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The dynamics of strategically important food preference in Indonesia: An empirical evaluation of consumption pattern and welfare loss

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ABSTRACT

This study evaluated regional heterogeneity in food consumption patterns across Indonesia. The demand system for strategically important food commodities was estimated for five regions: Sumatera, Java-Bali, Kalimantan, Sulawesi, and Nusa Tenggara-Maluku-Papua (Nusmapua). A two-step budgeting procedure based on the Quadratic Almost Ideal Demand System (QUAIDS) framework was used to estimate the unconditional elasticities of each food item in each regional setting, together with household data from the 2018 national socio-economic survey by Statistics Indonesia. The results showed that elasticities differ significantly across the regions, suggesting that regional heterogeneity needs to be considered when estimating demand structure. The estimated elasticities were used to conduct a welfare impact analysis of a simulated price increase, which showed that disregarding regional heterogeneity can overstate or understate welfare loss caused by price increases.

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1. Introduction

Increasing food prices are now a global phenomenon. The world food price index recorded by the World Bank reached 158.87 in April 2022, the highest value since its baseline year (2010), and it is expected to rise further before easing in 2023. The major cause of the increase is supply disruptions due to the war in Ukraine, as Ukraine and Russia are major exporters of globally important commodities (World Bank, 2022). Supply disruptions in energy and fertiliser have added to the higher food prices. Other explanations include low demand elasticity for food products, which means that higher production costs easily translate into higher market price. Higher food prices are currently not only affecting food-importing countries, but also food-exporting countries such as Indonesia (palm oil exporter). The price of cooking oil is normally stable on the domestic market in Indonesia, but it suddenly increased in early 2022 due to higher international prices and in January 2022 was up to 37% above its previous stable point according to official data. Thus studies on the welfare impact of food price increases on consumers are of relevance at this time.

Over the years, there have been many publications on consumption patterns in Indonesia with specific focus on food products. An early study by Boediono (1978) examined general consumption patterns for 41 commodity categories, while

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studies by Timmer and Alderman (1979), Teklu and Johnson (1987) and Deaton (1990) focused on food products deemed strategically important at the time. A more recent study by Widarjono and Rucbha (2016) considered general commodity categories and assessed the implications of price or income support policies, while Saliem (2016), Faharuddin et al. (2019, 2017) and Nikmatul et al. (2020) specifically focused on animal-based food products. However, no study had attempted to quantify the welfare impact of food price increases using consumption pattern data until newly published research by Khoiriyah et al. (2023) on animal-based food products. No previous study has explored the consumption pattern of strategically important food commodities or has considered regional heterogeneity in estimating consumption patterns.

Quantitative measurement of welfare impact in policy discussions at global level was recently raised by e.g. Azzam and Rettab (2012), Wang and Çakır (2021) and Roosen et al. (2022). The approach involves estimating demand elasticity using demand system analysis and then using the elasticities to calculate compensating variation. Food consumption patterns have been explored in depth, to compare the pattern between countries (Abdulai, 2002) and also within countries (Gould and Villarreal, 2006; Hovhannisyan et al., 2020). However, studies estimating specific food consumption patterns and measuring the welfare impacts of food price increase are lacking for the specific case of Indonesia.

Against this background, this aim of the present study was to fill research gaps as regards Indonesian food consumption patterns by using more recent survey data, considering different commodity categories and acknowledging recent suggestions that demand structure may differ across regions. In welfare impact analysis, the estimated elasticities obtained were used to assess the impacts of recent food price increases. Regional heterogeneity was considered by estimating the demand system for each region of Indonesia individually, allowing all parameters within the demand system to differ across regions. This enabled more accurate elasticities to be captured, since regional elasticities may be structurally different in Indonesia because of differing food origins across its regions.

Specific objectives of the present study were therefore to identify food consumption patterns across Indonesia and to calculate the welfare impact of food price increases for each region. The main research questions addressed were whether the strategic food consumption pattern in Indonesia (based on 2018 survey data) has been altered by recent price changes; whether the pattern differs significantly across regions; and whether estimated elasticities can quantitatively measure the welfare impacts of food price increases The remainder of this paper is organised as follows: Section 2 describes the data used in the analysis, descriptive statistics and the food products selected for analysis. Section 3 presents the empirical strategy employed, including unit value correction, demand system estimation, the two-stage budgeting procedure and welfare impact evaluation. Section 4 presents and discusses the results for each of the three research questions. Section 5 draws some conclusions, considers the policy implications and makes some recommendations for future studies.

2. Data description

Official Indonesia National Socio-Economic Survey data for 2018 obtained from Statistics Indonesia were used as the main data source in demand system estimation. This national survey is designed to represent all Indonesian households at the time of survey, using a weighting scheme for each observation. The main survey variables relevant for demand system estimation include budget share, unit value and sociodemographic variables such as age, education level, household size and location information. However, since the unit value is calculated from total spending divided by total quantity for each commodity it may contain quality variation, so in this study an adjustment procedure was used to remove quality variation and leave only price variation.[1] The survey data have been used in previous studies estimating demand system in Indonesia, e.g. by Boediono (1978), Deaton (1990) and Widarjono and Rucbha (2016).

Strategically important commodities selected for analysis in this study were: rice, chicken meat, beef, egg, shallot, garlic, chilli, fish, cooking oil, white sugar and flour, plus two other categories (processed food, other food items), to give a complete food demand system. However, since there were many zero observations for beef consumption in the data, aggregation was necessary to avoid problems caused by this (Bellemare and Wichman, 2020). Therefore, in this study the meat category consisted of poultry and beef meat, to avoid data-related complications while still gaining a picture of consumption in Indonesia.

The survey data used were: expenditure, price from adjusted unit value, budget share and socio-economic variables as demand shifters. The expenditure data consisted of total household expenditure for the first-stage demand system and household food expenditure for the second-stage demand system. The price data and budget share data were for each category within the first- and second-stage demand system. The sociodemographic data covered household size, household head age, household education level (as dummy variable) and household location. The total sample size in the survey was 295,155 households representing all 70,102,195 households in Indonesia, but not all observations were available for demand system estimation as only households with complete consumption data were included. Summary statistics for each variable are listed in Table 1 (and Table A.1 in an appendix and Table S1 in supporting documents to this paper).

Regional heterogeneity was not analysed for all provinces in Indonesia, but rather for five groups of provinces (Sumatera, Java-Bali, Kalimantan, Sulawesi, Nusa Tenggara-Maluku-Papua (Nusmapua)), based on a classification commonly

[1] Separation following a method developed by Cox and Wohlgenant (1986) and Goldman and Grossman (1978) and previously used in Faharuddin et al. (2019). This method has been criticised in Gibson and Kim (2017), who showed that the results exaggerate the true elasticity value. However, they also concluded that the elasticity estimates produced by this correction method are better than those obtained using the plain unit value measurement approach.

