On a Method of Calculating Regional Price Differentials with Illustrative Evidence from India

by

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1. INTRODUCTION

The measurement of regional differences in consumer price levels is important to policy makers in business, government and academics as well as to individual citizens faced with decisions on where to live. Estimates of the magnitude of regional price differences are needed in comparisons of real income, levels of living or consumer expenditure patterns across regions. In large Federal countries such as India and the US, with considerable heterogeneity in preferences, quality of items and household characteristics between regions, the calculation of regional price differentials, hence, acquires considerable importance. There is, therefore, a significant literature, mostly based on US data, on the measurement of regional cost of living [see, for example, Moulton (1995), Kokoski, Moulton and Zeischang (1999), Koo, Phillips and Sigalla (2000)].

When the number of regions compared is more than two, the price index number problem involved in such inter-regional real income comparisons are resolved in one of two major ways. The first and the most straightforward approach is to use binary price index numbers for pair-wise comparison of real income/level of living and then attempt to get a consistent ordinal ranking of the regions so as to obey transitivity. Examples include Sen (1976), Bhattacharya, Joshi and Roychowdhury (1980), Bhattacharya, Chatterjee and Pal (1988), and Coondoo and Saha (1990). Use of the methodology of binary price index numbers in such multilateral real income comparisons does not, however, ensure transitivity of price level comparisons except under trivial and simplifying assumptions. The International Comparison Project (ICP) of the United Nations Statistical Office and the World Bank popularised an alternative methodology of multilateral price comparisons whereby a set of internally consistent price indices, known as Purchasing Power Parities (PPP), are obtained from a set of country-wise price and quality data for a common set of items/item groups [see Geary (1958), Khamis (1972) and Kravis, Heston and Summers (1978)].

The methodology of multilateral price comparison has thrived over time both theoretically and in terms of its application to a wide variety of problem areas [see, for example, Prasada Rao (1997)]. However, like its binary price index number counterpart, the computation of a set of pure multilateral price index numbers requires a set of country-wise prices and quantities of items of uniform quality specifications, which is difficult to obtain. To resolve data problems arising from quality variation of items across regions and from gaps in the available country-wise price data, the Country Product Dummy (CPD) regression methodology is often used [see Summers (1973)]. The CPD, which is essentially an implementation of the *hedonic* approach accounting for quality variations present in the price data, offers a regression analysis-based econometric methodology of construction of multilateral price index numbers that takes care of the quality variations present in the cross-region price data [see Kokoski, Moulton and Zeischang (1999)]. The CPD methodology has undergone immense theoretical improvements – see, for example, Prasada Rao (2001) where the equivalence between a generalised CPD procedure and some standard multilateral price index number formulations has been discussed.

The literature on multilateral price index numbers is mostly concerned with the construction of PPP's/exchange rates from item/group-wise price and quantity/expenditure/share data available at the level of region/country. There is no reference to the use of micro-level data (for example, household level data on commodity prices/unit values available from countrywide consumer expenditure surveys) for estimation of multilateral price index numbers reflecting regional price differentials. However, given the fact that such micro-level data often contain valuable price information, it is worth while to explore if such data can be utilised to measure regional price differentials by estimating multilateral (consumer) price index numbers when the data set covers households belonging to more than one region (namely, districts within a region, states/provinces within a country or a set of countries).

The purpose of the present paper is to attempt and report such an exercise. To be precise, given a set of cross-sectional household level expenditure data obtained from a nation-wide survey, we consider the subset of items/item groups for which household level price/unit value and quantity measurements are both available. We then specify a price equation [ie., a 'quality equation' in the terminology of Prais and Houthakker (1955)] for each of these items/item groups by relating its price/unit value to the household's level of living (as measured by the household's per capita total consumer expenditure (PCE)) and a set of relevant household attributes (for example, household age-sex composition) together with two sets of dummies – one set relating to the items/products and the other set relating to the regions. The proposed methodology employs a two-stage estimation procedure. In the first stage, the item/item group-wise price equations are estimated and, hence, the region-wise estimates of slope and of the intercepts of the item-specific price equations are obtained. In the second stage, the set of multilateral regional price index numbers are estimated by regressing the region-specific intercept differentials on the corresponding slope differentials of individual items/item groups using another dummy variables based regression equation. This procedure is closely related to the CPD methodology because the price equation described above shares the *hedonic* feature which is central to the idea of the CPD model. There is, however, a basic difference – viz., we use the household PCE and attributes as *surrogates* for quality of items/item groups consumed by a sample household, rather than the information of item quality (which is usually not recorded in great detail in consumer expenditure surveys).

The paper is organised as follows: Section 2 specifies the price equation, explains via a reference to the CPD model the rationale of the proposed regression based procedure for estimating multilateral price index numbers from household level price/unit value data (Section 2.1) and describes the estimation method (Section 2.2). Section 3 presents a brief description of the data used (Section 3.1) and reports the results of the estimation (Section 3.2). The paper ends on the concluding note of Section 4.

2. METHODOLOGY

2.1 Specification of the Price Equation

In the basic CPD model, prices are regressed on two sets of dummy variables – viz, one set relates to the item specifications, while the other set relates to the countries covered in the price data used (other than a country chosen as the *numeraire* country) [see Summers (1973)]. The specification of the linear regression equation of a typical CPD model is thus as follows:

$$p_{jr} = \sum_{r=1}^{R} b_r S_r + \sum_{j=1}^{M} z_j D_j + \varepsilon_{jr} \qquad (1)$$

where there are R + 1 countries with r (=0, 1, 2,…,R) denoting the individual countries and r = 0 denoting the *numeraire* country; S_r's are the country dummies; M is the number of items in a basic heading, Dj's (j = 1, 2,…,M) are the item dummies and p_{jr} is the natural logarithm of the price of item j in country r. The country coefficients, namely, the b's are the natural logarithms of the estimated country parity for the heading, and the item coefficients, namely, the z's are the natural logarithms of the prices in the currency of the *numeraire* country. Note that if, as in the case here, the disaggregation of consumer expenditure is reasonably detailed so as to treat the terms *commodity* and *item* (ie., groups of commodities) synonymously, then the intercept term in the estimated equation (1) for price of item p_{jr} is the coefficient z_j (denoted as α_j below).

The CPD model was originally used for *filling gaps in available price information rather than for estimating purchasing power parities (PPP)* since it does not make use of any quantity or value data. Prasada Rao (1996) generalised the estimation procedure of this model by making use of quantity and value data[1]. Kokoski, Moulton and Zieschang (1999), Hill, Knight and Sirmans (1997) and Triplett (2000) proposed use of CPD model to incorporate quality adjustment in estimation of PPP for regional price comparison [see also Prasada Rao (2001)]. The basic CPD model used for making quality adjustments is given by the following regression equation:

$$p_{jr} = \sum_{r=1}^{R} b_r S_r + \sum_{j=1}^{M} z_j D_j + \sum_{q=1}^{Q} \theta_q C_{qjr} + \varepsilon_{jr} \qquad (2)$$

where C_{qjr}'s, q = 1, 2,…,Q, are the set of quality characteristics that are deemed to be relevant for a given price comparison problem.

The present study proposes the use of a variant of (2) to measure interstate/regional price differentials from a given set of household level cross-sectional data on item/item group-wise prices/unit values covering two or more states/regions. The logarithmic price equation for the jth item/item group is specified as follows:

$$\left(p_{jrh} - \Pi_r\right) = \alpha_j + \sum_i \delta_{ji} n_{irh} + \left(\lambda_j + \eta_{jr}\right)\left(y_{rh} - \Pi_r\right) + \varepsilon_{jrh} \qquad (3)$$

j = 1, 2,…,M

where p_{jrh} is the natural logarithm of nominal price of jth item for the sample household h of region r (= 0, 1, 2,…,R; 0 being the *numeraire* region), y_{rh} is the natural logarithm of the corresponding nominal per capita total consumer expenditure (PCE), n_{irh} is the number of

[1] Prasada Rao (2001) proposed a generalised CPD method in which a weighted residual sum of squares is minimised with each observation weighted according to the expenditure share of the item concerned in the given country.

household members of the i^{th} age-sex category (i = 1, 2, 3, 4 denote adult male, adult female, male child and female child, respectively), ε_{jrh} is the associated random disturbance term and α_j, δ_{ji}, λ_j, η_{jr}, Π_r's are the model parameters. We assume the random disturbance terms associated with individual observations to have zero expectation and to be uncorrelated.

2.2 Estimation

A CPD model is usually estimated on the basis of (R + 1)M data points. Here, however, we propose that the estimation of equation (3) be based on $M\sum_{r=0}^{R} N_r$ observations, N_r being the number of sample households in region r. In principle, Π_r may be interpreted as the natural logarithm of the value of a reference basket of items purchased at the prices of region r. Hence, $\Pi_r - \Pi_0$ is the natural logarithm of the price index number for the rth region with the price level of the *numeraire* region taken as the base. Equation (3) is basically the *quality equation* for the jth item/item group expressed in logarithmic form. It recognises three deterministic sources of the observed inter-household variations in the nominal price of an individual item/item group – viz, variation in regional price levels, inter-household variations in the level of living (as measured by the natural logarithm of PCE) and household size and composition. As per the specification, $(\lambda_j + \eta_{jr})$ measures the *quality elasticity* of the jth item/item group in region r. To normalise these elasticities, let us set $\eta_{jr} = 0$ for every j for r = 0, so that λ_j denotes the quality elasticity of item j in the *numeraire* region.

The regression model specified in equation (3) above is nonlinear in parameters. To estimate the parameters of this model, we suggest the following two-stage method.

In the first stage, the item price equations are estimated, using OLS, on the pooled data set of all the states/regions. For this purpose, the price equation of an individual item may be expressed as the following linear regression equation:

$$p_{jrh} = \alpha_j^* + \sum_{i=1}^{4} \delta_{ji} n_{irh} + \sum_{p=1}^{R} \phi_{jp} S_p + \lambda_j y_{rh} + \sum_{p=1}^{R} \eta_{jp} y_{ph} S_p + \varepsilon_{jrh} , \qquad (4)$$

j = 1, 2,…,M
r = 0, 1,…,R

S_p being a dummy variable, with $S_p = 1$ for p = r, and 0, otherwise.

To see the equivalence between equations (3) and (4), let us note that equation (3) can be rewritten as

$$p_{jrh} = \alpha_j + \Pi_r + \sum_i \delta_{ji} n_{irh} + (\lambda_j + \eta_{jr})(y_{rh} - \Pi_r) + \varepsilon_{jrh}$$

$$= \alpha_j + \Pi_r + \sum_i \delta_{ji} n_{irh} - (\lambda_j + \eta_{jr})\Pi_r + \lambda_j y_{rh} + \eta_{jr} y_{rh} + \varepsilon_{jrh}$$

$$= \alpha_j + (1 - \lambda_j)\Pi_0 + \sum_i \delta_{ji} n_{irh} + \{1 - (\lambda_j + \eta_{jr})\}\Pi_r - (1 - \lambda_j)\Pi_0 + \lambda_j y_{rh} + \eta_{jr} y_{rh} + \varepsilon_{jrh} .$$

Hence,

$$p_{jrh} = \{\alpha_j + (1 - \lambda_j)\Pi_0\} + \sum_i \delta_{ji} n_{irh} + [\{1 - (\lambda_j + \eta_{jr})\}\Pi_r - (1 - \lambda_j)\Pi_0] + \lambda_j y_{rh} + \eta_{jr} y_{rh} + \varepsilon_{jrh} \qquad (5)$$

Comparing equations (4) and (5), we see that the two equations are identical with

$$\alpha_j^* = \alpha_j + (1 - \lambda_j)\Pi_0 \qquad (6a)$$

$$\varphi_{jp} = \{1 - (\lambda_j + \eta_{jp})\}\Pi_p + \alpha_j - \alpha_j^* . \qquad (6b)$$

Note that Π_0 denotes the parameter Π_r for the reference region (r = 0). Note also from equation (3) that $(\lambda_j + \eta_{jr})$ is the slope coefficient for state/region r (≠ 0), λ_j is that for the *numeraire* (ie., reference) state/region, while α_j^* is the intercept for the numeraire state/region and ϕ_{jr} is the differential intercept for the state/region r (≠ 0) of item/item group j. Thus, exp (ϕ_{jr}) is the price relative of item j for region r with the *numeraire* region taken as base. This model (ie., equation (4)) reduces to the standard CPD model when $\phi_{jp} = \phi_p$ for every j, $\eta_{jp} = 0$ for every j and p, and $\lambda_j = 0$ for every j. Thus equation (4) extends the CPD model to the present case of regional price variation in the context of a single country.

While the first stage estimation of equation (4) yields the estimated parameters, namely, $\hat{\alpha}_j^*, \hat{\delta}_{ji}, \hat{\phi}_{jp}, \hat{\lambda}_j, \hat{\eta}_{jp}$, the estimate of Π_p, namely, $\hat{\Pi}_p, p = 0,1,...,R$ may be obtained from the following second stage dummy variables regression equation

$$\hat{\phi}_{jr} = \sum_{p=1}^{R} \Pi_p \left(1 - \left(\hat{\lambda}_j + \hat{\eta}_{jp}\right)\right) S_p - \Pi_0 \left(1 - \hat{\lambda}_j\right) + \varepsilon_{jr} \tag{7}$$

where $S_p = 1$ if $p = r$ and 0, otherwise. The parameters marked with hats are obtained from the price equations estimated at the first stage and ε_{jr} denotes the random disturbance term of the second stage regression equation.

It may be noted that (7) actually is an alternative representation of

$$\hat{\phi}_{jr} = \Pi_r \left(1 - \left(\hat{\lambda}_j + \hat{\eta}_{jr}\right)\right) - \Pi_0 \left(1 - \hat{\lambda}_j\right) + \varepsilon_{jr} \tag{7a}$$

r =1, 2, …, R

which constitutes a system of R linear regression equations in each of which the term $-\Pi_0\left(1 - \hat{\lambda}_j\right)$ appears. In other words, Π_0 in the present model is over-identified as R different estimates of this parameter may, in principle, be obtained by estimating (7a) separately for r=1,2, …, R. To resolve this over-determinacy of Π_0, we propose estimation of the dummy variable regression equation (7) instead , which ensures that a single estimate of Π_0 is obtained. The number of observations used in the second stage estimation thus equals the number of items times the number of states/regions.

It may be pointed out that equation (7) is derived from equation system (6a) – (6b) which is a system of 4 linear equations in 5 parameters, viz., $\Pi_0, \Pi_1, \Pi_2, \Pi_3$ and α_j. Thus each Π_r is a linear function of (every) α_j (which is unidentifiable and hence non-estimable, given the model). That is, the estimated Π's will have the α_j's confounded in them. Actually, the Π's estimated for a given data set will contain an additive component which is some kind of an average of the non-estimable α_j's, say $\overline{\alpha}$. Thus, while the estimates of Π's will not have any obvious interpretation, their differences will unambiguously measure the logarithm of the price index number of one region with respect to another (as the $\overline{\alpha}$ will cancel out).

2.3 Features

Three distinctive features of the proposed method as given below may be noted:

1. Unlike other methods of estimation of multilateral price index numbers, the present method does not require that price data on all items for all regions must be available for the method to work. For example, construction of a set of Geary-Khamis type multilateral regional price index numbers is necessarily based on price and quantity/value share data for the intersection set of commodities/items available in the regions under consideration. The proposed method does not have such a stringent data requirement and the method will work even if price data on some items are not available for some regions. As already described, for this method the first stage involves estimation of individual (logarithmic) price equations (based on item-wise price data for all the regions together). At the second stage the region-wise (logarithmic) price index numbers are estimated (based on linear regression equations with region-specific dummy variables) using region-specific item-wise intercept and slope differentials of the price equations estimated in the earlier stage. Therefore, if, say, for item j (j=1,2, .., M) price data for region p (p=0, 1, 2, …, R) are not available, estimation of the price equation for the jth item will not yield the estimate of ϕ_{jp}. This will, however, not hamper the estimation of the logarithmic price index numbers in the second stage as the second stage estimation will be based on $\sum_{p} M_p$ observations, M_p being the number of items available in the pth region.

