SHORT-CUT ESTIMATES OF REAL INCOME

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The United Nations International Comparisons Project (ICP) has conducted in-depth purchasing-power parity (PPP) studies of the so-called "benchmark" countries (of which there were 34 in the 1975 sample). In the absence of PPP studies of the rest of the countries in the world, the ICP team has constructed "short-cut" estimates of real income (that is, income converted from domestic currency to dollars at PPP) for the nonbenchmark countries. The idea of a "short-cut" procedure for estimating real income is to run a regression of real income on nominal income (that is, income converted from domestic currency to dollars at a market exchange rate) and other variables among the benchmark countries and then to use this regression to estimate real income for the nonbenchmark countries. The most recent ICP short-cut estimates have been based on regressions of real income on nominal income and the foreign trade ratio. The present study expands the list of candidate variables that might be included in a short-cut regression. The list includes educational attainments, the share of minerals in GDP, the trade balance, the growth of the money supply, tourist receipts, and the share of nontradables in GDP. The theory underlying the inclusion of each of these variables is discussed. Regressions are run with various combinations of these variables and some short-cut estimates of real income for 76 market economies are presented.

Summers and Heston (1984) provide estimates of real income and its composition for 124 countries for the period 1950–80. These estimates grow out of the United Nations International Comparisons Project (ICP), under the direction of Kravis, Heston, and Summers (KHS) of the University of Pennsylvania. The ICP has conducted full-blown purchasing-power parity (PPP) studies of the "benchmark countries" (of which there were 34 in the 1975 sample). From the data on the benchmark countries, Summers and Heston (SH) constructed structural relationships (or "short-cut regressions") that were used to derive estimates for the 90 nonbenchmark countries in 1970 and 1975. The purpose of the present paper is to consider alternative short-cut regressions and the logic behind them.

The ICP uses the term "real income" to refer to GDP per capita converted to a common currency by means of a PPP, and "nominal income" to refer to GDP per capita converted by an exchange rate. The ICP work (KHS 1978a, 1982) has amply demonstrated that exchange-rate conversions are an inadequate procedure for making international comparisons of standard of living; that is, real income comparisons among countries are quite different from nominal income comparisons. But since the deviations of PPP's from exchange rates are fairly systematic, there is a good basis for short-cut regressions. The short-cut regressions used in recent ICP work (KHS, 1982; SH, 1984) explain real income with nominal income and the foreign trade ratio (or openness). However, recent theoretical work on the relationship between the PPP and the exchange rate has suggested possible additional variables that might be included in a short-cut regression.

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Kravis and Lipsey (1983) use the term "national price level" to refer to the ratio of a PPP to an exchange rate. Their essay surveys and extends the theory of national price levels and also contains some regressions on the 34-country (1975) sample. In their regressions the dependent variable is the national price level (which is equal to the ratio of nominal income to real income). As independent variables they used (among others) real income and the foreign trade ratio. Such an equation is very similar to a short-cut regression, a main difference being that on the right-hand side appears real income rather than nominal income. Real income makes more sense as a determinant of the national price level, but nominal income must be used in short-cut estimating equations because of course that is what is available for nonbenchmark countries.

Kravis and Lipsey (1983) also used the share of nontradables in GDP at domestic prices (SNTD) and the growth of the money supply from 1970 to 1975 (MNGR) as independent variables. Both entered the equation with significant *t*-ratios. Interestingly they found that education and literacy variables did not enter significantly. Yet Isenman (1980), using the 16-country 1970 sample, developed short-cut equations using two variables related to education: teacher salaries and secondary school enrollment ratios.

Clague (1985a) suggested additional variables to explain the national price level: natural resource abundance, tourist receipts, and the trade balance. In an empirical study with the 1975 sample, Clague (1985b) used the mineral share in GDP (as a measure of natural resource abundance), tourist receipts as a proportion of GDP, the trade balance as a proportion of GDP, money growth (MNGR), and an education variable.

In the present paper we shall try all of the variables mentioned above in short-cut estimating regressions. Before doing that, however, we shall discuss some aspects of the theory underlying these regressions (section I). The data are described in section II, and the regressions are presented in section III. In section IV we present some alternative estimates of real income for nonbenchmark countries.

I. Theoretical Considerations

Clearly the purpose of short-cut estimating equations is different from that of testing economic models. While in the latter endeavor we are concerned about the causal relationships among the variables, in short-cut estimation we seek mainly to find a reliable empirical relationship between real income (or the price level) and variables that can readily be measured for nonbenchmark countries. It does not matter to us whether the right-hand side ("explanatory") variables cause or are caused by real income or the price level. Nevertheless, I would argue that we should not use a right-hand side (R.H.S.) variable unless we have some understanding of why it exhibits a correlation (or more properly a partial correlation) with real income or the price level. Consequently some discussion of the logic of the relationships is in order.

First we shall say a word about the form of the short-cut equations that will be discussed. Short-cut estimating equations may take a form such as the

following:

$$(1) \quad \log \text{RELY} = \text{const.} + a_1 \log \text{NOMY} + a_2(\log \text{NOMY})^2 + a_3 \log \text{EDUC} + \text{other variables}$$

where RELY = real income and NOMY = nominal income. The log form is usually preferred, either because that fits the data better or because one desires to minimize log errors. This equation can be manipulated so as to put the log of the price level (log PL) on the left-hand side (L.H.S.). Noting that PL = NOMY/RELY, we subtract log NOMY from both sides and reverse signs to obtain

$$(2) \quad \log \text{PL} = \text{const.} + b_1 \log \text{NOMY} + b_2(\log \text{NOMY})^2 + b_3 \log \text{EDUC} + \text{other variables}$$

where $b_1 = (1 - a_1)$ and $b_2 = -a_2$ and $b_3 = -a_3$. Thus the coefficients on variables other than log NOMY are simply reversed in sign in equations (1) and (2). The t-ratios on these variables will also be identical (apart from sign).

The two equations (1) and (2) are equivalent for purposes of short-cut estimation. In discussing the variables we find both forms to be useful. Equation (2) is rather similar in form to the price-level equations estimated by Kravis and Lipsey (1983)[1] and Clague (1985b). A difference is that in (2) nominal income is used instead of real income on the R.H.S. We turn now to a discussion of individual variables.

1. *Education*

There are two distinct reasons for putting education into the short-cut regression. First, if services are skill intensive, a higher level of education (holding income constant) would be associated with a lower relative price of services and, by the logic of the productivity differential model, a lower overall price level (Isenman, 1980). Thus b_3 in (2) would be negative. Second, since education is a consumption good with a positive real income elasticity, the level of education may serve along with nominal income to give an indication of the level of real income. Thus a_3 in (1) would be positive. Since $a_3 = -b_3$, the two arguments lead to the same result.

Note that the two arguments would give different predictions if nominal income were replaced by real income on the R.H.S. of (2). The second argument would suggest that education would no longer enter, while the first would still suggest a negative b_3. In fact we find that replacing nominal income by real income in (2) weakens the education variable considerably, usually to the point of insignificance. This finding suggests that we should think of the education variable in the short-cut equation as being justified primarily by the second of the two arguments given above.[2]

[1]Kravis and Lipsey (1983) actually estimate the price level in linear form.

