



Public Educational Expenditures in the United States: An Analytical Comparison with Other Industrialized Countries

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Abstract — This paper undertakes a fresh comparison of educational expenditures in the U.S. with those in other industrialized countries. Five main points are noted. First, in terms of expenditure-GNP ratio, the U.S. ranks neither “low” nor very high. Second, that fact provides no indication of “underfunding” or “overfunding” of education in the U.S. since there is no cross-country correlation between expenditure-GNP ratio and *per capita* income. Third, the U.S. does rank high in K-12 expenditure per student. Fourth, however, when actual K-12 expenditure per pupil is compared with that predicted from regression estimates of several reasonable models, some “underspending” is observed. Fifth, comparison of actual and predicted expenditures seems more useful and informative than consideration of country ranks for expenditures. [*JEL* I21]

1. INTRODUCTION

THE LEVEL of public spending on education in the United States has been a matter of considerable controversy. For instance, Rasell and Mishel (1990) challenged statements by several federal officials who had claimed that public expenditure on education in the country was very high and was not an issue in discussions of educational quality. Rasell and Mishel did a comparative study of educational expenditures in OECD countries, and concluded (1990, p. 10) “The claim that the U.S. spends more than other nations on education is misleading. By all comparisons, the U.S. devotes a smaller share of its resources to pre-primary, primary and secondary education than do most industrialized countries.” The Rasell–Mishel work has, however, been criticized by several researchers. Besides the critique by the U.S. Department of Education (1990), Perelman (1990) and Brimelow (1990) conclude almost the opposite. In one of his summarizing points, Perelman (1990, p. 2) states “U.S. spending on education, as a whole and on K-12, is virtually ‘unsurpassed’; no major nation spends more per

pupil — the only meaningful measure for such comparisons”. Brimelow (1990, p. 84) similarly states “. . . the actual dollar amount it (the U.S.) spends on its pupils is about the highest in the world. Significantly, the U.S. is spending much more than Japan and Germany.” Even for such a specific indicator as K-12 expenditure per student, the reports diverge considerably. For example, while Rasell and Mishel (1990, p. 15) show the U.S. to rank fourth or ninth, depending on which exchange rate is used, Perelman (1990, p. 3) shows the U.S. to rank second in essentially the same comparison group.

The main purpose of this study is to take a fresh look at the data, introduce some simple analytical considerations, and to make as fair a comparison as possible. The work is motivated largely by the thought that ranks of countries on expenditure-GNP ratio or expenditure per student are not easy to interpret. It is not obvious whether a high-income country “should” have a higher or lower expenditure-GNP ratio. Similarly, it is not evident whether real expenditure per student should rise with GNP *per capita*, and, if so, by how much. Thus

questions concerning "underfunding" or "overfunding" are difficult to answer through comparisons of ranks. One needs at least a simple model of educational expenditure from which "expected" numbers can be generated and compared with the actual expenditures. This work makes a preliminary attempt to model expenditures, and to compare actual values with those "predicted" by regression estimates of the model from a sample of OECD countries.

Two additional considerations underlie the work. First, in view of the volatility of conventional exchange rates and their intrinsic drawbacks for intercountry comparisons of real magnitudes, purchasing-power-parity (PPP) exchange rates may be used as far as possible.¹ Second, compilation of data seems to need considerable care so as to ensure accuracy and comparability.

2. COVERAGE, DATA, AND DATA SOURCES

This work is limited to the OECD group because (a) these industrialized countries constitute a reasonable comparison group for the United States, and (b) most of the recent debate on the subject rests on comparisons across the OECD countries. Excluding Greece, Portugal, Spain and Turkey, whose *per capita* incomes are considerably lower, and Iceland, which is small, the "sample" consists of 18 countries.²

As done by Rasell and Mishel (1990), U.S. Department of Education (1990), Perelman (1990), and Brimelow (1990), two measures of expenditure are considered. One is the ratio (percentage) of educational expenditure to GNP, and the other is public expenditure per student. Since economic modelling of expenditure per student seems more tractable than that of expenditure-GNP ratios, greater attention is paid to the former. Also, since the debate appears to deal largely with K-12 schooling (i.e., schooling from pre-elementary through secondary levels), this study also focuses on K-12 expenditures.

