Household Welfare Cost of the Indonesian Macroeconomic Crisis [1]

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Abstract

A theoretically consistent incomplete demand system is estimated to quantify the cost of the 1997 microeconomic crisis. Welfare cost per person was $128, which translates to $26.12 billion total cost. This amount is equivalent to agriculture's GDP contribution, and sufficient to pay for Indonesia's total annual government budget.

Household Welfare Cost of the Indonesian Macroeconomic Crisis

1. Introduction

In 1997-1998, many Asian economies experienced severe currency and financial crisis. Structural and policy distortions were often blamed as the root cause of the crisis.[2] Of the Asian countries affected, Indonesia was one severely hit by the crisis. Although the economic crisis began in 1997 and hit the hardest in 1998, its impact extended even in the early 2000. The magnitude of the economic shock was significant with per capita real income dropping from $1,000 in 1996 to $205 in 1998, and remained low even in 2001 at $208 (see table 1). The ruphia depreciated by 244 percent, from an exchange rate of 2,343 ruphias per U.S. dollar in 1996, it jumped to 10,013 rupiahs in 1998. Inflation skyrocketed to 68% percent between 1996 and 1998. In particular, fish price increased by 288-387%, eggs-milk by 227-268%, and meat prices by 174-192%.

The primary objective of this study is to estimate the welfare cost of the 1997 macroeconomic crisis in Indonesia using a theoretically consistent censored demand system. The availability of a national household survey data both before the crisis (1996) and during the crisis (1999) provides rich information for examining how households adjusted to the macroeconomic shock of this magnitude. However, the many zero observations common in household surveys pose a serious methodological challenge. The bias in the parameter estimates resulting from the use of only positive consumption when there are many zero observations is a common result. Treatment of this issue in the literature has been varied. From the simplistic use of a representative household as a unit of observation, with the expectation that averaging would eliminate observations with zero consumption, to the more advanced approaches such as Kuhn-

[2] In particular, public guarantees to private projects and network that encouraged personal favoritism made costs and riskiness considerations less important in investments projects.

Tucker model (Wales and Woodland, 1983, Lee and and Pitt, 1986) that treats zero consumption as a corner solution of a consumer's utility maximization problem, and the more statistical approaches which use a truncated distribution for the random disturbance to correct for any zero consumption.

Moreover, whereas, single-equation censored demand estimation and analysis is well established, development of its counterpart in a system of equations framework is slowed down by the difficulty of evaluating multiple integrals in the likelihood function. As a result, a two-step procedure is commonly used, instead, where the model is augmented by a "mills ratio" type regressor to account for the bias in the estimates (Heien and Wessels, 1990, Shonkwiler and Yen, 1999, Su and Yen, 2000).

2. Model

The model is developed in two steps. First, we specify the latent variables and censoring mechanism. Then we specify the structural component of the model using LinQuad. Following the representation used by Shonkwiler and Yen and Su and Yen, we model the zero consumption using latent variables with a selection mechanism in [1], i.e.,

[1] $$x_i^* = h(p,q,y) + \mu_i, \qquad d_i^* = z_i^{'}\lambda_i + \upsilon_i$$

$$d_i = \begin{cases} 1 & if \quad d_i^* > 0 \\ 0 & if \quad d_i^* \le 0 \end{cases}$$

$$x_i = d_i x_i^*$$

where *x* and *d* are observed values of the latent variables; *p* and *q* are prices, *y* is income, and *z* is a vector of regressors in the censoring equation that may include prices, income, and demographic variables; and μ and υ are error terms.

As derived by Shonkwiler and Yen, the correct unconditional expected value of the system in [1] is

[2] $$x_i = \Phi h(p,q,y) + \kappa_i \phi + \varepsilon_i$$

where ϕ and Φ are the standard normal density and cumulative density function, and ε is an i.i.d. error term.

This demand function is well-behaved and has the following properties (Agnew, G.K.):

Positive valued

[3] $$h(p,q,y) \geq 0$$

Homogeous of degree zero in prices and income

[4] $$h(p,q,y) = h(tp,tq,ty) \quad \forall \quad t \geq 0$$

Income greater than total expenditures of goods of interest

[5] $$ph(p,q,y) \leq y$$

Also, the compensated substitution effects for the goods of interest are symmetric and negative semidefinite.