[2]Under the skill interpretation of the education variable, the proper way to measure education would be to use the educational qualifications of the labor force, a measure of the stock of human capital. The data readily available, however, relate to enrollment rates, a flow measure of investment in human capital. Under the consumption good interpretation, enrollment rates would be preferred to a stock measure of human capital.

2. SNTD

SNTD is the share of nontradables in GDP at domestic prices. Nontradables are defined in KHS (1982, p. 193) as services (intangible goods) plus construction. All commmodities are included in tradables. The division of final expenditure into the ICP categories was provided to the ICP researchers by the national accounts offices in each of the benchmark countries. In principle it should be possible to calculate SNTD for nonbenchmark countries, but it would require some expertise in the national accounts data of these countries. Even though SNTD may not be readily available for short-cut estimation, it is an interesting variable that merits some discussion.

To try to understand the relationship between SNTD and the price level, let us consider the following identity[3]:

$$(3) \qquad (1/\mathrm{PL}) = (\mathrm{SNTD}/\mathrm{PN}) + (1 - \mathrm{SNTD})/\mathrm{PT}$$

where PN and PT refer to the prices of nontradables and of tradables, with U.S. = 1.00.

For most nonbase countries, PN and PT are below 1.00 and PT is closer to 1.00 than PN is. Since PL is a harmonic mean of PN and PT, where PN is below PT, an increase in SNTD would tend to reduce PL, other things equal. We call this the "argument from weights," and we note that by itself it would generate a *negative* correlation between PL and SNTD. However, the correlation is actually positive, a phenomenon which is arithmetically explained by the fact SNTD is positively correlated with both PN and PT.

SNTD is highly correlated with PL($r = 0.85$), with PN($r = 0.84$), and with PT($r = 0.84$). An argument will now be presented to explain these correlations. In comparing countries at different levels of income, we find the relative price of nontradables (PN/PT) is positively correlated with real income. The elasticity of substitution in consumption (or use) between tradables and nontradables is small (definitely less than unity) (KHS, 1983). Hence a higher relative price of

[3]In KHS (1982, p. 190) equation 3.15 is

$$\mathrm{PPP} = \sum_{i=1}^{T} \mathrm{PPP}_i Q_i / \sum_{i=1}^{T} \Pi_i Q_i$$

where Π_i are the international prices for category i, Q_i refers to the quantity of i consumed by the country, PPP_i is the category PPP relative to the dollar, and PPP is the country's PPP. Because of the way Q_i is defined (KHS, p. 190), the numerator is simply income at domestic prices measured in local currency. This numerator will be designed as Y.

Let us divide the categories of expenditure into nontradables and tradables and for convenience let us index the nontradables as $i = 1, \ldots, N$ and the tradables as $i = N+1, \ldots, T$. Dividing the above equation into the exchange rate (ER), we obtain

$$\mathrm{ER}/\mathrm{PPP} = \mathrm{SNTD}\ (1/\mathrm{PN}) + (1 - \mathrm{SNTD})\ (1/\mathrm{PT})$$

where

$$\mathrm{SNTD} = \sum_{i=1}^{N} \mathrm{PPP}_i Q_i / Y$$

$$\mathrm{PN} = \sum_{i=1}^{N} \mathrm{PPP}_i Q_i / \sum_{i=1}^{N} (\mathrm{ER}\ \pi_i) Q_i$$

$$\mathrm{PT} = \sum_{i=N+1}^{T} \mathrm{PPP}_i Q_i / \sum_{i=N+1}^{T} (\mathrm{ER}\ \pi_i) Q_i.$$

nontradables is associated with a larger SNTD. In support of this argument we find that SNTD is fairly highly correlated with the relative price of nontradables ($r = 0.77$), which is in turn highly correlated with PL ($r = 0.825$).

We have been explaining the simple correlation of SNTD with the price level. In a short-cut regression of course we would be introducing SNTD along with nominal income variables. We would still expect a positive coefficient on SNTD as long as there is some variation in the relative price of nontradables that is not perfectly captured by the nominal income variables.

3. *The Foreign Trade Ratio* (FTR)

The foreign trade ratio has been used successfully in short-cut regression by the ICP team, but to my mind it has not found a satisfactory theoretical explanation. In conversations with economists I have been struck by how readily they accept the idea that a high foreign trade ratio should be associated with a high price level.[4] I think part of the ready acceptance is based on the notion that a high FTR should be associated with a high share of tradables in GDP, and according to the "argument from weights" discussed above (since PT tends to be higher than PN), a high share of tradables should be associated with a high price level. But in fact FTR is a very different concept from the share of tradables in GDP, and the correlation between the two is actually negative ($r = -0.38$).

To explain why the FTR is correlated with the price level, one would need to consider what accounts for international variation in FTR itself. A variable often used to explain FTR, both theoretically and empirically, is country size. But now let us contemplate the effects of variations in country size on the price level. Suppose Brazil were to be divided up into its states. Do we think that the average price level would be higher for the collection of states than it had been for unified Brazil? There seems to be no theoretical reason to expect country size to be correlated with the price level (Clague, 1985a) and in price level regressions on the 1975 sample country size is generally quite insignificant.

Another variable which might help to explain international variation in FTR is the level of import restrictions. Countries with high FTR's would be expected to have low import barriers. If low import barriers were associated with high price levels, then we would have found an explanation for the positive partial correlation of FTR and PL. But is it reasonable to argue that low import barriers should be associated with high price levels?

In a recent paper on tariffs and the national price level (Clague, 1985c), I considered two different models: a specific-factors model and a capital-labor model. In the specific-factors model an import tariff always raises the national price level. In the capital-labor model it is possible for an import tariff to reduce the national price level, but this result requires that the tariff cause the domestic currency to depreciate when the price of home goods is held constant. It is part

[4]In a price-level regression (such as (2)) the coefficient on FTR has been found to be positive (e.g., Kravis–Lipsey (1983)). In a regression explaining real income (such as (1)), FTR enters negatively. One of the referees pointed out that in SH (1984, p. 211, equations 3 and 4) the signs on FTR (which they call openness, or OP) were incorrectly printed as positive, when in fact they are negative.

of the conventional wisdom of economists that a tariff causes an appreciation of the domestic currency (e.g. Balassa, 1971, pp. 324-331) and I think the conventional wisdom is well founded. I feel that the capital-labor model is inappropriate in the present context and that we should normally assume that an import tariff or other import barrier raises the national price level. If this conclusion is accepted, import barriers cannot be used to explain the positive partial correlation of FTR and the price level.

Another possible explanation for the positive coefficient on FTR in a price-level regression is that FTR is a proxy for abundance of natural resources. In the model of Clague (1985a), a measure of resource abundance should enter positively into a price-level regression, when an income variable is also present. The key to the theoretical result is that resources contribute to the production of commodities or tradables but not to the production of services or nontradables. If FTR is serving as a proxy for resource abundance, then we should investigate whether a more direct measure of resource abundance might work better. We turn now to such a measure.

4. *Mineral Share*

The share of minerals in GDP seems to be a reasonably good measure of the abundance of mineral resources. In the 1975 sample of 31 countries (excluding three centrally planned economies for lack of data), the mineral share has a median of only 1.2 percent but it ranges up to 35 percent for Iran and 30 percent for Zambia.