Almost all data relate to 1985, which is the year considered by most studies that have debated the issue recently.

Ratios of educational expenditure to GNP are taken from UNESCO's *Statistical Yearbook* for 1989.³ However, to ensure that, as far as possible, all data are for the year 1985, some other volumes of the *Statistical Yearbook* have also been used. Most

information on enrollments is taken from the *Statistical Yearbook* for 1989, which is also the source of data on duration of various levels of schooling.

Data on real income (GDP) *per capita* are based on PPP exchange rates for GDP, and the primary source is OECD (1989). Expenditure per student in national currencies is derived from UNESCO (1989), and the numbers are then converted into U.S. dollars on the basis of PPP exchange rates for GDP.⁴ Although PPP exchange rates for education are more appropriate, such rates are not easily available, and their reliability is uncertain. Some use has, however, been made of PPP exchange rates for education for deriving relative price of schooling. These rates are taken from OECD (1987, pp. 24-25).

3. COMPARISONS OF EXPENDITURE-GNP RATIOS

Table 1 contains the basic information. It is evident that when the ratio of total educational expenditures to GNP is considered, the U.S. ranks sixth, but is very close to Netherlands, Ireland and

Table 1

Comparison of the ratio of educational expenditure to GNP: Selected OECD countries, 1985 (arranged in the declining order of numbers which are percentages)^a

All levels			K-12 only		
1	Sweden	7.8	1	Ireland	5.5
2	Denmark	7.5	2	Sweden	5.3
3	Canada	7.0	3	Denmark	4.7
4	Ireland	6.9	4	Norway	4.7
5	Netherlands	6.8	5	Canada	4.5
6	U.S.A.	6.7	6	Belgium	4.3
7	Norway	6.4	7	Finland	4.1
8	Belgium	6.0	8	France	4.1
9	Australia	5.9	9	U.S.A.	4.1
10	Austria	5.8	9	Austria	4.1
10	France	5.8	11	Netherlands	4.0
12	Finland	5.7	12	Switzerland	3.7
13	Japan	5.1	13	Australia	3.7
14	U.K.	4.9	14	U.K.	3.6
14	New Zealand	4.9	15	New Zealand	3.3
16	Switzerland	4.8	16	Japan	3.2
17	Germany-FRG	4.5	17	Germany-FRG	3.0
18	Italy	4.0	18	Italy	3.0

^aIt might seem that the number of tied ranks is more than what the table shows. However, the stated ranks are actually correct when K-12 expenditure calculations are carried to two decimal places.

^bData are not available.

Canada who rank higher.⁵ If the ratio of K-12 expenditure to GNP is considered, the U.S. ranks ninth, but is very close to France and Finland (and even Belgium) who rank higher. Therefore, one cannot say that the United States ranks "low" in the OECD group; it is also difficult to say that the U.S. ranks very high; its location is in the upper 30% to 40% of the group.⁶

Implications of the U.S. rank indicated in Table 1 merit some reflection. Much of the discussion by Rasell and Mishell (1990) seems to assume that a higher rank is better. At least at a general level, that is not so. Taking an extreme case, it seems reasonable to say that a country which spends all its income on schooling is not doing "better" than the one that spends 90% of its income on education, irrespective of their income levels.

While good models of national educational effort are scarce, much of the argument suggesting that K-12 expenditure ratio for the U.S. is not high enough seems to rest on the premise that one expects a higher ratio from a country with higher income. In other words, the implicit model postulates the ratio to rise with income (GDP) per capita. Even though theoretical basis for such a model is not evident, an empirical assessment of its validity is relatively straightforward. One simple approach would be to look at the correlation between GDP *per capita* and ratio of educational expenditure to GNP in the relevant cross-country sample. For the 18-country OECD sample, correlations (with real GDP *per capita*) of total and K-12 expenditure ratios are 0.17 and -0.38 respectively, and neither is statistically significant even at the 10% level. Simple regressions of the ratios on indices of real GDP *per capita* reveal the same position.⁷ Therefore, one cannot use *per capita*-income criterion to determine whether the U.S. "overspends" or "underspends" on education in terms of expenditure-GNP ratios.⁸

