A Unified Framework for the Estimation of Intra and Inter Country Food Purchasing Power Parities with Application to Cross Country Comparisons of Food Expenditure: India, Indonesia and Vietnam

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Abstract

This paper proposes a preference based methodology, analogous to the estimation of equivalence scales in the demographic demand literature, for the estimation of the item specific intra country PPPs (i.e. spatial prices) and inter country PPPs in a unified framework using unit records of household food expenditures from three Asian countries: India, Indonesia and Vietnam, covering contemporaneous time periods. The study addresses a key limitation of the ICP exercise, namely, treating all countries, large and small, as homogeneous entities. Moreover, it (i) directly calculates bilateral PPPs between countries based on their expenditure patterns and prices alone and (ii) directly estimates the Price Level Indices (PLI) and their standard errors allowing formal tests of the hypothesis of PLI being unity. The usefulness of the estimated PPPs is illustrated by applying them to comparisons of real food expenditures between the three countries, and benchmarking the comparisons with those using the ICP PPPs.

Key words: Item specific PPP, Spatial Prices, QAIDS, Inequality adjusted Expenditures.

JEL Classifications: C12, D12, E31, O53, O57.

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1. Introduction

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. PPPs play an important role in international comparisons of consumption expenditure and, quite crucially, in defining poverty lines in locally denominated currencies based on an international standard such as $1.25 a day at 2005 PPP. 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. Recent examples of cross country comparisons using the ICP PPPs include Hill (2004), Neary (2004), Feenstra et al (2009), Deaton and Heston (2010), Deaton and Dupriez (2011b), Almas (2012), Oulton (2012) and Majumder, Ray and Sinha (2013a). While Clements et al. (2006) provide a method of comparison of consumption patterns between countries that is free of currency units, the requirement of PPP is, in general, unavoidable in most cross-country comparisons.

The recent publication of the results and findings of the 2011 International Comparisons Program (ICP) by the World Bank[1] has put the spotlight back on the concept of the PPP as measured in the ICP exercise. The reports of the ICP, 2005 and ICP, 2011 have both appeared with a 3 year lag from the year they relate to. From its modest beginning in the late 1960s, when it covered only a handful of countries - six countries in 1967, to be precise - the ICP exercise has grown exponentially in scale and diversity to cover nearly 150 economies in 2005[2], and nearly 200 economies in 2011. The scale and complexity of the ICP exercise is truly impressive. The scale of the exercise has grown to the

[1]World Bank (2014).

[2] See World Bank (2008) for the ICP, 2005 report. See, also, Diewert (2010), World Bank (2013) for a description of the different aspects of ICP, 2005.

point where in 2005 it was, for the first time, housed in the Global Office of the World Bank. The 2005 ICP is widely acknowledged to be the first globally comprehensive exercise with both China and India appearing together in the ICP for the first time. There were several methodological changes in ICP, 2011 over ICP, 2005, which included a new method of global linking and aggregation, and the use of a weighted country product dummy (CPD) method of estimation to reflect the relative importance of the products, unlike the unweighted CPD procedure used in the ICP, 2005 exercise.

The most widely used PPPs are those provided by the ICP. To date, the latest PPPs available from the ICP are those prevailing in 2011[3]. The PPPs, provided by the ICP suffer from several limitations, especially in their applications in cross country poverty comparisons[4]. First, since the poor spend their money, almost exclusively, on food, the relevant PPPs for poverty comparisons are the food PPPs, not those based on a wide selection of items considered by the ICP. A related issue is that the poor face different prices from the economy wide averages that are used in the ICP. This critique of the ICP PPPs is the basis for the recent study by Deaton and Dupriez (2011b) that provides PPPs for the global poor in 62 developing countries. However, the PPPs provided in their study have limited significance for poverty measurements since they are simply modified ICP PPPs based on the expenditure patterns of the poor, and do not take note of the more significant poverty features, namely, that the poor have different needs and face different prices as well. Deaton and Dupriez (2011b) identify actual consumption of the poor with their needs and in working with the conventional PPPs based on 'average prices' for the entire population, they end up with PPPs that are not all that relevant for the poor.

Second, the ICP treats all countries, large and small, as single entities on the assumption that a unit of the country's currency has the same purchasing power everywhere inside the country. Such an

[3] See Rao, Rambaldi and Doran (2010) for an extrapolation of the PPPs based on all those available from the ICP from 1970 onwards.

[4] See Reddy and Pogge (2007) for a critique of the World Bank methodology for fixing national poverty lines denominated in local currencies.

approach overlooks the spatial variation in prices within the country. There is now a small but expanding literature that questions this assumption and considers spatial prices in the intra country context- see, for example, the evidence of Aten and Menezes (2002) on Brazil, Coondoo, Majumder and Ray (2004), Coondoo, Majumder and Chattopadhyay (2011), Majumder, Ray and Sinha (2012, 2013a, 2013b) on India and Vietnam, Deaton and Dupriez (2011a) on India and Brazil, and Deaton, Friedman and Alatas (2004) on India and Indonesia. As several of these studies have found, spatial prices within countries as large and diverse as India and Indonesia can be as large as those between countries.

Third, the PPPs considered so far are not item specific and overlook the fact that the PPPs may vary substantially across items. The use of an economy wide single PPP is likely to introduce distortions in the welfare comparisons. The lack of transparency in the ICP calculations where one does not have easy access to the PPPs at the level of basic headings is difficult to understand in a document which is so full of numbers. Several researchers have commented on this[5].

Fourth, the ICP PPPs are calculated for a fixed, country invariant basket of items and are not based on any preference consistent demand systems. This limits the possibilities of substitution between items or between qualities of the same item in response to price changes. An attempt was made in Majumder, Ray and Sinha (2013a) to estimate preference based PPPs, but no item specific PPPs were introduced there.

Fifth, there is no information on the period over which the price information was collected in the ICP exercises and whether there was uniformity across countries in this regard. The issue of the recall period in designing survey questionnaires is quite significant in the context of expenditure comparisons. As reported by Beegle et al. (2012) in case of Tanzania, measured consumption (and hence budget shares) substantially differs by recall period. The Tanzanian evidence shows that the usual month method recall leads to 15% lower food consumption and 15% higher non-food

[5] See, for example, Diewert (2010).

consumption than 1-week recall. The issue is no less significant in the context of reported prices, and calls for evidence on how the PPPs change when adjustments are made for non-uniformity across in the reporting period for prices.

Finally, and most significantly, in expressing all the PPPs against the US dollar and in basing the reference basket on an 'international standard', that is both dubious and misleading, the ICP PPPs are not of much use in making bilateral and multilateral welfare comparisons between countries outside of the developed country regions. The practice of anchoring the PPP calculations on a common norm that holds world-wide makes the price indices satisfy the properties of transitivity and invariance to the base country. But this comes at a tremendous price since such a norm makes the ICP PPP rates of questionable significance in the context of bilateral comparisons between developing countries far removed from the U.S.A. or other developed country contexts. As reported in Majumder, Ray and Sinha (2013a), for example, the PPPs obtained from a bilateral comparison of India and Vietnam, using the preferences and prices in these two countries alone and anchoring on a norm that is relevant only for these two countries, are quite different from that implied by the ICP PPPs. These have a significant effect on the welfare comparisons between these two countries. This result is extended in this study by the inclusion of Indonesia in the three country exercise.

The present study was motivated by an attempt to address all the above limitations in a comprehensive exercise. It introduces, for the first time, the concept of item specific PPPs between countries as estimable parameters and operationalizes this concept by proposing a new methodology for estimating such PPPs, and using them in cross country welfare comparisons. The methodology for estimating item specific PPPs in the intra county context was introduced in Majumder, Ray and Sinha (2012). The present study shows that the concept can be used in the cross country context as well, and provides empirical evidence in support of this claim. In fact, this article unifies the intra- and cross country contexts of Majumder, Ray and Sinha (2012, 2013a,b) by proposing a comprehensive strategy that allows the calculation of overall PPPs between countries taking account of the spatial element in each

country and differences in PPPs between items. The present study highlights the importance of estimating and using item specific PPPs in cross country comparisons by not only formally testing and rejecting the assumption of item invariant PPPs but by also providing empirical evidence that they do make a difference to the welfare comparisons between countries. Moreover, in considering only food items, the present study provides PPPs that are relevant for the poverty comparisons and are better suited than those provided by the ICP. The econometric estimation of the PPPs, both item specific and overall, allows us to not only report their standard errors but also conduct tests of hypotheses on the PPPs that are not possible with the conventional price indices based PPPs. This is an advantage that the present procedure shares with the country product dummy (CPD) approach of estimating the PPPs. The present study illustrates the advantage of this approach by directly estimating the Price Level Indices (PLI) which is defined as the ratio of the PPP to the exchange rate. This study reports the tests of the equality of PLI between items, and of each of the PLI being significantly differing from unity. Ravallion (2013) suggests that, as a country grows and approaches the developed countries in affluence, their PLIs will move towards unity in what is called a 'dynamic Penn effect'. However, very little is known about the PLIs of developing countries vis a vis one another, other than the magnitudes implied by their PLIs with respect to the U.S. $. The present study provides a departure by reporting the matrix of the estimated PLI s between the three countries considered here.