5. *Money Growth*

Kravis and Lipsey (1983) introduced into a 1975 price-level regression the growth in the money supply from 1970 to 1975. They suggested that according to the Dornbusch overshooting model of exchange rates, a high growth in the money supply should create expectations that would raise the exchange rate more than the prices of goods, so that the price level (PPP/ER) should fall. They did find that the variable entered negatively as predicted.

6. *Trade Balance*

Clague (1985c) showed that a negative trade balance should be associated with a higher price level, other things equal, in a specific-factors model. The trade balance as a proportion of GDP was found in Clague (1985b) to enter negatively into a price-level regression.

7. *Tourism*

Clague (1985a) showed that foreign tourism would tend to raise the price of services relative to commodities and would raise the price level, other things equal. Tourist receipts as a share of GDP were found to enter positively into a price-level regression (Clague, 1985b), but the coefficient was quite sensitive to specification and in some specifications the variable was not significant.

We have identified seven candidate variables, apart from nominal income, for inclusion in short-cut regressions. We shall run some regressions for the sample of benchmark countries in 1975 (section III). Then we shall calculate some estimates of real income for nonbenchmark countries, comparing the results of different short-cut equations (section IV). But first, in section II we shall describe the data and the data sources.

II. Data Description and Sources for Benchmark Countries

Real per capita incomes and price levels for 34 benchmark countries in 1975 are available in KHS (1982). Three centrally planned economies (Hungary, Poland, and Romania) were excluded from the regressions for lack of data on several of the independent variables. (Even if the data were available, the hypothesized relationships might be inappropriate for these economies.) KHS (1982) also provide the share of nontradables in GDP measured in domestic prices. The foreign trade ratio is measured as the sum of exports and imports in relation to GDP, averaged over 1965–73. The data are identical to those used in KHS (1982) and were kindly supplied by Robert Summers.

The abundance of mineral resources is measured by the mineral share in GDP (taken from the World Bank, *World Tables*, 1980; the shares are averages for 1970–77). Tourist receipts and the trade balance for 1975 were taken from the IMF *Balance of Payments Yearbook*. Tourist receipts are simply the travel credit. The trade balance was calculated as the balance on goods and services (which excludes unilateral transfers) less net interest, dividend, and profit payments. Education was measured by the Harbison–Meyers education index, which is the secondary enrollment ratio plus five times the university enrollment ratio. The data were taken from the UNESCO *Statistical Yearbook* for 1975. The money growth variable was calculated from line 34 of *International Financial Statistics*.

III. Short-Cut Regressions

The regressions were run according to the form of equation (2), with the log of the price level as the dependent variable and with LNY (log of nominal income) and LNYS (LNY squared) as the first two right-hand side variables. Since the seven additional candidate variables exhibit some multicollinearity, they have been divided into groups.

In the first group are the log of education (LEDU) and money growth (MNGR). In Table 1 these two variables are entered first (after LNY and LNYS). Both variables enter negatively as expected; LEDU is quite significant and MNGR is marginally so. The next variable to be entered in Table 1 is the trade balance (TBAL). This variable enters negatively as expected and is significant. Lastly in Table 1 tourism (TOUR) and the log of one plus the mineral share (LMIN) are introduced, but neither is significant in that table.

In the second group of variables (in Table 2) we start instead with LMIN (mineral share variable) and TBAL (trade balance). LMIN enters positively as expected and is marginally significant. TBAL remains significant. Tourism (TOUR) enters positively as expected but is not significant. Finally in Table 2

TABLE 1

GROUP 1

	LNY	LNYS	LEDU	MNGR	TBAL	TOUR	LMIN	Intercept	$\bar{R}^2$ (S.E.)
1.	0.119	0.0378						−1.197	0.8751
	(1.01)	(1.80)						(−8.22)	(0.1638)
2.	0.307	0.0239	−0.193					−1.868	0.9180
	(2.87)	(1.38)	(−3.96)					(−9.04)	(0.1327)
3.	0.393	0.0077	−0.190	−0.0257				−1.908	0.9256
	(3.53)	(0.42)	(−4.10)	(−1.93)				(−9.64)	(0.1264)
4.	0.368	0.0149	−0.171	−0.0220	−1.029			−1.922	0.9343
	(3.50)	(0.84)	(−3.85)	(−1.75)	(−2.11)			(−10.33)	(0.1188)
5.	0.349	0.0172	−0.169	−0.0220	−0.998	1.055		−1.903	0.9329
	(3.18)	(0.95)	(−3.73)	(−1.73)	(−2.01)	(0.69)		(−10.01)	(0.1200)
6.	0.304	0.0243	−0.156	−0.0201	−1.02	1.31	0.242	−1.843	0.9311
	(2.29)	(1.12)	(−3.13)	(−1.52)	(−2.02)	(0.82)	(0.62)	(−8.55)	(0.1216)

t-ratio in parentheses below coefficients
LNY = log of nominal income.
LNYS = LNY squared.
LEDU = log of Harbison-Myers education index.
MNGR = money growth.
TBAL = trade balance.
TOUR = tourism.
LMIN = log of one plus mineral share.

TABLE 2

GROUP 2

	LNY	LNYS	LMIN	TBAL	TOUR	LEDU	Intercept	$\bar{R}^2$ (S.E.)
1.	0.0490	0.0513	0.752				−1.157	0.8827
	(0.40)	(2.35)	(1.68)				(−8.09)	(0.1587)
2.	0.0610	0.0558	0.722	−1.492			−1.283	0.9032
	(0.55)	(2.80)	(1.77)	(−2.60)			(−9.25)	(0.1441)
3.	0.0151	0.0624	0.829	−1.405	2.329		−1.255	0.9055
	(0.13)	(3.07)	(2.01)	(−2.45)	(1.27)		(−9.04)	(0.1425)
4.	0.214	0.0408	0.379	−1.128	1.460	−0.149	−1.781	0.9273
	(1.75)	(2.11)	(0.97)	(−2.21)	(0.89)	(−2.92)	(−8.20)	(0.1249)

we introduce education (LEDU) and we see that it reduces the coefficient on LMIN substantially and renders it insignificant. The TBAL coefficient is reduced somewhat but remains significant.

To summarize on Tables 1 and 2, we can say that LEDU and TBAL are always significant and MNGR is marginally so. These variables also have the advantage that their coefficients are reasonably stable across equations. They all seem to be good candidates for inclusion in a short-cut regression.

Before discussing the mineral share and tourism variables, let us recall that a short-cut regression is not necessarily designed to test hypotheses. In our case, there is a problem of reverse causation. In particular in regression (1), where real income is the dependent variable and nominal income and education are on the right-hand side, part of the causation may run from real income to education.

This reverse causation may weaken some of the other variables. The same problem affects regression (2), where the price level is the dependent variable, since as explained above the regression coefficients and the t-values of most of the variables are merely reversed in sign when we go from regression (1) to regression (2). A reasonable way to deal with this problem of reverse causation, when one is interested in testing hypotheses, is to replace nominal income with real income on the R.H.S. of regression (2).

When real income is used rather than nominal income on the R.H.S. of (2), and the education variable is also present, both the mineral share and the tourism variables perform somewhat better than they do in Tables 1 and 2. The tourism variable remains rather weak, however. The mineral share coefficient is both statistically significant and not very sensitive to the introduction of the education variable. In light of these considerations we shall include LMIN (but not TOUR) as one of our variables in the illustrative short-cut estimates.

