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Impacts of the Indonesian Economic Crisis
Price Changes and the Poor

James Levinsohn, Steven Berry, and Jed Friedman

12.1 Introduction

In July 1997, following the decline of the Thai bhat, the Indonesian rupiah fell dramatically (or so it seemed at the time). Since that initial decline of the rupiah, the Indonesian economy has undergone tremendous change. The rupiah has been subject to large swings, prices of some goods have risen substantially, and billions of dollars have been loaned by international lending organizations. These are not subtle changes. In this paper, we make a first-pass attempt at providing early estimates of the impact of the Indonesian economic crisis on Indonesia's poor.

Although some might argue that the very poor are so impoverished that they are essentially insulated from swings in the international economy, it is more frequently argued that the very poor are among the most vulnerable to such swings. This is especially probable for the urban poor. Furthermore, in countries with little or no social insurance, any impacts of price changes on the very poor are unlikely to be muted by government policies in the way that they might be in richer countries.

These issues matter. From a broad humanitarian view, the magnitude of

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the price changes and the size of the affected population argue that there is value simply to understanding what has happened. From a more narrow political view, the political economy of price changes may well depend in crucial ways on who bears the brunt of price increases. From the viewpoint of organizations such as the International Monetary Fund (IMF) that offer policy advice and (sometimes) loan conditionality, understanding how that advice might affect the poor is important. Finally, from a ridiculously narrow academic perspective, there is not an abundance of research on possible links between the international economy and the very poor.

In this paper, we use pre-crisis household-level data from approximately 60,000 households throughout Indonesia. These data provide a detailed view of expenditure patterns prior to the onset of the crisis. We match these expenditure data to detailed postcrisis data on prices. By combining these sources of data, we analyze how the inflation that followed the financial crisis affected households. Special attention is paid to how the crisis affected the very poor.

We find that prices for most commodities did indeed jump dramatically and that these price increases tended to hit the cost of living of poor households disproportionately hard. The impact, though, varies with where the household lives, because it turns out that the price increases were not uniform throughout the country. Further, it matters whether the household was in an urban or rural area. Rural households were better able to alleviate some of the disadvantageous price increases through limited self-production of food. The poor urban households, on the other hand, were the most adversely impacted.

The paper proceeds by including some background on the crisis in the next section. Section 12.3 presents the data, and section 12.4 describes our methodology. Section 12.5 presents results on the importance of heterogeneity in prices, products, and consumers. Section 12.6 investigates the impacts of the crisis on the poor, while section 12.7 concludes.

12.2 Some Background

We begin by setting the stage. The changes the Indonesian economy has undergone are dramatic. The purpose of this section is to very briefly review some of those changes. As background, table 12.1 provides some information on recent changes in prices and exchange rates. From December 1996 until July 1997, the rupiah traded in a narrow range of around 2,400 to the U.S. dollar. The consumer price index (CPI) provided by the Bank of Indonesia shows stable prices for each of four aggregates—food, housing, clothing, and health. In July 1997, the Thai bhat nose-dived and the rupiah followed suit. In table 12.1, this appears in the August 1997 entry, where the rupiah is reported at 3,035 to the dollar. Although this was a sudden depreciation on the order of 20 percent, prices rose only with a lag. Throughout the remainder of 1997, the rupiah continued to depreciate against the dollar and (except in November) against the yen. The food CPI rose from 105

Table 12.1 Some Background

	Rupiah Exchange Rates		CPI for			
	US$	100 Yen	Food	Housing	Clothing	Health
1996 Dec.	2,383.00	2,058.39	100.52	101.98	100.99	102.08
1997 Jan.	2,396.00	1,965.56	103.33	102.67	101.91	104.46
Feb.	2,406.00	2,000.63	105.99	102.90	102.43	105.32
Mar.	2,419.00	1,955.92	105.28	103.29	102.64	105.59
Apr.	2,433.00	1,921.19	105.24	103.99	102.62	107.56
May	2,440.00	2,095.15	105.30	104.82	102.71	107.69
Jun.	2,450.00	2,148.49	104.45	105.18	102.88	108.15
Jul.	2,599.00	2,210.83	105.93	105.82	102.80	108.41
Aug.	3,035.00	2,546.48	107.60	106.34	103.48	108.77
Sep.	3,275.00	2,715.56	109.59	107.58	104.56	109.21
Oct.	3,670.00	3,061.33	113.50	108.35	107.14	110.67
Nov.	3,648.00	2,867.48	117.25	106.82	107.01	112.27
Dec.	4,650.00	3,578.31	120.54	107.84	110.58	114.18
1998 Jan.	10,375.00	8,304.99	133.26	113.79	127.30	124.22
Feb.	8,750.00	6,895.21	157.79	123.28	145.14	148.98
Mar.	8,325.00	6,316.16	166.71	128.61	161.39	155.88
Apr.	7,970.00	6,034.46	176.56	131.56	168.39	164.12
May	10,525.00	7,580.14	183.42	136.99	176.01	168.06
Jun.	14,900.00	10,583.91	196.39	139.17	195.29	171.97
Jul.	13,000.00	9,048.21	220.27	146.93	219.23	186.41
Aug.	11,075.00	7,824.11	240.31	153.51	225.73	197.99
Sep.	10,700.00	7,921.25	261.00	155.92	225.22	204.49
Oct.	7,550.00	6,546.72	256.16	157.35	220.97	208.58
Nov.	7,300.00	5,903.77	255.70	158.11	215.99	210.71
Dec.	8,025.00	7,000.49	263.22	159.03	219.71	212.54
1999 Jan.	8,950.00	7,697.62	281.09	160.62	232.11	214.07

Source: Bank of Indonesia data available online [http://www.bi.go.id/ind/datastatistik/index.htm].

to 120—a noticeable increase but not an overwhelming one. The CPI for housing, clothing, and health care rose yet more modestly. On the economic policy front, the IMF approved a $10 billion loan, while the World Bank pledged $4.5 billion for a three-year program.

It was not until 1998 that matters became considerably more problematic. On 8 January, sometimes referred to as "Black Thursday," the rupiah began a free fall, and news accounts reported panic-like food purchasing. The exchange rate fell at one point in January to above 16,000 rupiah per dollar, and the CPI for food jumped almost as much in January as it had the previous six months combined. The CPI for clothing jumped even more. As international pressure to drop a proposed currency board increased and aid was deferred, uncertainty mounted. For the first four months of 1998, prices continued to rise, as documented in the last four columns of table 12.1. In May 1998, riots spread, and over one thousand people were reported killed. The World Bank postponed two loans totaling over one bil-

lion dollars, and the World Bank and IMF as well as many embassies evacuated nonessential staff. On 21 May, President Suharto resigned. The rupiah traded at around 11,000 immediately after the resignation. The Bank of Indonesia reported the largest monthly rupiah-to-dollar rate in June 1998—14,900. Thereafter the rupiah began a gradual appreciation (albeit from an astoundingly low level.) The CPI reported rising prices through September 1998. The CPI for food reached 261 (relative to a level of about 100 in January 1997), while the CPIs for housing, clothing, and health hit 156,225, and 204, respectively. (Throughout this period the CPI for housing was relatively more stable—perhaps reflecting the somewhat nontraded nature of housing.) Although peaceful protests turned violent in Jakarta in mid-November 1998, order was quickly restored.

It would of course be a tremendous oversimplification to attribute these changes to the international economy, or to any other single cause. Price levels and exchange rates are endogenously determined. Our goal is to analyze the impact of the changes surveyed in table 12.1, but we do not attempt to analyze the root cause(s) of the macroeconomic changes. We realize, for example, that it is (barely) conceivable that purely domestic inflation suddenly ran rampant, leading to the rupiah's depreciation, and in this (unlikely) scenario, the price changes in table 12.1 would have little to do with the international economy. Given most accounts of the East Asian crisis and the contagious behavior of other East Asian exchange rates and price levels, it seems plausible that there was indeed an international element to the changes surveyed in table 12.1.

Our goals include a more disaggregated analysis of the impacts of the price changes. The aggregated nature of the figures in table 12.1 hides potentially important heterogeneity. The first type of heterogeneity concerns heterogeneity within commodity groups. For example, "Food" contains hundreds of items, and it is possible that the price behavior of those items consumed by the nonpoor is quite different from the price behavior of food items consumed principally by the poor. The second type of heterogeneity is geographical. Indonesia is a geographically dispersed country where simple arbitrage may be costly due to transport costs. This suggests that there may be significant price variation within a narrowly defined product class across geographic areas. What happens to prices in especially poor areas may be quite different from what happens to prices in the wealthier areas. The third type of heterogeneity is across consumers. Our focus is *not* on the representative consumer; rather, we care about the consumption patterns of the very poor. Examining aggregate consumption patterns may be quite misleading in this context.

12.3 Data Concerns and Constraints

There are many ways one could estimate how the large changes in prices in Indonesia over the last one and a half years have affected the poor. In the

end, the methods used will depend quite crucially on the available data. With this in mind, we briefly outline the data that are, and are not, available. We begin with the unattainable ideal. In the best case, one would have detailed consumption data that spanned the period before and after the financial crises of 1997–98 for thousands (or tens of thousands) of households. The time series variation would allow the researcher to examine how consumption patterns changed when faced with the large price changes. The large household survey would give the researcher enough households so that a focus on the very poor would still allow a sufficient number of observations. It would also be important to have detailed price data on a disaggregated set of commodities. These data would need to cover the most recent two years. Even these data, ideal and unattainable as they are, would pose significant econometric issues due to the nature of the questions posed. This is because what we want to know is how households in a particular part of the income distribution behaved in response to price changes, and even the most sophisticated demand systems typically estimate a utility-consistent demand structure for a *representative* consumer. Although with infinite data one could estimate a demand structure for just a particular decile of the income or wealth distribution, this would be massively inefficient. (A topic of future research is the estimation of a utility-consistent demand system that explicitly accommodates the heterogeneity inherent in studying how the poor respond to price changes.)