Integrability conditions for the demand system give an expenditure function consistent with the LinQuad demand system, i.e.,

[6] $$E(p,q,\theta) = p'\alpha + p'Ar + 0.5p'Bp + \delta(r) + \theta(q,u,r)e^{\gamma p}$$

where θ is the constant of integration, *r* is a vector of demographic variables, and α, γ, and *B* are conformable matrix of parameters. The specific Marshallian demand is derived from the expenditure function in [6] through Shephard's lemma and substituting income (y) for expenditure. The estimating demand equation is of the form,

[7] $$x_i = \alpha_i + A_i r + B_i p + \gamma_i (y - p'\alpha - p'Ar - 0.5p'Bp)\cdot$$

Equation [7] is augmented with demographic variables to examine their impacts on consumption. Homogeneity is imposed by using real prices and income with *π(q)* as the deflator; symmetry is imposed in the B matrix with each element B_{ij}=B_{ji}; and adding-up is always satisfied with property [5] of the incomplete demand system.

The integrability property of LINQUAD allows estimation of exact welfare measures. From equation [6] the actual expenditure *y* is substituted in the LHS as one realization given actual prices and optimal x_i choices. Then solving for θ we get,

[8] $$\theta(q,u,z) = (y - p'\alpha - p'Ar - 0.5p'Bp - \delta(z))e^{-\gamma' p}.$$

The equivalent variation (EV) is derived by equating [10] of two different price regimes, i.e.,

[9]

$$[y + EV - p_0'\alpha - p_0'Ar - 0.5p_0'Bp_0 - \delta(z)]e^{-\gamma' p_0} = [y - p_1'\alpha - p_1'Ar - 0.5p_1'Bp_1 - \delta(z))e^{-\gamma' p_1}$$
.

The EV is interpreted as the income change required at the old prices to attain the same level of utility given new prices, where p_0 and p_1 are the old and new prices, respectively. EV is solved from [9] and is estimated using prices, income, and the LinQuad estimated parameters, i.e.,

[10]

$$EV = [y - p_1'\alpha - p_1'Ar - 0.5p_1'Bp_1 - \delta(z)]e^{\gamma(p_0 - p_1)} - [y - p_0'\alpha - p_0'Ar - 0.5p_0'Bp_0 - \delta(z)]\cdot$$

The standard Marshallian, income, and Hicksian elasticity formula for the LinQuad are:

[11] $$\varepsilon_{ij}^{s} = \left(\beta_{ij} - \gamma_i(\alpha_j + A_j z + B_j p)\right)\frac{p_j}{x_i}$$

[12] $$\varepsilon_i^s = \gamma_i \frac{y}{x_i}$$

[13] $$\varepsilon_{ij}^{s*} = \varepsilon_{ij}^s + \varpi_j \varepsilon_i^s.$$

Standard elasticity estimates need to be adjusted to account for the influence of the selection mechanism. The adjusted formula of the elasticity of the expected value of quantity consumed with respect to price and expenditure are given in [14] and [15]. Accounting for the probability of consumption, the adjusted elasticity is of the form

[14] $$\varepsilon_{ij}^a = \Phi_i \varepsilon_{ij}^s + \frac{\phi_i \lambda_{ij} p_j}{x_i}\{x_i - \kappa_i(z_i \lambda_i)\}$$, and

[15] $$\varepsilon_i^a = \Phi_i \varepsilon_i^s + \frac{\phi_i \lambda_{iy} y}{x_i}\{x_i - \kappa_i(z_i \lambda_i)\}.$$

It is easy to check that as the argument of the selection mechanism approaches infinity, that is, $\Phi \rightarrow 1$ and $\varphi \rightarrow 0$, then the elasticity formula collapses into the standard LinQuad elasticity formulae.

The part of the elasticity estimates that can be attributed to changes in probability of consumption is computed by taking the difference between the adjusted and standard elasticity estimates. The standard errors of the elasticity estimates can be derived using the delta method corrected to account for the two-step procedures used in estimation.