In Table 3 we introduce the log of the foreign trade ratio (LFTR). When introduced alone with the income variables, LFTR is quite significant; regression 1 in Table 3 is similar to the KHS (1982) and SH (1984) short-cut regressions. The introduction of additional variables weakens LFTR substantially. The regression coefficient is progressively reduced and it becomes insignificant. In comparing Table 1 and Table 3 we see that the addition of LFTR changes the coefficients on LEDU and TBAL only slightly and the coefficient on MNGR only moderately. The introduction of LFTR substantially weakens LMIN, as might be expected from the hypothesis that LFTR is serving partly as a proxy for natural resource abundance.

Finally in this section we introduce the share of nontradables in GDP (SNTD) into some of the regressions in Table 4. SNTD works quite well when there are not too many other variables in the equation, but as other variables are added its coefficient and t-ratio decline substantially. SNTD would definitely be a useful variable for short-cut purposes, but as pointed out above its availability for nonbenchmark countries is problematic.

TABLE 3

FOREIGN TRADE RATIO

	LNY	LNYS	LEDU	MNGR	TBAL	LMIN	LFTR	Intercept	$\bar{R}^2$ (S.E.E.)
1.	0.0930	0.0404					0.117	−1.483	0.8963
	(0.86)	(2.11)					(2.59)	(−8.60)	(0.1492)
2.	0.263	0.0276	−0.162				0.0642	−1.918	0.9217
	(2.41)	(1.61)	(−3.12)				(1.50)	(−9.37)	(0.1297)
3.	0.348	0.0128	−0.169	−0.0216			0.0450	−1.937	0.9258
	(2.92)	(0.67)	(−3.33)	(−1.56)			(1.04)	(−9.71)	(0.1262)
4.	0.334	0.0187	−0.155	−0.0189	−0.982		0.0361	−1.944	0.9336
	(2.95)	(1.02)	(−3.21)	(−1.44)	(−1.99)		(0.88)	(−10.30)	(0.1194)
5.	0.316	0.0216	−0.150	−0.0181	−0.997	0.116	0.0344	−1.917	0.9310
	(2.45)	(1.03)	(−2.90)	(−1.33)	(−1.97)	(0.30)	(0.81)	(−9.02)	(0.1217)

LFTR = log of foreign trade ratio.

TABLE 4

SNTD REGRESSIONS

	LNY	LNYS	SNTD	LEDU	MNGR	TBAL	Intercept	$\bar{R}^2$ (S.E.)
1.	−0.00086	0.0411	0.0176				−1.637	0.9084
	(−0.01)	(2.29)	(3.34)				(−9.03)	(0.1403)
2.	0.185	0.0295	0.0110	−0.145			−1.975	0.9271
	(1.59)	(1.78)	(2.09)	(−2.82)			(−9.80)	(0.1251)
3.	0.273	0.0141	0.0102	−0.146	−0.0236		−2.005	0.9335
	(2.26)	(0.79)	(2.03)	(−2.97)	(−1.88)		(−10.39)	(0.1195)
4.	0.285	0.0180	0.0076	−0.143	−0.0213	−0.787	−1.99	0.9371
	(2.42)	(1.03)	(1.46)	(−2.99)	(−1.73)	(−1.56)	(−10.59)	(0.1162)

SNTD = nontradables share.

IV. SOME SHORT-CUT ESTIMATES OF THE PRICE LEVEL AND REAL INCOME

Let us say a word about different philosophies of short-cut regressions. One position might be that short-cut regressions are simply too fragile a basis for estimates of income levels. This position would imply either the continued use of nominal income comparisons or the abandonment of income comparisons for nonbenchmark countries. A second position might be that short-cut regressions should rely entirely on nominal income as the independent variable, since nominal income accounts for most of the variance in national price levels and the theory underlying this relationship is fairly well understood. Comparisons under this procedure would not involve any changes in ranking of countries from the comparisons based on nominal incomes. Leaving the rankings unchanged would defeat many of the main goals of the ICP's effort to re-estimate real incomes.

A third position would admit additional variables into the short-cut regression. As other variables are introduced, the possibilities for changing the rankings of countries are enhanced. While the new procedures might yield smaller expected errors than the earlier ones, there is also the possibility of introducing new errors for particular countries. International organizations such as the World Bank are understandably reluctant to replace traditional procedures that are reasonably well understood and accepted by new procedures that have not been well tested. Since the regression results reported in the previous section are not clear cut and are based on just one sample, the resulting estimates of real income for nonbenchmark countries must be regarded as very tentative. The purpose of the present paper should be seen as that of advancing the art of short-cut estimation rather than that of providing definitive estimates of real income. The next round of the ICP (Phase IV, for 1980) covers some 60 countries and will afford an opportunity to test further some of the variables suggested here.

Proceeding in this spirit, then, we offer two sets of estimates of real income for 76 nonbenchmark countries. (These are all the market economies included in the Summers-Heston 1984 study). The first set is based on regression 3 of Table 1; besides nominal income variables, education and money growth are included. The second set is based on regression 2 of Table 2. It includes nominal income variables, the mineral share, and the trade balance. We also present an

average of these two estimates and the SH estimates, which are based on the foreign trade ratio.

Before discussing the results we shall comment on the difficulties encountered with particular variables. To start with the education variable, let us recall that it is the Harbison-Myers index, which is the secondary enrollment ratio plus five times the university enrollment ratio. On the skill interpretation of this variable, the proper way to measure it would be by the educational qualifications of the labor force. Such data could be collected, but they are not as readily available as the enrollment data. The other interpretation of the education variable is that it reflects real income, in which case enrollment data would be more suitable than the educational qualifications of the labor force. There has been an educational explosion in the Third World in recent decades, reflecting changed attitudes about education perhaps more than the rise in real incomes. Quality variation in education is of course not captured in the statistics. These difficulties may produce peculiar results in the estimation of real income for particular countries. There is an additional problem that merits mention. Some countries may have a significant import surplus or export surplus of secondary and university students. This seems to be a possibility for very small countries. In fact, the enrollment data for Luxembourg (one of the 31 benchmark countries) are quite low (53 percent for secondary and 2 percent for university); in the short-cut regressions I substituted the data for Belgium (84 percent for secondary and 22 percent for university) for the ones for Luxembourg.[5] No adjustment has been made for any of the nonbenchmark countries.

The education variable was available for every one of the 76 nonbenchmark countries. The numbers appearing in the table are in index form, with the U.S. = 100.

The money growth variable was available for the vast majority of nonbenchmark countries. The exceptions were Botswana, Swaziland, and Papua New Guinea, for which the data became available only after 1970, and Bangladesh, which did not exist in 1970. The numbers in the table are the ratio of the 1975 money supply, minus 1, or the growth in the money supply on a 1970 base. Among the benchmark countries, the largest values were for Uruguay (11.0) and Brazil (5.0).[6] Among the nonbenchmark countries, the values for Chile (297) and Argentina (18) were not used. The next largest value was for Indonesia (4.1).

The mineral share variable was available for most countries. Countries which did not distinguish mineral production from industrial production were assumed to have a mineral share of 1 percent. It seems to be a pretty safe assumption that countries not reporting mineral production separately have small mineral shares and the precise value of this share when it it small is not important. The mineral share is quite low for the majority of countries (the median for the 76 countries is around 2 percent), but it is very large indeed for some countries: Iraq (49.6), Gabon (42.1), Trinidad-Tobago (32.9), Nigeria (32.0), and Suriname (31.1). The

[5]This alteration in the data did not change the regression coefficients appreciably.