In fact, the data described above simply do not exist.[1] The good news, though, is that reality is less removed from this ideal than is usually the case. Indonesian data sources are in fact quite good. Indonesia conducts an extensive household consumption survey (SUSENAS) covering on the order of 50,000 households. Most recently, these surveys have been conducted in 1981, 1984, 1987, 1990, and 1993.[2] Although the surveys are large, they are not panels. That is, there is no systematic effort to track the same households over time. These surveys cover a wide geographic range of the country and contain very detailed consumption data.[3] The data do not contain prices, however. Rather, the data contain unit values that are defined as expenditure divided by quantity. These unit values may differ across households that in fact face identical prices due to differences in the quality of the households'

1. A special wave of the Indonesia Family Life Survey was conducted in late 1998 to investigate the immediate effects of the crisis. This data set, a true panel of households, can compare household consumption in late 1998 to a corresponding period one year earlier. Frankenberg, Thomas, and Beegle (1999) summarize the initial findings. The study surveys 1,900 households in seven provinces and thus does not provide the geographic coverage or sample size suitable for our purposes.

2. A survey was also conducted in 1996, but we have not been provided with those data yet.

3. For 203 individual food items, the survey recorded the quantity and value consumed by the household in the last week. For 89 individual and aggregate nonfood items, the survey recorded annual expenditures as well as expenditures in the month preceding the survey. For those households that consumed their own self-produced food, the survey imputed the value of that food. For those households that owned housing, SUSENAS imputed a monthly rental payment.

consumption. (I.e., although all households in a village may face the same prices for high-quality and low-quality rice, the unit values recorded for a household that bought mostly high-quality rice will be higher than the unit values recorded for the household that bought mostly low-quality rice.) This type of data can be (and in fact has been) used to estimate demand elasticities exploiting the spatial variation in the data using methods developed by Deaton (1988). We base our analysis on consumption data from the 1993 SUSENAS, the most recent wave available to us. The 1993 SUSENAS surveyed 65,600 households throughout the entire country. We have reduced our sample to the 58,100 households that have sufficient consumption and household information for the analysis that follows. To the extent that consumption patterns change over time, we are concerned about the accuracy of using 1993 consumption data to measure behavior in 1997. We investigate this by examining expenditure patterns as they evolved over the course of prior waves of the SUSENAS. We found some definite trends. In particular, the proportion of expenditure on food decreases slightly but steadily across each SUSENAS. This is probably due to rising real incomes. These trends may have persisted until 1997. To the extent that our consumption baskets are calculated with 1993 and not 1997 data, our measured impacts of the crisis will diverge from the actual impacts. However, one of our primary concerns is to highlight the heterogeneous effects of the crisis among households. The relative consumption baskets (among rich and poor households, or rural and urban households) did not change as much as the absolute consumption baskets over the 1993–97 period, and, consequently, the bias along this dimension is likely to be slight.

We also have very recent price data that have been supplied by the Badan Pusat Statistik (BPS). The price data contain monthly price observations for forty-four cities throughout the country over the period January 1997 to October 1998. This time period, which begins before the advent of the crisis, spans the steep devaluation of the rupiah and subsequent stabilization at the new higher rate. We employ a single price change measure: the percent change in prices from January 1997 to October 1998. By adopting such a long time period, from before the onset of rapid inflation until after the inflation had largely abated, we hope to capture a robust measure of the price changes brought on by the crisis.

The price data supply price information for both aggregate goods, such as food or housing, and individual goods, such as cassava or petrol. There are approximately 700 goods with observed prices in the data. However, the type of goods observed varies by city, perhaps reflecting taste and consumption heterogeneity throughout the country. On average, a particular city has price information on about 350 goods. Jakarta has as many as 440 goods listed, whereas some small cities only have price information for 300 goods.

Each of the twenty-seven Indonesian provinces is represented by at least

one city in the price data. In order to match households from the SUSENAS data to as local a price change as possible, we calculate province-specific price changes from the city-level data. For those provinces that have only one provincial city in the price data, we take those price changes as representative of the whole province. For those provinces with more than one city in the price data, we calculate an average provincial price change using city-specific 1996 population weights.

The accuracy of this extrapolation of city price data to an entire province will surely vary with the size and characteristics of the province considered. For example, Jakarta, the national capital, is also its own province, and the observed price changes may fairly accurately represent the price changes faced by residents throughout the province. On the other hand, the price changes for Irian Jaya, a vast mountainous province, are based on price changes observed in the provincial capital, Jayapura. Price changes in the provincial capital may not be a completely accurate proxy for price changes in remote rural areas. Indeed, a recent study suggests that overall inflation in rural areas is approximately 5 percent higher than in urban areas (Frankenberg, Thomas, and Beegle 1999).[4] We frequently report separate results for the urban and rural poor, and the fact that the price data were collected in the cities should be kept in mind as those results are reviewed.

For certain groups of goods the price data are more disaggregated than the consumption data reported in the SUSENAS. In order to link the new price data with the existing consumption data, we use the prices for those commodities that appear in both the price data set and the SUSENAS. In some cases, we also aggregate commodities in the price data to match a product category in the SUSENAS data.[5] The match between the price data and the consumption data is good, but not perfect. We find that we have detailed price data for most, but not all, of the goods that comprise a household's total expenditure. On average, expenditures on matched goods account for 75 percent of a household's total expenditure. We return to this point later.

12.4 Methodologies

Given our data sources, the usual approach to investigating how the Indonesian poor were affected by the recent crisis would be to do the following. First, one would estimate a demand system, ideally one based on an underlying utility-consistent framework. The SUSENAS surveys would

4. The same study also presents some evidence that the BPS price data may understate inflation by as much as 15 percent. To the extent that this is true, the impact of the crisis is even greater than measured here.

5. In these cases, we take simple averages of the products that comprise a single product in the SUSENAS data.

provide the data for such a demand system. Based on the estimated elasticities from that demand system, one would then estimate the welfare impact of the price changes that occurred recently in Indonesia. Special emphasis would be placed on how the poor were impacted by the crisis. It turns out that there are some very severe problems with this approach, given the data and the policy goals. In order to better motivate what we *do* do, we first highlight the problems with the approach outlined above.

Estimating demand elasticities from the SUSENAS is not an especially satisfying endeavor. The SUSENAS is a cross-sectional survey of households. Although we do have multiple waves, there is no panel, or time series, nature to the data. As noted above, the SUSENAS contains data on expenditures and on quantities consumed, but not on prices. Expenditures divided by quantities give unit values, and, as outlined in Deaton (1988), there is a misguided temptation to use these unit values as prices. As noted earlier, a naive swap between unit values and prices is wrong because unit values reflect the quality of the product as well as the market price. Deaton shows that under the appropriate separability conditions, one can exploit the spatial nature of the data to back out the true price elasticities. The idea is that within a geographic unit—say, a village—the prices will be the same, although they are unobserved by the econometrician. Unit values, however, will differ across households within the village. This within variation allows the econometrician to identify the quality effect: incomes vary and the observed unit values vary, but, by assumption, underlying prices are the same. The variation across villages, controlling for village fixed effects, allows one to then back out the true price elasticities, because the real price variation occurs only through the spatial dimension. All of this leads to a multistep estimation algorithm developed by Deaton (1988). The estimator employed deals quite carefully with the errors-in-variables issues that the use of unit values raises.

So what's the problem? This methodology is probably the best available, but it has some real drawbacks. From an economic perspective, it is troubling that the resulting demand elasticities are not consistent with an underlying utility framework. If at the end of the day one wants to compute a welfare measure such as compensating or equivalent variation, one needs to work with a framework that allows one to identify the primitives of the underlying utility function. From an econometric perspective, it is problematic that the methodology does not deal with the endogeneity of product quality. Consumers choose the quality as well as quantity of the products bought, and this induces the usual simultaneity concerns. These issues, though, are perhaps just academic quibbles. The bigger problems arise due to the policy application at hand. Recall that we are concerned with better understanding how the price changes affected the poor. There are at least three reasons that the methodology is ill suited to adequately addressing this concern. First, the estimated elasticities are essentially local approximations based on consumer behavior at the observed prices. Hence, the

SUSENAS might give pretty good estimates of how households respond to a price change on the order of 5 percent. When the price changes under consideration are instead on the order of 100 to 300 percent, the answer is essentially dictated by the choice of functional forms. This is troubling for most any parametric approach to the estimation of demand elasticities. Second, the underlying framework is one of a representative consumer. Our concern, though, is with anything but the representative consumer. Rather, we are especially focused on the very poor. F. Scott Fitzgerald wrote that the rich are different. So, we suspect, are the poor. A demand system that explicitly considers consumer heterogeneity is called for, but this is not currently available. Finally, it is not feasible to estimate a complete demand system at a highly disaggregated product level. There are simply too many products. The obvious solution is to aggregate products, but this aggregation hides very important variation in consumption patterns and price changes. Alternatively, one can estimate own-price elasticities (but not cross-price elasticities) for many disaggregated products.

We have done such an exercise with the SUSENAS data. Employing a simple ordinary least squares (OLS) framework, and controlling for some observed household characteristics, we have estimated own-price elasticities for individual food items. We do not attempt to correct for the quality effects discussed above. The elasticities, identified by the cross-sectional variation in unit values and quantities, yield the expected negative coefficients and are quite precisely estimated. For example, we estimated the own-price elasticity for rice to be –0.43 with a standard error of 0.02, and the same estimate for ground coffee yields a coefficient of –0.84 with a standard error of 0.01. Most of the point estimates for the 193 food items fall between –0.3 and –0.8. Only a handful of estimates exceed –1, perhaps indicating relatively inelastic demand even at the most disaggregate level. When the analysis includes fixed effects for each district (kabupaten), the point estimates, still precisely estimated, tend to be a bit larger in absolute value, but still very few exceed an estimate of –1.[6] Of course, these estimated own-price elasticities, like most parametric approaches, are subject to some of the problems mentioned above.

