A COMPARISON OF POUND STERLING–AUSTRALIAN DOLLAR PURCHASING POWER PARITIES FOR SELECTED POPULATION SUB-GROUPS IN AUSTRALIA AND THE UNITED KINGDOM[1]

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This paper utilizes Household Expenditure Survey and Consumer Price Index data supplemented by private survey data in an attempt to compare the purchasing power parities of the pound sterling and the Australian dollar for a range of population sub-groups in the United Kingdom and Australia. In spite of the close political, economic, social and cultural ties that exist between these two countries, there have been no attempts to measure differences in living costs and real expenditures. Further, Australia has not been a party to the International Comparisons project of the Statistical Office of the United Nations. This study derives purchasing power parities which explicitly account for variations in expenditure patterns of different population sub-groups. For example, a household living in London intending to move to Sydney will find it useful to have a comparison of cost-of-living between households living in these two cities which takes into account explicitly the general expenditure patterns in these two cities. Due to the nature of the data, it was necessary to employ a new index number method derived by one of the authors.

INTRODUCTION

The prevailing international political and economic interdependence has produced both popular and professional interest in comparative cost, expenditure and income studies. These comparative studies are conducted predominantly by large international statistical organizations such as those of the United Nations and the European Economic Community,[2] and to date have excluded Australia. To help redress this omission the present study attempts an objective, but modest, comparative cost–expenditure exercise between Australia and her closest political and cultural contemporary, the United Kingdom.

Significantly the nature and composition of the migrant flows between these countries implies that any study which concentrates on general, aggregate cost of living comparisons between the two countries may not be adequate. Such comparisons will not capture the differences in the purchasing power parities,

[1]The authors are indebted to the Australian Bureau of Statistics (ABS) and the Department of Employment (DE), London, U.K., for the release of price data. A complete list of products surveyed can be provided by the authors but both the ABS and DE have refused permission to publish actual prices.

[2]The Statistical Office of the United Nations (SOUN) introduced the "International Comparison Project" (ICP) in 1970 (Ref. 8). An enlarged Phase II took place in 1973 (Ref. 9); Phase III with 1975 reference data is complete with a published report. The Statistical Office of the European Economic Community (SOEC) conducted a similar exercise among members in 1970; the exercise was repeated in 1975 (Ref. 15). SOEC intends to calculate these ppps every year.

ppp—the condition that the exchange rate between two (or more) currencies must provide the same purchasing power for each currency—which will vary along with variations in expenditure patterns of different population sub-groups. For example, a household living in London intending to move to Sydney will find it useful to have a cost-of-living comparison between households living in these two cities. Consequently the objectives of this current study are:

(i) to provide easily interpreted[3] comparative-cost study results by concentrating explicitly on consumer expenditure comparisons; and
(ii) to advance an earlier study[4] and obtain more accurate estimates of ppp between the pound and the Australian dollar for a range of population sub-groups in the United Kingdom and Australia.

This article has four main sections. Section I describes briefly the price survey which produces a general, aggregate price level which may be regarded as representative of each nation's cost of living; Section II discusses the nature of the Rao index-number system for determining ppp; Section III presents a discussion of the results of utilizing this new methodology in an empirical analysis of real expenditures and living costs across a range of four selected population sub-groups in Australia and the U.K. and Section IV draws a few tentative conclusions.

I. The Price Survey and Selection of Comparative Population Sub-Groups

The concept of ppp may be used to determine an implicit exchange rate which, since it ignores the effect of trade barriers,[5] currency speculation and central bank defensive open market operations, can differ from the official exchange rate between currencies. The validity of this application of ppp as a conversion factor in transferring data from one national currency to another for purposes of international cost comparisons is dependent, in the first instance, on the price survey data being representative of a nation's cost of living. Ideally this study requires household expenditure survey data which detail levels, patterns, quantities and average prices for a basket of goods and services thought representative of a wide range of population sub-groups. To some extent such data are available in the form of the Family Expenditure Surveys (FES)[6] conducted by the Department of Employment (DE) in the U.K. Unfortunately recent comparable data are not available from the Australian Bureau of Statistics (ABS). Moreover neither the ABS nor the DE were able to furnish any data from their data banks for the 1981–82 period. Consequently it was necessary

[3]The SOUN and SOEC projects provide results that are not easily interpreted: e.g. currently SOEC makes comparisons of real Gross Domestic Product (GDP) as a whole; its three main components (aggregate consumption, investment and government expenditure); plus an additional 34 sub-aggregates of expenditure.

