used to add a column and a row to the overall matrix. By homogeneity restrictions, the last column can be generated as:

$$\theta^x_{GM+1} = -\beta^0_G - \sum_{H=1}^{M} \theta_{GJ} \tag{25}$$

By adding-up restrictions, the last row can be generated:

$$\theta^x_{M+1G} = -\sum_{H=1}^{M} \theta^x_{JG} \tag{26}$$

where the superscript of x indicates the completed/extended commodities. The adding-up restriction generates the budget share for the last group and the regression analysis using the budget share generates the parameters of β^0 and B' from the direct calculation. The quality elasticity β^1 cannot be extended the same way as explained before. Instead, it is assumed from the nonfood group.

Having the quality elasticity, followed by the complete systems to calculate θ^x and Ψ^x as follows:

$$\theta^x = B^{x\prime}\Psi^x \tag{27}$$

$$\Psi^x = I + D(\zeta^x)D(\overline{w}^x) - D(\zeta^x)B^{x\prime} \tag{28}$$

$$\Psi^x = [I + D(\zeta^x)D(\overline{w}^x)]^{-1}[I + D(\zeta^x)\theta^x] \tag{29}$$

The price and expenditure elasticities can be calculated in the same way as Equation 22 and Equation 23.

The symmetry restriction, on the other hand, provides the restrictions applied in matrix B. The Slutsky symmetry matrix of the demand system adds the precision of estimates and is fulfilled if $\theta_{HG}^x = \theta_{GH}^x$. However, this cannot be followed in the empirical studies using the model and household surveys because the exclusion of zero purchases applied in the estimation cannot produce a perfect symmetry restriction. When quality elasticity is small, the Ψ matrix approaches the identity matrix, which means B' is almost equal to Θ. The symmetry condition can be translated as:

$$B + \overline{w}\beta^{0'} \tag{30}$$

2.2.4. Price and tax reform

Deaton assumes social welfare as a function of individual welfare u, which by the indirect utility function V gives the highest welfare W possible. Personal welfare u is a function of prices and budget.

$$W = V(u_1, u_2, \dots, u_N) \tag{31}$$

$$u_h = \psi(x_h, p) \tag{32}$$

where N is the number of individuals and index h indicates the household.

Price paid by the consumer p_i is world price (fixed price) p_i^0added by the tax (t_i) (positive) or reduced by the subsidy (negative).

$$p_i = p_i^0 + t_i \tag{33}$$

Government revenue, which is tax times quantity, is formulated as follows:

$$R = \sum_{i=1}^{M}\sum_{h=1}^{H} t_i q_{ih} \tag{34}$$

where q_{ih} is the quantity of bought goods i by household h. Deaton assumes that the price change is the same as the tax change with three impacts: on government revenue, on individual welfare, and on social welfare.

The derivation of tax revenue with respect to any tax shift:

$$\frac{\partial R}{\partial t_i} = \sum_{h=1}^{H} q_{ih} + \sum_{h=1}^{H}\sum_{j=1}^{M} t_j \frac{\partial q_{jh}}{\partial p_i} \tag{35}$$

The chain rule, Equation 31 and 32, the welfare derivation with respect to tax change:

$$\frac{\partial W}{\partial t_i} = \sum_{h=1}^{H} \frac{\partial V}{\partial u_h} \cdot \frac{\partial u_h}{\partial p_i} \tag{36}$$

By using Roy's identity, the welfare change with respect to tax change is depicted as follows:

$$\frac{\partial W}{\partial t_i} = -\sum_{h=1}^{H} \eta_h q_{ih} \tag{37}$$

where η_h is the social marginal utility of money of a household h.

$$\eta_h = \frac{\partial V}{\partial u_h} \cdot \frac{\partial \psi_h}{\partial x_h} = \frac{\partial W}{\partial x_h} \tag{38}$$

In a distributional study, the shift in price is supposed to be beneficial for the poor more than for the rich; therefore, the different impacts across the income groups must be considered. The social benefit equation is Equation 32, and the social cost of an increased tax is Equation 37. The benefit is the additional revenue that the government collects, which would be spent on public expenditure. The cost is the equivalent money of change in the unit price times quantity aggregated for the whole household.

The ratio of cost (social welfare cost) to the benefit (government revenue) λ_i is depicted as follows:

$$\lambda_i = \frac{\sum_{h=1}^{H} \eta_h q_{ih}}{\sum_{h=1}^{H} q_{ih} + \sum_{h=1}^{H} \sum_{j=1}^{M} t_j \, \partial q_{jh} / \partial p_i} \tag{39}$$

The ratio (λ_i), in this matter, means the social cost sacrificed to increase one unit of the government revenue on good i[5]. The high ratio λ_i means that by decreasing the price of good i, social welfare is improved, which could be caused by two potential reasons, either because the good i is burdening the rich or because the tax is distortionary or both reasons. On the other hand, the low ratio indicates that the good i is the potential good to be taxed because it's not sensitive to a change. When all the ratios are the same, it means the tax is optimum, and no need for tax reform.

2.2.5. Adaptation for Practical Use

The equation of cost-benefit above is modified further to include the quality and quantity in the prices. Deaton assumed that the tax affects all the prices proportionately within a group. The subscript in capital G indicates a group and small i indicates goods.

Suppose that the shadow tax rate on good i is t_i so that the price paid, p_i, is $\widetilde{p_i}(1 + t_i$, and $\widetilde{p_i}$ is fixed as the tax rate changes. When there is a tax rate change Δt_i $\widetilde{p_i}$ changes as much as $\widetilde{p_i}\Delta t_i$. Since the group utility u_G is the aggregate utility of

[5] Therefore, the lower ratio of λ_i, the better from the perspective of taxing an item.

households and it is a function of the product of quality (ξ) and quantity (Q); the overall utility u can be written as:

$$u = V(\xi_1 Q_1, \dots, \xi_G Q_G, \dots, \xi_M Q_M) \tag{40}$$

where M indicates all community groups. The utility is maximised subject to budget constraints.

$$\sum_{1}^{M} p_G \xi_G Q_G = x \tag{41}$$

If a household buys $\xi_{ih} Q_{ih}$, the change of tax rate gives a compensation as much as $\tilde{p_i} \xi_{ih} Q_{ih} \Delta t_i = \mathrm{x}_h \mathrm{w}_{ih} \Delta \mathrm{t}_i (1 + t_i)^{-1}$ where x_h is the total expenditure of household and w_{ih} is the budget share of good i. From Equation 38 and Atkinson's social welfare, the equation of social marginal utility becomes:

$$\eta_h = \frac{\partial W}{\partial x_h} = \left(\frac{x_h}{n_h}\right)^{-\epsilon} \tag{42}$$

where n_h is the number of household members. The social welfare of a household is calculated based on the individual or each household member. Each member is assumed to enjoy the same amount of wealth; hence, per capita expenditure is the measurement of wealth.

From Equation 36, the numerator can now be transformed into:

$$\frac{\partial W}{\partial t_i} = (1 + t_i)^{-1} \Sigma_h \eta_h p_{ih} \xi_{ih} Q_{ih} = (1 + t_i)^{-1} \Sigma_h \left(\frac{x_h}{n_h}\right)^{-\epsilon} x_h w_{ih} \tag{43}$$

Here, ϵ is Atkinson's degree of inequality aversion (Atkinson, 1970); when ϵ increases, higher weight is applied to the lower-income households to highlight the distributional impact.

The consumption tax revenue collected from households, R_h is

$$R_h = \sum_{j=1}^{M} t_j \tilde{p}_j \xi_{jh} Q_{jh} = \sum_{j=1}^{M} \left(\frac{t_j}{1 + t_j}\right) x_h w_{jh} \tag{44}$$

Derivations of tax revenue with respect to a tax rate shift can be formulated by first derivating the budget share and averaging the revenue change.

$$(1 + t_i) \frac{\partial \bar{R}}{\partial t_i} = \bar{x} \tilde{w}_i \left[1 - \frac{\mathrm{t}_i}{1 + \mathrm{t}_i} + \sum_{j=1}^{M} \frac{t_j}{1 + t_j} \frac{\theta_{ji}}{\tilde{w}_i} \right] \tag{45}$$

where $\bar{x}$ is the mean of expenditure of households and $\tilde{w}_i$ is called by Deaton the "plutocratic" average budget share given by:

$$\tilde{w}_i = \frac{\sum_{h=1}^{H} x_h w_{ih}}{\sum_{h=1}^{H} x_h} \tag{46}$$

The socially representative budget share w_i^{ϵ} is calculated by the equation:

$$w_i^{\epsilon} = \frac{\sum_{h=1}^{H}\left(\frac{x_h}{n_h}\right)^{-\epsilon} x_h w_{ih}}{\sum_{h=1}^{H} x_h} \tag{47}$$

The λ_i ratio, the marginal cost-benefit ratio due to a tax change is written:

$$\lambda_i = \frac{w_i^{\epsilon}/\widetilde{w}_i}{1 + \frac{t_i}{1+t_i}\left(\frac{\theta_{ii}}{\widetilde{w}_i} - 1\right) + \sum_{j\neq i}\frac{t_j}{1+t_j}\frac{\theta_{ji}}{\widetilde{w}_i}} \tag{48}$$

The numerator of the equation assesses the distributional aspect of the ratio and the social welfare. w_i^{ϵ} is a number scaled to unity across goods. Two distributional terms of the numerator for good i:

1. $\frac{t_i}{1+t_i}\left(\frac{\theta_{ii}}{\widetilde{w}_i} - 1\right)$ is the tax term in which the tax component is multiplied by the expenditure elasticity of the good i in terms of quality, quantity, and price. The term measures the impact of the tax due to its own price elasticity.
2. $\sum_{j\neq i}\frac{t_j}{1+t_j}\frac{\theta_{ji}}{\widetilde{w}_i}$ represents the impact of the tax on goods i through cross-price elasticities on other goods.

3. Methodology

3.1. Background of Methodology

The main objective of the methodology is to evaluate the cost and benefit of new VAT policies: first, the increase of tax rate on several food items, which was initiated in 2022, and second, the imposition of tax on all food items, which is proposed be implemented in the future. Since the interest of the analysis is tax reform and prices, the work needs to observe potential different treatments on different goods and the cost and benefit of applying these treatments.

The method utilised in the paper follows Deaton's approach (Deaton, 1987). The approach is superior to AIDS or QUAIDS in the Indonesian context in the analysis because the estimation deals with quality issues. It examines both price effects on quality and the effects of total expenditure on quality, while in AIDS, quantities are functions of prices and budget. Indonesia is an archipelagic state that covers a vast area; hence, there is a wide variety of goods in price and quality. AIDS or QUAIDS and Deaton's approach may result in quite similar estimations; however, in the approach, the quality issue is addressed properly[6].

The main objective of the analysis is to examine the cost-benefit of VAT policy in Indonesia. Cost and benefit analysis requires price and income elasticities, which are calculated using the parameters in demand equations. In formulating the demand

[6] One of discussions in the formulation of VAT new regulation is regarding quality issue, https://www.antaranews.com/berita/2242346/stafsus-menkeu-sembako-tak-kena-ppn-kecuali-daging-beras-premium

equation, we need price data. What we have in the household surveys are data on expenditure and on the quantities of commodities bought by households interviewed in the surveys. Studies in the literature review section, except Deaton, formulate the price data by dividing the expenditure directly by the quantity or what we call unit value. However, the unit value is not the market price; they are different in many aspects. The unit value is observable data that contains information about the quality and market price and it can be controlled by a household. On the other hand, the market price is given and households do not have the capability to control it.

Developed countries collect reliable price data for small regions from time to time. The markets are highly integrated; hence, the spatial variance in price is small or zero. On the other hand, there is no reliable data for all areas, especially rural areas in developing countries. They have unintegrated markets with high transportation costs. Hence, spatial price variances across small areas are large. These variances can be utilised as substitutes for price variances across time. Based on the fact that, in Indonesia, rural areas lack price data, this method is appropriate to estimate cluster-based prices.

3.2. The estimation stages

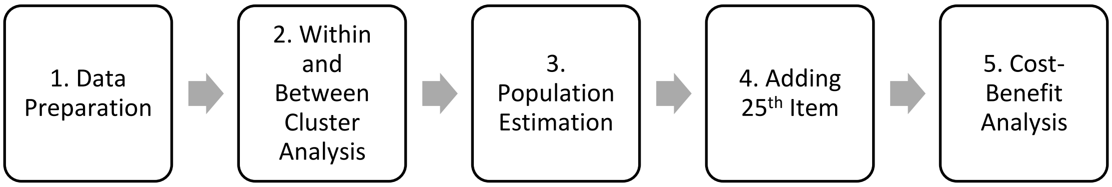

Figure 1. Data Preparation and Analysis

The main steps and equations in data preparation and estimation are described below. The first step is data preparation. The surveys contain 173 categories of food and are recategorised into 24 groups with the closest characteristics to match the food categories in the VAT Act (VAT Act, 2009) by considering the number of households purchasing the categorise. Afterward, the units purchased in the respective category are converted to the same unit measurement, mostly kilograms. In addition, I convert the weekly and yearly consumption to monthly consumption.

Afterwards, I calculate the unit price. The survey provides quantities of certain items demanded and their spending; thus, I can calculate unit prices. Unit price is the spending divided by the quantity of items consumed which are now in kilograms. However, the unit price is not the price itself; it is the unit value (v_{Ghc}) of good G of household h in cluster c in the analysis (Equation 2). The unit value cannot be regarded as price directly because it contains quality; in other words, unit value is part price part quality. Different households consume different goods of different quality, which causes different unit values.

Next is clustering. A cluster is a group of households living in a geographical area, a rural or an urban area, which can be in a village or a subdistrict; they are interviewed at the same time and, therefore, are assumed to have uniform market prices. I construct the clusters using the smallest area that can be identified from the household surveys, which is called the sample code number[7]. The area covers 6-9 households, which fulfils the requirements for a cluster since the area is smaller than the subdistrict. Deaton (Deaton, 1990) defined a cluster using villages in his work on Indonesian household surveys, which consist of 6-15 households. For individual and time dimensions for fixed-effect panel analysis, the method of estimation treats the clusters as the individuals and the number of households within each cluster as the time-series observations. Before moving to the next step, the mean of household budget shares w within clusters are calculated.

The second step is conducting two stages of estimation of within-cluster and between-cluster[8]. From the first stage, the within-cluster estimation is done by calculating Equation 1 to obtain estimated expenditure elasticities, and the second stage by calculating Equation 2 to obtain estimated price elasticities. These estimates are utilised afterward to construct the cluster variables using Equation 14 and Equation 15. The next step is to define variance and covariance matrices of Q, R, and S as stated in Equation 16 and Equation 17, and residual variances and covariances matrices (Σ, Ω, Γ) by calculating Equation 11, Equation 12, and Equation 13. The next step is to obtain population-level estimates by calculating the population level of Equation 14 and Equation 15, which are Equation 18 and Equation 19 to cover all clusters. The superimposed $\tilde{B}$ is the estimate of the population level. Calculating $\tilde{B}$, Θ, and E are the last calculations in the third step.

The fourth step is to complete the analysis by adding the 25th item of all nonfood groups to the 24 groups of food to give the overall analysis of total expenditure. It can be done by adding a column and a row to the matrix of food items. MxM matrix Θ becomes $(M+1)x(M+1)$ matrix of Θ^{x}. These matrices are utilised to estimate elasticities and, afterward, used in the fifth step to observe the implications of a tax policy on all categories of food and nonfood.

The fifth step, which is the last step, is the cost-benefit assessment of a tax policy reform. By using the results of previous steps, I observe the implication of several policy scenarios by discussing two main aspects: efficiency and equity. The efficiency aspect is represented by the denominator of Equation 48 and is related to the efficiency in tax collection. Theoretically, to achieve an efficient tax system, the cost of complying with the tax system or any distortion in its administration is minimised, which produces tax revenue. Hence, the efficiency of the system is captured by a measurement of tax collection. When dealing with consumption taxation, an efficient tax aims to tax all goods or impose a higher tax rate on inelastic commodities because an increase in tax rate generates more tax revenue and creates less distortion on the supply/demand of an economy because consumers tend to maintain their consumption level of these kinds of commodities. On the other hand, to maximise the

[7] Or in Indonesian NKS, Nomor Kode Sampel
[8] The process is done by using computer codes

equity in taxation, a tax system aims to lower the tax burden of the poor and impose higher tax rates on luxury regardless of how much tax revenue is collected. The equity aspect is captured by the numerator of Equation 48 using Atkinson's degree of inequality aversion. The observation of these two opposites, efficiency and equity aspects, will be discussed at the end of the work.

4. Data And Results

The analysis done in this section aims to measure the change in consumption patterns due to changes in price and the substitution effect across items. The analysis does not use the additive assumption but utilises a more flexible way of examining the consumption patterns in which the own-price ratio is not the same for all goods. The analysis emphasises how equity and efficiency work at the same time.

4.1. Data

Indonesian household survey data for three years, 2019, 2020, and 2021 are summarised in Table 1. These three surveys are three cross-sections with 989,933 households in total, 411,680 households in rural areas and 578,253 in urban areas, all grouped in 100,778 clusters, in which clusters from each survey are treated as different clusters and years of surveys are treated as different seasons. Further, these households are grouped into six larger areas: Sumatera, Java, Bali/Nusa Tenggara Timur (NTT), Kalimantan, Sulawesi, and Maluku/Papua in Appendix 1. These categories are based on the five largest islands of Indonesia and the smaller area of Bali/NTT. Households are visited before the survey interview. They are given all the information about the interview and the questionnaire, and they must give their consent. Otherwise, they can refuse to be a participant in the surveys. The form of consent can be seen in Figure A1[9].

The household surveys contain quantity and expenditure data on food items and data on nonfood expenditure. Most nonfood items do not have quantity information. The food items are recorded on a weekly basis, while the nonfood items are recorded on a monthly and yearly basis. Based on the methodology discussion based on Equation 1 and Equation 2, a household with zero purchases can still be included as a sample to observe its preferences within a cluster by having other households with non-zero purchases. However, if there is no household with a purchase in a cluster, then no data price can be estimated for the cluster. Therefore, only clusters with at least one purchase of commodities in a certain group will be used in the estimation.[10]

These samples are summarised under the Clusters and Samples columns in Table 1[11]. On average, each cluster is comprised of around nine households, of which an average of seven make one or more purchases of the relevant commodities. Unit value

[9] The form is available only in Indonesian language

[10] The same approach applied by Deaton (Deaton, 1990)

[11] Table 1 displays the result of first step of the methodology

calculations are only for households with expenditure records because prices are only relevant for them. Therefore, clusters with no purchase are also excluded in the estimation of demand parameters.

Unit values from self-produced consumptions are treated as missing values. These unit values are imputed by the mean of unit values generated from the households' reported values in the same area. Missing values from unreported quantity of food items by consuming households do not exist in the surveys used in the analysis. All reported food expenditure is followed by the related quantity of the food items consumed in weight.

Households are interviewed about their food consumption in 174 categories (14 bigger groups) and 115 categories of nonfood items. Cigarettes and Tobacco (14th group) are excluded from the analysis of food in the paper since the characteristics of the group, compared to others, are different. Here, we treat them as not food. Based on the characteristics of consumption in households and by considering the frequency of consumption, the food items are further reclassified into 24 groups. Each category uses the same weight measurement, most commonly kilograms. Several items are converted from other units, such as ounces or liters. Deaton (Deaton, 1990) suggests that calories may be a better unit for quantifying the actual consumption of food items by households. However, it is recognised that quantifying the consumption by weight still provides an appropriate measure of quantity in this context.

Household-wise, the most common food items consumed in Indonesia among the 24 groups are other-food, rice, salt, vegetables, and spices. Cluster-wise, the most widely consumed food groups are vegetables, salt, other drinks, spices, and white sugar. Rice is not a staple food in the eastern region of Indonesia. Consequently, it is not considered to be consumed widely. Budget share-wise, the other-food group represents the largest single budget share due to the wide variety of food items that are not categorised in other groups and which fall under this residual group. The other largest categories by budget share are rice, vegetables, fresh fish, and fruits. These categories are indeed necessities for Indonesian households as the main sources of carbohydrates, protein, and vitamins.