[6]If Brazil and Uruguay are omitted from the benchmark regression, the coefficient on MNGR increases sharply in absolute value. In regression 3 of Table 1, the coefficient changes from -0.0257 ($t = -1.93$) to -0.0704 ($t = -1.50$).

Summers-Heston study excluded some of the oil-rich countries with very high nominal per capita incomes, and the present study does the same.

Where possible the trade balance was calculated from the IMF sources in the same manner as for the benchmark countries. For nine countries, however, the required data were unavailable and data from the World Bank's *World Tables* 1984 were used instead. *World Tables* provides imports and exports of goods and non-factor services. To check the comparability of the concepts and the data, I calculated the trade balance variable from both sources for 66 countries and the results were on the whole reassuring. In only 6 cases did the estimates differ by more than 5 percentage points and in only one case (Botswana) by more than 11. The trade balance figures shown below are percentages of GDP.

Finally nominal income per capita for the nonbechmark countries came ultimately from the UN *Yearbook of National Accounts Statistics.* It was reconstructed in this study by making some calculations from the data tape supplied by SH in connection with their 1984 article. Specifically the SH estimate of real product per capita was multiplied by the SH estimate of the price level.

The first regression (based on education and money growth) yields price level estimates that we shall call P1; the associated real income estimates are called R1. (R1 is calculated as nominal income divided by P1.) The second regression results are called P2 and R2. The (geometric) average estimates are referred to as PAVE and RAVE, and finally we denote by PSH and RSH the Summers-Heston estimates of the price level and real income.

The results of the calculations are shown in Tables 5, 6, and 7. Table 5 deals with P1, Table 6 with P2, and Table 7 with RAVE. It might be best to start with RAVE figures in Table 7. That table shows nominal income (NOMI), RSH, R1, R2, and RAVE. The last column shows the ratio of RAVE to RSH.

One way to look at the results is to note the small number of discrepancies of RAVE from RSH. In only 10 of the 76 cases does the discrepancy exceed 20 percent in either direction. In four of these cases (Algeria, Gabon, Mauritania,

Key to Tables 5-8

999.00 = not available
NOMI = nominal income
PSH = Summers-Heston price level.
P1 = price level from regression 1 (based on EDUC, MNGR)
P2 = price level from regression 2 (based on TBAL, LMIN)
PAVE = average of P1 and P2
RSH = Summers-Heston real income
R1, R2, RAVE = real income estimâtes
P1/P = ratio of P1 to PSH
P2/P = ratio of P2 to PSH
PA/P = ratio of PAVE to PSH
RA/R = ratio of RAVE to RSH
EDUC = education.
MNGR = money growth.
TBAL = trade balance.
MINS = mineral share
TOUR = tourism.
POP = population.

TABLE 5

	NOMI	EDUC	MNGR	PSH	P1	P1/P
Algeria	12.76	9.45	1.63	52.30	63.71	1.22
Benin	2.40	3.41	1.79	37.40	38.22	1.02
Botswana	7.11	5.51	999.00	51.10	99.00	999.00
Burundi	1.46	0.92	0.58	32.60	41.38	1.27
Cameroon	5.66	4.86	0.98	48.50	52.02	1.07
Central African Republic	2.75	2.62	0.67	38.00	43.72	1.15
Chad	2.40	1.05	0.84	37.90	48.97	1.29
Congo	6.04	17.15	1.18	49.60	47.21	0.95
Egypt	5.03	29.27	1.38	38.60	34.81	0.90
Ethiopia	1.46	1.97	1.06	32.00	35.37	1.11
Gabon	59.14	11.72	3.71	88.40	114.53	1.30
Gambia	4.07	2.82	1.27	50.70	50.59	1.00
Ghana	6.38	10.89	2.30	47.80	45.35	0.95
Ivory Coast	8.05	4.99	1.15	51.20	59.79	1.17
Madagascar	3.34	4.86	0.50	42.00	42.31	1.01
Mali	1.21	2.62	1.36	32.70	30.79	0.94
Mauritania	4.49	1.05	1.64	42.60	62.12	1.46
Mauritius	9.72	11.55	3.33	55.00	52.22	0.95
Morocco	7.23	8.40	1.32	46.00	51.51	1.12
Niger	2.22	0.66	1.28	37.10	51.33	1.38
Nigeria	7.65	3.15	3.04	46.30	60.83	1.31
Rwanda	1.91	0.92	1.25	34.40	45.34	1.32
Senegal	5.28	5.12	1.18	46.30	49.75	1.07
Sierra Leone	3.10	3.67	1.11	39.00	42.57	1.09
Somalia	2.14	2.62	1.20	36.00	38.89	1.08
South Africa	20.36	11.44	0.90	60.20	76.74	1.27
Sudan	4.61	5.64	1.57	44.70	45.68	1.02
Swaziland	9.92	11.68	999.00	55.70	999.00	999.00
Tanzania	2.31	1.05	1.44	36.20	47.49	1.31
Togo	3.58	6.30	1.12	41.50	40.77	0.98
Tunisia	10.80	11.02	1.47	52.30	57.83	1.11
Uganda	3.70	11.06	1.88	43.10	36.42	0.84
Upper Volta	1.25	0.79	1.46	30.60	39.22	1.28
Zaire	2.13	5.77	1.48	39.70	33.18	0.84
Bangladesh	1.63	9.93	999.00	31.10	999.00	999.00
Burma	1.33	8.53	1.51	30.30	25.47	0.84
Iraq	17.30	21.00	1.88	59.10	62.09	1.05
Israel	52.07	48.29	2.13	89.40	85.99	0.96
Jordan	4.43	18.71	1.13	39.40	36.19	0.92
Singapore	35.35	25.98	1.13	87.70	83.38	0.95
Taiwan	13.28	52.05	2.17	54.60	46.23	0.85
Cyprus	14.60	17.91	0.46	57.50	61.64	1.07
Finland	80.15	59.06	1.84	110.10	101.58	0.92
Greece	31.89	44.62	1.39	67.70	71.36	1.05
Iceland	83.72	41.47	2.58	114.80	108.74	0.95
Malta	18.27	25.72	1.11	60.50	62.40	1.03
Norway	100.22	52.10	0.96	131.90	117.98	0.89
Portugal	21.75	27.69	1.46	64.70	65.83	1.02
Sweden	123.30	58.27	1.44	130.30	125.61	0.96
Switzerland	119.64	31.50	0.09	140.30	144.16	1.03
Turkey	12.53	16.40	2.36	51.40	55.86	1.09
Barbados	22.86	32.55	0.89	67.80	66.21	0.98
Canada	101.46	75.46	0.70	106.60	111.32	1.04
Costa Rica	13.89	34.12	1.71	54.00	51.68	0.96
Dominican Republic	9.65	21.78	1.25	47.70	48.68	1.02
El Salvador	6.12	15.35	1.25	43.40	42.87	0.99
Guatemala	8.16	8.40	1.05	46.60	54.60	1.17
Haiti	1.83	3.02	1.11	36.00	35.68	0.99

TABLE 5 cont.