[4]See Ref. 13.

[5]Ppp cannot completely ignore trade barriers because a large part of expenditure in the U.K. and Australia goes on imported products. See discussion of the influence of traded goods in ppp in Ref. 5. A comprehensive discussion of the ppp theory of exchange rates can be found in Refs. 10 and 11.

[6]See Ref. 7.

to adopt the approach described below to generate an appropriate representative selection of goods and services, average prices and expenditure levels, ratios and patterns for utilization in the computation of population sub-group ppps.

An earlier attempt by the authors to determine the ppp of the Australian dollar relative to the pound used expenditure categories, average prices and expenditure weights derived from the British and Australian Consumer Prices Indices (CPIs).[7] This approach seemed justified on two counts. First, the ABS had conducted its only Household Expenditure Surveys in 1974–75 and 1975–76.[8] This survey was patterned on the British FES and as with the latter in the U.K., the results of the 1974–75 Australian HES were used to determine the composition and expenditure weighting pattern of the goods and services included in the Australian CPI.[9] As a result, for the first time, the range of goods and services included in the Australian and British CPIs are very similar and hence broadly comparable. Second, with ppp being determined by the internal purchasing power of each currency, the latter being defined as the inverse of the general price level for goods and services,[10] then the aggregate cost of the goods and services included in the CPI[11] surveys provided the most relevant estimate of the cost of living in each country.[12]

As a result, a selection of 181 of the most common and easily priced goods and services were selected from the two indices. This approach provided a comparable set of prices and expenditure weights in Australia and the U.K. as of September 1979. Table 1 shows the eight sub-categories of expenditure used in the two indices and gives details of the ABS, DE and private survey sources used in the price survey.[13]

Four pairs of population sub-groups have been selected for ppp computations in this survey. The first pair is the all-households group. The ppp computed for this group gives a comparison of general, relative living costs in Australia and the U.K. The other groups chosen are households with a weekly income between A$200 and A$260 per week in Australia and between £120 and £140 per week in the U.K., referred to as the (then) average income households, households in Sydney and London, and those with incomes in excess of A$340

[7]See Ref. 14.

[8]See Refs. 1 and 3.

[9]See Ref. 2.

[10]pp £ = 1/Price Level U.K. = (say) 1/0.5 = 2.00.

pp A$ = 1/Price Level Australia = (say) 1/1 = 1.0

$$\text{Then ppp} = \frac{\text{pp £}}{\text{pp A\$}} = 2/1 = 2.00$$

This example means that 2 units of A$ = 1 unit of £.

[11]For details of these surveys in the U.K. see Refs. 6 and 7. For Australia see Ref. 1 and 2 for current Australian expenditure ratios.

[12]A variety of product price measures may be used in the definition of ppp. Examples are GDP, wholesale or general cost of living price levels. The CPI cost of living estimate is more relevant for this paper than the GDP price level which includes both aggregate consumption and investment expenditure and the wholesale price level which includes both traded and non-traded goods. It is also possible to use factor cost measures in the definition of ppp, e.g. wage rates, unit labour or unit factor costs. For further discussion of the latter and of the significance of using both traded and non-traded goods in a general index of the cost of living, see Ref. 10.

[13]Since the ABS initially provided more prices than the DE, 138 as against 72, it was necessary to undertake a private survey in the U.K. to make the data comparable. Details of this survey can be found in Ref. 14.

