Is the Calorie Income Elasticity Sensitive to Prices Changes?
Evidence from Indonesia

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First Draft: August 2001

I wish to acknowledge the helpful comments received by professor Jere Behrman and colleagues at IFPRI, especially Howard Bouis and David Coady.

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Abstract

The calorie-income demand elasticity is an important parameter in the development literature and in the policy arena. Yet, there is very little evidence on the extent to which it can be considered as an unchanging parameter or a time-shifting parameter that, for example, changes with the economic conditions faced by households. In the event that the latter case is a more accurate description of the relationship between income and calories then there would be less ground for using such a parameter as a guide for policy. This may also provide an additional explanation for the wide range of elasticity estimates observed in the literature.

In this paper I use data from the 1996 and 1999 SUSENAS surveys in Indonesia to examine whether the relationship between income changes and caloric availability has changed and if so how. Using the same questionnaire, the SUSENAS surveys collect detailed information on more than 200 different food items consumed over the last seven days by 60,000 households at the same point in time in each survey year. I use non-parametric as well as regression methods to examine two important relationships: a) the relationship between income and total calories; and 2) the relationship between income and calories from cereals and other foods (excluding cereals and root crops. The empirical analysis finds that the calorie income elasticity is remarkably insensitive to changes in relative prices and behavior that is consistent with the presence of a binding subsistence constraint.

1. Introduction

Since the onset of the financial crisis in 1997 and its intensification in 1998, rural and urban households in Indonesia experienced large increases in the price of rice and other food and nonfood products. Such price increases have two major consequences. Firstly, they result in a decrease in the purchasing power of household income especially among poorer households that spend a large share of their income on food. Secondly, they result in a relative price effect that induces households to substitute away from the more expensive foods. Concerns about the impact of the crisis on the quantity and quality of food available in poor households, for example, have given rise to a number of "social safety net" programs, aimed at protecting caloric availability within households by means of in-kind transfers of staple foods such as rice, the sale of rice at subsidized prices, and the creation of temporary employment for poorer households during the crisis (Suryahadi *et al*, 1999)

Such programs along with other related cash transfer programs are based on the underlying assumption that there is a positive relationship between caloric availability and income that is invariant to changes in the economic environment of the households. Much of the research in development economics and food policy has focused its attention on the size of the calorie income elasticity (e.g. Strauss and Thomas, 1995) while placing less emphasis on the sensitivity of this parameter to the price environment. When no restrictions are imposed on the preferences of consumers, basic economic theory implies that the sensitivity of consumer demand for any food item to changes in prices or total expenditure is likely to vary depending on the level of relative prices as well as the level of household income. Most of the empirical evidence to date has addressed the question of whether the price sensitivity of demand varies with level of income. A number of studies, for example, have confirmed empirically that the compensated price responsiveness of consumers varies substantially across different income strata (Timmer and Alderman, 1979; Timmer, 1981; Pitt, 1984). Along similar lines, Behrman and Deolalikar (1987), Ravallion (1990), Strauss and Thomas (1995) and Subramanian and Deaton (1996) examined whether the income elasticity of calories accessed through the consumption of all food items as a group varies with the level of income.

Yet, there is no empirical evidence on whether the income response of demand for calories in general or commodities in particular varies with the level of relative prices faced by households (e.g., Alderman, 1986). Ceteris paribus, when there are high prices for food relative to non-food, households may spend most of their additional income on non-food items instead of food. Similar reasoning may also be applied to the changes in the relative prices of specific food items. If this were to be the case, then the effectiveness of cash transfer programs at a time of crisis may be much weaker than what is implied using elasticity estimates estimated at a period of normal prices.

Part of the explanation for the paucity of evidence rests on the fact that economic theory provides no guidance on how the income elasticity of any given commodity may change as a result of changes in prices. Unless one is willing to make arbitrary assumptions about the separability of preferences between and within specific food groups there are no refutable propositions that can be derived on this subject. This however, does not justify the treatment of income elasticity estimates of demand for food as time invariant or insensitive to the economic environment. To my knowledge, there is no empirical evidence to date that validates this assumption. A complementary explanation for the absence of any relevant evidence is that most of the studies on the calorie-income relationship have relied on cross-sectional data (for a survey of this literature see Strauss and Thomas, 1995). A typical cross-sectional household survey collects data within a short time interval. As a consequence, most of the variation in the price of any given commodity faced by households arises from differences in the quality of the commodity consumed, transportation costs, market segmentation and other transaction costs that may prohibit the equalization of consumer prices across space.[1] To the extent that households in different regions are surveyed in different quarters in the calendar year then the survey may also capture seasonal variability in prices. But even if this were possible, it is till doubtful whether the seasonal variation in prices provides an adequate representation of the change in relative prices that consumers face during a major economic crisis. Household panel data provide an opportunity to relax some of these shortcomings. Behrman and Deolalikar (1987), for example, analyze the calorie income relationship using data from the Village Level Survey of ICRISAT. But even these data can shed little light on this question since the set of villages followed were characterized by a relatively stable economic environment during the period of the study.

[1] This may also then explain why some of the literature has focused on the differences in the quality of food consumed by richer and poorer households as a potential for explaining the concavity in the observed relation between calories and income.

During the recent financial crisis in Indonesia for example, the value of the rupiah depreciated dramatically in 1998. The rupiah fell from around 2,400 per US$ in June 1997 to just under Rp 15,000 per US $ in June 1998, finally settling down to Rp 8,000 or 9,000 per US$ by December 1998. These fluctuations in the exchange rate led to large increases in the price of tradable commodities in domestic markets leading to an annual inflation rate of 80% during 1998. In addition, during 1998 the subsidies were removed on a number of major consumer goods such as rice, oil and fuel. It is thus questionable whether estimates of the income elasticity of calories obtained from a sample of households observed during pre-crisis years can provide any guidance on how caloric availability may respond to additional income (*ceteris paribus)* during a period with a different set of relative prices. From a policy perspective the sensitivity of the calorie income elasticity to the relative prices in the economy implies that policies aimed at increasing household income such as employment and cash transfer programs may be more (or less) effective at different periods depending on the economic conditions prevailing at the time of their implementation.

I use household consumption and calorie data from the 1996 and 1999 consumption module of the National Socio-Economic Surveys (SUSENAS) in Indonesia to examine these issues in detail. The paper is structured as follows. In section 2 I discuss the data used for the analysis and some background information on the changes in calorie prices and caloric availability between 1996 and 1999 in Indonesia. In section 3 I use non-parametric methods to examine the relationship between the calorie income elasticity in 1996 and in 1999 and the level of household income in each survey round. I also provide estimates of the calorie income elasticity using regression methods that allow me to control for the role of observed household characteristics as well as differences in the level of relative pries across villages (or clusters). In section 4 I summarize the findings and conclude with some policy considerations.