2. For the proposed method the estimates of the region-wise price index numbers $\Pi_p - \Pi_0, p = 1,2,3$, are invariant to the choice of the default region due to the properties of the dummy variables regression model. This implies that the resulting price index numbers automatically fulfill the *circular* consistency required of a set of multilateral price index numbers.

3. Given that the proposed method is based on a model consisting of a system of regression equations, viz., equations (5), (6a)- (6b), it should be straightforward to devise a maximum likelihood method of estimation of the regression model (which is nonlinear in parameters) by making appropriate distributional assumptions about the random (equation) disturbance terms[2]. Now if such a maximum likelihood estimation is done, one will obtain, along with the estimates of the parameters, the asymptotic covariance matrix. Given these, the standard errors of the estimated region-wise (logarithmic) price index numbers (which are actually estimates of $\Pi_p - \Pi_0, p = 1,2,3$) can be obtained. Thus, the present method offers a means to measure the extent of sampling fluctuations of the estimated regional price index numbers as well.

3. DATA AND RESULTS

3.1.1 Data

The data base for this study is provided by the household level unit record data, in value and quantity, on consumer expenditure in the rural and urban areas collected for each of the States in India in the 50th round of the National Sample Survey (NSS) (July, 1993 – June, 1994). As indicated earlier, the observation on unit price was obtained by dividing the value

[2] However, given that the estimation is based on household level data, implementation of a maximum likelihood estimation may be computationally formidable.

of expenditure on item j for household h residing in region r by the corresponding quantity. This meant that the empirical exercise was restricted to items for which the information on both value and quantity was available, namely, a subset of the food items covered by the enquiry. In the 50^{th} round of the NSS, approximately 70,000 Indian households were surveyed in the rural areas, and 45,000 households in the urban, giving us a sample of over 1,15,000 households in one of the largest sampling exercises of its kind undertaken anywhere. The present study uses the original micro data from this survey. The sample size varies form State to State: while the number of observations for a smaller State is often less than 500, that for a larger State is generally over 5,000.

Table 1 presents the list of 25 States used in this exercise. For the purpose of this study, these States are classified into 4 geographical regions, namely, North (r = 0, ie., the numeraire or reference region), South (r = 1), East (r = 2), and West (r = 3). Table 1 indicates the regional classification of the 25 States. The series on per capita total expenditure (PCE), required in the estimation, was obtained by dividing total household expenditure (ie., the sum total of expenditure on food and non food items) by the household equivalence scale. In keeping with the spirit of this exercise, the equivalence scales, that were used, were estimated separately for each State – see Meenakshi and Ray (1999, Table 3) for the State specific equivalence scale estimates. These show considerable heterogeneity in the demographic effects across various States, thereby, pointing to the possibility of significant regional price differentials via the strong link between demographic and price effects often cited in the literature [e.g., see Barten (1964)].

Another feature of the empirical exercise, results of which are reported later, is that it is performed not only on all households but, also, separately on households above and below the poverty line. The State specific poverty lines, taking account of size economies and equivalence scale relativities, used in this study were constructed separately for rural and urban areas in each State from information contained in Dubey and Gangopadhyay (1998).

3.2 Results

The OLS estimates of the parameters $\alpha_j, \delta_{ji}, \lambda_j, \eta_{jr}$ of the item wise price equation (4) for three groups, viz., (i) all households, (ii) households above poverty line and (iii) households below poverty line, are presented in Tables 2 – 7 (Tables 2 – 4 for the rural sector and Tables 5 – 7 for the urban sector). As is clear from these Tables, most of the parameters turn out to be statistically significant. The following additional features of these Tables are worth noting:

(i) The $\hat{\lambda}_j$s show that the quality elasticity is significantly positive for almost all the items for North, the *numeraire* region. The $\hat{\eta}_{jp}$ magnitudes, via their size and significance, reveal considerable variation in the quality elasticity between regions. Fish (fresh), Salt, Milk and Milk Products, and Fruits (fresh) are examples of items in rural areas that exhibit high quality elasticity. In contrast, the quality elasticity of Fish (fresh) is much lower in the urban areas. There are other examples of strong rural urban differences in the quality elasticity. It is, however, interesting to note that the quality elasticity of Fish (fresh) increases sharply from the Northern to the Eastern region in both rural and urban areas. Items such as Rice and Wheat, available in the public distribution system (PDS), exhibit statistically significant quality elasticity, though this is clearly at odds with the basis of the PDS.

(ii) The $\hat{\delta}_{ji}$ estimates are mostly negative, thus, suggesting that *ceteris paribus* larger households witness a significant deterioration in item quality. The significant differences between the $\hat{\delta}_{ji}$ estimates (i = 1, 2, …4) across demographic groups (ie., $\hat{\delta}_{j1} \neq \hat{\delta}_{j2} \neq \hat{\delta}_{j3} \neq \hat{\delta}_{j4}$) establish strong household composition effects on prices/unit values.

(iii) The statistical significance and large magnitudes of the $\hat{\phi}_{jp}$'s confirm presence of regional variation in the level of prices in India. A closer examination of the estimates reveals several dissimilarities between the rural and urban sector and also between households below and above the poverty line in each of these sectors.

Table 8 presents the OLS estimates of the parameters of equation (7). To show the stability of the parameters, we have also presented the jackknife coefficients[3]. The Table clearly reveals that all the estimated Π parameters are statistically significant and stable.

The relationship between the slope and intercept of equation (6b) are presented graphically in Figs. 1-18. These show the plot of $\hat{\phi}_{jp} + \hat{\Pi}_0\left(1-\hat{\lambda}_j\right)$ (on the y axis) against corresponding $1-\left(\hat{\lambda}_j + \hat{\eta}_{jp}\right)$ (on the x axis). The graphs are shown separately for rural and urban sectors of the three regions for (i) all households (Figs. 1-3, 10-12), (ii) households above the poverty line (Figs. 4-6, 13-15), and (iii) households below the poverty line (Figs. 7-9, 16-18). These graphs provide a visual presentation of the (region wise) $\hat{\Pi}_r, r = 1,2,3$ estimates presented in Table 8. Each scatter diagram shows the corresponding estimated linear regression equation (without intercept). The close linear fit, underlined by a high R^2 in each case, provides strong supporting evidence for the relationships [eqns. (6a), (6b)] derived earlier (i.e., between the intercept and slope coefficients of equation (7) across items and regions).

Table 9 presents the region-wise price index numbers for each of the three different types of households separately for the rural and the urban sector with *North* taken as the reference region. The following features are worth noting:

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[3] The regressions have been run using SHAZAM. For the jackknife procedure, the regressions are run successively omitting a different observation [Judge, et.al. (1988)]. The jackknife coefficients are given by $\hat{\beta}_{(t)} = \hat{\beta} - (X'X)^{-1} X_t e_t^+$ where $e_t^+ = e_t / (1 - K_{tt}), K_{tt}$ being the t-th diagonal element of the matrix $X(X'X)^{-1}X'$, e_t the residuals and $\hat{\beta}$ the OLS estimate. A total of N (k + 1) coefficient vectors are generated each corresponding to a separate regression with the t-th observation dropped. The average of these N (k + 1) coefficient vectors is reported in the table.

(i) For the *all households* group, in both rural and urban areas, the price index number for the Eastern region is the highest among all the regions. The index numbers for 'South' and 'West' are lower than that of 'North', and Southern India is cheaper than Western India;

(ii) A similar pattern is observed for the group of *households above poverty line*;

(iii) For the group of *households below poverty line*, all price index numbers, except for Eastern India (urban), are greater than unity thus indicating a higher price level in Eastern India compared to that in Northern India. For rural India, *East* is the most expensive followed by *West* and then *East*;

(iv) An overall feature of the estimates presented in Table 9 is that the picture of regional differences in unit values/prices is not only sensitive to the rural-urban divide, but, perhaps more crucially, to whether a household lives below or above the poverty line.

4. CONCLUSION

In this paper we have proposed a method of estimating a set of regional price index numbers from a given household level data set on item-wise unit values/prices. The proposed method, being based on the linear regression technique, is quite simple and straightforward. To illustrate the method, we have used it to calculate regional consumer price index numbers for Eastern, Western and Southern India (taking Northern India as the reference region) separately for three categories of rural and urban households, viz., all households and those below and above the poverty line, using household level unit records of the NSS 50th round (1993 – 94) Consumer Expenditure Survey. Generally the results turn out to be robust and sensible.

So far as the technical features of the proposed method is concerned, it possesses several advantages relative to other methods of construction of multilateral price index numbers. First, the method, being based on household level data, is capable of bringing out the regional price differentials implicit in the given data set in a very robust manner.

Second, being based essentially on the CPD approach which was originally devised to fill gaps in the available price data required for construction of multilateral price index numbers, the proposed method will work even when all goods (and hence data on all prices) are not available in all the regions. Third, if one uses the method of maximum likelihood, the present method will give standard errors of the estimated price index numbers.

We may conclude by mentioning some of the potential uses of the proposed method of estimation of regional price index numbers to incorporate correction for regional price differentials in various studies on levels of living based on household level consumer expenditure data. The proposed method of estimation of regional price differentials is likely to be particularly useful in regional comparisons of poverty and inequality in large Federal countries such as India, Germany and U.S.A. with considerable regional heterogeneity in consumer preferences, quality of items and household characteristics. Yet another potential application of the method discussed here is in the area of optimal commodity taxes and tax reforms. Such tax calculations require reliable estimates of price elasticities which, in turn, are crucially dependent on the successful incorporation of regional variation in prices and behaviour in the tax analysis. Finally, the availability of regional price indices is useful in real income comparisons between different geographical areas within a country and in helping potential migrants with information on which to base their decision on their region of residence.

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Table 1: List of States Covered

North (r = 0: Reference Region)	**South** (r = 1)	**East** (r = 2)	**West** (r = 3)
Haryana	Andhra Pradesh	Arunachal Pradesh	Goa
Himachal Pradesh	Karnataka	Assam	Gujarat
Jammu & Kashmir	Kerala	Bihar	Maharashtra
Madhya Pradesh	Tamil Nadu	Manipur	Rajasthan
Punjab		Meghalaya	
Uttar Pradesh		Mizoram	
		Nagaland	
		Orissa	
		Sikkim	
		Tripura	
		West Bengal	

Table 2: Estimated Parameters of Price Equation (4) — All India Rural : All Households

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.311 *	-1.131 *	-0.209	-0.317	0.058 *	0.084 *	0.022 *	0.031	-0.006 *	0.012 *	-0.003	-0.002	16226	0.3063
Rice-other	1.094 *	0.361 *	-0.043	-0.619 *	0.122 *	-0.032 *	0.006	0.065 *	-0.022 *	-0.019 *	-0.017 *	-0.016 *	58039	0.0946
Rice- (s.t.)	1.100 *	-0.382 *	-0.134 *	-0.667 *	0.117 *	0.032 *	0.016 *	0.068 *	-0.017 *	-0.017 *	-0.014 *	-0.013 *	62726	0.1213
Wheat PDS	0.089	1.425	0.177	-1.122	0.200 *	-0.142	-0.004	0.118	-0.015	-0.052 *	-0.023	-0.033	446	0.1001
Wheat-other	1.356 *	-1.657 *	-0.503	0.055	-0.001	0.171 *	0.068 *	0.008	0.004	-0.006	-0.004	0.002	1587	0.107
Wheat-(s.t.)	1.159 *	-0.921 *	-1.006 *	-0.701 *	0.033 *	0.131 *	0.129 *	0.080 *	-0.010 *	-0.006 *	-0.005 *	-0.001	46812	0.267
Cereal subs.	0.142	1.108 *	0.265	-2.051 *	0.161 *	-0.130 *	0.087	0.314 *	-0.025 *	0.004	-0.016	-0.005	5465	0.5429
Milk-liquid	1.448 *	-0.416 *	-0.130 *	-0.265 *	0.058 *	0.037 *	0.022 *	0.039 *	-0.013 *	-0.008 *	-0.008 *	-0.009 *	45217	0.0872
Goat meat	3.690 *	0.026	-0.417 *	-0.350 *	0.021 *	0.016 *	0.055 *	0.031 *	-0.002	0.000	-0.004 *	-0.003 *	13634	0.2761
Mutton	3.592 *	0.363	-1.422 *	-3.506 *	0.025	-0.011	0.156 *	0.330 *	0.006	-0.015 *	-0.018 *	-0.008	2915	0.0873
Beef	3.033 *	-1.849 *	-1.823 *	-0.299	0.093 *	0.130 *	0.138 *	-0.014	-0.018 *	-0.003	-0.044 *	-0.033 *	4853	0.2065
Pork	2.657 *	0.474	-0.195	-1.395 *	0.153 *	-0.077	0.027	0.091	-0.029 *	-0.024 *	-0.046 *	-0.035 *	3826	0.1866
Buffalo meat	2.370 *	-1.209 *	-2.108 *	2.075 *	0.015	0.184 *	0.278 *	-0.179 *	-0.022 *	0.012	-0.007	0.001	1164	0.671
Fish-fresh	2.134 *	-0.208	-1.278 *	0.718 *	0.173 *	-0.018	0.123 *	-0.077 *	-0.024 *	-0.029 *	-0.024 *	-0.028 *	23202	0.1863
Root vegetables	0.510 *	0.477 *	-0.190 *	0.524 *	0.113 *	-0.009	0.034 *	-0.031 *	-0.030 *	-0.016 *	-0.027 *	-0.020 *	66655	0.1667
Gourd (s.t.)	-0.209 *	-0.021	-1.066 *	-0.766 *	0.204 *	0.028 *	0.102 *	0.096 *	-0.040 *	-0.016 *	-0.037 *	-0.029 *	42800	0.1399
Sugar PDS	2.226 *	-0.134 *	-0.031	-0.127 *	-0.008 *	0.012 *	0.005 *	0.010 *	0.002 *	-0.001	0.002 *	0.001	43809	0.0228
Sugar (s.t.)	1.887 *	0.078 *	-0.026	0.020	0.079 *	-0.011 *	0.002	0.000	-0.018 *	-0.014 *	-0.014 *	-0.013 *	62222	0.0466
Salt (s.t.)	-0.675 *	0.635 *	-0.135 *	0.615 *	0.193 *	-0.092 *	0.026 *	-0.079 *	-0.036 *	-0.027 *	-0.038 *	-0.031 *	67448	0.2222
Spices (s.t.)	-3.505 *	-0.695 *	-1.437 *	-0.340 *	0.036 *	0.031 *	0.126 *	0.024 *	-0.013 *	-0.006 *	-0.012 *	-0.007 *	67045	0.1571
Tea leaf	-2.526 *	-0.125 *	-0.628 *	-0.051	0.004	0.005	0.051 *	0.004	-0.001	-0.003 *	-0.001	0.000	49422	0.0535
Coffee powder	-0.599 *	-2.940 *	-7.560 *	-1.986	-0.086 *	0.133 *	0.613 *	0.136	0.019 *	0.009	0.014	0.012	4573	0.2123
Arhar	2.673 *	0.106 *	-0.024	-0.286 *	0.014 *	0.006	0.011 *	0.034 *	-0.008 *	-0.002 *	-0.004 *	-0.003 *	32632	0.1751

Note: * indicates statistical significance at 5% level.