By considering the characteristics of necessity and widespread usage required for food items to be exempt from VAT, as stated in the VAT regulation in Indonesia, the brief description in Table 1 shares that salt, rice, vegetables, spices, and white sugar are the most widely used food items, both household wise and cluster wise. It follows that all are currently exempt from VAT. So far, the knowledge from Table 1 can be utilised to rank the food items based on these two criteria if they were the only considerations.

The third column describes all the data obtained from three years of household surveys. The clusters section (the subsequent three columns) presents the data pertaining to clusters, as well as the non-zero-purchase[12] clusters used in the

[12] Zero purchase can be recorded due to many reasons, such as no purchase in the week of interview. A longer recall period can help avoid this problem. The surveys used in the paper have a recall period of one week. Another reason is the substitution of purchased consumption by own-produced consumption

estimation. Within these positive-purchase clusters (at least one of the households within the cluster has positive consumption), the households are depicted in the third section of samples (households). These households are actually examined in the analysis. Certainly, some households do not consume the item; however, since they are in the same clusters as positive-purchase household/s, they are included. The fourth section is the budget share of the item relative to the total food expenditure of the 24 groups, averaged over households in the clusters.

Table 1. Commodities, data, samples and budget shares (within-cluster estimation)

No	Items	HOUSEHOLDS			CLUSTERS			SAMPLES (households)*			BUDGET SHARE (w)
		zero purchase households	non-zero purchase households	total households	zero purchase clusters	non-zero purchase clusters	total cluster	zero obs	non-zero obs **	total obs***	
1	Rice	24,071	965,862	989,933	189	100,589	100,778	22,314	965,862	988,176	6.55%
2	Other rice	590,493	399,440	989,933	19,268	81,510	100,778	402,906	399,440	802,346	0.51%
3	Tuber	451,152	538,781	989,933	6,166	94,612	100,778	390,977	538,781	929,758	1.33%
4	Fresh fish	198,368	791,565	989,933	2,534	98,244	100,778	173,869	791,565	965,434	3.42%
5	Fresh shrimp	826,730	163,203	989,933	45,369	55,409	100,778	381,270	163,203	544,473	0.65%
6	Preserved seafood	496,763	493,170	989,933	13,287	87,491	100,778	367,989	493,170	861,159	0.65%
7	Fresh chicken	593,898	396,035	989,933	18,483	82,295	100,778	412,673	396,035	808,708	1.05%
8	Other meat	789,478	200,455	989,933	32,431	68,347	100,778	471,373	200,455	671,828	1.52%
9	Chicken eggs	178,338	811,595	989,933	1,434	99,344	100,778	164,642	811,595	976,237	0.97%
10	Milk	785,972	203,961	989,933	24,379	76,399	100,778	547,086	203,961	751,047	0.80%
11	Condensed milk	775,663	214,270	989,933	27,201	73,577	100,778	509,700	214,270	723,970	0.27%
12	Onion	79,739	910,194	989,933	407	100,371	100,778	75,975	910,194	986,169	0.50%
13	Garlic	118,419	871,514	989,933	915	99,863	100,778	109,699	871,514	981,213	0.34%
14	Vegetables	37,605	952,328	989,933	21	100,757	100,778	37,429	952,328	989,757	3.60%
15	Tofu	259,244	730,689	989,933	5,484	95,294	100,778	206,198	730,689	936,887	0.68%
16	Fruits	175,731	814,202	989,933	1,209	99,569	100,778	164,204	814,202	978,406	2.62%
17	Cooking Oil	115,995	873,938	989,933	2,472	98,306	100,778	91,879	873,938	965,817	0.84%
18	Coconut Product	628,904	361,029	989,933	24,736	76,042	100,778	387,651	361,029	748,680	0.51%
19	White sugar	77,429	912,504	989,933	230	100,548	100,778	75,318	912,504	987,822	0.64%
20	Other drinks	65,735	924,198	989,933	118	100,660	100,778	64,715	924,198	988,913	0.76%
21	Salt	37,550	952,383	989,933	57	100,721	100,778	37,131	952,383	989,514	0.10%
22	Spices	42,735	947,198	989,933	133	100,645	100,778	41,602	947,198	988,800	0.77%
23	Instant noodle	289,223	700,710	989,933	1,106	99,672	100,778	278,814	700,710	979,524	0.57%
24	Other food	19,303	970,630	989,933	666	100,112	100,778	12,954	970,630	983,584	18.26%

Notes: * within at least one positive consumption cluster; ** samples for logarithmic of unit value (luv) estimation; *** samples for budget shares (w) estimations
Source: Author's calculation

The demographic variables included in the analysis are household size and the age groups of household members, which are mostly grouped based on school ages in Indonesia (age two years and under, age three to five, age six to twelve, age thirteen to eighteen, age nineteen to fifty-nine, age sixty and above), the age of household head, the sex of household head, the field of the occupation of the household head and the education level of the household head. Other dummy variables are island, rural, or urban, and a seasonal dummy corresponding to the year of the survey.

4.2. First-Stage Estimation of All Indonesia

Table 2 displays the parameters of first-stage estimations (Equation 1 and Equation 2) of unit values regressions (β^1) in the third column and of budget shares regressions (β^0) in the first column, along with their respective t-values. The

by rural households. The paper uses the positive purchases in the calculation of unit values and use all observations in the budget share calculation.

independent variables on both estimations are per capita expenditure; the demographic variables are household size, education level, age, sex, occupation, marital status of household head, and age proportion of household members. The budget share (w) is taken from Table 1. Elasticity (ε) is the total expenditure elasticity of a given quantity. β^1 itself is the quality elasticity with relation to unit values in terms of expenditure per kilogram.

Luxury food items based on the income/expenditure elasticity of quantity (ε) are fresh shrimp, other meat, and milk, with income elasticities greater than unity. By this definition, the most luxurious of all food items is the other meat category, which contains beef, pork, and others. Higher-income households tend to consume these commodities in greater quantities.

A positive expenditure elasticity means that the higher the income, the greater the quantity a household buys of the item, considering the quality at the same time. For example, milk has a quality elasticity (β^1=0.359) and a quantity (ε=1.068), meaning that there is a tendency for households with a higher income to purchase both a higher quality and a large quantity of milk. The other highest quality elasticity can be observed in other foods, such as fruits and meat. The positive sign of all β^1 means that the quality level will be upgraded in each food group whenever the household has a higher income.

Table 2. First-stage estimates: quantity and quality effects

No	Items	β_G^0	$t(\beta_G^0)$	β_G^1	$t(\beta_G^0)$	w	ϵ
1	Rice	-0.0399	-420.6	0.1173	360.2	0.0655	0.274
2	Other rice	-0.0019	-63.8	0.1280	124.3	0.0051	0.499
3	Tuber	-0.0041	-96.7	0.2100	151.2	0.0133	0.483
4	Fresh fish	-0.0099	-129.2	0.2010	293.5	0.0342	0.510
5	Fresh shrimp	0.0020	38.7	0.2294	96.2	0.0065	1.075
6	Preserved seafood	-0.0036	-153.6	0.2126	150.4	0.0065	0.235
7	Fresh chicken	-0.0024	-55.4	0.1080	199.4	0.0105	0.665
8	Other meat	0.0066	65.9	0.2762	102.4	0.0152	1.161
9	Chicken eggs	-0.0059	-250.0	0.1146	298.5	0.0097	0.276
10	Milk	0.0034	64.2	0.3590	71.6	0.0080	1.068
11	Condensed milk	-0.0007	-44.6	0.1519	151.9	0.0027	0.577
12	Onion	-0.0028	-351.1	0.1590	243.1	0.0050	0.282
13	Garlic	-0.0020	-314.5	0.1406	189.6	0.0034	0.275
14	Vegetables	-0.0189	-382.2	0.1670	181.3	0.0360	0.308
15	Tofu	-0.0045	-302.5	0.1643	267.6	0.0068	0.173
16	Fruits	-0.0037	-55.7	0.2906	265.6	0.0262	0.570
17	Cooking Oil	-0.0050	-406.1	0.1459	324.0	0.0084	0.265
18	Coconut Product	-0.0023	-102.9	0.1047	72.5	0.0051	0.433
19	White sugar	-0.0039	-370.5	0.1034	159.2	0.0064	0.286
20	Other drinks	-0.0027	-94.4	0.1889	133.9	0.0076	0.453
21	Salt	-0.0007	-395.3	0.1611	169.5	0.0010	0.184
22	Spices	-0.0038	-295.8	0.1482	139.5	0.0077	0.360
23	Instant noodle	-0.0029	-190.9	0.2026	339.3	0.0057	0.290
24	Other food	0.0099	34.5	0.2921	268.0	0.1826	0.762

Notes: β_G^0 = coefficient of the budget share on household expenditure (Equation 1), β_G^0 = coefficient of the unit value on household expenditure, expenditure elasticity for quality (Equation 2), t = t-value, w = budget share, ϵ = expenditure elasticity for quantity (Equation 4).
Source: Author's calculation

Elasticity in β^1 is related to the weight of the commodity, and there are significant responses in each food item to the increase of expenditure per weight compared to the analysis results of Deaton (Deaton, 1990). He did a study on Indonesia and found that the quality elasticity indicates smaller quality responses on food consumption of almost all food items observed using only rural households in Java. The rural households' data is quite homogeneous, and the commodities consumed by households are quite similar compared to the more heterogeneous food consumption of the whole of Indonesia. The analysis in this paper covers both rural and urban areas. Urban areas have broader access to different markets and choices of food items with higher quality. Consequently, the quality elasticity exhibits higher responsiveness, which has been discussed in the previous section.

Table 3. First-stage estimates: covariances, cluster sizes, and fitness of equations

No	Items	sigma (σ)	omega (ω)	chi (χ)	sqrt of sigma	w	fitness	t_A	t_+
1	Rice	0.004994	0.016272	0.001631	0.07067	14.19%	-0.07	9.81	9.60
2	Other rice	0.000397	0.058745	0.000357	0.01992	1.03%	0.01	7.96	4.90
3	Tuber	0.000796	0.139118	0.000420	0.02822	2.47%	0.00	9.23	5.69
4	Fresh fish	0.003709	0.054593	0.003129	0.06090	7.77%	-0.02	9.58	8.06
5	Fresh shrimp	0.001117	0.103424	0.001767	0.03343	1.56%	0.02	5.40	2.95
6	Preserved seafood	0.000372	0.132244	0.000770	0.01928	1.46%	0.00	8.55	5.64
7	Fresh chicken	0.001207	0.016084	0.000437	0.03474	2.56%	0.01	8.02	4.81
8	Other meat	0.003898	0.160576	0.004553	0.06244	3.07%	0.03	6.67	2.93
9	Chicken eggs	0.000415	0.018584	0.000181	0.02037	2.26%	0.00	9.69	8.17
10	Milk	0.002018	0.649567	0.008873	0.04492	2.07%	0.02	7.45	2.67
11	Condensed milk	0.000169	0.022257	0.000174	0.01300	0.63%	0.01	7.18	2.91
12	Onion	0.000057	0.060576	0.000264	0.00753	1.16%	0.00	9.79	9.07
13	Garlic	0.000034	0.074340	0.000253	0.00586	0.78%	0.00	9.74	8.73
14	Vegetables	0.001720	0.126146	0.000697	0.04147	7.80%	-0.04	9.82	9.45
15	Tofu	0.000198	0.043179	0.000272	0.01406	1.62%	0.00	9.30	7.67
16	Fruits	0.002881	0.151928	0.006195	0.05368	5.92%	-0.01	9.71	8.18
17	Cooking Oil	0.000144	0.027427	0.000399	0.01200	1.98%	-0.01	9.58	8.89
18	Coconut Product	0.000261	0.095444	0.000587	0.01615	1.08%	0.01	7.43	4.75
19	White sugar	0.000095	0.060234	0.000145	0.00974	1.45%	0.00	9.80	9.08
20	Other drinks	0.000429	0.291640	0.000106	0.02070	1.70%	0.00	9.81	9.18
21	Salt	0.000003	0.135787	0.000175	0.00163	0.23%	0.00	9.82	9.46
22	Spices	0.000147	0.167992	0.000708	0.01211	1.81%	-0.01	9.81	9.41
23	Instant noodle	0.000206	0.036477	0.000325	0.01436	1.35%	0.00	9.72	7.03
24	Other food	0.026154	0.197062	0.015789	0.16172	38.40%	-0.22	9.76	9.70

Notes: *sigma, omega, and chi are the residual variances for the budget share and unit value regressions and the covariance between them (Equation 11, 12, and 13); t_A= elements of matrix T_A, averages of numbers of household per cluster in total; t_+= elements of the matrix T_+, averages of numbers of households per cluster reporting positive purchases of an item; *fitness of equation is the square root of sigma compared to budget share; *groups of other rice, other meat, other drinks, and other food are residual categories; *smaller groups (salt, instant noodles, white sugar, onion, garlic tofu, cooking oil, fresh chicken, condensed milk, chicken eggs), which consist of one detailed item in 188 categories, present low lambda means the value of measurement errors are low.
Source: Author's calculation.

Table 3 displays the diagonal variances and covariances of the budget share and unit value matrices of the first-stage estimations. Sigma (Equation 3) is the variance-covariance matrix of budget shares within clusters, omega (Equation 4) is the variance-covariance matrix of unit value within clusters, and chi (Equation 5) in the third column is the covariance matrix of unit value (row) and budget share (column). Chi shows the values of covariances of unit value and budget share equations. Chi will affect the corrections between clusters' budget shares and prices.

The error in expenditure reporting is in the same direction as the error in quantity reporting. Hence, the unit values measurement error will increase when the budget share measurement error increases. Errors in the unit value and budget share covariance in chi have a positive correlation.

The square root of sigma ($\sqrt{\sigma}$) is used to calculate the fitness of equations compared to the budget share of the item. The fitness itself is a comparison between the budget share (w) and the square root of sigma ($\sqrt{\sigma}$). All of the equations have good fitness except for the other food category. Some items, such as rice and other foods, have a bigger fitness number than or equal to -0.03. These are groups that have the two biggest budget shares. Other foods have the biggest number of fitness since they consist of residual food items with different characteristics. The fittest equations with the smallest residuals from the regression are in the smallest groups, which are homogenous, such as salt, white sugar, garlic, and onion.

In the last two columns, n and n^{+} are the average numbers of households per cluster used in the observations of budget shares and households with positive purchases used in the calculations of unit values. The highest average numbers of households with positive purchases are found in the other food and rice categories, while the lowest average numbers of households are for the milk and condensed milk groups.

4.3. Cross-Cluster Analysis

Table 4 presents the covariance and variance of cross-cluster estimations of budget share and unit value. The first column is the covariance of budget share (matrix T, Equation 12) and the logarithm of price or unit value after being purged from the effects of clusters in the first stage. The second column is the variance of the logarithm of prices (matrix S, Equation 11).

In Equation 13, ratio 1 is calculated by dividing the covariance matrix by the variance matrix in columns 1 and 2 of Table 4. Ratio 1 contains the coefficient of regression of budget share on the logarithm of unit value. Ratio 2 is the corrected estimator calculated from Equation 14.

Without the effect of quality, cross-price, and errors, the ratio 1 divided by the budget share would be one plus the own price elasticity, which is the elasticity (e1) in Table 4. The quality effect is shown in Table 2 (β^{1}) is relatively low, being no greater than 0.3 except for milk. The cross-price does not affect the own-price elasticities, which will be shown further in Table 7. The correction of own price elasticities using ratio 2 is shown in the last column (e2). These two columns of e1 and e2 are generally very similar, which indicates that the effect of quality, cross-price, and errors are not significant. Only fresh shrimp exhibits a bigger difference (0.16), which means the correction changes the price elasticity so far as to make these goods go from inelastic to elastic with respect to price change. The uncertainty of price elasticities is reflected in the table. However, by looking at the small differences between both e1 and e2, it can be said that measurement errors are not significant compared to the ratios of covariance-variance.

Table 4. Cross-cluster variances, covariances and corrections

No	Items	cov(w, lnp)	var(lnp)	Ratio 1	Ratio 2	e1	e2
1	Rice	0.00087	0.0247	0.0354	0.0338	-0.46	-0.48
2	Other rice	0.00003	0.0578	0.0005	0.0001	-0.90	-0.97
3	Tuber	0.00051	0.1330	0.0038	0.0044	-0.71	-0.67
4	Fresh fish	0.00034	0.0524	0.0065	0.0039	-0.81	-0.89
5	Fresh shrimp	0.00002	0.1576	0.0001	-0.0010	-0.98	-1.15
6	Preserved seafood	0.00013	0.1372	0.0010	0.0008	-0.85	-0.88
7	Fresh chicken	0.00015	0.0347	0.0043	0.0039	-0.59	-0.63
8	Other meat	0.00081	0.2068	0.0039	0.0033	-0.74	-0.78
9	Chicken eggs	0.00008	0.0247	0.0032	0.0030	-0.67	-0.69
10	Milk	0.00112	0.5026	0.0022	0.0025	-0.72	-0.69
11	Condensed milk	0.00004	0.0307	0.0014	0.0014	-0.48	-0.49
12	Onion	0.00014	0.0720	0.0020	0.0020	-0.60	-0.59
13	Garlic	0.00011	0.0839	0.0013	0.0013	-0.60	-0.60
14	Vegetables	0.00061	0.1165	0.0053	0.0056	-0.85	-0.84
15	Tofu	0.00002	0.0536	0.0003	0.0001	-0.95	-0.99
16	Fruits	0.00078	0.0813	0.0096	0.0077	-0.63	-0.71
17	Cooking Oil	0.00013	0.0263	0.0051	0.0049	-0.39	-0.42
18	Coconut Product	-0.00008	0.1781	-0.0005	-0.0008	-1.09	-1.15
19	White sugar	0.00010	0.0487	0.0021	0.0022	-0.68	-0.66
20	Other drinks	0.00002	0.1527	0.0002	0.0001	-0.98	-0.99
21	Salt	0.00012	0.2176	0.0005	0.0005	-0.48	-0.48
22	Spices	0.00033	0.1792	0.0018	0.0018	-0.76	-0.76
23	Instant noodle	0.00012	0.0353	0.0035	0.0035	-0.39	-0.39
24	Other food	0.00592	0.1060	0.0558	0.0560	-0.69	-0.69

Notes: lnp = natural log of price; Ratio 1 = covariance/variance ($\mathrm{B}_{\mathrm{OLS}}$ in Equation 13); Ratio 2 = corrected parameter ($\tilde{B}$ in Equation 14); e1 = own price elasticity following Equation 4 using $\mathrm{B}_{\mathrm{OLS}}$ (uncorrected); e2 = corrected own price elasticity, following Equation 4 using $\tilde{B}$ corrected.
Source: Author's calculation.

The simple presentation in Table 4 can give a brief description of the characteristics of each item of food consumption. All own-price elasticities are negative and all are approaching -1. The measurement error must be calculated to ascertain its effect on the statistical analysis. From Table 4, it is clear that it is not significant in this study and may be disregarded.

4.4. Consumption Patterns of Rural and Urban Areas

This section presents the demand system, including the elasticities estimated for rural and urban areas in Indonesia, to describe the differences between rural and urban consumption before providing Indonesia's overall consumption patterns. The analysis is further conducted on all of Indonesia to propose a comprehensive VAT policy since there is no differentiation between rural and urban areas when formulating and implementing VAT regulations.

Table 5[13] displays the parameters of within-cluster estimations (Equation 1 and Equation 2) of unit value regressions (β^1) in the third column and of budget share regressions (β^0) in the first column, along with their respective t-values in rural and urban areas. The results presented are only for the main commodities discussed in this section. The results on all commodities can be seen in Appendix 2. Parameters $\beta^0$and β^1 are the coefficients of total expenditure for regressions of budget share and the logarithm of unit value, w is budget share, ε is expenditure elasticity and σ, ω, χ are the variances and covariance of u^0 and u^1. The upper part is the rural sector and the lower part is the urban sector.