2. Data

My analysis is based on the detailed consumption module of the National Socio-Economic Survey (SUSENAS) collected every three years by the Central Statistical Agency (BPS) of the Government of Indonesia. The consumption module is nationally representative of urban and rural areas within each of the 27 provinces.[2] The 1996 round surveys 60,678 households and the 1999 round 62,217 households. Besides the detailed nature of the survey some of the main advantages obtained by the comparison of the income elasticity of calories in these two years include: (i) the opportunity to examine economic behavior in the context of dramatically different relative price regimes. In February 1999, the month in which the 1990 SUSENAS was conducted, the inflation rate in Indonesia had reached its peak since the start of the financial crisis in late 1997 and its intensification in mid 1998. (ii) The same questionnaire was applied at the same point in time in each survey year. In this manner the possible influence of seasonal factors in the caloric income relationship as emphasized by Behrman, Foster and Rosenzweig (1997) can be controlled.[3]

The consumption module includes 216 food items in 1996 and 214 food items in 1999. [4] The survey makes a very good effort at getting to the total value of the food consumed by households and not just to the value of household purchases of food. In each of these years households were asked explicitly to recall the quantity and value of each of these food items purchased from the market during the last week, or given to them as gifts or consumed out of own production.[5] The latter quantities are valued by local interviewers using the prevailing market prices in the villages where households reside.

The caloric content of each of food item is estimated the BPS using established conversion factors and provided as part of the data set. Calories are transformed in daily kilocalories by dividing by the reported caloric content of food items purchased and "auto-consumed" or received as gift during the week previous to the survey date by (1,000/7). Household per capita caloric availability, $CAL(t)=TCAL(t)/N(t)$, where $TCAL(t)$ denotes the total calories available in the household in survey period t and $N(t)$ denotes total family size in survey period t.

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[2] It should be noted that the core SUSENAS survey containing observations for approximately 205,000 households is representative at the district (kabupaten) level.
[3] The fasting month and the Idul Fitri-Lebaran holiday following it is a moving holiday, and in 1999 it fell in late January of 1999. We were informed by BPS officials that the survey were conducted two weeks after the Lebaran holiday and as result the value of household food consumption has little chance of appearing unusually high due to the feasting holiday.
[4] The difference of 2 items arises from the fact that high quality and imported rice in 1996 were treated as separate food items in the cereals category, but not in 1999.

The value of food consumption is the sum of expenditures on grains, meat, fish, eggs and milk, vegetables, pulses, fruits, seasonings, fats and oils, soft drinks, prepared food and other food items, and alcohol.[6] The reference period for consumption of these items is the week preceding the day of the interview. Weekly consumption was transformed into monthly consumption by multiplying by (30/7).

For non-food expenditures the survey collects two measures, each for a different reference period: last month and last 12 months. In order to avoid exclusion errors I utilized the average expenditures per month calculated from the reported expenditures based on the reference period of the last 12 months. Expenditures on non-food items include expenditures on tobacco, housing, clothing, health and personal care, education and recreation, transportation and communication, taxes and insurance and other ceremonial expenses. Expenditures on durables such as household furniture, electric appliances, and audio-visual equipment, are excluded for the aggregate of household consumption. The income of a household is measured by the value of per capita consumption, is denoted by *CON(t)* and is constructed by dividing the value of total food and plus nonfood consumption in survey period t by the size of the household in each period.[7]

In order to make any meaningful comparisons across two cross-sectional surveys that are three years apart it is essential to express the nominal income of households in 1999 in terms of 1996 rupiah. A critical point for the construction of "real" income in 1999 is the fact that changes in food prices impact on households differently depending on the share of their budget they spend on food. Typically, poorer households spend a much higher fraction of the income on food (closer to 60% for poor rural households in Indonesia), while this share diminishes down to 40 percent for households at the top of the expenditure scale in urban areas.

The availability of value and quantity for each of the food items in the SUSENAS consumption modules allows calculation of unit values down to the household level. Given the data available, I have constructed a deflator combining the unit values calculated from the

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[5]Van De Walle (1988) provides a guide to the SUSENAS consumption module that is still useful in spite of some changes in the questionnaire.
[6] In contrast to BPS, I do not include tobacco expenditures in the food consumption total.
[7] Thus it is implicitly assumed that that there are no economies of scale at the household level. For the present purpose of comparing income elasticity over time this assumption is not overly

consumption module and the province-specific prices reported for non-food items by the BPS.[8] First, given that for non-food items only expenditures are collected, I constructed a deflator for non-food items using the mean shares of major groups of non-food items in the February 1999 survey as weights and the province-specific price indices for these groups.[9] Second, I constructed a household-specific food deflator from a weighted average of the fifty-two food items used in the calculation of the poverty line in Indonesia. Specifically, the household-specific food deflator is calculated using the formula

$$P_F^h(99) = \left(\sum_{i=1}^{52}\left(S_i^h(99)\left(\frac{P_i\ (R,96)}{P_i\ (R,99)}\right)\right)\right)^{-1}, \qquad (1)$$

which is the standard formula for calculating a Paasche price index (see Deaton and Zaidi, 1999). The letter S denotes the share of food item *i* of the total amount expended on the 52 food items and the superscript h indicates that this share varies from household to household. The second term is the ratio of the median unit value of food item *i* in region R in 1996 to the corresponding unit value in 1999. Household-specific unit values of food items are replaced by median unit values within each of the 53 regions so as to minimize the influence of measurement errors and differences in the quality of food consumed by wealthier households (Deaton, 1988). Having a price deflator for food and non-food, the price deflator for household *h* in 1999, $P^h(99)$ can be expressed as

$$P^h(99) = \hat{W}_F^h(99)P_F^h(99) + \left(1 - \hat{W}_F^h(99)\right)P_{NF}(R,99)\ . \qquad (2)$$

Note that the weights applied to food and non-food are allowed to vary once more across households. The weight for each household was calculated from the predicted value of the regression of household food share in 1999, $\hat{W}_F^h(99)$, on the logarithm of per capita consumption, $\ln\left(C(99)\right)$, and the logarithm of household size (i.e., a log-linear Engel curve for food). In this manner the influence of household specific unobserved components or tastes on the share of food is eliminated.

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limiting. In any case the regression analysis below controls for the gender and age composition of families in each survey year.

[8] Suryahadi *et al.* (2000) and Levinson *et al.* (1999) adopt a similar approach in constructing household specific price indices for Indonesia.

[9] It should be noted that the province-specific price indices for food and non-food groups reported by BPS are based solely on urban prices, for 27 cities in 1996 and 44 cities in 1999.

At this point it is also appropriate to outline some of the caveats associated with this study. Firstly, this study is primarily concerned with the relationship between income and the demand for energy from calories. There is now a consensus that total caloric availability provides only limited insights on how the nutritional status of households responds to changes in income. When household income drops caloric availability within the household may be maintained more or less constant through substitutions within and between food groups while the consumption of essential micronutrients may decrease dramatically as households consume less meat, vegetables, egg and milk (Behrman, 1995). Since the micronutrient content of food consumed is not available for each of the two hindered or so food items covered by the survey I make an effort to get some insights on these issues by investigating the relationship between income and calories from two food groups: cereals and all other food sources excluding cereals (and root crops such as cassava and sweet potato).