Table 2: continued

Item	$\hat{\alpha}^*_j$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.512 *	0.321 *	-0.027	-0.655 *	0.035 *	-0.021 *	0.006	0.063 *	-0.012 *	-0.006 *	-0.012 *	-0.011 *	17893	0.0584
Moong	2.454 *	0.030	-0.339 *	-0.381 *	0.042 *	-0.002	0.035	0.031 *	-0.009 *	-0.006 *	-0.008 *	-0.007 *	26911	0.0544
Masur	2.126 *	0.410 *	0.172 *	-0.101	0.074 *	-0.032 *	-0.017 *	-0.002	-0.018 *	-0.012 *	-0.019 *	-0.014 *	29318	0.0823
Urd	2.229 *	0.510 *	-0.229 *	-0.751 *	0.049 *	-0.037 *	0.015 *	0.067 *	-0.011 *	-0.007 *	-0.008 *	-0.007 *	23595	0.1569
Khesari	2.080 *	2.912 *	-0.445 *	0.337	0.053 *	-0.284 *	0.028	-0.060 *	-0.011 *	-0.010	-0.010 *	0.002	3400	0.0791
Milk & milk products	1.603 *	-7.780 *	-2.299 *	-4.726 *	0.366 *	0.614 *	0.187 *	0.395 *	-0.050 *	0.005	0.013	0.004	10304	0.1939
Vanaspati	3.564 *	-0.568 *	-0.220 *	-0.126	0.011 *	0.062 *	0.027 *	0.014	-0.002	0.000	-0.003	0.001	9843	0.1109
Mustard oil	3.350 *	0.161	-0.068 *	0.459 *	0.012 *	-0.005	0.017 *	-0.045 *	-0.010 *	-0.001	-0.006 *	-0.004 *	38999	0.1678
Groundnut oil	3.637 *	-0.070	-0.137 *	-0.162 *	-0.001	0.000	0.012 *	0.016 *	-0.003 *	0.000	0.000	0.000	17164	0.0837
Coconut oil	3.881 *	-0.345 *	-1.781 *	-0.188	-0.035 *	0.033 *	0.174 *	0.017	0.007	0.009	0.007	0.003	2934	0.0085
Gingelly oil	3.352 *	-0.118	1.089 *	-0.656	0.034 *	0.014	-0.116 *	0.051	-0.008	0.001	-0.008	-0.009	2284	0.0899
Linseed oil	3.229 *	-0.076	0.426 *	-0.447	0.029 *	0.031	-0.040 *	0.043	-0.013 *	-0.008	-0.008	-0.016	945	0.1909
Refined oil	3.353 *	0.035	-1.518 *	0.083	0.040 *	0.003	0.143 *	-0.022	-0.007	-0.007	-0.009 *	-0.007 *	1709	0.4116
Palm oil	3.350 *	-0.254	0.691	-0.004	0.023	0.026	-0.075	-0.020	-0.003	-0.003	-0.030 *	0.016	417	0.2809
Rapeseed oil	4.426 *	-4.083 *	-2.893	-1.823	-0.144	0.373 *	0.269	0.162	0.051	-0.027	0.024	0.054	116	0.1556
LTP358	-1.032 *	1.646 *	-0.466 *	3.095 *	0.112 *	-0.103 *	0.030	-0.264 *	-0.039 *	0.027 *	-0.050 *	-0.028 *	37789	0.1643
LTP359	-0.949 *	0.747 *	-1.163 *	-2.906 *	0.404 *	-0.048 *	0.138 *	0.285 *	-0.051 *	-0.007	-0.052 *	-0.044 *	24051	0.126
Sugar-other	2.101 *	-0.339 *	-0.204 *	-0.370 *	0.055 *	0.020 *	0.013 *	0.031 *	-0.012 *	-0.011 *	-0.007 *	-0.008 *	59506	0.0817

Table 3: Estimated Parameters of Price Equation (4) – All India Rural : Households Above Poverty Line

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.353 *	-1.611 *	0.509 *	0.188	0.053 *	0.128 *	-0.045 *	-0.017	-0.005	0.013 *	-0.004	-0.010 *	10350	0.3557
Rice-other	1.183 *	0.154 *	-0.119 *	-0.258 *	0.110 *	-0.013 *	0.012 *	0.031 *	-0.020 *	-0.017 *	-0.017 *	-0.016 *	37229	0.0649
Rice- (s.t.)	1.178 *	-0.404 *	-0.160 *	-0.467 *	0.107 *	0.033 *	0.018 *	0.049 *	-0.015 *	-0.015 *	-0.013 *	-0.014 *	40054	0.0931
Wheat PDS	0.346	1.257	2.302	-3.637	0.169 *	-0.131	-0.211	0.352	-0.010	-0.046	-0.007	-0.040	301	0.1229
Wheat-other	1.385 *	-1.751 *	-1.009 *	0.593	-0.004	0.179 *	0.117 *	-0.042	-0.002	-0.005	-0.003	-0.001	1091	0.1614
Wheat-(s.t.)	1.201 *	-0.217 *	-0.684 *	-0.617 *	0.028 *	0.066 *	0.099 *	0.072 *	-0.010 *	-0.007 *	-0.006 *	-0.001	31427	0.3336
Cereal subs.	0.932 *	0.568	-0.941	-0.931	0.080	-0.099	0.180 *	0.191 *	-0.002	0.004	-0.014	0.012	3590	0.6105
Milk-liquid	1.482 *	-0.588 *	-0.212 *	-0.056	0.053 *	0.053 *	0.029 *	0.019	-0.011 *	-0.007 *	-0.007 *	-0.007 *	33164	0.0884
Goat meat	3.728 *	0.041	-0.313 *	-0.207	0.015 *	0.014 *	0.045 *	0.017	-0.001	0.001	-0.004	-0.002	9949	0.277
Mutton	3.568 *	0.498 *	-0.296	-5.188 *	0.030	-0.025	0.050	0.486 *	0.005	-0.017 *	-0.019 *	-0.006	2398	0.0642
Beef	3.449 *	-2.827 *	-0.874 *	-0.919	0.038	0.219 *	0.046	0.041	-0.017 *	0.003	-0.041 *	-0.027 *	3218	0.1691
Pork	3.591 *	-1.152 *	-0.148	-3.262 *	0.015	0.072	0.020	0.263 *	-0.002	0.005	-0.023 *	-0.008	2759	0.165
Buffalo meat	2.422 *	-1.549 *	2.122	2.620 *	0.011	0.214 *	-0.125	-0.231 *	-0.027 *	0.010	-0.014	0.000	826	0.702
Fish-fresh	2.555 *	-0.784 *	-1.506 *	-0.475	0.120 *	0.031	0.139 *	0.030	-0.019 *	-0.024 *	-0.019 *	-0.018 *	14627	0.1989
Root vegetables	0.657 *	0.097	-0.359 *	0.594 *	0.094	0.025 *	0.049 *	-0.038 *	-0.028 *	-0.018 *	-0.024 *	-0.017 *	42581	0.1577
Gourd (s.t.)	-0.044	-0.391 *	-1.218 *	0.499 *	0.182 *	0.061 *	0.116 *	-0.023	-0.039 *	-0.016 *	-0.037 *	-0.026 *	28000	0.1061
Sugar PDS	2.236 *	-0.120 *	0.072 *	-0.077	-0.009 *	0.011 *	-0.005	0.006	0.002 *	-0.001	0.003 *	0.002 *	29325	0.0194
Sugar (s.t.)	2.001 *	0.010	-0.168 *	0.078	0.063 *	-0.006	0.015 *	-0.006	-0.016 *	-0.011 *	-0.011 *	-0.011 *	41183	0.0326
Salt (s.t.)	-0.554 *	0.464 *	-0.307 *	0.194	0.178 *	-0.077 *	0.041 *	-0.041 *	-0.037 *	-0.027 *	-0.038 *	-0.029 *	42875	0.2113
Spices (s.t.)	-3.474 *	-0.474 *	-1.589 *	-0.218	0.033 *	0.010	0.140 *	0.013	-0.015 *	-0.008 *	-0.013 *	-0.007 *	42690	0.1602
Tea leaf	-2.529 *	0.204 *	-0.897 *	0.019	0.005	-0.025 *	0.076 *	-0.003	-0.001	-0.003 *	0.000	0.000	34716	0.0433
Coffee powder	-0.583 *	-2.925 *	-9.554 *	-2.032	-0.090 *	0.133 *	0.792 *	0.141	0.016	0.011	0.017	0.016	3769	0.2352
Arhar	2.746 *	-0.011	-0.132 *	-0.108	0.003	0.016 *	0.021 *	0.017 *	-0.005 *	-0.001	-0.002	-0.003 *	22596	0.1672

Note: * indicates statistical significance at 5% level.

Table 3: continued

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.540 *	0.365 *	0.193	-0.130	0.031 *	-0.025 *	-0.014	0.014	-0.011 *	-0.006 *	-0.011 *	-0.012 *	13618	0.0512
Moong	2.472 *	0.168 *	-0.086	-0.257 *	0.039 *	-0.015 *	0.011	0.020 *	-0.008 *	-0.006 *	-0.007 *	-0.008 *	20082	0.0367
Masur	2.247 *	0.421 *	-0.021	-0.467 *	0.057 *	-0.034	0.000	0.032 *	-0.015 *	-0.009 *	-0.017 *	-0.014 *	18452	0.0569
Urd	2.275 *	0.481 *	-0.540 *	-0.468 *	0.043 *	-0.035 *	0.044 *	0.040 *	-0.010 *	-0.008 *	-0.007 *	-0.007 *	16842	0.122
Khesari	2.020 *	6.002 *	-0.490	1.059 *	0.063 *	-0.570 *	0.032	-0.129 *	-0.009	-0.015	-0.016	0.005	1218	0.1232
Milk & milk products	2.435 *	-8.073 *	-1.961 *	-4.162 *	0.250 *	0.641 *	0.154 *	0.342 *	-0.041 *	0.024	0.020	0.029 *	8431	0.1772
Vanaspati	3.568*	-0.656 *	-0.198 *	-0.092	0.010 *	0.070 *	0.025 *	0.011	-0.001	-0.001	-0.003 *	0.001	7968	0.1205
Mustard oil	3.349 *	0.696	-0.072	0.295 *	0.013 *	-0.055	0.018 *	-0.029 *	-0.011 *	-0.002	-0.007 *	-0.004 *	24179	0.1699
Groundnut oil	3.657 *	-0.037	-0.262 *	-0.036	-0.004	-0.003	0.024 *	0.004	-0.003 *	-0.001	0.001	0.002	11859	0.094
Coconut oil	3.819 *	-0.257	-1.896 *	0.170	-0.025	0.024	0.185 *	-0.018	0.003	0.007	0.002	0.004	2194	0.0095
Gingelly oil	3.180 *	0.097	1.262 *	-0.296	0.060 *	-0.006	-0.132 *	0.017	-0.010 *	-0.005	-0.010 *	-0.017 *	1777	0.082
Linseed oil	3.236 *	-0.273	0.122	-0.726	0.027	0.048	-0.011	0.068	-0.013	-0.002	-0.008	-0.014	371	0.2457
Refined oil	3.345 *	0.249	-1.419 *	-0.133	0.042 *	-0.016	0.134 *	-0.002	-0.010 *	-0.005	-0.011 *	-0.003	1076	0.403
Palm oil	3.229 *	-0.101	1.854 *	-0.337	0.041	0.010	-0.183 *	0.011	0.006	-0.007	-0.037	0.010	290	0.3337
Rapeseed oil	5.220 *	-6.358 *	-2.836	-1.866	-0.252	0.583 *	0.262	0.163	0.038	-0.026	0.048	0.088	79	0.2247
LTP358	-1.030 *	0.733 *	-0.600 *	0.681	0.111 *	-0.020	0.043	-0.039	-0.040 *	0.026 *	-0.049 *	-0.022 *	27997	0.1517
LTP359	-0.417 *	0.315	-0.483	-1.465 *	0.333 *	-0.010	0.074 *	0.150 *	-0.046 *	-0.006	-0.045	-0.033 *	18838	0.0771
Sugar-other	2.200 *	-0.396 *	-0.402 *	-0.294 *	0.041 *	0.025 *	0.031 *	0.024 *	-0.009 *	-0.008 *	-0.005 *	-0.005 *	40134	0.0787

Table 4: Estimated Parameters of Price Equation (4) – All India Rural : Households Below Poverty Line

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.367 *	-3.007 *	-0.902 *	-0.916	0.047 *	0.280	0.092 *	0.091	-0.005	0.010	0.004	0.010	5875	0.2591
Rice-other	1.285 *	-1.025 *	-0.888 *	-0.798 *	0.082 *	0.115 *	0.096 *	0.085 *	-0.015 *	-0.011 *	-0.005 *	-0.004 *	20809	0.0594
Rice- (s.t.)	1.255 *	-2.002 *	-0.798 *	-0.899 *	0.085 *	0.202 *	0.087 *	0.094 *	-0.013 *	-0.012 *	-0.003	-0.002	22671	0.0843
Wheat PDS	0.668	-1.311	-3.549	-1.888	0.068	0.152	0.394	0.217	0.004	-0.016	-0.005	0.012	144	0.1213
Wheat-other	1.084 *	-3.506	0.894	-2.006	0.040	0.359	-0.077	0.213	0.016	-0.016	-0.013	0.002	495	0.0519
Wheat-(s.t.)	1.109 *	-2.684 *	-0.868 *	-0.966 *	0.038 *	0.305 *	0.115 *	0.108 *	-0.011 *	-0.003	-0.001	0.002	15384	0.1261
Cereal subs.	0.230	2.325	2.140	-7.278 *	0.005	-0.177	-0.025	0.916 *	-0.013	0.053 *	0.035	0.022	1874	0.4314
Milk-liquid	1.423 *	-1.886 *	-0.665 *	-0.657 *	0.062 *	0.190 *	0.077 *	0.079 *	-0.017 *	-0.010 *	-0.007 *	-0.009 *	12052	0.0817
Goat meat	3.545 *	-0.751 *	-0.491 *	-0.663 *	0.044 *	0.096 *	0.062 *	0.063 *	-0.005	-0.005	-0.006 *	-0.005	3684	0.2414
Mutton	4.302 *	-1.915	-4.369 *	-1.330	-0.105	0.229 *	0.459 *	0.134	0.014	0.009	0.009	0.009	516	0.1618
Beef	1.177 *	-2.102 *	-3.681 *	-29.209	0.250 *	0.250 *	0.410 *	2.961	-0.031 *	-0.028 *	-0.050 *	-0.044 *	1634	0.1952
Pork	0.625	3.256	-1.950	5.097	0.443 *	-0.334	0.223 *	-0.549	-0.073 *	-0.065 *	-0.063 *	-0.061 *	1066	0.2582
Buffalo meat	2.203 *	-4.370 *	-5.296*	-4.282	0.028	0.509 *	0.596 *	0.466	-0.010	0.024	0.012	0.005	337	0.6172
Fish-fresh	1.679 *	0.495	-2.317 *	1.813 *	0.218 *	-0.075	0.244 *	-0.173 *	-0.024 *	-0.025 *	-0.024 *	-0.030 *	8574	0.133
Root vegetables	0.266 *	-1.267 *	0.173	0.751 *	0.147 *	0.175 *	-0.001	-0.053 *	-0.031 *	-0.011 *	-0.029 *	-0.023 *	24073	0.1602
Gourd (s.t.)	-0.446 *	-1.393 *	-0.163	-0.506	0.234 *	0.174 *	0.012	0.067	-0.040 *	-0.012 *	-0.035 *	-0.030 *	14799	0.0846
Sugar PDS	2.247 *	-0.294 *	-0.279 *	-0.178	-0.012 *	0.029 *	0.030 *	0.016	0.003 *	0.000	0.003 *	0.001	14483	0.0356
Sugar (s.t.)	1.962 *	-0.263	-0.192	-0.204	0.060 *	0.026	0.022 *	0.025	-0.012 *	-0.010 *	-0.008 *	-0.007 *	21038	0.0188
Salt (s.t.)	-0.436 *	1.139 *	-1.334 *	-0.408	0.140 *	-0.141 *	0.154 *	0.032	-0.020 *	-0.015 *	-0.022 *	-0.019 *	24572	0.2307
Spices (s.t.)	-3.592 *	-1.334 *	-1.542 *	-0.590 *	0.046 *	0.097 *	0.138 *	0.050	-0.010 *	-0.002	-0.010 *	-0.006 *	24354	0.1303
Tea leaf	-2.438 *	0.609 *	0.359 *	-0.476 *	-0.012	-0.073 *	-0.049 *	0.048 *	0.003	0.002	0.001	0.001	14705	0.0691
Coffee powder														
Arhar	2.529 *	-0.311 *	0.218	-0.358 *	0.037 *	0.050 *	-0.014	0.041 *	-0.015 *	-0.004 *	-0.008 *	-0.004 *	10035	0.1857

Note: * indicates statistical significance at 5% level.

