ENGEL SCALES FOR AUSTRALIA, THE PHILIPPINES AND THAILAND: A COMPARATIVE ANALYSIS

Ma. Rebecca J. Valenzuela

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Engel Scales for Australia, the Philippines and Thailand: A Comparative Analysis

Ma. Rebecca Valenzuela
Department of Econometrics
University of New England
Armidale, NSW, Australia

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1 Introduction

Equivalence scales are indices that show the relative income levels required by people in different circumstances to attain the same level of economic well-being. As such, the importance of equivalence scales to public policy formulation is well recognized. The relevance of using scales in income distribution and poverty assessment studies has also gained increased recognition in recent years.

Recent developments show that there is a growing awareness among public policy researchers, particularly those who focus on international comparisons, of the importance of the choice of equivalence scales in determining conclusions reached. In a survey article by Coulter, et al. (1992), it is shown that there is a systematic relationship between equivalence scale 'generosity' and the extent of inequality and poverty. This finding supports those of an earlier study by Buhmann (1987) which report the sensitivity of cross-country estimates of poverty and inequality to the choice of equivalence scale. The question 'Which equivalence scale should be used?' is thus a researcher's dilemma that many find difficult to resolve. In a study which analysed the impact of divorce to the economic well-being of men, women and children in the United States and Germany, Burkhauser, et al. (1990) strongly recommend that it is best to use German scales to analyze German data and US scales to analyse US data. Their rationale is that each country's equivalence scales reflect circumstances unique to that country. On the other hand, Hanratty and Blank (1992) assume the simplest case and implicitly use the same equivalence scale for the US and Canada to compare poverty between the two countries. A more recent study by Phipps and Garner (1994) which derived comparable scales between the US and Canada find that their estimated scales were not, in general, statistically different.

In the Asia-Pacific region, the comparison of equivalence scale has not been formally analysed. Hence, in this paper, the question of how similar or how different are equivalence scales of selected countries in region is explored. In particular, the paper investigates whether equivalence scales for the Philippines, Thailand and Australia are comparable. That the Philippines and Thailand are two countries which are strikingly similar in their levels of socio-economic development lends itself to the
possibility that the relative income needs of households of different sizes in the two countries are similar. In contrast, Australia is seen as a relatively more developed country sufficiently different (say, in its taxation system or its social welfare system) to preclude any possibility of having comparable scales with any of the other two countries. The study is facilitated by the availability of the 1988 expenditure surveys from these three countries and the results, in general, is expected to shed light on the cross-country comparability of equivalence scales.

2 The Engel Methodology

The comparability problem posed in this paper is explored via the widely-used Engel methodology of equivalence scales estimation. Engel (1895) observed the empirical regularity that, other things being equal, poorer households devote a larger share of their total budget to food than richer households and that, again other things being equal, larger households devote a larger share of their total budget to food than smaller households. Engel thus proposed that the proportion of the budget devoted to food could serve as an indicator of material well-being. He concluded that households spending the same proportion of total expenditure on food must have the same standard of living.

This basic Engel principle can and has been extended to other necessary items in addition to or apart from food alone. A simple generalization of the Engel methodology is thus to assume that families devoting the same expenditure share to a 'basket of necessities' are equally well-off materially. An index of relative income needs results from a comparison of the incomes at which households of different sizes spend the same share on a common basket of necessities.

A major advantage of the Engel approach is that it is relatively easy to estimate, minimally requiring single-cross section data only. Some authors have, however, criticized the approach's basic premise - that households spending equal shares on food have the same standard of living - an assumption which, unfortunately, is not a testable one. Deaton and Muellbauer (1986) further argue that the assumption that the share of the budget devoted to food reflects material well-being implies that
additional household members have only income effects on household consumption. From this point of view, the addition of a child is simply treated as a reduction in income. Other methodologies have been alternatively proposed and used, the more notable of which is due to Barten (1964). Barten's scaling procedure allowed for the 'substitution effects' of additional household members but empirical application of the method resulted in estimates of these effects which are 'unbelievably large' and hence lead to estimates of additional income requirements which were 'implausibly low' (Muellbauer 1977).

It has also been pointed out that the Engel approach tends to overestimate the additional income requirements of larger households (Nicholson, 1976; Deaton and Muellbauer, 1986). The argument is that since a child's share of the household food budget is larger than his or her share of most other goods, the addition of a child will increase the proportion of the budget devoted to food. According to the Engel methodology therefore, households with higher food shares are 'worse-off' as family welfare will appear to fall substantially with the addition of a child. As a result, income needs associated with this extra household member will be overstated.