The standard errors of the elasticities were estimated using the delta method since elasticities are functions of several parameters, and are corrected for the two-step procedure used in estimation. In the first step, a probit is estimated to generate predicted values of the CDF and PDF, which in turn are used in the second stage estimation. The estimation error in the parameters of the probit model inflates the corrected standard error in the second stage. We follow Greene (2000) and Topel (1985) using the corrected variance-covariance matrix of the form,

[16] $$V_2^* = V_2 + V_2[CV_1C' - RV_1C' - CV_1R']V_2$$

where V_2 is the associated covariance matrix of the parameters in the second step, V_1 is the coefficient covariance matrix in the first step, and

$$C = E\left[\frac{\partial L_2}{\partial \Psi_2}\frac{\partial L_2}{\partial \Psi 1}\right] \qquad R = E\left[\frac{\partial L_2}{\partial \Psi_2}\frac{\partial L_1}{\partial \Psi 1}\right].$$

3. Empirical Results

The National Socio-Economic Household Survey (SUSENAS) had 60,674 households in 1996 and 60,681 in 1999. Nine aggregate major commodities are considered, including cereals, tubers, fish, meat, eggs-milk, vegetables, pulses (legumes), fruits, and oils-fat. Table 2 shows the per capita consumption of urban and rural households for the nine food groups. The difference in the food basket of consumers in urban and rural areas is very evident, with rural consumers consuming more cereals, tubers, and vegetables compared to urban consumers, while urban consumers are consuming more fish, meat, eggs and dairy, pulses, fruits, and oils. The most direct adjustment consumers made in response to the macroeconomic crisis was to change their level of consumption. Common in the adjustment of urban and rural consumers is the direction and magnitude of their changes in consumption. That is, there was a very large reduction in the consumption of food groups that are good sources of animal protein such as fish, meat, eggs-milk. To substitute for these losses, consumers increased their consumption of pulses (a plant source of protein). With the exception of cereals and meat, rural consumers had relatively larger reductions in the consumption of the other food groups. In particular, the biggest difference was in the level of eggs-milk consumption, where it declined by 62% in rural areas compared to the 47% decline in urban areas. The other adjustment possible to households is an extreme example of the earlier case, which is to simply stop consuming any of the food groups. This is seen in table 3 where the proportion of positive consumption is presented. Common in the consumption pattern of urban and rural consumers is the high proportion of positive consumption for cereals, vegetables, and oils, and relative low proportion of positive consumption of meat and eggs-milk. In 1996, the proportion of positive consumption is roughly the same for urban and rural consumers in the cereals and oils food groups. The largest difference in the proportion of positive consumption is in the meat (32% in rural to 60% in urban) and eggs-milk (69% in rural to 86% in urban) food groups. During the crisis, the proportion of positive consumption in urban areas declined for all food groups, whereas, the proportion of positive consumption of cereals and tubers increased in rural areas, while the rest of the seven food groups declined. The largest changes in the proportion of positive consumption were in the meat and eggs-milk food groups. In terms of allocation of food expenditure (table 4), urban and rural consumers share the same ranking of the top four food groups, including cereals, meat, vegetable, and fish. Urban consumers follow this four food groups with eggs-milk, while rural consumers have fruits. Moreover, rural consumers have higher expenditure shares than urban consumers in cereals, tubers, and oils, while urban consumers have higher expenditure shares than rural consumers in fish, meat, eggs-milk, vegetable, pulses, and fruit. The largest differential in expenditure share favoring rural consumers is in the cereals food group by 3.6 percentage points, while urban consumers have higher expenditure share by 1.5 percentage points in eggs-milk food group. The reallocation of expenditure shares during the crisis is somewhat similar in direction for urban and rural consumers, where cereals, vegetables, and oils gained share of expenditure, while the share for fish and pulses remained almost stable, and meat, eggs-milk, tubers, and fruits have the largest reductions in expenditure share. Where adjustments were made, rural consumers showed larger magnitudes of adjustments such as the 16.98 percentage points increase in the expenditure share of cereals compared to only 12.07 percentage points increase for urban consumers, and -12.17 percentage points decrease for meats for rural consumers compared to -10.58 for urban consumers. All of the above adjustments (i.e., in level of consumption, proportion of positive consumption, and expenditure shares) were mostly driven by the change in prices faced by urban and rural consumers. As shown in table 5, the price structure of the nine food groups are almost identical in urban and rural areas, where they share the top four most expensive food groups including meat, fish, eggs-milk, and oils, and the two cheapest food groups including tubers and cereals. Only the price ranking of vegetables and pulses differ. Before the crisis, prices in rural areas are lower than prices in urban areas for all the nine food groups, with the largest price differential in the following food groups, meat, vegetable, eggs-milk, fruits, and fish. However, during the crisis, some food items became more expensive in rural areas than urban areas including fish, eggs-milk, meat, and pulses, with fish having the largest price differential. On the other hand, other food groups that were already cheaper in rural areas even became more relatively cheap during the crisis including vegetables, cereals, tubers, and fruits. The prices of the nine food groups increased between 1996 and 1999. However, except for cereals, the price increase in rural areas were higher than the price increase in urban areas, with the largest differential in price increases as follows, fish, eggs, fruits, vegetables, tubers, meat, oils, and pulses.