The rest of this article is organised as follows. Section 2 describes the new methodology for estimating item specific PPPs in the cross country context. Section 3 describes the data sets from the three countries that figure in this study. Section 4 provides the prima facie case for integrating the intra country spatial price dimension with the cross country PPP calculations by providing the state/province wide PPPs and the rural urban PPPs in the three countries. Section 5 extends the discussion to the cross country context by presenting estimates of item specific PPPs and the overall PPP. Section 6 examines the robustness of the PPP estimates to changes in the item categories by reporting the estimates of the Price Level Index (PLI) on a finer food classification that is more easily

comparable across the three countries and is of greater relevance for the poor. This section also reports food expenditure comparison between the three countries and their sensitivity to alternative sets of PPPs. Section 7 concludes the article.

2. Procedure for Estimating the Spatial prices, the Rural-Urban Price Differentials and the Cross Country PPPs

There are three types of price differentials that are considered in this study- (i) spatial price differences between the constituent states/provinces in each country, (ii) rural-urban price differentials, and (iii) cross country price differentials giving rise to the conventional PPPs. In case of (i), the purchasing power of the currency was normalised at unity for each sector (rural, urban) in the country as a whole. In case of (ii), the rural urban PPPs took the form of expressing the urban purchasing power of the Rupee/Rupiah/Dong in terms of its rural counterpart. In case of (iii), we expressed the PPPs of the comparison countries (Indonesia and Vietnam) in terms of the numeraire country (India) and, also, in terms of each other. For (ii) and (iii), the estimations involve both item specific PPPs and the overall PPP along with a formal test of item invariance of the PPPs.

A methodology that is based on the fact that a spatial price index can be viewed as a True Cost of Living Index is defined below. The general cost function underlying the Rank 3 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:

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

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. Note that while "price situation" refers to the prices in a given year in temporal comparisons of prices and welfare, it refers to the prices prevailing in a particular region, i.e., state, in the spatial context. 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 expression for the temporal price index given by (2.3) can be modified to yield expressions of spatial price index as follows.

$$ln\, P(p^s, p^0, u^*) = [ln\, a(p^s) - ln\, a(p^0)] + \left[\frac{b(p^s)}{\frac{1}{ln\, u^*} - \lambda(p^s)} - \frac{b(p^0)}{\frac{1}{ln\, u^*} - \lambda(p^0)}\right], \tag{2.4}$$

Where s denotes a state/province and 0 denotes the country as a whole. (2.4), therefore, allows calculation of the regional spatial price indices with respect to the country as a whole by choosing an appropriate reference utility level u^*.

The above methodology, however, permits estimation of price indices at the overall level (item invariant) only. Following Majumder, Ray and Sinha (2012), we can extend the use of QAIDS to provide the framework for estimating the item specific PPPs both within each country in the form of rural urban PPPs and across countries in the form of cross country PPPs. We also estimate the overall PPPs in this framework.

On assuming the QAIDS functional forms chosen for $a(p), b(p)$ and $\lambda(p)$, the demand system in budget share terms is given by:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log(x/P) + \left(\frac{\lambda_i}{\prod_{k=1}^{n} p_k^{\beta_k}}\right) [\log(x/P)]^2 \quad (2.5)$$

$$\log P = \alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j \quad (2.6)$$

Equations (2.5, 2.6) hold for rural and urban areas separately in the intra country context, and for all countries in the cross country context. The above equation can be extended to hold for all areas (pooled) as follows, using the item specific PPPs, namely, the $k_i's$, to express the urban prices in terms of the rural prices or, alternatively, the PPP of the comparison country in terms of the reference country:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j^* + \beta_i \log(x/P^*) + \left(\frac{\lambda_i}{\prod_{k=1}^{n} p_k^{*\beta_k}}\right) (\log(x/P^*))^2 \quad (2.7)$$

where

$$\log P^* = \alpha_0 + \sum_i \alpha_i \log p_i^* + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i^* \log p_j^*, \quad (2.8)$$

and $p_i^* = p_i k_i^{D_s} \sqrt{n}$, with the restrictions $\sum_{j=1}^{n} \gamma_{ij} = \sum_{i=1}^{n} \gamma_{ij} = 0$ and $\gamma_{ij} = \gamma_{ji}$, where D_s denotes the sectoral dummy (rural=0, urban=1)[6] and $\sqrt{n}$ is the OECD equivalence scale, *n* being the household size. In the PPP incorporated demographic demand system (2.7), all the item specific PPP parameters (k_i) are identified and estimable and it relaxes the assumption of identical preferences in (2.5) via the introduction of demographically varying preferences between households of different size.

The justification for this formulation is that if we normalise the rural-urban PPP at rural prices, then, the urban price for each item,i, will need to be multiplied by $k_i$for parity with the rural prices. (2.7) is, therefore, a comprehensive system with the parameters$(\alpha_{i,} \beta_i, \lambda_i, \gamma_{ij}, k_i)$, treated as estimable parameters. Note that (2.7) is identical to the Barten (1964) variant of demographically extended demand systems, based on the concept of quasi price demographic effects ($p_i k_i$) with the Barten specific equivalence scales,k_i, playing a role analogous to the PPPs in the present context. The PPP for item *i* is given by $1/k_i$ wherethe k_i's are normalised at unity for the reference region/country. (2.7), which is the PPP extended basic estimating equation of this study allows a convenient test of item invariance of the PPPs by testing the nested hypothesis, $k_i = K$ for all *i*, in the unrestricted equation.

It may be pointed out that the comparison can be extended to more than two regions/countries by pooling data for the regions/countries and defining appropriate number of region/country dummies, keeping one of them as the numeraire. The overall rural urban PPP can be obtained as (i) *1/K*, where *K* is obtained by setting $k_i = K$, and (ii) by averaging over the item specific PPPs ($1/k_i$).[7]

[6] To keep the discussion simple, we have explained the item specific PPPs in terms of rural-urban price PPPs. but the explanation also holds for cross country PPP, with 'rural' replaced by the reference country, and 'urban' replaced by the comparison country.

[7] This is similar to the general equivalence scale in the Barten (1964) model of equivalence scales, where the general scale (m_o) is a function of the item specific equivalence scales.

3. Data Description and Comparison of Food Consumption between India, Indonesia and Vietnam

The data for the present analysis comes from household expenditure surveys conducted in the three countries, India, Indonesia and Vietnam. The choice of these three Asian countries was dictated by the fact that, though comparability of items between them remains an issue as with all cross country comparisons, the issue is much less in scale than that encountered in projects such as the ICP or in the study by Deaton and Dupriez (2011b) that covered 62 developing countries. The three surveys chosen covered periods that, though not identical, had large degree of overlaps between them making the calculation of cross country PPP s meaningful.

The Indian data came from the 66th round (July, 2009-June, 2010) of India's National Sample Surveys (NSS) on consumption expenditure. The analysis used complete consumption information on the quantity of food items included in the analysis. That is, consumption of food items from domestic production, food from the public distribution system (PDS) and item purchased were included in this analysis. The exercise was performed over 15 major states of the Indian union, with each state subdivided into rural and urban sectors. The list of the states covered, along with the number of districts in each state, is provided in Table A1 in the Appendix. The data from the unit records (household level) were used in our analysis.

The Indonesian data came from the Indonesian Social and Economic Survey (SUSENAS) 2011, collected by the Central Statistical Agency of the Government of Indonesia. The list of provinces and the number of districts in each province is presented in Table A2 in the Appendix. The present analysis is based on the detailed consumption module collected every three years. This module is nationally representative of urban and rural areas in each of the 32 provinces of Indonesia. The 2011 module collected data for 229 food items consumed by 285186 households comprising of approximately 1117827 individuals. The households are asked to report the quantity and value of consumption of each of the food items that were purchased from the market, gifted or home grown. The consumption

information in Indonesia is based on a 7 day recall period of consumption of food items.

The Vietnamese data came from the Vietnamese Household Living Standard Surveys (VHLSS) of 2010. The General Statistics Office (GSO) of Vietnam collects this data, with technical support from the World Bank and financial support from the UNDP (United Nations Development Program) and SIDA (Swedish International Development Cooperation Agency). The VHLSS 2010 is part of the Vietnam household living standard surveys conducted every two years between 2002 and 2010. The VHLSS questionnaires are the same as those of the VLSS surveys except that some modules are simplified and some modules are not included. The list of regions and communes in each region used in the present analysis is presented in Table A3 in the Appendix**.**

An important feature of the VHLSS/VLSS datasets is that they collect detailed consumption information on market purchase and home production and consumption during the `*tet*' holiday period for 45 food 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 including 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 into monthly consumption and expenditure for comparability with NSS data, which consists of monthly figures.