Our principal approach in this paper is nonparametric. As with the econometric approach outlined above, we will need to assume that the 1993 SUSENAS survey provides a reasonably accurate picture of consumption patterns before the crisis. We then use the price changes that actually occurred to predict who the price changes would have affected. This approach has both advantages and disadvantages. On the up side, it does not rely on functional forms, and we can more easily explore the three types of heterogeneity listed above. On the down side, it essentially ignores the possibility

6. A positive correlation between unobserved quality and price might also bias our estimates toward zero.

of substituting away from relatively more expensive goods. Consequently, our method will provide an upper bound on the predicted impacts of the price changes on the poor. The best approach is to combine the heterogeneity highlighted with the nonparametric approach with the structural economic relationships estimated by the econometric approach. We will do this, and this exercise has convinced us of the need to do this, but it is a longer-term project.

12.5 Heterogeneity

Our methods are motivated by our desire to capture the heterogeneity in prices, products, and consumers. We begin our analysis by simply documenting the extent of this heterogeneity. This serves two functions. First, it illustrates the importance of using methods that do not aggregate across the dimensions of heterogeneity. Second, it highlights exactly which sorts of heterogeneity are most important, and this will inform our analysis of the price changes.

12.5.1 Price Heterogeneity across Regions

We begin by analyzing how prices for narrowly defined products vary across Indonesia over the course of the financial crisis. The raw data that are used for this exercise are monthly prices for about 700 products that are collected on a city basis by the BPS. These data are then used to create the official CPIs for the entire country. Monthly prices for so many products in very many cities constitute a rather unwieldly data set. We have aggregated the data in three dimensions. In terms of the time series dimension, we simply computed the price change for each product for the period spanning January 1997 to October 1998. Hence, the twenty-two monthly price changes were reduced to one price change that spanned from before the crisis to the most recent data. This simplification is not without costs, for the reduced data set is no longer able to address questions about the timing of price changes across provinces. It may have taken more time for price increases to have occurred in the more distant provinces, and this sort of information is no longer retrievable with the reduced data set. In the geographic dimension, we have aggregated to create price series for each of twenty-seven provinces, as explained above. In the product dimension, for some analysis we have collapsed the 700 or so products into approximately 180 products or aggregates that we are able to match with goods in the consumption data (SUSENAS).

The price data are reported in *levels,* but we focus our analysis in this paper on *changes.* There is little doubt that some places are more expensive to live in than others. Our interest, however, is whether the financial crisis had a differential impact on different regions of Indonesia. Hence, price changes seem the appropriate focus.

The notion that the overall impact of the financial crisis may have had geographically differential impacts finds some empirical support in ongoing work by Poppele, Sumarto, and Pritchett at the World Bank in their working paper "Social Impacts of the Indonesian Crisis: New Data and Policy Implications" (1999). Relying on data sources different from those used in this paper, Poppele, Sumarto, and Pritchett found that the geographic impact of the crisis on poverty was quite uneven. We return to these results in section 12.6 where we evaluate the impact of the crisis on the poor.

The geographic pattern of price increases differs according to the specificity of the products considered. At the most general level, the price index encompassing all goods does not show much regional variation. An unweighted average of the general price index for each province shows that prices increased an average of 92.5 percent from January 1997 to October 1998. The general price index on a province-by-province basis ranged from an increase of 70 percent in Nusa Tenggara Timor (NTT) to an increase of 119 percent in East Java. As a baseline, the standard error of the series of provincial general price indexes is about 11 percent. Figure 12.1 shows the empirical distribution of the provincial general price index increases. As noted above, it varies from 70 percent to 120 percent, and most provinces are in the 80–100 percent range. Given the different consumption patterns across provinces across provinces and the geographic separation of many provinces, this does not seem like very much heterogeneity. However, this is deceiving.

There are 184 products and product aggregates that appear in both the SUSENAS and our price data. We have computed the change in the price index for all of them. The standard error of the change in the price index, as

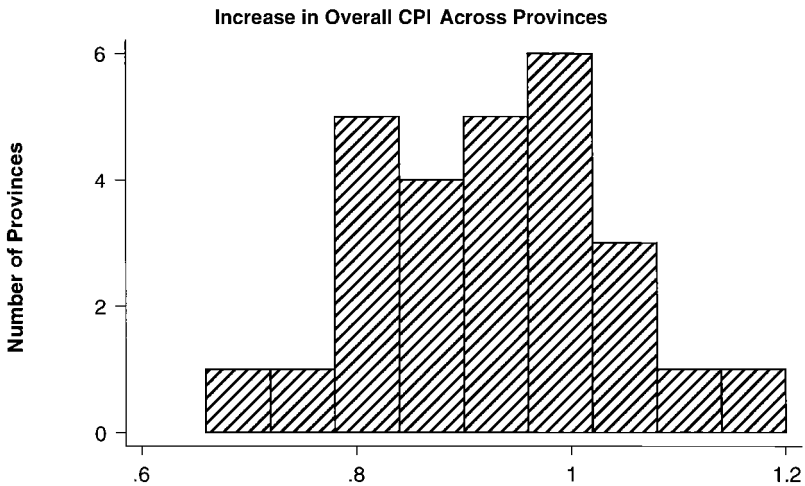

Fig. 12.1 Provincial variation in the CPI

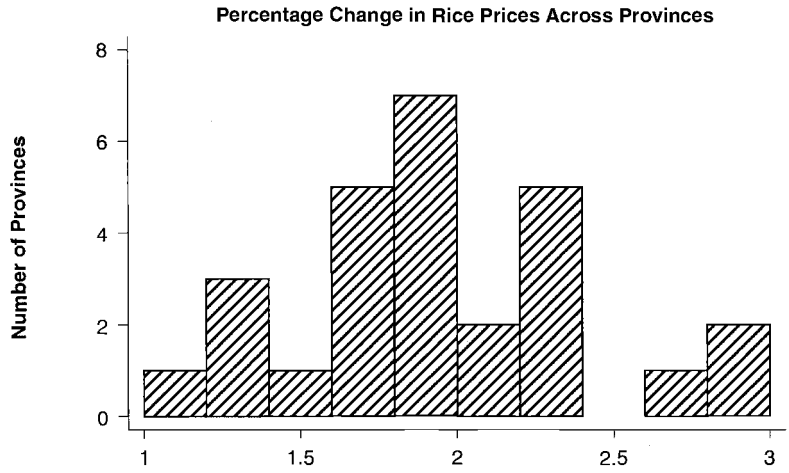

Fig. 12.2 Provincial variation in rice prices

one looks across provinces, is greater than 11 percent (that of the general price index) in over 170 of them. There are some extreme examples, but one that is more representative and is especially important is the geographic dispersion of the price increase for rice. Figure 12.2 shows the empirical distribution of the percentage changes in the price of rice. It varies from around 110 percent (in South Sumatra) to around 280 percent (in South and Central Kalimantan.) The fact that the price increases of individual products show much more geographic variation than that of the overall price index means that the price increases of products covary negatively across provinces. Loosely speaking, when the price of one product goes up a lot in a province, the price of another product goes up by less, so that the increase in the general price index is not that different across provinces.[7]

The substantial geographic variation of price increases following the financial crisis has economic implications. Suppose the poor consume a similar basket of goods regardless of where they live. In such a case, the economic impact of the crisis on the poor may vary substantially across regions. For example, if the poor always devote a substantial share of their budget to rice, the poor would have been much more adversely affected in

7. An alternative explanation, which we have investigated and rejected, is somewhat more complicated. There are about 700 products that comprise the overall price index. Not all of these appear in the SUSENAS consumption data. It could have been the case that the products that contribute to the general price index but do not appear in our consumption data contribute to the dampening of the variance of the general price index. This would happen if the excluded products had price increases that negatively covaried with the included products. We have gone back and investigated this possibility using all 700 prices, and, although there is some negative covariance between the price increases of included and excluded products, it is modest and does not explain the dampened variance of the province-level general price index.

South and Central Kalimantan than in Sumatra. Alternatively, if the poor consume very different baskets of goods in different regions, spatial price variation may in fact be coupled with a fairly uniform impact of the crisis on the poor. Further, if the poor are not evenly distributed across the provinces (and they are not), the geographic variation in prices has an additional impact that can serve to either alleviate or exacerbate the impact of the crisis on the poor.[8]

12.5.2 Product Heterogeneity across Product Aggregates

The previous subsection documented the spatial variation of prices. The general price index did not vary that much across provinces, but the prices of individual goods did. This finding has implications for product aggregation. If one wishes to estimate a demand system, some product aggregation is necessary. It is simply too hard to estimate a demand system for 184 (much less the original 700!) products complete with the all-important cross-price elasticities. One common practice is to aggregate products into groups such as food, housing, clothing, and the like. One can then estimate a demand system using the aggregated products. This is a relatively attractive option when the products that underlie the aggregate have price changes that are somewhat uniform. That is simply not the case in the Indonesian data. In this section, we document this finding and explain some economic implications of product heterogeneity across product aggregates. Like the spatial heterogeneity documented in the previous section, this type of heterogeneity also informs the methodology we use to investigate the impact of the crisis on the poor.

The price data have seven aggregate commodities, which in turn sum to the general price index. These aggregates are foodstuffs, prepared food, housing, clothing, health services, transportation, and education and recreation. Each of these is comprised of many individual products. The degree of disaggregation varies. There are 262 individual items under "foodstuffs," whereas there only about 40 or 50 for "health services" and for "transportation."

In order to abstract from heterogeneity across provinces and focus on the heterogeneity at the product level, we first collapse the data set and consider only the average price increase for each product when the average is taken across provinces. Hence, we compute the average increase in the price of the aggregate "foodstuff" as well as the average price increase in each of the 262 goods that comprise that aggregate. This removes the spatial dimension of the data. Figure 12.3 graphically illustrates the heterogeneity of the price increases of the products that comprise the aggregate for foodstuffs. In figure 12.3, one notes that although one or two products had either price decreases

8. The spatial variation in price changes might in principle help to econometrically identify demand elasticities, but this would require concurrent (and unavailable) data on household expenditures.