All estimations were done in SAS version 8.2. The probability for a positive consumption was estimated using a probit model. Predicted values of the probability and cumulative density functions were then used in the second step to estimate the unconditional mean of consumption. All theoretical demand restrictions were imposed. Homogeneity was imposed by using relative prices in the estimation. Adding-up is satisfied by construction of the LinQuad model, and symmetry was imposed on the parameter space. Concavity was checked after estimation and the necessary condition for concavity, that is, negative eigenvalues of the price parameter matrix is met.

Table 6 shows that the own-price and income parameter estimates are all significant. Tables 7 to 9b give the income and price and elasticities and their standard error. The standard error reported already corrected for the two step procedure used in estimation. Most of the income elasticities and own-price Marshallian and Hicksian elasticities are significant at 1%. Of the 9 own-price Marhsallian elasticities, six had t-values greater than two, and eight for income elasticities. Also, the Marshallian and Hicksian own-price elasticities have the correct negative sign and income elasticities have the correct positive signs. Table 7 shows that cereals consumption, which has the highest level of consumption and highest proportion of positive consumption, is no longer very responsive to changes in income, having the lowest elasticity of 0.021. On the other hand, the animal protein sources food groups (eggs-milk, meat, and fish) and fruits have the highest income elasticity. The decomposition of elasticity into elasticity of positive consumption and elasticity of the probability of consumption uncovers some differential responsiveness of the food groups to changes in income. Consumers' probability to consume is very responsive to changes in income in the case of fruits and eggs-milk, with their income elasticity increasing by 0.584 and 0.468, respectively. Also, a positive response in the probability to consume is shown by pulses, fish, and oils-fat. On the other hand, the probability to consume cereals and vegetables is not very responsive to changes in income anymore. This may be the case because almost 100 percent of the household in the sample already report a positive consumption for both food groups. In the case of meat, it is shown that almost all the responsiveness of consumers to changes in income comes from consumers that are already consuming meat, and very small responsiveness on the probability of consuming meat. This behavior may be largely influenced by religious-cultural factors. A change in income has an inverse impact on consumer's probability to consume tubers.

The demand model is used to derive exact welfare measures of the impact of the economic crisis in Indonesia. The availability of a national household survey data both before the crisis (1996) and during the crisis (1999)[3] provides rich information for examining how households adjusted to the macroeconomic shock of this magnitude. For the welfare analysis parameters estimates from the 1996 SUSENAS was used together with actual price changes faced by households between 1996 and 1999. Since there is no guarantee that the same households were included in the two surveys we used a representative household for each primary sampling unit (PSU), the smallest and most homogenous enumeration area used by SUSENAS. There are 3,043 PSUs that are common in the 1996 and 1999 data with an average of seven respondents in each PSU. For households with zero consumption we use the average price of households in the same PSU with positive consumption as the price they are facing. Equation [10] was used to estimate the welfare impacts and the results are summarized by province and by urban and rural classification within each province as presented in table 10. The economic crisis brought about a price increase in the range of 173% to 387%. The average welfare cost of the crisis of this magnitude was $128 per person. This amount represents 20% of the per capita income in Indonesia in 1999. This average number hides the differences in the welfare cost across the 27

[3] Although the macroeconomic crisis in Indonesia was most severe in 1998, its impact extended into 1999 and beyond.

provinces in Indonesia. The highest welfare cost was in the province of Timor Timur at $165 and the lowest was in Jawa Barat at $116. This crisis cost Indonesian consumers a total of $26.12 billion in 1999. To put this amount in perspective, this represents 95% of the total contribution to Indonesia's GDP coming from the entire agriculture, livestock, forestry, and fishery sector, and is equivalent to 90% of total domestic fixed capital formation in 1999 in Indonesia. Also, the amount could have paid for 95% of Indonesia's total government expenditure including both routine and development expenditures. The cost estimate accounted for differences in the cost both in the province level and between rural and urban areas within each province. The welfare cost would be overestimated by a quarter of a billion dollars if only the average cost for Indonesia is used, and by almost half a billion dollars if cost of provincial estimates is used without accounting for the differences in cost between rural and urban areas within the province.