If, however, the expenditure share of some other item, say housing, is taken into consideration instead of food share, household welfare would not appear to diminish as much. In this sense, Deaton and Muellbauer's criticism of the Engel approach would then be less applicable to the generalised versions of the Engel approach where a basket of necessities is used in lieu of food alone.

While not perfect, the Engel approach is at least reasonable and hence used in this study. The approach is also deemed appropriate for use in the estimation of scales particularly for developing countries like the Philippines and Thailand where a large proportion of the population struggle to meet just the basic of needs. Further, scales based on the Engel approach have been officially used in a number of developed nations such as Canada and the United States.
3 The Estimation Procedure

In what follows, we denote a household type by $h$ and the reference household by $r$. A household is characterised in terms of the number of members belonging to certain age groups such as the following:

$$n_a \quad \text{number of adults}$$
$$n_c \quad \text{number of children}$$

Expenditures share on food or some basket of necessities are assumed to vary with household income and the number of household members and the chosen functional form that summarises this relationship is an extension of the Working-Leser equation that incorporates a vector of characteristics:

$$w = \beta_0 + \beta_1 \ln \left( \frac{x}{n} \right) + \gamma_1 n_a + \gamma_2 n_c + \epsilon \quad (1)$$

where $w$ refers to the expenditure share of a specified basket of necessities, $x$ is total expenditure, $\beta_i, \gamma_i$ are parameters, and $\epsilon$ is a random error term.

The reference household $r$ is chosen to be the two-adult household for which we have $n_a = 2$ and $n_c = 0$. At equal expenditure shares $w^h = w^r$, we obtain the equation

$$\beta_1 \ln \left( \frac{x^h}{n^h} \right) + \gamma_1 n_a^h + \gamma_2 n_c^h = \beta_1 \ln \left( \frac{x^r}{2} \right) + 2 \gamma_1 \quad (2)$$

from which the equivalence scale $x^h/x^r$ is

$$\frac{x^h}{x^r} = \frac{n^h}{2} \exp \left[ \frac{\gamma_1 (2 - n^h)}{\beta_1} - \frac{1}{\beta_1} \gamma_2 n_c^h \right] \quad (3)$$

In the actual estimation, a term that is quadratic in $\ln (x/n)$ is added to the model which yields a set of scales that depends on a chosen level of reference income. In some instances, the fit of the model to the data improve substantially, in which case, the

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1This specification was chosen among a host of other alternative functional forms. This specification resulted after a tedious process of running regressions and estimating scales using the various other forms and evaluating which gave the most plausible results. Standard econometrics test procedures such as tests of significance and equality of coefficients and $R^2$ criteria were routinely employed in the process.
scales derived from the quadratic specification are presented. The various equations were estimated by simple least squares \(^2\) using the econometric package SHAZAM.

In general, the Engel equivalence scales can be expressed as \(s_h = s_h(\delta, n)\) where \(\delta\) is a \(m\)-vector of parameters and \(n\) a vector of household and economic characteristics. Let \(\hat{\delta}\) and \(\hat{s}_h\) be consistent estimates of \(\delta\) and \(s_h\), respectively. Then the estimated asymptotic variance of \(s_h\) is given by

\[
\text{Var}(\hat{s}_h) = \sum_{j=1}^{m} (\partial s_h / \partial \hat{\delta}_j)^2 \text{Var}(\hat{\delta}_j) + 2 \sum_{j>k=1}^{m} (\partial s_h / \partial \hat{\delta}_j)(\partial s_h / \partial \hat{\delta}_k)(\text{Cov}(\hat{\delta}_j, \hat{\delta}_k))
\]

This is used to derive the standard errors of the estimated scales.

4 The Data

The data used for the estimation of the Philippine equivalence scales in this study are from the Family Income and Expenditure Survey (FIES) conducted by the Philippines’ National Statistics Office covering the period between February 1988 and January 1989. The survey involved the interview of a national sample of about 18,500 households deemed sufficient to provide reliable estimates of income and expenditure levels for each province of the country, including key cities. The 1988 FIES uses a two-stage cluster sampling design where the urban and rural areas of each province are the principal domains of the survey. The primary sampling units under the sample design are the barangays and the households within each sample barangay comprise the secondary sampling units.

