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Estimating Intra Country and Cross Country Purchasing Power Parities from Household Expenditure Data Using Single Equation and Complete Demand Systems Approach: India and Vietnam[1]

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Abstract

This study departs from the previous literature on purchasing power parity (PPP) by proposing a demand system based methodology for calculating the PPP that takes account of consumer preferences and allows for the substitution effect of price changes. The methodology is applied to provide evidence on PPP between the Indian Rupee and the Vietnamese Dong. The study is conducted within a framework that allows for regional variation in preferences and price changes both inside the country and between countries and proposes and applies a methodology for constructing prices from unit values after adjusting them for quality and demographic effects. Using these prices the intra-country PPPs for India and Vietnam are calculated using the single equation (Engel curve based) procedure of Coondoo, Majumder and Chattopadhyay (2011). The cross country PPPs are calculated between sectors and across expenditure classes, apart from PPP at aggregate country to country level, using both the single equation and system based procedures. The paper contains evidence that the incorporation of price effects leads to a significant change in the PPP rates obtained from using cross section data (single equation procedure) ignoring price changes. The demand system based methodology yields PPP rates that are consistent with those obtained from conventional procedures such as the CPD method, yields standard errors of the PPPs and has the additional advantage of testing for invariance of inter-country PPP across expenditure classes. The disaggregated PPP rates question the conventional practice of using a single economy wide PPP in inequality and poverty comparisons.

Key Words: Purchasing Power Parity, QAIDS, CPD method, Spatial Prices, TCLI.
JEL Classification: C18, D11, E31, O53.

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Estimating Intra Country and Cross Country Purchasing Power Parities from Household Expenditure Data Using Single Equation and Complete Demand Systems Approach: India and Vietnam

1. Introduction

Conversion rates of one currency into another are required for a variety of reasons such as international comparison of living standards, ranking of countries by their per capita GDP and in cross country inequality and poverty comparisons[5]. Market exchange rates are considered inappropriate for such comparisons because they are based only on tradeable items. The purchasing power parity (PPP) provides the adjustments required to market exchange rates such that the price of an item in two countries is identical if expressed in a common currency. The PPP rates are, therefore, based on a much wider selection of items than market exchange rates including both tradeable and non tradeable items. Asian countries such as China and India rank much higher on per capita GDP if PPP rates are used instead of market exchange rates. The United Nations International Comparison Project (ICP) carries out detailed price comparisons across countries to arrive at the PPP values required for a variety of cross country comparisons such as the ones mentioned above. Given the crucial role that PPPs play in international comparisons, there has been considerable controversy on the PPP values that should be used as deflators[6]. While Clements, Wu and Zhang (2006) provide a method for comparing consumption patterns across countries that is free of currency units, the requirement of PPP is, in general, unavoidable in most cross country comparisons.

PPP rates are also required in intra national comparisons since a country's currency unit does not have the same purchasing power in all regions in that country. The issue of intra national PPP takes the form of spatial prices. The role that PPP s perform in converting an internationally denominated poverty line, for example, 1 US $ a day, into that of different countries expressed in their own currencies is analogous to the role that spatial prices play inside a country in converting the national poverty line into regional poverty lines taking into account regional prices and preferences. While considerable resources have been spent by the

[5] Examples include Chotikapanich, Valenzuela and Rao, (1997), Milanovic (2002), and Ravallion, Datt, and Van der Walle (1991).
[6] See, for example, Reddy and Pogge (2007)'s critique of the World Bank methodology for fixing national poverty lines denominated in local currencies in cross country poverty comparisons.

statistical agencies on calculating PPP rates between countries, as is evident from the scale of the ICP project, the issue of intra national PPP s has received much less attention. In viewing a country as a homogenous entity with the unit of that country's currency (falsely) assumed to have the same purchasing power everywhere, the ICP project betrays the views and interests of a foreigner providing a basis for currency conversions to do business with that country, in terms of aid, trade or travel, rather than that of an insider who takes into account the reality of diversity in that country in providing policy friendly information with the interests of her residents in mind. In large heterogeneous countries such as Brazil and India, the requirement of intra national PPP rates, i.e. spatial prices, is as important as that of the international PPP rates in the cross country context. This is evident from the recent attempts of Aten and Menzies (2002) on Brazil and Coondoo, Majumder and Ray (2004), Coondoo, Majumder and Chattopadhyay (2011), Majumder, Ray and Sinha (2011) on India to calculate spatial prices. The evidence in these studies shows that country to country PPP rates at the aggregate level that do not take into account the regional diversity in countries such as Brazil and India are likely to be seriously misleading. Setting aside the issue of regional diversity that is addressed by spatial prices, the idea of a distribution invariant PPP that is supposed to hold for all the expenditure classes, rich and poor alike, is another important issue of interest. This is an assumption that has been criticised in the poverty context by Reddy and Pogge (2007). If untrue, as the present results suggest, this is yet another indictment of the all purpose, single value, country wide PPP s that come out of high profile projects such as the ICP.

In view of its importance, the methodologies adopted to calculate the PPP has received considerable critical scrutiny. For example, Hill (2000) and Almas (2011) analyse and quantify the PPP bias in the widely used Penn World Table incomes of various countries. One of the most prominent methods adopted in the PPP calculations has been the Country Product Dummy Method (CPD), due to Summers (1973), that is based on the idea of hedonic price regressions, and was originally proposed to deal with the problem of missing observations in international price comparisons. The CPD method has been analysed and extended by Diewert (2005) and Rao (2005). Coondoo, Majumder and Ray (2004) extend the CPD methodology by using it in conjunction with the idea of a "quality or price equation", due to Prais and Houthakker (1955), to calculate spatial prices in the Indian context. The methodology proposed by Coondoo, Majumder and Ray (2004) has been used in modified

form in the cross country context by Deaton, Friedman and Alatas (2004) to calculate PPP rates between India and Indonesia.

A key limitation of the CPD approach is that it does not take into account the preferences of the consumer as revealed by her estimated demand pattern. Notwithstanding the fact that the PPP is analogous to the concept of a True Cost of Living Index (TCLI), and the increasing availability of household survey data provides the necessary information for a preference consistent, demand systems based approach to PPP calculations, such an approach is conspicuous by its absence. Recent studies that come closest to this spirit are O'Donnell and Rao (2007) who estimate demand systems to calculate PPP between Ethiopia and Uganda and Coondoo, Majumder and Chattopadhyay (2011) who use Engel curve analysis to estimate spatial prices in India. While O'Donnell and Rao (2007)'s study on calculating PPP exchange rates between Uganda and Ethiopia is based on estimated demand parameters, treating each country as a homogeneous entity, and does not concern itself with the spatial dimension inside each country, Coondoo, Majumder and Chattopdhyay (2011)'s study is entirely on the spatial dimension by calculating regional PPP s in India but is restricted to Engel curve analysis that ignores price induced substitution effect among commodities. Majumder, Ray and Sinha (2011) propose a demand systems based approach to the calculation of spatial prices in India.

The principal motivation of this exercise is to study the variation in PPPs within and between countries using data from India and Vietnam. For this, two methods have been used. First, the recently proposed single equation procedure of Coondoo, Majumder and Chattopadhyay (2011) has been used to study the intra-country spatial variation. Second, the issue of cross country PPPs has been addressed using the single equation method mentioned above and also using a preference consistent system based framework. In view of the absence of studies that estimate inter country TCLI using a system based approach, this study fills this significant gap in the literature. In the spirit of combining the spatial dimension in each country with the cross country aspect, the study calculates the PPP rates between the two countries both in aggregate and separately for the rural and the urban areas, and provides evidence on their movement over time. A second contribution of this study is that it tests for invariance of inter-country PPP across expenditure classes and hence departs from the practice of assuming that the PPPs between countries is the same for all households irrespective of their affluence, an assumption that has been criticised in the poverty context by Reddy and Pogge (2007), as

already mentioned earlier. To the best of our knowledge this assumption has never been tested before.

Perhaps for the first time, the present study estimates the PPP exchange rates between two countries (India and Vietnam) taking account of their regional heterogeneity in preferences and prices and using the same demand system uniformly between the two countries and across the regions in each country. The demand system that we employ, namely, the rank three Quadratic Almost Ideal System (QAIDS), due to Banks, Blundell and Lewbel (1997) is employed in its linearised version (LQAIDS) that uses the Stone price approximation, as is done in O'Donnell and Rao (2007). Other distinguishing features of this study include the modification of the procedure due to Cox and Wohlgenant (1986) and Hoang (2009) to generate quality adjusted prices of food items based on unit values from the household surveys that are subsequently used in the demand estimation, and the incorporation of demographic effects in the estimated quality equations. The quality adjusted food prices, obtained from the hedonic price regressions using the unit values from the household surveys, will help in constructing food poverty lines in both countries that can validate, or otherwise, the poverty lines currently in use.

The rest of the paper is organised as follows. Section 2 introduces the estimating equations, namely, the Engel curve equation, the demand system and the equations to generate the quality adjusted prices, and describes the procedure for calculating the intra country and the cross country PPP rates. The data sets are briefly described in Section 3, along with the presentation and discussion of the estimates of the quality adjusted prices of the principal food items in each country. The results on the intra country PPP rates (i.e., spatial prices in each country) and the PPP rates between the two countries are presented and discussed in Section 4. Section 5 concludes the paper.

2. Procedures for Estimating the PPPs

The methodology is based on the fact that the PPP can be viewed as a True Cost of Living Index that is defined below. The general cost function underlying Quadratic Logarithmic (QL) systems, (e.g., the Quadratic Almost Ideal Demand System (QAIDS) of (Banks, Blundell and Lewbel, 1997) and the Generalized Almost Ideal Demand System (GAIDS) of (Lancaster and Ray, 1998) is of the form:

$$C(u,p) = a(p).\exp\left(\frac{b(p)}{(1/\ln u)-\lambda(p)}\right) \qquad (2.1)$$

p is the price vector, $a(p)$ is a homogeneous function of degree one in prices, $b(p)$ and $\lambda(p)$ are homogeneous functions of degree zero in prices, and u denotes the level of utility. The budget share functions corresponding to the cost function (2.1) are of the form

$$w_i = a_i(p) + b_i(p) \ln\left(\frac{x}{a(p)}\right) + \frac{\lambda_i(p)}{b(p)}\left(ln\frac{x}{a(p)}\right)^2, \tag{2.2}$$

x denotes nominal per capita expenditure and *i* denotes item of expenditure.