	NOMI	EDUC	MNGR	PSH	P1	P1/P
Honduras	4.97	10.24	0.69	40.70	43.06	1.06
Nicaragua	9.54	17.72	1.19	49.90	50.47	1.01
Panama	16.14	17.53	0.78	56.80	55.48	0.98
Trinidad and Tobago	33.99	18.90	1.66	76.40	85.86	1.12
Argentina	22.24	51.31	999.00	50.20	999.00	999.00
Bolivia	7.05	23.49	2.11	46.70	41.08	0.88
Chile	11.65	34.25	999.00	45.30	999.00	999.00
Ecuador	8.71	46.98	2.06	47.80	39.43	0.82
Guyana	8.90	19.69	2.51	49.50	46.41	0.94
Paraguay	7.92	14.04	1.44	47.60	48.39	1.02
Peru	13.85	30.84	2.07	53.10	52.13	0.98
Suriname	20.29	15.22	0.96	64.90	72.46	1.12
Venezuela	30.64	34.12	2.65	65.30	71.43	1.09
Australia	97.85	54.33	0.79	117.90	116.25	0.99
Fiji	16.71	21.13	1.21	63.90	62.13	0.97
Indonesia	3.14	8.01	4.09	41.80	34.19	0.82
New Zealand	62.99	55.12	1.05	94.20	94.04	1.00
Papua New Guinea	7.14	6.43	999.00	50.50	999.00	999.00

TABLE 6

	NOMI	TBAL	MINS	PSH	P2	P2/P
Algeria	12.76	−11.80	27.70	52.30	66.13	1.26
Benin	2.40	−22.47	1.00	37.40	42.98	1.15
Botswana	7.11	−6.65	10.60	51.10	45.99	0.90
Burundi	1.46	−10.88	9.50	32.60	35.91	1.10
Cameroon	5.66	−5.89	0.30	48.50	39.87	0.82
Central African Republic	2.75	−18.36	3.10	38.00	41.98	1.10
Chad	2.40	−19.81	0.70	37.90	41.21	1.09
Congo	8.04	−27.86	12.90	49.60	66.34	1.34
Egypt	5.03	−16.56	9.10	38.60	48.23	1.25
Ethiopia	1.46	−2.96	0.20	32.00	29.93	0.94
Gabon	59.14	6.30	42.10	88.40	105.49	1.19
Gambia	4.07	7.08	3.70	50.70	31.14	0.61
Ghana	6.38	−0.14	3.20	47.80	38.53	0.81
Ivory Coast	8.05	−4.80	0.20	51.20	43.17	0.84
Madagascar	3.34	−5.79	0.50	42.00	35.42	0.84
Mali	1.21	−22.66	1.00	32.70	39.68	1.21
Mauritania	4.49	−20.79	24.40	42.60	55.00	1.29
Mauritius	9.72	0.56	0.10	55.00	42.16	0.77
Morocco	7.23	−10.84	6.30	46.00	47.79	1.04
Niger	2.22	−13.98	4.40	37.10	38.32	1.03
Nigeria	7.65	0.96	32.00	46.30	47.62	1.03
Rwanda	1.91	−11.18	2.00	34.40	35.37	1.03
Senegal	5.28	−6.71	2.80	46.30	40.36	0.87
Sierra Leone	3.10	−10.30	14.90	39.00	41.12	1.05
Somalia	2.14	−14.15	6.30	36.00	38.70	1.07
South Africa	20.36	−4.57	12.10	60.20	64.26	1.07
Sudan	4.61	−9.66	0.30	44.70	40.11	0.90
Swaziland	9.92	15.83	1.00	55.70	34.01	0.61
Tanzania	2.31	−12.83	0.80	36.20	36.95	1.02
Togo	3.58	−19.40	2.20	41.50	44.52	1.07
Tunisia	10.80	−5.26	8.60	52.30	50.45	0.96
Uganda	3.70	−2.30	0.70	43.10	34.36	0.80
Upper Volta	1.25	−26.61	0.10	30.60	41.95	1.37

TABLE 6 cont.

	NOMI	TBAL	MINS	PSH	P2	P2/P
Zaire	2.13	−15.54	14.90	39.70	41.76	1.05
Bangladesh	1.63	−9.71	1.00	31.10	33.69	1.08
Burma	1.33	−2.40	0.90	30.30	29.55	0.98
Iraq	17.30	13.35	49.60	59.10	56.87	0.96
Israel	52.07	−31.11	1.00	89.40	135.04	1.51
Jordan	4.43	−53.21	1.00	39.40	76.52	1.94
Singapore	35.35	−10.98	0.30	87.70	82.63	0.94
Taiwan	13.28	999.00	1.20	54.60	999.00	999.00
Cyprus	14.60	−15.91	0.50	57.50	62.01	1.08
Finland	80.15	−6.32	0.50	110.10	116.61	1.06
Greece	31.89	−8.32	1.40	67.70	76.40	1.13
Iceland	83.72	−8.56	1.00	114.80	123.96	1.08
Malta	18.27	−6.26	5.40	60.50	60.42	1.00
Norway	100.22	−6.87	2.40	131.90	135.14	1.02
Portugal	21.75	−12.14	0.60	64.70	68.31	1.06
Sweden	123.30	0.11	0.80	130.30	135.94	1.04
Switzerland	119.64	2.37	1.00	140.30	129.29	0.92
Turkey	12.53	−9.00	1.60	51.40	53.42	1.04
Barbados	22.86	−10.72	0.30	67.80	68.11	1.00
Canada	101.46	−1.57	3.60	106.60	126.81	1.19
Costa Rica	13.89	−9.93	1.00	54.00	55.93	1.04
Dominican Republic	9.65	−1.40	2.80	47.70	44.16	0.93
El Salvador	6.12	−5.67	0.20	43.40	40.51	0.93
Guatemala	8.16	−2.69	1.00	46.60	42.24	0.91
Haiti	1.83	−6.56	1.00	36.00	32.61	0.91
Honduras	4.97	−9.69	2.40	40.70	41.47	1.02
Nicaragua	9.54	−12.00	0.40	49.90	50.68	1.02
Panama	16.14	−8.69	0.20	56.80	57.63	1.01
Trinidad and Tobago	33.99	12.70	32.90	76.40	69.85	0.91
Argentina	22.24	−2.17	1.60	50.20	59.84	1.19
Bolivia	7.05	−5.56	12.10	46.70	45.58	0.98
Chile	11.65	−2.59	6.30	45.30	48.95	1.08
Ecuador	8.71	−5.16	11.10	47.80	47.86	1.00
Guyana	8.90	−0.70	15.30	49.50	45.88	0.93
Paraguay	7.92	−3.45	0.20	47.60	42.09	0.88
Peru	13.85	−10.85	6.00	53.10	58.65	1.10
Suriname	20.29	−6.18	31.10	64.90	73.59	1.13
Venezuela	30.64	9.70	24.90	65.30	66.66	1.02
Australia	97.85	−0.13	3.40	117.90	121.39	1.03
Fiji	16.71	−1.35	1.60	63.90	52.86	0.83
Indonesia	3.14	0.68	17.40	41.80	35.54	0.85
New Zealand	62.99	−9.31	1.00	94.20	107.54	1.14
Papua New Guinea	7.14	−6.18	11.50	50.50	45.98	0.91

TABLE 7

	NOMI	RSH	R1	R2	RAVE	RA/R
Algeria	12.76	24.40	20.03	19.30	19.66	0.81
Benin	2.40	6.42	6.28	5.59	5.93	0.92
Botswana	7.11	13.92	999.00	15.47	999.00	999.00
Burundi	1.46	4.47	3.52	4.06	3.78	0.85
Cameroon	5.66	11.68	10.89	14.21	12.44	1.06
Central African Republic	2.75	7.25	6.30	6.56	6.43	0.89
Chad	2.40	6.32	4.89	5.82	5.34	0.84
Congo	8.04	16.21	17.03	12.12	14.37	0.89

TABLE 7 cont.