Furthermore, except for two provinces the welfare cost of the crisis was higher in rural areas than in urban areas by around 10%. This is a direct result of the fact that price changes in rural areas between 1996 and 1999 was higher compared to price changes in urban areas for all food groups, except cereals. However, this result appears to be unexpected since it is a common assumption that rural areas are somewhat insulated from macroeconomic shocks. Rural areas are believed to have higher proportion of consumption from home production. But SUSENAS gives a market value to consumption from home production as an opportunity cost. Also, there is a higher proportion of zero consumption in rural areas, especially for meat and eggs-milk food groups. In this study, zero consumption is assumed to be an optimal corner solution, where a reservation price (at which price it is optimal for consumers to have zero consumption) is assumed to be the average price faced by households with positive consumption in the same PSU. Both valuations of home production and zero consumption, however, are reasonable approximations. It can also be argued that the higher price could be due to higher marketing cost associated with marketing activities in rural areas.

4. Summary and Conclusion

The increasing use of cross-section household survey data in applied demand analysis presents both opportunities and difficulties. Although detailed analysis on impacts of demographic variables is now possible, the many zero observations common in household survey data present a serious methodological challenge especially for imposing theoretical demand restrictions in a censored demand systems model.

We use an incomplete demand system (LinQuad) that is theoretically consistent but requires less direct restrictions on the parameter space, which is difficult in a censored demand model. Nine food groups are constructed from the 1996 Indonesian national socio-economic household survey. A wide differential in censoring of consumption is displayed in this data. Three groups approach 100 percent positive consumption for the 60,674 households in the survey, and two food groups had very low (43 and 51 percent) proportion of positive consumption.

All theoretical demand restrictions were satisfied. Homogeneity was imposed by using relative prices in the estimation. Adding-up is satisfied by construction of the LinQuad model, and symmetry was imposed on the parameter space. Concavity was checked after estimation and the necessary condition for concavity, that is, negative eigenvalues of the price parameter matrix is met.

All parameter estimates are significant. Marshallian and Hicksian own-price and income elasticities had the correct signs and reasonable magnitudes. The paper decomposed the responsiveness of consumers to changes in income into the standard response of the quantity demanded and response through changes in the probability of a positive consumption. Differential responsiveness was uncovered. With almost 100 percent of households having positive consumption, the responsiveness of cereals and vegetables was mostly through changes in quantity and very limited response on the probability of a positive consumption. On the other hand, fruits and eggs-milk showed the largest response in the probability of a positive consumption. Although, the response in quantity consumed was already high in meats, somewhat of a surprise is its lack of responsiveness on the probability of positive consumption. This may be driven by the fact that religious and cultural considerations play a major role in the meat consumption pattern of Indonesian consumers.

The model was used to estimate the welfare cost of the macroeconomic crisis in Indonesia in 1997. The average welfare cost per person is $128, which accounts for 20% of per capita income. The total cost was $26.12 billion, which is almost (95%) the value of the contribution to total GDP of the entire agriculture, livestock, forestry, and fishery sector. Also, it could have paid for 95% of government of Indonesia's total expenditure both for routine and development expenditures. It is estimated that the welfare cost would be overestimated by a quarter to half a billion dollars if provincial differences in cost and differences between urban and rural areas within each province are not accounted for.

The problem of reported zero consumption or expenditure is made more evident when analysts have the opportunity to analyze demand decisions at the household level. One challenge, addressed in this paper, is how to meet the empirical difficulties and at the same time retain a model that is theoretically consistent. By using the incomplete demand system with the LinQuad method, we identify an approach that is theoretically consistent and can be used with relative computational ease. These desirable properties and the results in an application to a large household survey suggest a fruitful area for further research.