Table 1
Statistical description of variables.
Source: Author's own calculation

Variable	Obs.	Weight	Mean	Std. dev.	Min	Max
Expenditure Variables						
lntotalexp	295,155	70,102,195	14.99	0.72	11.81	19.04
lntotalfoodexp	295,155	70,102,195	12.91	0.62	9.90	15.85
Price Variables						
lnpfood (food)	295,155	70,102,195	9.09	0.24	7.86	10.37
lnpnfood (non-food)	295,155	70,102,195	10.28	0.66	7.76	13.39
lnp1 (rice)	295,155	70,102,195	9.21	0.12	8.47	9.94
lnp2 (meat)	294,221	70,045,603	10.34	0.28	9.28	11.90
lnp3 (egg)	295,150	70,101,936	7.31	0.12	6.60	8.03
lnp4 (shallot)	295,155	70,102,195	7.86	0.28	6.71	9.43
lnp5 (garlic)	295,155	70,102,195	7.97	0.26	6.67	9.32
lnp6 (chilli)	295,155	70,102,195	10.43	0.29	8.70	11.89
lnp7 (fish)	294,775	70,075,010	9.93	0.40	7.65	11.33
lnp8 (cooking oil)	295,155	70,102,195	9.39	0.13	8.24	10.38
lnp9 (white sugar)	295,155	70,102,195	7.27	0.29	6.33	9.22
lnp10 (flour)	289,702	69,571,315	9.04	0.16	7.75	9.88
lnp11 (processed food)	295,150	70,101,936	8.34	0.27	6.88	9.87
lnp12 (other food items)	295,155	70,102,195	8.59	0.43	6.45	10.46
Budget Share Variables						
w1 (rice)	287,629	67,978,083	0.14	0.08	0.00	0.91
w2 (meat)	116,934	34,211,289	0.06	0.04	0.00	0.67
w3 (egg)	232,674	58,308,185	0.03	0.02	0.00	0.53
w4 (shallot)	268,954	63,125,695	0.01	0.01	0.00	0.17
w5 (garlic)	254,782	60,743,720	0.01	0.01	0.00	0.16
w6 (chilli)	254,821	60,619,044	0.02	0.02	0.00	0.36
w7 (fish)	261,872	60,365,098	0.09	0.06	0.00	0.68
w8 (cooking oil)	255,657	61,088,666	0.03	0.02	0.00	0.42
w9 (white sugar)	269,281	62,519,088	0.02	0.01	0.00	0.26
w10 (flour)	88,470	24,081,597	0.01	0.01	0.00	0.24
w11 (processed food)	292,362	69,826,196	0.34	0.17	0.00	1.00
w12 (other food items)	293,546	69,599,790	0.32	0.12	0.00	1.00
Socioeconomic Variables						
size	295,155	70,102,195	3.77	1.65	1.00	30.00
hhage	295,155	70,102,195	48.09	13.92	11.00	97.00
urban	295,155	70,102,195	0.55	0.50	0.00	1.00
Education Dummy						
hheduc0	295,155	70,102,195	0.23	0.42	0.00	1.00
hheduc1 (primary)	295,155	70,102,195	0.28	0.45	0.00	1.00
hheduc2 (secondary)	295,155	70,102,195	0.16	0.36	0.00	1.00
hheduc3 (high school)	295,155	70,102,195	0.25	0.43	0.00	1.00
hheduc4 (college)	295,155	70,102,195	0.08	0.27	0.00	1.00
hheduc5 (graduate)	295,155	70,102,195	0.01	0.09	0.00	1.00
Provincial Dummy	For provincial dummy statistical description, see Table A.1 in appendix					

used for evaluating price management policies (Table 2). This classification was used to obtain a picture of regional heterogeneity and of how price change is perceived in each region, and to determine whether a particular price change affects household welfare differently across regions. The results for the regions were used to assess whether regional heterogeneity plays a significant role in explaining food consumption pattern in Indonesia.

3. Method and empirical strategy

The approach employed to address the research questions involved: (i) interpreting elasticities and comparing these with elasticity values from previous studies, (ii) determining differences in elasticities between regions, and (iii) examining variations in welfare impact across regions. The empirical methods used were: (i) estimation of the first-stage (unconditional) and second-stage (conditional) demand system (Fig. 1), using the Quadratic Almost Ideal Demand System (QUAIDS) framework developed by Banks et al. (1997), for all observations and each region separately; (ii) calculation of unconditional elasticities from the two-stage budgeting procedure; and (iii) estimation of the welfare impact of food price increases by calculating compensating variation from compensated elasticities developed by Azzam and Rettab (2012). A program in Stata developed by Lecocq and Robin (2015) was used to estimate the demand system and calculate the elasticities.

Table 2
First-stage demand system estimation results.

Variables	Indonesia				Sumatera				Java-Bali				Kalimantan				Sulawesi				Nusmapua			
	Food		Non-Food		Food		Non-Food		Food		Non-Food		Food		Non-Food		Food		Non-Food		Food		Non-Food	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Constant	1.117*	0.009	−0.117*	0.009	0.982*	0.019	0.019	0.019	1.224*	0.015	−0.224*	0.015	0.947*	0.033	0.054	0.033	0.608*	0.027	0.393*	0.027	0.788*	0.025	0.213*	0.025
lnpfood	0.01*	0.002	−0.01*	0.002	0.044*	0.006	−0.044*	0.006	−0.016*	0.004	0.016*	0.004	0.08*	0.010	−0.08*	0.010	0.116*	0.007	−0.116*	0.007	0.057*	0.006	−0.057*	0.006
lnpnfood	−0.135*	0.002	0.135*	0.002	−0.154*	0.004	0.154*	0.004	−0.126*	0.003	0.126*	0.003	−0.185*	0.008	0.185*	0.008	−0.179*	0.006	0.179*	0.006	−0.129*	0.006	0.129*	0.006
lnx	−0.203*	0.002	0.203*	0.002	−0.224*	0.004	0.224*	0.004	−0.201*	0.003	0.201*	0.003	−0.239*	0.006	0.239*	0.006	−0.222*	0.005	0.222*	0.005	−0.168*	0.006	0.168*	0.006
lnx2	−0.014*	0.000	0.014*	0.000	−0.018*	0.001	0.018*	0.001	−0.012*	0.000	0.012*	0.000	−0.023*	0.001	0.023*	0.001	−0.021*	0.001	0.021*	0.001	−0.011*	0.001	0.011*	0.001
Sociodemographic variables																								
size	0.034*	0.000	−0.034*	0.000	0.028*	0.000	−0.028*	0.000	0.04*	0.000	−0.04*	0.000	0.027*	0.000	−0.027*	0.000	0.022*	0.000	−0.022*	0.000	0.029*	0.000	−0.029*	0.000
hhage	−0.001*	0.000	0.001*	0.000	−0.001*	0.000	0.001*	0.000	−0.001*	0.000	0.001*	0.000	−0.001*	0.000	0.001*	0.000	−0.001*	0.000	0.001*	0.000	−0.001*	0.000	0.001*	0.000
urban	−0.023*	0.001	0.023*	0.001	−0.026*	0.001	0.026*	0.001	−0.021*	0.001	0.021*	0.001	−0.037*	0.002	0.037*	0.002	−0.024*	0.001	0.024*	0.001	−0.037*	0.001	0.037*	0.001
hheduc1	−0.01*	0.001	0.01*	0.001	−0.006*	0.001	0.006*	0.001	−0.012*	0.001	0.012*	0.001	−0.011*	0.002	0.011*	0.002	−0.008*	0.002	0.008*	0.002	−0.019*	0.002	0.019*	0.002
hheduc2	−0.021*	0.001	0.021*	0.001	−0.014*	0.001	0.014*	0.001	−0.025*	0.001	0.025*	0.001	−0.024*	0.002	0.024*	0.002	−0.019*	0.002	0.019*	0.002	−0.032*	0.002	0.032*	0.002
hheduc3	−0.046*	0.001	0.046*	0.001	−0.038*	0.001	0.038*	0.001	−0.05*	0.001	0.05*	0.001	−0.038*	0.002	0.038*	0.002	−0.046*	0.002	0.046*	0.002	−0.052*	0.002	0.052*	0.002
hheduc4	−0.086*	0.001	0.086*	0.001	−0.082*	0.002	0.082*	0.002	−0.09*	0.002	0.09*	0.002	−0.075*	0.003	0.075*	0.003	−0.087*	0.003	0.087*	0.003	−0.084*	0.002	0.084*	0.002
hheduc5	−0.115*	0.003	0.115*	0.003	−0.12*	0.005	0.12*	0.005	−0.114*	0.005	0.114*	0.005	−0.12*	0.008	0.12*	0.008	−0.122*	0.006	0.122*	0.006	−0.114*	0.008	0.114*	0.008
Obs.	295,155		295,155		84,863		84,863		101,638		101,638		29,217		29,217		39,290		39,290		40,147		40,147	
R-square	0.434		0.434		0.3609		0.3609		0.4719		0.4719		0.3772		0.3772		0.3256		0.3256		0.4153		0.4153	
F-prob.	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	