The corresponding True Cost of Living Index (TCLI) in logarithmic form comparing price situation p^1 with price situation p^0 is given by

$$ln\,P(p^1, p^0, u^*) = [ln\,a(p^1) - ln\,a(p^0)] + \left[\frac{b(p^1)}{\frac{1}{ln\,u^*} - \lambda(p^1)} - \frac{b(p^0)}{\frac{1}{ln\,u^*} - \lambda(p^0)}\right] \tag{2.3}$$

$u^*$is the reference utility level. The first term of the R.H.S. of (2.3) is the logarithm of the basic index (measuring the cost of living index at some minimum benchmark utility level) and the second term is the logarithm of the marginal index. Note that for $p^1 = \theta p^0, \theta > 0$, $a(p^1) = \theta a(p^0)$, so that the basic index takes a value θ and hence, may be interpreted as that component of TCLI that captures the effect of uniform or average inflation on the cost of living. On the other hand, for$p^1 = \theta p^0, \theta > 0$; $b(p^1) = b(p^0)$ and $\lambda(p^1) = \lambda(p^0)$, the marginal index takes a value of unity. Hence, the marginal index may be interpreted as the other component of TCLI that captures the effect of changes in the relative price structure. The following discussion of the PPP estimation procedure can be divided into three parts: the first part (Section 2.1) describes the three step procedure due to Coondoo, Majumder and Chattopadhyay (2011) that calculates the PPPs based on Engel curve analysis. This procedure requires neither any price data nor any algebraic functional form for the cost function. The convenience of this procedure stems from the fact that many countries do not have any price information. However, this convenience comes at the cost of ignoring substitution effects of price changes that may bias the estimates of spatial prices/PPP. The second part (Section 2.2) describes an extension of this procedure by estimating demand systems using price information. Finally, the third part (Section 2.3) shows how unit values obtained from expenditure and quantity information on purchases can be used to provide the necessary price information after adjusting for quality and demographic characteristics and describes the procedure of generating quality adjusted unit values as prices.

2.1 The Coondoo, Majumder and Chattopadhyay (2011) procedure for calculating PPP (Engel curve analysis)

The procedure for estimating TCLI's (PPPs) for *R* regions, taking region 0 as base, involves three stages.

In the *first stage*, a set of item-specific Engel curves relating budget shares to the logarithm of income are estimated for each region $r = 0, 1, 2\ldots, R$ as follows.

$$w_{ij}^r = a_i^r + b_i^r lnx_j^r + c_{ir}(lnx_j^r)^2 + \varepsilon_{ij}^r, \qquad (2.4)$$

where*i* denotes item, *j* denotes household, ε_{ij}^r is a random disturbance term and a_i^r, b_i^r, c_i^r are parameters that contain the price information on item *i* in region *r*.

In the *second stage* $a(p^r)$, $r = 0, 1, 2\ldots, R$ is estimated from the following equation obtained by equating equations (2.2) and (2.4):

$$\hat{b}_i^r - \hat{b}_i^0 = lna(p^0)(2\hat{c}_i^0) - lna(p^r)(2\hat{c}_i^r) + e_i^r \; ; \qquad r = 1, 2, \ldots, R. \qquad (2.5)$$

Here e_i^r is a composite error term, which is a linear combination of the individual errors of estimation of the parameters a_i^r, b_i^r, c_i^r andp^0 denotes the price vector of the base region.

In the *third stage* $b(p^r)$and $\lambda(p^r)$, $r = 1, 2\ldots, R$ are estimated, using the normalization $b(p^0) = \lambda(p^0) = 1$ for the base region, from the following regression equation[7]:

$$\frac{1}{ln\left(\frac{x_j^r}{\widehat{a(p^r)}}\right)} = \frac{1}{b(p^r)}\left(\frac{1}{ln\frac{x_j^0}{\widehat{a(p^0)}}} + 1\right) - \frac{\lambda(p^r)}{b(p^r)} + \; error, \qquad (2.6)$$

where the money metric utility u_j^0 of a household of the base region that has nominal per capita income x_j^0 $\left(= C\left(u_{j,}^0 p^0\right)\right)$ is given by

$$\frac{1}{\ln u_j^0} = \frac{1}{\ln \frac{x_j^0}{a(p^0)}} + 1 \qquad (2.7)$$

Using these, the TCLI's are estimated for a given reference level of utility of the base region. It may be emphasized that $a(p^r)$, $b(p^r)$and $\lambda(p^r)$ are estimated as composite variables and no explicit algebraic forms for these functions are assumed. However, as already noted, being

[7] The regression set up arises because $\widehat{a(p^r)}$ and $\widehat{a(p^0)}$ are estimated values.

based on single equation Engel curves, the issue of price induced substitution effect among commodities is ignored.

2.2 Extending the Coondoo, Majumder and Chattopadhyay (2011) procedure to calculate PPP (demand systems estimation)

The specific functional forms of $a(p^r), b(p^r)$ and $\lambda(p^r)$ for QAIDS in (2.1) are as follows:

$\ln a(p^r) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \, lnp_i^r + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_i^r \ln p_j^r$; $\quad b(p^r) = \prod_{i=1}^{n} p_i^{r\beta_i}$ and

$\lambda(p^r) = \sum_{i=1}^{n} \lambda_i \ln p_i^r$, where p_i^r is the price of item *i* in region *r*.

The resulting budget share equations are given by

$$w_i^r = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j^r + \beta_i \log(x / a(p^r)) + \lambda_i [\log(x / a(p^r))]^2 \ . \qquad (2.8)$$

Given a reference utility level, the regional PPPs can be calculated from equation (2.3) using the estimated parameters and information on prices[8].

Based on the level (country/region/sector) of data used, estimation of demand system [eq. (2.8)] would yield the estimates of $a(p^r)$, $b(p^r)$ and $\lambda(p^r)$ wheresuperscript r denotes country/region/sector, as the case may be. Substitution in (2.3) and taking exponential yields the PPP between countries/regions/sectors, conditional on pre specified reference utility, u^*, in each situation. A comparison among regions yields spatial prices and that between countries measures the purchasing power parity between countries. In the empirical work, we have used the utility level corresponding to median expenditure in the base country, India, as the reference utility level[9], u^*, to calculate the PPP and have compared them with those at other percentile points of the expenditure.

2.3 The procedure to generate quality adjusted unit values as prices (food items)

The PPP s based on complete demand systems require price information for estimates of the price parameters. Such information is missing in most data sets. We use as proxies for

[8]In this study, we have used a linearised version of QAIDS, that we call LQAIDS, where *lna(p)* is approximated by the Stone price index to simplify the estimation - see also O'Donnell and Rao (2007).

[9] The QAIDS expenditure function [eqn. (2.1)] is inverted to obtain the reference utility level, u^*, required in (2.3), from the reference per capita household expenditure using eqn. (2.7).

prices[10] the unit values for food items that can be obtained by dividing expenditure values by quantities. However, the raw unit values need to be adjusted for quality and demographic effects. To do so, we adopt the following procedure.

The unit values, v_i, are adjusted for quality and demographic factors following Cox and Wohlgenant (1986) and Hoang (2009), through the following regression equation:

$$v_i^{hsjd} - \left(v_i^{sjd}\right)_{median} = \alpha_i D_s + \beta_i D_j + \gamma_i \sum_j \sum_d D_j D_d + \varphi_i x^{hsjd} + \omega_i f_i^{hsjd} + \sum_m b_i Z_{im}^{hsjd} + \varepsilon_i^{hsjd}, \qquad (2.9)$$

where v_i^{hsjd} is the unit value paid by household h for item i in state/province j, district d and sector s,$(v_i^{sjd})_{median}$ is the median unit value for the district in which the household resides, x is the household food expenditure per capita, $f$is the proportion of times meals consumed outside by that household and D_s, D_j and D_d are dummies for sector, state/province and district, respectively. While Huang estimates equation (2.9) using *mean* (in place of *median* being used here) unit prices and then adds the predicted residual ($\widehat{\varepsilon_i}$) to the district *mean* to get the quality adjusted price for each good, the present paper uses deviation of household level unit prices from *median* unit prices to represent quality effect. The quality adjusted unit prices are calculated by, first, estimating equation (2.9) which, for each commodity i, regresses the deviation of household's unit price from the *median* price in the district d, of state/province j, in each sector s (rural or urban), $\left(v_i^{sd}\right)_{median}$, on household characteristics.

Next, the district wise quality adjusted price for each item p_i is generated by adding the district *median* unit value for this item to the estimated residual from equation (2.9).

$$(p_i^{sd})_{median} = \left(v_i^{sd}\right)_{median} + (\widehat{\varepsilon_i^{sd}})_{median} \qquad (2.10)$$

The district wise *median* of the prices calculated in equation (2.10) is used to represent the district wise quality adjusted price for each food item i. In other words, each household is assumed to face the vector of quality adjusted *median* value, using equations (2.9) and (2.10), of the item in the district where the household resides.

[10] See Atella, Menon and Perali (2004) for an alternative methodology for constructing spatial prices in cross sections using the variability of budget shares that do not require quantity information.

3. **Data and the Quality Adjusted Unit values**

The Indian data came from the 55th (July, 1999 - June, 2000) and 61st (July, 2004 - June, 2005) rounds of India's National Sample Surveys (NSS) on consumer expenditure. Both these rounds are "thick" rounds, being based on large samples. The exercise was performed over 15 major states of the Indian union, with each state subdivided into rural and urban. The list of the states covered, along with the number of districts in each state, is provided in Table A1 in the Appendix. Data from published reports, which present expenditure group wise aggregate consumption, as well as data from unit records (household level) were used in our analysis.

The Vietnamese data came from the Vietnamese Living Standard Survey (VLSS) in 1997/98, and the Vietnamese Household Living Standard Survey (VHLSS) of 2004. For the purpose of this study, the eight major regions of Vietnam are grouped into three regions for rural and urban areas separately. North Vietnam comprises of Red River Delta, Northeast and Northwest; Central Vietnam comprises of North Central coast, South Central Coast and Central highlands; and South Vietnam comprises of South East and Mekong Delta. The list of the regions, along with the number of communes in each region, is presented in Table A2 in the Appendix.

The PPP rates were calculated at three different levels of commodity aggregation. Though these commodity categories have slight differences in definition between India and Vietnam, items have been merged appropriately so that they are largely comparable between the two countries. These are as follows.

1. All Items: Food, Tobacco, Clothing & Footwear; Fuel & Light; Bedding & Sundry Items; Transportation; Healthcare; Entertainment; Reading; Education; and Personal products.
2. Food items (only): Cereals & Cereal substitutes; Pulses; Milk & Milk Products; Edible Oil; Meat, Fish & Eggs; Vegetables; Fruits; Sugar; Salt; Spices; Beverage.
3. Restricted[11] List of Food items (with unit values): Cereals & Cereal substitutes; Pulses; Milk & Milk Products; Edible Oil; Meat, Fish & Eggs; and Vegetables.

The VLSS 1997-98 and VHLSS 2004 collect detailed consumption information on market purchase and home production and consumption during the *tet* holiday period for 45 food

[11] These are the dominant food items that constituted nearly three fourth of total food spending in each country.

items. The information on household consumption is computed for market purchase, home production and consumption during the *tet* holiday period. For a 12 month recall period information is collected on number of months (of the 12 months) each food item was purchased, usual frequency of purchase during those months, quantity purchased each time and value of each purchase. These pieces of information are combined to calculate the total expenditure on each food item over the past 12 months excluding the consumption during the *tet* holiday period. Besides market purchase, information is also collected for consumption from home production. Separate information is collected for food consumption during *tet* holiday period. The information on food consumption during *tet* holiday period and non-*tet* months is combined to get the quantity and value of food consumption during the last 12 months. This information is converted to monthly consumption and expenditure on commodity for comparability with NSS data, which is based on 30dayexpenditure. The quantity of food item purchased is reported in grams, kilograms, litres and numbers. For consistency these quantities were converted to kilograms where possible. For food items reported in numbers such as eggs and bananas, the following conversion has been used: 1 egg (58 grams), 10 bananas (1 kg), 1 orange (150 grams), 1 pineapple (1.5 Kg). Lemons and ginger were not included.