	NOMI	RSH	R1	R2	RAVE	RA/R
Egypt	5.03	13.03	14.44	10.42	12.27	0.94
Ethiopia	1.46	4.56	4.12	4.87	4.48	0.98
Gabon	59.14	66.90	51.63	56.06	53.80	0.80
Gambia	4.07	8.03	8.05	13.08	10.26	1.28
Ghana	6.38	13.35	14.07	16.56	15.26	1.14
Ivory Coast	8.05	15.73	13.47	18.66	15.85	1.01
Madagascar	3.34	7.96	7.91	9.44	8.64	1.09
Mali	1.21	3.69	3.92	3.04	3.45	0.94
Mauritania	4.49	10.54	7.23	8.17	7.68	0.73
Mauritius	9.72	17.67	18.61	23.05	20.71	1.17
Morocco	7.23	15.72	14.04	15.13	14.57	0.93
Niger	2.22	5.99	4.13	5.80	5.01	0.84
Nigeria	7.65	16.53	12.58	16.07	14.22	0.86
Rwanda	1.91	5.55	4.21	5.40	4.77	0.86
Senegal	5.28	11.40	10.61	13.08	11.78	1.03
Sierra Leone	3.10	7.95	7.28	7.54	7.41	0.93
Somalia	2.14	5.93	5.49	5.52	5.50	0.93
South Africa	20.36	33.82	26.53	31.68	28.99	0.86
Sudan	4.61	10.31	10.09	11.48	10.76	1.04
Swaziland	9.92	17.81	999.00	29.16	999.00	999.00
Tanzania	2.31	6.38	4.86	6.25	5.51	0.86
Togo	3.58	8.64	8.79	8.05	8.41	0.97
Tunisia	10.80	20.65	18.68	21.41	20.00	0.97
Uganda	3.70	8.60	10.17	10.78	10.47	1.22
Upper Volta	1.25	4.09	3.19	2.99	3.09	0.75
Zaire	2.13	5.36	6.41	5.09	5.71	1.07
Bangladesh	1.63	5.23	999.00	4.83	999.00	999.00
Burma	1.33	4.37	5.20	4.49	4.83	1.10
Iraq	17.30	29.28	27.87	30.43	29.12	0.99
Israel	52.07	58.24	60.55	38.56	48.32	0.83
Jordan	4.43	11.25	12.24	5.79	8.42	0.75
Singapore	35.35	40.31	42.40	42.79	42.59	1.06
Taiwan	13.28	24.33	28.73	999.00	999.00	999.00
Cyprus	14.60	25.39	23.69	23.54	23.62	0.93
Finland	80.15	72.80	78.91	68.73	73.64	1.01
Greece	31.89	47.11	44.69	41.75	43.20	0.92
Iceland	83.72	72.92	76.99	67.53	72.11	0.99
Malta	18.27	30.20	29.28	30.24	29.76	0.99
Norway	100.22	75.98	84.94	74.16	79.37	1.04
Portugal	21.75	33.61	33.03	31.83	32.43	0.96
Sweden	123.30	94.63	98.16	90.70	94.36	1.00
Switzerland	119.64	85.28	83.00	92.54	87.64	1.03
Turkey	12.53	24.37	22.42	23.45	22.93	0.94
Barbados	22.86	33.72	34.53	33.57	34.05	1.01
Canada	101.46	95.18	91.14	80.01	85.40	0.90
Costa Rica	13.89	25.73	26.88	24.84	25.84	1.00
Dominican Republic	9.65	20.23	19.83	21.85	20.82	1.03
El Salvador	6.12	14.09	14.27	15.10	14.68	1.04
Guatemala	8.16	17.51	14.95	19.32	16.99	0.97
Haiti	1.83	5.09	5.13	5.62	5.37	1.06
Honduras	4.97	12.21	11.54	11.98	11.76	0.96
Nicaragua	9.54	19.13	18.91	18.83	18.87	0.99
Panama	16.14	28.41	29.08	28.00	28.54	1.00
Trinidad and Tobago	33.99	44.49	39.59	48.66	43.89	0.99
Argentina	22.24	44.29	999.00	37.16	999.00	999.00
Bolivia	7.05	15.10	17.17	15.47	16.30	1.08
Chile	11.65	25.72	999.00	23.80	999.00	999.00
Ecuador	8.71	18.23	22.10	18.20	20.06	1.10

TABLE 7 cont.

	NOMI	RSH	R1	R2	RAVE	RA/R
Guyana	8.90	17.99	19.19	19.41	19.30	1.07
Paraguay	7.92	16.63	16.63	18.80	17.54	1.05
Peru	13.85	26.08	26.57	23.61	25.05	0.96
Suriname	20.29	31.27	28.00	27.57	27.79	0.89
Venezuela	30.64	46.92	42.89	45.96	44.40	0.95
Australia	97.85	82.99	84.17	80.60	82.37	0.99
Fiji	16.71	26.15	26.89	31.61	29.16	1.11
Indonesia	3.14	7.52	9.19	8.84	9.01	1.20
New Zealand	62.99	66.87	66.98	58.58	62.64	0.94
Papua New Guinea	7.14	14.13	999.00	15.52	999.00	999.00