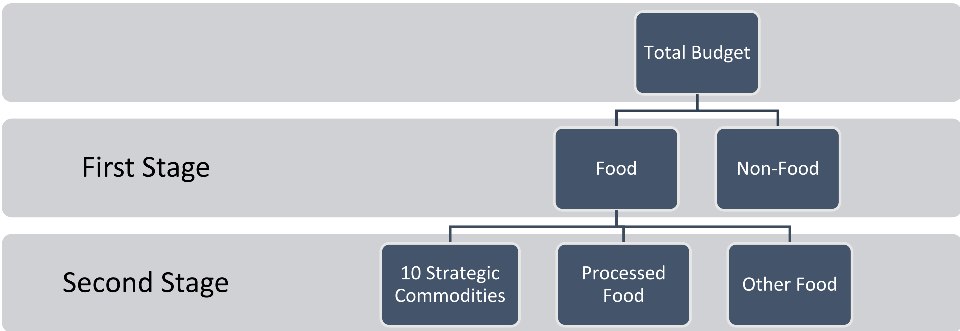

Fig. 1. Two-stage budgeting structure.

3.1. Demand system and elasticities

The QUAIDS framework used in this study is an extension of the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980), which is popular for empirical demand system estimation because it includes properties of the previous Rotterdam and Translog demand system models. The extension in the QUAIDS framework allows a non-linear Engel's curve to be accommodated in the model, so that a good can be a luxury at some income level and a necessity at a higher income level. Formulation of the demand system in this study started with the Price-Independent Generalised Logarithmic (PIGLOG) utility function and ended with budget share equation as a function of prices and total budget:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{m}{a(\boldsymbol{p})}\right) + \frac{\lambda_i}{b(\boldsymbol{p})}\left(\ln\left(\frac{m}{a(\boldsymbol{p})}\right)\right)^2 \quad (1)$$

where w is budget share, p is price, m is total budget and i denotes each commodity within the demand system;

$$\ln a(\boldsymbol{p}) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j \quad (2)$$

and

$$b(\boldsymbol{p}) = \prod_{i=1}^{n} p_i^{\beta_i} \quad (3)$$

The elasticities can be calculated by differentiating the budget share equation with respect to $\ln m$ and $\ln p_j$ to obtain:

$$\frac{\delta w_i}{\delta \ln m} = \mu_i = \beta_i + \frac{2\lambda_i}{b(\boldsymbol{p})}\left(\ln\left(\frac{m}{a(\boldsymbol{p})}\right)\right) \quad (4)$$

$$\frac{\delta w_i}{\delta \ln p_j} = \mu_{ij} = \gamma_{ij} - \mu_i \left(a_j + \sum_k \gamma_{jk} \ln P_k \right) - \frac{\lambda_i \beta_j}{b(\boldsymbol{p})} \left(\ln \left(\frac{m}{b(\boldsymbol{p})} \right) \right)^2 \tag{5}$$

The budget and price elasticities are then, respectively:

$$e_i = \frac{\mu_i}{w_i} + 1 \tag{6}$$

$$e^u_{ij} = \frac{\mu_{ij}}{w_i} - \delta_{ij} \tag{7}$$

$$e^c_{ij} = e^u_{ij} + e_i w_j \tag{8}$$

where upper superscripts u and c represent uncompensated and compensated price elasticity, respectively.

These demand system and elasticities equations were used to estimate unconditional elasticities from the first-stage demand system and conditional elasticities from the second-stage demand system, as illustrated in Fig. 1.

3.2. Unconditional elasticities

The elasticity for each region was determined using a two-stage budgeting procedure with unconditional elasticities produced from the first stage and conditional elasticities from the second stage. The elasticities within the second-stage demand system are conditional on the elasticity of the first-stage demand system, so further calculation was needed to transform these conditional elasticities into unconditional elasticities. The transformation method used was based on the Edgerton (1997) formula, as described in previous studies by e.g. Roosen et al. (2022), Säll and Gren (2015) and Widarjono and Rucbha (2016), since development of a complete demand system is nearly impossible.

Transformation of conditional elasticities from the second-stage demand system into unconditional elasticities was performed as follows:

The unconditional expenditure elasticity ($\hat{e}_i$) is:

$$\hat{e}_i = e_{(f)i} e_f \tag{9}$$

where $e_{(f)i}$ is the conditional expenditure elasticity of the ith classification in the second-stage demand system, and e_f is expenditure elasticity of food from the first stage.

The unconditional uncompensated price elasticity ($\hat{e}^u_{ij}$) is:

$$\hat{e}^u_{ij} = e^u_{(f)ij} + e_{(f)i} w_{(f)j} \left[1 + e^u_{(f)(f)} \right] \tag{10}$$

where $e^u_{(f)ij}$ is the conditional uncompensated price elasticity of the ith and jth pair in the second-stage demand system, $w_{(f)j}$ is the mean budget share of the jth commodity in the second stage, and $e^u_{(f)(f)}$ is the food-uncompensated own-price elasticity from the first stage.

The unconditional compensated price elasticity ($\hat{e}^c_{ij}$) is:

$$\hat{e}^c_{ij} = e^c_{(f)ij} + e_{(f)i} w_{(f)j} e^c_{(f)(f)} \tag{11}$$

where $e^c_{(f)ij}$ is the conditional compensated price elasticity of the ith and jth pair in the second stage, and $e^c_{(f)(f)}$ is the food-compensated own-price elasticity from the first stage.

For welfare impact calculation, the unconditional compensated cross-price elasticity of food commodities and non-food ($\hat{e}^c_{i,nf}$) is:

$$\hat{e}^c_{i,nf} = e_{(f)i} e^c_{(f)(\mathrm{nf})} \tag{12}$$

where $e^c_{(f)(\mathrm{nf})}$ is food-compensated cross-price elasticity with non-food.