Table 4: continued

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.052 *	0.640	-0.124	-0.427	0.110 *	-0.053	0.016	0.038	-0.023 *	-0.015 *	-0.022 *	-0.017 *	4274	0.0719
Moong	2.271 *	-1.306*	-0.740 *	-0.405	0.073 *	0.134 *	0.075 *	0.033	-0.017 *	-0.011 *	-0.013 *	-0.010 *	6828	0.0652
Masur	1.758 *	-0.047	0.219 *	0.911 *	0.133 *	0.015	-0.021	-0.104 *	-0.028 *	-0.020 *	-0.026 *	-0.020 *	10865	0.0975
Urd	1.990 *	-0.188	0.189	-0.355	0.087 *	0.035	-0.027	0.026	-0.018 *	-0.008 *	-0.012 *	-0.010 *	6752	0.1768
Khesari	2.145 *	5.064 *	-0.293	-0.399	0.040	-0.518 *	0.013	0.017	-0.013	-0.005	-0.006	0.002	2181	0.0438
Milk & milk products	-4.893 *	-6.388	-2.452	-6.929	1.389 *	0.492	0.204	0.616	-0.170 *	-0.132 *	-0.084 *	-0.135 *	1872	0.2004
Vanaspati	3.512 *	-5.691 *	0.034	-0.298	0.019	0.587 *	0.001	0.031	-0.004	0.002	-0.005	0.000	1874	0.0675
Mustard oil	3.245 *	-2.244	0.352 *	0.555 *	0.030 *	0.244 *	-0.027 *	-0.055 *	-0.011 *	-0.002	-0.009 *	-0.008 *	14819	0.1673
Groundnut oil	3.519 *	0.234	0.132	0.063	0.019 *	-0.032 *	-0.016	-0.008	-0.005 *	0.000	-0.005 *	-0.004	5304	0.0698
Coconut oil	3.982 *	-0.147	-0.148	-2.160	-0.053	0.013	0.009	0.223	0.015	0.010	0.014	-0.001	739	0.0227
Gingelly oil	3.912 *	-0.944 *	1.421	-1.397	-0.058 *	0.097 *	-0.154	0.125	0.000	0.018 *	0.005	0.014	506	0.1292
Linseed oil	3.324 *	-5.521	0.608 *	-0.431	0.009	0.585	-0.056 *	0.044	-0.009	-0.011	-0.006	-0.015 *	573	0.1457
Refined oil	3.536 *	-0.065	-0.478	-0.043	0.002	0.010	0.038	-0.006	0.010	-0.007	0.000	-0.005	632	0.0715
Palm oil	3.881 *	-2.483	-1.507	1.166	-0.064	0.254	0.149	-0.138	-0.015	0.021	-0.017	0.035	126	0.2337
Rapeseed oil	2.463 *	-293.043 *	-7.066 *	-1.930	0.159	30.295 *	0.699 *	0.191	0.004	-0.022	-0.051	-0.002	36	0.5758
LTP358	-0.422	-4.387 *	1.400	6.547 *	0.009	0.529 *	-0.158 *	-0.608 *	-0.014	0.039 *	-0.040 *	-0.027 *	9791	0.2025
LTP359	-1.627 *	1.857	-0.819	-3.920 *	0.474	-0.153	0.108	0.392 *	-0.052 *	0.011	-0.037 *	-0.034 *	5212	0.0934
Sugar-other	2.268 *	-0.987 *	-0.314 *	-0.933 *	0.022 *	0.089 *	0.027 *	0.091 *	-0.007 *	-0.007 *	-0.001	-0.001	19371	0.0393

Table 5: Estimated Parameters of Price Equation (4) – All India Urban : All Households

Item	$\hat{\alpha}^*_j$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.369 *	-0.853 *	0.208	0.073	0.045 *	0.062 *	-0.011	0.001	-0.002	0.010 *	-0.004	0.001	17869	0.2716
Rice-other	0.668 *	0.582 *	0.046	0.063	0.210 *	-0.059 *	-0.007 *	-0.004	-0.036 *	-0.026 *	-0.037 *	-0.035 *	55068	0.2566
Rice- (s.t.)	0.781 *	-0.092 *	-0.193 *	-0.405 *	0.185 *	0.000	0.018 *	0.041 *	-0.028 *	-0.024 *	-0.030 *	-0.028 *	59391	0.2595
Wheat PDS	0.870 *	0.787	0.045	-3.041 *	0.103 *	-0.092	-0.013	0.311 *	-0.019	-0.035 *	-0.016	-0.040 *	862	0.183
Wheat-other	1.043 *	-0.841 *	-0.911 *	0.228	0.057 *	0.095 *	0.110 *	-0.006	-0.006	-0.014	-0.004	-0.001	1594	0.2086
Wheat-(s.t.)	0.972 *	-0.326 *	-0.577 *	-0.619 *	0.091 *	0.056 *	0.077 *	0.064 *	-0.024 *	-0.027 *	-0.015 *	-0.010 *	54842	0.2398
Cereal subs.	2.119 *	-3.203 *	-0.304	0.425	0.069 *	0.169 *	0.036	-0.030	0.001	-0.015 *	-0.011	-0.003	7126	0.7211
Milk-liquid	1.502 *	-0.281 *	-0.616 *	-0.183 *	0.078 *	0.016 *	0.066 *	0.024 *	-0.009 *	-0.012 *	-0.011 *	-0.007 *	52370	0.188
Goat meat	3.342 *	-0.983	-2.651 *	-0.116	0.034	0.108	0.259 *	0.015	-0.036 *	0.025	0.029 *	0.026 *	113	0.5604
Mutton	3.664 *	0.151 *	-0.334 *	0.009	0.027 *	0.011 *	0.050 *	-0.002	-0.001	-0.003 *	-0.006 *	-0.007 *	17690	0.4311
Beef	3.651 *	0.201	-0.565 *	-2.843 *	0.023	0.009	0.070 *	0.259 *	-0.008	-0.003	-0.021 *	-0.011 *	4834	0.1929
Pork	2.554 *	-0.263	-1.343 *	-0.868	0.200 *	-0.040	0.064 *	0.005	-0.049 *	-0.031 *	-0.055 *	-0.046 *	4496	0.6118
Buffalo meat	2.231 *	1.091 *	1.933 *	2.113 *	0.259 *	-0.149 *	-0.188 *	-0.240 *	-0.073 *	-0.055 *	-0.075 *	-0.048 *	2615	0.2199
Fish-fresh	2.081 *	0.872 *	-2.305 *	-1.850 *	0.076 *	-0.022	0.245 *	0.189 *	-0.005	-0.014 *	-0.010 *	-0.006	1977	0.6106
Root vegetables	2.213 *	-0.376 *	-0.783 *	0.317	0.214 *	-0.028	0.052 *	-0.069 *	-0.027 *	-0.032 *	-0.032 *	-0.024 *	20577	0.3202
Gourd (s.t.)	0.361 *	0.993 *	0.180 *	0.635 *	0.152 *	-0.069 *	-0.007	-0.048 *	-0.034 *	-0.022 *	-0.034 *	-0.030 *	61007	0.1349
Sugar PDS	-0.022	0.653 *	-1.373 *	0.373 *	0.216 *	-0.053 *	0.140 *	-0.017	-0.034 *	-0.032 *	-0.042 *	-0.036 *	44276	0.146
Sugar (s.t.)	2.198 *	-0.137 *	-0.232 *	-0.246 *	0.039 *	0.005	0.021 *	0.024 *	-0.012 *	-0.016 *	-0.010 *	-0.010 *	60269	0.0866
Salt (s.t.)	-0.934 *	0.106	-0.025	-0.120	0.275 *	-0.060 *	0.001	-0.017 *	-0.043 *	-0.042 *	-0.050 *	-0.045 *	61206	0.369
Spices (s.t.)	-3.757 *	-0.277 *	-1.041 *	-0.230 *	0.084 *	-0.009	0.092 *	0.013 *	-0.019 *	-0.017 *	-0.022 *	-0.019 *	61164	0.2309
Tea leaf	-2.698 *	-0.041	-0.787 *	-0.035	0.031 *	-0.003	0.069 *	0.003	-0.005 *	-0.006 *	-0.003 *	-0.002	54052	0.0524
Coffee powder	-1.659 *	-1.869 *	-4.178 *	-0.816	0.039	0.062 *	0.325 *	0.081	-0.004	-0.019 *	-0.012	-0.008	8687	0.4717
Arhar	2.631 *	0.127 *	-0.306 *	0.155 *	0.028 *	0.001	0.039 *	-0.010 *	-0.006 *	-0.005 *	-0.006 *	-0.005 *	42924	0.1733

Note: * indicates statistical significance at 5% level.

Table 5: continued

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.580 *	0.247 *	-0.216 *	0.012	0.027 *	-0.018 *	0.023 *	-0.001	-0.005 *	-0.004 *	-0.007*	-0.007 *	23537	0.0336
Moong	2.555 *	0.055	-0.198 *	-0.124 *	0.029 *	-0.004	0.024 *	0.007	-0.004 *	-0.003 *	-0.006 *	-0.005 *	37006	0.0971
Masur	2.315 *	-0.226 *	0.063	-0.094	0.049 *	0.027 *	-0.007 *	0.000	-0.012 *	-0.006 *	-0.014 *	-0.013 *	24764	0.0665
Urd	2.437 *	0.092 *	-0.711 *	-0.354 *	0.025 *	-0.001	0.068 *	0.031 *	-0.004 *	0.000	-0.003 *	-0.004 *	25249	0.0807
Khesari	1.960 *	-1.381 *	-1.107 *	-1.602 *	0.082 *	0.133 *	0.089 *	0.138 *	-0.017	-0.012	-0.001	0.004	622	0.2737
Milk & milk products	3.102 *	-7.535 *	-1.212 *	-4.966 *	0.140 *	0.636 *	0.109 *	0.422 *	-0.017 *	0.007	0.022 *	0.011	22530	0.1419
Vanaspati	3.595 *	-0.013	-0.250 *	-0.081	0.006 *	0.015 *	0.033 *	0.012 *	-0.003 *	0.001	-0.003 *	0.000	15180	0.2026
Mustard oil	3.194 *	-0.154	0.349 *	0.215 *	0.037 *	0.033	-0.025 *	-0.024 *	-0.011 *	-0.008 *	-0.008 *	-0.006 *	25093	0.1153
Groundnut oil	3.455 *	0.162 *	-0.254 *	0.154 *	0.027 *	-0.021 *	0.024 *	-0.015 *	-0.007 *	-0.005	-0.007 *	-0.004 *	24189	0.1274
Coconut oil	3.958 *	-0.382 *	-1.851 *	-1.647 *	-0.025	0.026	0.169 *	0.149 *	0.004	0.002	0.006	0.005	3582	0.0507
Gingelly oil	3.603 *	-0.197	-1.783 *	-2.208 *	-0.006	0.023 *	0.180 *	0.208 *	0.004	0.000	0.008 *	0.000	2904	0.0915
Linseed oil	2.789 *	-0.102	0.056	1.275	0.120 *	0.011	-0.021	-0.142 *	-0.021 *	-0.020 *	-0.027 *	-0.017	456	0.3625
Refined oil	3.315 *	-0.011	-0.526 *	-0.831 *	0.047 *	0.007	0.057 *	0.062 *	-0.009 *	0.001	-0.007 *	-0.002	5993	0.466
Palm oil	3.641 *	-0.797 *	-1.962 *	-0.425	-0.011	0.064	0.176 *	0.019	-0.002	0.006	-0.002	-0.003	822	0.2155
Rapeseed oil	3.596 *	-3.698 *	-0.952	-0.335	-0.007	0.324 *	0.076	0.024	-0.028	0.030	0.027	-0.022	152	0.1207
LTP358	-1.874 *	2.956 *	-0.604 *	1.229 *	0.240 *	-0.232 *	0.052 *	-0.115 *	-0.050 *	0.004	-0.057 *	-0.054 *	49477	0.1563
LTP359	0.406 *	-0.110	-0.332 *	-0.473 *	0.256 *	0.025	0.068 *	0.065 *	-0.037 *	-0.039 *	-0.050 *	-0.038 *	36466	0.1488
Sugar-other	2.222 *	-0.145 *	-0.165 *	-0.062	0.041 *	0.005	0.014 *	0.006	-0.008 *	-0.011 *	-0.007 *	-0.007 *	59995	0.0635

Table 6: Estimated Parameters of Price Equation (4) – All India Urban : Households Above Poverty Line

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.291 *	-0.525 *	0.294 *	-0.070	0.057 *	0.033 *	-0.019	0.015	-0.003	0.004	-0.004	-0.001	12639	0.2113
Rice-other	0.654 *	0.721 *	-0.065	-0.006	0.214 *	-0.072 *	0.002	0.001	-0.039 *	-0.027 *	-0.040 *	-0.039 *	42787	0.2092
Rice- (s.t.)	0.736 *	0.161 *	-0.289 *	-0.482 *	0.193 *	-0.023 *	0.027 *	0.048 *	-0.031 *	-0.026 *	-0.035 *	-0.033 *	45746	0.2042
Wheat PDS	1.125 *	0.302	-0.167	-6.654 *	0.073	-0.053	0.001	0.632 *	-0.014	-0.020	-0.017	-0.041 *	647	0.2007
Wheat-other	1.058 *	-0.511	-1.093 *	0.662	0.055 *	0.067 *	0.126 *	-0.045	-0.006	-0.017	-0.008	0.006	1287	0.1998
Wheat-(s.t.)	1.077 *	-0.408 *	-0.732 *	-0.681 *	0.077 *	0.063 *	0.091 *	0.069 *	-0.023 *	-0.026 *	-0.012 *	-0.005 *	43011	0.2236
Cereal subs.	2.230 *	-2.855 *	-0.607	0.105	0.053	0.139 *	0.063	-0.002	0.007	-0.014	-0.005	-0.004	5482	0.6675
Milk-liquid	1.537 *	-0.124 *	-0.661 *	-0.025	0.073 *	0.002	0.069 *	0.009	-0.008 *	-0.013 *	-0.010 *	-0.007 *	41212	0.1729
Goat meat	3.590 *	-1.990	-4.300 *	-0.402	-0.006	0.196	0.408 *	0.041	-0.025	0.044 *	0.029	0.069 *	99	0.6339
Mutton	3.678 *	0.245 *	-0.050	0.185 *	0.025 *	0.003	0.025 *	-0.017 *	-0.001	-0.003	-0.006 *	-0.007 *	14120	0.4309
Beef	3.728 *	0.127	-0.454	-3.245 *	0.013	0.015	0.060 *	0.295 *	-0.004	-0.006	-0.012 *	-0.006	3744	0.1872
Pork	3.014 *	-0.496	-0.407	-0.966	0.136 *	-0.019	-0.019	0.014	-0.047 *	-0.020 *	-0.048 *	-0.022 *	3406	0.6144
Buffalo meat	3.060 *	-0.090	1.345 *	1.252	0.137 *	-0.043	-0.135 *	-0.161 *	-0.051 *	-0.017 *	-0.044 *	-0.017 *	2460	0.208
Fish-fresh	2.199 *	0.700 *	2.248 *	-0.253	0.062 *	-0.006	-0.168 *	0.037	0.002	-0.028 *	-0.005	-0.011	1101	0.6089
Root vegetables	2.643 *	-1.140 *	-1.050 *	-0.585 *	0.158 *	0.038 *	0.073 *	0.009	-0.020 *	-0.021 *	-0.019 *	-0.012 *	16608	0.3048
Gourd (s.t.)	0.553 *	0.687 *	-0.009	0.616 *	0.126 *	-0.043 *	0.010	-0.047 *	-0.032 *	-0.018 *	-0.028 *	-0.022 *	46625	0.1007
Sugar PDS	0.274 *	0.402 *	-1.878 *	0.471 *	0.176 *	-0.031 *	0.185 *	-0.026	-0.028 *	-0.029 *	-0.033 *	-0.030 *	34944	0.1145
Sugar (s.t.)	2.361 *	-0.337 *	-0.440 *	-0.389 *	0.017 *	0.023 *	0.039 *	0.037 *	-0.008 *	-0.012 *	-0.006 *	-0.005 *	46476	0.0702
Salt (s.t.)	-0.403 *	-0.808 *	-0.443 *	-1.140 *	0.203 *	0.021 *	0.038 *	0.073 *	-0.032 *	-0.029 *	-0.033 *	-0.032 *	46743	0.3479
Spices (s.t.)	-3.614 *	-0.351 *	-0.982 *	-0.349 *	0.065 *	-0.003	0.087 *	0.024 *	-0.016 *	-0.015 *	-0.020 *	-0.016 *	46719	0.2119
Tea leaf	-2.711 *	0.073	-1.031 *	-0.001	0.032 *	-0.013 *	0.091 *	0.000	-0.006 *	-0.006 *	-0.005 *	-0.002	42358	0.0547
Coffee powder	-1.556 *	-1.990 *	-4.242 *	-0.946	0.025	0.072 *	0.331 *	0.092	0.000	-0.016	-0.015	-0.002	7365	0.4753
Arhar	2.641 *	0.142 *	-0.293 *	0.235 *	0.026 *	-0.001	0.037 *	-0.017 *	-0.006 *	-0.005 *	-0.006 *	-0.005 *	32128	0.1746

Note: * indicates statistical significance at 5% level.

