

A COMPARISON OF PURCHASING POWER PARITY BETWEEN  
THE POUND STERLING AND THE AUSTRALIAN DOLLAR - 1979

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No. 10 - October 1980

ISSN 0157-0188  
ISBN 0 85834 339 8

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June, 1980

### ABSTRACT

This paper attempts to compare the cost of living in Australia and the United Kingdom. The comparisons are made on the basis of price and expenditure shares information provided predominantly by the Australian Bureau of Statistics and the Department of Employment, London and from a private survey conducted by one of the authors in London and Sydney in December 1979. Due to the nature of the data, absence of quantity information, it was necessary to employ a new index number method derived by one of the authors.

A Comparison of Purchasing Power Parity between the  
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INTRODUCTION

The inception of international organizations such as the United Nations (UN), and the International Monetary Fund (IMF), the development of large trading blocks such as the European Economic Community (EEC) and the Association of South East Asean Nations (ASEAN), and the introduction of international agreements such as the General Agreement on Tariffs and Trade (GATT) has encouraged substantial post-war social and economic integration.

This integration has focused general interest on the comparative affluence of nations and has stimulated a series of comparative cost of living studies. Such studies were originally carried out on the basis of official exchange rates [Gilbert & Kravis, 1954]. The limited extent to which exchange rates reflected real purchasing power parities of currencies broke down completely with the abandonment of fixed exchange rate system in the early 1970s. Consequently, the Statistical Offices of the United Nations (SOUN) and the European Economic Community (SOEC) have pioneered on-going attempts to develop a comprehensive and reliable system of estimates of PPP based on index number constructions and detailed price comparisons among a large number of countries.

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\* The authors are indebted to the Australian Bureau of Statistics and the Department of Employment in London, U.K. for the release of price data. A complete list of products can be supplied by the authors but the ABS and DE have refused permission to publish actual prices.

The SOUN introduced the International Comparison Project (ICP) in 1970 [Kravis et al., 1975]. The 10 countries involved in Phase I of this project <sup>(1)</sup> provided national data on prices expenditure and quantities for 153 expenditure categories. Phase II included revised 1970 and new 1973 estimates for the 10 original countries and both 1970 and 1973 estimates for 6 new countries [Kravis et al., 1978] <sup>(2)</sup>. A similar 1970 SOEC exercise restricted the PPP comparisons to the Member States of the Community. This exercise was repeated in 1975 incorporating improvements in price survey techniques and a larger survey encompassing some 1000 items including data from the new Member States of Denmark, Ireland and the United Kingdom [SOEC 1977].

Both ICP and SOEC exercises include binary and multilateral PPP comparisons. The ICP currently makes comparisons not only of PPPs, or price levels, but also of real Gross Domestic Produce (GDP) as a whole and for the three main components of GDP, consumption, investment, government and for 34 subaggregates of expenditure <sup>(3)</sup>. The SOEC study calculates PPP for the above aggregates plus collective consumption of private non-profit institutions and the net current account trading position of all nine Member States. Furthermore, SOEC intends to calculate these PPP every year. The 1980 price survey is well under way. Similarly, Phase III of the ICP, which currently includes more than 30 countries with a 1975 reference date is now in its final preparatory stages. These surveys provide the data to enable SOUN and SOEC to compute PPPs that are independent of official exchange rates.

Australian national statistical organizations are not a party to these or any such similar projects. Moreover, the obvious high costs involved make it impossible for any private study to replicate the comprehensive nature of the official exercises. Hence the objectives of this current study are considerably more modest. These are to attempt, first, a determination of the PPP of the Australian dollar relative to one other currency only, the

pound sterling and second, to make real term cost of living comparisons on the basis of available price survey data, as of September, 1979, on a range of goods and services common to the consumer price indices in Australia and the United Kingdom (UK).