Data for the estimation of the Thai Engel scales are from the 1988 Socio Economic Survey (SES) conducted by the National Statistics Office of Thailand covering the period between February 1988 and January 1989. The sample of households is designed to represent all private, non-institutional households in Thailand which can be found in municipalities, sanitary districts or villages. The 1988 SES utilised a stratified-three stage sampling design to collect some 11500 sample households. The

\(^2\)Given that sampling weights were not available for the Thai dataset, it was decided to use the unweighted samples from all the data sets even as the weights for the Australian and Philippine data sets were available.
primary and secondary sampling units were the *amphoe* and the block or village. Households were the ultimate sampling units.

Data for the estimation of the Engel scales for Australia are from the 1988 Household Expenditure Survey (HES) conducted by the Australian Bureau of Statistics. The 1988 HES is a multi-stage area sample of approximately 7500 dwellings randomly selected from private dwellings and caravan parks in Australia. Dwellings were selected in a manner which ensured the households living there were representative of Australian households as a whole. The sample households is spread evenly over the enumeration period (July 1988-July 1989) to ensure that the seasonal expenditure patterns do not affect the final data.

For the three surveys, the operational definition of the household appear to be comparable i.e. a household refers to a group of persons with common meal and other living arrangements. In the Philippines, it is common to find 'extended family' type households composed of the nuclear family plus one or more other relatives and/or domestic helpers. This set-up is quite typical of the Thai household as well but less common for the Australian household. In effect, Philippine and Thai households are generally larger in size relative to the Australian household.

Expenditures, rather than incomes, are used in the estimation of the scales. The three surveys maintain a comparable definition of expenditure: the amount spent on the purchase of goods and services used for private consumption. In all cases, expenditure is collected on a household basis rather than for selected individuals in the population.

The expenditure categories considered for this study are defined as follows:

- **Food** consists of food and non-alcoholic beverages consumed at home including that purchased for preparation by any household member on trips as well as food purchased from restaurants and school canteens. This category does not include alcoholic beverages.

- **Clothing** includes apparel, footwear, accessories, jewellery, watches, shoe repair and other shoe services, repair and alterations to apparel and materials for sewing. This category does not include expenditures for dry-cleaning and
THE DATA

storage.

- **Housing** includes expenditures for shelter and utilities. For homeowners, 'housing' includes mortgage interest payments, homeowner's insurance premiums, expenditures for maintenance and repairs, as well as expenditures on utilities (water, fuel, electricity, telephone, etc.). For renters, 'housing' includes rent, tenant's insurance premiums, tenant's expenditures on maintenance or repairs as well as expenditures on utilities.

- **Health Care** includes insurance premiums for medical and dental care, and direct out-of-pocket medical expenditure (e.g. prescription drugs, doctor's fees, eyeglasses, contact lenses, rental for medical equipment).  

With regards to the demographic groupings, a difference exists with the definition of children. For both the Philippines and Australia, children are defined as those aged below 15 years while children in the Thai data is defined as those aged 15 and below. This slight discrepancy is ignored and assumed not to significantly affect the results. Within each survey, it is also noted that children can be disaggregated into younger children and older children. Hence, estimation of equivalence scale from a more disaggregated demographic grouping is also undertaken, in which case, we extend the model in equation (1) to become

\[ w = \beta_0 + \beta_1 \ln \left( \frac{x}{n} \right) + \gamma_1 n_a + \gamma_2 n_{cy} + \gamma_3 n_{co} + \epsilon \]  

(4)

where \( n_{cy} \) now refers to younger children and \( n_{co} \) refers to older children. The equivalence scale \( x^h/x^r \) can then be derived from

\[ \frac{x^h}{x^r} = \frac{\eta^h}{2} \exp \left[ \frac{\gamma_1 (2 - n^h_a) - \frac{1}{\beta_1} \gamma_2 n^h_{cy} - \frac{1}{\beta_1} \gamma_3 n^h_{co}}{\beta_1} \right] \]  