Table 6: continued

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.648 *	0.173 *	-0.284*	0.110	0.017 *	-0.011	0.029 *	-0.010	-0.002	-0.001	-0.004 *	-0.006 *	19100	0.0251
Moong	2.612 *	0.020	-0.059	-0.096	0.021 *	-0.001	0.012 *	0.004	-0.002 *	-0.002	-0.004*	-0.005 *	29864	0.0863
Masur	2.428 *	-0.324 *	-0.078	-0.055	0.034 *	0.035 *	0.005	-0.004	-0.011 *	-0.005 *	-0.010 *	-0.010 *	19956	0.0413
Urd	2.481 *	0.087	-0.882 *	-0.112	0.020 *	-0.001	0.083 *	0.010	-0.002	-0.002	-0.001	-0.003	20304	0.07
Khesari	1.870 *	-1.756	-0.338	-1.152	0.089	0.169	0.022	0.100	-0.026	-0.004	0.011	0.016	296	0.2041
Milk & milk products	3.262 *	-5.838 *	-0.181	-3.785 *	0.120 *	0.488 *	0.019	0.316 *	-0.018 *	0.005	0.015 *	0.026 *	20144	0.0926
Vanaspati	3.592 *	0.000	-0.177 *	-0.020	0.007 *	0.014	0.026 *	0.006	-0.004 *	0.001	-0.004 *	0.000	12816	0.2091
Mustard oil	3.274 *	-0.418	0.189 *	0.249 *	0.026 *	0.057	-0.011 *	-0.027 *	-0.009 *	-0.006 *	-0.004 *	-0.003 *	20173	0.0774
Groundnut oil	3.429 *	0.130 *	-0.360 *	0.135 *	0.031 *	-0.019 *	0.034 *	-0.013 *	-0.008 *	-0.006 *	-0.009 *	-0.004 *	17597	0.1409
Coconut oil	3.868 *	-0.340	-1.972 *	-2.329 *	-0.019	0.026	0.183 *	0.213 *	0.003	0.005	0.003	0.005	2669	0.0617
Gingelly oil	3.618 *	-0.137	-0.781 *	-3.681 *	-0.006	0.017	0.095 *	0.339 *	0.003	-0.003	0.005	-0.001	2114	0.1039
Linseed oil	2.503 *	-0.016	-0.127	2.189	0.159 *	0.002	-0.003	-0.227	-0.020	-0.025	-0.034	-0.014	193	0.2751
Refined oil	3.310 *	0.063	-0.455 *	-1.276 *	0.048 *	0.001	0.051 *	0.102 *	-0.008 *	0.000	-0.005	-0.003	5412	0.3585
Palm oil	3.532 *	-0.662	-3.165 *	-0.596	0.005	0.051	0.281 *	0.035	-0.008	0.005	0.002	-0.009	635	0.2289
Rapeseed oil	3.796 *	-8.697 *	-1.324	-1.084	-0.027	0.775 *	0.108	0.086	-0.041	0.016	-0.007	0.033	131	0.1269
LTP358	-1.833 *	2.324 *	-1.104 *	0.740 *	0.232 *	-0.176 *	0.096 *	-0.072 *	-0.042 *	0.002	-0.044 *	-0.045 *	40178	0.1426
LTP359	0.866 *	-0.292	-0.293	0.143	0.195 *	0.041 *	0.065 *	0.010	-0.035 *	-0.029 *	-0.034 *	-0.027 *	31152	0.1218
Sugar-other	2.389 *	-0.275 *	-0.311 *	-0.200 *	0.017 *	0.017 *	0.027 *	0.019 *	-0.004 *	-0.006 *	-0.002 *	-0.002	46345	0.049

Table 7: Estimated Parameters of Price Equation (4) – All India Urban : Households Below Poverty Line

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Rice PDS	1.540 *	-1.511 *	-0.711 *	-0.094	0.023	0.124 *	0.079 *	0.015	-0.001	0.019 *	-0.003	0.004	5229	0.3535
Rice-other	1.131 *	-0.364 *	-0.198	-0.462 *	0.124 *	0.038 *	0.022	0.052 *	-0.016 *	-0.009 *	-0.015 *	-0.013 *	12280	0.0774
Rice- (s.t.)	1.105 *	-0.751 *	-0.048	-0.588 *	0.125 *	0.066 *	0.007	0.062 *	-0.016 *	-0.009 *	-0.012 *	-0.012 *	13644	0.1427
Wheat PDS	1.308	-0.081	-3.669	-7.282 *	-0.021	0.030	0.391	0.771 *	0.001	-0.035	0.007	-0.003	214	0.2104
Wheat-other	0.985	1.597	0.366	-1.769	0.064	-0.152	-0.016	0.189	-0.008	-0.011	0.008	-0.014	306	0.1133
Wheat-(s.t.)	1.260 *	0.247	-0.062	-1.551 *	0.033 *	0.002	0.029	0.161 *	-0.009 *	-0.012 *	-0.002	-0.001	11830	0.1644
Cereal subs.	1.937 *	-1.006	-2.077 *	-0.316	0.094	-0.053	0.217 *	0.048	-0.012	-0.013	-0.020	0.000	1643	0.8619
Milk-liquid	1.660 *	-1.973 *	-1.587 *	-0.719 *	0.047 *	0.185 *	0.165 *	0.078 *	-0.006 *	-0.002	-0.002	0.001	11157	0.1364
Goat meat														
Mutton	3.865 *	-1.354 *	-0.673 *	-0.960 *	-0.008	0.162 *	0.081 *	0.094 *	0.000	0.004	0.004	0.004	3569	0.3851
Beef	3.743 *	-0.381	-2.658	-1.002	-0.005	0.075	0.282 *	0.087	-0.009	0.013	-0.027 *	-0.010	1089	0.2041
Pork	1.501 *	-0.299	1.906 *	-4.214	0.218 *	0.050	-0.188 *	0.421	-0.026	-0.026	-0.039 *	-0.063 *	1089	0.1237
Buffalo meat	6.876 *	-7.486	-7.554	-4.405	-0.625	0.784	0.818	0.494	0.161 *	0.016	0.055	0.095	154	0.1626
Fish-fresh	1.913 *	-0.895	-1.912 *	-4.210 *	0.097 *	0.157 *	0.201 *	0.425 *	-0.014 *	0.003	-0.015 *	0.000	875	0.6194
Root vegetables	1.431 *	2.587 *	-0.805	0.408	0.288 *	-0.295 *	0.077	-0.048	-0.024 *	-0.040 *	-0.038 *	-0.031 *	3968	0.1723
Gourd (s.t.)	0.682 *	-0.538 *	-0.955 *	-1.062 *	0.082 *	0.092 *	0.114 *	0.128 *	-0.017 *	-0.004	-0.016 *	-0.017 *	14381	0.1967
Sugar PDS	-0.447 *	-0.244	-3.399 *	-0.608	0.263 *	0.044	0.354 *	0.086	-0.040 *	-0.020 *	-0.043 *	-0.032 *	9331	0.1167
Sugar (s.t.)	2.138 *	-0.200	-0.521 *	-0.353 *	0.037 *	0.016	0.055 *	0.039 *	-0.011 *	-0.011 *	-0.003	-0.006 *	13792	0.0497
Salt (s.t.)	-0.169	-0.039	-1.882 *	-1.536 *	0.103 *	-0.025	0.205 *	0.146 *	-0.005	0.001	-0.008 *	0.001	14462	0.2137
Spices (s.t.)	-3.640 *	-0.601 *	-1.867 *	-1.194 *	0.050 *	0.028	0.178 *	0.115 *	-0.013 *	-0.003	-0.008 *	-0.006	14444	0.1701
Tea leaf	-2.669 *	0.721 *	-0.314	0.026	0.026 *	-0.081 *	0.024	-0.003	-0.003	-0.009 *	0.000	-0.002	11693	0.035
Coffee powder														
Arhar	2.573 *	-0.237 *	-0.214	-0.409 *	0.037 *	0.037 *	0.029 *	0.046 *	-0.008 *	-0.007 *	-0.006 *	-0.004 *	10795	0.138

Note: * indicates statistical significance at 5% level.

Table 7: continued

Item	$\hat{\alpha}_j^*$	$\hat{\phi}_{j1}$	$\hat{\phi}_{j2}$	$\hat{\phi}_{j3}$	$\hat{\lambda}_j$	$\hat{\eta}_{j1}$	$\hat{\eta}_{j2}$	$\hat{\eta}_{j3}$	$\hat{\delta}_{j1}$	$\hat{\delta}_{j2}$	$\hat{\delta}_{j3}$	$\hat{\delta}_{j4}$	Sample size	R^2
Grams- split	2.630 *	-0.798 *	-0.339	-1.000 *	0.016	0.090 *	0.037	0.101 *	-0.007 *	-0.004	-0.005	-0.001	4436	0.0565
Moong	2.565 *	-0.809 *	-0.335 *	-0.285	0.023 *	0.084 *	0.036 *	0.024	-0.006 *	0.001	-0.004	0.003	7141	0.0639
Masur	2.387 *	-0.087	-0.551 *	-0.299	0.026 *	0.016	0.059*	0.024	-0.004	0.004	-0.008	-0.004	4807	0.0797
Urd	2.389 *	-0.417	-1.490 *	-0.897 *	0.028 *	0.051 *	0.149 *	0.085 *	-0.005	0.009 *	-0.002	-0.002	4944	0.1069
Khesari	2.350 *	-2.246	-0.723	-1.565	0.038	0.211	0.035	0.122	0.006	-0.014	-0.003	0.006	325	0.1701
Milk & milk products	1.425	-13.557 *	13.390 *	-20.104 *	0.371 *	1.215 *	-1.387 *	1.911 *	-0.046	0.020	0.054	-0.031	2385	0.2064
Vanaspati	3.654 *	-0.800	-0.456 *	-0.412	-0.004	0.093	0.052 *	0.044	0.000	0.003	-0.001	0.000	2363	0.1242
Mustard oil	3.348 *	0.173	-0.293 *	0.036	0.007	0.003	0.042 *	-0.004	-0.002	-0.001	-0.005	-0.001	4919	0.3926
Groundnut oil	3.479 *	0.151	0.226	0.154	0.022 *	-0.019	-0.022	-0.014	-0.005 *	-0.004 *	-0.004 *	-0.005 *	6591	0.0717
Coconut oil	4.485 *	-0.485	-0.379	0.546	-0.015	-0.020	-0.035	-0.121	0.000	-0.005	0.005	-0.001	912	0.0605
Gingelly oil	3.478 *	0.325	-2.174 *	-0.233	0.010	-0.029	0.211	0.015	0.005	0.001	0.011	-0.001	789	0.0544
Linseed oil	3.482 *	-16.283 *	-0.164	-0.864	0.003	1.600 *	0.002	0.076	-0.002	0.000	-0.004	-0.001	262	0.3679
Refined oil	3.400 *	-1.103	3.220 *	-0.234	0.037	0.108	-0.330 *	0.002	-0.008	0.002	-0.013	-0.001	580	0.4366
Palm oil	4.301 *	-2.608 *	-0.715	-0.594	-0.117	0.243 *	0.054	0.034	0.033	0.016	0.013	0.011	186	0.2081
Rapeseed oil	3.667	11.342	-9.842	-64.296	-0.080	-1.099	1.016	6.452	-0.381	0.351	0.115	-0.076	20	0.5731
LTP358	-0.703 *	-0.315	-4.783 *	0.093	0.053	0.103	0.481 *	0.007	-0.039 *	0.042 *	-0.056 *	-0.043 *	9298	0.205
LTP359	0.929 *	-1.545	-4.164 *	-6.374 *	0.114 *	0.185	0.460 *	0.665 *	0.016	-0.002	-0.011	0.016	5313	0.0874
Sugar-other	2.053 *	-0.472 *	-0.443 *	-0.129	0.059 *	0.042 *	0.046 *	0.017	-0.011 *	-0.010 *	-0.005 *	-0.007 *	13649	0.0528

Table 8: Estimated ∏ Coefficients for Different Regions and Household Groups: Rural and Urban India