3.3. Welfare impact calculation

The welfare impact of individual strategic commodity price increases within total household budget was calculated using the compensating variation (CV) measure formulated by Azzam and Rettab (2012), which allows calculation with only compensated price elasticities, without initial utility level information. The value obtained can be interpreted as the amount of compensation needed to keep the utility level constant after an increase in prices. It is suitable for evaluating the welfare impact of price increases as it used to neutralise the welfare loss (e.g. (Roosen et al., 2022); (Wang and Çakır, 2021). CV is calculated as:

$$CV = \sum_{i=1}^{12} p^0_i q^0_i \left(\frac{dp_i}{p^0_i} + \frac{dq^c_i}{q^0_i} + \frac{dp_i}{p^0_i} \frac{dq^c_i}{q^0_i} \right) + p^0_{nf} q^0_{nf} \left(\frac{dp_{nf}}{p^0_{nf}} + \frac{dq^c_{nf}}{q^0_{nf}} + \frac{dp_{nf}}{p^0_{nf}} \frac{dq^c_{nf}}{q^0_{nf}} \right) \tag{13}$$

where i denotes 12 strategic food commodities, $p_i^0 q_i^0$ is initial household budget before price increase, $\frac{dp_i}{p_i^0}$ is percentage price change, and $\frac{dq_i^c}{q_i^0}$ is percentage Hicksian quantity demand change approximated using:

$$\frac{dq_i^c}{q_i^0} \approx \sum_{j=1}^{12} \hat{e}_{i,j}^c \frac{dp_j}{p_j^0} + \hat{e}_{i,nf}^c \frac{dp_{nf}}{p_{nf}^0} \text{ for } i = 1, 2, \ldots, 12, \text{ and } nf \tag{14}$$

where nf denotes non-food items.

3.4. Estimation steps

Estimation proceeded as follows:

I. Estimation of demand system parameters and calculation of elasticities were performed using the program in Stata developed by Lecocq and Robin (2015). This was chosen instead of the program developed by Poi (2012) used in previous studies because it can produce similar elasticity estimates with lower computational needs and, more importantly, it allows observation weight to be accommodated in the estimation. Since there were two stage demand systems and five regional classifications in the present analysis, 12 estimations were performed: i) two estimations for first-stage and second-stage demand of whole observations and ii) 10 estimations for both stage demand in each regional classification.
II. The conditional elasticities from the second-stage demand system were transformed into unconditional elasticities using the mean value of estimated elasticities for the whole observations, and for each region separately.
III. The welfare impact was calculated using simulated price increase for each commodity and plotted using line plot.

4. Empirical results

Three sets of empirical results are reported here: (i) parameters of the demand system; (ii) estimated elasticities; and (iii) the welfare impact of price increases. Twelve demand equations were produced for the first-stage demand system, two for each of the five regions and two for all observations (Table 2), and 72 demand equations were produced for the second-stage demand system, 12 for each region and 12 for all observations (Table A.2 in appendix and Tables S2–S12 in supporting documents). Variations found between the regions in parameters for both stages of the demand system in turn affected the estimated elasticities and welfare impact.

4.1. Parameters of the demand system

All estimated parameters for the first-stage demand system were significantly different from zero (Table 2). The expenditure parameters were found to be negative for food share and positive for non-food share in all five regional settings, including all observation groups. This means that the average household allocates a higher proportion of its budget to non-food products than food products, and allocates proportionately more with a higher budget available. The estimated parameters for prices were mostly similar in direction, namely positive for food and negative for non-food, across all regions except Java-Bali. This means that the average household allocates more of its budget to food when food prices are higher, or alternatively that the income effect plays a more important role for non-food products. The diverging result found for Java-Bali means that the average household in this region allocates more of its budget to non-food products when food prices are higher, so the income effect plays a more important role for food products and substitution effects work in the same direction. Sociodemographic variables influenced household spending in the same direction across all regions, with higher budget share allocated for food by larger households and lower budget share allocated for food by older households, urban households, and more educated households.

The results for the second-stage demand system showed more variation between commodities and between regions, but some similarities were found. The own-price coefficient for all commodity equations in all regions was positive and significantly different from zero. This means that each commodity has limited income and substitution effects within the food budget, so the average household must allocate more of its budget to a commodity if the price is higher. The cross-price and expenditure coefficients were more varied and some had high standard error, with the 95% confidence interval range including positive and negative values. However, the mean value was not necessarily zero and could be positive or negative. The statistical direction of expenditure coefficients (Table 3) showed that some items in the food budget (meat, shallot, garlic, flour) had a positive relationship with expenditure, while rice generally had a negative relationship.

Sociodemographic variables were also important determinants in the second-stage demand system. A similar pattern in the relationship between sociodemographic variables and consumption of rice and meat was observed across the regions. The results showed that the average household in all regions allocates more of its food budget to meat if household size is smaller and if the household has a better educational background, while the allocation to rice is the opposite. The results also showed that the average urban household in all regions allocates less of its food budget to rice than the average rural household, while older households tend to allocate more of their budget to rice. The role of sociodemographic variables in consumption of other food commodities was relatively similar across the regions.

Table 3
Statistical direction of second-stage demand system expenditure coefficient.

Budget share	Regional setting											
	1		2		3		4		5		6	
	lnx	lnx^2	lnx	lnx^2	lnx	lnx^2	lnx	lnx^2	lnx	lnx^2	lnx	lnx^2
Rice	−	0	−	−	−	0	−	0	−	0	−	0
Meat	+	+	+	+	+	+	+	+	0	0	0	0
Egg	0	+	−	0	0	+	0	+	0	0	0	+
Shallot	+	+	0	+	+	+	+	+	0	+	0	+
Garlic	+	+	0	+	+	+	+	+	0	+	0	+
Chilli	0	+	0	0	0	+	0	+	0	+	0	0
Fish	+	+	+	+	0	0	0	0	0	0	0	0
Cooking Oil	0	+	−	0	0	+	+	+	0	0	0	0
White Sugar	+	+	−	0	+	+	+	+	0	+	0	0
Flour	+	+	0	+	0	+	+	+	+	+	0	+
Processed Food	0	−	+	0	0	−	0	0	0	0	0	0
Other Food	0	−	−	−	0	−	−	−	0	0	0	0

Notes: regional setting code (1: Indonesia, 2: Sumatera, 3: Java-Bali, 4: Sulawesi, 5: Kalimantan), zero values are for indicating statistically insignificant coefficient.

Overall, the results revealed systematic differences in demand system parameters between the regions. This study was able to capture this difference because it estimated the demand system for each region individually. A difference was observed not only in the constant term, but also in other parameters, e.g. the parameter in first-stage regression for food price differed between Java-Bali (−0.01), Sulawesi (0.11) and Nusmapua (0.05). This difference led to differences in elasticities and was reflected in the welfare impact calculations.

4.2. Elasticities

The Marshallian price elasticities, Hicksian elasticities and total expenditure elasticities were calculated for the two-stage demand system. The elasticities for the first-stage demand system were unconditional (Table 4), while those for the second-stage demand were conditional (see Tables S2–S12 in supporting documents].

For the first-stage demand system (Table 4), aggregated elasticities were statistically similar across regions. The expenditure elasticity for food was found to be inelastic in all regions, with a value between 0.80 and 0.88, while the elasticity for non-food was elastic in all regions, with a value between 1.14 and 1.26. The own-price elasticities were negative and inelastic for both food and non-food, and the value was relatively similar across the regions. Similarity between the regions also emerged in the cross-price elasticities, but the elasticities were still significantly different from each other because of low standard error. The results also revealed relatively large differences between Marshallian and Hicksian price elasticities, indicating different behaviour if households are compensated or uncompensated when prices change.

The calculated elasticities resulting from the second-stage demand system showed heterogeneity, as the demand system parameters varied between the regions. The heterogeneity between calculated expenditure and own-price Marshallian elasticities in all regional settings is illustrated in Fig. 2, which also shows the variation in elasticity across commodities in each region. The most noticeable difference in expenditure elasticity between the regions was found for eggs, with a value of 0.89 in Nusmapua and 0.44 in Kalimantan. The expenditure elasticity values for the other commodities did not diverge widely, but were still significantly different since the standard error was low for each estimate. The differences between regions were more noticeable for own-price Marshallian elasticities.