Table 1. Indonesia macroeconomic indicators

Variable	Units	1996	1997	1998	1999	2000
Level						
Nominal GDP	Bil Rupia	5.33E+05	6.28E+05	9.56E+05	1.10E+06	1.28E+06
Real GDP	Bil Rupia	4.90E+05	5.13E+05	4.46E+05	4.49E+05	4.71E+05
Exchange Rate	Rupia:$	2342.30	2909.38	10013.60	7855.15	8421.77
CPI	Percent	107.97	115.24	181.66	218.58	228.46
Population	Number	2.09E+08	2.13E+08	2.17E+08	2.20E+08	2.24E+08
Per capita NGDP	$/person	1000	828	205	260	250
Per capita RGDP	$/person	1086	1013	441	635	679
Growth Rate						
Real GDP	Percent	7.82	4.70	-13.13	0.79	4.90
Exchange Rate	Percent	4.17	24.21	244.18	-21.56	7.21
CPI	Percent	8.68	12.57	75.27	14.16	11.13
Population	Percent	1.79	1.77	1.73	1.70	1.72

SOURCE: International Financial Statistics

Table 2. Comparison of 1996 and 1999 urban and rural per capita consumption

	Urban			Rural		
	1996	1999	Change	1996	1999	Change
	Kg per month		Percent	Kg per month		Percent
Cereals	8.98	8.22	-8.41	10.66	10.03	-5.97
Tuber	1.90	1.86	-1.65	3.02	2.95	-2.14
Fish	1.93	1.47	-23.60	1.64	1.21	-25.98
Meat	1.07	0.82	-22.91	1.01	0.80	-20.92
Eggs and Milk	1.43	0.76	-46.73	1.34	0.51	-62.01
Vegetable	3.30	2.71	-17.90	3.60	2.86	-20.74
Pulses	1.54	1.69	9.75	1.38	1.41	2.07
Fruits	2.89	2.53	-12.40	2.87	2.40	-16.41
Oils and Fat	1.21	1.09	-9.31	1.19	1.07	-10.52

SOURCE: SUSENAS

Table 3. Comparison of 1996 and 1999 urban and rural proportion of positive consumption

	Urban			Rural		
	1996	1999	Change	1996	1999	Change
	Percent		Points	Percent		Points
Cereals	99.79	97.89	-1.91	99.53	99.64	0.11
Tuber	48.08	47.53	-0.55	53.43	55.16	1.73
Fish	88.69	85.45	-3.23	86.44	85.22	-1.21
Meat	59.75	42.88	-16.87	31.58	21.20	-10.37
Eggs and Milk	86.40	77.16	-9.24	69.32	58.64	-10.69
Vegetable	98.39	95.89	-2.50	99.37	99.21	-0.16
Pulses	82.83	81.69	-1.14	71.29	70.70	-0.59
Fruits	81.53	74.59	-6.94	72.26	66.30	-5.96
Oils and Fat	98.53	96.44	-2.09	98.77	98.60	-0.18

SOURCE: SUSENAS

Table 4. Comparison of 1996 and 1999 urban and rural expenditure shares

	Urban			Rural		
	1996	1999	Change	1996	1999	Change
	Percent		Points	Percent		Points
Cereals	26.12	38.19	12.07	29.75	46.72	16.98
Tuber	2.38	1.22	-1.16	2.79	1.73	-1.06
Fish	12.89	13.44	0.55	11.77	11.83	0.06
Meat	14.52	3.94	-10.58	14.16	1.99	-12.17
Eggs and Milk	9.40	7.35	-2.05	7.95	4.26	-3.69
Vegetable	13.37	15.38	2.01	12.70	15.88	3.18
Pulses	6.04	6.23	0.19	5.81	5.69	-0.12
Fruits	9.37	7.09	-2.28	8.99	3.87	-5.11
Oils and Fat	5.93	7.16	1.24	6.09	8.02	1.93

SOURCE: SUSENAS

Table 5. Comparison of 1996 and 1999 urban and rural food prices

	Urban			Rural		
	1996	1999	Change	1996	1999	Change
	Rupiah/kilogram		Percent	Rupiah/kilogram		Percent
Cereals	981	2,688	174	938	2,561	173
Tuber	547	1,457	166	467	1,335	186
Fish	3,294	12,792	288	3,116	15,168	387
Meat	5,457	14,967	174	5,161	15,094	192
Eggs and Milk	3,272	10,710	227	3,057	11,250	268
Vegetable	1,453	4,442	206	1,171	3,859	229
Pulses	1,315	3,262	148	1,310	3,282	151
Fruits	1,157	2,127	84	956	2,011	110
Oils and Fat	1,776	4,578	158	1,663	4,560	174