Fig. 12.3 Variation in food prices across products

Table 12.2 Product Heterogeneity

Product Aggregate	Number of Individual Products	Average Price Increase (%)	Standard Deviation of Price Increases (%)	Minimum Price Increase (%)	Maximum Price Increase (%)
Foodstuffs	262	112.8	80.5	–68.3	612
Prepared foods	72	78.4	41.6	0.04	169
Housing	105	107.7	76.4	0.4	499
Clothing	94	80.3	46.4	–0.04	214
Health services	38	85.8	51.2	0.0	263
Transportation	48	77.3	84.1	–0.13	482
Education & recreation	43	73.1	71.5	–9.70	310

Notes: Price increases are from January 1997 through October 1998. Average price increases are computed as the average across all provinces reporting price data for a given good.

greater than 50 percent or price increases greater than 400 percent, most products had price increases in the zero to 200 percent range. The results of this aggregation across provinces for all product categories are provided in table 12.2.

Table 12.2 lists, for each of the seven aggregates, the number of individual products, the average price increase when the average is taken across all the products that comprise the aggregate, the standard deviation of the price increases, and the minimum and maximum price increase. (One should keep in mind that these standard deviations do not account for the regional variation in price increases, only the variation of the average price increases.) For example, there are 262 products that comprise the aggregate

"foodstuffs." Of these 262 products, one had an average price decrease of about 68 percent (a leafy vegetable that defies English translation), whereas one had an average increase of over 600 percent (red onions). Of all foodstuffs, the average price increase was 114 percent, and the standard deviation of the price increase was about 80 percent. There was, in sum, tremendous variation in the average price changes of individual food items. This pattern holds for all of the aggregate commodities.

Once we have abstracted from spatial price variation, we have seen that how much prices increase depends on the degree of aggregation with which we define a product. This too has economic implications. Consider foodstuffs as an example. If poor households consume a different basket of specific food items than do the nonpoor, the poor may be quite differentially affected by the crisis. Perhaps the food items whose prices skyrocketed most were imported luxury items, whereas the price rise for basic stables was more modest. Using an aggregate for foods will hide this important source of heterogeneity. This reasoning suggests that one should examine the impact of the crisis at the most disaggregated level. There is, however, a line of reasoning that works in the opposite direction. The methodology we use to investigate the impact of the crisis on the poor essentially assumes that there is no substitutability among goods (this is discussed in some detail below). Although the assumption of perfectly inelastic demands is clearly not correct, it is less incorrect as goods are more broadly defined. For these competing reasons, we analyze the impact of the crisis at different levels of product aggregation.

12.5.3 Heterogeneity across Households

The above two subsections have documented the heterogeneity of prices across provinces and within product aggregates. The purpose of this subsection is to illustrate the heterogeneity of households in the sample. One can either do this correctly, and write the ensuing book, or be too brief, while giving a glimpse into relevant dimensions of household heterogeneity. Our choice will be obvious.

Table 12.3 quantifies how a handful of household characteristics vary across the population, both overall and by income groups. The first column gives the (weighted)[9] means of per capita household income, expenditure, whether the head of the household had completed secondary school, the size of the household, the budget share of food in total expenditure, whether the household was rural, and the age of the household head. Means are reported for three separate deciles in the income distribution, as well as the overall sample. The sample is made up of the 58,100 households (from SUSENAS) included in the subsequent analysis.

Table 12.3 indicates that income is quite unequally distributed, as the aver-

9. When computing means, we use the sampling weights reported by SUSENAS.

Table 12.3 Household Heterogeneity

	Bottom Decile	Middle Decile	Top Decile	Overall
Per capita income	19,241	51,959	229,097	61,596
	(3,916)	(2,411)	(74,424)	(218,335)
Per capita expenditure	21,687	46,028	136,271	49,726
	(11,342)	(10,985)	(91,594)	(41,859)
Schooling	0.2526	0.5097	0.7628	0.4734
	(0.4345)	(0.4999)	(0.4253)	(0.4993)
Household size	4.3958	3.7722	3.6142	3.8911
	(1.6940)	(1.6500)	(1.7225)	(1.6911)
Food share of income	0.83483	0.5569	0.3233	0.5824
	(1.3818)	(0.1375)	(0.1462)	(0.5182)
Rural	0.9222	0.6767	0.3042	0.6959
	(0.2678)	(0.4677)	(0.4601)	(0.4600)
Age of household head	47.877	43.828	43.147	45.000
	(13.714)	(13.980)	(13.467)	(13.910)
Number of households	5,811	5,811	5,811	58,100

Source: 1993 SUSENAS.

Notes: Deciles are by per capita household income. The middle decile includes households with per capita incomes between the 50th and 60th percentile. All means are weighted by population sampling weights. Household size is defined as number of adults plus one-half the number of children under ten. Income and expenditure values are in current (1993) rupiahs.

age income at the top decile is almost twelve times that of the bottom decile. Expenditure is less unequally distributed. Only about 25 percent of the very poor household heads have graduated secondary school, whereas almost 75 percent of those in the top decile have done so. Richer households are smaller. (We have defined household size as the number of adults plus one-half times the number of children.) About 90 percent of the households in the bottom decile are rural, whereas about 70 percent of those in the top decile are urban. Households in the bottom decile devote about 85 percent of their income to food, whereas those in the top devote only a bit more than one-third of that share. As noted in table 12.1, the CPI for food rose by more than the CPI for other categories, and this alone suggests that at this very aggregated level, the poor may have been more adversely affected by the financial crisis.

As important as the averages across deciles reported in table 12.3 are the standard errors of these averages. Even within households in the poorest decile, there is tremendous variation in the income share devoted to food consumption, the household size, the age of the head of the household, and whether the head of the household has completed secondary school. The very poor are themselves a quite heterogeneous group.

The poorest households do not just spend a larger share of their budget on food than middle- and high-income households, but, as mentioned earlier, they also purchase a very different basket of products. Even within the category of food, poor households typically buy different items from those

Table 12.4 Expenditure Shares (%)

Product	Bottom Decile	Mean	Top Decile
Food	68.1	62.2	46.9
Cereals	27.6	17.8	6.9
Rice	24.8	16.7	6.4
Tubers	2.2	1.1	0.4
Cassava	0.7	0.4	0.1
Fish	4.6	5.4	4.4
Meat	0.7	2.2	4.0
Eggs and milk	1.2	2.5	3.5
Chicken eggs	0.8	1.3	1.3
Vegetables	7.3	5.9	3.7
Legumes and soy products	2.8	2.6	1.6
Fruit	1.9	2.5	3.0
Oil and animal fat	3.8	3.1	1.8
Beverages	4.2	3.7	2.4
Sugar	2.7	2.4	1.5
Seasonings	2.6	2.3	1.4
Salt	0.3	0.2	0.1
Ready-made food and beverages	4.2	6.9	8.7
Tobacco and beetle leaf	4.5	5.3	3.9
Filter clove cigarettes	1.1	2.6	2.7
Nonfood	31.9	37.8	53.1
Housing, fuel, lighting, and water	15.8	17.5	22.2
Estimated monthly rent if owned	5.7	7.5	11.8
Electricity	0.7	1.4	2.4
Kerosene	2.7	2.8	1.9
Firewood	5.3	3.0	0.5
Health care	0.9	1.2	1.7
Education	1.4	1.9	3.2
Gasoline (for transport)	0.0	0.6	2.1
Clothing, shores, and hats	6.4	6.2	5.5
Durable goods	1.7	2.7	4.9
Taxes and insurance	0.6	1.0	2.1

Source: 1993 SUSENAS.

Notes: Durable goods include items such as furniture, household utensils, jewelry, and vehicles. Expenditure shares are given as a percentage of total household expenditures. Deciles are ranked by per capita household income.

wealthier households buy. This is apparent in table 12.4, which presents the mean expenditure shares for the overall sample as well as for those households in the top and bottom per capita household income deciles. As expected, poor households spend a greater share of total expenditures on food than rich households (68 percent for those in the bottom decile compared with 47 percent in the top decile).[10] Even within food items, spending

10. Because we are now looking at food outlays as a share of total expenditures, and not income, the figures here will differ from those in table 12.3.

patterns vary by income level. The poor spend a far greater share on basic foodstuffs such as cereals and tubers (30 percent of all expenditures) than the wealthy (7 percent). Indeed, expenditures on rice alone comprise one-quarter of all expenditures for poor households, compared with 6 percent for the wealthy. In contrast, the wealthy devote more than twice the expenditure share as the poor to meat, eggs and milk, and prepared food and beverages. Among nonfood expenditures, the wealthy devote proportionately more resources to housing and education and are more reliant on electricity and gasoline (for transport), whereas the poor spend significantly higher proportions on kerosene and firewood. Because the prices of individual products do not all move together, the fact that richer and poorer households buy different products suggests that the financial crisis may have differentially affected richer and poorer households in a complicated way. If one could simply multiply the poor's consumption basket by some scalar to get the rich's consumption basket, untangling the impact of the financial crisis on the poor would be simpler. However, that is not the case.

12.6 Changes in the Cost of Living and the Impact of the Crisis on the Poor

The purpose of the previous section has been to establish that (a) price changes varied a great deal across Indonesian provinces so that *where* a household lived may matter when evaluating the impact of the financial crisis; (b) price changes varied a great deal depending on how one aggregates products, so that the degree of disaggregation of product definition matters when evaluating the impact of the financial crisis; and (c) households themselves are very heterogeneous, so a methodology investigating the impact of the financial crisis should accommodate this heterogeneity. With these concerns in mind, we now turn to measuring the impact of the crisis on the poor.

We measure the impact of the crisis on households (rich and poor) by computing household-level cost-of-living indexes. Because we only have data on consumption patterns well before the crisis, we use these precrisis consumption baskets to compute what is essentially a Lespeyres cost-of-living index for each household. This index provides a *maximum* bound on the impact of the crisis, because the index does not take into account the substitution toward relatively less costly products that surely takes place (to some extent) after price increases. Denoting the price of good i faced by household j in time t by p_{ijt} and expenditure shares by q_{ijt}, the household cost-of-living index for household j is given by

$$C_j = \frac{\sum_{i=1} p_{ij1} q_{ij0}}{\sum_{i=1} p_{ij0} q_{ij0}}.$$

We compute 58,100 cost-of-living indices, or as many indices as there are households in our sample.