An important part of the present exercise is to create food groups that would be comparable across the three countries. The empirical exercise was conducted on the following eight Food items in each

country: Cereals & Cereal substitutes; Milk & Milk Products; Edible Oil; Meat, Fish & Eggs; Vegetables; Fruits; Alcohol, tobacco and intoxicants; Beverages. These are well-defined food items whose meaning does not change much between India, Indonesia and Vietnam. Also, we have household level quantity and expenditure information that goes down to district level in all three countries. 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.

Table 1 compares the pattern of food consumption between the three countries by reporting the quantity consumed of the first six food items by the median household in each country. While India and Vietnam consumed similar quantities of Cereal and Cereal substitutes, the corresponding consumption of this item in Indonesia is much less. While the Indian consumption of Milk, Milk Products and Vegetables exceeds that of the Indonesians and the Vietnamese, Indians consume far less of the non-vegetarian item, Meat, Fish and Eggs than the Indonesians or the Vietnamese. In other words, the Indian diet is generally more vegetarian in nature in comparison with that in the other countries. The large Hindu population in Indonesia possibly explains the larger consumption of vegetables in that country vis a vis Vietnam, though it does not come up to Indian levels. The consumption of fruits in India and Indonesia are fairly similar, but higher than in Vietnam.

The PPPs based on estimated demand systems require price information that is missing on most data sets. This study followed the practice in Majumder, Ray and Sinha (2012, 2013a, 2013b) in using as proxies the raw unit values of the food items, but adjusted for quality and demographic factors using the procedure introduced by Cox and Wohlgenant (1986) and extended by Hoang (2009)[8].

[8] An alternative procedure for constructing price series from adjusted unit values is available in Deaton (1988). Gibson and Rozelle (2005) suggest the use of 'price opinion' as better than adjusted unit values that they consider biased measures of prices but, as McKelvey (2011) has found recently, such price information is not free of bias either.

4. Spatial Prices in India, Indonesia and Vietnam

The estimated spatial food prices, along with their standard errors, for India and Vietnam have been reported in Majumder, Ray and Sinha (2013a), and are not presented again to save space. The Indonesian estimates of spatial food prices by provinces, with respect to all Indonesia as base, have been reported in Table 2. Consistent with the evidence for India and Vietnam reported in our earlier study, Table 2 contains evidence of considerable regional heterogeneity in food prices in Indonesia. The picture is quite robust, though the estimates are not identical, between the rural and urban areas. Taken together, the three Asian countries provide strong evidence against treating the purchasing power of a country's currency as constant in all states/provinces in that country. The intra country regional heterogeneity in food prices in these multiethnic countries is driven by both differences in preferences between communities and by differences in prices of the same food item between the states and provinces.

The evidence on rural urban price differentials in each country, and separately by items, is provided in Tables 3-5 for India, Indonesia and Vietnam, respectively. The intra country rural urban PPPs were obtained by estimating the PPP extended QAIDS demand system (2.7) for each country separately, by setting D_s=0 for rural sector and D_s=1 for urban sector. Each of these tables contains two sets of estimates - one that does not adjust for the spatial price differences between regions, and one that does using the spatial price indices reported above. While Tables 3-5 report only the PPPs and the k_is, the full set of PPP extended QAIDS parameter estimates for the three countries has not been reported here but are available on request. Since the rural prices are normalised at unity, an estimate of k_i that is significantly smaller than one indicates a higher urban price for that item, i.e. lower purchasing power of a unit of currency for that item in the urban areas. Since in the intra country context, the 'exchange rate' is 1, hence, the item specific PPP, $1/k_i$, in the intra country context is analogous to the item specific Price Level Index (PLI), δ_i in the cross country context. Correspondingly, the overall intra country PPP parameter,$1/K$, is analogous to the overall PLI, δ_0 , in the cross-country context.

The following features emerge from these tables.

(i) With a few exceptions, the estimates of k_i are mostly significantly different from unity, confirming rural urban price differentials in all three countries. This extends the evidence for India presented in Majumder, Ray and Sinha (2012) to Indonesia and Vietnam, and adds to the evidence of intra country price differences that our earlier evidence has already established.

(ii) There is considerable heterogeneity between items in the magnitude of rural urban price differentials. For example, in both India and Indonesia, edible oil has small and insignificant rural urban price differentials while Alcohol has a large and highly significant price differential.

(iii) A formal nested test of the hypothesis of item invariant rural urban PPPs is provided in these tables, and these show conclusive rejection of the assumption that all the $k_i{}'$s are equal.

(iv) There is an interesting difference in the nature of the rural urban price differentials between these countries. Vietnam is an exception in recording higher purchasing power of the country's currency in the urban areas compared to the rural, and this is true of all the food items. In other words, after adjusting for quality and demographic factors, the rural price of an item exceeds that in the urban areas in Vietnam with corresponding implications for poverty measurement and food security.

(v) The estimates of rural urban PPPs in India and Vietnam are fairly robust to adjustments for the differential purchasing power of the country's currency between states and provinces using the spatial price estimates obtained earlier. However, this is not true in Indonesia where the rural urban PPP estimates are quite sensitive to the adjustments. For example, in Indonesia, the absence of rural urban price differential for Edible Oil in case of the unadjusted estimates changes to a large and significant differential on adjustment. While all the three countries have recorded significant spatial differences in prices, the larger number of provinces in Indonesia along with a greater heterogeneity in tastes and preferences possibly explain the greater spatial variation in that country.

5. Preference Consistent Purchasing Power Parities between India, Indonesia and Vietnam

Extending the calculations to cross country PPPs, but using the same PPP extended QAIDS demand framework that was used for estimating the rural urban PPPs within each country, and given by equation (2.7) above, the item specific cross country PPPs (along with their standard errors) are presented in Table 6. In the bilateral cross country context of Table 6 involving pooled estimation of India/Indonesia (D_s=0 for India and D_s=1 for Indonesia) and India/Vietnam (D_s=0 for India and D_s=1 for Vietnam), the k_i's denote the item specific PPPs of Indonesian Rupiah and Vietnamese Dong with respect to the Indian Rupee. Alternatively, $1/k_i$ denotes the PPP of the Indian Rupee with respect to the other two currencies. In keeping with the spatial aspect of this study, the PPPs reported in Table 6 correspond to rural-rural (left half) and urban-urban (right half) comparisons of purchasing power of the respective countries' currency units. The PPP estimates are mostly well determined, and there is evidence of considerable variation of the PPPs between items in both the rural and urban sectors. The coefficient of variation (CV) between the item specific PPP s records greater variability in the PPPs in Vietnam than in Indonesia. The variation is higher in the rural areas than in the urban in both countries. Much of the fluctuation in the PPPs is on account of the smaller food items, such as Pan/Tobacco/Intoxicants and Beverages. Since there are issues of comparability and differences in the meaning of these items between countries, this result should be treated with some caution. Nevertheless, as Table 6 reports, the hypothesis of item invariance of the PPPs (i.e.,$k_i = K$ for all *i*) is easily rejected on a likelihood ratio test for both sectors. This table also underlines the importance of the intra country spatial price differences by establishing several cases of large differences in the PPPs between the rural and urban sectors, most noticeably, for the principal food items, Cereals and Cereal substitutes, Milk and Milk Products, and Vegetables. The idea of a single PPP between countries that hold for all items and for both the rural and urban sectors is convincingly rejected by the evidence contained in Table 6.

The item invariant PPPs obtained from the bilateral estimations of the PPP extended QAIDS equation

(2.7) on pooled data from India/Indonesia, India/Vietnam and Indonesia/Vietnam have been presented in Table 7. This table also presents, as bench marks, the PPPs obtained from the estimation of (2.7) on the trilateral pooling of the three countries[9] and combining the rural and urban sectors. Two features of this table are worth noting. First, the trilaterally pooled PPP estimates are consistent with the bilaterally pooled estimates and generally lie between the rural to rural and urban to urban PPPs. This suggests that not much is gained from the multilateral estimation of the PPPs, especially given the larger and more complex exercise that the latter involves. Of course, this is true in the current context of Asian countries with comparable taste and food habits, and will not extend to the multilateral context of the ICP which involves countries spanning an enormously wide range of economic, political and cultural characteristics. Second, consistent with Table 6, the rural to rural and urban to urban PPPs diverge and often by quite large margins. It is therefore misleading to assign a single country wide value to the PPP as is done in the ICP[10].

The estimates of the pair wise differences between the item specific PPPs (along with their t-statistics) have been presented in Tables 8 (India/Indonesia) and 9 (India/Vietnam). While the lower triangular section in each table reports the pair wise differences and their t-statistics in the rural areas, the upper triangular section reports the corresponding differences in the urban areas. Two features of these tables are worth noting, in particular. First, the tables contain widespread evidence of statistical significance of the pair wise differences between the item wise PPPs. Second, in nearly all cases, the differences vary in both magnitude and, quite crucially, in sign between the rural and urban sectors. The differences in the item specific PPPs between the rural and urban sectors shows that the differences between the overall PPPs in the two sectors, that has been established in Tables 6 and 7, is due not only to the divergent rural and urban expenditure patterns but also reflects the rural and urban price differences for each item, after correcting for quality and demographic factors.