The results indicate that β^1, the quality elasticities with respect to expenditure are all positive, with values that are generally larger in urban areas than in rural areas, except for seven food commodities for which the differences are relatively small. These results justify the estimation of all of Indonesia, with no significant differences between the two areas. These products are mostly agricultural products such as garlic and spices, which are available widely in rural areas. A greater variety of cooking oil products are available in rural areas. Lower-quality cooking oils are sold in traditional markets and are commonly found in rural areas. The products with the highest quality elasticities are milk, meat, fruits, and other food. First, all these items can be imported freely, which means that the quality covers a wide range of products. Secondly, a wide range of quality in the supply is available in most urban areas, which have more integrated markets. Based on the income elasticity ε, the luxury goods for households in rural areas are fresh shrimp, other meat (including beef), and milk. Other food is almost a luxury for them. On the other hand, for urban households, fewer commodities are luxurious. Other meat and fresh shrimp have more than unity expenditure elasticities for urban areas but lower values than those for rural areas. Milk is almost luxurious for urban households.

The residual variances from both regression equations, σ, ω, χ, are all positive since they are relations between residuals of the equation of budget share, between residuals of the equations of unit value and between residuals of both equations of budget share and unit value respectively.

Table 6[14] shows own-price elasticities without the symmetry restriction for rural and urban areas. It is clear that the price elasticities in rural areas are different from those in urban areas. The most inelastic own-price elasticities (unconstrained) in rural areas are for milk, condensed milk, and salt. In comparison, the most elastic is for coconut products, drink materials, and other rice. On the other hand, the most inelastic own-price elasticity in cities is rice, instant noodles, and other meat, while the most elastic goods are shrimp, tofu, and tuber. The majority of the commodities (16 out of 24 commodities) are more inelastic in cities than in villages. The markets are

[13] Table 5 displays the result of second step of methodology for rural and urban areas

[14] Table 6 displays the result of third step of methodology for rural and urban areas

more integrated in cities, and it is easier to move from market to market when prices change. Then, the price variance factor is less significant for urban areas.

Table 5. First-stage estimates: rural-urban consumption patterns

	Parameter	Fresh shrimp	Other meat	Milk	Garlic	Fruits	Cooking Oil	Spices	Other food
RURAL	$\beta^0(t)$	0.00252(26.69)	0.01099(60.67)	0.00376(49.06)	-0.00194(-207.87)	-0.00355(-35.25)	-0.00508(-285.46)	-0.00394(-197.54)	0.03101(78.01)
	$\beta^1(t)$	0.22809(56.18)	0.19811(55.8)	0.36296(42.07)	0.16710(162.48)	0.25927(167.23)	0.17214(267.9)	0.16945(117.38)	0.27321(171.57)
	$\tilde{\sigma}$	0.00034	0.00171	0.00033	0.00001	0.0008	0.00002	0.00003	0.01255
	$\tilde{\omega}$	0.11407	0.11635	0.57794	0.07148	0.14408	0.02843	0.15733	0.19621
	$\tilde{\chi}$	0.00090	0.00194	0.00319	0.00012	0.00274	0.00023	0.00035	0.01044
	w	0.77%	2.08%	0.68%	0.36%	2.88%	0.90%	0.85%	17.60%
	ε	1.1004	1.3296	1.1916	0.2953	0.6176	0.2662	0.3648	0.9030
URBAN	$\beta^0(t)$	0.00162(29.62)	0.00297(33.33)	0.00323(43.28)	-0.00198(-244.21)	-0.00388(-46.86)	-0.00486(-291.67)	-0.00367(-236.08)	-0.00918(-21.88)
	$\beta^1(t)$	0.22936(78.9)	0.32642(79.89)	0.35668(57.58)	0.11474(106.16)	0.31768(203.44)	0.11978(191.25)	0.12709(79.91)	0.30894(207.95)
	$\tilde{\sigma}$	0.00017	0.00049	0.00041	0.00001	0.00055	0.00002	0.00002	0.01425
	$\tilde{\omega}$	0.09491	0.21217	0.70480	0.07870	0.16204	0.02666	0.18481	0.17788
	$\tilde{\chi}$	0.00057	0.00196	0.00398	0.00010	0.00304	0.00017	0.00029	0.01073
	w		0.83%	0.93%	0.30%	2.27%	0.76%	0.67%	19.19%
	ε	1.0660	1.0311	0.9894	0.2270	0.5117	0.2377	0.3285	0.6432

Notes: β^0 = coefficient of the budget share on household expenditure (Equation 1); β^1 = coefficient of the unit value on household expenditure, expenditure elasticity for quality (Equation 2); $\tilde{\sigma}$ = variance in Equation 11; $\tilde{\omega}$ = variance in Equation 12; $\tilde{\chi}$ = covariance in Equation 13; w = budget share; ε = expenditure elasticity (of quantity).
Source: Author's calculation.

Table 6. Own-price elasticities estimates (unconstrained)

No	Food items	Own price elasticity	
		Rural	Urban
1	Rice	-0.5693	-0.1915
2	Other rice	-1.0275	-0.5843
3	Tuber	-0.5920	-1.0145
4	Fresh fish	-0.9115	-0.7651
5	Fresh shrimp	-0.9682	-1.1031
6	Preserved seafood	-0.8386	-0.8494
7	Fresh Chicken	-0.8342	-0.7023
8	Other meat	-0.7154	-0.3501
9	Chicken eggs	-0.7535	-0.4503
10	Milk	-0.3511	-0.4564
11	Condense milk	-0.4852	-0.3964
12	Onion	-0.8582	-0.8075
13	Garlic	-0.7904	-0.8750
14	Vegetables	-0.8867	-0.8567
15	Tofu and tempeh	-0.9887	-1.0698
16	Fruits	-0.5300	-0.5037
17	Cooking oil	-0.5177	-0.5032
18	Coconut products	-1.0645	-0.9283
19	White sugar	-0.9889	-0.9648
20	Other drinks	-1.0335	-0.9932
21	Salt	-0.4971	-0.6306
22	Spices	-0.7280	-0.9252
23	Instant noodle	-0.5442	-0.3035
24	Other food	-0.5595	-0.4702

Source: Author's calculation.

4.5. Price Elasticities

Table 7[15] shows the impact of cross-price changes calculated with Equation 19. Each cell shows how the change in the price of the commodity in the given column affects the commodity in the given row. For instance, from the upper part, we know that a one percent increase in the price of rice is estimated to increase the consumption of other rice by 0.38793. The upper part contains the unconstrained estimates of price elasticities, while the lower part gives the symmetry-constraint price elasticities.

For the upper part, all estimated own-price elasticities are negative, which indicates they are normal goods. The own-price elasticities here are close to the own-price elasticities in Table 4, which are calculated without the impact of cross-price elasticities. This means cross-price elasticities are not too significant in the calculation of own-price elasticities. The price elasticity values lie between zero and minus one. The own-price elasticities in the analysis are mostly in that range, except for some food

[15] Bootstrapping is only conducted on 25 item price elasticities. Bootstrapping produces standard deviation. Deaton's approach does not produce p-value of the estimation.

items, such as rice, fresh shrimp, coconut products, and other drinks, for which the own-price elasticities are just above minus one.

In the case of rice and tuber, a positive price elasticity means that the increase in the price of rice would increase the demand for tuber. This makes sense since these two items are substitutions. On the other hand, when the price of rice increases, the items that are estimated to decrease in budget share are other meat (beef, pork, and other meat other than fresh chicken), followed by fresh fish, fresh shrimp, and condensed milk. The change in the price of rice significantly affects the demand for other food items. The impact is the biggest among the impacts of the change in the prices of other food items. Deaton (Deaton, 1990) also made the same observation regarding the observation of ''other food" category.

The highest price elasticity pertains to the change in demand for tuber when the price of cooking oil increases. These two items are not obvious substitution goods. It is clear, however, that when the prices of rice, cooking oil, or instant noodles increase, the first item that decreases in budget share is tuber.

Table 8 presents the complete price elasticities for 25 categories, including the nonfood category. By using homogeneity, adding up, and symmetry restrictions following Equation 25 to Equation 30, the 25th group is added. Table 8 presents the symmetry-unconstrained elasticities.

Table 9 presents a complete set of estimations of symmetry-constraint elasticities of 25 items, and the figures in the bracket are bootstrap standard errors. The column is the good whose price is changing, and the row is the good affected. For example, from Table 9, a one percent increase in the price of preserved food is estimated to decrease the consumption of non-food by -0.10415.

Table 7. Own- and cross-price elasticities estimates (symmetry unconstrained & constrained) for 24 categories

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24
r1	**-0.52**	0.13	-0.09	0.07	-0.04	-0.10	0.22	-0.04	0.43	-0.02	-0.03	-0.01	-0.02	-0.07	0.11	-0.11	-0.08	-0.03	0.04	-0.12	0.01	-0.04	-0.10	-0.09
r2	0.39	**-1.03**	-0.12	-0.59	0.01	-0.05	0.24	0.12	0.29	-0.19	0.17	0.32	-0.07	-0.20	0.09	-0.13	0.47	0.06	-0.02	-0.13	-0.02	0.08	0.13	0.20
r3	2.93	-0.15	**-0.82**	-0.44	-0.42	0.12	-0.69	-0.01	-0.35	-0.13	-0.05	0.30	-0.16	-0.41	-0.55	-0.04	2.99	0.01	0.95	-0.31	0.26	-0.23	1.76	1.15
r4	-0.38	0.14	-0.04	**-0.87**	-0.18	0.08	0.12	0.01	0.31	0.00	0.05	0.11	0.09	-0.01	0.07	0.08	-0.02	0.02	-0.14	0.15	-0.03	-0.03	-0.01	-0.04
r5	-0.48	0.04	0.01	-0.31	**-1.07**	0.08	0.14	0.11	0.54	0.03	0.03	0.06	0.16	-0.06	0.16	0.05	-0.17	-0.01	-0.07	0.16	0.01	-0.07	0.31	-0.01
r6	-0.20	0.03	-0.14	0.22	0.08	**-0.87**	0.40	-0.04	0.36	-0.03	-0.21	0.13	-0.09	-0.15	0.09	-0.07	0.26	0.08	-0.06	-0.04	0.05	-0.05	-0.12	0.12
r7	0.29	0.04	-0.11	0.13	0.05	0.02	**-0.75**	0.16	0.10	0.00	-0.29	0.00	0.01	-0.01	-0.02	-0.02	-0.01	0.05	0.09	0.12	0.09	0.01	-0.04	-0.14
r8	-0.50	-0.07	-0.30	0.12	-0.19	-0.17	0.22	**-0.60**	0.82	0.07	0.00	0.23	-0.10	-0.22	-0.03	-0.28	0.25	-0.17	0.01	-0.23	0.11	-0.11	0.45	0.40
r9	0.26	0.04	0.04	0.06	0.05	0.02	-0.07	0.04	**-0.70**	-0.02	-0.11	-0.02	0.00	0.01	0.00	0.05	-0.03	0.03	0.00	0.06	0.04	0.00	-0.02	-0.17
r10	0.03	-0.02	0.06	-0.02	0.04	0.03	-0.02	0.08	-0.20	**-0.36**	-0.12	0.00	-0.01	-0.04	-0.09	0.12	0.04	0.04	-0.06	0.02	0.03	-0.01	0.14	-0.14
r11	-0.04	0.00	-0.13	-0.04	-0.13	-0.04	-0.02	-0.02	0.02	-0.02	**-0.41**	-0.05	0.01	0.08	0.05	0.05	0.21	-0.03	0.08	0.13	0.08	-0.03	-0.16	0.02
r12	0.51	-0.03	-0.06	-0.10	-0.01	-0.06	0.10	-0.01	-0.05	-0.02	0.27	**-0.83**	-0.08	0.29	-0.06	0.00	0.48	0.00	0.08	-0.01	0.07	-0.03	0.15	-0.01
r13	0.52	-0.03	-0.10	-0.10	0.03	-0.04	0.04	0.04	-0.25	0.02	0.10	-0.01	**-0.81**	0.29	-0.11	0.01	0.73	0.04	0.03	0.01	0.09	-0.02	-0.07	-0.02
r14	0.51	-0.02	-0.09	0.01	-0.01	-0.03	-0.01	-0.04	0.18	-0.01	0.02	-0.01	-0.04	**-0.90**	-0.03	-0.11	0.45	-0.01	0.13	-0.09	0.07	-0.01	0.13	0.26
r15	0.19	0.00	0.00	0.12	0.09	0.00	0.04	0.00	-0.17	0.01	-0.05	0.00	-0.09	0.00	**-1.02**	0.00	0.08	0.02	0.01	0.04	0.03	0.01	0.07	-0.06
r16	-0.11	0.02	-0.23	-0.19	0.04	-0.02	0.06	-0.08	0.00	-0.08	-0.03	0.10	-0.05	0.00	0.03	**-0.53**	0.06	-0.09	-0.01	-0.08	-0.03	-0.02	-0.08	0.17
r17	0.10	-0.01	-0.01	0.03	0.01	0.00	0.03	0.05	0.02	0.00	0.09	-0.07	0.04	0.09	0.02	-0.01	**-0.51**	-0.13	0.00	0.02	0.04	0.00	-0.07	-0.08
r18	-0.02	0.36	-0.05	-0.39	-0.15	-0.09	-0.08	-0.05	0.58	0.02	0.08	0.32	-0.18	0.10	0.09	-0.39	0.18	**-1.09**	0.11	-0.12	0.08	-0.06	0.03	0.10
r19	0.23	0.07	-0.03	-0.14	-0.13	-0.04	0.18	0.00	0.15	0.03	0.26	0.05	0.03	0.08	0.03	0.00	0.24	0.00	**-0.96**	0.00	0.09	-0.01	-0.07	-0.03
r20	0.26	0.04	-0.12	0.01	0.03	-0.08	0.12	0.01	0.31	-0.07	0.25	-0.02	-0.02	0.10	0.00	-0.07	0.15	-0.02	0.04	**-1.04**	0.06	-0.04	-0.10	0.07
r21	0.27	0.05	-0.09	0.02	-0.06	-0.08	0.15	0.02	0.37	-0.03	-0.09	0.10	-0.06	0.00	0.13	-0.08	0.01	-0.04	0.21	0.04	**-0.53**	-0.11	0.09	-0.02
r22	-0.02	0.10	-0.02	-0.06	-0.07	-0.02	0.06	-0.03	0.15	-0.01	0.04	-0.01	0.01	0.05	0.09	-0.03	0.24	-0.06	-0.10	0.01	0.01	**-0.78**	0.10	-0.01
r23	0.10	0.01	-0.04	0.01	-0.04	-0.01	0.06	0.02	0.02	-0.09	-0.02	0.00	-0.01	0.06	0.06	0.02	0.07	0.02	0.03	0.08	0.05	-0.01	**-0.47**	-0.07
r24	-0.06	-0.08	-0.04	-0.07	0.00	-0.01	-0.04	-0.13	-0.19	-0.08	0.01	-0.11	0.05	-0.04	-0.06	-0.09	-0.03	0.00	-0.03	-0.06	-0.06	0.02	-0.15	**-0.56**

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24
r1	**-0.49**	0.10	0.07	0.00	-0.04	-0.10	0.17	-0.03	0.24	-0.01	0.00	0.01	-0.03	0.00	0.09	-0.12	-0.02	-0.04	0.04	-0.10	0.01	-0.05	-0.03	-0.15
r2	1.24	**-1.03**	0.02	0.24	-0.01	-0.02	0.09	0.09	0.10	-0.12	0.05	0.21	0.02	-0.03	0.11	-0.01	-0.11	0.10	0.01	-0.02	-0.01	0.13	0.03	-1.34
r3	0.34	0.01	**-0.71**	-0.02	-0.13	0.13	-0.01	-0.11	0.31	0.01	0.28	0.23	0.15	-0.25	-0.09	-0.21	0.75	0.06	0.60	-0.03	0.33	-0.05	0.62	0.31
r4	-0.02	0.03	-0.01	**-0.87**	-0.14	0.09	0.07	0.03	0.06	0.01	0.01	0.07	0.07	0.05	0.07	0.02	-0.02	0.00	-0.08	0.14	-0.02	-0.02	0.00	-0.24
r5	-0.48	-0.01	-0.28	-0.73	**-0.88**	0.15	0.11	-0.09	0.03	0.12	-0.06	0.01	0.09	0.00	0.16	0.14	-0.08	-0.02	-0.11	0.15	0.04	-0.01	-0.03	-0.45
r6	-1.06	-0.01	0.28	0.46	0.15	**-0.86**	0.13	-0.17	0.05	0.08	-0.05	0.02	0.00	-0.07	0.09	-0.06	-0.05	0.03	-0.07	0.02	0.06	0.00	-0.07	-0.51
r7	1.06	0.04	-0.01	0.23	0.07	0.08	**-0.86**	0.26	-0.21	-0.01	-0.16	0.01	0.00	0.14	-0.03	0.04	-0.11	0.04	0.06	0.15	0.06	0.03	-0.04	-0.76
r8	-0.18	0.03	-0.10	0.04	-0.04	-0.08	0.17	**-0.60**	0.17	0.06	0.07	0.10	0.03	-0.11	0.03	-0.20	0.10	-0.12	0.08	-0.08	0.10	-0.05	0.15	-0.89
r9	1.65	0.05	0.44	0.24	0.02	0.03	-0.22	0.28	**-0.92**	-0.04	-0.13	0.04	-0.07	0.31	-0.08	0.05	-0.14	0.02	-0.01	0.10	0.01	-0.01	0.06	-1.13
r10	-0.17	-0.08	0.00	0.03	0.10	0.06	-0.01	0.12	-0.06	**-0.34**	0.01	0.01	0.04	-0.01	0.00	-0.15	0.02	0.06	0.04	0.01	0.03	0.05	-0.03	-1.46
r11	-0.07	0.09	1.41	0.16	-0.15	-0.12	-0.62	0.42	-0.48	0.03	**-0.29**	0.23	-0.10	0.80	-0.10	0.04	0.31	-0.02	0.28	0.37	0.09	-0.05	0.17	-1.52
r12	0.09	0.21	0.63	0.52	0.02	0.03	0.03	0.33	0.07	0.02	0.12	**-0.73**	-0.01	0.35	0.00	0.26	-0.01	0.06	0.16	0.08	0.07	0.00	0.18	-1.78
r13	-0.51	0.03	0.58	0.73	0.19	0.00	0.00	0.16	-0.21	0.11	-0.08	-0.01	**-0.69**	0.25	-0.12	0.08	0.01	0.07	-0.01	0.14	0.06	0.05	-0.13	-0.57
r14	0.00	0.00	-0.09	0.05	0.01	-0.01	0.04	-0.03	0.08	0.00	0.06	0.05	0.02	**-0.88**	0.01	-0.01	0.12	0.01	0.10	-0.01	0.07	0.01	0.08	0.02
r15	0.83	0.08	-0.17	0.37	0.16	0.08	-0.05	0.09	-0.12	0.01	-0.04	0.00	-0.06	0.07	**-0.99**	0.14	-0.11	0.05	-0.01	0.08	0.01	0.07	0.02	-1.16
r16	-0.32	0.00	-0.11	0.02	0.04	-0.02	0.01	-0.11	0.01	-0.04	0.00	0.05	0.01	-0.03	0.03	**-0.54**	-0.04	-0.09	-0.01	-0.05	-0.02	0.00	-0.05	-0.26
r17	-0.16	-0.06	1.18	-0.07	-0.05	-0.04	-0.13	0.19	-0.16	0.02	0.10	-0.01	0.00	0.52	-0.09	-0.11	**-0.40**	-0.14	0.08	0.08	0.05	-0.02	0.13	-0.71
r18	-0.49	0.10	0.16	0.03	-0.03	0.04	0.08	-0.34	0.04	0.10	-0.01	0.06	0.04	0.03	0.07	-0.44	-0.24	**-1.08**	0.01	0.00	0.06	-0.04	0.00	-0.33
r19	0.45	0.01	1.27	-0.43	-0.11	-0.07	0.10	0.20	-0.01	0.06	0.12	0.12	-0.01	0.56	-0.01	-0.04	0.11	0.01	**-0.93**	0.10	0.10	-0.06	0.14	-0.90
r20	-0.87	-0.01	-0.05	0.62	0.14	0.01	0.20	-0.15	0.12	0.01	0.13	0.05	0.06	-0.05	0.07	-0.15	0.08	0.00	0.08	**-0.96**	0.08	0.04	0.09	-1.07
r21	0.77	-0.06	4.31	-0.65	0.23	0.40	0.63	1.50	0.14	0.24	0.22	0.34	0.19	2.58	0.08	-0.44	0.40	0.31	0.64	0.59	**-0.53**	0.04	0.49	-9.97
r22	-0.39	0.09	-0.09	-0.08	0.00	0.00	0.04	-0.09	-0.01	0.06	-0.02	0.00	0.02	0.06	0.06	0.02	-0.03	-0.02	-0.05	0.04	0.01	**-0.75**	-0.01	0.11
r23	-0.39	0.03	1.45	-0.01	-0.03	-0.08	-0.08	0.40	0.10	-0.03	0.08	0.16	-0.07	0.49	0.02	-0.20	0.18	0.00	0.15	0.12	0.09	-0.02	**-0.22**	-1.74
r24	-0.10	-0.04	0.02	-0.06	-0.01	-0.02	-0.05	-0.07	-0.07	-0.06	-0.02	-0.05	-0.01	-0.02	-0.05	-0.04	-0.04	-0.01	-0.04	-0.05	-0.06	0.00	-0.06	**-0.58**