Secondly, the analysis is based on a food expenditure survey rather than a 24-hr recall consumption survey. Food expenditure surveys have been argued to lead to upwardly biased estimates of the calorie income elasticity (Bouis and Haddad, 1992; Bouis, 1994). Correlated measurement errors in the total food consumption and thus caloric availability are one potential source of an upward bias in estimates of the level of calorie income elasticities. A related source of upward bias is attributed to the under coding of food transfers from richer households to poorer households. For example, a food expenditure survey may overstate the caloric availability within wealthier households since it is common for these households to provide meals to employees and domestic servants. In contrast a food expenditure survey may understate the caloric consumption of poorer households if they consume food outside their home (for example, meals provided at their place of employment). Although generally valid, these issues do not diminish the credibility of this study of whether there have been changes in the level of the calorie-income elasticity. The exact same questionnaire was applied at the same point in time in each survey year and there are no reasons to believe that there are changes in the sources of these biases across the two years. Nevertheless, it is worthwhile to point out that the SUSENAS survey asks whether household members received food from sources other than own production and market purchases for the purpose of getting at the total caloric availability within households. Although no explicit questions are asked about food given to others, it should be noted that domestic servants are counted as members of the household roster so to some extent upwardly biased estimates of caloric availability within wealthier households may be reduced by using calories and consumption per capita.

To provide more concrete evidence about the relative price regimes prevailing in the two survey years, Table 1 presents the mean prices per 1,000 calories paid by households in 1996 and in 1999 in rural and urban areas in Indonesia.[10] In order to preserve some of the heterogeneity of the country, it is divided into five broad geographic regions: Sumatra, Java and Bali, Nusa Tengara, Kalimantan and Sulawesi (including Maluku and Irian Jaya).[11] The prices per (kilo) calorie are calculated by dividing the nominal value of household consumption for each food group by the total quantity of calories provided by all the food items in the group. Columns 1 and 2 contain the means of these prices for the full sample of households in each region in 1996 and in 1999. Poorer households may consume food items of lower quality and as a consequence the prices of calories paid by these households may be lower than those paid by richer households. In order to investigate for this possibility prices per 1,000 calories are also calculated separately for households at the bottom and at the top 25th percent of the distribution of total consumption per capita in each year (see columns 3-4, and 5-6, respectively). In 1999, the percentiles of total consumption per capita are estimated after dividing consumption bythe deflator discussed earlier. Columns 7-8, 10–11 and 13-14 express these prices relative to the price of cereals in each region in each year. Lastly, columns 9, 12, and 15 present the changes in these relative prices between 1996 and 1999.

Table 1 confirms that the relative prices faced by households changed considerably between 1996 and 1999.[12] Noncereals are defined to include all other foods except cereals and thus include root crops such as cassava and sweet potatoes that are also rich in calories and typically serve as a substitute for rice. In order to get a better sense of the changes in the relative prices of foods such as fish, meat, eggs and milk, and vegetables that are rich in micronutrients I have also constructed another food group aggregate named “other foods” that excludes root crops. In all of the five regions and in both urban and rural areas the relative prices of

[10] Means were obtained by weighting individual household observations by the inverse probability of selecting the household into the sample times the number of family members in the household.

[11] Specifically Sumatra includes province codes 11 to 18 (inclusive), Java and Bali codes 31 to 51, Nusa Tengara codes 52 to 54, Kalimantan codes 61 to 61, and Sulawesi codes 71 to 82.

noncereals and other foods decreased. In general, the relative price of noncereals, which include root crops, decreased more than other foods, which implies that the lower price of root crops is primarily responsible for this difference. The extent to which relative prices changed also varies from region to region. There seems to be greater variation in how relative prices changed in rural areas than in urban areas across regions. For example, the relative price of other foods decreased by 3 percent in rural Java and Bali and as much as 27 percent in Nusa Tengara. In contrast the drop in the relative price of other foods in urban areas varied between 11 percent in urban Java and Bali and 15 percent in urban Sulawesi, Maluku and Irian Jaya.

To complete the picture, table 2 presents the mean total calories per capita available within households through the broad food groups: cereals and noncereals (and other foods).[13] Average (total) daily calories per capita are generally lower in 1999 than in 1996. For example, among poor households in rural Java and Bali average daily calories per capita decrease from 1,651 calories in 1996 to 1,493 calories in 1999. Cereals and rice in particular provide between 60 and 72 percent of the total calories of poor households in rural areas of Indonesia. Among poor households in 1996, the lowest share of calories from cereals, 59 percent, is in rural Sulawesi. In this region, root crops provide 12 percent of the share of total calories, which is the highest share of calories obtained from root crops than in any other region of Indonesia. Irrespective of whether the minimal daily caloric requirement of 2,100 calories represents an appropriate measure of the minimum daily calories for an adult, the lower mean daily calories per capita in 1999 relative to 1996 suggest that Indonesian households experienced a serious reduction in the level of energy available from calories.

Table 2 also reveals a remarkable stability in the average share of calories obtained from the different food groups between 1996 and 1999. Although cereals are relatively more expensive in 1999, poor households in rural areas appear to either maintain or increase slightly the share of their calories from cereals. Given that the two food groups examined so far may too broad I also investigated whether and how the share of calories obtained from a finer decomposition of food into various groups changes between 1996 and 1999. Table 3, for

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[12] For a related analysis of the impact of the Indonesian crisis on budget shares with repeated observations on sampled households see Thomas, Frankenberg, Beegle, and Teruel (1999).
[13] These means are derived using weights as in footnote 10.

example, contains the share of calories obtained from twelve major food groups in the region of Java and Bali.

Table 3

As it can be seen in this region that experienced the smallest decrease in the relative price of noncereals (see table 1) among poorer households in rural areas, the shares of calories obtained from fish, meat, eggs and milk products and fruits and vegetables decreased in 1999. The share of calories from meat, in particular, decreased by fifty percent in 1999, from an already low level in 1996. In contrast, the share of calories from cereals and root crops such as cassava and sweet potatoes increased. In consideration of the fact that fish, meat, eggs and milk products and fruits and vegetables are important sources of necessary micronutrients or dense calories, such as, vitamin A and C, calcium, iron, niacin, thiamin and riboflavin, table 3 suggests that poorer households in 1999 experienced a significant reduction in their dietary intake as well as in the total energy available from calories Whether these adjustment to the crisis have adverse consequences on the nutritional status of children, pregnant and lactating women and other adult members as well as permanent impacts on their health and human capital is a critical policy question that cannot be addressed with the SUSENAS data. What is clear, however, is that the changes in the relative prices of cereals and noncereals or other foods do not appear to be associated with any major change in the way poorer households acquire their calories. Put differently, holding income constant the changes in relative calories between 1996 and 1999 do not appear to induce a poor household to substitute away from cereals or change significantly the way in which it acquires calories. This finding is generally consistent with the earlier finding of Timmer (1981) who provided evidence that the poorest segment of the Indonesian population exhibited no compensated price reaction at all to calorie prices aside from the income effect resulting from the changed prices. To the extent that the preceding insights are valid then this also implies that the income elasticity of total calories is less likely to be affected by relative price changes not matter how large these changes are. Whether this is indeed the case is examined empirically in the next two sections of the paper.