The proposition that the ratio of educational expenditure to GNP bears no significant relation to GDP (or GNP) *per capita* in cross-country samples is not a statistical "coincidence" observed in the sample used in this study. In a much broader international context, Zymelman (1976, p. 3), who estimated several models of expenditure-GNP ratios for various levels of education, stated "the portion of the GNP a nation dedicates to education, and the way the budget is allocated among the different levels of education is not a function of GNP *per capita*". Although he did not report regression

estimates for the OECD group, his tabulations (1976, pp. 77-80) show that expenditure-GNP ratio for the U.S. at the elementary level was slightly above that for the "typical" OECD country, ratio for the secondary level (and the one for all levels) was well above the typical case, and that for post-secondary education was much above the typical-country ratio.

The foregoing discussion suggests that while the U.S. rank on the ratio of educational expenditure to GNP is neither low nor very high among the OECD countries, it cannot be reasonably inferred from such a comparison alone whether there is under-spending or overspending on education in the United States. The belief that seems to underlie some studies on the subject, namely, that a higher-income country is expected to have a larger ratio of educational expenditure to GNP, is not supported by any clear theoretical consideration or by data from the OECD countries or broader cross-country samples.⁹

4. COMPARISONS OF K-12 EXPENDITURE PER STUDENT

As stated earlier, since the controversy seems to relate largely to K-12 schooling, this part of the study focuses on precollege expenditures. Table 2

Table 2

K-12 expenditure per student in selected OECD countries, 1985: Current U.S. dollars based on PPP exchange rates (arranged in the decreasing order of expenditure)*

1	Switzerland	3683
2	Sweden	3215
3	Canada	3192
4	U.S.A.	3177
5	Denmark	3076
6	Norway	2899
7	Austria	2497
8	Finland	2394
9	U.K.	2251
10	Belgium	2234
11	France	2032
12	Australia	1983
13	Netherlands	1956
14	Germany-FRG	1864
15	Japan	1805
16	New Zealand	1231
17	Ireland	1161

* Data for Italy are not available. As stated in the text, PPP exchange rates for GDP are used to convert national currency numbers into U.S. dollars.

contains the basic information on ranks. It is obvious that the U.S. ranks fourth. Moreover, since the difference between the numbers for Canada, Sweden and U.S.A. is small, the U.S. can be considered as virtually ranking second or third.¹⁰

Like the expenditure-GNP ratios, interpretation of country ranks on expenditure per student is not easy. As illustrated through an extreme case of expenditure-GNP ratio, it is not true that a higher expenditure per student, or a higher cross-country rank on that measure, is necessarily better.

Instead of working with some implicit restrictions on the relation between expenditure per student and income *per capita*, as Rasell and Mishel (1990) and some other researchers seem to do, it is better to specify an expenditure function and to obtain its parameter estimates from the sample information. The assumed model then becomes explicit, and one can obtain "predicted" or "expected" values for expenditure and compare these with the actual numbers.¹¹

At the simplest level, a specification for K-12 expenditure per student can be formulated in terms of income (GDP) *per capita* and "relative price" of education.¹² The following specification seems to be a reasonable candidate for the purpose

$$\text{Log}(E_i) = a + b \log(RY_i) + c \log(RPE_i) + u_i \quad (1)$$

where E_i denotes K-12 dollar expenditure per student in country i , RY_i stands for real GDP *per capita* of that country, RPE_i denotes "relative price" of education defined as ratio of the country's PPP exchange rate for education to PPP exchange rate for GDP, "log" indicates (natural) logarithm of the variable, and u is the random stochastic term having the properties assumed in standard regression models.¹³ Logarithmic specification appears somewhat better than a linear model because the parameters b and c in equation (1) can be interpreted as elasticities of educational expenditure with respect to income and relative price. Also, Zymelman's (1976) study indicates that log-log regressions do better than linear equations.