Appendix Tables A3(a,b) and A4 present the mean per capita quantity and per capita expenditure(in local currencies) of the six principal food items in India and Vietnam, respectively, obtained from NSS 61stround(India) and VHLSS 2004 (Vietnam). Notwithstanding differences in definition and in their composition, we have tried to ensure that these 6 food groups are as comparable as possible between the 2 countries. The Vietnamese consume more cereals than the Indians, and their consumption of Meat, egg and fish is a good deal higher. In contrast, the Vietnamese consumption of Milk and Vegetables is considerably lower than that of the Indians. In both countries, cereals and cereal products is, in quantity and expenditure terms, by far the single most important group of food items, with rural households consuming more than the urban ones.

The PPP rates between India and Vietnam were computed adopting the median household in the expenditure distribution of the NSS as the reference household. While the NSS 61stround and VHLSS, 2004 were conducted over a near identical time period, there was a gap of around 12-18 months between the NSS 55thround (1999/2000) and VLSS 1997/98. In calculating the PPP s between Vietnam and India in the earlier period, the expenditure figures in 55th round NSS were, therefore, adjusted downwards by 10 % to account for inflation

during the period between the two surveys[12]. No such adjustment was needed for the later year due to the contemporaneous nature of NSS, 61st round and VHLSS 2004.

The coefficient estimates of the quality adjustment regressions of the unit values, item by item, [equation (2.9)] are presented[13] in the Appendix- Table A5 for NSS 61st round, and Table A6 for VHLSS, 2004. Several of the quality and demographic effects are highly significant, though much more in case of India than in Vietnam. In both countries and for several items, notably for Cereals and Cereal Products, the more affluent households consume superior quality food items, as evident from the positive and significant coefficient estimate of the per capita expenditure variable on unit values. This is also true of the variable measuring the proportion of meals consumed outside the household in India since households that eat outside the home are the more affluent households. The fact that this variable is less significant in Vietnam may reflect the greater tendency to eat outside the home in Vietnam than in India.

The quality and demographically adjusted unit values of the food items in the restricted list of six items, mentioned above, are presented in Tables 1 and 2 for India and in Tables 3 and 4 for Vietnam. These tables report the adjusted unit values, treated as proxies for prices, for each state/province, disaggregated by rural and urban, and at the all country level. The Indian estimates show that over the period between NSS rounds 55 and 61, much of the food inflation has been on account of Edible Oil and Meat, Egg & Fish. The prices of Cereals & Cereal substitutes were mostly static or, in some cases, even recorded a slight decline. There are some similarities and dissimilarities between India and Vietnam. There was not much movement in the prices of cereals in either India or Vietnam. As suggested by Engel's law, with growing affluence, there has been a movement in both countries away from cereals to non cereal items and, within the former, a move to superior quality cereals. In case of Vietnam, there has been the additional push to cereals consumed outside the home which are more expensive than home cooked food due to the service costs. Once the quality and the other factors are controlled for, there was hardly any increase in the price of cereals and even a decline in rural Vietnam. In contrast, the price of Edible Oil increased in both countries with India experiencing a sharper increase in proportionate terms. Vegetables prices also increased in both countries, though the magnitude was much higher in Vietnam. While there

[12] Since this adjustment for the non identical time periods of the two surveys is, inevitably, ad hoc, we need to treat the corresponding PPP rates with care. No such qualification needs to be made for the PPP rates between India and Vietnam in the later year (2004).

[13] To save space, we have reported the regressions for the later year only. Those for NSS 55th round and VLSS98 are available on request.

was a sharp decline in the price of Meat, Egg & Fish in Vietnam, the reverse was the case in India. There are two other differences between the two countries that are apparent from the tables. The rural urban difference in the prices is generally much greater in Vietnam than in India. Also, the all Vietnam prices are much closer to the rural figures than the urban, which is not necessarily the case in India. This suggests that Vietnam is more rural than India[14], and this is reflected in the result reported later that the intra country PPP in Vietnam and the Vietnam/India PPP is much closer to their rural counterpart than the urban.

Comparison of the item wise prices between India and Vietnam shows wide variation in the item specific PPPs, both between items and in their movement over time. It is, therefore, not possible to draw any inference on the overall PPP between the Indian Rupee and the Vietnamese Dong, both on its magnitude and its movement between the two surveys, by simply inspecting the item specific PPPs. Also, the sharp variation among the item specific PPPs, and given the varying importance of the items in the expenditure pattern of households, both between regions and between varying affluent levels, suggests that the PPP s will vary across different population subgroups. We now turn to the evidence on these issues.

4. Results

4.1 All-item PPPs: Single equation method using grouped data (decile figures)

Spatial Prices in India

Table 5 presents the All-item PPPs for 15 major states of India (rural and urban), with All-India (for the respective sectors) as base, computed using the data from published reports, for the two NSS rounds 55^{th} and 61^{st} along with their standard errors. The calculations follow the procedure due to Coondoo, Majumder and Chattopadhyay (2011) outlined earlier. In other words, Table 5 presents the intra country PPPs, i.e., spatial prices in India at the level of "all items" that has been numbered as aggregation number 1 in the Data section. Several features are worth noting: first, the regional PPP s are generally well determined; second, in several cases, though not always, the state PPP s are considerably different from the all India PPP normalised value of 1; prominent examples are Haryana, Kerala and Punjab where 1 Rupee buys much less what it buys elsewhere; third, there is rural urban agreement on the PPP s in both rounds with a reasonable degree of stability in the PPP values over this period; fourth,

[14] Vietnam does not have the equivalent of the large cities and semi urban metropolitan centres that India has and, consequently, the "all Vietnam" figures are closer to those in "rural Vietnam" than in case of India.

the idea, that a Rupee buys the same everywhere in India, underlying the conventional between-country PPP calculations in ICP[15], is inconsistent with the picture portrayed in Table 5.

To validate the procedure, we compare our results with officially published indices. The available state wise official Consumer Price Indices (CPI) are CPI for Rural labourers for the rural sector and CPI for Industrial workers for the urban sector. These are temporal indices, the base being the particular state itself at a particular point of time. Since the indices in Table 5 are not directly comparable with these, for each state we have computed state specific temporal PPPs for the 61st round with 55th round as base for both rural and urban sectors using the Coondoo et al. (2011) procedure. These figures are directly comparable with the ratios of the published state wise consumer price indices of these two periods.[16] Table 5(a) compares the ones estimated in this study with the official figures for the rural and urban sectors. Though the two sets of numbers are not identical, there is a reasonable amount of agreement between the temporal PPPs implied by our calculations and that implied by the official figures. The former is generally higher than the latter which is possibly the result of the overlooking of substitution effects in the procedure of Coondoo et al. (2011) due to its reliance on Engel analysis. As we report below, this feeds through to a difference between the inter country PPPs based on the Engel analysis and that based on the demand system estimates that allow price induced substitution between items. However, the sign of the rural urban difference in the temporal indices is remarkably similar between the Engel based procedure and the official figures. In other words, there is large agreement between the qualitative picture on state wise temporal PPPs obtained using the Coondoo, et al (2011) procedure with that from the official figures.

Spatial Prices in Vietnam

Table 6 presents the corresponding All-item PPPs for 3 regions of Vietnam (rural and urban), with All-Vietnam (for the respective sectors) as base, for 1998 and 2004 along with their standard errors. The PPPs are less well determined than in India which largely reflects the much smaller sample size in VLSS/VHLSS compared to the NSS. The affluent Southern

[15] See also the PPPs for 141 countries over the period, 1970-2005, available in **uqicd.economics.uq.edu.au** .

[16]Source: Labour Bureau, Govt. of India (available at http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx). The urban price indices are available only for some selected centres. The ones reported here are those of the state capitals.

region[17] is the most expensive region with the Dong buying less there than in the rest of the country. A comparison with the spatial prices in India in Table 5 shows that the cost of living spread between the most expensive (Southern) region and the least expensive (Central) region is much smaller than in India. However, as in India, the qualitative picture is robust between the rural and urban sectors and is stable over the period between the 2 Vietnamese surveys.

Purchasing Power Parity between India and Vietnam

Table 7 presents the All-item PPP s for Vietnam (rural, urban and rural-urban combined) with respect to India (rural, urban and rural-urban combined, respectively) for 1998 and 2004 along with their standard errors. This table also presents the PPP rates between the Indian Rupee and the Vietnamese Dong with respect to the US $ that have been reported in the website[18]www.uqicd.economics.uq.edu.au. There are no PPP figures available from the ICP for the years for which we have calculated the PPP rates. The nearest is the PPP rate of 266.28 Dong per Re. implied by the PPP rates of these currencies with respect to the US $ at the poverty line of 1 $ a day reported in ADB (2008, Table 30, p. 73). The following features are worth noting from Table 7: first, the all country PPP hides large differences between the rural to rural and the urban to urban PPPs, thus suggesting that a single country wide PPP may be misleading; second, the PPP estimates of the Dong vis a vis the Rupee obtained from the Engel analysis is considerably higher than those implied by the UQICD data set in each year, and by the 2005 figure from the ICP program in Asia and the Pacific; third, the present calculations and the UQICD data set both agree that over the period, 1998-2004, the Dong has slipped against the Rupee, though the disaggregated picture in Table 7 shows that there has been reverse movements between the rural and urban areas.

4.2 Food PPP s between India and Vietnam: a comparison of single equation based estimates and other comparable estimates

Table 8 presents the Food PPP s for Vietnam (rural, urban and rural-urban combined) with respect to India (rural, urban and rural-urban combined) for 1998 and 2004, calculated using alternative procedures, namely, the Coondoo et al. (2011) procedure, the CPD method (Rao,

[17] See Mishra and Ray (2009) for evidence on disparity in affluence between the various regions in Vietnam.

[18] See Rao, Rambaldi and Doran (2010) for the details on the econometric approach to the extrapolation of PPP s from past benchmarks that have been reported in this website.

2005) and the conventional Divisia (DIV), Paasche (PA), Laspeyre (LA) and Fisher (FI) formulae. While the Coondoo et al. (2011) method is based on 11 food items, (i.e., aggregation number 2 in the Data section),the others are based on 6 food items (i.e., aggregation number 3 in the Data section), for which the quality adjusted prices have been computed herein[19]. For the first two estimates the corresponding standard errors have also been presented.