Notes: r1 = rice; r2 = other rice; r3 = tuber; r4 = fresh fish; r5 = fresh shrimp; r6 = preserved seafood; r7 = fresh chicken; r8 = other meat; r9 = chicken eggs; r10 = milk; r11 = condense milk; r12 = onion; r13 = garlic; r14 = vegetables; r15 = tofu and tempeh; r16 = fruits; r17 = cooking oil; r18 = coconut products; r19 = white sugar; r20 = other drinks; r21 = salt; r22 = spices; r23 = noodle; r24 = other food; r25 = non-food; the column is the good whose price is changing, and the row is the good affected.
Source: Author's calculation

Table 8. Own- and cross-price elasticities estimates (symmetry unconstrained) for 25 categories

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24	r25
r1	**-0.52**	0.13	-0.09	0.07	-0.04	-0.10	0.22	-0.04	0.43	-0.02	-0.03	-0.01	-0.02	-0.07	0.11	-0.11	-0.08	-0.03	0.04	-0.12	0.01	-0.04	-0.10	-0.09	0.12
r2	0.39	**-1.03**	-0.12	-0.60	0.01	-0.05	0.24	0.12	0.29	-0.19	0.17	0.32	-0.07	-0.20	0.09	-0.13	0.47	0.06	-0.02	-0.13	-0.02	0.08	0.13	0.20	-0.64
r3	2.93	-0.15	**-0.82**	-0.44	-0.42	0.12	-0.69	-0.01	-0.35	-0.13	-0.05	0.30	-0.16	-0.41	-0.56	-0.04	3.00	0.01	0.95	-0.31	0.27	-0.23	1.77	1.15	-6.41
r4	-0.38	0.14	-0.04	**-0.87**	-0.18	0.08	0.12	0.01	0.31	0.00	0.05	0.11	0.09	-0.01	0.07	0.08	-0.02	0.02	-0.14	0.16	-0.03	-0.03	-0.01	-0.04	-0.18
r5	-0.48	0.04	0.01	-0.31	**-1.07**	0.08	0.14	0.12	0.54	0.03	0.03	0.06	0.16	-0.06	0.16	0.05	-0.17	-0.01	-0.08	0.16	0.01	-0.07	0.31	-0.01	-0.97
r6	-0.20	0.03	-0.14	0.22	0.08	**-0.87**	0.40	-0.04	0.36	-0.03	-0.21	0.13	-0.09	-0.15	0.09	-0.07	0.26	0.08	-0.06	-0.04	0.05	-0.05	-0.12	0.12	-0.18
r7	0.29	0.04	-0.11	0.13	0.05	0.02	**-0.76**	0.16	0.10	0.00	-0.29	0.00	0.01	-0.01	-0.02	-0.02	-0.01	0.05	0.09	0.12	0.09	0.01	-0.04	-0.14	-0.53
r8	-0.50	-0.07	-0.30	0.12	-0.19	-0.17	0.22	**-0.60**	0.82	0.07	0.00	0.23	-0.10	-0.22	-0.03	-0.28	0.25	-0.17	0.01	-0.23	0.11	-0.11	0.45	0.40	-1.16
r9	0.26	0.04	0.04	0.06	0.05	0.02	-0.07	0.04	**-0.70**	-0.02	-0.11	-0.02	0.00	0.01	0.00	0.05	-0.03	0.03	0.00	0.06	0.04	0.00	-0.02	-0.17	0.04
r10	0.03	-0.02	0.06	-0.02	0.04	0.03	-0.02	0.08	-0.21	**-0.36**	-0.12	0.00	-0.01	-0.04	-0.09	0.12	0.04	0.04	-0.06	0.02	0.03	-0.01	0.14	-0.14	-0.99
r11	-0.04	0.00	-0.13	-0.04	-0.13	-0.04	-0.02	-0.02	0.02	-0.02	**-0.41**	-0.05	0.01	0.08	0.05	0.05	0.21	-0.03	0.08	0.13	0.08	-0.03	-0.16	0.02	-0.33
r12	0.51	-0.03	-0.06	-0.10	-0.01	-0.06	0.10	-0.01	-0.05	-0.02	0.27	**-0.83**	-0.08	0.29	-0.06	0.00	0.48	0.00	0.08	-0.01	0.07	-0.03	0.15	-0.01	-1.05
r13	0.52	-0.03	-0.10	-0.10	0.03	-0.04	0.04	0.04	-0.25	0.02	0.10	-0.01	**-0.81**	0.29	-0.11	0.01	0.73	0.04	0.03	0.01	0.09	-0.02	-0.07	-0.02	-0.81
r14	0.51	-0.02	-0.09	0.01	-0.01	-0.03	-0.01	-0.04	0.18	-0.01	0.02	-0.01	-0.04	**-0.91**	-0.03	-0.11	0.45	-0.01	0.13	-0.09	0.07	-0.01	0.13	0.27	-0.80
r15	0.19	0.00	0.00	0.12	0.09	0.00	0.04	0.00	-0.17	0.01	-0.05	0.00	-0.09	0.00	**-1.02**	0.00	0.08	0.02	0.01	0.04	0.03	0.01	0.07	-0.06	0.35
r16	-0.12	0.02	-0.23	-0.19	0.04	-0.02	0.06	-0.08	0.00	-0.08	-0.03	0.10	-0.05	0.00	0.03	**-0.53**	0.06	-0.09	-0.01	-0.08	-0.03	-0.02	-0.08	0.17	0.29
r17	0.10	-0.01	-0.01	0.03	0.01	0.00	0.03	0.05	0.02	0.00	0.09	-0.07	0.04	0.09	0.02	-0.01	**-0.51**	-0.13	0.00	0.02	0.04	0.00	-0.07	-0.08	-0.07
r18	-0.02	0.36	-0.05	-0.39	-0.15	-0.09	-0.08	-0.05	0.58	0.02	0.08	0.32	-0.18	0.10	0.09	-0.39	0.18	**-1.09**	0.11	-0.12	0.08	-0.06	0.03	0.10	0.11
r19	0.23	0.07	-0.03	-0.14	-0.13	-0.04	0.18	0.00	0.15	0.03	0.26	0.05	0.03	0.08	0.03	0.00	0.24	0.00	**-0.96**	0.00	0.09	-0.01	-0.07	-0.03	-0.42
r20	0.26	0.04	-0.12	0.01	0.03	-0.08	0.12	0.01	0.31	-0.07	0.25	-0.02	-0.02	0.10	0.00	-0.07	0.15	-0.02	0.04	**-1.04**	0.06	-0.04	-0.10	0.07	-0.48
r21	0.27	0.05	-0.09	0.02	-0.06	-0.08	0.15	0.02	0.37	-0.03	-0.09	0.10	-0.06	0.00	0.13	-0.08	0.01	-0.04	0.21	0.04	**-0.53**	-0.11	0.09	-0.02	-0.63
r22	-0.02	0.10	-0.02	-0.06	-0.07	-0.02	0.06	-0.03	0.15	-0.01	0.04	-0.01	0.01	0.05	0.09	-0.03	0.24	-0.06	-0.10	0.01	0.01	**-0.78**	0.10	-0.01	-0.17
r23	0.10	0.01	-0.04	0.01	-0.04	-0.01	0.06	0.02	0.02	-0.09	-0.02	0.00	-0.01	0.06	0.06	0.02	0.07	0.02	0.03	0.08	0.05	-0.01	**-0.47**	-0.07	-0.34
r24	-0.06	-0.07	-0.04	-0.07	0.00	-0.01	-0.04	-0.13	-0.18	-0.08	0.01	-0.10	0.04	-0.04	-0.06	-0.09	-0.03	0.00	-0.03	-0.06	-0.06	0.02	-0.15	**-0.54**	0.79
r25	0.06	0.00	-0.03	-0.02	-0.02	-0.01	0.02	-0.02	0.03	-0.02	0.00	0.00	0.00	-0.01	-0.01	-0.02	0.06	-0.01	0.01	-0.02	0.00	0.00	0.00	0.09	**-0.50**

Notes: r1 = rice; r2 = other rice; r3 = tuber; r4 = fresh fish; r5 = fresh shrimp; r6 = preserved seafood; r7 = fresh chicken; r8 = other meat; r9 = chicken eggs; r10 = milk; r11 = condense milk; r12 = onion; r13 = garlic; r14 = vegetables; r15 = tofu and tempeh; r16 = fruits; r17 = cooking oil; r18 = coconut products; r19 = white sugar; r20 = other drinks; r21 = salt; r22 = spices; r23 = noodle; r24 = other food; r25 = non-food; the column is the good whose price is changing, and the row is the good affected.

Source: Author's calculation

Table 9. Own- and cross-price elasticities estimates (symmetry constrained) for 25 categories with

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24	r25
r1	**-0.49232**	0.09646	0.07212	-0.00062	-0.04196	-0.10415	0.17245	-0.02527	0.24293	-0.01303	-0.00213	0.0065	-0.02593	0.00144	0.0863	-0.11531	-0.02008	-0.03706	0.04304	-0.09888	0.01164	-0.04552	-0.03349	-0.15363	0.08869
	[0.0157]	[0.0392]	[0.0106]	[0.0007]	[0.0152]	[0.0335]	[0.0334]	[0.0056]	[0.0523]	[0.0054]	[0.0022]	[0.0027]	[0.016]	[0.0001]	[0.0264]	[0.0101]	[0.005]	[0.0155]	[0.0141]	[0.0276]	[0.0243]	[0.0125]	[0.0122]	[0.003]	[0.0006]
r2	1.23878	**-1.02921**	0.02194	0.23887	-0.00695	-0.01859	0.08841	0.09442	0.09802	-0.12119	0.0463	0.20569	0.02215	-0.02827	0.10669	-0.00919	-0.10618	0.0987	0.00997	-0.01681	-0.01229	0.1299	0.02825	-1.34207	-0.36375
	[0.003]	[0.0009]	[0.0002]	[0.0011]	[0.0003]	[0.0004]	[0.0013]	[0.0009]	[0.0017]	[0.0025]	[0.0028]	[0.0066]	[0.0011]	[0.0001]	[0.0025]	[0.0001]	[0.002]	[0.0031]	[0.0003]	[0.0004]	[0.0018]	[0.0027]	[0.0008]	[0.0012]	[0.0001]
r3	0.33644	0.00785	**-0.71211**	-0.01596	-0.13505	0.13477	-0.00521	-0.10759	0.31458	0.00536	0.28539	0.23452	0.1469	-0.25182	-0.08888	-0.20775	0.74949	0.05996	0.60471	-0.03148	0.33369	-0.0534	0.62615	0.31154	-3.23467
	[0.0023]	[0.0007]	[0.0091]	[0.0002]	[0.0089]	[0.0088]	[0.0002]	[0.0033]	[0.0138]	[0]	[0.0447]	[0.0199]	[0.0185]	[0.0029]	[0.0053]	[0.0034]	[0.0375]	[0.005]	[0.04]	[0.0017]	[0.1363]	[0.0028]	[0.0459]	[0.0006]	[0.0014]
r4	-0.02163	0.03495	-0.00634	**-0.87617**	-0.13684	0.08627	0.07053	0.02801	0.06465	0.01143	0.01272	0.0749	0.0709	0.04721	0.07159	0.01567	-0.02037	0.00342	-0.08215	0.13599	-0.02024	-0.01994	-0.00325	-0.24557	-0.00477
	[0]	[0.0076]	[0.0005]	[0.0038]	[0.0232]	[0.0146]	[0.0072]	[0.0012]	[0.0076]	[0.0008]	[0.0051]	[0.0165]	[0.023]	[0.0017]	[0.0117]	[0.0005]	[0.0023]	[0.0009]	[0.0136]	[0.0195]	[0.0206]	[0.0026]	[0.0003]	[0.0018]	[0.0002]
r5	-0.48072	-0.00874	-0.28277	-0.7346	**-0.88317**	0.14729	0.10627	-0.09001	0.02651	0.12091	-0.06325	0.01291	0.09262	0.00455	0.16049	0.13785	-0.07681	-0.02493	-0.11286	0.15263	0.03576	-0.0114	-0.02983	-0.45171	0.9485
	[0.0013]	[0.0002]	[0.0043]	[0.0043]	[0.0037]	[0.0049]	[0.0022]	[0.0013]	[0.0008]	[0.0031]	[0.0048]	[0.0007]	[0.0059]	[0.0002]	[0.005]	[0.0012]	[0.0017]	[0.0009]	[0.0035]	[0.0043]	[0.0073]	[0.0001]	[0.0009]	[0.0004]	[0.0002]
r6	-1.05927	-0.01381	0.27967	0.46298	0.15381	**-0.86216**	0.13506	-0.16634	0.04813	0.0797	-0.05097	0.01958	0.00174	-0.0735	0.08744	-0.05687	-0.05426	0.03043	-0.06637	0.01529	0.06345	0.00058	-0.07121	-0.51054	1.16027
	[0.0033]	[0.0006]	[0.0043]	[0.0027]	[0.0047]	[0.0044]	[0.0026]	[0.0024]	[0.001]	[0.0018]	[0.0039]	[0.0008]	[0.0001]	[0.0004]	[0.0026]	[0.0005]	[0.0013]	[0.0012]	[0.0021]	[0.0004]	[0.0127]	[0]	[0.0025]	[0.0007]	[0.0002]
r7	1.05619	0.0419	-0.0074	0.22738	0.0695	0.08137	**-0.86299**	0.25647	-0.20607	-0.00551	-0.15794	0.01239	-0.00014	0.13571	-0.03445	0.0381	-0.10579	0.03634	0.05528	0.14662	0.0616	0.02569	-0.04335	-0.75609	-0.8377
	[0.0055]	[0.0028]	[0.0002]	[0.0022]	[0.0034]	[0.0043]	[0.0043]	[0.0054]	[0.007]	[0.0004]	[0.0195]	[0.0009]	[0.0001]	[0.0013]	[0.0015]	[0.0005]	[0.0041]	[0.0025]	[0.003]	[0.0065]	[0.02]	[0.0012]	[0.0024]	[0.0014]	[0.0003]
r8	-0.1757	0.02772	-0.10422	0.03916	-0.0397	-0.07736	0.17123	**-0.59888**	0.16871	0.06289	0.07198	0.10457	0.03268	-0.11191	0.03228	-0.20545	0.09851	-0.11849	0.07787	-0.08133	0.10123	-0.05077	0.14587	-0.89713	-0.10991
	[0.0008]	[0.003]	[0.0034]	[0.0009]	[0.0028]	[0.0053]	[0.0081]	[0.0126]	[0.0088]	[0.0038]	[0.0132]	[0.0105]	[0.0051]	[0.001]	[0.0028]	[0.0035]	[0.0061]	[0.0108]	[0.0063]	[0.0048]	[0.0474]	[0.0027]	[0.0126]	[0.0021]	[0]
r9	1.65447	0.05249	0.43673	0.2396	0.02375	0.03276	-0.21989	0.27931	**-0.9225**	-0.03823	-0.13172	0.03859	-0.07295	0.31442	-0.08219	0.04563	-0.14281	0.02257	-0.00802	0.09879	0.01463	-0.00519	0.05725	-1.13072	-0.94681
	[0.0077]	[0.0031]	[0.0099]	[0.002]	[0.0008]	[0.0015]	[0.0065]	[0.0053]	[0.0024]	[0.0018]	[0.0151]	[0.0024]	[0.0066]	[0.0026]	[0.0037]	[0.0004]	[0.0052]	[0.0013]	[0.0004]	[0.0039]	[0.0045]	[0.0003]	[0.003]	[0.002]	[0.0004]
r10	-0.17083	-0.08043	-0.00061	0.02536	0.09766	0.05852	-0.01378	0.11869	-0.05554	**-0.34151**	0.00747	0.01081	0.04341	-0.01417	-0.0004	-0.14817	0.01681	0.05787	0.04279	0.0062	0.0294	0.04843	-0.02819	-1.45965	0.32348
	[0.0004]	[0.0038]	[0.0002]	[0.0004]	[0.0038]	[0.0025]	[0.0002]	[0.002]	[0.0012]	[0.0208]	[0.0009]	[0.0008]	[0.0035]	[0.0001]	[0.0002]	[0.0013]	[0.0007]	[0.0031]	[0.0019]	[0.0004]	[0.0075]	[0.0018]	[0.001]	[0.0019]	[0.0001]
r11	-0.07102	0.08707	1.41398	0.16205	-0.15047	-0.12479	-0.61817	0.4164	-0.47799	0.02753	**-0.28993**	0.2274	-0.10257	0.79868	-0.09965	0.03865	0.30671	-0.01951	0.27564	0.36642	0.08569	-0.05378	0.17135	-1.51823	-1.57994
	[0.0001]	[0.0015]	[0.009]	[0.0004]	[0.002]	[0.0016]	[0.005]	[0.0023]	[0.0042]	[0.0002]	[0.0224]	[0.0039]	[0.0026]	[0.0019]	[0.0012]	[0.0001]	[0.0031]	[0.0003]	[0.0037]	[0.0041]	[0.0071]	[0.0006]	[0.0025]	[0.0007]	[0.0001]
r12	0.08613	0.21016	0.62906	0.52282	0.02233	0.02577	0.02964	0.33169	0.07461	0.02467	0.12306	**-0.72801**	-0.00961	0.34831	-0.00076	0.25887	-0.0105	0.0634	0.1567	0.08246	0.0695	0.00499	0.18454	-1.78617	-1.15508
	[0.0002]	[0.0065]	[0.0074]	[0.0024]	[0.0004]	[0.0006]	[0.0004]	[0.0033]	[0.0012]	[0.0003]	[0.0072]	[0.0086]	[0.0005]	[0.0015]	[0]	[0.0015]	[0.0002]	[0.002]	[0.0039]	[0.0017]	[0.0107]	[0.0001]	[0.0051]	[0.0016]	[0.0002]
r13	-0.50757	0.03426	0.58392	0.72892	0.18545	0.00355	0.00312	0.1618	-0.21006	0.11106	-0.08101	-0.01432	**-0.6879**	0.25254	-0.12017	0.08208	0.011	0.06822	-0.0148	0.14167	0.05763	0.04796	-0.12784	-0.57173	-0.55362
	[0.0008]	[0.0007]	[0.0046]	[0.0022]	[0.0029]	[0.0001]	[0]	[0.001]	[0.0023]	[0.0014]	[0.0032]	[0.0003]	[0.0099]	[0.0007]	[0.0019]	[0.0003]	[0.0001]	[0.0014]	[0.0002]	[0.002]	[0.006]	[0.0006]	[0.0024]	[0.0004]	[0.0001]
r14	-0.00316	-0.00345	-0.09022	0.05264	0.00614	-0.01356	0.0426	-0.03309	0.08355	0.00409	0.06023	0.04794	0.02343	**-0.88605**	0.01275	-0.01338	0.12119	0.00516	0.0987	-0.01054	0.07349	0.01433	0.07904	0.0158	-0.1612
	[0]	[0.0009]	[0.008]	[0.0015]	[0.0001]	[0.0023]	[0.0043]	[0.0035]	[0.0099]	[0.0004]	[0.0252]	[0.011]	[0.008]	[0.0035]	[0.0023]	[0.001]	[0.0164]	[0.0011]	[0.0177]	[0.0017]	[0.0815]	[0.0021]	[0.0156]	[0.0005]	[0.0006]
r15	0.83551	0.08042	-0.16742	0.37028	0.15939	0.0837	-0.04841	0.08728	-0.11568	0.00768	-0.0381	-0.00018	-0.05878	0.07311	**-0.99442**	0.14274	-0.11294	0.05401	-0.00914	0.08183	0.01242	0.06921	0.01699	-1.16114	0.29446
	[0.0027]	[0.0034]	[0.0028]	[0.0023]	[0.0051]	[0.0028]	[0.0011]	[0.001]	[0.0026]	[0]	[0.0031]	[0]	[0.0038]	[0.0004]	[0.0002]	[0.0011]	[0.0029]	[0.0023]	[0.0003]	[0.0023]	[0.0027]	[0.0019]	[0.0006]	[0.0015]	[0]
r16	-0.32044	-0.00304	-0.10782	0.01544	0.03732	-0.01675	0.01432	-0.11057	0.01226	-0.04112	0.00358	0.04725	0.00909	-0.0319	0.03377	**-0.54046**	-0.03781	-0.08643	-0.01295	-0.04555	-0.01782	0.00181	-0.04719	-0.25999	0.64574
	[0.0036]	[0.0003]	[0.0066]	[0.0005]	[0.0044]	[0.0018]	[0.0012]	[0.0065]	[0.0014]	[0.0047]	[0.0012]	[0.0082]	[0.0026]	[0.0004]	[0.0045]	[0.0145]	[0.0033]	[0.0138]	[0.0013]	[0.0048]	[0.0138]	[0.0005]	[0.0065]	[0.0013]	[0.0004]
r17	-0.15664	-0.06292	1.18519	-0.07206	-0.05384	-0.04145	-0.12815	0.19171	-0.16412	0.02363	0.0983	-0.00624	0.00443	0.51898	-0.09223	-0.10542	**-0.40372**	-0.14112	0.08509	0.07735	0.04865	-0.02386	0.12592	-0.70946	-0.60839
	[0.0006]	[0.0034]	[0.0237]	[0.0006]	[0.0024]	[0.0017]	[0.0033]	[0.0031]	[0.0045]	[0.0005]	[0.0097]	[0.0003]	[0.0003]	[0.0038]	[0.0036]	[0.0012]	[0.0188]	[0.0075]	[0.0036]	[0.0027]	[0.0127]	[0.0009]	[0.0058]	[0.0012]	[0.0002]
r18	-0.49027	0.09913	0.15957	0.02891	-0.02731	0.03837	0.07769	-0.34117	0.04151	0.09835	-0.00991	0.06175	0.04493	0.03481	0.07149	-0.4376	-0.23609	**-1.08293**	0.0054	-0.00259	0.06168	-0.03543	0.00157	-0.33015	1.63049
	[0.0012]	[0.0031]	[0.0019]	[0.0001]	[0.0008]	[0.001]	[0.0011]	[0.0037]	[0.0007]	[0.0018]	[0.0006]	[0.002]	[0.0022]	[0.0002]	[0.0017]	[0.0027]	[0.0045]	[0.0026]	[0.0002]	[0.0001]	[0.0097]	[0.0007]	[0.0001]	[0.0004]	[0.0002]
r19	0.44628	0.009	1.26612	-0.42896	-0.10997	-0.06713	0.09512	0.20024	-0.01224	0.06167	0.11689	0.12276	-0.00769	0.56034	-0.01023	-0.04079	0.11288	0.0051	**-0.92988**	0.10185	0.10255	-0.06424	0.13954	-0.90166	-1.15737
	[0.0014]	[0.0003]	[0.0191]	[0.0026]	[0.0036]	[0.0021]	[0.0017]	[0.0025]	[0.0003]	[0.0014]	[0.0087]	[0.005]	[0.0005]	[0.0031]	[0.0003]	[0.0004]	[0.0027]	[0.0002]	[0.0022]	[0.0027]	[0.0201]	[0.0017]	[0.0049]	[0.0011]	[0.0003]
r20	-0.87416	-0.01139	-0.05431	0.6165	0.136	0.01202	0.20506	-0.15151	0.12402	0.01239	0.13015	0.05335	0.06238	-0.05482	0.07206	-0.15157	0.08449	-0.00215	0.08429	**-0.96147**	0.08001	0.03996	0.09316	-1.07413	0.88741
	[0.0031]	[0.0005]	[0.001]	[0.0043]	[0.0048]	[0.0005]	[0.0046]	[0.0026]	[0.0031]	[0.0002]	[0.0116]	[0.0026]	[0.0045]	[0.0003]	[0.0026]	[0.0014]	[0.0024]	[0.0001]	[0.0032]	[0.0012]	[0.0187]	[0.0013]	[0.0039]	[0.0015]	[0.0002]
r21	0.7691	-0.05816	4.31282	-0.65204	0.2322	0.40214	0.63434	1.50122	0.1409	0.23571	0.22451	0.33819	0.18967	2.57708	0.08482	-0.43597	0.40155	0.30558	0.6365	0.59109	**-0.52939**	0.04338	0.48783	-9.96816	-2.80987
	[0.0004]	[0.0004]	[0.0105]	[0.0006]	[0.0011]	[0.002]	[0.0019]	[0.0032]	[0.0005]	[0.0009]	[0.0027]	[0.0022]	[0.0018]	[0.0023]	[0.0004]	[0.0006]	[0.0015]	[0.0019]	[0.0032]	[0.0025]	[0.0149]	[0.0002]	[0.0028]	[0.0017]	[0.0001]
r22	-0.39432	0.08533	-0.089	-0.08124	-0.00451	-0.00002	0.03733	-0.0855	-0.00799	0.0571	-0.01814	0.0026	0.02045	0.06503	0.05963	0.01503	-0.02697	-0.02307	-0.05372	0.03972	0.00528	**-0.75031**	-0.01202	0.10741	0.54353
	[0.0014]	[0.0041]	[0.0017]	[0.0006]	[0.0004]	[0]	[0.0008]	[0.0016]	[0.0002]	[0.0015]	[0.0017]	[0.0002]	[0.0015]	[0.0005]	[0.0022]	[0.0001]	[0.0008]	[0.0011]	[0.002]	[0.0013]	[0.0014]	[0.0079]	[0.0005]	[0]	[0]
r23	-0.38609	0.0256	1.45088	-0.01102	-0.02886	-0.08036	-0.07625	0.39756	0.09562	-0.03247	0.08055	0.15983	-0.07497	0.49493	0.01939	-0.20459	0.18437	0.0018	0.15419	0.12374	0.08702	-0.01567	**-0.21707**	-1.74551	-0.8948
	[0.0011]	[0.0009]	[0.0198]	[0.0001]	[0.0009]	[0.0023]	[0.0014]	[0.0046]	[0.0018]	[0.0009]	[0.0054]	[0.0058]	[0.004]	[0.0025]	[0.0005]	[0.0015]	[0.004]	[0]	[0.0044]	[0.0029]	[0.0154]	[0.0004]	[0.0247]	[0.0018]	[0.0002]
r24	-0.09425	-0.0382	0.01744	-0.05547	-0.01412	-0.02124	-0.04501	-0.06667	-0.06417	-0.05935	-0.02245	-0.05015	-0.01223	-0.01646	-0.04681	-0.04079	-0.03686	-0.01132	-0.03448	-0.04602	-0.0552	0.00047	-0.0563	**-0.56612**	0.46584
	[0.0049]	[0.0424]	[0.0098]	[0.0078]	[0.0143]	[0.0161]	[0.0239]	[0.0284]	[0.0357]	[0.0461]	[0.048]	[0.0565]	[0.0181]	[0.0005]	[0.0367]	[0.0082]	[0.0224]	[0.0104]	[0.0285]	[0.034]	[0.3151]	[0.0034]	[0.0552]	[0.0112]	[0.0021]
r25	0.01989	0.00281	0.04431	0.00782	-0.00647	-0.00496	0.01016	-0.0011	0.01204	-0.00409	0.00442	0.00685	0.00297	0.0183	0.00058	-0.01211	0.00782	-0.00632	0.00923	-0.00481	0.0026	-0.00134	0.00631	-0.06793	**-0.44727**
	[0.0162]	[0.0233]	[0.1119]	[0.0093]	[0.0396]	[0.0192]	[0.0336]	[0.0103]	[0.0492]	[0.0237]	[0.0585]	[0.0542]	[0.036]	[0.0217]	[0.0116]	[0.016]	[0.0379]	[0.0369]	[0.0559]	[0.0167]	[0.1095]	[0.0016]	[0.0443]	[0.0163]	[0.0015]