The results for the second-stage demand system agreed with theoretical predictions, as all strategically important foods were found to be inelastic to both expenditure and price change, while the processed food and other food items categories were elastic to expenditure change. This is because strategic foods are likely perceived as necessities by the average household, and therefore expenditure and price change have little effect on demand for these foods. On the other hand, processed foods and other food items are not necessities for the average household in all regions, so demand is more elastic than for strategic food commodities. Some variation was found between strategic foods, indicating that some strategic foods are more luxurious than others, e.g. expenditure elasticity for fish and meat was higher than that for rice. Rice was even found to be a Giffen good overall in Indonesia and for the Java-Bali region, with positive own-price elasticity.

4.3. Welfare impact measurement

The calculated welfare impact from a simulated price increase in a single commodity was found to be affected by the variation in elasticities across commodities and regions (Fig. A.1 in appendix). The difference between commodities was greatest for rice compared with meat. The welfare impact of a 100% increase in rice price resulted in up to 140% of total expenditure being needed as compensation to keep the household utility level constant, while a 100% increase in meat

Table 4
Elasticity estimates from the first-stage demand system.
Source: Author's own calculation

	Marshallian		Hicksian		Expenditure
	(1)	(2)	(1)	(2)	
All Observations (Indonesia)					
Food (1)	−0.98*	−0.05*	−0.52*	0.31*	0.82*
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Non-Food (2)	−0.03*	−0.94*	0.67*	−0.40*	1.24*
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Sumatera					
Food (1)	−0.98*	−0.04*	−0.50*	0.32*	0.84*
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)
Non-Food (2)	−0.03*	−0.95*	0.68*	−0.43*	1.22*
	(0.004)	(0.001)	(0.004)	(0.002)	(0.002)
Java-Bali					
Food (1)	−0.99*	−0.04*	−0.54*	0.31*	0.80*
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)
Non-Food (2)	−0.02*	−0.95*	0.69*	−0.39*	1.26*
	(0.003)	(0.001)	(0.004)	(0.001)	(0.001)
Kalimantan					
Food (1)	−0.96*	−0.07*	−0.49*	0.31*	0.85*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.002)
Non-Food (2)	−0.05*	−0.91*	0.60*	−0.38*	1.18*
	(0.007)	(0.003)	(0.007)	(0.003)	(0.003)
Sulawesi					
Food (1)	−0.93*	−0.06*	−0.46*	0.35*	0.88*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.002)
Non-Food (2)	−0.08*	−0.93*	0.54*	−0.41*	1.14*
	(0.005)	(0.002)	(0.006)	(0.002)	(0.002)
Nusmapua					
Food (1)	−0.92*	−0.06*	−0.40*	0.28*	0.86*
	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)
Non-Food (2)	−0.13*	−0.91*	0.60*	−0.43*	1.21*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.003)

Notes: standard error in brackets
*Denotes statistically different from zero within 95% confidence interval.

price resulted in up to 500% of total expenditure being needed. However, there were differences between the regions in this regard, e.g. the welfare impact of a 100% meat price increase represented 494% of total expenditure worth of welfare in Kalimantan, but only 240% in Nusmapua. This variation indicates that price increases are perceived differently for different commodities and in different regions. The variation itself derived from differences in the Hicksian elasticities (Table 4), reflecting different consumer behaviour in general when dealing with changes in price. Consumers may have a high or low degree of substitutability or complementarity between commodities, so that a price increase for one commodity can affect the consumption of other commodities. Therefore, the calculated welfare impact from a simulated single commodity price increase cannot represent the full effect of the price increase, because an increase in one commodity price can affect other commodity prices at the same time.

The results of the welfare impact calculation also indicated that more luxurious foods, such as meat, generate a higher welfare impact when their price increases compared with more basic foods such as rice. The explanation for this is that households allocate more expenditure to perceived 'luxurious' foods in the initial situation, resulting in higher weight in household utility construction. Thus, after a price increase in more luxurious foods, the household needs to use a larger share of its expenditure in order to keep its utility constant by consuming an equal amount of more luxurious food. Consumption of such foods may need to cease if there is no additional expenditure available, and the utility level will be lower.

5. Discussion

The present analysis revealed regional heterogeneity in food preferences between different regions of Indonesia A difference was found not only for the constant but also for other parameters, resulting in differences in elasticities and welfare impact size. Similarly, studies in other countries, such as that by Hovhannisyan et al. (2020) in Russia and that by Gould and Villarreal (2006) in China, have found differences in food preferences between domestic regions. Moreover, the diverse ethnicity and food origins across Indonesia can have resulted in food preferences being structurally