The CPD index is obtained from the following regression equation:

$$\sqrt{w_i^r}\, log p_i^r = \pi\sqrt{w_i^r} D_r + \sqrt{w_i^r}\sum_j \eta_j D_j^* + \varepsilon_i, \qquad (4.1)$$

where w_i^r is the budget share of the i-th item in the r-th country, $D_r, r = 0$ (India) and 1(Vietnam) is the country dummy and $D_j^*, j = 1,2,..,n$ are the product (item) dummies. If $\hat{\pi}$ is the ordinary least square squares estimator of π, then exp($\hat{\pi}$) yields the CPD index. The DIV, PA, LA and FI indices are given, respectively, by the following formulae:

$$\text{DIV} = \exp\left[0.5\sum_{i=1}^{k}(w_i^1 + w_i^0)\log\left(\frac{p_i^1}{p_i^0}\right)\right]; \quad \text{PA} = \frac{\sum_i p_i^1 q_i^1}{\sum_i p_i^0 q_i^1}; \quad \text{LA} = \frac{\sum_i p_i^1 q_i^0}{\sum_i p_i^0 q_i^0}; \quad \text{and}$$

$$\text{FI} = \sqrt{LA.PA}.$$

All the calculated PPP s are in agreement that the urban PPP s are higher than the rural PPPs. As in the case of "All items", for food items over the period 1998-2004 the overall (rural-urban combined) Dong has slipped against the Rupee, but here the disaggregated picture (rural and urban separately) also shows a similar pattern, unlike in the case of "All items". For all periods and sectors the PPP values are between the corresponding PA and LA values. Thus, the Paasche's index serves as the lower bound and the Laspeyre's index serves as the upper bound for the calculated PPPs. Broadly speaking, the values of CPD and Divisia indices are close in both periods. While in 1998-99 the Coondoo et al. index is closer to these values compared to the other indices, in 2004-5 the Fisher's index is closer to these values compared to the other indices and the Coondoo et al. index is higher than these values.

[19]As in the second stage of the Coondoo et al. (2011) procedure the observations are 'items', the 6-item aggregation renders insufficient number of observations for running a regression. However, given that the remaining 5 items constitute only about 25% of the budget share, this comparison is not unreasonable.

4.3 Food PPPs between India and Vietnam: a comparison of single equation based estimates and system based estimates

Table 9 presents the PPP s between India and Vietnam, along with the standard errors, using the LQAIDS[20] for the 6 food items mentioned above for rural, urban and rural-urban combined sectors. The demand system has been estimated on the unit record data at the level of the individual households for the year 2004-5. For comparison, the single equation based Coondoo et al. estimates (reported earlier) is also presented. The table also gives the Relative Standard Errors (RSE)[21] of the estimates. A lower RSE would mean a more precise measurement. From the table it may be clearly observed that the single equation based estimates are higher than the corresponding system based estimates. A comparison of the RSEs shows that the RSEs are smaller for the QAIDS based estimates in the urban sector and at the country level. Thus, the comparison of magnitudes of the indices points to a systematic bias in the single equation based estimates. While the major part of this bias would be due to ignoring substitution effects of price changes, the item aggregation level may play some role, presumably a minor one. The comparison of RSE s does not show any such systematic pattern.

4.4 PPP between India and Vietnam- variation across reference households at different affluence levels

Table 10 presents the LQAIDS based PPPs between India and Vietnam, using the 6 food items, calculated at five different reference utility levels, namely, at 30% ("ultra poor"), at 50% ("poor"), at 200% ("rich") and at 300% ("ultra rich") of median household expenditure of the NSS 61st round data, besides the median expenditure itself, for rural, urban and rural-urban combined sectors. Table 10 also presents the pair wise differences in the PPP values along with the associated t-statistics. Both the sectors agree that the PPP increases with household affluence. In the rural sector and at the all country level all the t-statistics are highly significant. In the urban sector the PPP s differ significantly in the middle section of the population. Thus, Table 10 provides evidence of the sensitivity of the PPP estimates to the reference household, an issue that received hardly any attention in the literature. The

[20] The LQAIDS parameter estimates for India and Vietnam based on the unit records in the NSS 61st round and VHLSS, 2004 data sets have been reported in the Appendix – Tables A7 (India) and A8 (Vietnam).

[21] RSE is defined as the ratio of the standard error and the estimate, expressed in percentage form.

evidence also confirms large variation between the PPPs corresponding to the reference households, especially in the rural areas, less in the urban. At the all country level, for example, the PPP of 260.37 Dong per Rupee for an "ultra poor" household at 30% of median expenditure is considerably lower than the PPP figure of 344.23 Dong per Rupee for a median household. It is clear that the provision of a single PPP that is intended for use at all levels of affluence will severely restricts its usefulness especially in cross country welfare comparisons. This has the policy implication that in poverty calculations using the $1[22] a day poverty line, one needs to use different PPP s in calculating the number of "ultra poor" and the "poor" in a given country. This adds to the evidence, presented above, on the need to use regionally varying cross country PPP s (in cross country inequality and poverty comparisons) and regional poverty lines (in intra national poverty comparisons).

5. Summary and Conclusion

This study marks a departure from the previous literature on purchasing power parity (PPP) by proposing a demand system based methodology for calculating the PPP that takes account of consumer preferences and allows for the substitution effect of price changes. The study is conducted within a framework that allows for regional variation in preferences and price changes both inside the country and between countries. The framework is applied to calculate PPP between countries and to provide evidence on PPP between the Indian Rupee and the Vietnamese Dong. These Asian countries were chosen for, principally three reasons: (a) both of them registered impressive economic growth following significant economic reforms, (b) they have comparable household expenditure surveys with quantity and expenditure information of food items at unit record levels covering contemporaneous time periods, and (c) though not identical, these two countries have comparable item classifications. This is the first study in the published literature that calculates the PPP between countries not only at the aggregate country to country level, but also between sectors (namely, rural to rural and urban to urban) and by expenditure classes. This paper also provides evidence, using a recently proposed Engel curve based approach by Coondoo et al. (2011), on how the spatial prices and the PPP have moved over the period,1998/9 to 2004 and suggests that the Rupee has strengthened against the Dong over this period.

[22] This is separate from the argument of Reddy and Pogge (2007) on whether the $1 a day (or $ 1.25 a day as has been used lately) is an appropriate figure to use as the international poverty line.

This paper extends the methodology proposed in Coondoo et al. (2011) in two significant respects: (a) the single equation Engel based methodology that ignores price induced substitution effects is extended to the "complete demand systems" methodology that allows price, demographic and quality effects, (b) the single country context of India is extended to the cross country context of India and Vietnam. On the way to calculating the spatial prices and PPP, the study extends the methodology due to Cox and Wohlgenant (1984) to construct prices from unit values that incorporate quality and demographic effects. The empirical evidence supports the extension of the procedure proposed by Coondoo et al. (2011) by showing that the incorporation of the price effects has a large impact on the PPP.

The results are benchmarked against comparable estimates, where available, and found to be quite consistent. For example, movement in the estimated spatial prices in India is in line with the official figures. Similarly, the Rupee-Dong PPP, though higher than that implied by the recent results obtained by Rao, Rambaldi and Doran (2010), as reported in www.uqicd.economics.uq.edu.au, are not totally out of line with them. The PPP obtained using the suggested procedure is also compared with those obtained using traditional procedures such as the CPD and the conventional price indices. More significantly, the present study reports that the PPP varies sharply not only across sectors but, perhaps more crucially, across expenditure classes. A particular advantage of our procedures, that it shares with the "weighted CPD" procedure [Rao (2005)], is that it allows the calculation of standard errors of the PPP. The usefulness of this is illustrated by the tests of PPP between expenditure classes which question the conventional practice of using a single economy wide PPP in inequality and poverty comparisons.

The evidence of this study points to the potential for future such investigations that combine calculation of spatial prices with PPP s in a uniform analytical framework. However, for such studies to proceed there needs to be greater and improved information than is currently available. For example, cross country studies such as the present study require more countries to conduct household expenditure surveys and provide unit record information on quantity and expenditures at the household level. Even for countries such as India and Vietnam that provide data on household consumption in quantity and expenditure terms, such information is restricted to food items only- they need to be provided for the non food items as well. There needs to be greater synchronisation between countries on the time periods for their surveys and on the definition of the items used. Collection of prices is another area where the need for more information cannot be overstated. One limitation of this study is the use of unit

values from the expenditure records in the household budget surveys as prices. Adjusted or not, unit values of the various items are unsatisfactory proxies for prices. While the corrections minimise the distortions in the unit values, they do not eliminate them completely. However, reliance on them is unavoidable as there is hardly any information on regional market prices. One of the messages of this study is the need to embark on a project to make available regional prices using methods such as “price opinion” suggested by Gibson and Rozelle (2005).

References

Asian Development Bank (2008), Research Study on Poverty- Specific Purchasing Power Parities for Selected Countries in Asia and the Pacific, Manila, Philippines.

Almas, I. (2011), "International Income Inequality: Measuring PPP Bias by Estimating Engel Curves for Food", mimeographed, Norwegian School of Economics and Business Administration, Bergen, and forthcoming in *American Economic Review*.

Atella, V., Menon, M. and F.Perali (2004), "Estimation of Unit values in Cross Sections without Quantity Information and Implications for Demand and Welfare Analysis", in Household Behaviour, Equivalence Scales, Welfare and Poverty, edited by C. Dagum and G. Ferrari, Physica-Verlag.

Aten, Betinaand T. Menezes(2002), "Poverty Price Levels: An Application to Brazilian Metropolitan Areas," World Bank ICP Conference, Washington, D.C., March11–15, 2002.

Banks, J., R. Blundell and A. Lewbel (1997), "Quadratic Engel Curves and Consumer Demand", *Review of Economics and Statistics*, 79, 527-539.

Chotikapanich, D., R. Valenzuelaand D.S.P.Rao (1997), "Global and regional inequality in the distribution of income: estimation with limited and incomplete data", *Empirical Economics*, 22, 533-46.

Clements, K., Wu, Y. and J. Zhang (2006), "Comparing international consumption patterns", *Empirical Economics*, 31, 1-30.

Coondoo, D., A. Majumder and S. Chattopdhyay (2011), "Estimating Spatial Consumer Price Indices Through Engel Curve Analysis", *Review of Income and Wealth*, 57(1), 138-155.

Coondoo, D., A. Majumder and R. Ray (2004), "A Method of Calculating Regional Consumer Price Differentials with Illustrative Evidence from India", *Review of Income and Wealth*, 50(1), 51-68.

Cox, T. L. and M. K. Wohlgenant (1986), "Prices and Quality Effects in Cross-Sectional Demand Analysis", *American Journal of Agricultural Economics*, 68 (4), 908-919.

Deaton, A. S., Friedman, J. and V. Alatas (2004), " Purchasing power parity exchange rates from household survey data: India and Indonesia", Working paper no. 173, Research Program in Development Studies, Woodrow Wilson School, Princeton University.

Diewert, W. E. (2005), "Weighted Country Product Dummy Variable Regressions and Index Number Formulae", *Review of Income and Wealth*, 51(4), 561-570.

Gibson, J. and S. Rozelle, (2005), "Prices and Unit Values in Poverty Measurement and Tax Reform Analysis", *The World Bank Economic Review,* 19(1), 69-97.

Hill, R. J. (2000), "Measuring substitution bias in international comparisons based on additive purchasing power parity methods",*European Economic Review*, 44, 145-162.

Hoang, L. V. (2009), "Estimation of Food Demand from Household Survey Data in Vietnam", DEPOCEN Working paper series, no. 2009/12, available in *http://www.depocenwp.org*.

Majumder, A., Ray, R. and K. Sinha (2011), "The Calculation of Rural Urban Food Price Differentials from Unit values in Household Expenditure Surveys: a new procedure and comparison with existing methods", Discussion paper 24/11 of Economics Department, Monash University, Australia.