Notes: standard errors in square brackets; r1 = rice; r2 = other rice; r3 = tuber; r4 = fresh fish; r5 = fresh shrimp; r6 = preserved seafood; r7 = fresh chicken; r8 = other meat; r9 = chicken eggs; r10 = milk; r11 = condense milk; r12 = onion; r13 = garlic; r14 = vegetables; r15 = tofu and tempeh; r16 = fruits; r17 = cooking oil; r18 = coconut products; r19 = white sugar; r20 = other drinks; r21 = salt; r22 = spices; r23 = noodle; r24 = other food; r25 = non-food; the column is the good whose price is changing, and the row is the good affected. Thus, a one percent increase in the price of rice is estimated to increase the consumption of non-food by 0.01989, the figures below the elasticities are bootstrap standard error, are obtained from 1,000 replications of bootstrap using the cluster-level data and are defined as half the length of the interval around the bootstrap mean (the fraction of a normal random variable within two standard deviations of the mean) of the bootstrap replications.

Source: Author's calculation

4.6. Efficiency, Equity, and Cost-Benefit Ratio of Tax Policy Scenarios

After observing the consumption patterns and estimating prices and price elasticities, we now consider the efficiency and equity factors in imposing VAT or increasing the VAT rate on food commodities based on the results of previous sections. The complete 25-categories analysis, including a nonfood category that exhausts the total expenditure, enables the cost-benefit analysis to be conducted thoroughly.

There is a possibility that certain items should be taxed from the equity point of view, but it is not efficient to tax from the tax collection efficiency point of view or the opposite. This analysis examines the equity and efficiency of the policies by considering shadow taxes and prices[16], which do not cover all policies[17] related to price calculations applied in Indonesia. Shadow prices in cost-benefit analysis play a vital role. Cost-benefit analysis examines a decision based on its consequences of costs and benefits. The shadow prices enable measurement of social cost and benefit and give the picture of whether the proposed projects are improving or not. In policy making, government must consider shadow prices in deciding what policy should be undertaken, the one with the highest social profit (Drèze & Stern, 1987; International Monetary Fund, 1988).

Policies discussed here only regard significant taxes and subsidies the government of Indonesia had in the year of surveys, which are related to the demand side since it is assumed that consumer and producer prices are separated.

The most significant commodity in Indonesia is rice. Therefore, protection and subsidies are given to rice producers and consumers, which is called rice policy, by setting a price ceiling and price floors in rice prices to protect the farmers and the consumers at the same time. The government formulates a rice policy to stabilise the price of rice[18] and thus protect farmers at the production level. Consequently, the domestic rice price is around 160% of the international or world price in 2019 – 2021 (Ruspayandi et al., 2022; Timmer, 2014). This means that the (shadow) tax share of the price within Indonesia is 60/160 (0.375) for rice.

The VAT is imposed on certain food products: milk, condensed milk, cooking oil, coconut products, and instant noodles. A small portion of coconut products are exempt from VAT; however, since most of the products are taxed, the group is considered to be subject to VAT. This means the tax share of the price is 10/110 (0.09) for these products and the tax factors of 24 food items and one nonfood item: rice, other rice, tuber, fresh fish, fresh shrimp, preserved seafood, fresh chicken, other meat, chicken eggs, milk, condensed milk, onion, garlic, vegetables, tofu tempeh, fruits, cooking oil, coconut products, white sugar, other drinks, salt, spices, instant noodle, other food, nonfood are 0.625, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 0.91, 0.91,

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[16] Shadow price is an estimated price for something that is not normally priced in the market and the shadow tax is tax on this shadow price.

[17] Other than VAT, other components may be in form of fixed price, tariff, export tax or other trade policies related to the products.

[18] Indonesian Minister of Trade Regulation No.127/2018

1.0, 1.0, 1.0, 1.0, 1.0, 0.91, 0.91, 1.0, 0.91, 1.0, 1.0, 0.91, 1.0, 1.0, 1.0 These numbers are then included in the experiments of the cost-benefit ratio.

Table 10 presents the denominator components of the cost-benefit ratio in Equation 48, which depicts the effect of the efficiency of price changes in Indonesia on each of the goods. In the first column, t is the tax rate and $\frac{t}{1+t_i}$ the tax factors/shadow tax with respect to shadow prices, which are calculated by comparing the domestic and world prices. Nonzero-tax-factors items are those items taxed by VAT or protected by current government policy. The second column, $\frac{\theta_{ii}}{\tilde{w}_i} - 1$ calculates the own price elasticities in terms of both quality and quantity. Quality elasticities are generally small; therefore, the numbers here are more or less the same as quantity elasticities. The third column is the product of these two previous columns to show the amount of distortion found due to the increase in prices in the first column. The fourth column presents the cross-price impact. The impact of price increases in several commodities would attract households to buy other cheaper products. The sum of these own and cross-price impacts is shown in the fifth column, the denominator of the cost-benefit ratio.

In the first column, as described above, milk, condensed milk, cooking oil, coconut products, other drinks, and instant noodles have a shadow tax factor of 0.09, and rice has a shadow tax/shadow subsidy factor of 0.375. Both have positive signs since both cause the price to increase above world prices.

The second column of Table 10 presents the own price elasticities in terms of quality and quantity. The product of the first and second columns is the third column, which represents the effect of the change in the price of a certain item due to the VAT policy, along with the rice policy, in this analysis. The effect is calculated based on the own-price elasticity and the tax factor of each item. The nonzero own-effects are only for those impacted by tax or subsidy since the column is related to the own-price impact. Rice has the biggest number of own-effects since it has a bigger tax factor than others; therefore, even though the own-price elasticity (column 2) is inelastic, the own effect is the highest. The negative signs of the own-effect indicate that the increase in price decreases the demand for these respective products.

Further, the fourth column shows the cross-price impact in which all products are affected by the change of prices on these seven groups of products. Positive signs mean that the products attract more demand when the price of other products is increased due to tax or other factors and the opposite for negative signs. Positive signs are found only on untaxed food items, which indicates the increase in demand is due to the substitution effect. Based on the analysis of the policy before the VAT reform, chicken eggs, salt, and other rice have the largest positive cross effects. The largest negative cross effect is for preserved seafood, which means that the increase in prices due to tax/subsidy causes a decrease in the demand for preserved seafood. The impacts are almost all caused by changes in the price of rice. Rice has a big subsidy/tax shadow and cross-price elasticities (Table 8) are the largest compared to other commodities. An increase in the price of rice would cause an increase in demand for other rice, fresh chicken, and chicken eggs elastically (more than unity). On the other hand, an increase in rice prices causes a decrease in demand for preserved seafood elastically. Hence, these four products with elastic cross-price impact are among those that have the largest values in column four.

The last column in Table 10 is the complete denominator of the cost-benefit ratio. Both own and cross-price impacts are summed and added by one, the first term of the denominator of the equation. By only considering the denominator (the numerator will be discussed in the subsequent table), the most efficient tax revenue collection can be achieved by taxing and thus increasing the price of chicken eggs, salt, other rice, fresh chicken, and tofu tempeh. Less efficient commodities to be taxed are preserved seafood, other drinks, and coconut products, which are candidates to be VAT exempt or subsidised. Preserved seafood is complementary to rice and has the biggest negative cross-impact from rice, while other drinks and coconut products have both own- and cross-impacts.

Table 10. Efficiency of VAT policy in Indonesia before the tax reform

No	Items	$\frac{t_i}{1+t_i}$	$\frac{\theta_{ii}}{\tilde{w}_i}-1$	Own effect (c1xc2)	$\frac{t_j}{1+t_j}\frac{\theta_{ji}}{\tilde{w}_i}$	Total (1+c3+c4)
		c1	c2	c3	c4	c5
1	Rice	0.375	-0.327	-0.123	-0.026	0.851
2	Other rice	0.000	-1.037	0.000	0.592	1.592
3	Tuber	0.000	-0.712	0.000	0.287	1.287
4	Fresh fish	0.000	-0.864	0.000	0.014	1.014
5	Fresh shrimp	0.000	-0.887	0.000	-0.145	0.855
6	Preserved seafood	0.000	-0.824	0.000	-0.517	0.483
7	Fresh Chicken	0.000	-0.847	0.000	0.444	1.444
8	Other meat	0.000	-0.612	0.000	-0.022	0.978
9	Chicken eggs	0.000	-0.902	0.000	0.774	1.774
10	Milk	0.090	-0.425	-0.038	-0.029	0.933
11	Condense milk	0.090	-0.164	-0.015	0.067	1.052
12	Onion	0.000	-0.659	0.000	0.092	1.092
13	Garlic	0.000	-0.607	0.000	-0.228	0.772
14	Vegetables	0.000	-0.863	0.000	0.029	1.029
15	Tofu tempeh	0.000	-0.993	0.000	0.410	1.410
16	Fruits	0.000	-0.502	0.000	-0.143	0.857
17	Cooking oil	0.090	-0.235	-0.021	-0.056	0.923
18	Coconut products	0.090	-1.109	-0.100	-0.257	0.644
19	White sugar	0.000	-0.907	0.000	0.287	1.287
20	Other drinks	0.090	-0.953	-0.086	-0.364	0.551
21	Salt	0.000	-0.372	0.000	0.642	1.642
22	Spices	0.000	-0.697	0.000	-0.176	0.824
23	Instant noodle	0.090	-0.039	-0.003	-0.139	0.857
24	Other food	0.000	-0.606	0.000	-0.042	0.958
25	Non-Food	0.000	-0.921	0.000	0.004	1.004

Notes: t_i = tax rate on good i; θ_{ii} = own price elasticity; $\tilde{w}_i$ = average budget share calculated by Equation 46; θ_{ji} = cross price elasticity; index i = index of good i; index j = index of all goods.
Source: Author's calculation.

Cost-benefit ratios combine both efficiencies (from Table 10) and equity aspects (from Table 11) of price reform. Since the efficiency aspect is the denominator and the equity aspect is the numerator, the cost-benefit ratio is the total equity divided by efficiency. When there is no distributional consideration, several commodities have cost-benefit ratios greater than unity, in which preserved food, other drinks, and coconut products have the highest ratios.

Table 11 presents the numerator of the equation, which is the equity impact ($w_i^\epsilon/\widetilde{w}_i$) and the cost-benefit ratios (λ). $w_i^\epsilon/\widetilde{w}_i$ is the relative budget share. An equity impact of one[19] in Table 11 is the equity impact without distributional consideration (Atkinson inequality ϵ=0). Their relative values are more important than their absolute values. When ϵ=0, it means that regardless of their income levels, all households are treated the same. In this case, the resulting equity would be directly calculated from the total efficiency, and the ranks resulting from it would be the same as those of efficiency. When ϵ increases, the degree of consideration for distribution increases as well, in which poorer households' consumption is given greater weighting. Hence, when an item is most widely consumed by low-income households, the weight is higher.