TABLE 1

NUMBER OF PRICES PROVIDED BY PRIVATE AND OFFICIAL PRICE SURVEYS PER SUB-CATEGORY OF EXPENDITURE

CPI Sub-categories of Expenditure	Australia			United Kingdom		
	Total Items	ABS Survey	Private Survey	Total Items	DE Survey	Private Survey
1. Food	58	52	6	58	35	23
2. Clothing and footwear	41	32	9	41	28	13
3. Housing	3	1	2	3	1	2
4. Housing operation and equipment	28	12	16	28	5	23
5. Transportation	8	5	3	8	3	5
6. Tobacco and alcohol	8	8	—	8	—	8
7. Health and personal care	19	18	1	19	—	19
8. Recreation and miscellaneous goods and services	16	10	6	16	—	16
Total	181	138	43	181	72	109

in Australia and £250 per week in the U.K.[14] To a great extent the availability of relevant information conditioned the selection of these population sub-groups.

In order to produce expenditure ratio estimates for the range of population sub-categories chosen, it was necessary to adjust the 1979 British FES sub-group expenditure levels and ratios to accommodate the September 1979 price data. Similarly the 1975–76 Australia-wide HES sub-group expenditure levels and ratios were adjusted to fit the September 1979 Australia price data. These adjustments were carried out in the following manner.

The December 1975 quarter was chosen (arbitrarily) from the 1975–76 HES data to serve as the base period. Since the September 1979 price data covered 181 items it was necessary to aggregate, to 181, the 319 "fine level" expenditure classifications contained in the 1975–76 HES. These 181 1975–76 expenditure levels were then adjusted to September 1979 levels by use of published index numbers of inflation for each expenditure sub-category.[15] The adjustment process for the U.K. data required that the 89 sub-categories in the British FES had to be expanded—not aggregated—to meet the 181 September 1979 price data. This approach produced comparable September 1979 expenditure levels from which were calculated expenditure ratios for each sub-category of the HES and FES. Table 2 shows the expenditure ratios for the eight main sub-categories of expenditure for all four population sub-groups.

[14]These income figures refer to 1975–76 in the Australian position and to 1979 in the U.K. case. The expenditure ratios for 1975–76 were adjusted to September 1979 levels. There is no need to adjust the income levels directly.

[15]For details of adjustments, see Ref. 4.

TABLE 2

EXPENDITURE RATIOS PER POPULATION SUB-GROUP IN AUSTRALIA AND THE UNITED KINGDOM: SEPTEMBER 1979

	Australia			
	All Households	Average Income Households	Sydney Households	High Income Households
1. Food	20.5095	20.0813	20.1387	18.0324
2. Clothing and footwear	8.1716	8.1716	8.0672	8.6601
3. Housing	12.7332	13.4672	14.9151	11.2338
4. Housing operation and equipment	13.5534	13.0926	11.5824	13.3056
5. Transportation	17.2010	16.1642	17.3353	19.0695
6. Tobacco and alcohol	5.6903	5.8079	5.8587	5.7208
7. Health and personal care	7.4293	8.2694	7.3773	6.7221
8. Recreation	14.7087	14.6268	14.7253	17.2557
Total	100.00	100.00	100.00	100.00

	United Kingdom			
	All Households	Average Income Households	London Households	High Income Households
1. Food	23.1496	23.4098	23.4912	18.6407
2. Clothing and footwear	8.7133	8.6353	8.3113	8.4234
3. Housing	14.5694	15.0347	16.7344	11.9029
4. Houisng operation and equipment	15.9711	16.1141	15.1494	14.3503
5. Transportation	13.9429	14.2155	13.8691	16.7830
6. Tobacco and alcohol	7.8794	8.1534	6.8685	7.8828
7. Health and personal care	3.7592	3.5948	3.9829	4.0643
8. Recreation	12.0101	10.8424	11.5932	17.9526
Total	100.00	100.00	100.00	100.00

II. INDEX NUMBER METHODOLOGY USED FOR THE DETERMINATION OF ppp

The foregoing expenditure data are combined with the Rao index number construction to produce ppp estimates for each of the sub-groups chosen for investigation.[16] The index number system is described fully in Prasada Rao (1980).

Let ppp_j $(j = 1, 2)$[17] denote the ppp of the j-th currency expressed in terms of a common currency unit, and p_{ij} and q_{ij} $(i = 1, 2, \ldots, N,\ j = 1, 2)$ denote the

[16]Several index number constructions could be used for computation of ppps. These are discussed in Ref. 12.