Equation (1) can be treated as a reduced-form demand function for K-12 schooling. Although the model is for public expenditure per student, the recent public-choice literature suggests that it can be interpreted as representing demand function of the "median" citizen (voter). Standard demand theory

would then imply that, unless education is an inferior good, the income coefficient should be positive. Since the left-hand side variable is real expenditure, the relative-price parameter depends on the price elasticity of demand; the coefficient would be negative if the demand is elastic, and positive if the demand is inelastic.¹⁴

The model has been estimated by the ordinary least-squares procedure, and the predicted values and the "residuals" have been obtained on the basis of the estimated parameters. First (model 1) panel in Table 3 contains the actual expenditure, predicted value, and the residual for each country.

As notes in Table 3 indicate, fit of the model is very good, and adjusted- R^2 is of the order of 0.66. Coefficient of the *per-capita*-income term is positive, carries high statistical significance, and suggests an equiproportionate increase in K-12 expenditure per student as income rises. Coefficient of the relative-price term is positive, but is not statistically significant at the conventional levels. Therefore, one could say that the demand is either inelastic or unit-elastic in the sample studied.

It is also noted that the U.S. spending level (3177) is below the predicted level (3342), and there is a relatively small "underspending" of the order of 5%. The two big "overspenders" are Denmark and Sweden, who spend about 30 to 35% more than the predicted levels. Two major underspenders are Japan and Germany (FRG), who spend some 25% less than the expected levels.

Two points may be inferred from Table 2 and model 1 panel of Table 3. First, the U.S. does rank high in the OECD group in terms of K-12 public expenditure per student. Second, despite its high rank, K-12 public spending per pupil in the U.S. is lower by about 5% than the level predicted by regression estimates of the model specified in equation (1). Relative to the predicted (or expected) numbers, two major overspenders are Denmark and Sweden, and two important underspenders are Japan and Germany (FRG). Thus one can reconcile to some extent the seemingly contradictory positions taken by Rasell and Mishel (1990) and some other scholars, who allege underspending, and researchers like Brimelow (1990) and Perelman (1990) who suggest that K-12 spending per student in the U.S. is almost "unsurpassed" and is well above the levels in Japan and Germany who are the two main economic competitors.¹⁵

Although the model specified in equation (1)

Table 3
Actual and predicted values and "residuals" from models of K-12 expenditure per student: Selected OECD countries, 1985
[arranged in decreasing order of the residuals]^a

	Model 1 ^{a, b}			Model 2 ^{a, b}			Model 3 ^{a, b}				
	ACT.	PRED.	RES.	ACT.	PRED.	RES.	ACT.	PRED.	RES.		
1 Denmark	3076	2257	819								
2 Sweden	3215	2474	741	1 Sweden	3215	2482	733	1 Switzerland	3683	2694	989
3 Austria	2497	2136	361	2 Switzerland	3683	3002	681	2 Sweden	3215	2670	545
4 Finland	2394	2142	252	3 Denmark	3076	2415	661	3 Denmark	3076	2633	443
5 Norway	2899	2711	188	4 Austria	2497	1991	506	4 U.K.	2251	1813	438
6 Belgium	2234	2074	160	5 Belgium	2234	1990	244	5 Austria	2497	2093	404
7 U.K.	2251	2099	152	6 Finland	2394	2183	211	6 Finland	2394	2282	112
8 Ireland	1161	1120	41	7 U.K.	2251	2054	197	7 Ireland	1161	1082	79
9 Canada	3192	3183	9	8 Ireland	1161	1080	81	8 Belgium	2234	2185	49
10 Australia	1983	2132	-149	9 Norway	2899	2860	39	9 Canada	3192	3175	17
11 U.S.A.	3177	3342	-165	10 Canada	3192	3290	-98	10 Netherlands	1956	2040	-84
12 New Zealand	1231	1426	-195	11 Netherlands	1956	2150	-194	11 Norway	2899	3058	-159
13 France	2032	2323	-291	12 Australia	1983	2183	-200	12 Australia	1983	2254	-271
14 Netherlands	1956	2250	-294	13 France	2032	2249	-217	13 France	2032	2321	-289
15 Germany-FRG	1864	2434	-570	14 U.S.A.	3177	3623	-446	14 New Zealand	1231	1551	-320
16 Japan	1805	2382	-577	15 Japan	1805	2282	-477	15 U.S.A.	3177	3522	-345
				16 Germany-FRG	1864	2348	-484	16 Japan	1805	2255	-450
				17 New Zealand	1231	1833	-602	17 Germany-FRG	1864	2465	-601

^a Data for Italy are not available, and the country is not included in this table. Information on relative price of education for Switzerland is not available, and that country could not be included in model 1 estimates.