Table 11 shows us the increasing pattern of relative budget share ($w_i^\epsilon/\widetilde{w}_i$) with respect to Atkinson inequality (ϵ) of most food items except fresh shrimp and milk. An example is the equity impact of rice, which moves from 1.00, 1.30, 1.62, and 2.26 when ϵ moves from ϵ=0 to ϵ=2.0. This means that rice is consumed by poorer households more heavily than richer households by relative expenditure share. Fresh shrimp and milk show the same patterns until ϵ=1.0 and lower weights when the ϵ increases to ϵ=2.0. It means that poor households do not consume these commodities as heavily as other food items. On the other hand, the nonfood group depicts totally different patterns, which means that richer households spend more of their money on nonfood items.

[19] The equity impact with ϵ=0 is normalised to 1 so that the values are more easily compared.

Table 11. Equity and cost-benefit ratios before the tax reform

Items	$\epsilon = 0$		$\epsilon = 0.5$		$\epsilon = 1.0$		$\epsilon = 2.0$	
	$w_i^\epsilon/\tilde{w}_i$	λ	$w_i^\epsilon/\tilde{w}_i$	λ	$w_i^\epsilon/\tilde{w}_i$	λ	$w_i^\epsilon/\tilde{w}_i$	λ
Rice	1	1.17	1.30	1.53	1.62	1.90	2.26	2.66
Other rice	1	0.63	1.26	0.79	1.55	0.97	2.19	1.37
Tuber	1	0.78	1.11	0.86	1.20	0.93	1.38	1.08
Fresh fish	1	0.99	1.18	1.17	1.35	1.33	1.61	1.59
Fresh shrimp	1	1.17	1.05	1.23	1.07	1.26	1.06	1.24
Preserved seafood	1	2.07	1.22	2.53	1.44	2.97	1.82	3.76
Fresh Chicken	1	0.69	1.14	0.79	1.26	0.87	1.41	0.98
Other meat	1	1.02	1.07	1.09	1.11	1.14	1.14	1.16
Chicken eggs	1	0.56	1.23	0.69	1.45	0.82	1.87	1.06
Milk	1	1.07	1.05	1.12	1.07	1.14	1.06	1.14
Condense milk	1	0.95	1.19	1.13	1.36	1.29	1.65	1.56
Onion	1	0.92	1.20	1.10	1.39	1.28	1.75	1.60
Garlic	1	1.30	1.20	1.56	1.39	1.81	1.76	2.28
Vegetables	1	0.97	1.21	1.17	1.40	1.37	1.77	1.72
Tofu tempeh	1	0.71	1.22	0.87	1.44	1.02	1.86	1.32
Fruits	1	1.17	1.12	1.31	1.21	1.41	1.33	1.55
Cooking oil	1	1.08	1.23	1.33	1.45	1.57	1.88	2.03
Coconut products	1	1.55	1.27	1.98	1.54	2.39	2.00	3.11
White sugar	1	0.78	1.26	0.98	1.52	1.18	2.04	1.58
Other drinks	1	1.82	1.18	2.14	1.35	2.45	1.66	3.02
Salt	1	0.61	1.25	0.76	1.50	0.91	2.01	1.22
Spices	1	1.21	1.19	1.44	1.37	1.66	1.67	2.03
Instant noodle	1	1.17	1.21	1.41	1.40	1.63	1.75	2.04
Other food	1	1.04	1.09	1.14	1.16	1.21	1.22	1.27
Non food	1	1.00	0.90	0.89	0.81	0.80	0.66	0.65

Notes: ϵ = is Atkinson's degree of inequality aversion, a specific term, higher value means higher proportion to the poor (not to be confused with expenditure elasticity of demand estimation); w_i^ϵ = socially representative budget share (Equation 47); $\tilde{w}_i$ = average budget share calculated (Equation 46); λ = the marginal cost-benefit ratio (Equation 48).
Source: Author's calculation

By looking only at Table 11, the results can be summarised as follows:

1. The changes in distributional impact ($w_i^\epsilon/\tilde{w}_i$) from zero or without any different weight (ϵ=0) to more weight shows the significance of the items in the poor households' consumption (ϵ=2.0). For poor families, rice is the most important commodity, followed by other rice, white sugar, salt, and coconut products. When the Atkinson inequality is increased to ϵ=2.0, the items most heavily consumed by poor people are the same across all degrees of inequality, except the gaps between items are higher. They are the commodities with the most potential to be decreased in price or the most potential to be exempt from VAT from the point of view of distributional factors[20].
2. The increasing patterns with respect to Atkinson inequality (ϵ) are found in almost all groups of items except fresh shrimp, milk, and nonfood items. Since the

[20] The government of Indonesia has done two main programmes in distributing cheap rice in these years since it is considered to be the important component in low-income households' consumption.

government needs tax revenue, and from the point of view of equity, these items are the potential items to be increased in price by imposing tax. Milk itself is taxed, while fresh shrimp is not. In addition, increasing the VAT rate is also appropriate for these categories.

3. By combining both efficiency and equity aspects, the equity impact of taxing fresh chicken is outweighed by the efficiency ratios; hence, in the highest distributional concern, the cost-benefit ratio is less than one, which means that even though fresh chicken shows an increasing pattern in relative budget share, the item is still a good candidate to be taxed by VAT from the efficiency point of view, because it has higher efficiency or lower social cost sacrificed in imposing VAT.

Further, to answer the third research question, two main policies are to be investigated to present the possible impact of the policy. The first policy is the increase of 1% in the VAT rate and the second policy is the broadening of the VAT base to cover all food items. The steps conducted can be replicated to investigate other kinds of VAT policies. The assumption in the estimation is that the expenditure and the elasticities are fixed. Therefore, only the tax amount changes on both policies were investigated.

The point that should be emphasised here is what changes the new policies would bring in the consumption patterns of poor households by considering efficiency and equity ratios. The two policies are expected to increase the price of commodities as well as increase the government's tax revenue.

4.6.1. Scenario 1: Increase of VAT Rate

The first policy is to increase the VAT rate from 10% to 11% on the same food items as the policy considered in the previous section. The taxable items are milk, condensed milk, other drinks, coconut sugar, and instant noodles. Rice is exempt from VAT but is given protection in price; therefore, there is no change of tax in the treatment of rice.

In the first column of Table 12, the VAT rate on these commodities is increased by 1%, which causes only a small difference in the efficiency ratio before and after the increase. The second column of Table 12 is the same as the second column of Table 10. Since the third column is the product of the first and second columns, it is affected only by taxed and subsidised items or protected items. The fourth column shows the impact of the increase in the tax rate on all food items due to the cross-effect. The commodities affected the most are chicken eggs, salt, and other rice, and these commodities make the largest contribution of all components to the denominator of Equation 48, in the fifth column, which leads to the smaller cost-benefit ratio in Table 12.

Table 12. Efficiency ratios of the increase of 1% VAT rate

No	Items	$\frac{t_i}{1+t_i}$	$\frac{\theta_{ii}}{\widetilde{w}_i}-1$	Own effect (c1xc2)	$\sum_{k\neq i}\frac{t_j}{1+t_j}\frac{\theta_{ji}}{\widetilde{w}_i}$	Total (1+c3+c4)
		c1	c2	c3	c4	c5
1	Rice	0.375	-0.327	-0.123	-0.029	0.849
2	Other rice	0.000	-1.037	0.000	0.592	1.592
3	Tuber	0.000	-0.712	0.000	0.302	1.302
4	Fresh fish	0.000	-0.864	0.000	0.015	1.015
5	Fresh shrimp	0.000	-0.887	0.000	-0.145	0.855
6	Preserved seafood	0.000	-0.824	0.000	-0.517	0.483
7	Fresh Chicken	0.000	-0.847	0.000	0.443	1.443
8	Other meat	0.000	-0.612	0.000	-0.021	0.979
9	Chicken eggs	0.000	-0.902	0.000	0.772	1.772
10	Milk	0.099	-0.425	-0.042	-0.028	0.930
11	Condense milk	0.099	-0.164	-0.016	0.076	1.060
12	Onion	0.000	-0.659	0.000	0.097	1.097
13	Garlic	0.000	-0.607	0.000	-0.227	0.773
14	Vegetables	0.000	-0.863	0.000	0.032	1.032
15	Tofu tempeh	0.000	-0.993	0.000	0.410	1.410
16	Fruits	0.000	-0.502	0.000	-0.145	0.855
17	Cooking oil	0.099	-0.235	-0.023	-0.054	0.923
18	Coconut products	0.099	-1.109	-0.110	-0.258	0.632
19	White sugar	0.000	-0.907	0.000	0.293	1.293
20	Other drinks	0.099	-0.953	-0.094	-0.360	0.546
21	Salt	0.000	-0.372	0.000	0.669	1.669
22	Spices	0.000	-0.697	0.000	-0.176	0.824
23	Instant noodle	0.099	-0.039	-0.004	-0.135	0.861
24	Other food	0.000	-0.606	0.000	-0.044	0.956
25	Non-Food	0.000	-0.921	0.000	0.004	1.004

Notes: t_i = tax rate on good i; θ_{ii} = own price elasticity; $\widetilde{w}_i$ = average budget share calculated by Equation 46; θ_{ji} = cross price elasticity; index i = index of good i; index j = index of all goods.
Source: Author's calculation.

Let us observe rice as the main staple food. Here, rice is not taxed by VAT but is controlled in price by the government to protect the consumers and the producers. In that case, when the VAT rate is increased by 1% on six other items, the price of rice would be affected due to the cross effect by a slightly larger amount than it is when the VAT rate is only 10%. It subsequently causes the low denominator of Equation 48 or a low-efficiency ratio. Instant noodles as a taxed commodity indicate that when there is a 1% increase in the VAT rate, the efficiency ratio is higher than before the increase in the VAT rate, and thus, the cost-benefit ratio decreases for poor households.

The new VAT rate policy changes the consumption patterns of poor households. From an equity perspective in Table 13, coconut products, other drinks, and rice exhibit larger gaps between λ for ϵ=1 and ϵ=2, meaning that these products are more important for poor families in their consumption. On the other hand, condensed milk, white sugar, and salt indicate that these items are now becoming less significant for poor families. From an efficiency perspective, these more significant goods in poor households consumption exhibit a low-efficiency ratio, meaning that they are supposed to be VAT exempt, and they are in this scenario.

From the equity point of view, Table 13 shows that the relative shares are the same as those in Table 11 and later in Table 15**.** However, since the efficiency ratios change, so do the cost-benefit ratios (λ). As there is a higher weight on equity and a larger amount of ϵ (0.5, 1.0, and 2.0), some items would approach luxurious nature or further from nature.

Let us observe rice again. The more weight of distributional concern, the higher the relative share is. Rice has the highest relative shares in each amount of ϵ, which produces the highest cost-benefit ratios.

Table 13. Equity and cost-benefit ratios for the increase of 1% VAT rate

Items	$\epsilon = 0$		$\epsilon = 0.5$		$\epsilon = 1.0$		$\epsilon = 2.0$	
	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ
1	1.00	1.18	1.30	1.54	1.62	1.91	2.26	2.66
2	1.00	0.63	1.26	0.79	1.55	0.97	2.19	1.37
3	1.00	0.77	1.11	0.85	1.20	0.92	1.38	1.06
4	1.00	0.99	1.18	1.17	1.35	1.33	1.61	1.59
5	1.00	1.17	1.05	1.23	1.07	1.25	1.06	1.24
6	1.00	2.07	1.22	2.54	1.44	2.98	1.82	3.77
7	1.00	0.69	1.14	0.79	1.26	0.87	1.41	0.98
8	1.00	1.02	1.07	1.09	1.11	1.13	1.14	1.16
9	1.00	0.56	1.23	0.69	1.45	0.82	1.87	1.06
10	1.00	1.08	1.05	1.13	1.07	1.15	1.06	1.14
11	1.00	0.94	1.19	1.12	1.36	1.28	1.65	1.55
12	1.00	0.91	1.20	1.10	1.39	1.27	1.75	1.59
13	1.00	1.29	1.20	1.55	1.39	1.80	1.76	2.28
14	1.00	0.97	1.21	1.17	1.40	1.36	1.77	1.72
15	1.00	0.71	1.22	0.87	1.44	1.02	1.86	1.32
16	1.00	1.17	1.12	1.31	1.21	1.42	1.33	1.56
17	1.00	1.08	1.23	1.33	1.45	1.57	1.88	2.03
18	1.00	1.58	1.27	2.02	1.54	2.43	2.00	3.17
19	1.00	0.77	1.26	0.97	1.52	1.17	2.04	1.58
20	1.00	1.83	1.18	2.16	1.35	2.47	1.66	3.05
21	1.00	0.60	1.25	0.75	1.50	0.90	2.01	1.20
22	1.00	1.21	1.19	1.44	1.37	1.66	1.67	2.03
23	1.00	1.16	1.21	1.40	1.40	1.62	1.75	2.03
24	1.00	1.05	1.09	1.14	1.16	1.21	1.22	1.28
25	1.00	1.00	0.90	0.89	0.81	0.80	0.66	0.65

Notes: ϵ = is Atkinson's degree of inequality aversion, a specific term, higher value means higher proportion to the poor (not to be confused with expenditure elasticity of demand estimation); w_i^ϵ = socially representative budget share (Equation 47); $\widetilde{w}_i$ = average budget share calculated (Equation 46); λ = the marginal cost-benefit ratio (Equation 48).
Source: Author's calculation

4.6.2. Scenario 2: Broadening The Tax Base

In scenario two, all food commodities are taxed at the 11% VAT rate. Theoretically, the efficiency of VAT is increased when all items are taxed by a single rate VAT, which would decrease the distortion in decision-making when purchasing commodities, in this case, in household decisions to buy food products. For instance, when the price of a commodity increases, households would choose a cheaper substitute commodity, but now all food items are with VAT.

The assumption used here is that both rice protection and tax policies are applied to rice. In reality, the government might consider all policies together, which the paper does not discuss. When the price of rice increases, the household shifts its consumption to a cheaper substitute or reduces the quantity bought, or they do both. The close substitutions of rice from Table 8 are other rice, which contains sticky rice, corn, powder, and others, all of which are with VAT applied.

Table 14. Efficiency ratios of imposition of VAT on all food items

No	Items	$\frac{t_i}{1+t_i}$	$\frac{\theta_{ii}}{\widetilde{w}_i} - 1$	Own effect (c1xc2)	$\sum_{k \neq i} \frac{t_j}{1+t_j} \frac{\theta_{ji}}{\widetilde{w}_i}$	Total (1+c3+c4)
		c1	c2	c3	c4	c5
1	Rice	0.474	-0.327	-0.155	0.018	0.863
2	Other rice	0.099	-1.037	-0.103	0.752	1.649
3	Tuber	0.099	-0.712	-0.071	0.801	1.730
4	Fresh fish	0.099	-0.864	-0.086	0.040	0.954
5	Fresh shrimp	0.099	-0.887	-0.088	-0.365	0.548
6	Preserved seafood	0.099	-0.824	-0.082	-0.731	0.188
7	Fresh Chicken	0.099	-0.847	-0.084	0.668	1.584
8	Other meat	0.099	-0.612	-0.061	-0.093	0.846
9	Chicken eggs	0.099	-0.902	-0.089	1.110	2.021
10	Milk	0.099	-0.425	-0.042	-0.185	0.773
11	Condense milk	0.099	-0.164	-0.016	0.299	1.283
12	Onion	0.099	-0.659	-0.065	0.366	1.301
13	Garlic	0.099	-0.607	-0.060	-0.048	0.892
14	Vegetables	0.099	-0.863	-0.085	0.117	1.032
15	Tofu tempeh	0.099	-0.993	-0.098	0.433	1.334
16	Fruits	0.099	-0.502	-0.050	-0.272	0.678
17	Cooking oil	0.099	-0.235	-0.023	0.096	1.073
18	Coconut products	0.099	-1.109	-0.110	-0.569	0.321
19	White sugar	0.099	-0.907	-0.090	0.617	1.527
20	Other drinks	0.099	-0.953	-0.094	-0.566	0.340
21	Salt	0.099	-0.372	-0.037	1.016	1.979
22	Spices	0.099	-0.697	-0.069	-0.250	0.681
23	Instant noodle	0.099	-0.039	-0.004	0.008	1.004
24	Other food	0.099	-0.606	-0.060	-0.140	0.800
25	Non-Food	0.099	-0.921	-0.091	0.011	0.920

Notes: t_i = tax rate on good i; θ_{ii} = own price elasticity; $\widetilde{w}_i$ = average budget share calculated by Equation 46; θ_{ji} = cross price elasticity; index i = index of good i; index j = index of all goods.
Source: Author's calculation.

In the first column of the assumption used here is that both rice protection and tax policies are applied to rice. In reality, the government might consider all policies together, which the paper does not discuss. When the price of rice increases, the household shifts its consumption to a cheaper substitute or reduces the quantity bought, or they do both. The close substitutions of rice from Table 8 are other rice, which contains sticky rice, corn, powder, and others, all of which are with VAT applied.

Table 14, all have tax factors that produce non-zero values in the third column as the product of the second and third columns. The second column, the own-price impact itself, is the same as in Table 10. The values of the own-price impact are all negative, which means that an increase in the price of a good decreases the demand for the goods; in this case, all groups are normal goods. In the fourth column, the cross-price effect shows that some commodities have negative values, and some are not. The positive sign indicates that the cross-impact increase in prices of other goods increases the demand for these goods. Two items that have quite a large cross-effect compared to their own effect due to the increase in prices of all items are chicken eggs and salt. These two products also have the two highest efficiency ratios.

Table 15. Equity and cost-benefit ratios for the imposition of VAT on all food items

Items	$\epsilon = 0$		$\epsilon = 0.5$		$\epsilon = 1.0$		$\epsilon = 2.0$	
	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ	$w_i^\epsilon/\widetilde{w}_i$	λ
1	1.00	1.16	1.30	1.51	1.62	1.88	2.26	2.62
2	1.00	0.61	1.26	0.77	1.55	0.94	2.19	1.33
3	1.00	0.58	1.11	0.64	1.20	0.70	1.38	0.80
4	1.00	1.05	1.18	1.24	1.35	1.41	1.61	1.69
5	1.00	1.83	1.05	1.92	1.07	1.96	1.06	1.94
6	1.00	5.33	1.22	6.53	1.44	7.66	1.82	9.69
7	1.00	0.63	1.14	0.72	1.26	0.79	1.41	0.89
8	1.00	1.18	1.07	1.26	1.11	1.31	1.14	1.34
9	1.00	0.49	1.23	0.61	1.45	0.72	1.87	0.93
10	1.00	1.29	1.05	1.35	1.07	1.38	1.06	1.38
11	1.00	0.78	1.19	0.93	1.36	1.06	1.65	1.28
12	1.00	0.77	1.20	0.92	1.39	1.07	1.75	1.34
13	1.00	1.12	1.20	1.35	1.39	1.56	1.76	1.98
14	1.00	0.97	1.21	1.17	1.40	1.36	1.77	1.72
15	1.00	0.75	1.22	0.92	1.44	1.08	1.86	1.39
16	1.00	1.47	1.12	1.65	1.21	1.79	1.33	1.97
17	1.00	0.93	1.23	1.14	1.45	1.35	1.88	1.75
18	1.00	3.11	1.27	3.97	1.54	4.79	2.00	6.24
19	1.00	0.65	1.26	0.82	1.52	0.99	2.04	1.33
20	1.00	2.94	1.18	3.47	1.35	3.96	1.66	4.89
21	1.00	0.51	1.25	0.63	1.50	0.76	2.01	1.01
22	1.00	1.47	1.19	1.75	1.37	2.01	1.67	2.46
23	1.00	1.00	1.21	1.20	1.40	1.39	1.75	1.74
24	1.00	1.25	1.09	1.37	1.16	1.45	1.22	1.53
25	1.00	1.09	0.90	0.98	0.81	0.88	0.66	0.71

Notes: ϵ = is Atkinson's degree of inequality aversion, a specific term, higher value means higher proportion to the poor (not to be confused with expenditure elasticity of demand estimation); w_i^ϵ = socially representative budget share (Equation 47); $\widetilde{w}_i$ = average budget share calculated (Equation 46); λ = the marginal cost-benefit ratio (Equation 48).
Source: Author's calculation

From an equity point of view, when all food items are taxed, preserved seafood, coconut products, and other drinks show larger gaps between λ for $\epsilon=1$ and $\epsilon=2$, meaning that these products are more significant for poor families in their consumption, while poor households would consume cooking oil, garlic, and white sugar less. In addition, from an efficiency point of view, these significant products within poor household consumption have low efficiency of being taxed; however, in this scenario, all food items are taxed.