[17]Ppp_j as defined below gives the value of 1 unit fo the j-th country currency in terms of a common currency. Therefore this gives an implicit exchange rate between 1 unit of the j-th country currency and a common currency. For example ppp_{Aus} gives the implicit exchange rate between A$1 in terms of £1 of the U.K. The terms ppp and implicit exchange rate are used synonymously throughout the study.

price and quantity, respectively, of the i-th commodity in the j-th country. (Only the special case of the two country comparison is considered.) The Rao index number system is thus defined through a system of interdependent log–linear equations:

$$\text{ppp}_j = \prod_{i=1}^{N} \left[\frac{P_i}{P_{ij}}\right]^{V_{ij}} \qquad \text{for } j = 1, 2$$

and

$$P_i = \prod_{j=1}^{2} [\text{ppp}_j + p_{ij}]^{V^*_{ij}} \qquad \text{for } i = 1, 2, \ldots, N.$$

where

$$V_{ij} = p_{ij}q_{ij} \Big/ \sum_{i=1}^{N} p_{ij}q_{ij}$$

is the expenditure share of the i-th commodity in the j-th country,

$$V^*_{ij} = V_{ij} \Big/ \sum_{k=1}^{2} V_{ik},$$

and P_i is the average price of the i-th commodity, averaged over the two countries and expressed in terms of a common currency unit.

The required sub-group ppp can be expressed in terms of the price survey data. Since the purchasing power parities are defined relative to a common currency unit, the solution for ppp_j's can be expressed in terms of one country's currency. Choosing the first country's currency as base,

$$\text{(1)} \qquad \text{ppp}_1 = 1 \quad \text{and} \quad \text{ppp}_2 = \prod_{i=1}^{N} (p_{i1}/p_{i2})^{W_i}$$

and the price index[18] for country 2 with country 1 as base is given by

$$I_{12} = \frac{\text{ppp}_1}{\text{ppp}_2} = \prod_{i=1}^{N} (p_{i2}/p_{i1})^{W_i}$$

where

$$W_i = [V_{i1}V_{i2}/(V_{i1} + V_{i2})] \Big/ \sum_{i=1}^{N} [V_{i1}V_{i2}/(V_{i1} + V_{i2})].$$

Equation (1) expresses ppps for both countries in terms of the currency of country 1. Thus ppp_2 in (1) gives the equivalent of one unit of country 2 currency in terms of country 1 currency on the basis of purchasing power.[19] Clearly from equation (1) ppps can be computed even in cases where only price and value share weights are known and actual expenditure quantities are not readily

[18]The relationship between the binary index derived here and the log-change index numbers derived in Refs. 16 and 17 is further discussed in Ref. 12.

[19]In the simplest of cases where prices in country 1 are exactly twice prices in country 2, equation (1) gives $\text{ppp}_2 = 2$ which shows that in terms of purchasing power parity, one unit of currency of country 2 is equivalent to two units of country 1 currency.

available. Since this is the case with CPI data[20] the Rao index has been selected for use because of its ready applicability to this particular type of data.

III. Empirical Results

Table 3 presents the implicit or ppp exchange rate of the Australian dollar and pound for each of the population sub-groups together with the official exchange rate. Table 3 thus makes possible comparison of the relative ppp of each of the four sub-groups between countries. For example, the results presented in the first column are obtained by comparing the relevant data for the all-