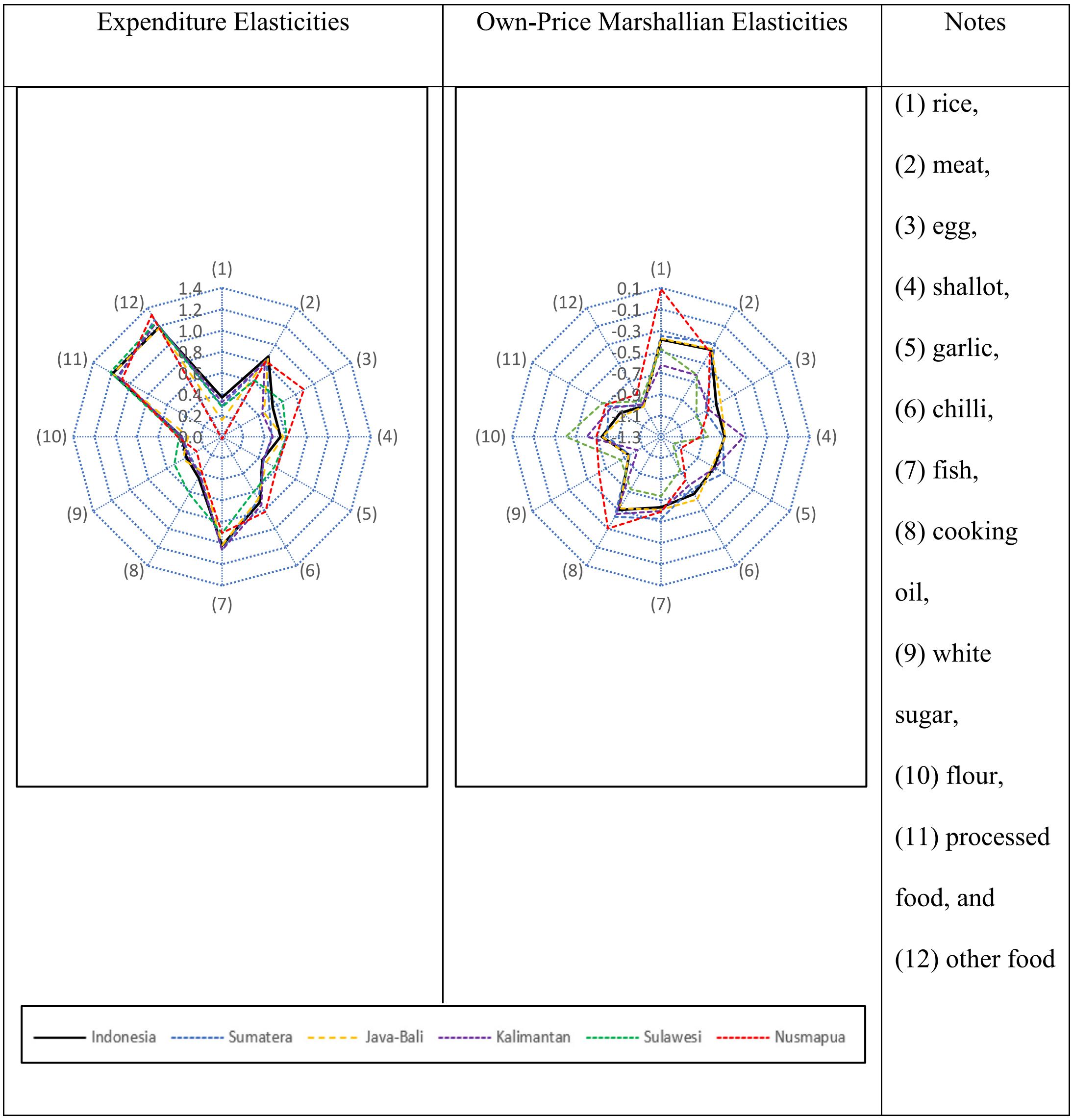

Fig. 2. Calculated expenditure and own-price Marshallian elasticities.
Source: Author's own calculation.

different. Other factors such as environmental conditions can also have affected the food consumption pattern observed for Indonesia, because some regions have a supporting environment where e.g. fish is relatively more abundant on a per capita basis, so baseline fish consumption is higher. The lower expenditure elasticity found for fish in the Java-Bali region compared with Sulawesi and Nusmapua supports this suggestion. Differences in marketing system and lifestyles between regions (Huang and Bouis, 2001) can also cause consumption patterns to be structurally different between regions in Indonesia.

Some regional heterogeneity was found for specific food products, but overall food consumption pattern was similar across the regions, with food being inelastic to total expenditure change and non-food products being elastic. This finding is a strong indication that the economy is moving towards more diversified activities in the non-food category or according to the general transformation model developed by Johnston and Mellor (1961). However, small differences in elasticities for Java-Bali compared with the other regions suggest that the elasticities have not changed much over time, i.e. elasticities tend to converge between regions since their economies tend to converge, based on Purwono et al. (2021). The food expenditure elasticities found in this study were similar in value to those in Thailand, and lower than those in South

Korea, according to an early study by Weisskoff (1969) in a period when per capita output was higher in Thailand than South Korea.

The present study also explored strategically important food elasticities individually and found variation between regions. Overall, the total expenditure elasticities were found to be positive for all strategically important food categories, meaning that individual consumers tend to increase their food consumption as total expenditure increases. This pattern was even found for rice, a basic staple in the Java-Bali region, with 0.16 expenditure elasticity. Therefore, even in the most advanced economy in the region, staple food supply is not yet fulfilled because the average consumer would like to increase their consumption if their budget increases. Moreover, some food categories within the demand system were found to be luxuries or nearly luxuries, such as meat, egg, fish, processed food and other food items. The pattern for these more luxurious food items was relatively similar to that in Japan in 1963–1985 according to Sasaki (1993) and in some Western European countries after World War II (Collantes, 2019; Grigg, 1995). However, in the study in Japan rice was found to be strongly inelastic to price change during the period analysed and most other food products were also inelastic to price change. The expenditure elasticity found within Indonesia for rice in the present study was lower than values reported previously by Faharuddin et al. (2017) and Widarjono and Rucbha (2016), indicating economic progress towards more diversified production activities. Moreover, rice was found to be a Giffen good, overall in Indonesia and in the Java-Bali region, resulting from the necessity of rice as a staple food and its relatively higher abundance in that region.

The variation between regions observed in this study was reflected in welfare impact measurements for the regions. This indicates that it is important to consider regional heterogeneity in consumption patterns and to use regional elasticities to interpret household perceptions to price changes arising from policies introduced within Indonesia, or other similar regional context. A practical approach would be to use welfare impact calculation, instead of only price changes, in evaluating the effects of regional government policies related to managing food prices, in order to make the results more representative of the population. The regional heterogeneity observed for food commodities in this study may also exist for other commodities, an issue that should be considered when analysing the impact of policies such as subsidies or taxes.

The welfare impact results in this study also highlight the importance of cross-price elasticities in determining the magnitude of impact. The clear example of this is obtained when comparing the welfare impact of a change in rice and meat prices, where an increase in meat price had a higher welfare impact that a change in rice price even though own-price elasticity for rice was lower than that for meat. In this case, partial equilibrium analysis without consideration of cross-price elasticities would result in a higher welfare impact for rice price increase compared with meat. However, since cross-price elasticity is more important for rice than for meat, an increase in rice price also highly influences the demand for other food items. In this study, most food items were found to be complements to rice and an increase in rice price decreased demand for most other foods. Thus lower compensation was needed to keep the utility level constant according to compensating variation calculation. A related study by Khoiriyah et al. (2023) also identified a difference between using only own-price elasticity and using own-price elasticity together with cross-price elasticities for animal-based products.

Overall, disregarding regional heterogeneity was found to overstate or understate the welfare impact obtained. For example, a 50% increase in meat price cost IDR 123,965 per household per month overall, but it cost IDR 146,303 in Kalimantan and IDR 95,122 in Nusmapua. These differences are quite large especially when considering that Indonesia has more than 70 million households in total. This indicates the importance of understanding preference dynamics across regions before using elasticities in policy discussions.

6. Conclusions

This study examined food consumption pattern in five regions of Indonesia (Sumatera, Java-Bali, Kalimantan, Sulawesi, Nusmapua) and calculated the welfare impact of food price increases for each region. The consumption pattern for the most strategically important food commodities in Indonesia was found to vary between the regions, resulting in differences in estimated parameters of the demand system, elasticities and the welfare impact of simulated price increases. These results are consistent with findings in previous studies comparing regions and countries. Disregarding regional heterogeneity can thus overstate or understate the welfare impact of food price changes.

The main policy implication from this study is that regional heterogeneity in food consumption pattern should be considered when formulating food price policies for Indonesia, especially as regards strategically important food commodities. The findings in this study also suggest one key element for the feasibility of investment in food production is protein sources, because Indonesian consumers are increasing their meat consumption. Increased productivity in domestic food production would decrease food prices and promote economic transformation, as households would have more available budget for non-food products.

There were some limitations in this study. First, the unit value measure might be affected by other factors that also affect the expenditure share for each food category. An attempt was made to avoid this problem by separating the quality effect from unit value, but other methods such as using instrumental variables might be preferable. Gibson and Kim (2017) also suggest use of another method to accommodate quality variation in estimating elasticities, as they show that the method used in this study exaggerates the elasticity value. Second, 2018 survey data were used and there may have been some changes in household food preferences since then, especially due to the COVID-19 pandemic. However, a study in Japan by Ito et al. (2022) found that changes in food preference due to COVID-19 related to the eating out category, so preference differences between Indonesian regions should have remained constant as COVID-19 hit all regions. Third, possible problems can arise from many zero observations in consumption data and correcting for this can be an interesting topic for future study, especially as regards more detailed food categories.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data can be shared on request.

Acknowledgements

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Ethic statement:

Not applicable. This research was not performed on human/animals.

Appendix A

See Table A.1 and A.2. See Fig. A.1.

Appendix B. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.eap.2023.06.024.