5. Conclusion

The government of Indonesia needs to increase public revenue by imposing a higher VAT rate and by proposing a new tax policy to tax all food items. This study estimates the elasticities of price and income in terms of quantity and quality. The elasticities are further utilised in the investigation of the implication of VAT policies.

The price elasticities in rural areas are different from those in urban areas. Almost all food items are more inelastic in urban areas than in rural areas. The market is more integrated in cities, and it is convenient to move from market to market when prices shift. Therefore, the price variances in cities are not as high as in villages.

The current VAT policy has six food categories, and one nonfood category taxed. By using the cost-benefit ratio to analyse the policy, the study finds that by only considering the efficiency ratio, the most efficient food items to tax are chicken eggs, salt, and other rice, which have the largest efficiency ratios. While considering both efficient and equity ratios, the study suggests that the most beneficial item to tax is fresh chicken, which has less than one cost-benefit ratio.

Two VAT policies are proposed to increase government revenue: increase the VAT rate and impose VAT on all food items. The new VAT rate policy changes the consumption patterns of poor households. From an equity perspective in Table 13, coconut products, other drinks, and rice exhibit larger gaps between λ for $\epsilon=1$ and $\epsilon=2$, meaning that these products are more important for poor families in their consumption. On the other hand, condensed milk, white sugar, and salt indicate that these items are now becoming less significant for poor families.

When the VAT rate is increased, an equity perspective shows that coconut products, other drinks and rice would become more significant in the consumption of food in poor households. However, these households would reduce their consumption of condensed milk, white sugar, and salt. However, when VAT is implemented on all food, poorer households will consume preserved seafood, coconut products, and other drinks more and consume cooking oil, garlic, and white sugar less.

6. Limitations of The Study

The difficulties in the implementation of the methodology are mostly in choosing the appropriate list of goods and their appropriate categorisation, distinguishing the taxed and untaxed categories in detail and the calculation of unit values to be analysed and the numerous adjustments that must be made to produce satisfactory results in the Indonesian context, although there would be no perfect policy suggestions. The study utilises a parametric approach, which can reduce the complexities, but several important variables are missing, which would contribute to bias, such as in the price calculations. Another weakness is that the method and assumption of the fixed market price for a community/village is generally true for rural areas but not urban areas.

The existence of self-produced commodity items that do not bear VAT directly is prevalent in the agricultural sector or rural areas. In the calculation, the own-produced items are treated as taxed, utilising the prices generated from bought commodities and hence there is probably bias. The self-produced consumption items indeed contain an element of VAT (technically called input tax) in the production of the item.

Future research can be done by conducting a tax optimisation study on VAT, income taxes, and subsidies given by the government to calculate the effectiveness of the distributional policy of both taxes and subsidies.

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Appendix

Table A1. Households based on regions

No	Area	Urban	Rural	Total
	Sumatera (Island 1)			
1	ACEH	11,496	27,199	38,695
2	NORTH SUMATERA	27,156	34,396	61,552
3	WEST SUMATERA	14,304	19,495	33,799
4	RIAU	8,923	15,068	23,991
5	JAMBI	5,544	14,558	20,102
6	SOUTH SUMATERA	9,990	22,280	32,270
7	BENGKULU	4,981	11,795	16,776
8	LAMPUNG	7,605	22,817	30,422
9	BANGKA BELITUNG ISLAN	5,851	5,822	11,673
10	RIAU ISLANDS	8,745	3,421	12,166
	Java (Island 2)			
11	DKI JAKARTA	16,486	-	16,486
12	WEST JAVA	48,484	26,203	74,687
13	CENTRAL JAVA	45,806	40,771	86,577
14	DI YOGYAKARTA	7,934	3,718	11,652
15	EAST JAVA	49,742	44,766	94,508
16	BANTEN	13,710	7,110	20,820
	Bali/NTT (Island 3)			
17	BALI	11,160	7,212	18,372
18	WEST NUSA TENGGARA	8,814	11,417	20,231
19	EAST NUSA TENGGARA	6,204	30,469	36,673
	Kalimantan (Island 4)			
20	WEST KALIMANTAN	6,935	18,202	25,137
21	CENTRAL KALIMANTAN	7,442	15,504	22,946
22	SOUTH KALIMANTAN	9,472	14,455	23,927
23	EAST KALIMANTAN	10,234	7,122	17,356
24	NORTH KALIMANTAN	3,685	4,067	7,752
	Sulawesi (Island 5)			
24	NORTH SULAWESI	9,749	15,138	24,887
25	CENTRAL SULAWESI	4,652	17,292	21,944
26	SOUTH SULAWESI	14,838	29,510	44,348
27	SOUTH EAST SULAWESI	5,656	21,434	27,090
28	GORONTALO	3,293	6,703	9,996
29	WEST SULAWESI	1,858	8,386	10,244
	Maluku/Papua (Island 6)			
30	MALUKU	5,677	11,832	17,509
31	NORTH MALUKU	3,549	12,101	15,650
32	WEST PAPUA	3,991	14,220	18,211
33	PAPUA	7,714	33,770	41,484

Table A2. First-stage estimates: Rural-Urban Consumption Patterns

RURAL	1	2	3	4	5	6	7	8	9	10	11	12
	Rice	Other rice	Tuber	Fresh fish	Fresh shrimp	P seafood	Fresh chicken	Other meat	Chicken eggs	Milk	Condensed milk	Onion
$\beta^0(t)$	-0.04731(-309.04)	-0.00278(-53.04)	-0.00599 (-80.51)	-0.01036(-86.68)	0.00252(26.69)	-0.00370(-104.14)	-0.00075(-10.48)	0.01099(60.67)	-0.00557(-156.16)	0.00376(49.06)	-0.00049(-20.05)	-0.00313(-256.25)
$\beta^1(t)$	0.10303(223.68)	0.11379(81.08)	0.18126(98.31)	0.19696(206.42)	0.22809(56.18)	0.22764(115.8)	0.10724(114.47)	0.19811(55.8)	0.11527(200.52)	0.36296(42.07)	0.14482(104.93)	0.14859(164.42)
$\tilde{\sigma}$	0.00187	0.00018	0.00041	0.00111	0.00034	0.00009	0.00031	0.00171	0.00010	0.00033	0.00003	0.00001
$\tilde{\omega}$	0.01642	0.05640	0.12244	0.05550	0.11407	0.13257	0.01712	0.11635	0.01947	0.57794	0.02159	0.05883
$\tilde{\chi}$	0.00104	0.00023	0.00028	0.00172	0.00090	0.00043	0.00022	0.00194	0.00012	0.00319	0.00010	0.00013
w	7.94%	0.70%	1.94%	3.96%	0.77%	0.72%	1.06%	2.08%	0.98%	0.68%	0.29%	0.56%
ε	0.3010	0.4865	0.5103	0.5413	1.1004	0.2607	0.8219	1.3296	0.3191	1.1916	0.6877	0.2973

RURAL	13	14	15	16	17	18	19	20	21	22	23	24
	Garlic	Vegetables	Tofu	Fruits	Cooking Oil	Coconut Product	White sugar	Other drinks	Salt	Spices	Instant noodle	Other food
$\beta^0(t)$	-0.00194(-207.87)	-0.02356(-296.86)	-0.00420(-193.36)	-0.00355(-35.25)	0.00508(-285.46)	-0.00321(-84.12)	-0.00457(-284.14)	-0.00271(-64.6)	-0.00086(-318.31)	0.00394(-197.54)	-0.00259(-118.27)	0.03101(78.01)
$\beta^1(t)$	0.16710(162.48)	0.14740(116.37)	0.14939(162.04)	0.25927(167.23)	0.17214(267.9)	0.07653(42.94)	0.10434(121.47)	0.18565(93.54)	0.14377(111.9)	0.16945(117.38)	0.20411(228.32)	0.27321(171.57)
$\tilde{\sigma}$	0.00001	0.0005	0.00004	0.0008	0.00002	0.00009	0.00002	0.00014	0.00000	0.00003	0.00004	0.01255
$\tilde{\omega}$	0.07148	0.12318	0.04436	0.14408	0.02843	0.08038	0.05269	0.2851	0.12631	0.15733	0.03971	0.19621
$\tilde{\chi}$	0.00012	0.00035	0.00015	0.00274	0.00023	0.00037	0.0001	0.00019	0.00009	0.00035	0.00019	0.01044
w	0.36%	4.43%	0.68%	2.88%	0.90%	0.67%	0.75%	0.83%	0.13%	0.85%	0.59%	17.60%
ε	0.2953	0.3210	0.2359	0.6176	0.2662	0.4420	0.2828	0.4869	0.1673	0.3648	0.3609	0.9030

URBAN	1	2	3	4	5	6	7	8	9	10	11	12
	Rice	Other rice	Tuber	Fresh fish	Fresh shrimp	P seafood	Fresh chicken	Other meat	Chicken eggs	Milk	Condensed milk	Onion
$\beta^0(t)$	-0.03277(-323.05)	-0.00109(-44.59)	-0.00233(-74.2)	-0.00946(-103.42)	0.00162(29.62)	-0.00346(-115.78)	-0.00358(-71.23)	0.00297(33.33)	-0.00618(-204.29)	0.00323(43.28)	-0.00094(-43.73)	-0.00245(-252.63)
$\beta^1(t)$	0.13044(282.86)	0.14220(92.92)	0.2380(111.07)	0.20440(207.58)	0.22936(78.9)	0.19711(96.41)	0.10808(163.6)	0.32642(79.89)	0.11347(221.33)	0.35668(57.58)	0.15834(107.94)	0.16880(176.36)
$\tilde{\sigma}$	0.0008	0.0000	0.0001	0.0007	0.0002	0.0001	0.0002	0.0005	0.0001	0.0004	0.0000	0.0000
$\tilde{\omega}$	0.0163	0.0621	0.1632	0.0534	0.0949	0.1329	0.0154	0.2122	0.0176	0.7048	0.0239	0.0633
$\tilde{\chi}$	0.0008	0.0001	0.0001	0.0013	0.0006	0.0003	0.0002	0.0020	0.0001	0.0040	0.0001	0.0001
w	4.61%	0.26%	0.49%	2.68%	0.55%	0.55%	1.04%	0.83%	0.94%	0.93%	0.24%	0.41%
ε	0.1593	0.4430	0.2854	0.4426	1.0660	0.1725	0.5486	1.0311	0.2311	0.9894	0.4436	0.2287

URBAN	13	14	15	16	17	18	19	20	21	22	23	24
	Garlic	Vegetables	Tofu	Fruits	Cooking Oil	Coconut Product	White sugar	Other drinks	Salt	Spices	Instant noodle	Other food
$\beta^0(t)$	-0.00198(-244.21)	-0.01440(-270.16)	-0.00483(-233.59)	-0.00388(-46.86)	0.00486(-291.67)	-0.00149(-69.37)	-0.00321(-249.02)	-0.00267(-68.7)	-0.00049(-262.01)	0.00367(-236.08)	-0.00321(-150.14)	-0.00918(-21.88)
$\beta^1(t)$	0.11474(106.16)	0.1881(138.93)	0.17570(213.8)	0.31768(203.44)	0.11978(191.25)	0.13803(56.23)	0.10197(101.59)	0.19141(94.52)	0.17817(124.35)	0.12709(79.91)	0.20054(255.71)	0.30894(207.95)
$\tilde{\sigma}$	0.0000	0.0002	0.0000	0.0006	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0143
$\tilde{\omega}$	0.0787	0.1324	0.0418	0.1620	0.0267	0.1214	0.0716	0.2966	0.1496	0.1848	0.0321	0.1779
$\tilde{\chi}$	0.0001	0.0003	0.0001	0.0030	0.0002	0.0002	0.0001	0.0001	0.0001	0.0003	0.0001	0.0107
w	0.30%	2.42%	0.68%	2.27%	0.76%	0.28%	0.48%	0.66%	0.07%	0.67%	0.55%	19.19%
ε	0.2270	0.2179	0.1184	0.5117	0.2377	0.3336	0.2329	0.4022	0.1340	0.3285	0.2112	0.6432

Notes:

$\tilde{\sigma}$ variance and covariance of martix $u^{0\prime}s$

$\tilde{\omega}$ variance and covariance of martix $u^{1\prime}s$

$\tilde{\chi}$ variance and covariance of martix $u^{0\prime}s$ $u^{1\prime}s$

w budget share

ε Income elasticity

β^0 parameter of equation 1

β^1 quality elasticity, parameter of equity 2

Table A3. Own- and cross-price elasticities estimates – Rural (unconstrained)

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24
r1	-0.56929	0.13601	-0.03155	0.09115	-0.02332	-0.05719	0.21309	-0.03102	0.17974	-0.02751	-0.07225	-0.09758	0.03489	-0.06028	0.06309	-0.09388	-0.07214	-0.00283	0.06471	-0.07580	-0.00087	-0.02039	-0.04232	-0.08311
r2	0.21763	-1.02750	-0.03578	-0.46211	0.05281	-0.09312	0.28429	0.09294	0.15399	-0.16415	-0.00694	0.28498	-0.00968	-0.14599	-0.04873	-0.03991	0.52524	0.08249	-0.12378	-0.04086	-0.03851	0.11581	0.06983	0.14780
r3	2.01425	-0.01724	-0.59201	-0.31902	-0.29594	0.12682	-0.60645	0.01263	-0.22440	-0.07342	0.00563	0.30155	-0.13167	-0.36984	-0.50677	0.03495	2.36281	0.02668	0.81980	-0.37068	0.11491	-0.12726	1.41658	0.73359
r4	-0.33829	0.13315	-0.00299	-0.91151	-0.11806	0.09347	0.10174	-0.03313	0.21015	-0.00102	0.06192	0.11004	0.06857	-0.03158	0.07381	0.05306	0.07122	0.03119	-0.20543	0.12548	-0.06004	-0.02267	-0.04413	-0.06167
r5	-0.36956	0.05942	0.13782	-0.26796	-0.96823	0.10855	0.14971	0.03069	0.44029	0.06356	-0.07913	0.10152	0.13524	-0.01724	0.14405	-0.02654	-0.19510	-0.01268	-0.16297	0.19029	-0.00848	-0.06488	0.31951	0.05233
r6	-0.10724	0.02760	-0.13605	0.21130	0.03939	-0.83861	0.37760	-0.00813	0.07534	-0.01198	-0.11828	0.04866	-0.03841	-0.16844	0.10302	-0.07324	0.18885	0.14926	-0.05542	-0.03395	0.03636	-0.05071	0.00197	0.04459
r7	0.16336	0.08301	-0.17456	0.15935	0.02749	0.01283	-0.83419	0.20105	0.12842	0.00234	-0.52184	0.00705	0.00936	0.00316	-0.00367	-0.04895	0.10193	0.06836	0.13281	0.17191	0.12787	0.00710	-0.07803	-0.14777
r8	-0.57928	-0.05297	-0.15844	0.15079	-0.08155	-0.09187	0.09530	-0.71541	0.50326	0.04644	-0.02539	0.23077	-0.14348	-0.15450	-0.10713	-0.21271	0.03881	-0.12193	-0.06044	-0.17075	0.08060	-0.08684	0.49119	0.32127
r9	0.25313	0.04997	0.02925	0.07074	0.04406	0.01779	-0.07427	0.04918	-0.75355	-0.00251	-0.16304	-0.00570	-0.00676	0.02638	0.02947	0.03239	0.00859	0.03276	0.00483	0.06811	0.04953	-0.00092	-0.02342	-0.16984
r10	-0.06455	-0.02953	0.02470	-0.09629	0.03127	0.03710	-0.02931	0.06932	-0.14743	-0.35112	0.05851	0.09349	-0.05576	-0.06759	-0.05201	0.10425	0.04413	0.03837	0.00125	0.03346	0.02044	-0.01858	0.13115	-0.18279
r11	-0.06897	0.03732	-0.11717	-0.00373	-0.11132	-0.01089	-0.09316	0.03159	-0.16069	-0.02202	-0.48517	-0.07625	0.01531	0.14157	0.02193	0.03052	0.20083	-0.00564	0.08952	0.17184	0.09208	-0.02109	-0.22124	0.04247
r12	0.49877	-0.04812	-0.04312	-0.07083	0.01444	-0.04343	0.09811	-0.01141	-0.14812	-0.02179	0.35318	-0.85819	-0.04097	0.31300	-0.10408	0.00548	0.51192	0.02549	0.07490	-0.02345	0.05680	-0.00685	0.13888	-0.01295
r13	0.50741	-0.05915	-0.12711	-0.09114	0.01766	-0.07935	0.05650	0.02572	-0.24369	0.00827	0.14748	0.01149	-0.79042	0.36087	-0.13471	0.00450	0.82345	0.05988	-0.01485	0.00100	0.09581	-0.02055	-0.17247	-0.01010
r14	0.51201	-0.03162	-0.03030	0.05850	0.00700	-0.03435	-0.07327	-0.02660	0.06576	-0.01382	-0.01323	-0.05766	-0.00955	-0.88672	-0.09008	-0.07728	0.38981	0.01440	0.10943	-0.07949	0.04618	0.01465	0.08839	0.21576
r15	0.22117	0.01494	-0.01536	0.07468	0.06585	-0.00292	-0.04041	0.01813	-0.17164	0.02522	-0.12463	-0.02984	-0.07267	0.00932	-0.98869	0.03560	0.09037	0.01444	0.01437	0.07031	0.05600	0.02256	0.03282	-0.07479
r16	-0.05100	0.04050	-0.18879	-0.17637	0.05299	0.00886	0.04077	-0.06530	-0.06365	-0.08628	-0.10425	0.08740	-0.06185	0.02269	0.03624	-0.53001	0.03116	-0.08590	-0.03422	-0.05559	-0.04382	0.00162	-0.16323	0.14612
r17	0.15130	-0.01763	-0.00117	0.04562	0.03124	0.00256	0.03709	0.03804	-0.01240	0.00039	0.06241	-0.08081	0.03939	0.09914	0.01863	-0.00937	-0.51771	-0.14694	-0.02742	0.03073	0.04649	0.00956	-0.08730	-0.07180
r18	-0.00988	0.30099	-0.01602	-0.28157	-0.07470	-0.05710	-0.19937	-0.02279	0.18853	-0.00076	0.09713	0.21789	-0.10965	0.14506	-0.01311	-0.34715	0.14141	-1.06449	0.07687	-0.09534	0.04211	-0.02434	0.09389	0.08233
r19	0.23451	0.03015	-0.01775	-0.09452	-0.07499	-0.03771	0.14358	-0.01139	0.04280	0.00938	0.26818	0.00539	0.05653	0.10165	-0.01775	0.00379	0.27777	0.02818	-0.98886	-0.01636	0.06976	0.00425	-0.07817	-0.03246
r20	0.24759	0.06678	-0.11884	0.02507	0.06357	-0.07389	0.14039	0.04826	0.26604	-0.05358	0.25382	-0.04710	-0.01825	0.14552	-0.02080	-0.05824	0.12129	0.00158	0.04577	-1.03351	0.07249	-0.04570	-0.15448	0.06461
r21	0.28887	0.01381	-0.07462	0.05209	-0.00886	-0.05152	0.10375	0.00187	0.22421	-0.03753	-0.18295	0.01023	-0.00047	0.00827	0.07329	-0.05965	-0.03573	0.00691	0.23181	0.03955	-0.49709	-0.08801	0.07888	-0.05516
r22	0.05043	0.09770	-0.00112	-0.03283	-0.02318	0.00578	0.03834	-0.02857	0.08152	-0.00609	0.05379	-0.00818	-0.01110	0.04502	0.05657	-0.02003	0.18892	-0.05859	-0.15685	0.00281	-0.00195	-0.72798	0.08981	0.01872
r23	0.07973	0.03082	-0.03383	-0.01803	-0.02585	0.00380	0.09227	0.04663	0.04080	-0.06996	-0.06638	0.00440	-0.02067	0.07229	0.08812	0.00975	0.06239	0.02003	0.05603	0.08339	0.07439	-0.00359	-0.54416	-0.08278
r24	0.05254	-0.07655	-0.03388	-0.06788	0.00572	-0.01402	-0.05477	-0.08346	-0.13953	-0.07983	-0.01065	-0.05176	-0.01065	-0.05490	-0.02768	-0.07145	-0.18161	-0.02693	-0.03369	-0.05905	-0.06127	0.01208	-0.19051	-0.55945