Milanovic, B. (2002), "True World Income Distribution, 1988 and 1993: First Calculation based on Household Surveys alone", *The Economic Journal*, 112, 51-92.

Mishra, V. and R. Ray (2009), "Dietary Diversity, Food Security and Undernourishment: The Vietnamese Evidence", *Asian Economic Journal,* 23 (2), 225-247.

O'Donnell, C.J. and D.S.P. Rao (2007), "Predicting Expenditure Shares for Computing PPP Exchange Rates", mimeographed, University of Queensland, Brisbane.

Prais, S. J. *and* H. S. Houthakker (1955), The Analysis of Family Budgets, *Cambridge University Press, Cambridge (*2nd edition, 1971).

Rao, D.S.P. (2005), "On the Equivalence of Weighted Country- Product-Dummy (CPD) Method and the Rao- System for Multilateral Price Comparisons", *Review of Income and Wealth*, 51(4), 571-580.

Rao, D.S.P., Rambaldi, A. and H.Doran (2010), "Extrapolation of Purchasing Power Parities Using Multiple Benchmarks and Auxiliary Information: a New Approach", *Review of Income and Wealth*, 56(1), Special Issue, S59-S98.

Ravallion, Martin,Datt, Gaurav and van de Walle, Dominique(1991),. "Quantifying Absolute Poverty in the Developing World," *Review of Income and Wealth*, 37(4), 345-61.

Reddy, S. and T. Pogge (2007): "How *Not* to Count the Poor" in SudhirAnand and Joseph Stiglitz (ed.), *Measuring Global Poverty* (Oxford: OUP).

Summers, R. (1973), "International Price Comparisons Based Upon Incomplete Data," *Review of Income and Wealth*, 19(1), 1–16.

Table 1: Quality adjusted unit values of 6 food items in India (NSS 55th Round)[a]

State	Cereals/grams and cereal substitutes	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables	Cereals/grams/cereal subs	Pulses and Products	Milk and milk products	Edible oil	Meat, Fish and Egg	Vegetables	Cereals/grams and cereal substitutes	Pulses	Milk and Milk Products	Edible oil	Meat, Fish and Egg	Vegetables
	All India						Rural						Urban					
Andhra Pradesh	10.46	28.17	10.36	40.36	55.19	7.37	10.65	28.65	10.66	40.65	51.41	7.38	12.60	28.44	12.61	39.60	53.52	8.02
Assam	12.28	27.88	21.79	46.00	49.64	6.15	12.77	28.58	12.81	45.77	48.92	6.60	13.88	28.88	15.23	47.47	55.85	8.96
Bihar	10.11	22.58	14.03	42.54	49.40	5.05	10.99	23.52	13.38	42.38	41.72	5.82	12.23	26.07	15.88	43.86	49.58	6.96
Gujarat	9.07	26.80	15.07	43.12	52.95	9.16	8.39	26.31	14.32	44.31	53.31	8.45	10.66	27.21	15.42	43.41	51.07	10.30
Haryana	7.83	24.26	12.26	40.26	55.66	6.83	7.05	24.34	12.51	38.09	39.26	6.89	9.43	25.51	16.51	40.50	51.49	7.49
Karnataka	10.79	27.29	10.29	40.29	52.80	7.00	9.92	25.73	10.42	40.65	49.04	6.84	12.81	28.57	11.58	40.57	60.67	7.60
Kerala	12.51	29.36	13.31	50.32	31.15	9.69	12.71	29.31	13.60	50.68	30.74	10.06	13.16	29.54	13.68	53.12	32.78	10.19
Maharashtra	10.08	26.41	13.41	40.41	56.91	8.43	9.27	25.58	10.96	41.02	61.27	8.32	13.23	28.84	15.65	43.64	55.78	11.64
Madhya Pradesh	8.35	23.30	13.88	36.30	51.19	5.83	7.98	21.27	10.72	35.76	43.30	6.01	9.30	26.43	14.17	37.85	48.86	7.25
Orissa	10.05	25.05	26.83	42.23	40.05	5.30	10.74	25.16	10.85	42.23	36.01	5.79	11.22	27.82	11.89	41.36	46.53	6.92
Punjab	7.63	25.38	12.18	39.29	53.84	6.01	8.02	25.75	11.21	41.20	52.75	6.84	9.66	26.37	14.04	40.20	51.96	7.33
Rajasthan	7.78	23.02	12.28	40.28	69.55	7.88	7.42	22.62	10.42	40.42	80.38	7.36	8.80	24.43	16.44	40.43	70.37	8.46
Tamil Nadu	12.29	29.70	11.53	40.29	54.78	9.29	11.85	29.85	10.88	40.85	52.06	9.60	13.04	30.91	12.84	40.83	51.38	10.15
Uttar Pradesh	8.06	24.82	12.35	39.52	50.76	5.02	8.20	24.12	10.75	40.38	46.23	5.27	9.69	26.68	14.71	39.40	38.83	6.49
West Bengal	11.70	29.29	17.85	44.75	41.94	5.65	11.02	28.89	10.59	44.52	38.53	5.63	13.11	30.74	13.99	44.74	45.46	7.18
Total(15 States)	9.95	25.42	12.33	40.33	51.57	6.32	10.65	25.58	10.85	41.02	48.92	6.84	12.60	28.44	14.71	41.36	51.38	8.46
CV (15 States)	17.04	8.82	30.51	7.80	16.37	22.34	19.39	10.04	11.45	8.25	24.58	20.17	15.24	6.78	11.00	9.08	17.07	18.73
CV (All India)	16.80	9.55	92.15	12.57	19.28	28.49	20.58	11.51	23.41	14.12	23.32	30.41	15.61	9.17	48.55	13.77	21.10	26.32

[a]All prices are in Rupees per Kilogram.

Table 2: Quality adjusted unit values of 6 food items in India (NSS 61st Round)[a]

State	Cereals/grams and cereal substitutes	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables	Cereals/grams and cereal substitutes	Pulses	Milk and Milk Products	Edible oil	Meat, Fish and Egg	Vegetables	Cereals/grams and cereal substitutes	Pulses	Milk and Milk Products	Edible oil	Meat, Fish and Egg	Vegetables
	All India						Rural						Urban					
Andhra Pradesh	11.12	27.95	11.71	50.59	58.48	7.91	10.37	27.87	10.37	49.78	55.37	7.69	12.30	28.61	12.36	51.75	57.94	8.09
Assam	10.65	30.20	20.83	59.36	60.23	7.37	10.58	29.78	20.32	59.31	57.98	7.21	11.82	30.65	24.50	59.52	67.29	8.36
Bihar	9.08	24.60	14.03	57.40	51.88	5.43	8.98	24.34	12.60	57.27	50.27	5.29	10.14	26.30	16.00	57.61	55.42	6.00
Gujarat	9.61	27.24	16.55	53.72	64.49	10.39	8.50	26.34	15.78	53.57	63.77	9.84	10.59	27.69	17.40	53.84	72.93	11.38
Haryana	7.32	27.50	15.49	50.18	56.92	7.63	7.05	27.19	15.17	50.15	52.66	7.53	8.83	27.96	18.17	50.06	54.65	7.84
Karnataka	10.65	26.51	10.56	52.93	58.98	6.94	9.54	25.83	10.41	51.92	57.33	6.66	12.50	28.36	12.89	53.92	58.07	7.60
Kerala	12.05	30.71	15.08	65.16	30.94	9.97	11.92	30.98	15.06	63.81	31.46	9.89	12.72	30.06	15.59	65.70	33.69	10.49
Maharashtra	10.25	27.29	15.82	52.37	69.04	9.20	8.86	26.14	12.63	50.27	75.42	8.44	11.58	28.90	17.39	55.34	67.71	10.65
Madhya Pradesh	8.09	23.83	12.93	50.02	51.97	6.90	7.58	21.88	11.13	49.96	50.14	6.79	8.98	26.11	15.77	50.18	52.81	7.29
Orissa	8.47	25.57	17.19	58.57	44.78	6.56	8.39	24.81	16.08	58.48	42.45	6.41	9.91	27.30	17.43	58.57	53.13	7.15
Punjab	7.90	27.46	12.51	51.08	63.15	7.49	7.16	27.20	12.49	50.67	63.85	7.11	9.46	28.10	14.63	51.77	62.35	7.88
Rajasthan	7.21	25.26	13.90	54.86	87.81	8.58	7.03	24.90	13.78	54.71	94.39	8.25	8.45	26.04	17.06	54.83	85.40	8.65
Tamil Nadu	12.37	29.99	12.24	55.92	61.01	9.47	12.04	29.71	10.28	54.80	57.36	8.99	14.42	30.20	13.29	56.19	61.36	9.58
Uttar Pradesh	7.70	25.84	12.90	52.27	59.38	6.30	7.43	25.15	13.09	51.87	62.66	6.00	9.11	27.54	15.60	52.55	57.63	6.83
West Bengal	10.84	31.14	20.03	57.68	48.39	6.18	10.30	30.42	17.44	58.87	42.23	6.02	12.37	32.29	23.81	57.40	51.00	7.67
Total (15 States)	10.08	27.63	14.64	55.02	60.20	7.81	8.98	26.14	13.09	54.80	57.36	7.53	11.58	28.61	15.77	55.34	58.07	8.61
CV(15 States)	17.39	7.97	19.30	7.47	20.77	18.40	18.75	9.53	20.90	7.94	25.86	18.54	16.40	6.27	20.64	7.46	19.41	6.60
CV (All India)	18.49	9.52	64.68	10.08	19.76	24.81	18.97	10.52	77.22	10.69	24.84	24.70	14.84	7.48	54.01	9.98	21.22	23.12

[a]All values are in Rupees per Kilogram.

Table 3: Quality adjusted unit values of 6 food items in Vietnam (VLSS1998)[a]

Region	Cereals and Cereal Products	Peanuts, sesame seeds, beans	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables
Rural						
North Vietnam	3954.62	6555.24	18507.72	10447.38	8888.94	1832.41
Central Vietnam	4400.02	5640.39	20157.3	11071.07	9081.23	2166.66
South Vietnam	4219.69	6877.13	19114.55	10775.22	11699.05	2527.67
Total	4135.61	6208.25	19308.74	10719.8	9856.65	2120.93
Urban						
North Vietnam	3768.93	7980.29	23335.69	10727.47	16848.65	1884.59
Central Vietnam	3806.02	7554.25	17850.71	14221.84	13878.85	2373.03
South Vietnam	4551.17	7362.56	23606.05	12573.04	20012.28	3059.08
Total	4117.65	7548.84	22473.04	12272.71	16848.65	2666.18
All Vietnam						
North Vietnam	3981.12	6652.76	19975.94	10501.82	10247.83	1726.75
Central Vietnam	4187.71	5620.36	19370.01	11679.61	9620.81	2265.27
South Vietnam	4337.01	7327.99	20615.9	11946.93	13495.74	2673.94
Total	4187.71	6652.76	19975.94	11679.61	10247.83	2265.27

[a]All values are in Dongs per kilogram.