Table A.1
List of provinces in each regional classification.
Source: Author's own calculation

Region	Province list
Sumatera	Aceh, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Bangka Belitung Island, and Riau Island
Java-Bali	Jakarta, West Java, Central Java, Yogyakarta, East Java, Banten, and Bali
Kalimantan	West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, and North Kalimantan
Sulawesi	North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, and West Sulawesi
Nusa Tenggara-Maluku-Papua (Nusmapua)	West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, West Papua, and Papua

Notes: horizontal line is simulated price increase for each strategic food commodity and vertical line is compensating variation in 2018 Indonesian Rupiah

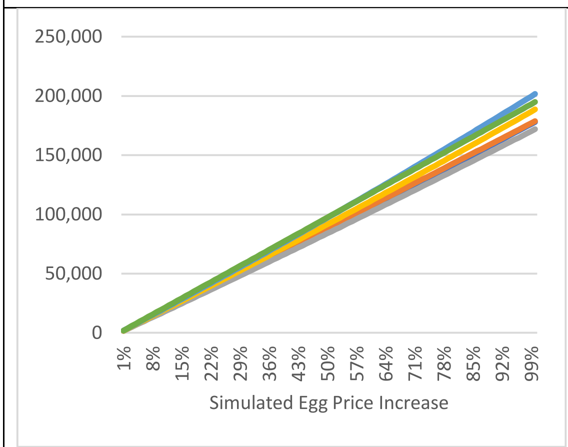
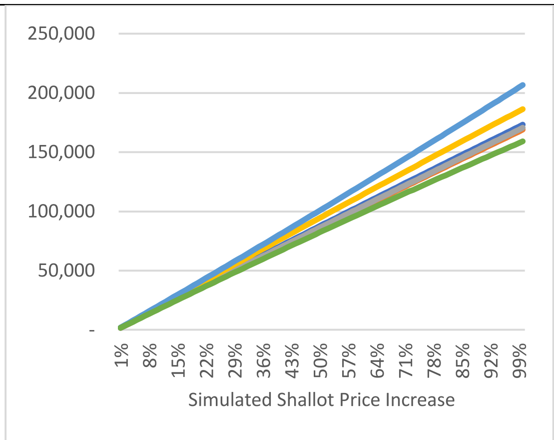
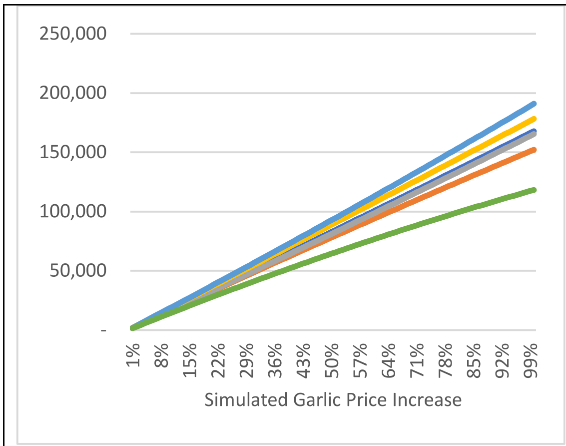
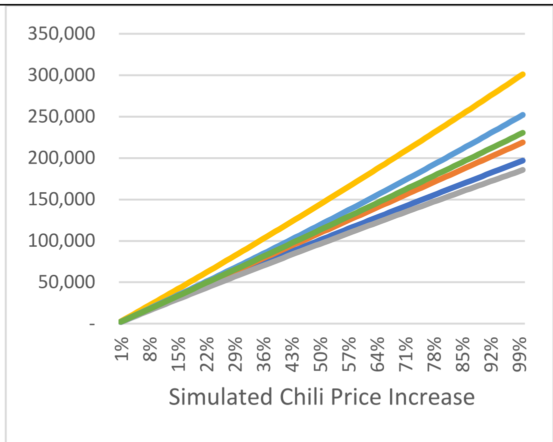
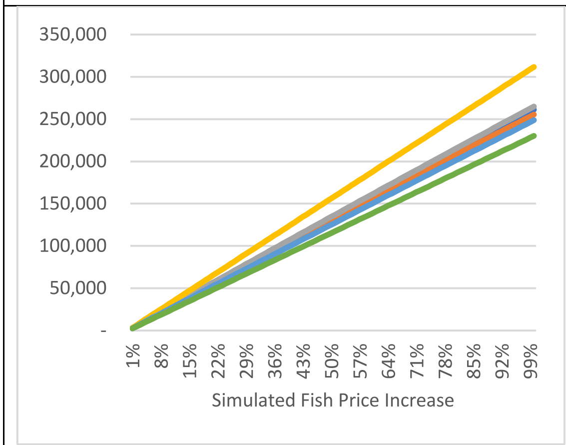
Rice	Meat
	
Egg	Shallot
	
Garlic	Chilli

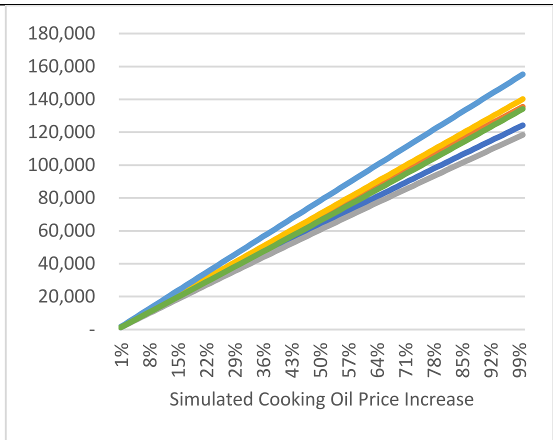
Fig. A.1. Calculated welfare impact of simulated price increase.



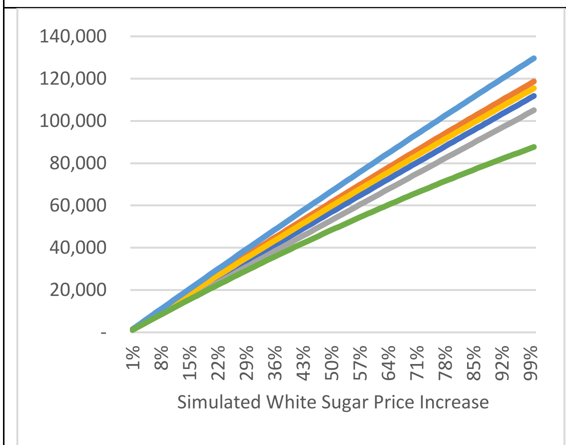


Fish	Cooking Oil





White Sugar	Flour



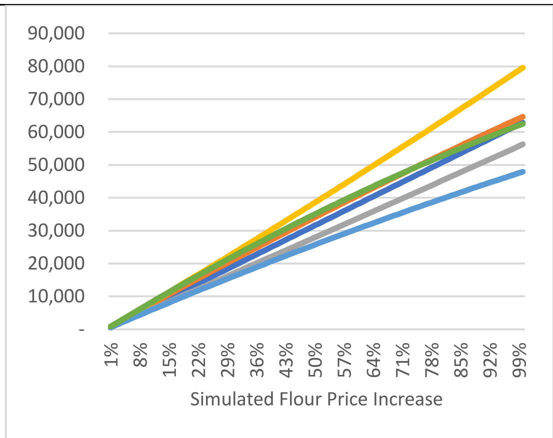


Fig. A.1. (*continued*).

Table A.2
Second stage demand system estimation results for all observations.