We actually compute three such household-level indices. The first index that we compute matches the price changes of goods in the price data with the monthly expenditures of the same goods in the 1993 SUSENAS. For the monthly expenditure of food items, we simply convert the recorded weekly expenditures to monthly equivalents. For nonfood items, we use the monthly average of annual expenditures, and not the expenditures in the month preceding the survey, in order to more accurately measure monthly expenditures for durables that are infrequently purchased. We attempt to match goods across the two data sets at the lowest level of aggregation possible. For the case of food (both raw and prepared), we were able to match 132 different individual goods between the two data sets. In the case of nonfood items, we matched 52 different goods, both individual goods, such as firewood and kerosene, and aggregate goods, such as toiletries or men's clothing. Hence, the *i* subscript in the Lespeyres formula above runs from 1 to 184. Through this matching, we were able to account for 75 percent of total household expenditures on average—a little greater for poor households and a little less for rich ones. This index is, then, an average of the observed price changes, with each price change weighted by the household-specific expenditure share for that good.

The second index is computed for the case in which we use 19 aggregate commodities instead of the original 184 that we matched between SUSENAS and the BPS price data. These aggregates include fifteen food categories, such as cereals and meat, and four nonfood categories, such as housing and clothing. The motivation for this is twofold. First, recall that the Lespeyres index, by construction, ignores substitutability across products. By defining products more broadly, as in the second index, we reduce the likely overstatement of the impact of the crisis. Put another way, when products are broadly defined, those aggregates are going to be less elastically demanded than the disaggregated products. The second motivation for this index stems from the fact that the disaggregated index only accounted for about 75 percent of households' expenditures. It is possible that for many households, the goods excluded in the first index may either exacerbate or mitigate the measured welfare effects, depending on the relative price changes of those goods. The expenditures for these aggregates (e.g., meat, cereals, housing, etc.) are also supplied by the 1993 SUSENAS, and the price changes for these aggregates are found in the price data. A benefit of this index is that it covers nearly 100 percent of the individual household's expenditures. Of course, by attempting to compensate for the above potential biases, we may be introducing another bias, aggregation bias, which we have also previously discussed.

The third index that we compute accounts for the services provided by owner-occupied housing and for self-produced agriculture. Many households, especially in rural areas, own their home. Although the price of hous-

ing has increased, these households are, in an absolute sense, perhaps not better off (they are still living in the same house). However, these households are better off relative to those that do not own their home. We account for the services provided by owner-occupied housing by treating the imputed rental value for these homes as a negative expenditure. Many households produce some of their own food. Over 90 percent of these households are classified as rural. Households that consume self-produced foodstuffs also tend to be net exporters of agricultural products.[11] As the price of food rose, the value of their production also increased. Clearly, if the household was a net exporter of food, the household would benefit from the price increase. To the extent that a household produced some of its own food, such production would mute the impact of price increases relative to a household that purchased food in the market. We modify the first index to account for self-produced agricultural products by treating the imputed value of self-produced food as a negative expenditure.[12] Note that this modified index will understate the effects of the price increases to the extent that we do not observe or adjust for price increases of intermediate inputs used in agricultural production. On the other hand, this index does not allow supply responses to the increased food prices, and one would expect more self-production in the goods whose relative prices increased the most.

12.6.1 Nonparametric Evidence

Figure 12.4 provides kernel density estimates of the first and third indexes. The biggest difference between the two densities is the existence of households that are *better* off after the crisis due to the consumption of self-produced (and now more expensive) agricultural goods. Although there are not very many of these households (less than 10 percent of the sample), they are nonnegligible. More generally, including household production muted the cost-of-living increases, and this was especially true in the rural areas.

Table 12.5 summarizes how the cost-of-living index varied across per capita household income deciles. This table begins to address the impact of the crisis on the very poor.[13] Because the rapid price change resulting from the crisis may have differentially affected rural and urban areas, we report

11. Fifty-four percent (weighted) of households in the sample report operating an agricultural business. 69 percent (weighted) of those households report income from the sale of agricultural goods.

12. There is a long-standing debate over whether shadow prices in rural households engaged in agricultural production equate market prices for agricultural inputs such as labor or land. To the extent that these shadow prices may diverge from market prices, the "valuation" for self-produced food, based on market prices, will not be entirely accurate. Benjamin (1992) presents evidence from rural Java that household shadow prices for agricultural inputs such as labor are not significantly different from market prices.

13. We use income to measure "poor" and "nonpoor" although we are well aware of the controversy around this definition. Our results were substantively the same when we looked at expenditure or food-related expenditure instead of income. See Chaudhuri and Ravallion (1994) for an investigation of the relative merits of these various poverty indicators.

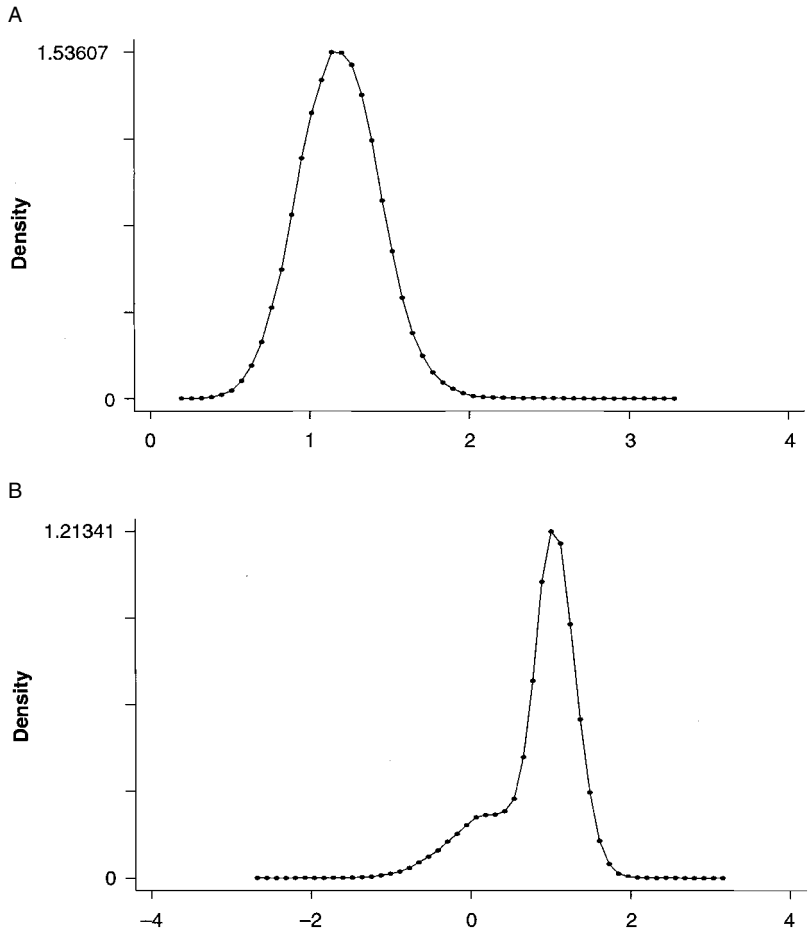

Fig. 12.4 Distribution of the cost of living: *A*, Index without self-production; *B*, Index with self-production

separate results for rural and urban households. When we do not take into account self-production and use disaggregated product definitions (index 1), we find that the cost of living for the poorest urban households increased an average of 128 percent over the January 1997 through October 1998 period. The increase for urban households in the top income decile was 89 percent. Among rural households, where the overall cost-of-living increases were greater, the parallel figures are 136 percent for the poorest and 107 percent for the wealthiest households. For both rural and urban households, we find that the increase in the cost of living declines monotonically by income decile. Hence, in both areas, the poorer a household was, the greater was the increase in its cost of living.

Table 12.5 Cost-of-Living Indexes and Income Levels

	Index 1		Index 2		Index 3	
Income Decile	Urban	Rural	Urban	Rural	Urban	Rural
1	1.28	1.36	1.25	1.32	1.11	0.73
2	1.26	1.34	1.24	1.30	1.07	0.74
3	1.21	1.32	1.21	1.28	1.06	0.74
4	1.19	1.30	1.19	1.27	1.04	0.75
5	1.14	1.28	1.16	1.25	1.03	0.75
6	1.11	1.26	1.14	1.24	1.01	0.79
7	1.07	1.22	1.12	1.21	0.98	0.81
8	1.03	1.19	1.09	1.19	0.95	0.80
9	0.98	1.14	1.05	1.16	0.91	0.84
10	0.89	1.07	0.99	1.12	0.80	0.83
Overall average	1.19		1.20		0.84	

Notes: Price index 1 is computed across all disaggregated commodities and does not take into account either self-produced agriculture or owner-occupied housing. Price index 2 is computed across about twenty aggregated commodities and does not take into account either self-produced agriculture or owner-occupied housing. Price index 3 is computed across all disaggregated commodities and accounts for both owner-occupied housing and self-produced goods. Deciles are by per capita household income.

The middle columns of table 12.5 (index 2) use the more aggregated product definitions. The results are very similar to those using the disaggregated product definitions, although the differences across income deciles are mitigated, mostly because wealthier households in both areas now have somewhat higher cost-of-living increases. The overall similarities between the two indexes are striking, given that index 2 employs broadly aggregate goods demanded less elastically than the individual goods of index 1. Thus, while the Lespeyres index is, by construction, an overestimate of the true change in the cost of living, the bias may not be huge. Indeed, the averages of the first and second indexes are almost identical. It remains the case that the poorer households saw their cost of living increase by more than did wealthier households.