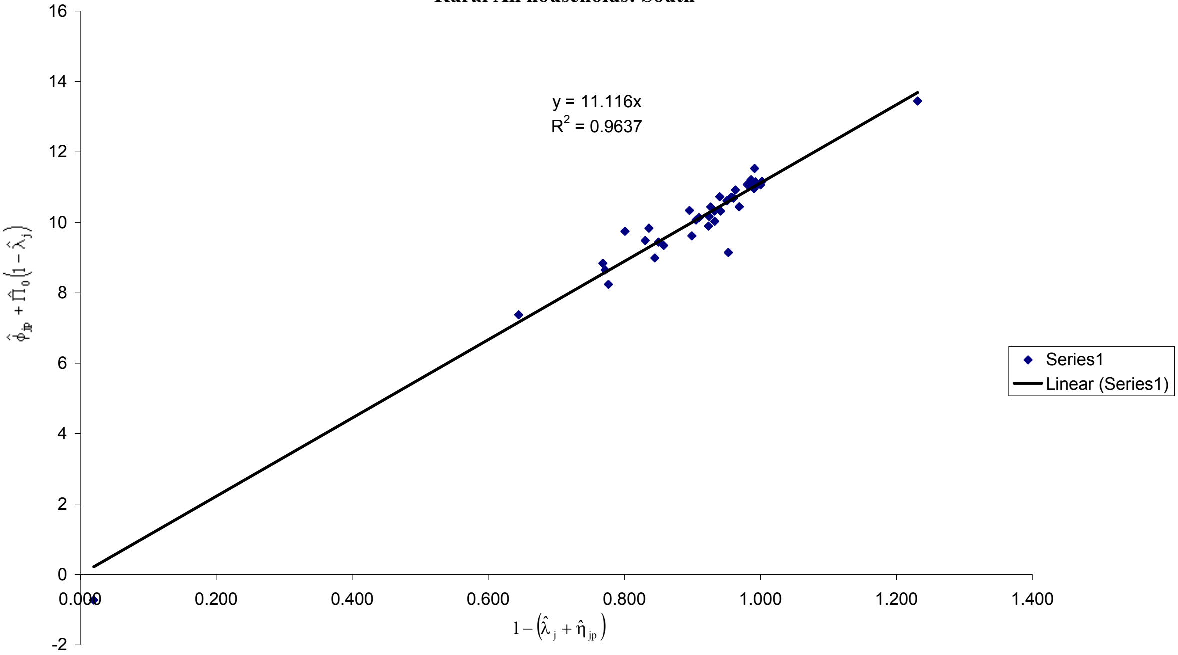
RURAL INDIA										
Household Group	No. of observations	OLS coefficients				R^2	Jackknife coefficients			
		North	South	East	West		North	South	East	West
		$(\hat{\pi}_0)$	$(\hat{\pi}_1)$	$(\hat{\pi}_2)$	$(\hat{\pi}_3)$		$(\hat{\pi}_0)$	$(\hat{\pi}_1)$	$(\hat{\pi}_2)$	$(\hat{\pi}_3)$
All households	123	11.125 (0.229)	11.115 (0.238)	11.216 (0.251)	11.121 (0.242)	0.9489	11.208 (0.522)	11.199 (0.520)	11.302 (0.545)	11.208 (0.526)
Households above poverty line	123	11.277 (0.181)	11.251 (0.190)	11.358 (0.196)	11.275 (0.195)	0.9683	11.316 (0.352)	11.287 (0.352)	11.397 (0.364)	11.315 (0.359)
Households below poverty line	120	9.598 (0.051)	9.677 (0.012)	9.694 (0.083)	9.687 (0.070)	0.9998	9.502 (0.128)	9.512 (0.167)	9.593 (0.152)	9.623 (0.137)
URBAN INDIA										
Household Group	No. of observations	OLS coefficients				R^2	Jackknife coefficients			
		North	South	East	West		North	South	East	West
		$(\hat{\pi}_0)$	$(\hat{\pi}_1)$	$(\hat{\pi}_2)$	$(\hat{\pi}_3)$		$(\hat{\pi}_0)$	$(\hat{\pi}_1)$	$(\hat{\pi}_2)$	$(\hat{\pi}_3)$
All households	123	11.139 (0.227)	11.068 (0.235)	11.179 (0.248)	11.099 (0.238)	0.9508	11.194 (0.350)	11.123 (0.351)	11.237 (0.369)	11.155 (0.364)
Households above poverty line	123	11.163 (0.188)	11.085 (0.199)	11.205 (0.206)	11.114 (0.200)	0.9646	11.152 (0.219)	11.073 (0.224)	11.193 (0.233)	11.102 (0.231)
Households below poverty line	117	9.982 (0.052)	10.083 (0.073)	9.976 (0.077)	9.990 (0.047)	0.9979	9.936 (0.091)	9.998 (0.119)	9.925 (0.108)	9.924 (0.098)

∗ Figures in parentheses are the standard errors.

Table 9: Estimated Price Index Numbers for Different Regions and Household Groups: Rural and Urban India (Base: North =1.0)

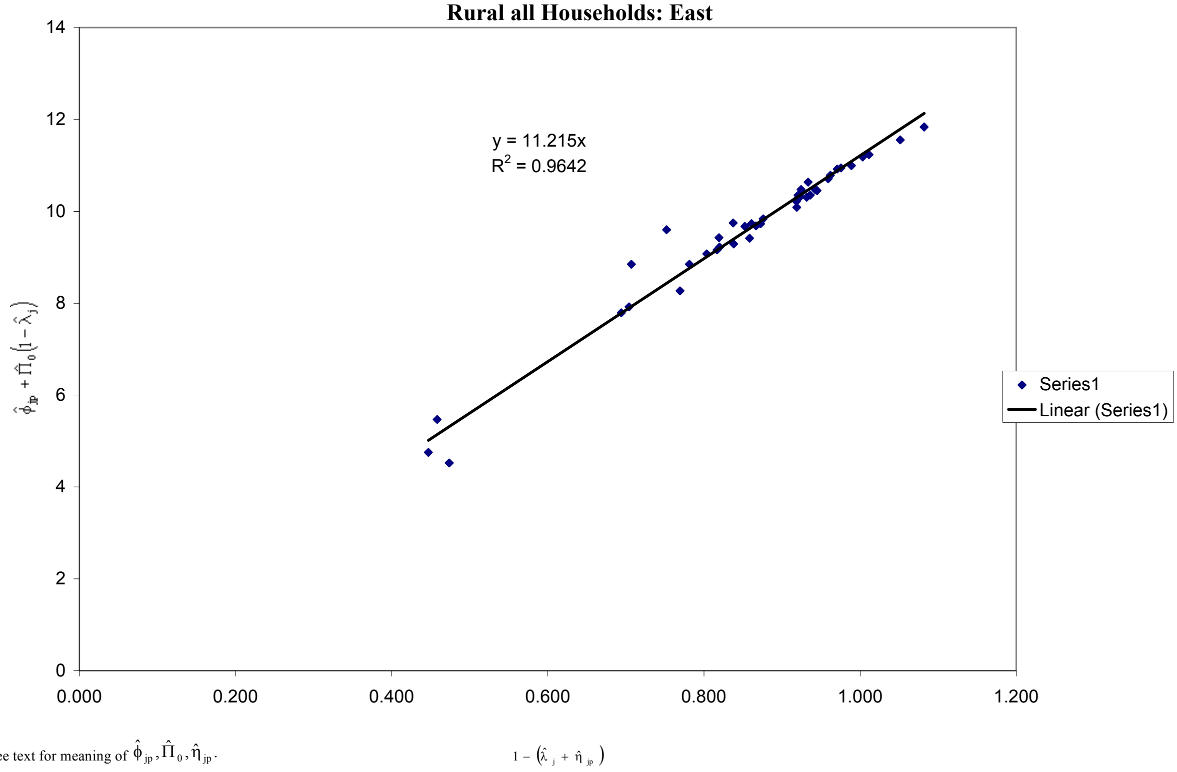
Household Group	Rural India			Urban India		
	South	East	West	South	East	West
	$(e^{(\hat{\pi}_1-\hat{\pi}_0)})$	$(e^{(\hat{\pi}_2-\hat{\pi}_0)})$	$(e^{(\hat{\pi}_3-\hat{\pi}_0)})$	$(e^{(\hat{\pi}_1-\hat{\pi}_0)})$	$(e^{(\hat{\pi}_2-\hat{\pi}_0)})$	$(e^{(\hat{\pi}_3-\hat{\pi}_0)})$
All households	0.990	1.095	0.996	0.931	1.041	0.961
Households above poverty line	0.974	1.084	0.998	0.925	1.043	0.952
Households below poverty line	1.082	1.101	1.092	1.058	0.994	1.009

Figure 1: Graph Showing Relationship Between Slope and Intercept Parameters:
Rural All households: South



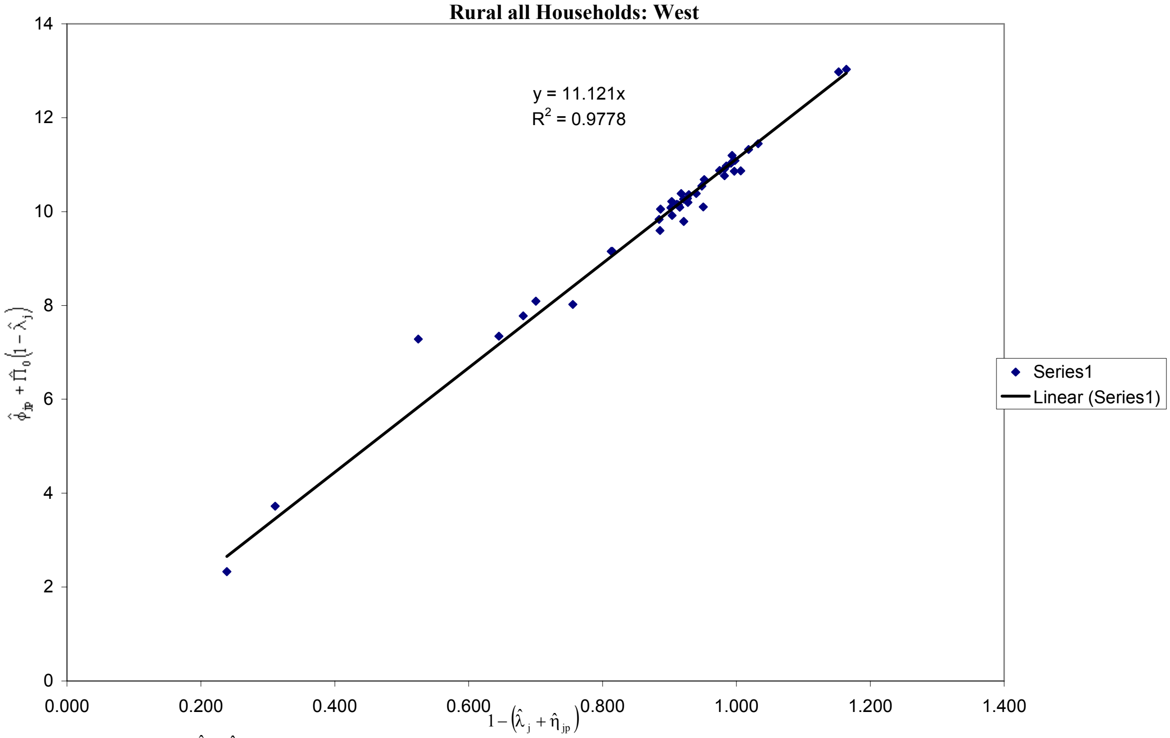
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 2: Graph Showing Relationship Between Slope and Intercept Parameters:
Rural all Households: East



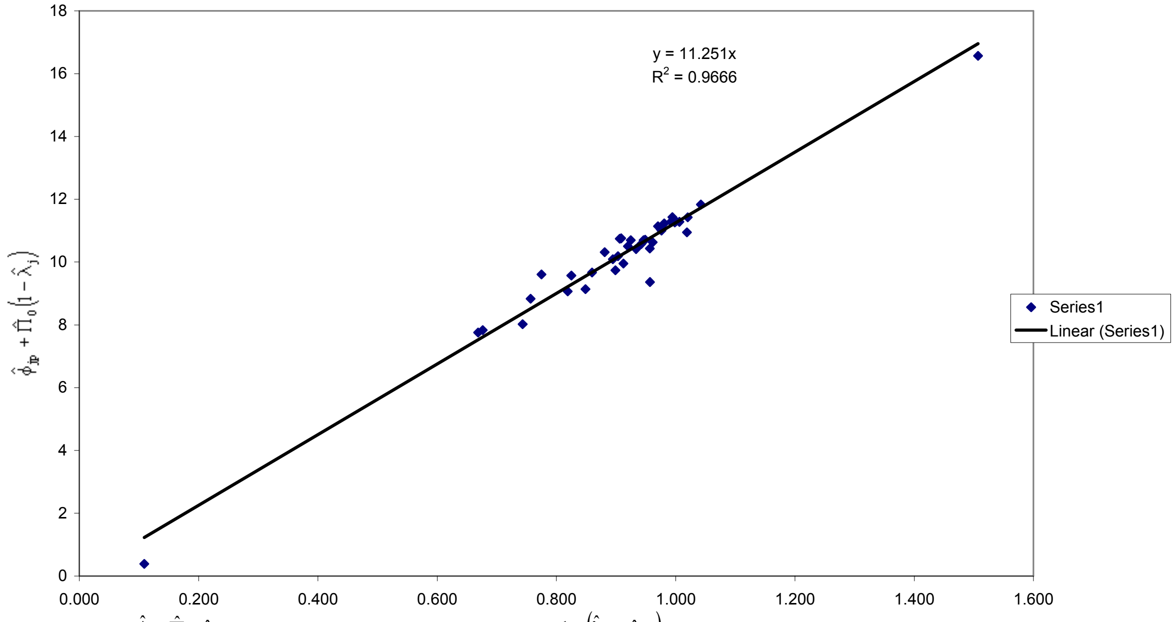
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 3: Graph Showing Relationship Between Slope and Intercept Parameters: Rural all Households: West



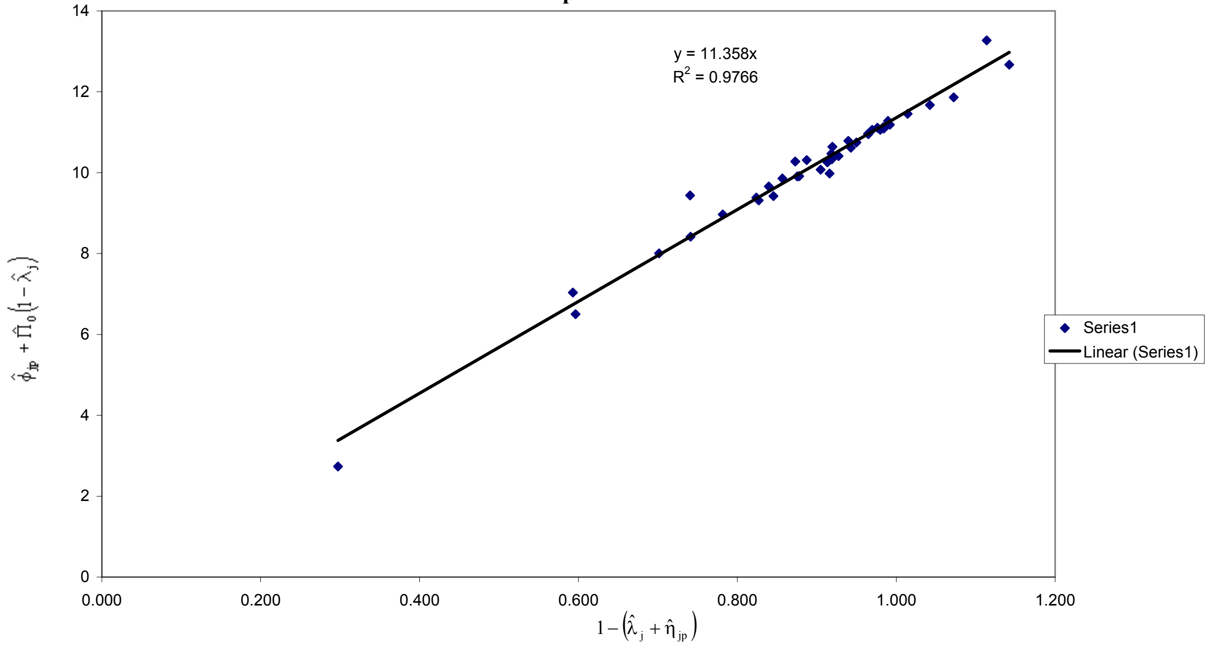
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 4: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Non-poor Households: South