The main justification for this particular emphasis stems from the close political, economic and social ties between Australia and the U.K. and, to the authors' knowledge, the lack of any other systematic attempt to compare respective living costs. Recent conventional opinion suggests that the high rates of inflation experienced by the U.K. in the 1970s have raised that country's previously perceived lower aggregate price level above that currently prevailing in Australia. It is hoped that this study will provide some objective analysis of this controversial issue. Finally, it must be emphasized that this exercise is concerned merely with assessing relative costs and not standards of living. Hence no attempt is made to compute real incomes<sup>(4)</sup> or to assess the worth of State provided communications, cultural activities, health and education.

This article has four main sections. Section I describes the price survey and data collection and examines the construction of the current British and Australian consumer price indices; Section II discusses and assesses the index number constructions used by SOUN and SOEC and suggests a new index number construction for determining PPP; Section III utilizes this new index in an empirical analysis of (one measure) aggregate price levels in Australia and the United Kingdom. Conclusions and qualifications necessary for acceptance of the results of this study are made in Section IV. Comments on methodological weaknesses are made as needs arise in the various sections.

## I. THE PRICE SURVEY AND DATA COLLECTION

With consumer price indices (CPI) now serving as one general, standard gauge of the cost of living in different countries<sup>(5)</sup> the Australian Bureau of Statistics (ABS) has moved to make the Australian index more consistent with international convention.

In 1974-75 the ABS carried out its first major 'Household Expenditure Survey' (HES) [ABS 1974-75]<sup>(6)</sup>. The results of this survey were used, with some interim adjustments, to determine the composition and expenditure weighting pattern of the goods and services included in the 1979 Australian consumer price index [ABS 1978]<sup>(7)</sup>. A similar exercise was conducted, based on the results of the 1978 HES carried out by the Department of Employment (DE) to determine the appropriate expenditure weights for the goods and services included in the 1979 British CPI [D.E. 1975-1978(b)]<sup>(8)</sup>. Table 1 summarises the official categories of consumer expenditure and expenditure weights as used in the British and Australian CPIs. Since this article is written predominantly for Australian readers and to ensure maximum comparability with the Australian position, Table 1 also summarises a minor regrouping of official United Kingdom data into the adjusted United Kingdom equivalent categories and weights.

(INSERT TABLE 1 HERE)

Due to the limitations on data availability it was necessary to adopt the following research methodology. A selection of 181 of the most common and easily priced goods and services were selected from the eight sub-categories of the two indices. As Table 2 shows the ABS provided 134 or 76.0 per cent of the prices in the survey. The DE provided 72 or 40.0 per cent of the prices of the items surveyed. Of these some 26 prices for clothing and footwear

items came from a pricing exercise carried out by the DE on behalf of SOEC in London in October 1978. The prices of the 43 outstanding items in the Australian survey and the 109 in the British survey were collected privately by the authors in a comparable range of retail outlets in Sydney and London, respectively, in December 1979.

(INSERT TABLE 2 HERE)

Since the prices provided by the ABS and DE are average prices as of September 1979 it was necessary to adjust the October 1978 clothing and footwear prices and the December 1979 prices to the September 1979 level by use of published index numbers showing price level differences between October 1978 and September 1979 and between September and December 1979<sup>(9)</sup>. To remain consistent with the aggregate expenditure weights it was also necessary to adjust the eight sub-category weights in the indices to accommodate the products not priced by the ABS or the DE. Individual product weights were thus calculated by taking the individual product price relative to the sub-group product expenditure as a proportion of the sub-group expenditure weight.

The main justification for utilizing government agencies research staffs' which price brands and varieties of items that sell in greatest volume across a range of retail outlets [ABS 1978, p.6] is to minimize the inevitable subjective biases that arise in price surveys and to obtain a 'more accurate' average price of commonly purchased goods and services than any one private individual could hope to attain. However, it must be noted that this approach merely produces a series of expenditure weights which give an indication of the proportion of the average consumer's total expenditure that is spent on a particular category of expenditure. The survey does not produce any data on the value or quantity of goods purchased. As is discussed in Section 2, this form



of data conditions the nature of the statistical techniques that may be used in determining purchasing power parities of national currencies.