[9]The Dummy variables were defined as follows: D_{s1}=1 for Indonesia and =0otherwise; D_{s2}=1 for Vietnam and =0 otherwise.

[10] The PPP rates presented in Table 7 can be compared with the PPP rates from ICP, 2005 and ICP, 2008 that have been reported in Appendix Table A4.

Table 10 compares the log of the item specific rural urban PPPs in each country with the mean of the log of the spatially adjusted rural urban price ratios across the provinces/states in each country. The two generally, though not always, share the same sign, but there is a wide discrepancy between the two sets of estimates of the rural urban price differentials. One of the causes of discrepancy between the two estimates could be the equivalence scale adjustment that affects the estimate of k_i .but not the log of the spatially adjusted rural urban price ratio. The latter underestimates the extent of rural urban price differential in each country. Table 10 confirms that, while urban prices are greater than the rural prices in Vietnam, the reverse is generally the case in India and Indonesia.

6. Estimates of the Price Level Index and Comparisons of Food Expenditure

There are comparability issues in item definitions in any cross country study and ours is no different. To address the issue, and to focus on a food basket that is more closely aligned to the food consumption of the poor, we repeated the exercise on a narrower basket of 5 food items. We also omitted some outliers in the data due to the presence of some rich households. The item classification along with the summary means has been presented in Table 11. Vietnam is primarily a rice eating country with her rice consumption levels exceeding that in India and Indonesia.

In re-estimating eq. (2.7), we respecified the PPP parameter, k_i, as $1/k_i = \delta_i x$, where x is the Exchange Rate and δ_i is the item specific Price Level Index (PLI) defined as the ratio of PPP of item i to the Exchange rate. If δ_i exceeds one, then the item in question is cheaper in the comparison country than in the base country, and otherwise if δ_i is less than one. Taking India as the base country, δ_i measures how much an Indian Rupee is worth, in terms of item i, in the county/region that is being compared. The PLIs, rather than the PPPs, are now directly estimated from eq. (2.7)[11]. The results are presented in Table 12, which also reports the PPPs implied by the estimated PLIs. For example, Re. 1 will buy in

[11] The exchange rates were fixed at the official exchange rates prevailing in 2009 - see the footnote of Table 12.

rural India the same amount of rice that 62 paise will buy in rural Indonesia, and 69 paise in rural Vietnam. The figures in parentheses show the t-statistics against the null hypothesis: δ_i =1, i.e. the Rupee buys the same amount in each country. Nearly all the PLIs are significantly different from one, but there are several differences in the PLI magnitudes between items and between rural and urban areas. For example, Rice is much more expensive in the rural areas of Indonesia and Vietnam than in rural India, but the reverse holds in the corresponding urban comparisons. Table 12 confirms rejection, on a likelihood ratio test, of the hypothesis of equality of the PLIs. The estimates of the overall PLI parameter, δ_0, show that the chosen basket of food items in Indonesia and Vietnam is more expensive than in India. There is a presumption that as a developing country grows and becomes more affluent its non-tradeable items become more expensive so that the country's PLI increases and approaches one (see Ravallion, 2013). However, this hypothesis is based on the U.S. $ as the numeraire currency and the adoption of an international norm in the PPP calculations. Little is known about the magnitudes of the PLIs of developing countries vis a vis one another, let alone how they will behave, as they grow differentially over time. The PPPs of Indonesia and Vietnam reported in Table 12 are out of line with the magnitudes reported in Table 6. The deletion of the 3 smaller items, Fruits, Pan/Tobacco/intoxicants and Beverages along with the omission of outliers leads to a sharp increase in the PPP of the Indonesian Rupiah and the Vietnamese Dong vis a vis the Indian Rupee. These magnitudes are in line with the PPPs of these two currencies with respect to the Rupee implied by the ICP PPPs.

Table 13 presents the full set of PLIs between the three countries, disaggregated between rural and urban areas in the bilateral case. The PLI estimates, which are generally well determined, show that (a) the Rupee has the least purchasing power in Indonesia which is the most expensive of the three countries, (b) there are rural urban differences in the PLI estimates that point to the need to calculate sub-national PLIs and PPPs, and (c) the trilateral calculations of the PLI have an appreciable impact on the bilaterally estimated PLIs. The last feature is also evident from the overall PPPs presented in Table 14. Both Tables 13 and 14 contain evidence of the impact on the bilateral PLIs and PPPs between

countries' currencies due to the inclusion of a third country in the estimation of preferences used in the calculations. This has implications for the use of the multilateral PPPs from the ICP exercise in bilateral welfare comparisons between developing countries.

It is also useful to benchmark the bilaterally and trilaterally estimated PLIs obtained in this study against the multilaterally estimated ICP PPPs, by comparing the δ_0 estimates presented in Table 13 with the PLIs from ICP (2005, 2011) reported in Appendix Table A4. Though not completely out of line with one another, the two sets of estimates are not identical. This provides a prima facie case for undertaking more bilateral PPP calculations between countries in the same region, as in the Asian example considered here, to supplement the ICP exercise.

Note that the Indonesian food expenditures are possibly biased upwards in relation to India and Vietnam, since they are based on weekly recall unlike the monthly recall in the other countries. As the study by Beegle et al (2012) found, weekly recall leads to 15 % higher food consumption than monthly recall. Table 15 provides evidence on the sensitivity of the estimated PPPs and the PLIs in the trilateral case by making adjustments to the Indonesian food expenditure figures. As expected, the adjustments have more of an impact on the Indonesian PPP than the Vietnamese PPP, though it is significant that the PPP of the Dong is also affected by the Indonesian data adjustments. It is worth noting, for example, that if the Indonesian food expenditures are scaled down by 20 %, in line with the results of Beegle at al (2012) based on experimental work, the PPP of the Indonesian Rupiah with respect to the Indian Rupee comes down sharply so that the PLI of the Indonesian currency is only slightly above one. Though the adjustments are on expenditures rather than prices, Table 15 shows the importance for the ICP of undertaking similar adjustment exercises to account for non-uniformity between the 200 or so countries regarding the period over which the prices are recorded.

The PPPs estimated in this study are used to compare the inequality adjusted per capita expenditures on

the 5 major food items between the three countries[12]. Following Majumder, Ray and Sinha (2013a, 2013b), we use the Sen (1976) index, W $=\mu(1-G)$ to compare the inequality adjusted food expenditures in the three countries, where μ is the per capita food expenditure in a common currency, namely, Indian Rupees (the numeraire currency) at PPPs, and *G* is the Gini inequality of food expenditures. The results are presented, for rural and urban areas separately, in Table 16. This table also provides evidence on the sensitivity of the Sen (1976) index to the PPPs used in the currency conversions, notably, the PPPs from (a) the 2005 and 2011 ICP (b) the item varying PPPs and (c) the item invariant PPP obtained from the trilateral pooling of the three countries in the QAIDS estimations. Since the Gini inequalities are invariant to a PPP conversion that is item invariant, the estimates of *G* in the comparison countries (Indonesia and Vietnam) only alter for the item specific PPPs that are a special feature of this study. Based on the Sen (1976) welfare measure, Vietnam enjoys an unambiguously higher ranking than India and Indonesia. India is, also, generally ranked higher than Indonesia. The ICP 2011 PPPs yield real expenditures that are not far from the ones based on the PPPs estimated in this study. Due to high food inflation in Vietnam, there was a sharp upward revision in the PPP of the Dong between the 2005 and 2011 ICP, and this is consistent with the PPPs estimated in our earlier study [Majumder, Ray and Sinha (2013a, Table 3)]. Consequently, there was a sharp downward revision in the Rupee denominated Vietnamese food expenditure, though the country still maintained her lead over India and Indonesia. The use of item specific PPPs in converting the Indonesian and Vietnamese currencies to Indian Rupees increases the Rupee denominated food expenditures in these countries quite sharply. A comparison of the real expenditures between the bilateral and trilateral PPP based currency conversions confirms the effect that multilateral PPP calculations have on bilateral welfare comparisons. This has wider implications in the context of using the ICP PPPs in making bilateral welfare comparisons between developing countries far removed from the developed country contexts.

[12]To ensure comparability in the meaning of items between countries, we deleted the smaller items, namely, Pan/tobacco/intoxicants and Beverages, from the cross country comparisons in Table 10.