^{b,c} The three models are given below:

Model 1: Equation (1) of the text; regression estimates (with *t*-statistics) are:

$$\text{Log}(E_i) = 2.814 + 1.082 \log(RY_i) + 0.419 \log(RPE_i) \\ (2.17) \quad (3.83) \quad (1.62)$$

Model 2: Equation (1) without the $\log(RPE)$ term; regression estimates are:

$$\text{Log}(E_i) = 1.400 + 1.387 \log(RY_i) \\ (1.22) \quad (5.51)$$

Model 3: $\text{Log}(E_i) = a_2 + b_2 \log(RY_i) + c_2 \text{VRATIO}_i + d_2 \log(\text{YEARS}_i)$, where VRATIO is the ratio of enrollment in vocational institutions to total K-12 enrollment, and YEARS stands for total number of years of schooling in elementary and secondary cycles. Regression estimates are:

$$\text{Log}(E_i) = 3.672 + 1.491 \log(RY_i) + 0.867 \text{VRATIO}_i - 1.131 \log(\text{YEARS}_i) \\ (1.70) \quad (5.81) \quad (1.36) \quad (-1.31)$$

Adj. R^2 : 0.66; SEE: 0.182

Adj. R^2 : 0.65; SSE: 0.195

Adj. R^2 : 0.66; SEE: 0.191

seems reasonable and does well empirically, the estimated parameter of the relative-price term is not statistically significant even at the 10% level, and one may wish to see how the comparisons would look if that term is dropped. Second (model 2) panel in Table 3 reports the position after dropping the RPE term. It is evident that the broad picture remains unchanged: Sweden and Denmark continue to be two major overspenders, and Japan and Germany are among the major underspenders; overspending by Sweden and Denmark is about 30 and 27% respectively, and underspending by each of Japan and Germany is 21%.¹⁶ The main difference from model 1 results is that (a) Switzerland, which could not be included in estimation of model 1 due to lack of data on RPE, also emerges as a major overspender, (b) New Zealand is seen to be the most significant underspender, and (c) underspending in the U.S. is now larger at 12%.¹⁷

Since some other factors besides income (and relative-price) may also affect expenditure, another model was estimated to see the sensitivity of the main results to model specification. Third (model 3) panel in Table 3 shows the position when model 2 is augmented by including a term to represent the proportion of K-12 students who are in vocational institutions and another variable to show the total number of years in elementary and secondary cycles. Once again, the broad picture remains the same, and an underspending of about 10% is observed for the United States.¹⁸ It is also noted that, although all models yield very similar results, model 1, which conforms to the basic demand theory, appears to be the best in terms of regression standard error (SEE).

5. CONCLUDING REMARKS

This study seeks to shed additional light on the question about the extent of "overspending" or "underspending" on education in the United States, especially at the precollege levels. The work introduces some simple models of educational expenditures so that actual expenditures can be compared with the "expected" or "predicted" levels, and relies heavily on PPP exchange rates for cross-country comparisons. Six points are noted. First, after careful attention is given to the data, the U.S.