## II COMPUTATION OF PURCHASING POWER PARITIES.

Purchasing Power Parity (PPP) of a currency is a measure of its purchasing power reflected by the vector of prices. Any price index between two countries is then defined as the ratio of the PPPs of the respective currencies. Since purchasing power is a relative concept, in general PPP for the currency of a country is measured in terms of a common currency unit.

This section examines different methods available for computation of PPPs. These are the Geary-Khamis method, the Geometric-Walsh method and a new method, the Rao-Index. The following notion is used throughout the rest of the paper.

- Let
- M: number of countries under comparison ( $M \geq 2$ )
  - N: number of commodities which are used for comparison
  - $P_{ij}$ : represents the price of the  $i$ th commodity in the  $j$ th country
  - $Q_{ij}$ : represents the quantity or volume of the  $i$ th commodity in the  $j$ th country
  - $PPP_j$ : represents the purchasing power parity of the  $j$ th country currency expressed in terms of a common currency
  - $P_i$ : represents the average price of  $i$ th commodity averaged over all countries and expressed in terms of a common currency unit
  - $PPP_j/PPP_k$ : defines the price or cost-of-living index for the  $k$ th country with  $j$  as base, denoted by  $I_{jk}$

### II.1 THE UNITED NATIONS STATISTICAL OFFICE/INTERNATIONAL COMPARISON PROJECT METHOD.

The method used in the ICP is based on work by Geary, R.C. [1958] and Khamis, S.H. [1972]. This system is specified through a set of interdependent

linear equations. These are, for each  $i$  and  $j$

$$PPP_j = \frac{\sum_{i=1}^N P_i q_{ij}}{\sum_{i=1}^N P_{ij} q_{ij}} ; \quad P_i = \frac{\sum_{j=1}^M R_j P_{ij} q_{ij}}{\sum_{j=1}^M q_{ij}}$$

Solution for  $PPP_j$  (for  $j = 1, \dots, M$ ) can be obtained by solving a system of linear homogeneous equations. Explicit solution may be obtained for the case  $M = 2$  and is given by

$$PPP_1 = 1 \quad \text{and} \quad PPP_2 = \frac{\sum_{i=1}^N P_{i1} \frac{q_{i1} q_{i2}}{q_{i1} + q_{i2}}}{\sum_{i=1}^N \frac{q_{i1} q_{i2}}{q_{i1} + q_{i2}}}$$

The main advantages of this SOUN/ICP method are that it is based on an intuitive framework of definitions and, more importantly, it yields consistent inter-country comparisons. Index numbers resulting from this method are consistent in the sense that, for any three distinct countries  $j$ ,  $\kappa$  and  $\ell$

$$I_{j\kappa} = I_{j\ell} \cdot I_{\ell\kappa}$$

The major limitation in the application of this method for the problem under consideration, is that it requires separate quantity and price observations. This is a serious problem in the context of the U.K.-Australia comparisons due to the non-provision of separate quantity data by the ABS and the DE. This makes this method inapplicable. A minor problem with this method, which is hardly an issue in the context of U.K.-Australia comparisons, is that it yields somewhat distorted comparisons in the presence of countries that are not homogeneous.