7. Concluding Remarks

The recent release of the results of the 2011 ICP has come against the background of a proliferating literature on Purchasing Power Parities (PPP). PPPs are used in a host of cross country welfare comparisons, such as poverty and real expenditures, that require currency conversions into a common currency. The ICP PPPs are designed for use in such comparisons. This study was motivated by an attempt to address one of the key limitations of the International Comparison Project (ICP), namely, that it treats all countries, large and small, as single entities with the purchasing power of the country's currency assumed to be the same in all regions within the country. Another limitation of the ICP exercise is its universal use of the U.S. dollar as the numeraire, The requirement of transitivity in the multilateral calculations of the ICP implies that the PPP between two countries, such as India and Indonesia, depends not only on the expenditure patterns in these two countries, as it should, but also on that in the 195 other countries that figure in the latest ICP. The ICP PPPs between two non U.S. nations will have to be worked out from their ICP PPPs with respect to the US $. This ignores the fact that the PPPs required in bilateral welfare comparisons between developing countries with vastly different consumption habits from the 'international norm' are quite different from the ICP PPPs. This study provides evidence from three countries in the Asian region to support this claim.

Yet another shortcoming of the ICP is the use of distribution invariant prices to calculate purchasing power parities. For example, this overlooks the fact that the poor face different prices from the 'representative' individual. While some researchers have tried to address this issue by constructing poverty lines by using the consumption patterns of the poor from household budget surveys, such studies do not tackle the real issue, namely, that the poor face different prices and only have access to qualitatively inferior items from the ones that the ICP bases its calculations on. This study shows the usefulness of unit values obtained from unit records in household surveys in constructing prices for the

lower expenditure percentiles and using them in constructing PPPs that are more relevant in poverty comparisons.

This study proposes a preference based methodology to calculate bilateral and trilateral food PPPs between three Asian countries, namely, India, Indonesia and Vietnam, with comparable expenditure patterns. It departs from the ICP practice by using reference norms that are based on (a) utility rather than on a fixed basket of items, and (b) the food preferences in the countries being compared, not of other countries. The study uses quality and demographically adjusted unit values from the household expenditure surveys to construct prices that are distribution sensitive and allow the preferences to be recovered from the observed expenditure patterns. The study also departs from the ICP practice by providing sub national PPPs between these three countries. The results are benchmarked against those implied by the 2005 and 2011 ICP PPPs. There should be more such studies that involve direct bilateral comparison of purchasing power of the concerned countries' currencies without having to go through international norms or reference consumption baskets that are not relevant for the residents of those countries. One requires matrices of PPPs between and within countries that are based on information from the concerned countries alone and not derived from PPPs based on extraneous sources. Of course, this requires greater synchronisation between household budget surveys in different countries regarding the definition of items, the recall periods of the consumption expenditures, and the item detail. There are currently only a few countries that provide expenditure and quantity information from which unit values can be calculated. The experience of this study suggests that more countries should provide such information. The Global office of the World Bank, which conducts the ICP, can take the lead in this.

The methodology for calculating item specific and overall PPPs between and within countries that is proposed here is analogous to the estimation of specific and general equivalence scales in the demographic demand literature. The study provides formal statistical tests of the hypothesis of item invariance of the PPPs. The usefulness of the proposed methodology is illustrated by applying the

estimated PPPs in comparisons of food expenditures between subgroups in the three countries. The sensitivity of the expenditure comparisons to the use of item wise PPPs underlines the need to provide price information on highly disaggregated PPPs to a much greater extent than the ICP has done to date.

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Table 1: Per capita Median Monthly Consumption (Quantity) of the principal food items

Fooditem[a]	India 2009-10			Indonesia 2011			Vietnam 2010		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
Cereals/grams	24.00	20.21	22.45	14.85	12.45	14.00	20.57	23.83	21.47
Milk and Milk Products	8.16	10.00	8.66	2.00	2.00	2.00	0.72	0.75	0.74
Edible Oil	1.15	1.41	1.25	2.50	2.15	2.31	0.50	0.58	0.57
Meat, Fish and Egg	2.00	2.24	2.07	3.51	3.95	3.62	5.15	6.00	5.40
Vegetables	13.20	13.06	13.15	8.00	6.93	7.51	3.58	4.04	3.75
Fruits	3.39	4.00	3.68	4.00	4.16	4.00	2.00	2.31	2.04

[a]All food items converted to Kilograms and litre.

Table 2: Spatial Food Prices in Indonesia (2011)

Province	Rural			Urban		
	PPP	Std Err.	t-test	PPP	Std. Err.	t-test
Aceh	1.330***	0.0408	8.09	1.396***	0.0508	7.78
Sumatera Utara	1.290***	0.0486	5.96	1.087***	0.0281	3.10
Sumatera Barat	1.301***	0.0768	3.92	1.483***	0.1196	4.04
Riau	1.382***	0.0613	6.23	1.215***	0.0672	3.20
Jambi	1.229***	0.0639	3.59	1.419***	0.0734	5.71
Sumatera Selatan	0.979	0.0322	-0.65	1.106***	0.0444	2.38
Bengkulu	1.252***	0.0780	3.22	1.038	0.0824	0.46
Lampung	1.007	0.0363	0.19	1.026	0.0430	0.60
Kepulauan Bangka Belitung	1.649***	0.1010	6.43	1.277***	0.0979	2.83
Kepulauan Riau	1.319***	0.1041	3.06	1.179***	0.0637	2.81
DKI Jakarta				1.275***	0.0400	6.87
Jawa Barat	1.060	0.0398	1.50	0.989	0.0190	-0.57
Jawa Tengah	0.984	0.0244	-0.65	0.856***	0.0174	-8.28
DI Yogyakart	0.968	0.1314	-0.24	0.924	0.0561	-1.35
JawaTimur	0.889***	0.0234	-4.73	1.090***	0.0388	2.31
Banten	0.961	0.0478	-0.81	1.156***	0.0265	5.87
Bali	1.111	0.1620	0.68	1.523***	0.1017	5.14
Nusa Tenggar Barat	1.186	0.1791	1.04	1.110	0.1678	0.65
Nusa TenggarTimur	0.997	0.0715	-0.04	1.175	0.1324	1.32
Kalimantan Barat	1.583***	0.0905	6.44	1.168***	0.0598	2.82
Kalimantan Tengah	1.936***	0.1038	9.02	1.505***	0.1362	3.71
Kalimantan Selatan	1.126***	0.0479	2.63	1.160***	0.0678	2.36
Kalimantan Timur	1.280***	0.0576	4.86	1.319***	0.0570	5.59
Sulawesi Utara	1.075*	0.0413	1.82	1.045	0.0510	0.88
Sulawesi Tengah	1.037	0.0409	0.90	0.937	0.0467	-1.36
Sulawesi Selatan	0.861***	0.0178	-7.81	0.846***	0.0167	-9.20
Sulawesi Tenggara	0.919***	0.0268	-3.02	0.872***	0.0281	-4.57
Gorontalo	0.779***	0.0829	-2.66	1.308*	0.1824	1.69
Sulawesi Barat	0.763***	0.0716	-3.32	0.713***	0.0457	-6.28
Maluku	0.894***	0.0192	-5.52	1.144***	0.0612	2.35
Maluku Utara	1.046	0.0280	1.63	1.175***	0.0590	2.96
Papua Barat	1.220***	0.0388	5.69	1.052	0.2209	0.23
Papua	1.290***	0.0877	3.30	1.122	0.1430	0.85
All	1			1		

[a]The Province's median household is the comparison household and the All Indonesia median household is the reference household.

[b]The t-statistic is the test statistic $\frac{S^{State}-1}{se(S^{State})}$.

* p<0.10, ** p<0.05, ***p<0.01 are level of significance for testing PPP=1.

Table 3: Estimates of Item Specific Urban PPPs (base: Rural): India (NSS 66th Round)

Commodities	Spatial price adjusted				Unadjusted			
	k_i	t-statistic for testing: $k_i = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	Value of Log-likelihood[b]	k_i	t-statistic for testing: $k_i = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	Value of Log-likelihood[b]
Cereals/grams	0.6643 (19.76)[a]	-9.98***	1.505	11226.56	0.6643 (17.43)	-8.81***	1.505	11226.56
Milk and Milk Products	0.6606 (17.88)	-9.19***	1.514		0.6606 (17.42)	-8.95***	1.514	
Edible Oil	1.0388 (10.50)	0.39	0.963		1.0392 (9.47)	0.36	0.962	
Meat, Fish and Egg	0.9010 (9.61)	-1.06	1.110		0.9013 (8.95)	-0.98	1.109	
Vegetables	0.7811 (14.72)	-4.12***	1.280		0.7813 (14.29)	-4.00***	1.280	
Fruits	0.7393 (7.55)	-2.66***	1.353		0.7389 (6.92)	-2.44***	1.353	
Pan/tobacco/ intoxicants	0.4070 (9.97)	-14.53***	2.457		0.4071 (9.62)	-14.01***	2.457	
Beverages	0.5242 (10.56)	-9.58***	1.908		0.5242 (9.64)	-8.75***	1.908	
All Items (k_i= K)	0.7831 (49.61)	-13.74***	1.277	11153.49	0.7831 (49.66)	-13.76***	1.277	11153.49

[a]Figures in parentheses are the asymptotic *t*-values.