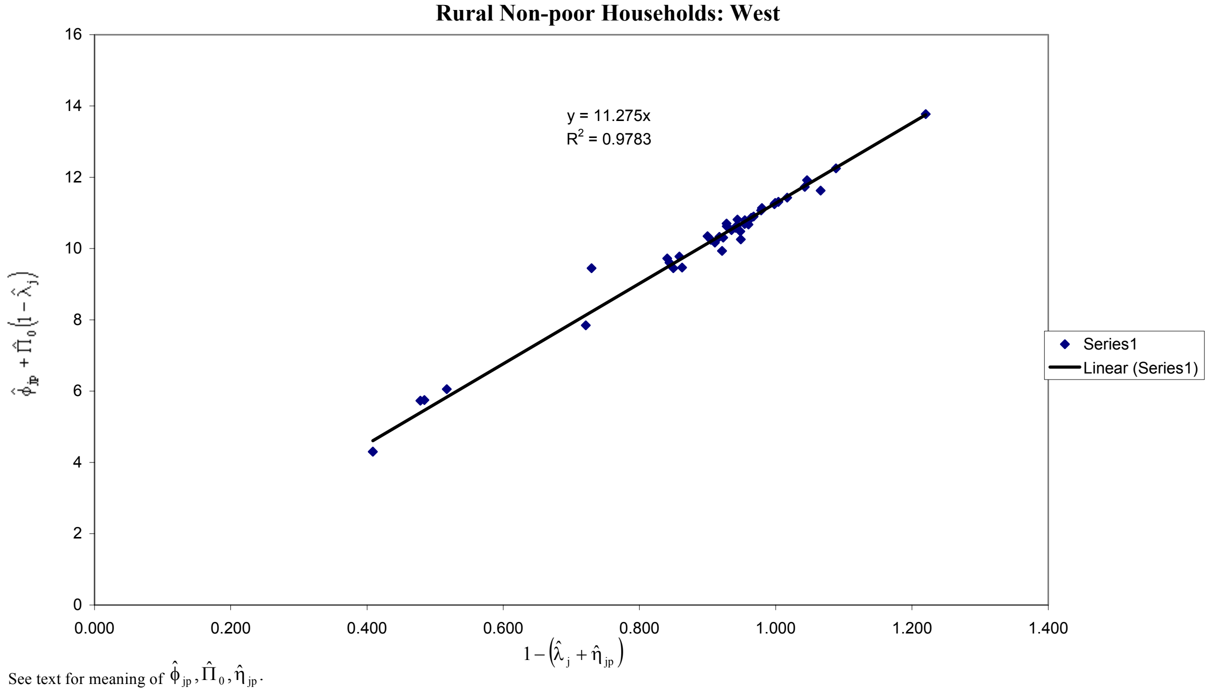
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 5: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Non-poor Households: East



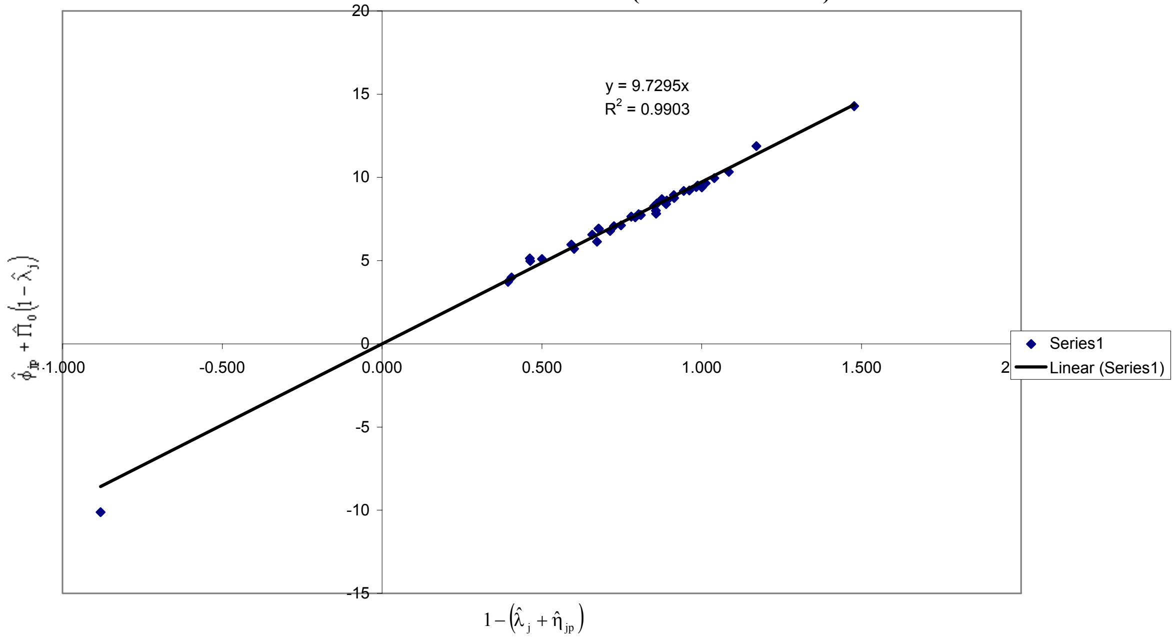
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 6: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Non-poor Households: West



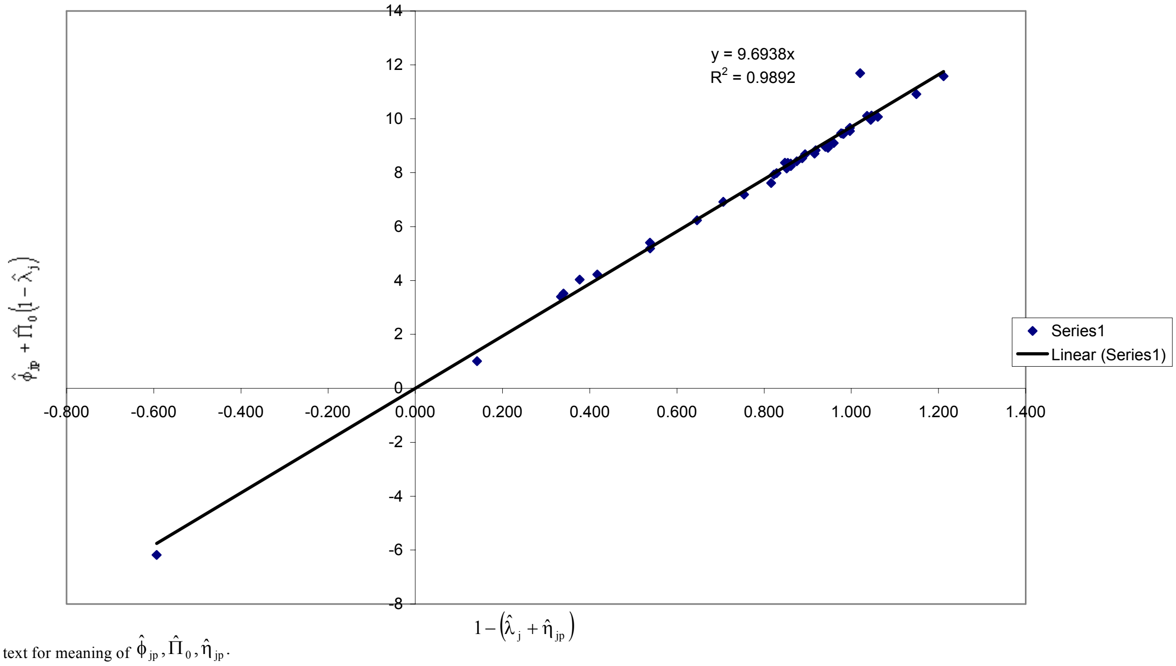
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 7: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Poor Households: South (outlier 262 deleted)



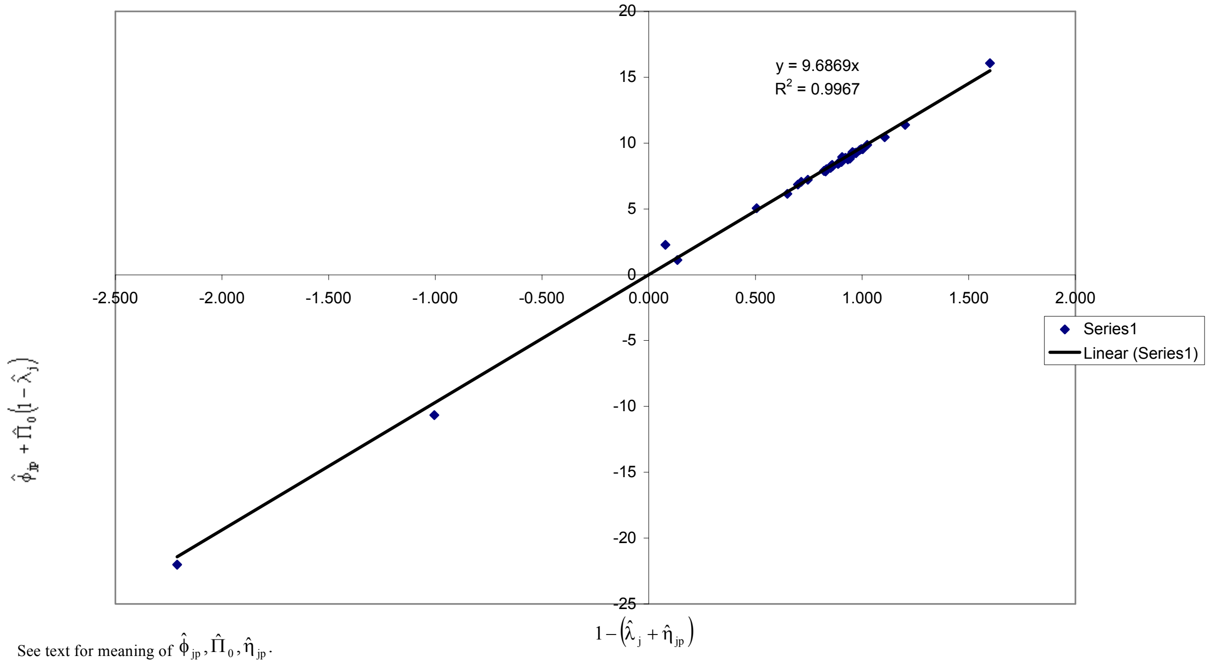
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 8: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Poor Households: East



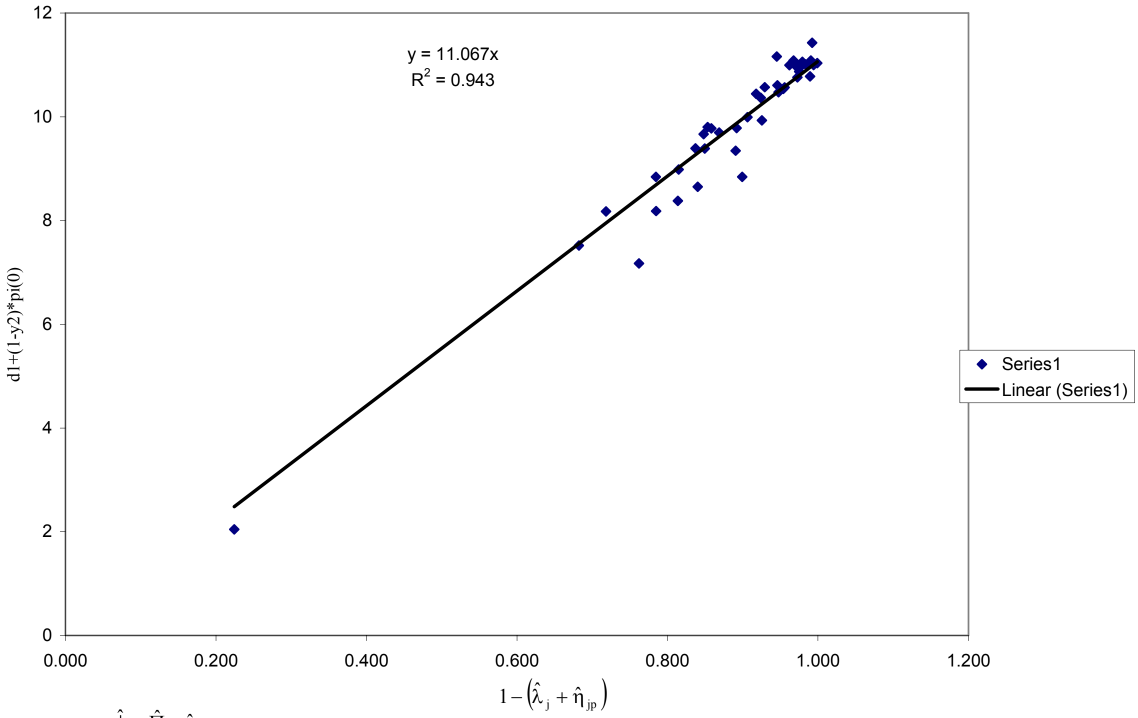
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 9: Graph Showing Relationship Between Slope and Intercept Parameters: Rural Poor Households: West



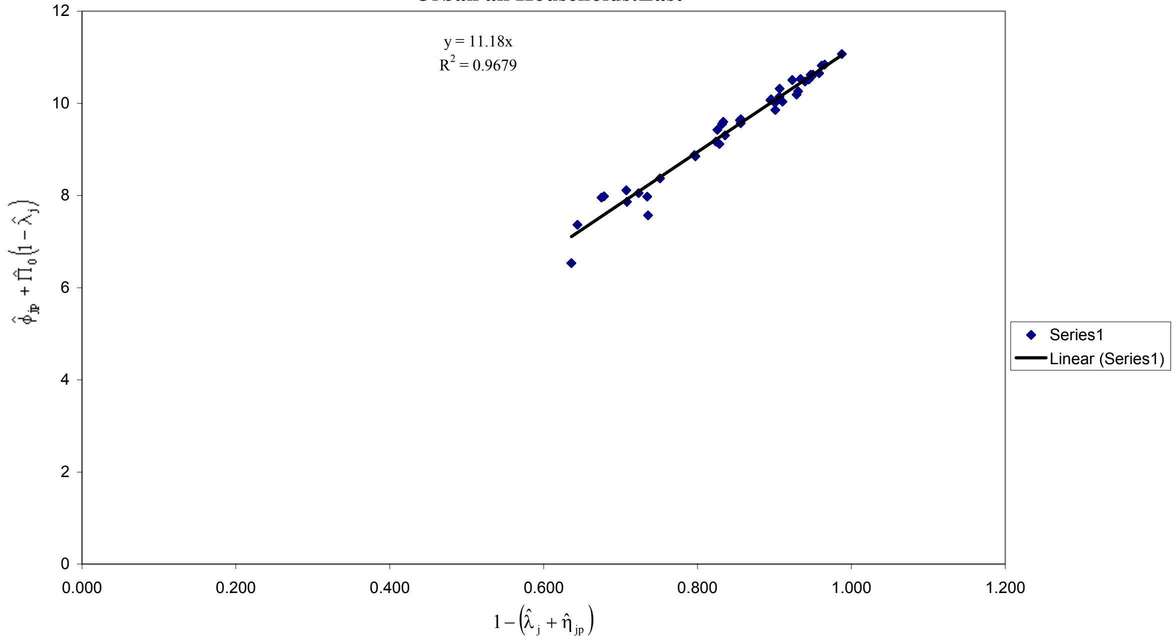
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$.