## II.2 STATISTICAL OFFICE OF THE EUROPEAN COMMUNITY METHOD

This method is known in the literature as the geometric-Walsh index number system [SOEC 1977]. This system is defined through the following equations,

$$PPP_j = \frac{\sum_{i=1}^N P_i q_{ij}}{\sum_{i=1}^N P_{ij} q_{ij}} ; \quad P_i = \prod_{j=1}^M [p_{ij}]^{1/M}$$

since the definition of the  $P_i$ 's do not involve PPPs, one can solve for PPPs explicitly. The solution is given by

$$PPP_j = \frac{\sum_{i=1}^N \prod_{\kappa=1}^M [p_{i\kappa}]^{1/M} q_{ij}}{\sum_{i=1}^N P_{ij} q_{ij}}$$

or alternately in a form using only the value (expenditure) shares as

$$PPP_j = \sum_{i=1}^N \prod_{\kappa=1}^M \left[ \frac{P_i}{P_{ij}} \right]^{1/M} \cdot v_{ij} \quad \text{where } v_{ij} = \frac{P_{ij} q_{ij}}{\sum_{i=1}^N P_{ij} q_{ij}}$$

The solution can be computed for the case  $M=2$  as in the previous example. The main advantages of the SOEC method are that it is also consistent; it may be computed when only value ratios are given and since the average price is defined as an unweighted geometric mean of prices, it produces fewer binary distortions in the presence of non-homogenous countries than the SOUN/ICP method. The main disadvantage of this method is that it uses an unweighted geometric mean to define average prices. Furthermore, average price defined here is ambiguous with respect to the units in which it is measured. In view of these shortcomings the following method is used in the computation of the PPPs.

### II.3 A NEW METHOD : THE RAO-INDEX.

This is a new index number system prepared by Prasada Rao [1980]. It is defined through a set of log-linear equations

$$PPP_j = \prod_{i=1}^N \left[ \frac{P_i}{P_{ij}} \right]^{v_{ij}} ; \quad P_i = \prod_{j=1}^M \left[ R_j P_{ij} Q_{ij} \right]^{v_{ij}^*}$$

$$\text{where } v_{ij}^* = \frac{v_{ij}}{\sum_{k=1}^M v_{ik}}$$

Solutions for the PPPs can be obtained by solving a system of log-linear equations implied by the above equations. Explicit solution in the case M=2 is given by

$$PPP_1 = 1 \quad \text{and} \quad PPP_2 = \prod_{i=1}^N \left[ \frac{P_{i1}}{P_{i2}} \right]^{w_i} \quad \text{where } w_i = \frac{\frac{v_{i1}v_{i2}}{v_{i1} + v_{i2}}}{\sum_{i=1}^N \frac{v_{i1}v_{i2}}{v_{i1} + v_{i2}}}$$

This system is also consistent. The method is readily applicable to the present problem since it uses only the value ratios and the prices information. Moreover, since it is a log-linear system based on value share weights it produces fewer distortions in the presence of heterogenous countries. This system also makes use of average prices which we defined as weighted geometric means in terms of a common currency unit. Thus it overcomes both the problems inherent in the SOEC method.

In view of the above discussion, the new method for deriving the PPPs has been chosen for the computations in this paper.

### III EMPIRICAL RESULTS

This section discusses the empirical results obtained by using the Rao methodology discussed in the previous section together with the data collected on prices and expenditure value shares. In Table 3 the implicit exchange rates of the Australian dollar and the pound Sterling, derived on the basis of the relative costs are presented against official exchange rates.

(INSERT TABLE 3 HERE)

From Table 3 it can be seen that on the basis of the cost-of-living comparisons derived using the Rao methodology, the implicit exchange rate is  $\pounds 1 = \text{A}\$1.8299$  or equivalently  $\text{A}\$1 = \pounds 0.5465$ . This indicates that the purchasing power of one pound is approximately 1.83 times that of an Australian dollar. In other words, one requires 83 per cent more dollars than pounds to buy an equivalent basket of goods in Australia. Significantly this is much lower than the parity suggested by the then prevailing official exchange rate of  $\pounds 1 = \text{A}\$1.9450$ . Thus, despite the fact that Australian aggregate price level still exceeds that in the United Kingdom, it appears that on the basis of the implicit PPP obtained from this study, that the recent inflationary experience in the United Kingdom has gone a long way towards narrowing the popularly conceived cost-of-living differential between the two countries.