(5)

\[^3\text{It is noted that unlike the Philippines and Thailand, the price of health care services in Australia is primarily paid via the tax system rather than the market mechanism. This should be borne in mind when interpreting results.}\]

\[^4\text{Younger and older children are defined differently for the three countries. Younger children are aged less than 7 years old in the Philippines, aged less than 6 in Thailand and aged less than 5 in Australia. Older children are aged between 7 and 14 in the Philippines, aged between 6 to 15 in Thailand and aged 5 to 14 in Australia. Given this, results from this estimation are not strictly comparable.}\]
Table 1 presents full sample (unweighted) means and standard deviations for expenditure, income and demographic variables. Philippine and Thai currencies are presented in 1988 Australian and American dollars to facilitate comparison. Expenditure levels in Australia are substantially much higher compared to the Philippines and Thailand and of the two latter countries, households in Thailand spent more than Philippine households for all types of expenditure items. Not surprisingly, the average income levels of households in both the Philippines and in Thailand countries stand at a mere 7 percent that of the average Australian household. Overall, Philippine households devote about 44 percent of expenditures to food, Thai households 37 percent and Australian households 20 percent. The combined expenditures on food, clothing, shelter and medical care comprise about 70 percent of the total expenditures of Philippine and Thai households. The same basket comprise less than half (46 percent) of the Australian household’s total expenditure.

As expected, Australian households tend to be smaller than Philippine or Thai households. The estimated average household sizes of 5.4 and 4.2 for Philippine and Thai households, respectively, are noted have large variances as well.

5 Estimation Results and Calculated Scales

Table 2 presents Engel curve parameter estimates for the Philippines, Thailand and Australia, respectively. The Engel curves presented are estimated using three different baskets of necessities as alternative indicators of welfare:

- \( w_1 \) food only
- \( w_2 \) \( w_1 \) plus clothing and housing
- \( w_3 \) \( w_2 \) plus health care

In the estimation, one-member households were excluded as well as those where the number of adults were zero. For consistency, also edited out were households that had values of less than or equal to zero for either \( w_1 \), \( w_2 \) or \( w_3 \). Diagnostic checks were

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routinely carried out in running the regressions and, not surprisingly, heteroskedasticity always appeared to be present. The results presented are derived from models that have been corrected for heteroskedasticity where the error variances are assumed to be directly related to the per capita income variable. F-tests for equality of coefficients are consistent in indicating that for all the three countries and for all the expenditure items used, demographic variable coefficients are clearly different from each other.

Engel curves for all expenditure categories show reasonable fit for both Thailand and the Philippines with food equations exhibiting the highest $R^2$ values. Engel curves for Australia exhibited relatively poor fit for all basket types. The regression results are shown to be sensitive to the choice of basket as the values of the estimated coefficients change considerably as one moves from food-based equations to the those based on the two other baskets.

The signs of the coefficient estimates conform with the a priori expectation that expenditure share of food or some other basket of necessities is inversely proportional to income levels. At the same time, these shares are shown to increase along with the addition of household members. Most coefficients were found to be highly significant at the 5 percent level. The magnitude of the coefficients for the demographic variables $\gamma$ are observed to be consistently small compared to those of the income coefficient $\beta_1$. For developing countries like the Philippines and Thailand, this result is atypical of foodshare equations from household surveys (Deaton and Mueblauer, 1986) and results here indicate that it may well be for the other baskets of necessities used above. Foodshare equations for Australia, on the other hand, have relatively larger $\gamma$ values for the number of adults but the rest of the estimated demographic coefficients are likewise small compared to the income coefficients. Overall, these results imply that income is a major determinant of expenditure levels and that demographic variables, while all significant, have less influence on the variability of the expenditure level of households in all the countries.

Table 3 presents the Engel scales estimated from equation (1) which are comparable across the three countries. The scales show that in terms of food consumption, an additional child costs about 44 percent of a couple in the Philippines, about 41
percent of the same in Thailand, but only about 24 percent of a couple in Australia. In all the countries, the marginal costs of additional children tend to decrease as the household size increases. The calculated scales based on the food-only basket for Thailand and the Philippines appear to approximate each other whereas the Australian scales calculated are significantly lower. It is also observed that for larger households, relative costs are found to be higher in the two developing countries particularly in the Philippines. These results make empirical sense considering that: (1) it is well-known that there is not much room for economies of scale in food; and, (2) food expenses comprise a large proportion of total expenditure in the Philippines (44 percent) and in Thailand (37 percent) but the same comprise only about 19 percent of total expenditure in a typical Australian household.