Figure 10:Graph Showing Relationship Between Slope and Intercept: Urban all Households:South



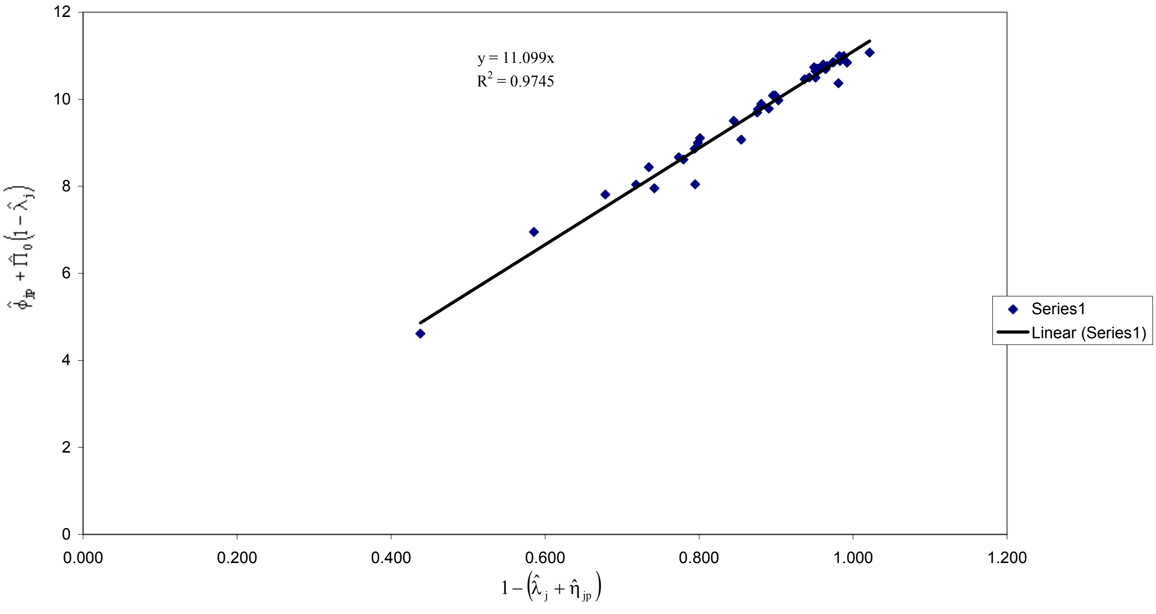
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 11: Graph Showing Relationship Between Slope and Intercept: Urban all Households:East



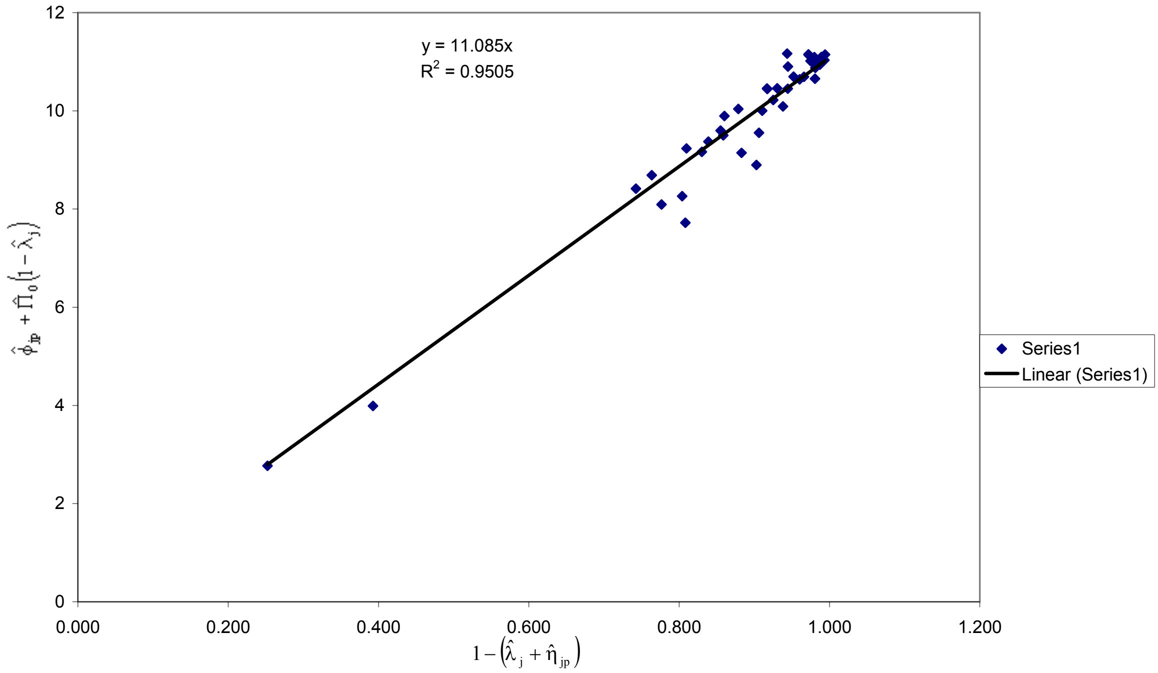
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 12: Graph Showing Relationship Between Slope and Intercept: Urban all Households:West



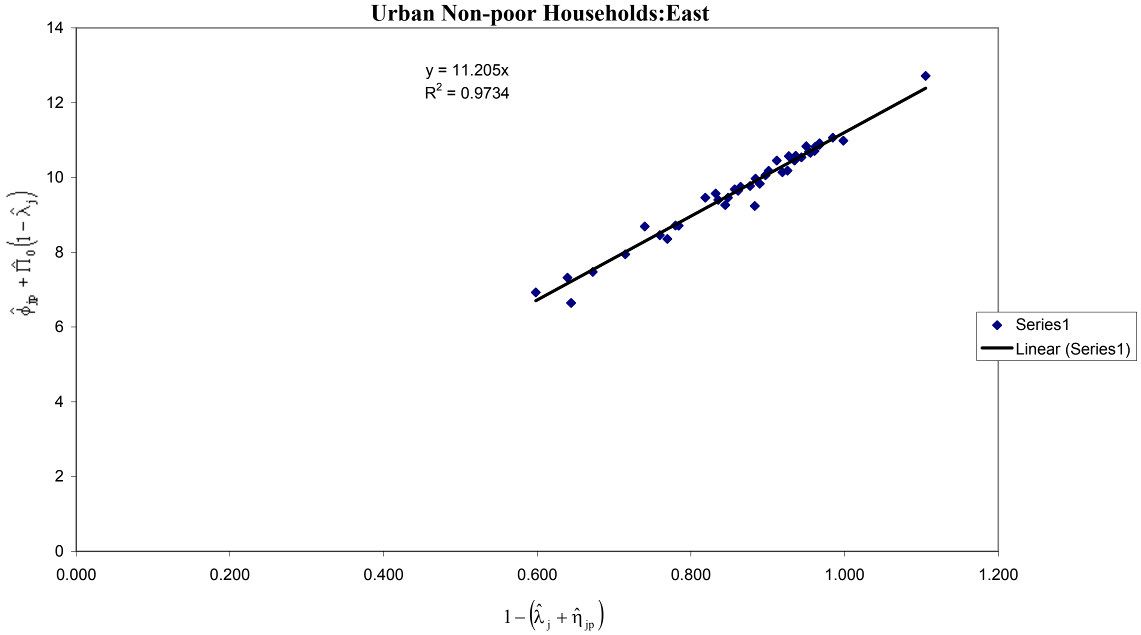
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 13: Graph Showing Relationship Between Slope and Intercept: Urban Non-poor Households:South



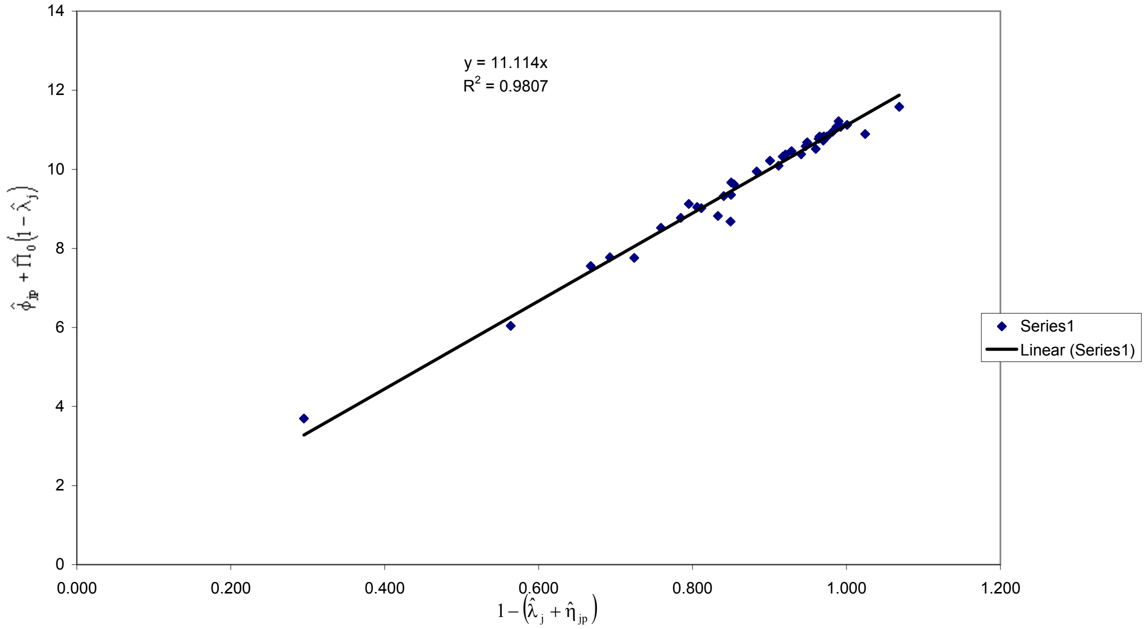
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 14: Graph Showing Relationship Between Slope and Intercept: Urban Non-poor Households:East



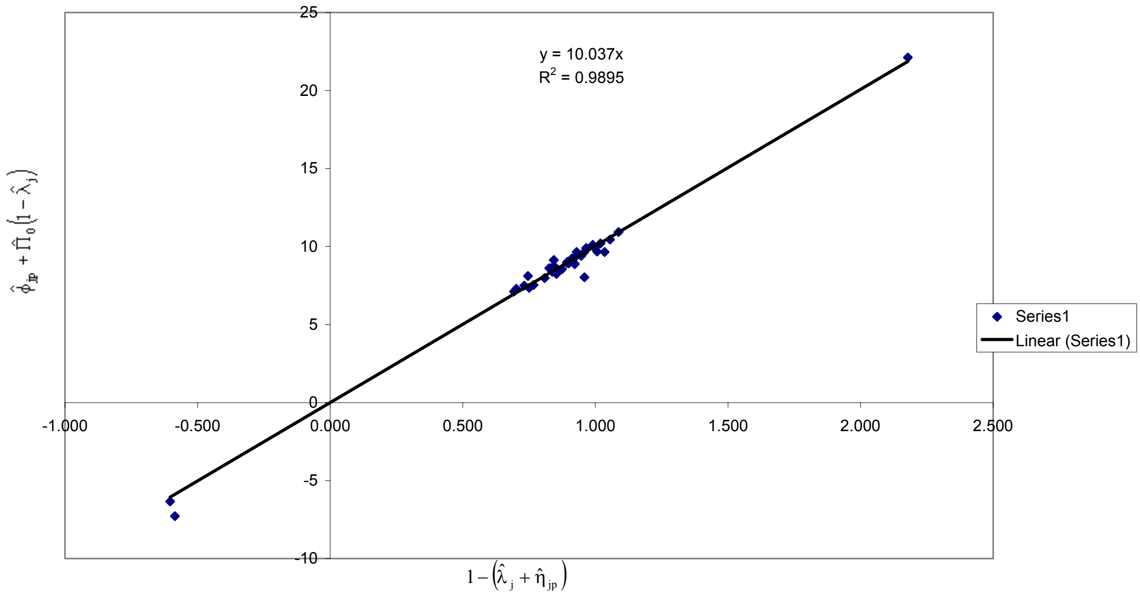
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 15: Graph Showing Relationship Between Slope and Intercept: Urban Non-poor Households:West



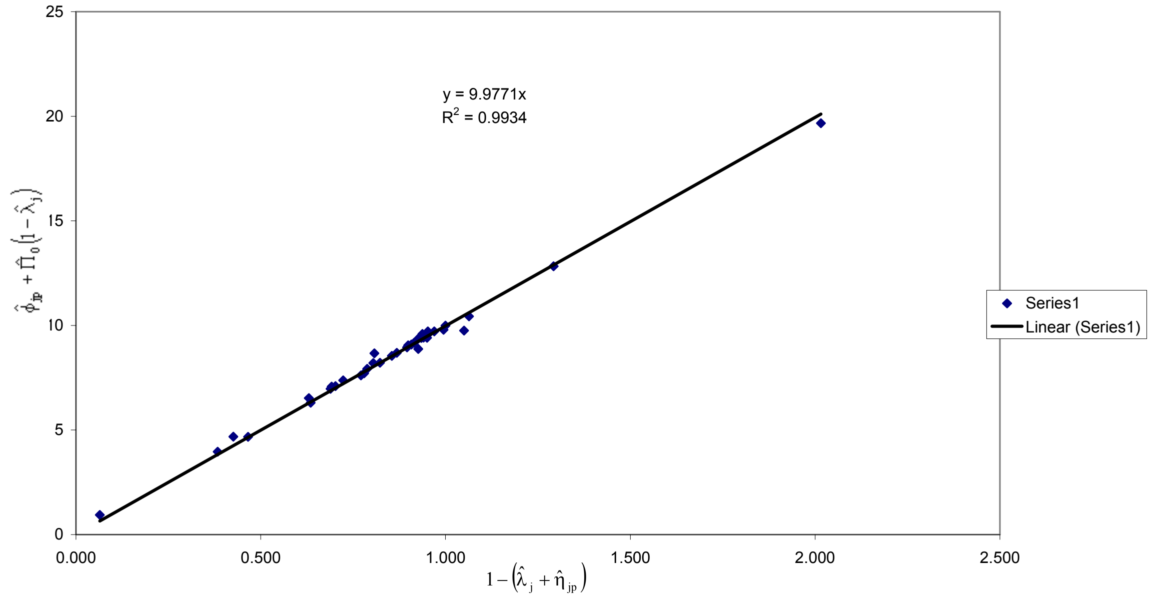
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 16: Graph Showing Relationship Between Slope and Intercept: Urban Poor Households:South



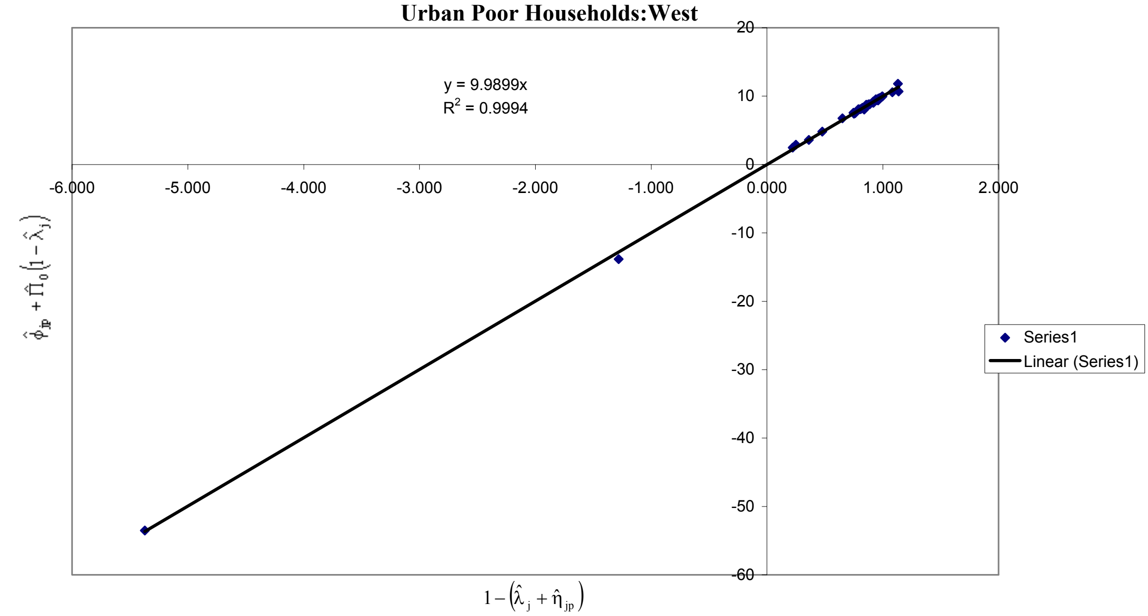
See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 17: Graph Showing Relationship Between Slope and Intercept: Urban Poor Households:East



See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;

Figure 18: Graph Showing Relationship Between Slope and Intercept: Urban Poor Households:West



See text for meaning of $\hat{\phi}_{jp}, \hat{\Pi}_0, \hat{\eta}_{jp}$;