TABLE 8

	NOMI	EDUC	MNGR	TBAL	MINS	TOUR	POP
Algeria	12.76	9.45	1.63	−11.80	27.70	0.74	15,680.00
Benin	2.40	3.41	1.79	−22.47	1.00	0.51	3,040.00
Botswana	7.11	5.51	999.00	−6.65	10.60	999.00	720.00
Burundi	1.46	0.92	0.58	−10.88	9.50	999.00	3,930.00
Cameroon	5.66	4.86	0.98	−5.89	0.30	0.92	7,530.00
Central African Republic	2.75	2.62	0.67	−18.36	3.10	0.89	1,980.00
Chad	2.40	1.05	0.84	−19.81	0.70	2.00	4,030.00
Congo	8.04	17.15	1.18	−27.86	12.90	0.31	1,350.00
Egypt	5.03	29.27	1.38	−16.56	9.10	999.00	36,920.00
Ethiopia	1.46	1.97	1.06	−2.96	0.20	0.27	28,770.00
Gabon	59.14	11.72	3.71	6.30	42.10	0.57	520.00
Gambia	4.07	2.62	1.27	7.08	3.70	6.34	520.00
Ghana	6.38	10.89	2.30	−0.14	3.20	0.30	9,990.00
Ivory Coast	8.05	4.99	1.15	−4.80	0.20	0.97	6,710.00
Madagascar	3.34	4.86	0.50	−5.79	0.50	0.20	7,670.00
Mali	1.21	2.62	1.38	−22.66	1.00	0.23	5,810.00
Mauritania	4.49	1.05	1.64	−20.75	24.40	1.29	1,420.00
Mauritius	9.72	11.55	3.33	0.56	0.10	3.54	900.00
Morocco	7.23	8.40	1.32	−10.84	6.30	3.29	17,300.00
Niger	2.22	0.66	1.28	−13.98	4.40	0.26	4,590.00
Nigeria	7.65	3.15	3.04	0.96	32.00	0.09	65,660.00
Rwanda	1.91	0.92	1.25	−11.16	2.00	0.15	4,120.00
Senegal	5.28	5.12	1.18	−6.71	2.80	1.82	4,980.00
Sierra Leone	3.10	3.67	1.11	−10.30	14.90	0.50	3,040.00
Somalia	2.14	2.62	1.20	−14.15	6.30	0.18	3,170.00
South Africa	20.36	11.44	0.90	−4.57	12.10	0.93	25,500.00
Sudan	4.61	5.64	1.57	−9.66	0.30	0.09	16,010.00
Swaziland	9.92	11.68	999.00	15.83	1.00	3.86	480.00
Tanzania	2.31	1.05	1.44	−12.83	0.80	0.37	15,390.00
Togo	3.58	6.30	1.12	−19.40	2.20	1.16	2,320.00
Tunisia	10.80	11.02	1.47	−5.26	8.60	7.12	5,610.00
Uganda	3.70	11.06	1.88	−2.30	0.70	0.13	11,340.00
Upper Volta	1.25	0.79	1.46	−26.61	0.10	0.31	6,070.00
Zaire	2.13	5.77	1.48	−15.54	14.90	0.14	24,650.00
Bangladesh	1.63	9.93	999.00	−9.71	1.00	0.03	76,580.00
Burma	1.13	8.53	1.51	−2.40	0.90	0.09	31,240.00
Iraq	17.30	21.00	1.83	13.35	49.60	999.00	11,020.00
Israel	52.07	48.29	2.13	−31.11	1.00	2.41	3,450.00
Jordan	4.43	18.71	1.13	−53.21	1.00	11.11	2,700.00
Singapore	35.35	25.98	1.13	−10.98	0.30	8.38	2,250.00
Taiwan	13.28	52.05	2.17	999.00	1.20	999.00	16,150.00

TABLE 8 cont.

	NOMI	EDUC	MNGR	TBAL	MINS	TOUR	POP
Cyprus	14.60	17.91	0.46	−15.91	0.50	2.15	640.00
Finland	80.15	59.06	1.84	−6.32	0.50	1.19	4,710.00
Greece	31.89	44.62	1.39	−8.32	1.40	3.23	9,050.00
Iceland	83.72	41.47	2.58	−8.56	1.00	0.90	220.00
Malta	18.27	25.72	1.11	−6.26	5.40	16.80	330.00
Norway	100.22	52.10	0.96	−6.87	2.40	1.29	4,010.00
Portugal	21.75	27.69	1.46	−12.14	0.60	2.44	9,420.00
Sweden	123.30	58.27	1.44	0.11	0.80	0.48	8,190.00
Switzerland	119.64	31.50	0.09	2.37	1.00	3.84	6,400.00
Turkey	12.53	16.40	2.36	−9.00	1.60	0.56	40,060.00
Barbados	22.86	32.55	0.89	−10.72	0.30	19.76	240.00
Canada	101.46	75.46	0.70	−1.57	3.60	1.08	22,730.00
Costa Rica	13.89	34.12	1.71	−9.93	1.00	2.64	1,960.00
Dominican Republic	9.65	21.78	1.25	−1.40	2.80	1.63	5,230.00
El Salvador	6.12	15.35	1.25	−5.67	0.20	1.03	4,140.00
Guatemala	8.16	8.40	1.05	−2.69	1.00	2.14	6,240.00
Haiti	1.83	3.02	1.11	−6.56	1.00	2.68	5,160.00
Honduras	4.97	10.24	0.69	−9.65	2.40	1.00	3,090.00
Nicaragua	9.54	17.72	1.19	−12.00	0.40	1.66	2,320.00
Panama	16.14	17.53	0.78	−8.65	0.20	7.08	1,680.00
Trinidad and Tobago	33.99	18.90	1.66	12.70	32.90	2.86	1,080.00
Argentina	22.24	51.31	999.00	−2.17	1.60	0.39	25,380.00
Bolivia	7.05	23.49	2.11	−5.56	12.10	0.77	4,890.00
Chile	11.65	34.25	999.00	−2.59	6.30	0.96	10,200.00
Educador	8.71	46.98	2.06	−5.16	11.10	0.67	6,890.00
Guyana	8.90	19.69	2.51	−0.07	15.30	0.51	790.00
Paraguay	7.92	14.04	1.44	−3.45	0.20	0.68	2,650.00
Peru	13.85	30.84	2.07	−10.85	6.00	0.67	15,480.00
Suriname	20.29	15.22	0.96	−6.18	31.10	1.46	360.00
Venezuela	30.64	34.12	2.65	9.70	24.90	0.65	12,650.00
Australia	97.85	54.33	0.79	−0.13	3.40	0.35	13,630.00
Fiji	16.71	21.13	1.21	−1.35	1.60	10.93	570.00
Indonesia	3.14	8.01	4.09	0.68	17.40	0.11	135,230.00
New Zealand	62.99	55.12	1.05	−9.31	1.00	1.15	3,090.00
Papua New Guinea	7.14	6.43	999.00	−6.18	11.50	999.00	2,720.00

and Indonesia) there is a rather large mineral share; RAVE lies below RSH in each of these cases. Five of the other discrepancies can be largely attributed to the trade balance variable. There were large positive trade balances for Gambia and Swaziland (RAVE above RSH) and large negative ones for Upper Volta, Israel, and Jordan (RAVE below RSH). Finally, Uganda's discrepancy (RAVE above RSH) is largely attributable to an unusually high value for the education variable in relation to its income.

The discrepancies between our results and those of SH loom larger when one looks at P1 and P2 separately. Moreover, P1 and P2 differ from one another quite substantially, as would be expected from the fact that the two regressions use different variables. The differences between P1 and P2 are moderated by the tendency for the mineral share and the education variables to pull in the same direction, when the mineral share is large; that is, countries with large mineral shares tend to have low levels of education for their incomes. But the other

variables—the trade balance and money growth—are quite independent of each other and of education and the mineral share.

The interested reader can peruse Tables 5 and 6 and get a good idea of which variables are pushing the estimates for particular countries. All the independent variables are gathered together in Table 8, which also lists population and the tourism variable. The tourism share in GDP is like the mineral share in that it is quite unimportant for most countries but is large for a few: Barbados (20 percent), Malta (17 percent), Jordan (11 percent), Fiji (11 percent), Singapore (8 percent), Tunisia (7 percent), and Panama (7 percent).

I think it is appropriate to focus on the average estimates (RAVE) rather than on the separate ones R1 and R2. The average estimates are presumably rather similar to ones that would be derived from including LEDU, MNGR, TBAL, and MINS in the same regression. A reason for showing R1 and R2 separately was that this procedure illustrates more vividly the effects of particular variables.

Even though the short-cut estimates often differ substantially from one another, there is a strong tendency for all three real income estimates (R1, R2, and RSH) to lie closer to one another than to nominal income. This conclusion is even stronger when we compare RAVE and RSH with nominal income. Thus the uncertainties arising from short-cut regressions do not support a case for abandoning short-cut estimation in favor of continued reliance on nominal income.

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