Such pattern is also observed in Table 4 which shows the scales derived from equation (4) and hence the relative foodcost requirements of children by age\(^6\). In terms of this demographic grouping, the results show that in the Philippines, younger children appear to have higher relative costs compared to older children. The same is observed from the estimated scales for Thailand but not for Australia. This observation may be a reflection of the high cost of maintaining children in both the Philippines and Thailand in terms of food and, most possibly, of medical care as well particularly for very young children. Unlike in Australia where there exists a generous welfare program particularly for families with young dependent children, the high cost of having (small) children in these two developing countries are only minimally subsidised by their respective government’s social welfare system.

Referring back to Table 3 and moving on to scales based on \(w_2\) and \(w_3\) which comprise of some basic necessities in addition to food, the differences in the estimated scales across the three countries do not appear to be significant. In fact, rounding off the values to 1 decimal point would yield more or less the same scales. The comparability of these scales is further demonstrated if the average per person cost of the first two adults incurred with different number of extra children is calculated. Table 5 shows that the level of agreement between the three countries and between

\(^6\)As earlier mentioned, these scales are not strictly comparable across the countries due to the differences in the age cut-offs.
the two levels of inclusiveness of the definition of necessities is close to perfect! In contrast, the corresponding results for $w_1$ shown on the bottom half of the same table show more variability in the proportions.

6 Conclusion

The purpose of this study is to explore the question of how similar or how different are equivalence scales for the three countries of Australia, the Philippines and Thailand. The comparability problem was addressed via the widely-used Engel estimation methodology applied to identically selected samples and a common model specification. The estimation results show that the level of agreement between the country-specific scale was found to be highly dependent on the basket of necessities used as an indicator of welfare, hence, there appears to be no clear-cut answer to the question.

An interesting and important outcome of the study that may well be of useful empirical regularity is the observation that with necessities defined to include food, clothing, housing and/or medical care, the equivalence scales for the Philippines, Thailand (two similar developing countries) and Australia (an industrialised country) seem to be more or less invariant. No such regularity existed if the definition of necessities was confined to food alone.
<table>
<thead>
<tr>
<th>Year</th>
<th>Sample Size</th>
<th>Mean No. of Children</th>
<th>Mean No. of Household Members</th>
<th>Total Yearly Income (after tax)</th>
<th>Total Yearly Income (before tax)</th>
<th>Clothing, Shelter &amp; Medical Care</th>
<th>Clothing &amp; Shelter</th>
<th>Weekly Expenditure on Food</th>
<th>Weekly Expenditure on Health Care</th>
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**Note:** Standard errors are in parentheses.
Notes: (8) W1, W2 and W3 indicate the reference basket used as the dependent variable. W1 consists of food only; W2 consists of food, clothing, and shelter; W3 consists of food, clothing, shelter & medical care.

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Table 2: Parameter Estimates of Engel Equations

*Philippines*

Australia

Thailand
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<td>w1(1)</td>
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<td>1.460(0.006)</td>
<td>1.481(0.005)</td>
<td>1.530(0.003)</td>
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<tr>
<td>w2(1)</td>
<td>1.290(0.003)</td>
<td>1.222(0.009)</td>
<td>1.205(0.006)</td>
<td>1.270(0.003)</td>
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<td>w3(1)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>na</th>
</tr>
</thead>
<tbody>
<tr>
<td>w1(1)</td>
<td>1.179(0.022)</td>
<td>1.170(0.023)</td>
<td>1.173(0.021)</td>
<td>1.180(0.022)</td>
<td>1.000</td>
</tr>
<tr>
<td>w2(1)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>w3(1)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>na</th>
</tr>
</thead>
<tbody>
<tr>
<td>w1(1)</td>
<td>1.496(0.006)</td>
<td>1.503(0.003)</td>
<td>1.485(0.003)</td>
<td>1.640(0.003)</td>
<td>1.000</td>
</tr>
<tr>
<td>w2(1)</td>
<td>1.290(0.003)</td>
<td>1.222(0.009)</td>
<td>1.205(0.006)</td>
<td>1.270(0.003)</td>
<td>1.000</td>
</tr>
<tr>
<td>w3(1)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Notes:
1. w1, w2, and w3 indicate the reference basket used as the dependent variable. w1 consists of food, clothing, shelter, and medical care.
2. na refers to the number of adults. nc refers to the number of children.
Table 4. Estimated Engel Scales (derived from Equation (4))

(a) refers to the number of adults; (c) refers to the number of children.