Table 4: Quality adjusted unit values of 6 food items in Vietnam (VHLSS 2004)[a]

Region	Cereal and Substitutes	Peanut, sesame seeds, beans	Milk and Milk Products	Edible Oil	Meat,Fish and Egg	Vegetables
Rural						
North Vietnam	3912.65	10747.62	14688.33	12661.16	4599.64	4754.03
Central Vietnam	3671.56	10483.46	14425.54	12293.71	6097.18	5591.05
South Vietnam	3952.79	12323.01	14913.91	12541.88	7745.59	6589.51
Total	3855.42	10756.6	14659.14	12520.53	6278.98	5828.44
Urban						
North Vietnam	4700.13	12610.85	18538.97	17325.14	21687.77	5128.17
Central Vietnam	4328.10	11508.6	16788.11	15540.86	12600.52	5681.28
South Vietnam	4838.84	14686.24	15775.44	17289.42	9971.37	7163.05
Total	4649.01	12827.88	16662.18	16485.5	11949.72	6240.53
All Vietnam						
North Vietnam	3973.86	10604.75	15604.75	13604.75	5522.79	4773.35
Central Vietnam	3793.08	10518.25	15518.25	13518.25	7047.11	5696.33
South Vietnam	4039.27	12493.64	15192.44	13493.64	8037.38	6517.57
Total	3973.86	10604.75	15518.25	13518.25	7047.11	5696.33

[a]All values are in Dongs per kilogram.

Table 5: Indian State specific All-Item PPPs with respect to All-India (for the respective sectors)(Method: Coondoo et al., 2011)

State	NSS 55th Round				NSS 61st Round			
	Rural		Urban		Rural		Urban	
	PPP	Standard Errors	PPP	Standard Errors	PPP	Standard Errors	PPP	Standard Errors
Andhra Pradesh	0.993	0.022	0.865	0.053	1.076	0.069	0.938	0.099
Assam	0.972	0.027	0.964	0.110	1.089	0.042	1.065	0.075
Bihar	0.879	0.044	0.664	0.134	0.840	0.055	0.656	0.071
Gujarat	1.222	0.028	1.078	0.088	1.119	0.081	1.212	0.058
Haryana	1.543	0.058	1.119	0.074	1.542	0.097	1.089	0.049
Karnataka	1.112	0.194	1.019	0.082	0.977	0.044	0.990	0.077
Kerala	1.686	0.099	1.041	0.084	1.757	0.106	1.119	0.240
Madhya Pradesh	0.862	0.043	0.797	0.090	0.807	0.073	0.763	0.029
Maharashtra	1.116	0.051	1.038	0.087	1.032	0.065	1.103	0.050
Orissa	0.791	0.041	0.723	0.093	0.704	0.090	0.730	0.037
Punjab	1.601	0.128	1.113	0.096	1.624	0.254	1.213	0.074
Rajasthan	1.238	0.032	0.943	0.071	1.106	0.108	0.886	0.057
Tamil Nadu	1.120	0.085	1.030	0.156	1.077	0.066	1.096	0.063
Uttar Pradesh	0.993	0.041	0.756	0.056	0.941	0.049	0.776	0.042
West Bengal	1.341	0.095	0.962	0.088	1.006	0.042	1.070	0.057
ALL INDIA	1.000		1.000		1.000		1.000	

Table 5(a): Indian State specific Temporal All-Item PPPs for NSS 61st Round (NSS 55th Round = 1.000 for each state)

State	NSS 61st Round price indices			
	Rural		Urban	
	Method: Coondoo et al., 2011	Official figure	Method: Coondoo et al., 2011	Official figure
Andhra Pradesh	1.310	1.123	1.359	1.286
Assam	1.377	1.084	1.407	NA[a]
Bihar	1.180	1.079	1.221	1.165
Gujarat	1.155	1.129	1.344	1.218
Haryana	1.200	1.157	1.244	1.308
Karnataka	1.084	1.073	1.187	1.249
Kerala	1.334	1.121	1.384	1.328
Madhya Pradesh	1.152	1.067	1.224	1.149
Maharashtra	1.193	1.155	1.257	1.229
Orissa	1.148	1.016	1.227	1.199
Punjab	1.195	1.129	1.382	1.226
Rajasthan	1.098	1.113	1.148	1.196
Tamil Nadu	1.204	1.156	1.290	1.347
Uttar Pradesh	1.174	1.127	1.267	1.291
West Bengal	1.266	1.105	1.298	1.213
ALL INDIA	1.184	1.110	1.300	1.239

[a]Not available

Table 6: Vietnamese Region specific All-item PPPs with respect to All-Vietnam (for the respective sectors)

(Method: Coondoo et al., 2011)

Region	1998				2004			
	Rural		Urban		Rural		Urban	
	PPP	Standard Errors	PPP	Standard Errors	PPP	Standard Errors	PPP	Standard Errors
Northern	0.928	0.366	1.383	1.907	0.955	0.809	0.824	0.802
Central	0.887	0.457	0.913	0.607	0.879	0.866	0.867	2.990
Southern	1.213	1.450	1.344	0.532	1.265	0.850	1.312	1.649
All-Vietnam	1.000		1.000		1.000		1.000	

Table 7: All-item PPP of Vietnam with respect to India

(Method: Coondoo et al., 2011)

Year	Country	Rural		Urban		All		PPP (UQICD)[a]
		PPP	Standard Errors	PPP	Standard Errors	PPP	Standard Errors	
1998	Vietnam	401.241	293.947	316.784	195.361	346.569	40.82957	261.42
	India	1		1		1		
2004	Vietnam	308.162	119.126	400.96	294.131	358.762	242.147	292.83
	India	1		1		1		

[a]Calculated from the PPP series of the Indian Rupee and the Vietnamese Dong, available in www.uqicd.economics.edu.au .

Table 8: Food PPP of Vietnam with respect to India (India=1) using various procedures[a]

Year	Sector	Coondoo et al. (2011)	CPD Index (Rao, 2005)	Divisia Index	Paasche's Index	Laspeyre's Index	Fisher's Index
1999-2000	**Rural**	341.409 (34.71)	366.695 (1.17)	361.153	274.779	608.632	408.949
	Urban	348.105 (176.33)	397.038 (1.06)	405.367	335.625	629.104	459.503
	All	338.811 (56.49)	346.741 (0.82)	382.560	278.633	640.348	422.400
2004-2005	**Rural**	402.325 (63.71)	322.579 (1.49)	343.723	192.320	558.731	327.803
	Urban	428.971 (482.06)	407.046 (1.37)	400.957	280.289	584.229	404.664
	All	423.117 (800.32)	361.048 (1.10)	318.353	191.794	521.634	316.300

[a]Figures in parentheses are the asymptotic standard errors.

Table 9: Food PPP of Vietnam with respect to India (India=1) using LQAIDS: 2004-5

Sector	LQAIDS based estimates	Coondoo et al. (2011)	Relative standard error (RSE)[a]	
			LQAIDS PPP	Coondoo et al(2011)PPP
Rural	385.65 (167.37)	402.325 (63.71)	43.40	15.84
Urban	379.13 (402.44)	428.971 (482.06)	106.15	112.38
All	344.230 (122.35)	423.117 (800.32)	35.54	189.15

[a]$RSE = \frac{\text{Standard error}}{\text{Estimate}} * 100$

Table 10: Pair wise comparison of LQAIDS based Food PPPs evaluated at different reference utility levels: Vietnam and India for 2004-05

	Expenditure points	Per capita expenditure (Rs.)	PPP[a] (India=1)	Difference with PPP of[b]			
				30% of median	50% of median	Median	200% of median
Rural							
	30% of median	83.29	294.50 (132.50)				
	50% of median	124.94	328.53 (146.51)	34.03 (14.35)*			
	Median	249.88	385.65 (167.37)	91.95 (34.13)*	57.12 (21.39)*		
	200% of median	499.76	438.48 (340.51)	143.98 (31.61)*	109.95 (24.14)*	52.83 (11.60)*	
	300% of median	749.65	466.05 (243.08)	171.55 (34.16)*	137.52 (27.38)*	80.40 (16.01)*	27.57 (5.49)*
Urban							
	30% of median	97.78	333.73 (372.94)				
	50% of median	146.67	350.78 (388.61)	17.05 (1.50)			
	Median	293.33	379.13 (402.44)	45.40 (3.85)*	28.35 (2.40)**		
	200% of median	586.67	405.98 (850.97)	72.25 (3.64)*	55.20 (2.78)*	26.85 (1.35)	
	300% of median	880.00	420.78 (530.05)	87.05 (4.12)*	70.00 (3.31)*	41.65 (1.97)**	14.80 (0.70)
All							
	30% of median	87.88	260.37 (98.70)				
	50% of median	131.82	290.73 (108.99)	30.36 (9.79)*			
	Median	263.64	344.23 (122.35)	83.86 (24.28)*	53.50 (15.49)*		
	200% of median	527.28	397.94 (363.39)	137.57 (17.02)*	107.21 (13.26)*	53.71 (6.64)*	
	300% of median	790.92	428.56 (192.14)	168.19 (19.41)*	137.83 (15.90)*	84.33 (9.73)*	30.62 (3.53)*

[a]Standard errors in parenthesis.
[b]t-statistic in parenthesis.
*p<0.01, ** p<0.05, ***p<0.10.All estimates are based on LQAIDS estimates for six food items.

APPENDIX

Table A1: Statewise number of Districts in India

States	NSS 55th Round		NSS 61st Round	
	Rural	Urban	Rural	Urban
Andhra Pradesh	22	23	22	23
Assam	23	20	23	23
Bihar	52	47	55	55
Gujarat	18	18	25	24
Haryana	16	16	19	19
Karnataka	20	20	27	27
Kerala	14	13	14	14
Madhya Pradesh	44	44	61	61
Maharashtra	29	29	33	34
Orissa	30	23	30	30
Punjab	14	13	17	17
Rajasthan	30	28	32	32
Tamil Nadu	22	23	29	30
Uttar Pradesh	71	62	83	83
West Bengal	16	17	17	18

Table A2: Number of communes in each region of Vietnam

	VLSS98		VLSS04	
	Rural	Urban	Rural	Urban
North Vietnam	46	20	972	256
Central Vietnam	41	11	624	193
South Vietnam	49	27	717	300
	136	58	2313	749

Table A3a: Per Capita Quantity and Value: India (Rural and Urban), NSS 61st Round[a]