The final two columns of table 12.5 now account for housing services and self-produced food. As suggested by the kernel density estimates in figure 12.4, the increases in the cost of living are substantially muted relative to the figures for index 1 in both areas, although this is especially true for rural households due to the tendency of rural households to engage in agricultural production. The average increase falls from 120 percent in index 1 to 84 percent. (In results not reported here, we find that it is indeed self-produced agriculture and not owner-occupied housing that accounts for most of the difference between the indexes.) Interestingly, for rural households there is no longer a differential impact across the income spectrum. Indeed, the cost-of-living increase is now slightly *greater* for the wealthier rural households, suggesting that self-production has equalized the impact

of the financial crisis across the income deciles in rural areas. The story is quite different for urban households, however, where there is still a clear monotonic decrease in the changes in cost of living. The cost of living for the poorest urban households increased 111 percent, whereas the wealthiest households faced an increase of only 80 percent. It is important to note that the cost of living increases for the wealthy *urban* households are greater than those measured for the poor or median *rural* households. Thus, this index suggests the impacts of the crisis have been greater for urban areas than for rural, and greatest overall for the urban poor.

We turn now from variation across household income to the regional variation in the cost-of-living indices. Table 12.6 gives the change in the cost-of-living index for urban and rural households in each province. As an example, using index 1 (disaggregated products and no correction for housing services or self-production), the cost of living for urban households in Aceh increased 102 percent, while for rural households it increased 125 percent. For most provinces, index 1 and index 2 (with aggregated products) give similar results. As in table 12.5, we find that when we do not account for housing services and self-production, rural households consistently faced greater increases in their cost of living than did their provincial urban counterparts. Our index 1 results suggest that there was substantial regional variation in the cost of living. In Irian Jaya, to the far east, the increase in urban cost of living measured 75 percent, whereas in southeast Sulawesi, the increase was 138 percent. The regional variation for rural households is equally dramatic. In southeast Sulawesi, rural households faced a 161 percent cost-of-living increase, whereas in Irian Jaya the increase was only 91 percent.

When we focus on an index that accounts for housing services and self-produced agriculture (index 3), the regional variation remains, but the urban-rural comparison is changed. The depreciation of the rupiah helped export-oriented provinces, and the increased cost of food was offset by household production in rural areas. In every province, rural households faced a smaller increase in their cost-of-living index than did their urban counterparts. In some provinces, the differences are especially large. In East Timor and Irian Jaya, the cost of living for rural households only increased about 39 percent. The pattern of regional variation remains, because other provinces had increases (for rural households) more than double that.

We view the particular results for some provinces with some caution because our results do not always coincide with the results reported by Poppele, Sumarto, and Pritchett (1999). For example, they report that on Sulawesi, 70 percent of rural Kecamatans reported that things were better in August 1998 than they were one year prior. Although these measures are subjective, this figure is hard to reconcile with our cost-of-living changes. Overall, the Poppele, Sumarto, and Pritchett results suggest substantial regional variation (as do we) and that rural households fared relatively better

Table 12.6 Regional Variation of Cost-of-Living Indexes

Province	Region Type	Index 1	Index 2	Index 3
Aceh	Urban	1.02	1.10	0.98
	Rural	1.25	1.25	0.63
North Sumatra	Urban	1.13	1.18	1.05
	Rural	1.39	1.36	0.87
West Sumatra	Urban	1.02	1.12	0.85
	Rural	1.26	1.26	0.64
Riau	Urban	0.94	1.04	0.90
	Rural	1.14	1.14	0.85
Jambi	Urban	1.00	0.99	0.95
	Rural	1.24	1.16	0.78
Bengkulu	Urban	1.18	1.29	1.10
	Rural	1.52	1.51	1.09
South Sumatra	Urban	1.06	1.16	0.96
	Rural	1.31	1.31	0.63
Lampung	Urban	0.98	1.11	0.85
	Rural	1.17	1.18	0.69
Jakarta	Urban	0.93	1.01	0.87
	Rural	n.a.	n.a.	n.a.
West Java	Urban	1.06	1.12	0.93
	Rural	1.21	1.23	0.67
Central Java	Urban	1.05	1.06	0.96
	Rural	1.18	1.16	0.78
Yogyakarta	Urban	1.15	1.14	0.92
	Rural	1.36	1.23	0.80
East Java	Urban	1.13	1.17	0.97
	Rural	1.33	1.29	0.98
Bali	Urban	1.08	1.10	0.97
	Rural	1.29	1.27	0.95
NTB	Urban	1.25	1.22	1.14
	Rural	1.50	1.41	1.01
NTT	Urban	0.84	0.85	0.74
	Rural	0.98	1.02	0.09
East Timor	Urban	0.92	1.06	0.83
	Rural	1.02	1.07	0.39
West Kalimantan	Urban	1.10	1.26	0.98
	Rural	1.49	1.53	0.76
Central Kalimantan	Urban	1.09	1.14	1.03
	Rural	1.43	1.37	0.71
South Kalimantan	Urban	1.13	1.12	1.07
	Rural	1.45	1.28	0.85
East Kalimantan	Urban	0.90	1.02	0.83
	Rural	1.14	1.18	0.80
North Sulawesi	Urban	1.05	1.04	0.98
	Rural	1.23	1.14	0.88
Central Sulawesi	Urban	1.21	1.23	1.10
	Rural	1.52	1.40	0.70
South Sulawesi	Urban	0.93	1.00	0.84
	Rural	1.09	1.13	0.42

Table 12.6 (continued)

Province	Region Type	Index 1	Index 2	Index 3
Southeast Sulawesi	Urban	1.38	1.37	1.3
	Rural	1.61	1.54	0.98
Maluku	Urban	0.95	1.06	0.90
	Rural	1.19	1.22	0.61
Irian Jaya	Urban	0.75	0.81	0.67
	Rural	0.91	0.89	0.38

Notes: Price index 1 is computed across all disaggregated commodities and does not take into account either self-produced agriculture or owner-occupied housing. Price index 2 is computed across about twenty aggregated commodities and does not take into account either self-produced agriculture or owner-occupied housing. Price index 3 is computed across all disaggregated commodities and accounts for both owner-occupied housing and self-produced goods. n.a. = not applicable.

(as do we once we account for household production). These general findings are also echoed in Frankenberg, Thomas, and Beegle (1999).

It might be interesting to investigate how the provincial and regional changes in the cost of living reported here vary with other provincial characteristics such as mean income or expenditure levels. Have wealthier or poorer regions of the country experienced higher cost-of-living increases? For rural areas, there is little correlation between mean per capita household income or expenditures and increases in mean cost of living. However, for urban areas the cost-of-living changes are negatively and significantly correlated with provincial mean household income (and, to a lesser extent, expenditures). Thus, urban areas with lower average household income experienced greater price changes than the more wealthy cities. These findings hold true for any of the three indexes. Another provincial characteristic more sensitive to the distribution of income within the province is the provincial population share categorized as poor. What might be the relation between regional variation in price changes and regional variation in poverty? We take as our poverty measure the population share deemed poor by Bidani and Ravallion (1993) from calculations based on the 1990 SUSENAS. Although these poverty indicators pertain to a period seven years before the currency crisis, it is unlikely that the relative variation in regional poverty profiles would be much changed in the intervening years. We find no relation between the provincial cost-of-living increases and the provincial poverty indicators for urban areas. We also find no relation between cost-of-living changes and poverty indicators in rural areas when our cost of living is measured by index 1 or index 2.[14] However, the cost-of-living changes as determined by index 3 are negatively and significantly correlated

14. Poppele, Sumarto, and Pritchett (1999), using different poverty measures, also find no association across regions between the impacts of the crisis and precrisis levels of poverty.

Table 12.7 Cost-of-Living Regressions

Independent Variable	OLS	Fixed Effects	OLS	Fixed Effects	OLS	Fixed Effects
Dependant Variable: Index 1 (Index without Housing or Self-Production)						
ln(Income)	–0.100	–0.098	–0.151	–0.154	–0.146	–0.150
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rural	0.163	0.158	0.141	0.138	0.138	0.135
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
ln(Size)		0.143	0.147	0.142	0.146	
		(0.002)	(0.001)	(0.002)	(0.001)	
Degree			–0.023	–0.019		
			(0.001)	(0.001)		
Dependent Variable: Index 3 (Index with Housing and Self-Production)						
ln(Income)	–0.046	–0.028	–0.046	–0.029	–0.049	–0.031
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Rural	–0.214	–0.201	–0.214	–0.201	–0.212	–0.199
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
ln(Size)		–0.000	0.001	0.000		0.001
		(0.005)	(0.005)	(0.005)	(0.005)	
Degree			0.014	0.012		
			(0.004)	(0.004)		

Note: Regressions had approximately 58,000 observations.

with the share of rural provincial population deemed poor. Hence, provinces with a greater proportion of poor experienced lower cost-of-living increases than the more well-off rural areas once adjustments for agricultural self-production were made.

12.6.2 Parametric Evidence

The results in tables 12.5 and 12.6 suggest that the crisis affected the cost of living of the poor more than that of the rich, at least for indexes 1 and 2, and urban households more than rural ones, after we account for owned housing and self-produced food. In order to investigate how the cost of living varies conditional on more than one household attribute, regression analysis is helpful. Our approach is simple and descriptive. It is without structural interpretation.

Regression results are summarized in table 12.7.[15] The top half of table 12.7 includes results using the cost-of-living index that does *not* account for housing services or self-produced food. We include three specifications and two estimation methods. All specifications are linear, with the index being regressed on two to four explanatory variables. In each specification, we include the log of income and a dummy variable that takes a value of 1 if the

15. The regressions reported in table 12.7 are not weighted by sampling weights, but we find that doing so makes little to no substantive difference in the results.

household is rural. (We use the actual index instead of its log because the index when accounting for self-production may be negative.) In the most parsimonious specification, OLS yields a coefficient of –0.100 on log income and 0.163 on the rural dummy variable. Each is quite precisely estimated. The coefficient on log income has a natural interpretation. The negative sign on the coefficient indicates that the cost of living rises with declines in income. The poor are harmed most. A value of –0.100 indicates that as income doubles (a 100 percent increase), the cost-of-living index falls by 10 points (0.10). The coefficient of –0.10 is large when considered in conjunction with the range of incomes. At the 10th percentile, household income is 75,802, whereas it is only 101,667 at the 20th percentile. At the 80th and 90th percentiles, income is 324,167 and 460,656. These large absolute differences translate into large differences in the cost of living. Because income is easily five times larger at the high end of the distribution than at the low end, the –0.100 coefficient corresponds to a cost-of-living index that is 50 points higher for poor households. This strikes us as a large disparity in the cost of living. The coefficient on "rural," still in the simplest OLS specification, is 0.163, indicating that rural households have a cost-of-living increase 16 points higher than their urban counterparts. Recall, though, that this result is for the index that does not account for self-production.