Notes: r1 = rice; r2 = other rice; r3 = tuber; r4 = fresh fish; r5 = fresh shrimp; r6 = preserved seafood; r7 = fresh chicken; r8 = other meat; r9 = chicken eggs; r10 = milk; r11 = condense milk; r12 = onion; r13 = garlic; r14 = vegetables; r15 = tofu and tempeh; r16 = fruits; r17 = cooking oil; r18 = coconut products; r19 = white sugar; r20 = other drinks; r21 = salt; r22 = spices; r23 = noodle; r24 = other food; r25 = non-food; the column is the good whose price is changing, and the row is the good affected.
Source: Author's calculation

Table A4. Own- and cross-price elasticities estimates – Urban (unconstrained)

	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15	r16	r17	r18	r19	r20	r21	r22	r23	r24
r1	-0.19151	0.00300	-0.12217	-0.04981	-0.01460	-0.05652	0.03929	-0.02726	0.28284	0.02048	-0.07866	-0.04920	0.03926	-0.04337	-0.01095	-0.05629	0.11619	-0.04422	0.01709	-0.12950	0.00707	-0.02065	-0.20332	-0.07231
r2	0.25005	-0.58433	-0.22451	-0.19504	-0.09880	0.07647	-0.02731	0.00498	0.40409	-0.20742	0.15535	0.13745	0.06581	-0.13147	0.10255	-0.13903	0.39778	-0.06249	0.01059	-0.17346	0.03951	0.05243	0.02794	0.22130
r3	0.77569	0.09927	-1.01451	0.01450	-0.15093	-0.04373	-0.03545	-0.00780	0.50453	-0.09355	-0.39474	0.16674	0.10772	-0.26831	0.09314	0.06435	1.42774	-0.10451	0.14542	-0.15622	0.11584	-0.02528	0.25693	0.40791
r4	-0.08129	0.07153	-0.09555	-0.76511	-0.21129	0.03372	0.09254	0.07305	0.53346	-0.00596	0.07085	0.05067	0.07669	0.04126	0.09321	0.10673	-0.07430	-0.03342	-0.01998	0.17666	0.02475	-0.04822	0.05846	-0.01510
r5	-0.23561	0.07436	-0.07865	-0.12079	-1.10312	0.01856	0.02042	0.18593	0.67055	-0.05523	0.19060	-0.06209	0.11449	-0.03888	0.05423	0.31111	-0.06064	0.01182	0.07276	0.10649	0.01958	-0.04209	0.11083	-0.22706
r6	-0.56866	0.02679	-0.11221	0.11971	0.18129	-0.84944	0.27655	-0.05933	0.45284	-0.06866	-0.19736	0.18849	-0.11696	-0.09469	-0.01858	-0.02842	0.30636	0.03414	-0.10174	-0.04201	0.05821	-0.01200	-0.20772	0.23217
r7	0.46863	0.00445	0.06188	0.12572	0.04809	0.02857	-0.70226	0.14043	0.04642	-0.01053	-0.11812	0.05289	-0.00986	-0.03238	-0.03539	0.05041	-0.22847	0.03894	0.00892	0.01947	0.03984	0.02555	0.05527	-0.18264
r8	-0.24228	-0.08397	-0.27839	0.00672	-0.15810	-0.23351	0.35037	-0.35007	0.64640	0.02313	-0.15981	0.07029	0.03405	-0.15511	0.01809	0.03455	0.31741	-0.13140	-0.06980	-0.23982	0.06055	-0.01293	-0.13010	0.08636
r9	0.39078	0.03578	0.06552	0.03532	0.04490	0.00829	-0.08090	0.04730	-0.45033	-0.04373	-0.05641	0.00640	-0.01721	-0.02221	-0.03354	0.04789	-0.13019	0.01566	0.00959	0.02584	0.03774	0.00214	0.02323	-0.10302
r10	0.06345	0.00503	0.05203	0.07986	0.02068	-0.01369	0.02124	0.06485	-0.12904	-0.45636	-0.11971	-0.05149	-0.00466	-0.03750	-0.05109	0.13129	0.06802	0.01830	-0.07408	0.00148	0.03044	-0.01800	0.23573	-0.10826
r11	0.07045	-0.07908	-0.02660	-0.05943	-0.10324	-0.04226	-0.08185	-0.05995	0.16853	-0.01209	-0.39635	-0.01573	0.01190	-0.03759	0.03129	0.12850	0.09752	-0.03854	0.04649	0.03192	0.05458	-0.01584	-0.01204	-0.08081
r12	0.14377	0.07204	-0.00537	-0.07834	-0.00342	-0.05940	0.05219	0.04258	0.04228	0.01032	0.05650	-0.80748	-0.09644	0.22929	0.05326	-0.00039	0.02407	-0.02750	-0.00078	0.01759	0.05963	-0.02146	0.05246	-0.12173
r13	0.26632	0.05834	-0.00817	-0.05452	0.02912	0.01412	-0.00884	0.07992	-0.13585	0.04627	-0.00681	0.01843	-0.87505	0.13139	0.00138	0.02075	0.22104	-0.01460	0.02200	-0.01437	0.07190	0.01417	0.12150	-0.10837
r14	0.02706	0.03839	-0.02325	-0.02516	0.01543	0.01240	0.01378	-0.04364	0.21155	-0.02500	-0.04081	0.06180	-0.03700	-0.85666	0.02431	-0.04479	0.21858	-0.06258	0.00802	-0.09752	0.04892	0.02561	0.00358	0.08900
r15	0.33513	-0.02640	0.04402	0.18027	0.07860	0.01601	0.13618	0.01995	-0.07169	-0.02401	-0.00281	0.05737	-0.12241	-0.02543	-1.06976	-0.11533	0.10115	0.03092	0.02182	-0.02533	0.01636	0.00592	0.14941	0.01438
r16	-0.05999	-0.06909	-0.20012	-0.10772	0.03865	-0.04220	-0.01448	-0.05455	-0.11043	-0.07535	0.02286	0.07543	0.00309	-0.01419	-0.05460	-0.50374	0.01492	-0.04343	-0.00339	-0.14710	0.00242	-0.03618	0.00839	0.23203
r17	0.03613	-0.00568	-0.00184	0.01372	-0.01775	0.01251	-0.00768	0.08013	0.13967	-0.00306	0.05951	-0.04390	0.03194	0.05713	-0.00401	-0.00442	-0.50323	-0.11932	0.01820	-0.00838	0.04114	-0.00258	-0.01479	-0.06280
r18	-0.00228	0.26025	-0.10710	-0.52790	-0.10905	-0.07091	-0.06281	-0.09439	0.29483	0.00346	0.12179	0.11768	0.03230	-0.06862	0.13127	-0.03825	0.26090	-0.92828	0.10184	-0.13922	0.10836	-0.08327	-0.29052	0.04390
r19	0.13922	0.09971	-0.06195	-0.12681	-0.20386	-0.03129	0.14688	0.02819	0.12966	0.03631	0.15918	0.02874	0.03679	0.04012	0.07847	0.00015	0.18693	-0.03228	-0.96477	0.06376	0.10902	-0.02410	0.00984	-0.05959
r20	0.14414	0.01272	-0.04743	-0.01325	0.00378	-0.06113	0.06631	-0.03372	0.29099	-0.08550	0.09360	0.03151	-0.00107	0.00373	-0.00615	-0.07865	0.07328	-0.06091	-0.02614	-0.99318	0.02656	0.01626	-0.01552	0.04661
r21	-0.09262	0.07132	-0.03702	-0.08060	-0.08555	-0.07787	0.09335	0.09805	0.17841	-0.00144	0.02818	0.11309	-0.03843	0.01317	0.12942	-0.02497	0.11964	-0.06377	0.06280	0.04706	-0.63062	-0.09122	0.02612	-0.06592
r22	0.07426	0.07527	-0.04806	-0.08596	-0.11458	-0.03813	0.07178	0.02666	0.01336	-0.03078	-0.01778	-0.04544	0.05646	0.07970	0.11239	-0.01073	0.24561	-0.04260	-0.02958	0.05468	0.03747	-0.92519	0.04946	0.00195
r23	0.13204	0.01023	-0.04908	0.08097	-0.06887	-0.03642	-0.02419	-0.00115	0.06359	-0.09472	-0.00385	0.02576	-0.00561	0.01786	0.03822	-0.00997	0.00131	0.01667	0.01914	0.06075	0.03439	-0.02438	-0.30347	-0.01869
r24	-0.18211	-0.03447	-0.07361	-0.08852	-0.01323	-0.04384	0.01642	-0.14885	-0.13016	-0.07596	0.06334	-0.07984	0.03621	-0.00641	-0.07313	-0.13468	0.07804	0.02402	-0.02515	-0.05038	-0.05060	0.00141	-0.05048	-0.47017

Notes: r1 = rice; r2 = other rice; r3 = tuber; r4 = fresh fish; r5 = fresh shrimp; r6 = preserved seafood; r7 = fresh chicken; r8 = other meat; r9 = chicken eggs; r10 = milk; r11 = condense milk; r12 = onion; r13 = garlic; r14 = vegetables; r15 = tofu and tempeh; r16 = fruits; r17 = cooking oil; r18 = coconut products; r19 = white sugar; r20 = other drinks; r21 = salt; r22 = spices; r23 = noodle; r24 = other food; r25 = non-food; the column is the good whose price is changing, and the row is the good affected.
Source: Author's calculation

Table A5. Food commodities grouping

No.	Code	Label	Items	Description
1	r1	rice	Rice	rice (locally produced, medium quality, premium quality, and imported
2	r2	othrice	Other rice	sticky rice, corn, powder, others
3	r3	tuber	Tuber	tuber, potatoes, sagoo, others
4	r4	ffish	Fresh fish	all kind of fish
5	r5	fshrimp	Fresh shrimp	shrimp, lobster, squids, crab, other sea products, snails
6	r6	pseafood	Preserved seafood	all preserved fish and preserved sea products
7	r7	fchicken	Fresh Chicken	non Free range Chicken
8	r8	othmeat	Other meat	beef, goat, pork, free range chicken, other meat
9	r9	ceggs	Chicken eggs	non free range eggs
10	r10	milk	Milk	liquid milk, powder milk, baby powder milk, other milk
11	r11	cmilk	Condense milk	condense milk
12	r12	onion	Onion	onion
13	r13	garlic	Garlic	garlic
14	r14	vege	Vegetables	all kind of vegetables except herbs and spices
15	r15	tofu	Tofu and tempeh	tofu and tempeh
16	r16	fruits	Fruits	all kind of fruits
17	r17	cookingoil	Cooking oil	cooking oil made of (palm oil, sunflower)
18	r18	coconut	Coconut products	coconut oil, coconut, other
19	r19	sugar	White sugar	white sugar
20	r20	drinks	Other drinks	palm sugar, other sugar, tea, coffee, other drink materials
21	r21	salt	Salt	salt
22	r22	spices	Spices	all spices: candlenut, ketchup, vetsin, ready to use seasoning, other spices
23	r23	noodle	Instant noodle	instant noodle
24	r24	othfood	Other food	free range eggs, duck eggs, other eggs, nuts, ungbean, oncom and other nut products, crackers, baby porridge, all processed food, and drink (ready to consume), snacks, water, ice cream, alcohol.

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SURVEI SOSIAL EKONOMI NASIONAL 2021

KETERANGAN SOSIAL BUDAYA DAN PENDIDIKAN

SELAMAT PAGI/SIANG/SORE/MALAM. KAMI/SAYA DARI BPS SEDANG MENGUMPULKAN DATA/INFORMASI KEADAAN SOSIAL EKONOMI RUMAH TANGGA SEPERTI SOSIAL, BUDAYA, PENDIDIKAN, DAN PENGELUARAN RUMAH TANGGA. UNTUK ITU KAMI/SAYA AKAN MEWAWANCARAI BAPAK/IBU BESERTA ANGGOTA RUMAH TANGGA (ART) LAINNYA. SELURUH DATA YANG BAPAK/IBU BERIKAN KEPADA KAMI AKAN DIRAHASIAKAN DAN HANYA AKAN DIGUNAKAN UNTUK KEPERLUAN PERENCANAAN PEMBANGUNAN. BOLEH SAYA MULAI WAWANCARA SEKARANG?

☐ *Ya bersedia ⇨ Mulai wawancara*
☐ *Bersedia dengan perjanjian di lain waktu ⇨* ***Blok XXII Catatan***
☐ *Tidak bersedia ⇨ Lengkapi isian Blok I, II, dan Blok XXII. Catatan. Lampirkan Berita Acara Nonrespon. Selesai dan segera laporkan ke pengawas.*

RAHASIA SEPTEMBER

BLOK I. KETERANGAN TEMPAT			
101	Provinsi		☐☐
102	Kabupaten/Kota*)		☐☐
103	Kecamatan		☐☐☐
104	Desa/Kelurahan*)		☐☐☐
105	Klasifikasi Desa/Kelurahan	*1.Perkotaan 2. Perdesaan*	☐
106	Nomor Blok Sensus		
107	Nomor Kode Sampel		☐☐☐☐☐
108	Nomor Urut Bangunan Fisik di Sketsa Peta WB		
109	Nomor Urut Sampel Rumah Tangga		Maret 2021 ☐☐ / September 2021 ☐☐
110	Nama Kepala Rumah Tangga	....	
111	Alamat (Nama Jalan/Gang, RT/RW/Dusun)	....	
112	Koordinat Lokasi Rumah Tangga	*Latitude* (lintang) : ☐ ☐☐°☐☐'☐☐" *Longitude* (bujur) : T ☐☐☐°☐☐'☐☐"	

*) *Coret yang tidak perlu*

BLOK II. KETERANGAN PENCACAHAN				
Uraian	Nama dan Kode/NIP	Jabatan	Tanggal	Tanda tangan
201. Pencacah	.... ☐☐☐☐☐	Staf BPS Provinsi ...1 Staf BPS Kab/Kota .2 KSK ....3 Mitra....................4	Tgl ☐☐ Bln ☐☐	
202. Pengawas	.... ☐☐☐☐☐	Staf BPS Provinsi ...1 Staf BPS Kab/Kota .2 KSK ....3 Mitra....................4	Tgl ☐☐ Bln ☐☐	
203.Hasil pencacahan rumah tangga		Terisi lengkap..........................1 Terisi tidak lengkap....................2 Tidak ada ART/responden yang dapat memberi jawaban sampai akhir masa pencacahan. ....3 Responden menolak ....4 Rumah tangga pindah/bangunan sensus sudah tidak ada 5	☐ *Blok XXII. Catatan*	

BLOK III. RINGKASAN		
301	Banyaknya anggota rumah tangga	☐☐
302	Banyaknya anggota rumah tangga berumur 0 - 4 tahun	☐☐
303	Banyaknya anggota rumah tangga berumur 0 - 17 tahun dan belum kawin	☐☐
304	Banyaknya anggota rumah tangga berumur 5 tahun ke atas	☐☐
305	Banyaknya anggota rumah tangga berumur 10 tahun ke atas	☐☐

BLOK XXI. KETERANGAN PENGHASILAN RUMAH TANGGA	
2101. A. APAKAH SUMBER TERBESAR PEMBIAYAAN DI RUMAH TANGGA INI?	1. ART YANG BEKERJA →***2101.B*** 2. KIRIMAN UANG/BARANG →***2101.C*** 3. INVESTASI (DEPOSITO, ROYALTI, SAHAM, BUNGA BANK, DAN SEJENISNYA) 4. PENSIUNAN ☐
B. (***Jika 2101.A = 1***), SIAPAKAH ANGGOTA RUMAH TANGGA YANG MENANGGUNG PEMBIAYAAN TERBESAR?	Nama: .... / No.urut ART: ☐☐
C. (***Jika 2101.A = 2***), APABILA MENERIMA KIRIMAN UANG/BARANG, DARI MANAKAH SUMBER UTAMANYA?	1. ORANG TUA 2. ANAK 3. FAMILI LAIN 4. LAINNYA ☐
	Waktu selesai wawancara: ☐☐ : ☐☐

BLOK XXII. CATATAN						
KUNJUNGAN I	:	TANGGAL:	MULAI: ☐☐ : ☐☐	SELESAI: ☐☐ : ☐☐	NAMA DAN NOMOR URUT PEMBERI INFORMASI	:.............................. ☐☐
KUNJUNGAN II	:	TANGGAL:	MULAI: ☐☐ : ☐☐	SELESAI: ☐☐ : ☐☐	NAMA DAN NOMOR URUT PEMBERI INFORMASI	:.............................. ☐☐
KUNJUNGAN III	:	TANGGAL:	MULAI: ☐☐ : ☐☐	SELESAI: ☐☐ : ☐☐	NAMA DAN NOMOR URUT PEMBERI INFORMASI	:.............................. ☐☐

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Figure A1. Ethical document for SUSENAS (National Socio-Economic Household Survey)

Chapter 5 Conclusion

VAT has been applied since 1984 in Indonesia and its structure has been shifted several times by legislative changes in 1994, 2000, and 2009. However, the major change in VAT exemption design has not changed significantly.

The first study found that Indonesian VAT is highly regressive in terms of income but proportional or slightly progressive from the point of view of expenditure. Lower-income households pay a higher proportion of their income in VAT compared to higher-income households. However, when the basis of measurement is an expenditure, VAT seems quite proportional. The key indicators, Gini, Kakwani and Reynold-Smolensky Indices, were employed and the result indicates that the power of Indonesian VAT to redistribute any progressivity in its current system is small. Therefore, it is better for the government to think about the design and structure of Indonesian VAT.

The reform in 2009 introduced additional food commodities: vegetables, meat, and dairy. In the first study, the policy slightly improved the progressivity by using the inequality indicators and IFLS data. However, after analysing the 2009 VAT reform by using a different method which is unbalanced fixed-effect panel regression, the more detailed results show that these three commodities have different consumption patterns. Vegetables show negative income elasticity, in which the higher income a household has, the less percentage of total expenditure it would consume. On the other hand, meat and dairy have positive elasticity in which the higher income a household has, the more in the percentage of total expenditure it consumes the items. Therefore, imposing VAT on vegetables will hurt the poor, and on the contrary, imposing VAT on meat and dairy will hurt the rich. This indicates the vegetables must be considered to be on the VAT-exempt list, which it is now. However, meat and dairy must be considered to be taxed in the future.

The consumption patterns of other food commodities are examined. For the purpose of distributional or progressivity, staple food, salt, vegetables, fish, beverages, spices, alcohol-tobacco, cooking oil, and sugar should be considered to be exempted, while snacks, prepared food bought and eaten away from home, dried food, and meat are potential to be taxed.

The third study formulates the scheme to examine VAT exemption policy recommendations by using the knowledge of consumption patterns of Indonesian households. The knowledge of price and income elasticities, the share of consumption across households, and the formula produces the cost-benefit ratio that the proposed policy may cause.

All in all, the government still has much space to reform the current VAT system and can improve the VAT design by diligently conducting evidence-based policymaking.