[b]Chi-square (d.f. 7) statistics for testing equality of k_i's= 2(11153.49-11226.56) = 146.14, significant at 1 % level.

*** Significant at 1% level.

Table 4: Estimates of Item Specific Urban PPPs (base: Rural): Indonesia (SUSENAS 2011)

Commodities	Spatial price adjusted				Unadjusted			
	k_i	t-statistic for testing: $k_i = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	**Value of Log-likelihood[b]**	k_i	t-statistic for testing: $k_l = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	**Value of Log-likelihood[c]**
Cereals/grams	0.7793 (42.63)[a]	-12.07***	1.283	26720.21	0.9043 (38.92)	-4.12***	1.106	26735.40
Milk and Milk Products	1.0299 (57.42)	1.67**	0.971		0.8445 (23.49)	-4.33***	1.184	
Edible Oil	0.7623 (39.57)	-12.34***	1.312		1.0367 (22.33)	0.79	0.965	
Meat, Fish and Egg	0.7898 (49.63)	-13.21***	1.266		0.9510 (25.51)	-1.32*	1.052	
Vegetables	0.8403 (40.41)	-7.68***	1.190		0.9202 (34.24)	-2.97***	1.087	
Fruits	0.5928 (28.87)	-19.84***	1.687		0.3360 (7.38)	-14.58***	2.977	
Pan/tobacco/ intoxicants	0.6058 (37.37)	-24.32***	1.651		0.6212 (39.02)	-23.79***	1.610	
Beverages	0.6367 (26.81)	-15.29***	1.571		0.3779 (9.01)	-15.16***	2.646	
All Items (k_i= K)	0.7970 (95.38)	-24.29***	1.255	26500.59	0.7970 (105.78)	-26.94***	1.255	26500.59

[a]Figures in parentheses are the asymptotic t-values.

[b]Chi-square (d.f. 7) statistics for testing equality of k_i's= 2(26720.21-26500.59) = 439.24, significant at 1% level.

[c]Chi-square (d.f. 7) statistics for testing equality of k_i's= 2(26735.40-26500.59) = 469.62 , significant at 1% level.

*Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level.

Table 5: Estimates of Item Specific Urban PPPs (base: Rural): Vietnam (VHLSS 2010)

Commodities	Spatial price adjusted				Unadjusted			
	k_i	t-statistic for testing: $k_i = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	**Value of Log-likelihood[b]**	k_i	t-statistic for testing: $k_i = 1$ $=\frac{k_i-1}{se(k_i)}$	$PPP_i = 1/k_i$	**Value of Log-likelihood[c]**
Cereals/grams	1.8587 (8.57)[a]	3.96***	0.538	2251.473	1.8457 (8.66)	3.97***	0.542	2251.471
Milk and Milk Products	1.6692 (6.40)	2.56***	0.599		1.6590 (6.76)	2.68***	0.603	
Edible Oil	1.1263 (7.27)	0.81	0.888		1.1346 (7.80)	0.92	0.881	
Meat, Fish and Egg	1.3715 (9.16)	2.48***	0.729		1.3771 (8.42)	2.31**	0.726	
Vegetables	1.8952 (5.27)	2.49***	0.528		1.8838 (5.15)	2.42***	0.531	
Fruits	1.0973 (7.60)	0.67	0.911		1.1074 (7.83)	0.76	0.903	
Pan/tobacco/ intoxicants	1.0472 (6.18)	0.28	0.955		1.0568 (6.71)	0.36	0.946	
Beverages	1.7726 (11.04)	4.81***	0.564		1.7594 (9.79)	4.23***	0.568	
All Items (k(i)= K)	1.5812 (14.39)	5.29***	0.632	2244.299	1.5812 (14.15)	5.20***	0.632	2244.299

[a]Figures in parentheses are the asymptotic t-values.

[b]Chi-square (d.f. 7) statistics for testing equality of k_i's= 2(2251.473-2244.299) = 14.348, significant at 5% level.

[c]Chi-square (d.f. 7) statistics for testing equality of k_i's= 2(2251.471-2244.299) = 14.344, significant at 5% level.

** Significant at 5% level, *** Significant at 1% level.

Table 6: Estimates of Item Specific Inter-country PPP Parameters (k_i) and the Corresponding PPPs ($1/k_i$): Indonesia and Vietnam with India as Base[a]

Commodities (i)	Rural				Urban			
	Indonesia		Vietnam		Indonesia		Vietnam	
	k_i	$1/k_i$	k_i	$1/k_i$	k_i	$1/k_i$	k_i	$1/k_i$
Cereals/grams	0.00975 (26.67)[b]	102.62	0.00285 (30.27)	349.83	0.00525 (24.77)	190.30	0.00193 (27.73)	518.59
Milk and Milk Products	0.00651 (18.72)	153.56	0.00835 (19.55)	119.75	0.01249 (25.43)	80.07	0.00842 (32.24)	118.76
Edible Oil	0.00789 (27.43)	126.81	0.01081 (29.78)	92.53	0.01275 (34.30)	78.40	0.00327 (17.13)	305.49
Meat, Fish and Egg	0.01276 (25.15)	78.35	0.00320 (25.26)	313.01	0.00946 (41.60)	105.63	0.00162 (18.76)	618.89
Vegetables	0.00651 (49.27)	153.62	0.00127 (11.98)	792.64	0.00591 (58.69)	169.20	0.00566 (11.63)	176.71
Fruits	0.00867 (22.28)	115.28	0.00307 (30.69)	325.37	0.00392 (28.89)	255.43	0.02261 (12.55)	44.22
Pan/tobacco/ intoxicants	0.01066 (23.48)	93.79	0.02165 (20.07)	46.19	0.01255 (23.59)	79.66	0.00270 (14.22)	370.08
Beverages	0.00269 (27.78)	371.36	0.00122 (12.11)	816.86	0.00547 (21.21)	182.54	0.00163 (18.88)	614.55
Value of Log-likelihood (LL2)	18355.11		6515.67		18349.84		6467.527	
Chi-square (d.f. 7) statistics for testing equality of k_i's [c]	186.72***		108.33***		175.94***		101.92***	
Simple Average of itemwise PPPs (APPP)		149.42		357.02		142.65		345.91
Weighted[d] Average of itemwise PPPs		119.20		360.06		123.38		466.34
Coefficient of Variation (CV) of APPP (%)		62.63		83.83		46.40		64.64

[a]That is, for India k(i)=1 for all commodities, where i denotes commodities.
[b] Figures in parentheses are the asymptotic t-statistics. All are significant at 1% level
[c] These are computed as 2(LL2-LL1), where LL1 is taken from the relevant rows of the last column of Table 3.
*** Significant at 1% level.
[d]Theweights are budget shares of respective countries and sectors.

Table 7: Estimates of Inter-country Overall PPPs (*1/K*) for the broad 8 item classification: India, Indonesia and Vietnam[a]

Type of Comparison		India	Indonesia	Vietnam	Value of Log-likelihood (LL1)
Bilateral	Rural	1	143.2583 (11.27)[b]		18261.75
		1		341.8219 (18.21)	6461.51
		-	1	2.316 (9.14)	13180.62
	Urban	1	141.0457 (12.53)		18261.87
		1		371.8578 (11.56)	6416.57
		-	1	2.935 (24.11)	14148.18
Trilateral (All) (Rural Urban combined)		1	142.6289 (83.82)	357.0026 (25.07)	17466.62

[a]The data considered for the three countries are as follows: India (NSS 66th Round, 2009-10), Indonesia (SUSENAS 2011),Vietnam (VHLSS 2010).

[b]Figures in parentheses are the asymptotic t-statistics for estimated values of *K*. All are significant at 1% level.