Our main focus is on how robust these results are to other specifications. Because we are not being guided by theory, the decision of which other regressors might be included in the regression is essentially arbitrary. Insofar as included regressors might covary with income or rural location, the coefficients on log income and the rural dummy might change. We include two additional regressors. One is the log of household size, where children under ten are counted as one-half and adults as one. The other included variable ("degree") is a dummy variable set to 1 if the head of the household is a secondary school graduate. We find that the inclusion of household size increases (in absolute value) the coefficient on log income to –0.151. The coefficient on the rural dummy remains relatively stable. Household size itself conditionally covaries positively with the price index. Larger households face larger cost-of-living increases. Controlling also for the education of the head of the household has virtually no impact on the other coefficients.

There is good reason to believe that the residuals of the regression may be correlated by province. This would be consistent with the substantial regional variation that we found in earlier cuts of the data. Provinces seem to matter. For this reason, we estimated all specifications with a province fixed effects estimator. This effectively sweeps out any cross-province variation, so the estimates instead capture only within-province variation. We find that the inclusion of province fixed effects makes remarkably little difference to the estimates. All coefficients are about the same as with OLS. Put another way, the variation in the data that gave rise to the OLS estimates also exists at the province level.

In the bottom half of table 12.7, we use the cost-of-living index that accounts for housing services and self-produced agriculture (index 3). The results are broadly consistent with those in tables 12.5 and 12.6. We focus first on the OLS estimates. In our most parsimonious specification, we find that the coefficient on log income is –0.046, and the coefficient on the rural dummy variable is –0.214. Hence, if household income doubles, the cost of living decreases 4 points. Because income at the 10th percentile is about one-sixth of that at the 90th percentile, these results indicate that the cost of living is about 25 points (0.25) higher for the very poor. This is a large difference, because the mean of the cost-of-living index is only 0.83. The OLS coefficient on log income is stable across specifications and is always precisely estimated. The coefficients on log income are always smaller with the index that includes self-production, and this is consistent with the notion that self-production mutes the impact of the crisis on the poor. It remains the case, though, that the poor are more adversely affected than the wealthy.

When we include housing services and self-production, the coefficient on the rural dummy variable becomes negative. Hence, when we account for these influences, urban households faced a higher cost of living. The difference is on the order of 20 points, which, again, is large given the mean of the index (0.83). This coefficient is also stable across specifications. That the crisis affected urban households more than rural ones is consistent with the preliminary results of Poppele, Sumarto, and Pritchett (1999) as well as with Frankenberg, Thomas, and Beegle (1999). We find that household size no longer seems to matter and that the coefficient on the education of the head of household becomes negative. The former effect is consistent with larger households' having more housing services and self-produced agriculture. The later effect is consistent with higher-education households' engaging in less self-production. Finally, including provincial fixed effects mutes the impact of log income, but it remains the case that the coefficient is precisely estimated and negative. Little else changes with the fixed effects.[16]

12.7 Conclusions and Caveats

12.7.1 Conclusions

The recent financial crisis in Indonesia has resulted in dramatic price increases. When we ask if these price increases have hit the cost of living of poor households disproportionately hard, the answer is usually "yes." Just how hard the poor have been hit, though, depends crucially on where the house-

16. We also experimented with an interaction term between log income and the rural dummy. In those (unreported) results, we find that Priceindex $= 2.22 - 0.10 \times \ln(y) - 1.46 \times$ Rural $+ 0.10 \times (\ln(y) \times$ Rural). All coefficients were precisely estimated. Hence, the negative relationship between income and the price index (index 3) is present only for households in urban areas (as we might expect, given the findings in table 12.5).

hold lives, whether the household is in a rural or urban area, and just how the cost of living is computed. What is clear is that the notion that the very poor are so poor as to be insulated from international shocks is simply wrong. Rather, in the Indonesian case, the very poor appear the most vulnerable.

Our results emphasize the importance of heterogeneity when measuring the impact of the Indonesian economic crisis on households. We find that prices vary substantially across the disparate regions of Indonesia. Prices also vary across the types of goods considered. Households are also quite heterogeneous, even within income deciles, with respect to observable characteristics. On top of this variation, consumption patterns vary both by region and by income class. For these reasons, we find it most helpful to think about *distributions* of responses, and we have employed methods that, in most cases, do not rely on particular parametric assumptions.

By matching data on price changes with data on household consumption from a nationally representative Indonesian data source, we have calculated household-specific cost-of-living increases. Because our measure—a Lespeyres-type index—does not account for potential substitution among products, our figures provide an upward bound on the likely increase in the cost of living. We find a substantial increase in the mean cost of living, on the order of 130 percent, if we disregard the relative benefits of self-produced agriculture and owned housing. The measured increase is greater for poorer households and households in rural areas. There is a great deal of provincial variation in the measured cost-of-living increases, although, as evidenced by the fixed effects estimation results, there is as much variation within provinces as between them.

Our results also illustrate the role that agricultural self-production and owned housing played in dampening the impact of the crisis. When we account for these benefits, the estimated mean cost of living falls to 84 percent, and this cost is now lower for rural households. Of all households, the urban poor appear the most adversely impacted by the crisis. Their cost of living tended to rise the most, and, being poor, these households are presumably among the least able to absorb these increases.

12.7.2 . . . And Caveats

There are several reasons to view our results with caution. These include the absence of information about wages and incomes, potential problems with the price data that underlie our indexes, the fact that we used 1993 consumption data to proxy 1997 consumption patterns, the biases inherent in a Lespeyres index approach, and the confounding influences of shocks other than that of the economic crisis. Each is discussed in turn.

Wages

This paper has analyzed variations in the changes in nominal prices during the Indonesian economic crisis. Of course we would also like to know

what has happened with wages and income to better measure the real effects of the crisis. Unfortunately, our data contain no information on the changes in household income over the course of the crisis. However, two alternative sources of data do have some information on wage changes. Data from the BPS (obtained from their web site at [http://www.bps.go.id]) reveal that nominal wages for many broad occupational classifications have increased throughout 1998. For example, the reported increase in the mean wage from September 1997 through September 1998 for industrial workers stands at 26 percent. The median wage has also increased an almost identical 25 percent. Workers in the basic metal and metal working industries witnessed the highest wage increases, of about 40 percent, while wages in the paper and chemical industries increased less than 20 percent. There is also extensive regional variation in nominal wage increases. The largest wage gains reported were for workers in Sulawesi, who experienced increases of 87 percent, whereas wages in Jakarta increased only 12 percent. It is apparent, however, that the nominal increase in wages was not nearly enough to offset the detrimental effects of the rapid price changes. Frankenberg, Thomas, and Beegle (1999) find significant erosion in the real wage, especially for workers in urban areas, where the real wage has fallen 30 percent for men and 37 percent for women. The real wage has declined less in rural areas (18 percent for men and 19 percent for women), although overall wages are still significantly lower for rural workers.

Although rising nominal wages will dampen the impact of rising prices, that helps only workers who actually earn the wages. Workers who instead become unemployed are hit doubly hard. Badan Pusat Statistik statistics indicate that unemployment rose from about four million workers in 1997 to over five million in 1998. On the other hand, the crisis has led to a slightly higher proportion of men, and a considerably higher proportion of women, currently working. The increased proportion working is largely due to unpaid family workers entering the labor force and somewhat mitigates the detrimental effects of the decline in real wages and the rise in unemployment. This is apparent in the reported changes in household per capita expenditures, where the declines, although still significant, are not as large as the declines in wages. According to Frankenberg, Thomas, and Beegle (1999), mean per capita household expenditures have fallen 34 percent in urban areas and 13 percent in rural areas (although the median per capita expenditures have declined only 5 percent and 2 percent for urban and rural households, respectively).

Inaccurate Price Data

Our price data come from observations in urban areas. Due to the lack of information on rural prices, we extend these measured price changes to rural areas. However, prices in rural areas, especially remote areas, may behave quite differently. Frankenberg, Thomas, and Beegle (1999) determine

that overall inflation may be slightly higher (5 percent higher) in rural areas than in urban. As well, at least for the seven provinces for which they have some limited independent price data, Frankenberg, Thomas, and Beegle suggest that actual inflation may be as much as 15 percent higher than the BPS-derived inflation estimates. This is another reason to view our results with caution.

1993 Consumption Data

We base our household expenditure shares on consumption data from the 1993 SUSENAS. As incomes rise, consumption patterns change. This is apparent if we review expenditure shares over the 1987–93 period, where a smaller proportion of total expenditures is devoted to basic foodstuffs, such as rice, for all households throughout the period-specific income distribution. Up until the economic crisis, this trend was likely to continue. To the extent that our consumption baskets are calculated with 1993 and not 1997 data, our measured impacts of the crisis will diverge from the actual impacts. However, we are also concerned with the heterogeneous effects of the crisis among households, and the relative consumption baskets (among rich and poor households, or rural and urban households) are not likely to have changed as much as the absolute consumption baskets over the 1993–97 period.

The Lespeyres Index

We have examined the impact of the crisis with price data that both pre- and postdate the crisis, but we do not observe quantities corresponding the higher prices. For households that do not engage in any self-production (which would include virtually all urban households), this means that our cost-of-living index is an upper bound on the true change in the cost of living. For households that do engage in agricultural self-production, the bias is lessened.