Additional information emerges from examination of the implicit exchange rates computed for the individual sub-categories of consumer expenditure also shown in Table 3. As one would expect food prices in Australia are less than overall ( $\pounds 1 = \text{A}\$1.7525$  against 1.8299). Similarly, tobacco and alcohol, health and personal care and recreation are significantly higher than the overall costs, they being respectively 2.1030, 2.9680 and 2.2360. Housing is almost exactly the same as the average, 1.8219 but housing equipment and operation are

significantly cheaper, indeed on a par with British costs, 1.0209. It can also be seen that transportation is much cheaper than the average, only 1.4295 which quite probably reflects Australia's relative immunity from the oil-crisis. Finally, clothing and footwear which for long have been regarded as much more expensive in Australia than in the United Kingdom, are also cheaper, at 1.7205 than the overall, average implicit PPP exchange rate of 1.8299.

Naturally these estimates must be interpreted cautiously. No doubt the most reliable sub-category estimates are for those which contain the greatest number of items. Thus it is possible to be reasonably confident of the food, clothing and footwear, housing operation and equipment, health and personal care and recreation sub-category estimates which contain, respectively, 58, 41, 28, 19, and 16 items but perhaps less confident about the housing, transportation and tobacco and alcohol estimates which contain, respectively, 3, 8 and 8 items.

#### IV CONCLUSIONS

The results are quite encouraging and conform to the expectation that recent economic trends have narrowed the conventionally perceived, considerable cost-of-living differential between Australia and the United Kingdom. Further work should take either, or both, of the following directions: similar work on the basis of a more comprehensive list of goods and services, and/or an extension to encompass G.D.P. comparisons along the lines delineated by the SOUN and SOEC studies. Although further work in this area would be fruitful, it may prove too voluminous and expensive for private investigation. This article will have served a useful purpose if it stimulates further effort in collaboration with government agencies in both the United Kingdom and Australia.

TABLE 1: CONSTRUCTION OF THE CONSUMER PRICE INDICES IN AUSTRALIA AND THE UNITED KINGDOM 1979

AUSTRALIA		ADJUSTED UK EQUIVALENT WEIGHTS	UNITED KINGDOM	
SECTION	WEIGHT		SECTION	WEIGHT
(1) FOOD (including meals out 2.091; excluding animal food )	20.839	27.7	FOOD (including meals out 5.1; excluding animal food 0.6)	23.2
(2) CLOTHING AND FOOTWEAR (including repairs, laundry 0.532)	10.280	9.3	CLOTHING AND FOOTWEAR (including repairs 0.1; laundry 0.1 dry-cleaning 0.9)	8.2
(3) HOUSING	13.258	12.0	HOUSING	12.0
(4) HOUSING OPERATION (including fuel and light 2.165)	14.170	12.3	DURABLE HOUSEHOLD GOODS PLUS FUEL AND LIGHT 5.9	12.3
(5) TRANSPORTATION	17.761	14.3	TRANSPORTATION	14.3
(6) TOBACCO AND ALCOHOL	9.348	12.1	TOBACCO AND ALCOHOL	12.1
(7) HEALTH AND PERSONAL CARE	6.625	5.4	PERSONAL SERVICES (excluding repairs, etc. 0.1; including animal food 0.6)	5.9
(8) RECREATION	7.719	6.9	MISCELLANEOUS GOODS/SERVICES	6.9
<u>TOTAL WEIGHTS</u>	<u>100.000</u>	<u>100.0</u>	<u>NET</u>	<u>94.9</u>

SOURCE: "A Guide to the Consumer Price Index", pp 12-4, ABS, Canberra/3655/78L  
"Employment Gazette", Department of Employment, London, March 1979

TABLE 2: PRICES PROVIDED BY PRIVATE AND OFFICIAL PRICE SURVEYS

PER SUB-CATEGORY OF EXPENDITURE.