3. Empirical Analysis and Results

The available evidence to date on the calorie-income relationship in Indonesia suggests that it is nonlinear with poorer households having a higher elasticity than richer households (e.g., Timmer and Alderman, 1979; see Timmer, et al. 1983; Ravallion, 1990). In order to get a better sense about how the income elasticity of calories varies with the level of income in each of the two years of the SUSENAS surveys, I use nonparametric methods. Using *y* to denote the logarithm of per capita calorie availability, and *x* the logarithm of per capita total household expenditure, the regression function, can be written as

$$m(x) = E(y|x)\,. \tag{3}$$

Following Subramanian and Deaton (1996), I estimate *m(x)* using a smooth local regression technique propose by Fan (1992).[14] At any given point *x*, I run a weighted linear regression of the logarithm of calories per capita on the logarithm of per capita consumption. The weights are chosen to be largest for sample points close to *x* and to diminish with distance from *x*. Instead of estimating a regression for each point *x* in the sample, I divided the distribution of log per capita into 100 evenly spaced grids and estimated local regressions for each grid. For the local regression at *x*, observation *i* gets the (quartic kernel) weight

$$w_i(x) = \frac{15}{16}\left[1-\left(\frac{x-x_i}{h}\right)^2\right]^2 \tag{4}$$

if $-h \le x - x_i \le h$ and zero otherwise. The quantity *h* is a bandwidth that is set so as to trade off bias and variance, and that tends to zero with the sample size. I have set the bandwidth to the value of 0.8.[15]

A useful feature of the smooth local regression technique is that it allows estimation not only of the regression function at each point but of its derivative. Given that both *y* and *x* are expressed in log form, the derivative of the regression function, denoted by *m'(x)*, is an estimate of the elasticity of calories with respect to income. Then a graph of the calorie-income elasticity estimate against the level of (log) income allows one to determine easily the extent to which the elasticity varies with income. Given the focus of the paper on the elasticity of calories with

[14] Fan (1993) has demonstrated the superiority of the smooth local regression technique over kernel and other methods.

[15] As pointed out by Deaton (1995) graphs of the slope of the regression function *m'(x)* may necessitate higher bandwidths than graphs of the regression function itself.

respect to income I will limit my presentation and discussion to estimates of the slope of the regression function.

The topography of Indonesia also requires consideration of the differences in the cost of living across space within any survey year. For this reason my non-parametric analysis of the calorie income-relationship will be limited within a specific region: rural areas of the province of East Java. The reason for choosing this region is based on three facts: (i) rural East Java is a very densely populated province with a high concentration of poor people; (ii) there is a sufficiently large number of households sampled in this region which facilitates the application of the non-paremetric regression method; and (iii) there is a number of other studies that have conducted an analysis of the calorie-income relationship in the same area (e.g. Ravallion, 1990). In the latter part of the paper I use regression methods that allow me to control for differences in the price level of food items not only at the province level but even at the village (or cluster) level. Figure 1 below contains graphs of the estimated income elasticity of calories against the level of income for rural East Java in 1996 and in 1999. The elasticity for 1999 was constructed using the per capita consumption that has been deflated by the household specific price index discussed above. The vertical line in the graph denotes the 25th percentile on the log of 1996 per capita expenditures in each region so as to make it easier to identify the poorest quartile.

Figure 1

Inspection of figure 1 confirms that the estimated relationship between the income elasticity of calories and income is best described by a “curve” rather than a straight line as already indicated by earlier studies on the calorie income relationship in Indonesia. At low levels of income, the elasticity in 1996, the year of normal price environment, rises slowly from 0.32 to 0.35. This estimate is very close to the 0.334 estimate reported by Ravallion (1990) using SUSENAS data from the same province, and substantially lower than earlier estimates of calorie income elasticity for Indonesia. [16] Timmer and Alderman (1979), for example, using the 1976 round of the same SUSENAS survey, report elasticity estimates of 0.776 and 0.615 for households in the lowest and second lowest quartiles of the income in rural areas of Indonesia.

[16] Ravallion’s (1990) estimate derived from a regression model that allows nonlinear effects of income, is evaluated at 1 standard deviation below the mean. At the mean the elasticity is estimated to be 0.146.

Chernichovsky and Meesook (1984) using the 1978 SUSENAS survey report a slightly higher calorie income elasticity estimate of 0.79 for the poorest 40% of households.[17]

At levels of income higher than the 25% percentile the value of the elasticity begins to decrease at a steady rate. The calorie-income elasticity in 1999 appears to have the same general shape but it seems to be slightly higher among poorer households (i.e. just over 0.4) and slightly lower among richer households relative to the elasticity in 1996.

Figure 2

In order to determine whether the two elasticity values at each level of income are significantly different from each other it is essential to have some estimates of the standard error associated with each of the elasticity values. Figure 2 contains graphs of the standard error bands separately for the 1996 and 1999 estimates of the calorie-income elasticity. They were calculated using the formula $m'(x) \pm 2s.e(m'(x))$. The standard errors in each year are estimated by bootstrapping (Efron and Tibshirani, 1993) with a modification that takes into consideration the clustered structure of the SUSENAS sampling procedure.[18] One simple way of determining whether the elasticity estimates are significantly different at different levels of outlay is by checking whether the standard error bands for the 1996 estimate overlaps with standard error bands for the 1999 estimate. If at some range of outlay the standard error band for the 1999 estimate is clearly above the standard error band for the 1996 estimate then it is safe to say that the elasticity estimate in 1999 is significantly higher. The confidence interval bands around the estimated elasticity is wider at the tails of the distribution suggesting that the elasticity is measured with less precision at the very bottom and very top ends of the distribution of per capita consumption. Nevertheless, there seems to be a considerable range of per capita consumption to the left and to the right of the vertical line at the 25 percentile where the elasticity in 1999 is statistically significantly higher than that in 1996. However, although the

[17] It should be noted that, empirical studies based on the estimated (or actual) caloric intake of individual household members typically obtained from 24 hour recall surveys yield calorie-income elasticity estimates that are zero (Bouis and Haddad, 1992 and Bouis, 1994). This implies that changes in household income per capita will have little or no effect on malnutrition.
[18] For a detailed description of how to do bootstrapping within a clustered sampling design see Subramanian and Deaton (1996)

increase in the calorie income elasticity is significantly higher in a statistical sense, the increase does not seem to be substantially higher in any economic sense.

Regression Analysis

The analysis so far has focused on the bivariate relationship between calories and total outlay. Next, I examine whether the elasticity estimated by the non-parametric methods for 1996 and 1999 is robust to controlling for household age and gender composition and other observable characteristics. Given that figure 1 reveals that the relationship between the log of caloric availability and the log of income is nonlinear, I estimate, separately for each survey round, linear regressions of the form:

$$\ln CAL(i,u) = aD(u) + b \ln CON(i,u) + g\,(\ln CON(i,u))^2 + d\tilde{X}(i,u) + h(i,u) \qquad (7)$$

where *CAL(i, v)* is per capita caloric availability in household *i* in cluster/village *v*, *CON* is per capita outlay (deflated in 1999), a, b, g and d are fixed parameter vectors allowed to vary across survey rounds, *D(v)* is vector of binary variables summarizing cluster-specific fixed effects, $\tilde{X}$ is a vector of household characteristics and h is an error term summarizing the influence random disturbances.