Not a Controlled Experiment

It is easy to forget that the Indonesian economic crisis was not the only change in the economic environment over this period. Concurrent with the crisis, some areas of Indonesia were hard hit by forest fires and others by drought. These and other disasters affect prices, so not all the price changes we observe in the data are due solely to the economic crisis. Put another way, prices would have changed some even absent the crisis.

For all of these reasons (and surely more), one should view our results with some caution. On the other hand, the severity of the crisis and the sheer magnitude of the affected population argue for presenting some evidence given the currently available data. That has been one aim of this paper. Another was to document the high degree of heterogeneity in the effects of the crisis across such dimensions as region, household location, and income.

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Comment

Lant Pritchett

This paper is a valuable contribution to a study of the impacts of the Indonesian crisis. I'd like to make comments in three areas: the time series evolution of the impact, and estimates of the impact, of the crisis; the regional distribution of impacts; and the household. My comments are in part academic but principally draw on my experience of living in Indonesia from August 1998 to August 2000, during which time I switched the academic hat for the role of helping the World Bank and government of Indonesia finance, design, and implement safety net programs aimed at mitigating the impacts of the financial crisis.

First, on the *time evolution* of the impact of the crisis this paper was actually a crucial part of unraveling a puzzle that confronted us in trying to determine the impact on poverty of the crisis. In September 1998 there were two estimates of the poverty impact of the crisis. One, from the government's statistics agency, was that absolute poverty had increased from 11 percent precrisis to over 40 percent. This estimate was badly methodologically flawed in that it scaled up the poverty line by the inflation rate while assuming that nominal incomes were fixed (the basic point that every buyer has a seller and vice versa got lost in the heat of the moment).

On the other hand, there were overly sanguine estimates coming from the

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World Bank and others. These estimates pointed out that, although gross domestic product (GDP) had fallen 15 percent, it was mainly driven by a dramatic collapse in investment, and personal consumption expenditures (the closest aggregate analogue to the expenditures used in calculating poverty) had fallen by only about 3 percent. If the usual elasticities between consumption expenditures and poverty held, this meant that poverty had increased very, very little. This view had some logic to it, but the sanguinity it implied was belied by the enormous sense of crisis in the country—and not just in the financial circles.

As it happens, that view too was wrong (as we came to realize, at least, by December 1998) precisely because it overlooked the heterogeneous impact of relative price shifts across households emphasized in this paper. The main action, and the simplest way to think about the issue, was just to think about rice. Rice is a tradable commodity (even though it is bulky and hence actual trade is not large as a fraction of the total market) and hence the rapid devaluations, especially during January 1998 and then again following the political crisis in May 1998, had created an enormous gap between world prices and domestic prices. The logistics agency was able to stabilize domestic prices only until August, and during three weeks in August alone the price of rice rose over 50 percent. Because rice was a much larger component of the consumption bundle of the poor than of the nonpoor, this meant that the poverty line—the level of consumption expenditures necessary—increased by much more than measured CPI inflation.

Therefore, the increase in poverty caused by the crisis came on very suddenly and was much larger than anyone had expected—an increase of at least 15 percentage points (not the mistaken 30 of the statistics agency, but not the puny 3 of the first-round World Bank estimates either).

The second point on the time series of impact was the evolution of nominal wages, which is of course a weakness of pure price-based measures of impact. Because Indonesia has been a low-inflation country (less than 20 percent since the inflations of the late 1960s) there was little short-run indexation of wages. Therefore the impact effect was almost perfectly measured by price changes, because nominal wages responded very slowly. However, as inflation accelerated it was clear that real wages had clearly overshot, as they had fallen by 40 percent or more (and more for the poor than nonpoor, given the relative price effects). By 1999, one year after the crisis increase in rice prices (which followed the financial crisis of 1997 by one year), inflation had been contained, there were favorable developments in the price of rice (partly occasioned by reductions in the international dollar price), and real wages had recovered substantially.

Second, the *regional* dimension of the crisis was an important dimension, especially in trying to design programs to mitigate impact, because we needed to know where to focus. Here there are three points.

On the urban/rural difference in impact, I think of the impact of the cri-

sis as an earthquake, which means we got the impact of the crisis right, then wrong. That is, there is no question that the epicenter of the crisis was urban areas: this was principally a crisis of the collapse of the modern sector tied into international finance. However, although that was the epicenter, the shock waves rolled out to affect everyone in two ways. The price effects of the devaluation passed into prices, so that even the peasant farthest removed from the financial centers saw his or her real wages fall. Also, however, the labor markets in Indonesia are very integrated between rural and urban areas (especially on Java), so that what began as a loss of work for urban construction workers, bus drivers, and informal service providers quickly spilled into a loss of remittances to their rural families and then an impact on the rural labor market as they returned from the cities.

On the distribution of the impact across provinces, there were clearly areas in which at least some benefited from the crisis—the areas that grew agriculture exports, especially. In some areas the phrase was *hidup krismon* ("long live the monetary crisis"), and one often heard reports that local Suzuki dealerships were short of stock and were shipping from Jakarta to the outer islands to meet demand.

The third point, and this is more closely related to the paper methodologically, is the inability of price changes to distinguish between demand and supply shocks. That is, it is impossible to tell a priori whether prices are rising more in an area exogenously and hence represent a negative shock or whether prices are increasing in that area because there is a positive shock and hence demand is driving up prices more in that region than others. As I look at the distribution of price changes reported in the paper, I am not sure whether I am seeing negative welfare effects, positive "demand pull" effects, or measurement error. Certainly from a program design point of view we would have had a very difficult time convincing the authorities to allocate the fiscal resources being devoted to the crisis on the basis of price changes alone.

Third, although this method does give a good look at some heterogeneity across households at an aggregate level (e.g., rural versus urban poor), one thing we learned was that the churning in household welfare was huge, even relative to the large changes in averages. We were lucky to have several panel data sets collected that spanned the crisis. In those we could see that more than one-quarter of those who were "in poverty" in the postcrisis period were more than 50 percent above the poverty line in the precrisis data. Not surprisingly, the increase in poverty was not a uniform downward shift in the income distribution but a downward shift accompanied by enormous churning.

One thing this points to was the heterogeneity even within income and regional groups. For instance, the paper makes the good point that whether you grew your own rice made a huge difference, because the negative price impact was at least partially offset by a positive gain in income (conceptu-

ally) from own-produced rice consumed. However, even if groups like the "poorest 10 percent of rural households" produced on average 50 percent of the rice they consumed, obviously not all households produced 50 percent; rather, some produced zero, others 100 percent, and everything in between.

This is also true within regions. As we got more data, we realized that even within areas that were booming it was not the case that everyone was benefiting, and even in booming export crops the gains were slow to pass into real wage gains. Thus, even within "winner" regions there were huge differences between "winner" and "loser" households.

This meant in targeting programs we either had to go universal or devise a mechanism that did better than aggregate groupings, or else the risk of missing some badly shocked households within aggregates was very large. In the event, there was a mix of programs, some universal (or nearly so), some targeted at the community level, and some (such as labor creation) that targeted "self-selection."

In conclusion, this paper is an excellent illustration of beginning to trace through the impacts of the crisis, which are fundamentally complex, as relative price and employment shifts produce reallocations across regions and households. In the end, the programs that were implemented benefited from the conceptual clarity this type of exercise brings, but unfortunately program design was often more determined and constrained by politics and administrative pragmatics than by good estimates of the impacts.

Discussion Summary

Olivier Blanchard inquired why food prices increased more than the prices of other goods—as a lot of these are nontradable. *Lant Pritchett* replied that rice, the major component of food expenditures in Indonesia, is a tradable because there was a lot of export of rice and even re-exporting of subsidized imported rice. *Jeffrey A. Frankel* added that rice is a textbook example of a traded good subject to world market prices.

John McHale related this paper to the causes of the output loss following a crisis. He noted that participants have been attributing the loss to balance sheet effects, but this paper finds declines in real wages. In industrial countries such declines are typically long run, but this, it seems, was not the case in Indonesia.

Martin Feldstein noted that following these price increases it is likely that households reduced, first of all, their consumption of durables, such as clothing. He then suggested ways to account for that in the data and thus measure more accurately the immediate loss, in terms of current consumption of nondurables (food), that was caused by the crisis.

Allan Drazen commented that this paper stresses the heterogeneity of the effects of crises on different groups, which is a topic that is typically ignored. This heterogeneity, he noted, has political economy implications for getting support for adjustment programs, because there were even, as Pritchett made clear, gainers from the real exchange rate depreciation. Also, he noted that many times the adjustment is not undertaken not because domestic policy makers don't know what should be done, as *Martin Eichenbaum* implied in a previous comment, but because they don't have the political support to implement it.

Jong-Wha Lee suggested better characterization of the ones who were hardest hit in terms of education levels, age, and the like. In terms of unemployment, for example, he asked who were the ones who lost their jobs and whether that loss was permanent. This information has significance for social expenditure decisions.

Lastly, *Jeffrey Shafer* remarked that identifying the reasons for heterogeneity, such as the distinction between urban and rural, is very important. This heterogeneity is important both for mitigating policy questions and because it is a result of policy decisions.

James Levinsohn noted that differentiating between demand and supply shocks should, as Pritchett noted, be accounted for, provided better data are available. The exact way in which households adjusted is not entirely clear. He mentioned a survey that found that there was a huge disinvestment in jewelry—households sold the jewelry they owned. In response to Feldstein's comment, Levinsohn noted that it is worthwhile trying to account for this change in consumption patterns, but better time series data might be needed.

Peter B. Kenen also noted that it would not change the results much, because expenditures on clothing and on the durable component of housing are relatively small in poor or rural communities.

Pritchett remarked, in response to Drazen, that although there certainly is a political economy of adjustment, it doesn't focus on objections to adjustment because it hurts the rural poor. Typically, as was the case in Indonesia with fuel and rice subsidies, the poor have no political power, and objections to adjustment come from the middle class. He noted that the Indonesian government chose to continue subsidizing fuel massively, and not rice, because of such considerations.