Table 8: Pairwise Comparisons[a] of k_is in Indonesia with India as base (Rural and Urban)

URBAN → / RURAL ↓	**Cereals/grams k_1**	**Milk and Milk Products k_2**	**Edible Oil k_3**	**Meat, Fish and Egg k_4**	**Vegetables k_5**	**Fruits k_6**	**Pan/tobacco/ Intoxicants k_7**	**Beverages k_8**
Cereals/grams k_1		-0.0072*** (25.09)[b]	-0.0075*** (43.55)	-0.0042*** (43.82)	-0.0007*** (3.45)	0.0013*** (-11.82)	-0.0073*** (22.33)	-0.0002*** (3.51)
Milk and Milk Products k_2	-0.0032*** (-34.15)		-0.0003** (1.81)	0.0030*** (-10.43)	0.0066*** (-14.78)	0.0086*** (-21.88)	-0.0001 (0.64)	0.0070*** (-29.03)
Edible Oil k_3	-0.0019*** (-21.04)	0.0014*** (12.09)		0.0033*** (-19.07)	0.0068*** (-21.05)	0.0088*** (-32.54)	0.0002 (-1.02)	0.0073*** (-52.22)
Meat, Fish and Egg k_4	0.0030*** (18.80)	0.0063*** (28.39)	0.0049*** (21.32)		0.0036*** (-20.23)	0.0056*** (-36.77)	-0.0031*** (9.04)	0.0040*** (-35.63)
Vegetables k_5	-0.0032*** (-11.86)	0.0000 (-0.01)	-0.0014*** (-6.93)	-0.0063*** (-15.24)		0.0020*** (-13.23)	-0.0066*** (13.49)	0.0004*** (-1.88)
Fruits k_6	-0.0011*** (-16.06)	0.0022*** (20.53)	0.0008*** (6.43)	-0.0041*** (-25.36)	0.0022*** (7.16)		-0.0086*** (20.10)	-0.0016*** (9.36)
Pan/tobacco/ Intoxicants k_7	0.0009*** (8.26)	0.0041*** (29.79)	0.0028*** (15.01)	-0.0021*** (-16.54)	0.0042*** (11.38)	0.0020*** (17.98)		0.0071*** (-25.80)
Beverages k_8	-0.0071*** (-26.00)	-0.0038*** (-14.85)	-0.0052*** (-26.57)	-0.0101*** (-24.28)	-0.0038*** (-46.44)	-0.0060*** (-20.13)	-0.0080*** (-22.25)	

[a] The cell (k_i, k_j) gives the value of (k_i - k_j) and the corresponding t-statistics are given by $\frac{k_i - k_j}{std.err.(k_i - k_j)}$.

[b] Figures in parentheses are the asymptotic t-statistics.

*** Significant at 1% level.

Table 9: Pairwise Comparisons[a] of k_i's in Vietnam with India as base (Rural and Urban)

URBAN → / RURAL ↓	**Cereals/grams k_1**	**Milk and Milk Products k_2**	**Edible Oil k_3**	**Meat, Fish and Egg k_4**	**Vegetables k_5**	**Fruits k_6**	**Pan/tobacco/ Intoxicants k_7**	**Beverages k_8**
Cereals/grams k_1		-0.0065*** (26.67)[b]	-0.0013*** (10.13)	0.0003*** (-7.41)	-0.0037*** (8.66)	-0.0207*** (11.84)	-0.0008*** (4.06)	0.0003*** (-3.35)
Milk and Milk Products k_2	0.0055*** (12.38)		0.0051*** (-20.71)	0.0068*** (-28.19)	0.0028*** (-6.25)	-0.0142*** (8.49)	0.0057*** (-22.25)	0.0068*** (-29.21)
Edible Oil k_3	0.0079*** (23.91)	0.0025*** (5.19)		0.0017*** (-14.86)	-0.0024*** (7.65)	-0.0193*** (11.83)	0.0006*** (-2.23)	0.0016*** (-8.97)
Meat, Fish and Egg k_4	0.0003*** (2.53)	-0.0052*** (-12.35)	-0.0076*** (-27.90)		-0.0040*** (9.91)	-0.0210*** (12.14)	-0.0011*** (5.31)	0.0000 (0.11)
Vegetables k_5	-0.0016*** (-15.52)	-0.0071*** (-15.93)	-0.0095*** (-24.38)	-0.0019*** (-12.13)		-0.0170*** (12.35)	0.0030*** (-5.96)	0.0040*** (-8.83)
Fruits k_6	0.0002*** (2.52)	-0.0053*** (-11.75)	-0.0077*** (-21.29)	-0.0001*** (-0.78)	0.0018*** (13.51)		0.0199*** (-11.18)	0.0210*** (-11.89)
Pan/tobacco/ Intoxicants k_7	0.0188*** (17.19)	0.0133*** (13.49)	0.0108*** (10.06)	0.0185*** (17.10)	0.0204*** (18.88)	0.0186*** (17.03)		0.0011*** (-7.02)
Beverages k_8	-0.0016*** (-11.13)	-0.0071*** (-20.62)	-0.0096*** (-27.29)	-0.0020*** (-12.60)	0.0000 (-0.23)	-0.0018*** (-11.76)	-0.0204*** (-19.62)	

[a] The cell (k_i, k_j) gives the value of (k_i - k_j) and the corresponding t-statistics are given by $\frac{k_i - k_j}{std.err.(k_i - k_j)}$.

[b] Figures in parentheses are the asymptotic t-statistics.

*** Significant at 1% level.

Table 10: Comparison of Intra country logarithm of item wise PPP parameter k_i and rural-urban price ratios[1]

Commodities	India		Indonesia		Vietnam[2]	
	Spatial price adjusted logk_i	Spatial price adjusted Mean $log\frac{p_i^R}{p_i^U}$	Spatial price adjusted $log\ k_i$	Spatial price adjusted Mean $log\frac{p_i^R}{p_i^U}$	Spatial price adjusted log k_i	Spatial price adjusted Mean $log\frac{p_i^U}{p_i^R}$
Cereals/grams	-0.178	-0.107	-0.108	-0.024	0.269	0.015
Milk and Milk Products	-0.180	-0.077	0.013	-0.099	0.223	0.057
Edible Oil	0.017	-0.012	-0.118	-0.084	0.052	0.021
Meat, Fish and Egg	-0.045	-0.027	-0.102	-0.047	0.137	0.010
Vegetables	-0.107	-0.061	-0.076	-0.070	0.278	0.055
Fruits	-0.131	-0.108	-0.227	-0.088	0.040	0.058
Pan/tobacco/ intoxicants	-0.390	-0.163	-0.218	-0.110	0.020	0.029
Beverages	-0.280	-0.212	-0.196	-0.006	0.249	0.023

Note:

1. One of the causes of discrepancy between the two columns could be the equivalence scale adjustment. While this adjustment in inherent in calculating k_I, the price ratios are pure price adjusted ratios.

2.Since the k_i's are less than 1 for India and Indonesia, the comparable figures are $log\frac{p_i^R}{p_i^U}$, while for Vietnam the comparable figure is $\log\frac{p_i^U}{p_i^R}$, as k_i'**s** are greater than 1 here.

Table 11: Per capita Median Monthly Consumption (Quantity) of 5 food items

Fooditems	India 2009-10			Indonesia 2011			Vietnam 2010		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
Rice	11.55	8.94	10.39	14.00	12.00	13.23	18.09	20.78	18.86
Milk	8.66	10.61	10.00	2.00	2.00	2.00	1.13	1.22	1.15
Edible Oil	1.15	1.41	1.25	2.50	2.15	2.31	0.50	0.58	0.57
Meat	1.63	1.63	1.63	1.79	1.79	1.79	2.79	3.33	2.92
Vegetables	13.20	13.06	13.15	8.00	6.93	7.51	3.58	4.04	3.75

Table 12: Estimates of Item Specific and Overall Inter-country PLI (δ_i) and the Corresponding PPP (Official exchange rate×δ_i): Indonesia and Vietnam with India as Base[a]

Commodities (i)	Rural[b]				Urban[b]			
	Indonesia		Vietnam		Indonesia		Vietnam	
	δ_i	PPP =192.6× δ_i	δ_i	PPP =399.9× δ_i	δ_i	PPP =192.6× δ_i	δ_i	PPP =399.9× δ_i
Rice	0.611 (-14.99)[b]	117.69	0.693 (-4.38)	277.27	1.511 (14.95)	291.02	1.264 (1.64)	505.63
Milk	1.471 (9.02)	283.31	0.836 (-4.38)	334.34	0.931 (-2.40)	179.30	0.915 (-2.17)	366.05
Edible Oil	1.478 (4.81)	284.74	1.025 (0.24)	409.70	1.170 (10.43)	225.36	1.199 (3.20)	479.36
Meat	1.124 (2.49)	216.54	1.018 (0.19)	407.10	0.726 (-14.01)	139.77	1.576 (8.45)	630.40
Vegetables	0.736 (-19.54)	141.82	1.329 (3.46)	531.31	0.648 (-20.83)	124.86	0.947 (-0.63)	378.86
Value of Log-likelihood	8660.89		2702.96		8697.41		2732.89	
Overall value ($\delta_i = \delta_0$ for all i)	δ_0= 1.5502 (2.57)	PPP = 298.57	δ_0 = 1.2069 (5.44)	PPP = 482.64	δ_0= 1.4346 (14.12)	PPP = 276.30	δ_0= 1.1365 (1.88)	PPP = 454.49
Chi-square (d.f. 4) statistics for testing equality of δ_is	58.70***		85.85***		428.48***		29.02***	

Note:
(1) The official exchange rate (2009-10) between India and Indonesia has been set as:1 Indian Rupee (INR) = 192.6 Indonesian Rupiah (IDR)
(2) The official exchange rate (2009-10) between India and Vietnam has been set as:1 Indian Rupee (INR) = 399.9 Vietnamese Dong (VND)

[a]That is, for India, δ_i=1 for all commodities , where i=1,2,..5; and overall δ_0=1

[b] Figures in parentheses are the asymptotic t-statistics for testing δ_i=1. Almost all are significant at 5% level.