TABLE 3

Official and Implicit Exchange Rates, Australia and the United Kingdom

	All Households, Australia and U.K.	Average Income Households, Australia and U.K.	Households, Sydney and London	High Income Households, Australia and U.K.
	£1 = A$	£1 = A$	£1 = A$	£1 = A$
Official exchange rate on 28 September 1979	$1.95 (0.51)	$1.95 (0.51)	$1.95 (0.51)	$1.95 (0.51)
Exchange rate based on current study	$1.87 (0.54)	$1.88 (0.53)	$1.86 (0.54)	$1.90 (0.53)
Current exchange rates for sub-categories of expenditure				
1. Food	$1.76 (0.57)	$1.76 (0.57)	$1.74 (0.58)	$1.73 (0.58)
2. Clothing and footwear	$1.93 (0.52)	$1.93 (0.52)	$1.93 (0.52)	$1.95 (0.51)
3. Housing	$1.83 (0.55)	$1.83 (0.55)	$1.84 (0.54)	$1.83 (0.55)
4. Housing operation and equipment	$1.97 (0.50)	$2.03 (0.49)	$1.97 (0.50)	$2.02 (0.50)
5. Transportation	$1.44 (0.69)	$1.44 (0.69)	$1.39 (0.72)	$1.46 (0.69)
6. Tobacco and alcohol	$2.04 (0.49)	$2.03 (0.50)	$2.00 (0.50)	$2.12 (0.48)
7. Health and personal care	$3.00 (0.33)	$2.99 (0.33)	$3.02 (0.33)	$2.96 (0.34)
8. Recreation	$2.29 (0.44)	$2.29 (0.43)	$2.28 (0.44)	$2.28 (0.44)
Non-food group	$1.91 (0.52)	$1.92 (0.52)	$1.90 (0.53)	$1.94 (0.51)

Note: The only significance attaching to the date of the official exchange rate is that it corresponds to the date of the official price survey. While the first entry in each cell shows the implicit exchange rate of £1 in terms of Australian dollars, the second entry, in parentheses, shows the implicit exchange rate for 1 Australian dollar in terms of U.K. pounds.

[20]This is the case with ABS publications on the CPI. From the latter it is obvious that only value shares are given along with prices for different items. It is not easy to attach specific expenditure figures to the data on prices and value shares and derive implicit quantities indirectly. This makes it difficult to apply the Geary–Khamis system used in Refs. 8 and 9.

households group in each country. Thus on the basis of the desired cost of living comparisons, the implicit ppp exchange rate is £1 = A$1.8740 for the all-household sub-group. The three remaining population sub-groups delineate a similar pattern; the average income household, the Sydney/London and the high income households produce implicit or ppp exchange rates of £1 = A$1.8812, A$1.8604 and A$1.8971 respectively. In other words it takes approximately A$1.87, A$1.88, A$1.86 and A$1.89 to purchase the same amount of goods and services in Australia as £1 buys for the respective household categories in the U.K.

Additional information emerges from examination of the ppp exchange rates computed for the individual sub-categories of consumer expenditure in each of the four population sub-categories. In broad terms Table 3 indicates that food is relatively cheaper while non-food items on average tend to be more expensive in Australia than in the U.K. Food prices in Australia are less than the overall average, i.e. it takes approximately $1.75 and not $1.87 to purchase the equivalent amount of food in Australia as £1 would in the U.K. Non-food prices however require on average approximately $1.90 to $1.93 to purchase the same amount of non-food items as £1 would in the U.K. However, within the non-food category there are considerable variations. Thus housing and particularly transportation are relatively cheap taking approximately $1.83 and $1.42 respectively, rather than $1.87 to purchase the same quantities in Australia as £1 could in the U.K. On the other hand clothing and footwear, housing equipment and operation, tobacco and alcohol and in particular health and recreation are relatively expensive,[21] taking respectively $1.93, $1.98, $2.00, $3.00 and $2.28 approximately rather than $1.87 to purchase the same quantities in Australia as £1 could in the U.K. Naturally, given the nature of the data used, these estimates must be interpreted very cautiously.

The figures in Table 3 also suggest that in terms of purchasing power the official Australian dollar exchange rate was undervalued against the pound at A$1.95 = £1 in September 1979; that in fact it took only A$1.86 to A$1.89 to purchase the same amount of goods and services in Australia as £1 could buy in the U.K. Given the imperfect nature of the data, this deviation between the official and derived implicit exchange rate is really quite small. Nevertheless it may well be that, on the basis of the implicit ppp obtained from this study, the rapid rates of inflation experienced in the U.K. throughout the 1970s lowered the internal purchasing power of the pound relative to its external purchasing power.

Finally, Table 4 examines the relative ppp of the four sub-groups within each country. Table 4 presents the implicit exchange rate derived when each population sub-group in Australia (U.K.) is compared with every other sub-group in the U.K. (Australia).