The cluster-specific fixed effects (denoted by *D(v)*) are included in order to control for price differences across clusters and other village or cluster-specific characteristics that may have also a direct impact on caloric availability.[19] The elements of the vector $\tilde{X}$ are specified to be as follows: the logarithm of household size and variables characterizing the age and gender composition of the household all expressed as ratios of the total family size (the number of children 0-5 years of age, the number of children 6-12 years of age, the number of males and females 13-19 and 20-54 years of age and the number of males grater than 55 years of age). The list of additional binary variables includes whether the household head is a female, and a group of a group of dummy variables describing the educational level of the household head and his/her spouse, such as whether he/she completed primary school, junior high school, or senior

[19] Each cluster contains 16 households that are surveyed by the SUSENAS.

high school, and the sector of employment of the household head and his/her spouse, such as whether one is self-employed, unemployed or wage worker.

Table 4

Table 4 contains the estimated income elasticity of calories evaluated at the 25 percentile of outlay in the respective sample. Equation (7) is estimated separately for the rural and urban region of East Java as well as separately for the urban and rural areas of the five regions of Indonesia.[20] The estimates for rural East Java reveal that the elasticity estimates obtained earlier from the non-parametric bivariate graphs are robust to the inclusion of other control variables. In 1996 the elasticity of calories from cereals is low; between 0.15 an 0.39 in rural areas and between 0.04 and 0.16 in urban areas depending on the region examined. In contrast to cereals, the income elasticity for calories from other foods is higher, between 0.84 and 1.09 in rural areas and between 0.62 and 0.86 in urban areas.

A comparison of the income elasticity estimates for total calories in 1999 against those in 1996 reveals that the pattern that was observed in rural East Java also holds in urban East Java as well as within any other geographic region (rural or urban): the income elasticity of total calories either remains the same or increases slightly in 1999.

It is possible that focusing on the total energy available in the household may be hiding opposing changes in the income elasticity of specific food groups that cancel each other out thus leaving the elasticity for total calories unaffected. One of the restrictions imposed on income elasticities by the budget constraint of the household is that the expenditure share weighted sum of the income elasticities of all goods consumed is equal to one. Using formal notation, economic theory implies that

$$\sum_{i=1}^{N} w_i \, e_{iM} = 1 \qquad (8)$$

where w_i is the expenditure share of commodity i e_{iM} is the income elasticity of commodity i. Assuming for the moment that the utility function is separable between food and nonfood and there are only 2 food groups, cereals and other foods denoted by subscripts C and O, a change in the price of any food item j (cereals or other foods) implies that:

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[20] The coefficients of the individual regressors are not reported but are available upon request directly from the author. In all regressions, the parameters *b* and *g* were significantly different from zero at conventional levels of significance.

$$\left(\frac{\partial w_C}{\partial p_j}e_{CM}+w_C\frac{\partial e_{CM}}{\partial p_j}\right)+\left(\frac{\partial w_O}{\partial p_j}e_{OM}+w_O\frac{\partial e_{OM}}{\partial p_j}\right)=0. \qquad (9)$$

Rearranging the above expression yields

$$\frac{\partial e_{OM}}{\partial p_j}=\left(\frac{-1}{w_O}\right)\left(\frac{\partial w_C}{\partial p_j}e_{CM}+\frac{\partial w_O}{\partial p_j}e_{OM}+w_C\frac{\partial e_{CM}}{\partial p_j}\right), \qquad (10)$$

which implies that in response to a price change the income elasticity for other food items has to change in an opposite direction to the change in the income elasticity for cereals.

I now turn to a discussion of the separate regressions for the demand for calories from cereals and calories from foods other than grains and root crops. In all other regions, the calorie income elasticity for cereals is higher in 1999 while the income elasticity of calories from other foods remains the same or decreases in 1999. In urban areas, in particular, where the elasticity for calories from cereals is low during 1996, the normal year, the income elasticity for calories from cereals more than doubles in 1999 (e.g., compare the elasticities in 1996 and in 1999 in urban areas in Sumatra, Java and Bali and Kalimantan). Thus during the period of higher relative prices for cereals, households allocate a larger percentage of their additional income on cereals foods even though cereals are relatively more costly relative to other foods.[21]

One plausible interpretation of this finding is that it is consistent with the presence of a binding minimum subsistence constraint. As higher prices decrease the purchasing power of income and push households closer to or below the minimum level of calories required for subsistence, households exhibit the willingness to allocate a higher proportion of a marginal increase in their income to cereals. Irrespective of whether the relative price of cereals is higher or not, on an absolute level cereals continue to provide more calories per rupiah than any other food group.

The increase in the income elasticity of calories from cereals also appears to be accompanied by a corresponding decrease in the income elasticity for calories from foods other that cereals and root crops (such as cassava). This finding is consistent with what is predicted by economic theory for the extreme case where there are only two food groups that are being

[21] There is practically no other empirical evidence that can be related to these findings. Timmer, Falcon, and Pearson (1983), in figure 2.8 of their classic book, display a higher income elasticity for rice of poorer households during the September to December period, when rice prices are also higher, but provide no discussion of this finding.

consumed, such as cereals and other foods, and utility is strongly separable in the consumption of nonfood items.

4. Concluding Remarks and Policy Considerations

This paper has examined the robustness of the income elasticity of the demand for calories to changes in the relative prices and economic environment price faced by households. Using household consumption and calorie data from the 1996 and 1999 consumption module of the National Socio-Economic Surveys (SUSENAS) in Indonesia the analysis revealed that the calorie income elasticity is remarkably insensitive to changes in relative prices. The income elasticity of the demand for total calories in Indonesia appears to be slightly higher in February 1999 (the crisis year) compared to its level in February 1996. Although statistically significant this increase in elasticity is very small which implies that from an economic perspective, at least, the income elasticity of calories may be considered as invariant to the level of relative prices. This suggests the effectiveness of either cash transfer programs or other programs aimed at protecting caloric availability within households at a time of crisis do not run any risk of becoming less effective due to changes in the price environment faced by households. At a broader level this finding also suggests that structural parameters estimated using cross sectional data from a normal economic environment continue to be very useful in describing economic behavior even at times of crises and higher inflation.

In an effort to uncover the main reasons behind this finding, income elasticity estimates were also obtained for calories from cereals and calories from other food crops (excluding cereals and root crops). The income elasticity of the demand for calories is a weighted aggregate of the income elasticity of the demand for individual food items, each one of which may be sensitive to changes in the relative price environment faced by the consumer. The change in the income elasticity of calories for cereals may be countered by opposing changes in the income elasticity of other foods thus leading to the absence of any significant effect of the change in prices on the income elasticity of total calories. A closer look at the changes in the income elasticity of the demand for calories from cereals and other food items in 1999 relative to 1996 reveals that the calorie income elasticity for cereals as a group increases while the calorie income elasticity for other food items as a group decreases.