Table 13: Comparisons of Overall PLI[a] (δ_0) Between Countries (Rural, Urban and Combined)

Bilateral Comparison: Rural			
	India	Indonesia	Vietnam
India	1[b]	1.550 (2.57)[c]	1.207 (5.44)
Indonesia	0.645 (-3.99)	1	0.830 (-12.07)
Vietnam	0.829 (-6.56)	1.205 (10.02)	1
Bilateral Comparison: Urban			
India	1	1.435 (14.12)	1.137 (1.88)
Indonesia	0.697 (-20.26)	1	0.876 (-1.91)
Vietnam	0.880 (-2.14)	1.142 (1.67)	1
Trilateral Comparison: Combined			
India	1	1.328 (9.44)	1.155 (6.59)
Indonesia	0.753 (-12.53)	1	0.870 (-4.52)
Vietnam	0.865 (-7.62)	1.149 (3.93)	1

[a] PLI=PPP/Exchange Rate

[b] A value of 1 in the diagonal indicates the base country for the corresponding row and column.

[c] Figures in parentheses are the asymptotic t-statistics for testing δ_0=1. All are significant at 10% level. The lower diagonal terms are reciprocals of the corresponding upper diagonal terms. For these the standard errors are estimated by delta method.

Table 14: Estimates of Inter-country Overall PPPs (Exchange Rate× δ_0) for the broad 5 item classification: India, Indonesia and Vietnam

Type of Comparison		India	Indonesia	Vietnam	Estimated PLI (δ_0)
Bilateral	Rural	1	298.57		1.550 (2.57)[a]
		1		482.64	1.207 (5.44)
		-	1	1.769	0.830 (-12.07)
	Urban	1	276.30		1.435 (14.12)
		1		454.49	1.137 (1.88)
		-	1	1.865	0.876 (-1.91)
Trilateral (All) (Rural Urban combined)		1	255.72	461.84	1.328, 1.155 (9.44) (6.59)

[a]Figures in parentheses are the asymptotic t-statistics for testing δ_0=1. All are significant at 10% level.

Note:

(1) The official exchange rate (2009-10) between India and Indonesia has been set as:
1 Indian Rupee (INR) = 192.6 Indonesian Rupiah (IDR)

(2) The official exchange rate (2009-10) between India and Vietnam has been set as:
1 Indian Rupee (INR) = 399.9 Vietnamese Dong (VND)

(3) The official exchange rate (2009-10) between Indonesia and Vietnam has been set as:
Indonesian Rupiah (IDR)= 2.13 Vietnamese Dong (VND)

Table 15: Estimates of Inter-country Overall PPPs (Exchange Rate× δ_0) under alternative Indonesian expenditure adjustments for the 5 food item classification and India as Base[a]

(Trilateral: Rural Urban combined, accounting for different recall period of Indonesia)

Level of adjustment of Indonesian data		Estimated PLI[b] δ_0		PPP		Value of Log-likelihood
		Indonesia	Vietnam	Indonesia	Vietnam	
Indonesian expenditure data scaled up by	10%	1.406 (2.13)**	1.156 (0.88)	270.78	462.16	17581.17
	15%	1.461 (2.59)**	1.179 (1.21)	281.31	471.36	17580.37
	20%	1.561 (2.72)**	1.174 (1.01)	300.73	469.56	17580.73
Indonesian expenditure data scaled down by	10%	1.130 (5.59)**	1.174 (4.52)**	217.68	469.60	17580.17
	15%	1.102 (0.83)	1.140 (0.95)	212.21	455.85	17580.68
	20%	1.013 (0.09)	1.134 (0.82)	195.07	453.45	17580.66

[a]That is, δ_0=1for India.

[b]Figures in parentheses are the asymptotic t-statistics for testing δ_0=1.

** Significant at 5% level

Table 16: Comparison of Inequality Adjusted Food Expenditures Between India, Indonesia,Vietnam in 2010/2011 using different PPP conversion (5 food item calculations)

	Sector	India			Indonesia			Vietnam		
		Expenditure on 5 food items (Rupees)	Gini Coefficient	Sen's W	Expenditure on 5 food items (Rupees)	Gini Coefficient	Sen's W	Expenditure on 5 food item Vietnam (Rupees)	Gini Coefficient	Sen's W
ICP PPP[a]	Rural	707.01	0.2739	513.33	671.55	0.2596	497.21	1501.08	0.3164	1026.08
	Urban	820.22	0.2709	598.03	708.52	0.2723	515.59	1742.56	0.3231	1179.60
ICP PPP[b]	Rural	707.01	0.2739	513.33	659.14	0.2596	488.0172	947.12	0.3164	647.42
	Urban	820.22	0.2709	598.03	695.42	0.2723	506.0583	1099.48	0.3231	744.28
Item invariant PPP (Median PPP)	Rural	707.01	0.2739	513.33	603.25	0.2596	446.6342	999.21	0.3164	683.02
	Urban	820.22	0.2709	598.03	687.75	0.2723	500.47	1231.79	0.3231	833.84
Item varying PPP	Rural	707.01	0.2739	513.33	1192.41	0.2463	898.78	1380.67	0.3085	954.71
	Urban	820.22	0.2709	598.03	845.57	0.2733	614.49	1093.11	0.3237	739.23
Item invariant PPP (Trilateral PPP)	Rural	707.01	0.2739	513.33	704.33	0.2596	521.48	1044.21	0.3164	713.78
	Urban	820.22	0.2709	598.03	743.10	0.2723	540.75	1212.18	0.3231	820.57

[a]ICP 2005: India (INR) PPP=14.669; Indonesia (IDR) PPP=3934.26 ; Vietnam(VND) PPP= 4712.75. Converting VND to INR, 1VND=14.669/4712.75=0.00311262; 1 IDR=14.669/3934.26=0.00372853.

[b]ICP 2011: India PPP=14.975; Indonesia PPP=4091.94 ; Vietnam PPP= 7624.973. All calculations are in INR, 1 VND=14.975/7624.973=0.00196394; 1 IDR=14.973/4091.94 = 0.00365963.

Table A1: Number of Districts (State wise) in India: NSS 66th Round

States	NSS 66st Round	
	Rural	Urban
Andhra Pradesh	23	23
Assam	27	27
Bihar	38	31
Gujarat	24	23
Karnataka	25	27
Kerala	14	14
Madhya Pradesh	48	42
Maharashtra	33	33
Orissa	29	28
Punjab	18	15
Rajasthan	32	31
Tamil Nadu	31	29
Uttar Pradesh	70	70
West Bengal	19	19

Table A2: Number of Districts (Region wise) in Indonesia (SUSENAS, 2011)

Province	Rural	Urban
Aceh	22	23
Sumatera Utara	28	32
Sumatera Barat	18	19
Riau	12	12
Sumatera Selatan	15	15
Bengkulu	10	10
Lampung	14	14
Kepulauan Bangka Belitung	7	7
Kepulauan Riau	7	7
DKI Jakarta(in urban sector only)		6
Jawa Barat	19	26
Jawa Tengah	31	35
DI Yogyakart	4	5
JawaTimur	31	38
Banten	6	8
Bali	8	9
Nusa Tenggar Barat	9	10
Nusa TenggarTimur	21	19
Kalimantan Barat	13	14
Kalimantan Tengah	14	14
Kalimantan Selatan	13	13
Kalimantan Timur	14	13
Sulawesi Utara	15	15
Sulawesi Tengah	11	11
Sulawesi Selatan	24	24
Sulawesi Tenggara	12	12
Gorontalo	6	6
Sulawesi Barat	5	5
Maluku	11	11
Maluku Utara	9	9
Papua Barat	11	6
Papua	29	14

Table A3: Number of Districts (Region wise) in Vietnam (VHLSS 2010)

Region	2010	
	Rural	Urban
North Vietnam	810	408
Central Vietnam	729	176
Southern Vietnam	684	325
All-Vietnam	2223	909

Table A4: PPPs and PLIs for ICP figures (2005, 2011)

ICP	Base	PPP			Exchange Rate (ER)			PLI = PPP/ER		
		India	Indonesia	Vietnam	India	Indonesia	Vietnam	India	Indonesia	Vietnam
ICP 2005 (GDP)	US as base	14.67	3934.26	4712.69	44.1	9704.74	15858.9	0.3327	0.4054	0.2972
	India as Base	1	268.18	321.25	1	220.06	359.61	1	1.219	0.893
ICP 2011 (GDP)[b]	US as base	15.109	3606.566	6709.192	46.67	8770.43	20509.75	0.32087	0.466561	0.371773
	India as Base	1	238.7032	444.0527	1	187.9244	439.4633	1	1.45405	1.158641
ICP 2011 (Household Expenditure)[b]	US as Base	14.975	4091.94	7624.973	46.67	8770.43	20509.75	0.323741	0.411219	0.327122
	India as Base	1	273.2514	509.1802	1	187.9244	439.4633	1	1.270209	1.010443

[a]**Source: World Bank (2008)**

[a]**Source: World Bank (2014)**