State	Cereal and grams	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables	Cereal and grams	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables
	Per Capita Quantity						Per Capita Value					
Rural												
Andhra Pradesh	10.000	0.675	3.600	0.500	0.511	4.250	107.11	19.00	37.50	28.00	27.38	33.00
Assam	13.000	0.583	2.233	0.500	1.013	7.100	142.50	17.05	38.40	27.60	58.75	52.13
Bihar	13.333	0.667	4.000	0.417	0.400	6.938	117.00	16.00	51.43	24.00	21.56	36.14
Gujarat	9.500	0.750	6.015	0.875	0.366	4.333	82.33	20.50	88.00	47.25	22.50	44.00
Haryana	10.600	0.500	10.271	0.400	0.457	4.770	74.40	14.50	162.50	20.00	26.67	35.17
Karnataka	8.667	0.786	3.750	0.500	0.565	3.643	86.90	20.00	37.50	25.00	31.00	24.83
Kerala	9.600	0.556	3.750	0.400	2.548	3.875	118.29	17.20	52.50	26.25	76.67	36.70
Maharashtra	10.000	0.875	3.000	0.667	0.395	3.500	89.33	22.60	36.41	34.67	26.50	30.33
Madhya Pradesh	11.750	0.750	3.394	0.417	0.342	4.600	88.71	16.83	40.67	20.82	18.00	30.60
Orissa	13.917	0.500	1.925	0.286	0.449	5.950	116.00	12.29	25.00	16.00	20.00	37.00
Punjab	10.000	0.833	11.250	0.667	0.333	5.750	75.00	22.86	136.00	34.63	20.71	39.80
Rajasthan	12.500	0.500	7.667	0.429	0.263	3.625	86.50	11.50	100.00	22.50	24.00	29.20
Tamil Nadu	7.200	0.792	3.750	0.500	0.527	4.000	86.13	23.31	37.50	25.00	33.00	37.00
Uttar Pradesh	12.571	0.850	5.000	0.500	0.415	5.667	93.17	20.75	60.00	24.29	24.00	34.00
West Bengal	12.300	0.414	2.500	0.500	1.039	7.686	129.00	12.13	33.10	28.00	47.20	45.00
All India (Rural)	11.333	0.667	4.000	0.500	0.771	5.067	102.90	17.50	52.50	25.71	42.50	37.17
Urban												
Andhra Pradesh	9.88	0.70	3.75	0.60	0.55	4.44	125.47	20.06	50.00	30.00	30.83	35.25
Assam	12.33	0.67	2.85	0.60	1.17	7.63	150.36	20.75	63.00	35.00	80.67	61.50
Bihar	12.71	0.75	5.02	0.50	0.50	7.94	128.00	20.20	78.50	29.00	30.00	45.75
Gujarat	8.33	0.90	7.00	1.00	0.46	4.99	89.50	24.70	115.00	56.00	28.57	56.00
Haryana	8.86	0.65	9.20	0.50	0.53	5.90	75.83	18.50	163.33	26.00	30.00	46.40
Karnataka	9.16	0.85	4.80	0.50	0.80	4.21	114.00	23.27	56.25	27.50	44.50	31.38
Kerala	8.50	0.57	3.75	0.44	2.51	3.45	108.75	17.40	56.00	28.33	76.67	35.63
Maharashtra	8.50	0.93	4.64	0.80	0.67	4.22	102.25	26.50	75.00	44.80	42.00	46.25
Madhya Pradesh	10.50	0.83	4.43	0.57	0.50	5.38	95.22	21.00	68.57	27.58	26.50	39.75
Orissa	12.83	0.60	3.00	0.38	0.62	6.24	125.00	16.00	43.50	20.83	32.00	44.60
Punjab	9.17	0.88	10.17	0.75	0.40	5.56	86.50	24.50	151.67	37.50	26.00	42.75
Rajasthan	11.29	0.50	7.65	0.50	0.41	4.50	94.67	13.61	120.00	30.00	32.00	38.67
Tamil Nadu	7.45	0.88	5.00	0.50	0.67	4.18	107.67	26.42	66.00	29.00	39.50	40.56
Uttar Pradesh	11.13	0.88	5.33	0.50	0.54	6.33	100.00	23.38	84.00	27.75	28.50	41.57
West Bengal	10.31	0.50	3.70	0.67	1.35	7.78	127.50	16.33	58.75	37.50	69.27	54.83
All India (Urban)	9.74	0.75	5.08	0.60	0.89	5.25	108.40	21.80	80.00	32.86	51.75	45.60

[a]Quantities are in Kilograms and values are in Rupees.

Table A3b: Per Capita Quantity and Expenditure: All India NSS 61st Round[a]

	Cereal and gram	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fish and Egg	Vegetables	Cereal and gram	Pulses and Products	Milk and Milk Products	Edible Oil	Meat, Fishand Egg	Vegetables
State	Per Capital Quantity						Per Capita Value					
Andhra Pradesh	10.000	0.688	3.750	0.565	0.520	4.313	113.50	19.33	40.00	28.75	28.60	33.88
Assam	12.833	0.600	2.400	0.500	1.032	7.183	143.90	17.75	42.00	29.00	61.10	54.17
Bihar	13.200	0.667	4.286	0.429	0.438	7.183	120.00	16.80	60.00	24.86	23.00	38.29
Gujarat	8.875	0.833	6.429	1.000	0.400	4.650	86.00	22.33	100.80	52.00	25.00	49.17
Haryana	10.000	0.571	10.000	0.500	0.500	5.214	75.00	16.00	162.50	22.50	27.14	38.50
Karnataka	8.905	0.813	3.750	0.500	0.674	3.875	99.90	21.33	45.00	26.00	36.25	27.25
Kerala	9.150	0.563	3.750	0.417	2.540	3.725	114.90	17.30	54.00	26.88	76.67	36.33
Maharashtra	9.200	0.889	3.750	0.750	0.532	3.867	96.25	24.38	54.00	39.00	34.50	37.10
Madhya Pradesh	11.250	0.797	3.750	0.500	0.400	4.860	91.40	18.00	50.00	22.92	20.00	33.43
Orissa	13.600	0.500	2.286	0.300	0.500	6.033	118.33	13.25	30.00	17.50	22.83	39.00
Punjab	9.600	0.857	10.450	0.700	0.363	5.667	80.00	23.50	144.00	36.00	24.00	41.00
Rajasthan	12.000	0.500	7.667	0.500	0.333	3.900	89.55	12.17	110.00	24.00	25.71	32.33
Tamil Nadu	7.333	0.833	4.000	0.500	0.616	4.050	97.75	24.67	50.00	27.33	36.00	38.50
Uttar Pradesh	12.075	0.857	5.000	0.500	0.451	5.857	95.20	21.50	67.50	25.00	25.00	36.00
West Bengal	11.436	0.464	2.929	0.500	1.132	7.725	128.40	13.75	42.00	30.00	53.43	48.00
Total	10.650	0.700	4.500	0.500	0.809	5.150	105.14	19.00	63.00	28.00	45.71	40.00

[a]Quantities are in Kilograms and values are in Rupees.

Table A4: Per capita quantity and expenditure: Vietnam (VLSS2004)[a]

Region	Cereals and Cereal Products	Peanuts, sesame seeds, beans	Milk and Milk Products	Edible Oil	Meat,Fish and Egg	Vegetables	Cereals and Cereal Products	Peanuts, sesame seeds, beans	Milk and Milk Products	Edible Oil	Meat,Fish and Egg	Vegetables
	Per Capita Quantity						**Per Capita Value**					
Rural												
North Vietnam	14.67	0.13	0.25	1.52	2.28	0.75	48000.00	1250.00	3333.33	8666.67	7916.67	3700.00
Central Vietnam	13.67	0.11	0.25	1.10	1.54	0.50	43125.00	1166.67	3200.00	7333.33	6357.14	2708.33
South Vietnam	12.68	0.10	0.33	1.38	1.54	0.67	43333.33	1354.17	5433.33	9770.83	9229.17	4683.33
Total	13.98	0.12	0.25	1.35	1.83	0.63	45383.34	1250.00	3750.00	8645.83	7733.33	3687.50
Urban												
North Vietnam	10.86	0.07	0.25	0.50	2.92	2.19	44208.33	900.00	5000.00	6833.33	47777.78	9583.33
Central Vietnam	10.91	0.08	0.25	0.67	2.27	1.23	41875.00	1000.00	4500.00	7000.00	20750.00	6166.67
South Vietnam	9.29	0.13	0.33	1.60	2.30	1.06	40222.22	2000.00	5333.33	23444.5	17875.00	9145.83
Total	10.46	0.08	0.30	1.00	2.54	1.39	42291.67	1250.00	5000.00	10000	23194.45	8466.67
All Vietnam												
North Vietnam	13.94	0.10	0.25	1.32	2.46	0.94	47250.00	1180.56	3611.11	8000.00	9583.33	4500.00
Central Vietnam	13.20	0.10	0.25	1.01	1.68	0.60	42944.44	1111.11	3428.57	7222.22	7633.33	3333.33
South Vietnam	11.46	0.11	0.33	1.43	1.81	0.79	41944.45	1500.00	5333.33	12500	12104.17	5722.22
Total	13.18	0.10	0.27	1.29	2.03	0.78	44750.00	1250.00	4000.00	8958.33	9833.33	4500.00

[a]Quantities are in Kilograms and values are in Dongs.

Table A5: Unit Price Regressions: India, NSS 61st Round[a]

Food Item	Variable	Coefficient	Std. Err	t-stat	R^2
Cereals and Substitutes	Per capita Food exp. 30 days	0.0007*	0.0000	114.92	0.1343
	Proportion meals outside	1.2659*	0.0683	18.55	
	Head Age	0.0013**	0.0004	2.89	
	Male household head	-0.063*	0.0180	-3.51	
	Household Size	-0.234*	0.0037	-63.29	
	Adult Females	-0.0270**	0.0079	-3.41	
	Adult males	-0.071*	0.0068	-10.42	
Pulses and Substitutes	Per capita Food exp. 30 days	0.0003*	0.0000	27.06	0.0264
	Proportion meals outside	0.3674*	0.1295	2.84	
	Head Age	0.0018*	0.0008	2.26	
	Male household head	-0.0017	0.0315	-0.05	
	Household Size	-0.170*	0.0065	-26.08	
	Adult Females	0.0077	0.0140	0.55	
	Adult males	0.0147	0.0121	1.22	
Milk and Milk Products	Per capita Food exp. 30 days	-0.0002*	0.0000	-4.64	0.021
	Proportion meals outside	1.4601**	0.5323	2.74	
	Head Age	-0.0171*	0.0037	-4.6	
	Male household head	0.2921*	0.1541	1.9	
	Household Size	-0.0463	0.0310	-1.49	
	Adult Females	0.0280	0.0667	0.42	
	Adult males	0.1684**	0.0571	2.95	
Edible Oils	Per capita Food exp. 30 days	0.0008*	0.0000	41.61	0.0489
	Proportion meals outside	0.5652**	0.2441	2.32	
	Head Age	0.0057*	0.0015	3.86	
	Male household head	-0.2365*	0.0598	-3.96	
	Household Size	-0.2887*	0.0124	-23.26	
	Adult Females	-0.1298*	0.0266	-4.89	
	Adult males	-0.1287*	0.0230	-5.6	
Meat, Egg, Fish	Per capita Food exp. 30 days	0.0040*	0.0001	52.21	0.0462
	Proportion meals outside	-6.1191*	0.9270	-6.6	
	Head Age	0.0274*	0.0059	4.64	
	Male household head	-1.7084*	0.2283	-7.48	
	Household Size	-1.1147*	0.0486	-22.95	
	Adult Females	0.2663**	0.1005	2.65	
	Adult males	0.1717**	0.0870	1.97	
Vegetables	Per capita Food exp. 30 days	0.0000*	0.0000	53.8	0.0407
	Proportion meals outside	0.0146**	0.0067	2.18	
	Head Age	0.0000	0.0000	-0.24	
	Male household head	-0.0033**	0.0017	-2	
	Household Size	-0.0105*	0.0003	-30.23	
	Adult Females	0.0007	0.0007	0.95	
	Adult males	-0.0007	0.0006	-1.16	

*p<0.01, ** p<0.05, ***p<0.10.