SOURCE: SUSENAS

Table 6. Parameter estimates 1996 SUSENAS

	Coefficient	**Std Error**
Cereals Equation		
Cereals Price	-2.21E-03	3.80E-05
Food Expenditure	3.34E-07	2.60E-08
Tubers Equation		
Tuber Price	-2.06E-03	3.60E-05
Food Expenditure	3.32E-07	5.01E-08
Fish Equation		
Fish Price	-1.40E-04	1.10E-06
Food Expenditure	4.08E-07	8.54E-09
Meat Equation		
Meat Price	-3.00E-05	2.35E-07
Food Expenditure	1.98E-07	3.55E-09
Eggs and Milk Equation		
Eggs and Milk Price	-5.83E-06	2.87E-07
Food Expenditure	2.52E-07	2.38E-08
Vegetable Equation		
Vegetable Price	-4.50E-04	1.51E-06
Food Expenditure	7.83E-07	1.36E-08
Pulses Equation		
Pulses Price	-2.90E-04	2.13E-06
Food Expenditure	1.81E-07	8.46E-09
Fruit Equation		
Fruits Price	-4.60E-04	9.99E-06
Food Expenditure	5.77E-07	1.76E-08
Oil Equation		
Fruits Price	-2.80E-04	1.99E-06
Food Expenditure	2.64E-07	5.09E-09

SOURCE: Estimated

Table 7. Standard and adjusted income elasticity SUSENAS 1996

	Standard	**Adjusted**	**Std. Error**	**Probability**
Cereals	0.021	0.021	0.014	0.000
Tubers	0.158	0.123	0.187	-0.035
Fish	0.170	0.239	0.018	0.069
Meat	0.283	0.285	0.049	0.002
Eggs and Milk	0.153	0.621	0.038	0.468
Vegetables	0.145	0.144	0.005	-0.001
Pulses	0.105	0.209	0.072	0.104
Fruits	0.168	0.752	0.161	0.584
Oils and Fat	0.142	0.150	0.009	0.008

SOURCE: Estimated

Table 8a. Marshallian elasticity SUSENAS 1996

	Cereals	Tubers	Fish	Meat	Egg	Vege	Pulses	Fruits	Oils
Cereals	**-0.43**	-0.02	0.01	0.01	0.00	-0.02	0.02	-0.02	0.02
Tubers	-0.32	**-1.58**	-0.01	-0.14	-0.01	-0.29	-0.03	-0.09	0.01
Fish	0.01	0.00	**-0.59**	-0.02	0.00	0.00	0.00	0.02	-0.01
Meat	0.01	-0.04	-0.03	**-0.77**	-0.01	-0.04	0.00	-0.01	-0.01
Egg	-0.01	0.00	0.00	-0.01	**-0.05**	-0.01	0.00	0.00	0.00
Veg	-0.04	-0.04	0.00	-0.02	-0.01	**-0.37**	0.01	-0.02	0.01
Pulses	0.12	-0.01	0.00	0.00	-0.01	0.02	**-0.75**	0.01	0.05
Fruits	-0.10	-0.03	0.04	-0.01	-0.01	-0.04	0.01	**-0.46**	0.02
Oils	0.11	0.00	-0.03	-0.01	-0.01	0.02	0.04	0.02	**-0.82**

SOURCE: Estimated

Table 8b. Standard error Marshallian elasticity SUSENAS 1996

	Cereals	Tubers	Fish	Meat	Egg	Vege	Pulses	Fruits	Oils
Cereals	0.036	0.003	0.005	0.026	0.006	0.005	0.016	0.060	0.172
Tubers	0.051	0.023	0.025	0.272	0.018	0.134	0.091	0.449	0.200
Fish	0.015	0.003	0.020	0.102	0.010	0.020	0.025	0.113	0.020
Meat	0.039	0.058	0.098	0.255	0.014	0.042	0.032	0.221	0.007
Egg	0.015	0.008	0.003	0.011	0.058	0.003	0.003	0.004	0.004
Veg	0.047	0.020	0.015	0.055	0.006	0.011	0.215	0.108	0.220
Pulses	0.163	0.008	0.036	0.098	0.009	0.481	0.043	0.210	0.114
Fruits	0.222	0.200	0.211	0.424	0.018	0.188	0.121	0.229	0.021
Oils	0.722	0.195	0.053	0.007	0.009	0.477	0.073	0.006	0.271