Examining the results in columns 1–4, where the four sub-groups in Australia are compared against each of the groups as base in the U.K., makes it clear that

[21]For the expenditure sub-category Health and Personal Care the ppps are substantially different from the overall ppps derived in this study. This reflects the operation of the National Health System in the U.K. which subsidizes the cost of health care. In 1979 no such national health service was in operation in Australia. However, if one compared real incomes between Australia and the U.K. one should then take account of the mandatory national insurance contributions deducted from salaries in the U.K. to fund the operation of the national health system.

TABLE 4

PURCHASING POWER PARITIES OF CURRENCIES FOR DIFFERENT PAIRS OF POPULATION GROUPS

			United Kingdom		
		All Households	Average Income Households	London Households	High Income Households
Australia	All Households	1.87 (0.54)	1.87 (0.54)	1.87 (0.54)	1.89 (0.53)
	Average Income Households	1.88 (0.53)	1.88 (0.53)	1.88 (0.53)	1.90 (0.53)
	Sydney Households	1.86 (0.54)	1.86 (0.54)	1.86 (0.54)	1.88 (0.53)
	High Income Households	1.88 (0.53)	1.88 (0.53)	1.88 (0.53)	1.90 (0.53)

Note: The first entry in each cell shows the implicit exchange rate of £1 in terms of Australian dollars. The second entry, in parentheses, shows the implicit exchange rate for 1 Australian dollar in terms of U.K. pounds.

Sydney households fare better by having a higher ppp for the A$, i.e. the implicit exchange rate for A$1 spent by Sydney householders is equivalent to £0.5370, £0.5381, £0.5375 and £0.5327 when it is compared against all households, average income households, London households, and high income households, respectively, in the U.K. In other words Sydney households can purchase more goods and services in the U.K. for A$1 than can any of the other three groups in Australia. Similarly examining the results in rows 1–4 where the four sub-groups in the U.K. are compared against each of the groups as base in Australia, it is clear that the high income households in the U.K. are relatively well-off by having higher ppps for pounds, i.e. the implicit exchange rate for pounds spent by high income groups in the U.K. is equivalent to A$1.8895, A$1.9000, A$1.8773 and A$1.8971 when it is compared against all households, average income households, Sydney households and high income households, repectively, in Australia. Thus high income households in the U. K. can purchase more goods and services in Australia for £1 than can any of the other groups in the U.K.

These results arise predominantly because of the different consumption/expenditure patterns exhibited by the different population sub-groups. This is significant because it permits comparison of relative ppps for different population sub-groups within a country even though each sub-group is faced with a common set of average prices of goods and services. From a practical point of view this implies that any British or Australian resident wishing to assess his relative real income position in each country should attempt to do so by employing the ppp exchange rate applicable to the expenditure pattern for his particular population sub-group. Hence, skilled tradesmen, for example, would convert their nominal, net salaries to real terms, i.e. equalize purchasing power in each country, using

the average income households' implicit exchange rate of £1 = A$1.87 (or £0.5384 = A$1) and professional groups, say academics, would use the high income households' implicit exchange rate of £1 = A$1.89 (or £0.5291 = A$1).[22] Quite clearly distorted real income comparisons would arise using either the official exchange rate or an inappropriate population sub-group implicit exchange rate.

Conclusions

The results show clearly that different expenditure patterns among population sub-groups produce different ppps or implicit exchange rates. However, the differences are not substantial. This may be due to two factors; first, the study made use of the same average prices for each population sub-group, and second, the expenditure patterns for different household groups in each country, with the exception of the high income households group, were fairly similar. On the other hand the results show quite marked differences between the official exchange rate and the implicit exchange rate between the Australian dollar and the pound derived from the ppps computed in this study. Therefore the results suggest that more accurate cost and income studies would eventuate from the use of differentiated ppps for different population sub-groups rather than the simple application of average ppps or official exchange rates. Nevertheless, the study is limited in scope and suffers from the usual data limitations that are common to private studies of this nature. Further work in this area requires continued involvement of national and international statistical organizations in producing comprehensive and expensive price survey data.

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