[a]State and Region dummies have not been reported. Units for all food items are converted to kilograms where possible. For items with food consumption reported in numbers such as eggs and bananas the following conversion has been used. 1 egg (58 grams), 10 bananas (1 kg), 1 orange (150 grams), 1 pineapple (1.5 Kg), Lemons and ginger are not included.

Table A6: Unit Value Regressions: Vietnam (VLSS 2004)[a]

Food item	Variable	Coeff.	Std Err.	t-stat	p-value	R^2
Cereals and Cereal Products	Per capita Food Expenditure	0.0002*	0	4.12	0	0.02
	Proportion of Food Outside	120.86*	20.33	5.94	0	
	Head Age	0.01	0.35	0.02	0.99	
	Male household head	-4.24	11.01	-0.39	0.7	
	Household size	-21.23*	4.32	-4.91	0	
	Adult Females	2.12	7.06	0.3	0.76	
	Adult Males	1.46	6.2	0.24	0.81	
Peanuts, sesame seeds, beans	Per capita Food Expenditure	-0.001	0.001	-1.18	0.24	0.03
	Proportion of Food Outside	714.21***	379.45	1.88	0.06	
	Head Age	16.86**	6.59	2.56	0.01	
	Male household head	-356.53**	205.53	-1.73	0.08	
	Household size	121.94	80.66	1.51	0.13	
	Adult Females	-385.61*	131.88	-2.92	0	
	Adult Males	-274.77*	115.93	-2.37	0.02	
Milk and Milk Products	Per capita Food Expenditure	0.009*	0.002	4.36	0	0.02
	Proportion of Food Outside	443.78	793.72	0.56	0.58	
	Head Age	-13.14	13.8	-0.95	0.34	
	Male household head	-426.48	430.47	-0.99	0.32	
	Household size	441.55**	168.94	2.61	0.01	
	Adult Females	-116.31	276.01	-0.42	0.67	
	Adult Males	-467.95***	242.35	-1.93	0.05	
Oils	Per capita Food Expenditure	0.0005	0.0008	0.62	0.54	0.01
	Proportion of Food Outside	229.78	315.42	0.73	0.47	
	Head Age	-2.61	5.48	-0.48	0.63	
	Male household head	63.97	170.79	0.37	0.71	
	Household size	-3.42	67.23	-0.05	0.96	
	Adult Females	8.88	109.59	0.08	0.94	
	Adult Males	-42.46	96.23	-0.44	0.66	
Meat, Egg, Fish	Per capita Food Expenditure	0.003*	0.001	3.34	0	0.03
	Proportion of Food Outside	97.45	359.88	0.27	0.79	
	Head Age	-12.18**	6.25	-1.95	0.05	
	Male household head	-412.88**	194.74	-2.12	0.03	
	Household size	164.06**	76.53	2.14	0.03	
	Adult Females	6.09	124.93	0.05	0.96	
	Adult Males	-274.31**	109.67	-2.5	0.01	
Vegetables	Per capita Food Expenditure	0.0004	0.0007	0.58	0.56	0.03
	Proportion of Meals Outside	304.07	265.22	1.15	0.25	
	Head Age	5.8	4.61	1.26	0.21	
	Male household head	207.89	143.58	1.45	0.15	
	Household size	-33.95	56.38	-0.6	0.55	
	Adult Females	-104.82	92.09	-1.14	0.26	
	Adult Males	-4.51	80.85	-0.06	0.96	

*p<0.01, ** p<0.05, ***p<0.10.

[a]Region and commune dummies are not reported. Units for all food items are converted to kilograms where possible. For items with food consumption reported in numbers such as eggs and bananas, the following conversion has been used. 1 egg (58 grams), 10 bananas (1 kg), 1 orange (150 grams), 1 pineapple (1.5 Kg), Lemons are not included.

Table A7: Parameter Estimates of LQAIDS for India (NSS61st round)

Parameter	Rural India		Urban		All India	
	Coefficient	z	Coefficient	z	Coefficient	Z
α_1	0.145*	24.95	0.346*	57.19	0.226*	66.54
α_2	0.031*	11.92	0.050*	14.44	0.046*	28.39
α_3	0.587*	123.14	0.263*	58.15	0.373*	131.53
α_4	0.095*	32.10	0.063*	14.69	0.112*	60.35
α_5	0.141*	44.55	0.212*	59.60	0.179*	89.26
α_6	0.000	0.16	0.066*	19.93	0.064*	34.13
β_1	-0.224*	-65.70	-0.037*	-16.11	-0.120*	-66.20
β_2	-0.010*	-9.75	-0.005*	-7.21	-0.004*	-7.46
β_3	0.258*	74.66	0.067*	25.67	0.122*	62.57
β_4	0.001	1.11	-0.019*	-23.73	-0.002*	-3.17
β_5	-0.012*	-6.24	-0.001	-0.42	0.000	0.39
β_6	-0.013*	-7.73	-0.006*	-5.45	0.004*	4.40
λ_1	-0.045*	-63.56	-0.011*	-21.84	-0.025*	-62.74
λ_2	0.001*	4.24	0.000	-1.02	0.001*	7.88
λ_3	0.032*	43.82	0.009*	15.34	0.012*	28.78
λ_4	0.006*	26.85	-0.002*	-8.93	0.003*	24.49
λ_5	0.002*	5.99	0.003*	9.51	0.004*	17.19
λ_6	0.004*	10.87	0.001*	2.44	0.004*	23.57
γ_{11}	0.076*	23.12	0.089*	19.00	0.040*	15.67
γ_{12}	-0.017*	-11.99	0.008*	3.78	-0.004*	-4.12
γ_{13}	0.046*	23.94	-0.005**	-1.68	0.033*	20.29
γ_{14}	-0.040*	-28.55	-0.052*	-23.61	-0.026*	-25.18
γ_{15}	0.026*	19.04	0.028*	14.30	0.029*	26.98
γ_{16}	-0.092*	-56.79	-0.068*	-29.29	-0.071*	-56.54
γ_{22}	-0.011*	-6.87	0.008*	2.80	-0.006*	-4.22
γ_{22}	-0.019*	-26.29	-0.035*	-30.33	-0.025*	-40.99
γ_{23}	-0.004*	-3.70	-0.009*	-4.32	-0.005*	-5.38
γ_{24}	0.029*	43.88	0.023*	28.10	0.026*	51.74
γ_{25}	0.023*	25.99	0.004*	3.51	0.013*	19.19
γ_{33}	-0.093*	-44.82	-0.034*	-9.26	-0.083*	-44.33
γ_{34}	-0.002*	-2.28	-0.007*	-5.42	-0.002*	-3.59
γ_{35}	0.040*	41.23	0.060*	34.00	0.048*	55.51
γ_{36}	0.028*	28.51	0.021*	13.48	0.029*	35.48
γ_{44}	-0.022*	-13.88	0.008*	3.27	-0.022*	-19.14
γ_{45}	0.022*	32.91	0.020*	22.61	0.020*	37.03
γ_{46}	0.046*	50.95	0.039*	29.60	0.036*	50.64
γ_{55}	0.029*	43.88	0.023*	28.10	0.026*	51.74
γ_{56}	-0.010*	-11.70	-0.002	-1.43	-0.009*	-13.59
γ_{66}	0.005*	3.47	0.006*	2.86	0.002	1.46

*p<0.01, ** p<0.05, ***p<0.10.

Table A8: Parameter Estimates of LQAIDS for Vietnam 2004

Parameter	Rural		Urban		All Vietnam	
	Coefficient	z	Coefficient	z	Coefficient	z
α_1	1.023*	20.42	0.596*	4.60	1.000*	22.88
α_2	0.094*	3.60	0.220*	3.54	0.111*	5.11
α_3	-0.121*	-2.18	-0.371*	-6.17	-0.111*	-2.45
α_4	0.075	1.41	-0.189	-1.62	0.117*	2.60
α_5	-0.286*	-6.50	0.266*	2.84	-0.377*	-10.58
α_6	0.214*	10.75	0.477*	8.14	0.260*	14.02
β_1	-0.108*	-5.00	0.030	0.90	-0.083*	-4.91
β_2	-0.028*	-2.72	-0.066*	-4.37	-0.036*	-4.73
β_3	0.056*	2.55	0.112*	6.40	0.052*	3.16
β_4	-0.029	-1.42	0.034	1.14	-0.051*	-3.24
β_5	0.178*	10.45	0.007	0.30	0.199*	15.62
β_6	-0.070*	-13.17	-0.116*	-15.71	-0.080*	-19.16
λ_1	-0.001	-0.31	-0.008*	-3.95	-0.003*	-2.05
λ_2	0.003*	2.86	0.005*	4.86	0.004*	5.18
λ_3	-0.002	-0.76	-0.006*	-4.04	-0.002	-1.17
λ_4	0.011*	4.95	0.002	0.99	0.012*	7.56
λ_5	-0.018*	-9.11	-0.001	-0.76	-0.018*	-12.21
λ_6	0.007*	18.46	0.008*	18.04	0.008*	28.95
γ_{11}	0.025*	2.18	0.077*	5.25	0.056*	7.09
γ_{12}	-0.002	-0.49	0.000	-0.03	-0.008*	-2.81
γ_{13}	0.027*	3.37	0.007	0.52	0.029*	5.34
γ_{14}	-0.013*	-2.21	-0.028*	-4.40	-0.025*	-5.86
γ_{15}	-0.005	-0.45	-0.061*	-13.15	-0.019**	-1.98
γ_{16}	-0.032*	-7.66	0.006	0.37	-0.032*	-8.14
γ_{22}	0.018*	8.14	0.007	0.83	0.018*	8.60
γ_{22}	-0.005	-1.72	0.026*	3.76	-0.001	-0.35
γ_{23}	-0.009*	-5.04	0.005	0.62	-0.011*	-5.58
γ_{24}	0.006	1.19	-0.006	-0.87	0.013*	2.91
γ_{25}	-0.008*	-3.73	-0.033*	-4.04	-0.011*	-5.60
γ_{33}	0.051*	6.87	0.007	0.51	0.049*	8.70
γ_{34}	-0.057*	-12.60	-0.064*	-5.00	-0.052*	-12.05
γ_{35}	-0.023*	-2.39	-0.013	-1.25	-0.031*	-3.58
γ_{36}	0.007	1.66	0.037*	4.56	0.006	1.46
γ_{44}	0.088*	19.91	0.136*	12.68	0.099*	18.87
γ_{45}	-0.008	-0.84	-0.066*	-11.22	-0.005	-0.50
γ_{46}	-0.001	-0.24	0.017	1.26	-0.006**	-1.79
γ_{55}	-0.009	-0.58	0.133*	23.17	-0.012	-0.86
γ_{56}	0.039*	10.23	0.013	1.20	0.054*	14.69
γ_{66}	-0.005*	-2.18	-0.040*	-3.80	-0.010*	-3.79

*p<0.01, ** p<0.05, ***p<0.10.