SOURCE: Estimated

Table 9a. Hicksian elasticity SUSENAS 1996

	Cereals	Tubers	Fish	Meat	Egg	Vege	Pulses	Fruits	Oils
Cereals	**-0.42**	-0.02	0.01	0.01	0.00	-0.01	0.02	-0.02	0.03
Tubers	-0.26	**-1.58**	0.01	-0.13	0.01	-0.27	-0.02	-0.08	0.02
Fish	0.08	0.00	**-0.57**	-0.01	0.01	0.03	0.01	0.03	0.00
Meat	0.12	-0.04	0.00	**-0.76**	0.01	0.00	0.01	0.01	0.01
Egg	0.05	0.00	0.02	0.01	**-0.04**	0.02	0.01	0.01	0.01
Veg	0.02	-0.04	0.02	-0.01	0.00	**-0.35**	0.01	-0.01	0.02
Pulses	0.16	-0.01	0.01	0.01	0.00	0.04	**-0.74**	0.02	0.06
Fruits	-0.03	-0.03	0.06	0.00	0.01	-0.02	0.02	**-0.44**	0.03
Oils	0.16	0.01	-0.01	-0.01	0.01	0.04	0.04	0.03	**-0.81**

SOURCE: Estimated

Table 9b. Standard error Hicksian elasticity SUSENAS 1996

	Cereals	Tubers	Fish	Meat	Egg	Vege	Pulses	Fruits	Oils
Cereals	0.037	0.004	0.005	0.026	0.006	0.005	0.016	0.060	0.172
Tubers	0.051	0.023	0.025	0.272	0.018	0.134	0.091	0.449	0.200
Fish	0.015	0.003	0.020	0.102	0.010	0.020	0.025	0.113	0.020
Meat	0.039	0.058	0.098	0.255	0.014	0.042	0.032	0.221	0.007
Egg	0.015	0.008	0.003	0.011	0.058	0.003	0.003	0.004	0.004
Veg	0.047	0.020	0.015	0.055	0.006	0.011	0.215	0.108	0.220
Pulses	0.163	0.008	0.036	0.098	0.009	0.481	0.043	0.210	0.114
Fruits	0.222	0.200	0.211	0.424	0.018	0.188	0.121	0.229	0.021
Oils	0.722	0.195	0.053	0.007	0.009	0.477	0.073	0.006	0.271

SOURCE: Estimated

Table 10. Welfare Impacts of the 1997 macroeconomic crisis

	Ave	Rural	Urban	R:U		
	US$ per person per year			Ratio	Rank	Rank
Bali	-118	-119	-116	1.02	25	below
Bengkulu	-131	-131	-130	1.01	16	above
Di Yogyakarta	-153	-157	-149	1.06	4	above
Dista Aceh	-137	-138	-133	1.04	10	above
Dki Jakarta	-133	-109	-135	0.81	15	above
Irian Jaya	-151	-149	-152	0.97	5	above
Jambi	-135	-147	-121	1.21	12	above
Jawa Barat	-116	-120	-108	1.11	27	below
Jawa Tengah	-126	-131	-119	1.10	22	below
Jawa Timur	-117	-122	-110	1.11	26	below
Kalimantan Barat	-127	-131	-118	1.11	21	below
Kalimantan Selatan	-161	-170	-152	1.12	3	above
Kalimantan Tengah	-162	-172	-154	1.12	2	above
Kalimantan Timur	-122	-125	-119	1.05	23	below
Lampung	-127	-131	-121	1.09	20	below
Maluku	-130	-134	-129	1.04	18	above
Nusa Tenggara Barat	-121	-125	-114	1.10	24	below
Nusa Tenggara Timur	-151	-158	-134	1.18	6	above
Riau	-134	-143	-124	1.15	14	above
Sulawesi Selatan	-138	-143	-134	1.07	9	above
Sulawesi Tengah	-137	-145	-127	1.14	11	above
Sulawesi Tenggara	-146	-163	-131	1.25	7	above
Sulawesi Utara	-130	-133	-127	1.05	17	above
Sumatera Barat	-145	-148	-141	1.04	8	above
Sumatera Selatan	-134	-136	-130	1.05	13	above
Sumatera Utara	-129	-136	-120	1.13	19	above
Timor Timur	-165	-166	-159	1.05	1	above
INDONESIA	-128	-133	-121	1.10		

SOURCE: Estimated

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