The opposing changes in the income elasticity for cereals and other foods are not only consistent with economic theory but also plausible with the presence of a binding subsistence constraint. As higher prices decrease the purchasing power of income and push households below the minimum level of calories required for subsistence, households tend to allocate a higher proportion of a marginal increase in their income to cereals. Irrespective of whether the relative price of cereals is higher or not, on an absolute level cereals continue to provide more calories per rupiah than any other food group. This finding also highlights a serious limitation of an income transfer program aimed at protecting the nutritional status of poorer households. Cash transfers may be effective at maintaining the total amount calories available at the household level but as the analysis in this paper demonstrates most of these calories are likely to be derived from cereals rather than foods such as meat, fish, fruits and vegetables that provide essential micronutrients. Any effort to maintain the consumption of micronutrients of poorer households during a lengthy economic crisis must involve something different than or complementary to an income transfer.

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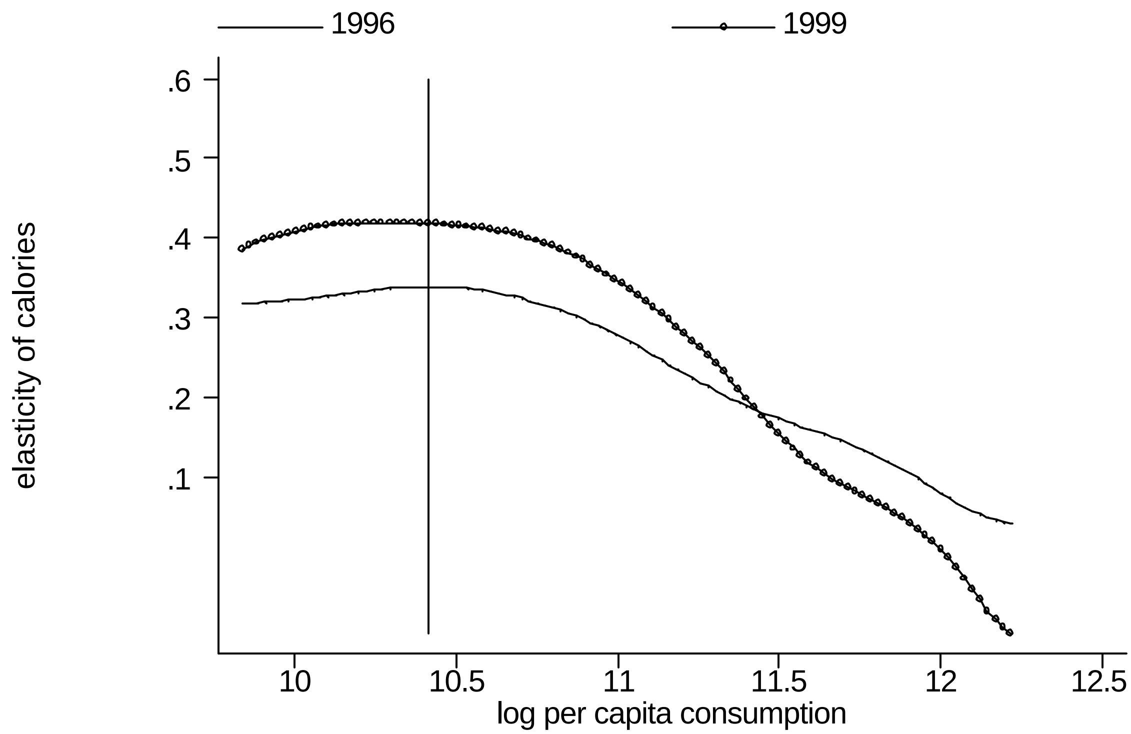

Figure 1: Income Elasticity for Total Calories in 1996 and in 1999, Rural East Java, Indonesia

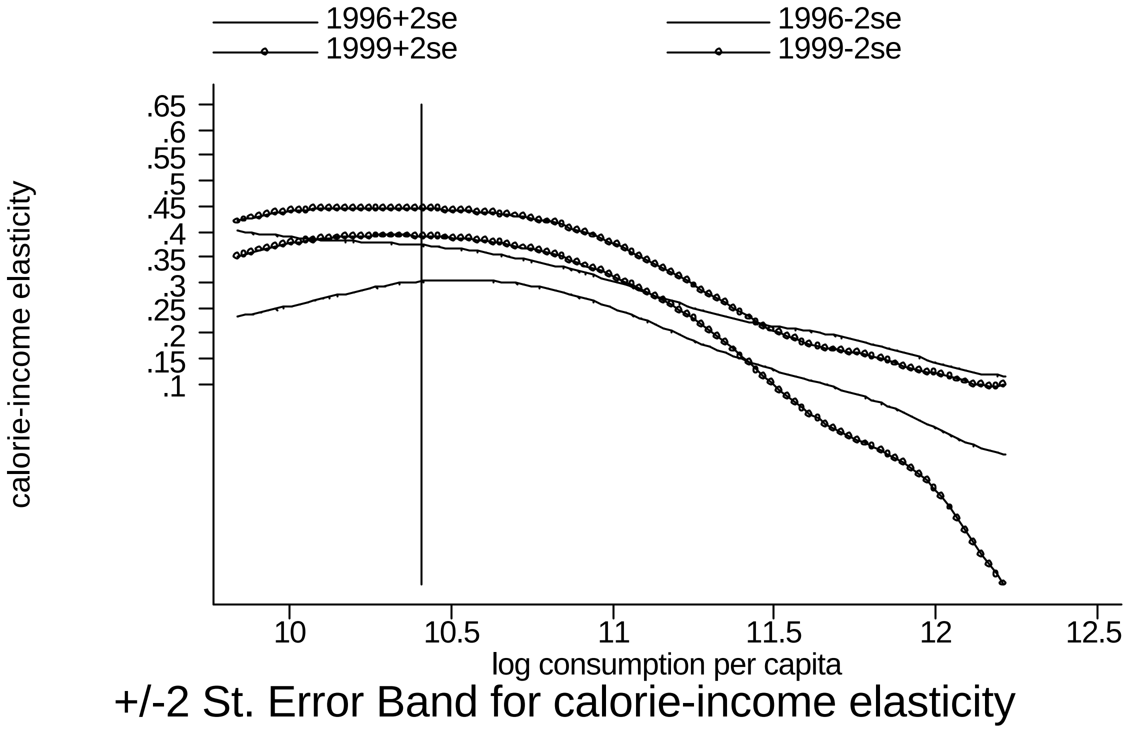

Figure 2: Standard Error Bands around the Income Elasticity for Total Calories in 1996 and in 1999, Rural East Java, Indonesia