<table>
<thead>
<tr>
<th>WT</th>
<th>W2</th>
<th>W3</th>
<th>WT</th>
<th>W2</th>
<th>W3</th>
<th>WT</th>
<th>W2</th>
<th>W3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.080</td>
<td>0.115</td>
<td>0.166</td>
<td>0.080</td>
<td>0.115</td>
<td>0.166</td>
<td>0.080</td>
<td>0.115</td>
<td>0.166</td>
</tr>
<tr>
<td>1.571</td>
<td>1.775</td>
<td>2.117</td>
<td>1.571</td>
<td>1.775</td>
<td>2.117</td>
<td>1.571</td>
<td>1.775</td>
<td>2.117</td>
</tr>
<tr>
<td>0.136</td>
<td>0.147</td>
<td>0.154</td>
<td>0.136</td>
<td>0.147</td>
<td>0.154</td>
<td>0.136</td>
<td>0.147</td>
<td>0.154</td>
</tr>
<tr>
<td>0.087</td>
<td>0.108</td>
<td>0.121</td>
<td>0.087</td>
<td>0.108</td>
<td>0.121</td>
<td>0.087</td>
<td>0.108</td>
<td>0.121</td>
</tr>
<tr>
<td>1.047</td>
<td>1.094</td>
<td>1.141</td>
<td>1.047</td>
<td>1.094</td>
<td>1.141</td>
<td>1.047</td>
<td>1.094</td>
<td>1.141</td>
</tr>
<tr>
<td>0.099</td>
<td>0.106</td>
<td>0.111</td>
<td>0.099</td>
<td>0.106</td>
<td>0.111</td>
<td>0.099</td>
<td>0.106</td>
<td>0.111</td>
</tr>
<tr>
<td>0.310</td>
<td>0.314</td>
<td>0.330</td>
<td>0.310</td>
<td>0.314</td>
<td>0.330</td>
<td>0.310</td>
<td>0.314</td>
<td>0.330</td>
</tr>
<tr>
<td>1.840</td>
<td>1.933</td>
<td>1.979</td>
<td>1.840</td>
<td>1.933</td>
<td>1.979</td>
<td>1.840</td>
<td>1.933</td>
<td>1.979</td>
</tr>
<tr>
<td>0.078</td>
<td>0.081</td>
<td>0.089</td>
<td>0.078</td>
<td>0.081</td>
<td>0.089</td>
<td>0.078</td>
<td>0.081</td>
<td>0.089</td>
</tr>
<tr>
<td>0.097</td>
<td>0.104</td>
<td>0.115</td>
<td>0.097</td>
<td>0.104</td>
<td>0.115</td>
<td>0.097</td>
<td>0.104</td>
<td>0.115</td>
</tr>
<tr>
<td>1.461</td>
<td>1.475</td>
<td>1.539</td>
<td>1.461</td>
<td>1.475</td>
<td>1.539</td>
<td>1.461</td>
<td>1.475</td>
<td>1.539</td>
</tr>
<tr>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Notes: 1. WT and W2 = indicate the reference basket used as the dependent variable; W3 consists of food only. W2 consists of food.
Table 5. Proportion of the average per person cost of the first two adults of a household incurred by adding a first through a fourth child to the household based on $w_2$ and $w_3$.

<table>
<thead>
<tr>
<th>Additional Child</th>
<th>Philippines $w_2$</th>
<th>Philippines $w_3$</th>
<th>Thailand $w_2$</th>
<th>Thailand $w_3$</th>
<th>Australia $w_2$</th>
<th>Australia $w_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Child</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>2nd Child</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>3rd Child</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>4th Child</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Proportion of the average per person cost of the first two adults of a household incurred by adding a first through a fourth child to the household based on $w_1$.

<table>
<thead>
<tr>
<th>Additional Child</th>
<th>Philippines $w_1$</th>
<th>Thailand $w_1$</th>
<th>Australia $w_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Child</td>
<td>0.9</td>
<td>0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>2nd Child</td>
<td>0.8</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>3rd Child</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>4th Child</td>
<td>0.7</td>
<td>0.6</td>
<td>negative</td>
</tr>
</tbody>
</table>

* Expenditure basket $w_1$ consists of food only
Expenditure basket $w_2$ consists of food, clothing and shelter
Expenditure basket $w_3$ consists of food, clothing, shelter and medical care
Bibliography


A Note on A Bayesian Estimator in an Autocorrelated Error Model. William Griffiths and Dan Dao, No. 3 - April 1979.


Bayesian Econometrics and How to Get Rid of Those Wrong Signs. William E. Griffiths, No. 31 - November 1987.