Variables	Rice, j=1		Meat, j=2		Egg, j=3		Shallot, j=4		Garlic, j=5		Chilli, j=6	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Constant	−0.058*	0.026	−0.037	0.024	0.015	0.011	0.026*	0.004	−0.004	0.004	0.017	0.009
lnp1	0.076*	0.003	−0.012*	0.002	0.003*	0.001	−0.003*	0.000	−0.001	0.000	−0.008*	0.001
lnp2	−0.011*	0.001	0.037*	0.001	−0.001	0.000	0.001*	0.000	0.001*	0.000	−0.001	0.000
lnp3	0.018*	0.002	0.001	0.002	0.008*	0.001	0.001*	0.000	−0.001	0.000	0.002*	0.001
lnp4	−0.005*	0.001	0.001	0.001	0.001	0.000	0.003*	0.000	−0.001	0.000	0.002*	0.000
lnp5	−0.001	0.001	0.001	0.001	−0.001	0.000	−0.002*	0.000	0.003*	0.000	−0.001*	0.000
lnp6	−0.003*	0.001	−0.001	0.001	−0.001	0.000	0.001*	0.000	−0.001	0.000	0.007*	0.000
lnp7	−0.007*	0.002	−0.004*	0.001	−0.001*	0.000	0.001	0.000	0.001	0.000	0.001*	0.000
lnp8	−0.005*	0.002	−0.002	0.002	0.001	0.001	0.001	0.000	0.001*	0.000	0.002*	0.001
lnp9	−0.004*	0.001	0.004*	0.001	0.001*	0.000	0.001	0.000	0.001	0.000	0.001	0.000
lnp10	−0.002	0.001	−0.006*	0.001	−0.002*	0.001	−0.001	0.000	0.001	0.000	0.002*	0.000
lnp11	−0.05*	0.003	0.001	0.002	−0.005*	0.001	−0.001*	0.000	−0.001	0.000	−0.002*	0.000
lnp12	−0.039*	0.003	−0.005*	0.001	−0.006*	0.000	−0.003*	0.000	−0.003*	0.000	−0.004*	0.000
lnx	−0.068*	0.005	0.036*	0.004	−0.002	0.002	0.006*	0.001	0.008*	0.001	0.004	0.002
lnx2	0.001	0.000	0.005*	0.000	0.001*	0.000	0.001*	0.000	0.002*	0.000	0.001*	0.000
Sociodemographic Variables												
size	0.013*	0.000	−0.002*	0.000	0.001*	0.000	−0.001*	0.000	−0.001*	0.000	−0.001*	0.000
hhage	0.001*	0.000	0.001*	0.000	0.001	0.000	0.001*	0.000	0.001*	0.000	0.001*	0.000
urban	−0.021*	0.000	−0.002*	0.000	−0.001	0.000	−0.001*	0.000	0.002*	0.000	0.001*	0.000
hheduc1	0.001	0.001	−0.001	0.001	0.001	0.000	−0.001*	0.000	−0.001	0.000	0.001*	0.000
hheduc2	−0.005*	0.001	0.003*	0.001	0.001*	0.000	0.001	0.000	0.001*	0.000	0.001*	0.000
hheduc3	−0.007*	0.001	0.007*	0.001	0.002*	0.000	−0.001	0.000	0.001*	0.000	0.001*	0.000
hheduc4	−0.008*	0.001	0.015*	0.001	0.002*	0.000	−0.001*	0.000	0.001*	0.000	−0.001	0.000
hheduc5	−0.006*	0.002	0.024*	0.002	0.003*	0.001	0.001	0.000	0.001*	0.000	−0.001	0.001
Obs.	32,750		32,750		32,750		32,750		32,750		32,750	
R-square	0.499		0.1176		0.1151		0.2338		0.2716		0.2551	
F-prob.	0.00		0.00		0.00		0.00		0.00		0.00	

Variables	Fish, j=7		Cooking oil, j=8		White sugar, j=9		Flour, j=10		Processed food, j=11		Other food, j=12	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Constant	0.056	0.031	0.022*	0.007	0.079*	0.006	0.011*	0.004	0.253*	0.077	0.622*	0.072
lnp1	−0.028*	0.003	−0.005*	0.001	−0.004*	0.001	−0.001*	0.000	0.015*	0.006	−0.034*	0.006
lnp2	0.011*	0.001	0.001	0.000	0.002*	0.000	0.001*	0.000	−0.022*	0.003	−0.018*	0.003
lnp3	−0.007*	0.002	0.003*	0.001	0.004*	0.000	0.002*	0.000	−0.047*	0.006	0.017*	0.005
lnp4	0.005*	0.001	0.002*	0.000	0.002*	0.000	0.001*	0.000	−0.017*	0.003	0.007*	0.003
lnp5	0.002	0.001	−0.001	0.000	−0.001	0.000	−0.001*	0.000	0.005	0.003	−0.006	0.003
lnp6	−0.003*	0.001	0.001	0.000	−0.001*	0.000	−0.001	0.000	−0.007*	0.002	0.009*	0.002
lnp7	0.03*	0.001	−0.001	0.000	0.001	0.000	−0.001	0.000	−0.009*	0.002	−0.012*	0.002
lnp8	−0.001	0.002	0.012*	0.001	−0.001*	0.000	−0.001	0.000	−0.007	0.006	−0.002	0.005
lnp9	0.004*	0.001	−0.001*	0.000	0.001*	0.000	0.001*	0.000	0.002	0.002	−0.007*	0.002
lnp10	−0.004*	0.002	−0.001	0.000	−0.001	0.000	0.003*	0.000	0.008*	0.004	0.001	0.004
lnp11	−0.001	0.001	−0.006*	0.001	−0.004*	0.000	−0.003*	0.000	0.074*	0.004	−0.007	0.004
lnp12	0.001	0.001	−0.008*	0.000	−0.006*	0.000	−0.004*	0.000	0.03*	0.003	0.043*	0.003
lnx	0.016*	0.006	0.002	0.001	0.006*	0.001	0.003*	0.001	0.014	0.015	−0.02	0.012
lnx2	0.002*	0.001	0.002*	0.000	0.002*	0.000	0.001*	0.000	−0.005*	0.001	−0.008*	0.001
Sociodemographic Variables												
size	−0.005*	0.000	0.001*	0.000	0.001*	0.000	0.001*	0.000	0.005*	0.000	−0.013*	0.000
hhage	0.001*	0.000	0.001*	0.000	0.001*	0.000	0.001*	0.000	−0.001*	0.000	−0.001*	0.000
urban	0.008*	0.001	−0.001*	0.000	−0.002*	0.000	−0.002*	0.000	0.033*	0.001	−0.016*	0.001
hheduc1	−0.001	0.001	0.001	0.000	−0.001	0.000	−0.001	0.000	0.004	0.002	−0.004*	0.002
hheduc2	0.002	0.001	0.001	0.000	−0.001*	0.000	−0.001*	0.000	0.011*	0.002	−0.011*	0.002
hheduc3	0.005*	0.001	−0.001	0.000	−0.001*	0.000	−0.001*	0.000	0.02*	0.002	−0.025*	0.002
hheduc4	0.013*	0.001	0.001	0.000	−0.002*	0.000	−0.001	0.000	0.024*	0.002	−0.044*	0.002
hheduc5	0.017*	0.002	−0.001	0.000	−0.002*	0.000	−0.001	0.000	0.033*	0.005	−0.069*	0.005
Obs.	32,750		32,750		32,750		32,750		32,750		32,750	
R-square	0.2463		0.2969		0.3466		0.2369		0.2182		0.0888	
F-prob.	0.00		0.00		0.00		0.00		0.00		0.00	

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