SECTION	<u>AUSTRALIA</u>				<u>UNITED KINGDOM</u>			
	TOTAL ITEMS	ABS SURVEY	PRIVATE SURVEY		SECTION	TOTAL ITEMS	DE SURVEY	PRIVATE SURVEY
FOOD	58	52	6	(1)	FOOD	58	35	23
CLOTHING & FOOTWARE	41	32	9	(2)	CLOTHING & FOOTWARE	41	28	13
HOUSING	3	1	2	(3)	HOUSING	3	1	2
HOUSING EQ.& OPERATION	28	12	16	(4)	HOUSING EQ.& OPERATION	28	5	23
TRANSPORT- ATION	8	5	3	(5)	TRANSPORT- ATION	8	3	5
TOBACCO & ALCOHOL	8	8	-	(6)	TOBACCO & ALCOHOL	8	-	8
HEALTH & PERSONAL CARE	19	18	1	(7)	HEALTH & PERSONAL CARE	19	-	19
RECREATION	16	10	6	(8)	RECREATION	16	-	16
<b>TOTAL</b>	<b>181</b>	<b>138</b>	<b>43</b>		<b>TOTAL</b>	<b>181</b>	<b>72</b>	<b>109</b>



TABLE 3: OFFICIAL AND IMPLICIT EXCHANGE RATES:

AUSTRALIA AND THE UNITED KINGDOM

	UNITED KINGDOM AS BASE COUNTRY	AUSTRALIA AS BASE COUNTRY
	£1 = A\$	1A\$ = £
OFFICIAL EXCHANGE RATE 28 SEPT. 1979	\$1.9450	£0.5141
EXCHANGE RATE BASED ON CURRENT STUDY	\$1.8299	£0.5465
CURRENT STUDY EXCHANGE RATE PER CONSUMPTION CATEGORY:		
FOOD	\$1.7525	£0.5706
CLOTHING & FOOTWEAR	\$1.7205	£0.5812
HOUSING	\$1.8219	£0.5489
HOUSING OPER/EQUIP.	\$1.0209	£0.9795
TRANSPORTATION	\$1.4295	£0.6995
TOBACCO & ALCOHOL	\$2.1030	£0.4755
HEALTH & PERSONAL CARE	\$2.9680	£0.3369
RECREATION	\$2.2360	£0.4472

Note: Official Exchange Rates are those obtaining on the 28th September 1979. The only significance attaching to this rate is that it corresponds to the date of the official price survey.

#### FOOTNOTES

- (1) The Phase I countries are Columbia, France, the Federal Republic of Germany, Hungary, India, Italy, Japan, Kenya, the United Kingdom and the United States.
- (2) The six new countries in Phase II are Belgium, Iran, the Republic of Korea, Malaysia, the Netherlands and the Phillipines.
- (3) For details of these subaggregates of expenditure see [Kravis et al, 1975, p.2 footnote 2 and Tables 4.1-4.10, pp.86-113 and Tables 5.1-5.30, pp.174-218.]
- (4) A subsequent article by W.F. Shepherd entitled 'Aggregate Price Levels, Real Average Earnings and Academic Salaries in Australia and the United Kingdom 1979' makes a start at examining real earnings in both countries.
- (5) Actually the CPI measures the change in a basket of goods and services representative of the expenditure pattern of a particular sample of the population in a specified time period. For details of this sample in the Australian situation see [ABS 1974-75] and in the British case see [DE 1975 & 1978(a)].
- (6) This survey is designed to elicit how the expenditure patterns of private households vary according to such criteria as income levels, size and composition of the household and the age and occupational status of the household head.
- (7) See this source for the current expenditure weights.
- (8) In the U.K. the CPI is actually known as the Retail Prices Index.
- (9) For details of price changes see [DE 1978(b), 1980] and [ABS 1980].

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