Table 1: 1996 vs 1999 Prices per 1,000 calories

	Price per 1,000 calories (nominal)						Prices Relative to the Price of Cereals in each year							
	All		Bottom 25%		Top 25%		All		%	Bottom 25%		%	Top 25%	
	1996	1999	1996	1999	1996	1999	1996	1999	Change	1996	1999	Change	1996	1999
	1	2	3	4	5	6	7	8	9	10	11	12	12	14
A: RURAL AREAS														
SUMATRA														
All foods	514	1,304	407	1,077	685	1,682								
Cereal	255	718	244	699	269	743	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	947	2,336	792	1,973	1,161	2,833	3.7	3.3	-12	3.1	2.8	-9	4.3	3.8
Other Foods	989	2,479	849	2,176	1,192	2,925	3.9	3.5	-11	3.3	3.1	-6	4.4	3.9
JAVA & BALI														
All foods	489	1,208	379	1,011	655	1,528								
Cereal	252	684	239	645	265	728	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	851	2,037	704	1,809	1,069	2,415	3.4	3.0	-12	2.9	2.8	-5	4.0	3.3
Other Foods	891	2,173	758	1,974	1,095	2,518	3.5	3.2	-10	3.2	3.1	-3	4.1	3.5
NUSA TENGARA														
All foods	428	1,063	350	872	567	1,373								
Cereal	255	710	249	652	263	760	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	883	1,939	894	1,630	1,033	2,389	3.5	2.7	-21	3.6	2.5	-30	3.8	3.2
Other Foods	952	2,132	976	1,861	1,078	2,536	3.7	3.0	-20	3.9	2.9	-27	4.0	3.4
KALIMANTAN														
All foods	589	1,414	469	1,188	783	1,756								
Cereal	286	857	278	832	295	887	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1,037	2,316	884	2,017	1,270	2,713	3.6	2.7	-25	3.2	2.4	-24	4.3	3.1
Other Foods	1,108	2,492	985	2,231	1,323	2,845	3.9	2.9	-25	3.5	2.7	-24	4.5	3.2
SULAWESI														
All foods	447	1,222	357	1,021	581	1,533								
Cereal	238	725	227	694	242	745	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	769	1980	628	1693	992	2449	3.2	2.7	-15	2.8	2.4	-12	4.1	3.3
Other Foods	857	2241	734	2001	1050	2648	3.6	3.1	-14	3.2	2.9	-11	4.3	3.6
B: URBAN AREAS														
SUMATRA														
All foods	737	1,711	543	1,321	1,007	2,338								
Cereal	285	754	268	716	305	814	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1,271	2,855	1,051	2,405	1,579	3,550	4.5	3.8	-15	3.9	3.4	-14	5.2	4.4
Other Foods	1,295	2,928	1,078	2,494	1,601	3,604	4.5	3.9	-15	4.0	3.5	-13	5.2	4.4
JAVA & BALI														
All foods	724	1,650	488	1,207	1,015	2,344								
Cereal	279	758	264	704	298	831	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1,196	2,612	882	2,076	1,561	3,422	4.3	3.4	-20	3.3	2.9	-12	5.2	4.1
Other Foods	1,216	2,676	907	2,162	1,579	3,466	4.4	3.5	-19	3.4	3.1	-11	5.3	4.2
NUSA TENGARA														
All foods	604	1,435	440	1,119	869	1,943								
Cereal	272	748	263	716	290	787	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1,096	2,581	879	2,150	1,396	3,141	4.0	3.5	-14	3.3	3.0	-10	4.8	4.0
Other Foods	1,137	2,661	938	2,247	1,421	3,201	4.2	3.6	-15	3.6	3.1	-12	4.9	4.1
KALIMANTAN														
All foods	820	1,923	632	1,532	1,057	2,524								
Cereal	295	828	284	774	313	889	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1,309	2,957	1,133	2,613	1,530	3,535	4.4	3.6	-20	4.0	3.4	-15	4.9	4.0
Other Foods	1,336	3,046	1,164	2,729	1,558	3,589	4.5	3.7	-19	4.1	3.5	-14	5.0	4.0
SULAWESI														
All foods	624	1,577	463	1,240	851	2,090								
Cereal	247	733	235	695	264	771	1.0	1.0		1.0	1.0		1.0	1.0
NonCereal	1114	2669	909	2266	1400	3312	4.5	3.6	-19	3.9	3.3	-16	5.3	4.3
Other Foods	1155	2779	962	2408	1428	3388	4.7	3.8	-19	4.1	3.5	-15	5.4	4.4

Table 2: 1996 vs 1999 Daily Calories per capita

	Daily Calories per capita						Calories as share of total calories in each year					
	All		Bottom 25%		Top 25%		All		Bottom 25%		Top 25%	
	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999
	1	2	3	4	5	6	7	8	9	10	11	12
A: RURAL AREAS												
SUMATRA												
All foods	2,157	2,001	1,806	1,608	2,641	2,539						
Cereals	1,325	1,250	1,230	1,089	1,391	1,384	61	62	68	68	53	55
NonCereals	831	751	576	519	1,250	1,155	39	38	32	32	47	45
Other Foods	768	677	503	432	1,192	1,086	36	34	28	27	45	43
JAVA & BALI												
All foods	1,988	1,840	1,651	1,493	2,426	2,314						
Cereals	1,181	1,113	1,114	1,002	1,229	1,215	59	60	67	67	51	53
NonCereals	807	727	537	491	1,197	1,099	41	40	33	33	49	47
Other Foods	753	666	474	431	1,150	1,036	38	36	29	29	47	45
NUSA TENGARA												
All foods	2,059	1,799	1,713	1,483	2,544	2,380						
Cereals	1,393	1,229	1,236	1,084	1,528	1,444	68	68	72	73	60	61
NonCereals	665	570	477	400	1,016	935	32	32	28	27	40	39
Other Foods	578	486	373	315	950	849	28	27	22	21	37	36
KALIMANTAN												
All foods	2,101	1,919	1,727	1,541	2,617	2,444						
Cereals	1,241	1,171	1,159	1,058	1,292	1,276	59	61	67	69	49	52
NonCereals	861	748	568	484	1,325	1,169	41	39	33	31	51	48
Other Foods	789	677	485	417	1,252	1,093	38	35	28	27	48	45
SULAWESI												
All foods	2,121	1,929	1,731	1,514	2,646	2,530						
Cereals	1,180	1,080	1,019	887	1,393	1,322	56	56	59	59	53	52
NonCereals	941	849	713	628	1253	1208	44	44	41	41	47	48
Other Foods	760	682	502	444	1133	1064	36	35	29	29	43	42
B: URBAN AREAS												
SUMATRA												
All foods	1,998	1,836	1,681	1,500	2,392	2,282						
Cereals	1,079	1,004	1,080	955	1,062	1,018	54	55	64	64	44	45
NonCereals	920	832	602	544	1,330	1,264	46	45	36	36	56	55
Other Foods	889	798	575	514	1,294	1,227	44	43	34	34	54	54
JAVA & BALI												
All foods	1,942	1,762	1,661	1,476	2,301	2,126						
Cereals	1,003	920	1,040	923	976	879	52	52	63	63	42	41
NonCereals	939	842	621	553	1,325	1,247	48	48	37	37	58	59
Other Foods	913	811	594	522	1,295	1,215	47	46	36	35	56	57
NUSA TENGARA												
All foods	2,022	1,863	1,614	1,473	2,534	2,387						
Cereals	1,206	1,159	1,130	1,045	1,211	1,211	60	62	70	71	48	51
NonCereals	816	705	484	427	1,323	1,177	40	38	30	29	52	49
Other Foods	773	670	429	393	1,287	1,136	38	36	27	27	51	48
KALIMANTAN												
All foods	2,069	1,845	1,661	1,500	2,625	2,286						
Cereals	985	892	971	881	1,010	873	48	48	58	59	38	38
NonCereals	1,085	954	690	620	1,614	1,413	52	52	42	41	62	62
Other Foods	1,048	914	662	585	1,562	1,370	51	50	40	39	60	60
SULAWESI												
All foods	2,099	1,895	1,801	1,536	2,578	2,348						
Cereals	1,156	1,049	1,124	965	1,216	1,104	55	55	62	63	47	47
NonCereals	944	846	677	571	1361	1244	45	45	38	37	53	53
Other Foods	881	788	587	504	1316	1193	42	42	33	33	51	51

Source: Author's calculation based on the 1996 and 1999 SUSENAS Consumption modules, Indonesia.

Table 3: 1996 vs 1999 Calories per Capita (JAVA & BALI)

	Calories per Capita						Calories as % of total				
	All		Bottom 25%		Top 25%		All		Bottom 25%		Top 2
	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996
	1	2	3	4	5	6	7	8	9	10	11
A: RURAL AREAS											
Cereals	1181	1113	1114	1002	1229	1215	59.4	60.5	67.5	67.1	50.6
Root Crops	54	61	63	60	47	62	2.7	3.3	3.8	4.0	1.9
Fish	29	24	21	16	41	36	1.5	1.3	1.3	1.1	1.7
Meat	27	13	6	2	67	38	1.4	0.7	0.4	0.2	2.7
Eggs&Milk	24	15	9	5	50	35	1.2	0.8	0.6	0.4	2.1
Vegetables	38	34	31	27	45	43	1.9	1.8	1.9	1.8	1.9
Pulses	70	62	46	44	100	91	3.5	3.4	2.8	2.9	4.1
Fruits	38	31	22	16	65	56	1.9	1.7	1.3	1.1	2.7
Oils&Fats	196	184	146	130	262	260	9.9	10.0	8.8	8.7	10.8
Beverages NA	97	89	70	65	135	128	4.9	4.9	4.2	4.4	5.6
Spices	17	18	11	12	25	25	0.9	1.0	0.7	0.8	1.0
Misc.Food	29	23	14	11	55	47	1.4	1.2	0.8	0.7	2.3
Prepared Food	187	174	98	103	304	278	9.4	9.5	5.9	6.9	12.5
Alcohol	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**1988**	**1840**	**1651**	**1493**	**2426**	**2314**					
B: URBAN AREAS											
Cereals	1003	920	1040	923	976	879	51.6	52.2	62.6	62.5	42.4
Root Crops	26	31	28	32	30	32	1.4	1.8	1.7	2.2	1.3
Fish	30	24	19	15	45	34	1.5	1.3	1.1	1.0	1.9
Meat	58	28	18	7	111	69	3.0	1.6	1.1	0.4	4.8
Eggs&Milk	50	34	20	11	93	73	2.6	1.9	1.2	0.7	4.0
Vegetables	32	28	27	23	38	34	1.7	1.6	1.6	1.5	1.7
Pulses	74	70	56	53	93	87	3.8	4.0	3.4	3.6	4.0
Fruits	36	28	21	14	56	49	1.9	1.6	1.3	1.0	2.4
Oils&Fats	222	201	162	143	299	274	11.4	11.4	9.7	9.7	13.0
Beverages NA	112	97	80	67	149	133	5.8	5.5	4.8	4.6	6.5
Spices	19	18	13	12	25	24	1.0	1.0	0.8	0.8	1.1
Misc.Food	50	40	22	16	86	74	2.6	2.3	1.3	1.1	3.7
Prepared Food	230	243	155	160	299	363	11.9	13.8	9.3	10.8	13.0
Alcohol	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**1942**	**1762**	**1661**	**1476**	**2301**	**2126**					

Source: Author's calculation based on the 1996 and 1999 SUSENAS Consumption modules, Indonesia.

Table 4: Calorie-Income Elasticity Estimates using Regression Analysis

	RURAL AREAS				URBAN AREAS			
	1996		1999		1996		1999	
Total calories	**Elasticity**	**St. error**	**Elasticity**	**St. error**	**Elasticity**	**St. error**	**Elasticity**	**St. error**
East Java	0.36	0.0108	0.38	0.0081	0.27	0.0129	0.35	0.0101
Sumatra	0.44	0.0081	0.48	0.0071	0.33	0.0106	0.38	0.0081
Java and Bali	0.38	0.0056	0.41	0.0045	0.29	0.0064	0.32	0.0048
Nusa Tengara	0.53	0.0138	0.53	0.0139	0.35	0.0202	0.44	0.0172
Kalimantan	0.47	0.0131	0.50	0.0105	0.36	0.0153	0.51	0.0297
Sulawesi (incl. Maluku & I. Jaya)	0.51	0.0124	0.52	0.0112	0.35	0.0125	0.38	0.0111
All regions pooled	0.43	0.0039	0.45	0.0034	0.32	0.0046	0.35	0.0036
Calories from cereals								
Sumatra	0.23	0.0119	0.33	0.0112	0.07	0.0161	0.14	0.0127
Java and Bali	0.15	0.0080	0.19	0.0072	0.04	0.0095	0.11	0.0079
Nusa Tengara	0.38	0.0195	0.39	0.0209	0.12	0.0294	0.22	0.0253
Kalimantan	0.26	0.0201	0.30	0.0165	0.06	0.0236	0.15	0.0503
Sulawesi (incl. Maluku & I. Jaya)	0.39	0.0215	0.39	0.0189	0.16	0.0194	0.16	0.0182
All regions pooled	0.23	0.0059	0.27	0.0053	0.07	0.0069	0.13	0.0058
Calories from other foods (excludes grains and root crops)								
Sumatra	0.88	0.0117	0.85	0.0100	0.71	0.0146	0.68	0.0099
Java and Bali	0.87	0.0091	0.82	0.0071	0.64	0.0099	0.56	0.0066
Nusa Tengara	1.09	0.0274	1.11	0.0268	0.86	0.0301	0.81	0.0253
Kalimantan	0.97	0.0212	0.80	0.0150	0.71	0.0203	0.85	0.0359
Sulawesi (incl. Maluku & I. Jaya)	0.89	0.0191	0.89	0.0167	0.72	0.0173	0.68	0.0146
All regions pooled	0.90	0.0063	0.85	0.0052	0.69	0.0067	0.61	0.0048

Notes:
Elasticities are evaluated for the 25th percentile of the 1996 per capita outlay in the respective sample using the parameter estimates from equation (7) in the text. For more details on the additional explanatory variables used in the regressions see text.