cannot be deemed to rank "low" in the OECD group in terms of expenditure-GNP ratios; nor can it be considered as ranking very high. Second, however, such ranking provides no indication of underspending or overspending; there seems no theoretical basis for expecting a positive (or negative) relation between income-*per-capita* and the ratio, and no relationship is empirically observed in the OECD group or in broader cross-country samples. Third, the U.S. does have a high rank in terms of K-12 public expenditure per student. Fourth, such a high rank by itself cannot be treated as indicative of any "generous" public support for K-12 education; one needs to compare the actual expenditure with an expected or predicted number based on a model of expenditures. Fifth, when a fairly reasonable model of "demand" for K-12 public expenditure per pupil is estimated for the OECD group, and the actual and the expected (predicted) values are compared, the U.S. is observed to be a mild underspender; Sweden and Denmark (and perhaps Switzerland) seem to be the major overspenders, and Japan and Germany (and possibly New Zealand) are the most significant underspenders. Last, three variants of the model yield essentially similar results. The main conclusions of the study may, therefore, be summarized in two statements. Substantively, the OECD sample provides little indication of any major underspending or overspending on education in the United States. Although the regression residuals do indicate a small underspending at K-12 levels in a recent year, richer data and more extended models are needed before any strong conclusions can be drawn. Methodologically, comparisons of actual expenditures with expected (predicted) numbers, that are derived from estimation of reasonable models, seem more useful and informative than discussions of country ranks on observed expenditures or expenditure-GNP ratios.

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NOTES

1. A good discussion of the weaknesses of conventional exchange rates is provided by Kravis, Heston and Summers (1982). Note that several other researchers have also used PPP exchange rates at least on a limited scale, but Rasell and Mishel (1990) seem to constitute an important exception; they stated (p. 28) "Purchasing power parity rates could be used for the conversions, but these also give misleading results".
2. Ireland's *per capita* income is also low, and is in fact lower than that of Spain. However, Ireland is included here because of its inclusion in the countries studied by Rasell and Mishel (1990). As explained by Ram (1991), inclusion or exclusion of Ireland does not alter the broad position.
3. Expenditure-GNP ratios are based on data in national currencies.
4. Ram (1991) provides complete details concerning the data, data sources, and their limitations. He also reports several additional results. Note that the information for Denmark is for 1986, except the PPPE/PPPY ratio which is for 1985.
5. Inclusion of private expenditure in the U.S. makes the position somewhat ambiguous, but the broad picture does not seem to be affected, especially for K-12 schooling.
6. Ranks in Table 1 are different from those reported by Rasell and Mishel (1990, p. 11), especially for K-12 expenditure. However, as Ram (1991) explains, it is not easy to reconcile the differences.
7. Regression results are available from the author.
8. As stated in note 3, ratios in Table 1 are based on expenditures and GNP measured in national currencies. If PPP exchange rate for education (PPPE) is used to convert (deflate) expenditures and PPP exchange rate for GDP (PPPY) is used to deflate income (i.e., Table 1 ratios are multiplied by PPPY/PPPE), the position remains broadly similar, but there are sizable changes in ranks of countries for which the divergence between PPPE and PPPY is large. As shown in OECD (1987, pp. 24-25), difference between the two rates is most marked for New Zealand whose PPPE is 0.63 (national currency per dollar) and PPPY is 1.35. The difference for Ireland is also fairly large. The appendix includes a comparison of the ratio of K-12 expenditure to GNP in national currencies (ordinary ratio) with that (PPP ratio) obtained after multiplication with PPPY/PPPE. In view of the somewhat tentative nature of PPPEs, caution is appropriate in making the comparisons.
9. The position here regarding correlation between expenditure-GNP ratio and GDP *per capita* is somewhat different from the results reported by Schultz (1988), and by Behrman (1987) for enrollment rates and average schooling relative to a synthetic cohort.
10. The appendix includes a comparison of Table 2 ranks with those based on conventional (market) exchange rates. Although the broad picture is similar, the differences are sizable for several countries.
11. Among the scholars who provided educational models, two seem particularly notable. Schultz (1988) used a demand-framework to model educational expenditures in a wide cross-country perspective. Behrman (1987) developed a model of school enrollments and applied it to a large intercountry sample.
12. Unlike the case of expenditure-GNP ratio, there is a strong positive correlation between K-12 expenditure per student and GDP *per capita*. The sample correlation coefficient is 0.75, and carries high statistical significance.
13. The PPPs are taken from OECD (1987, pp. 24-25) and are based on ICP expenditure categories. The variable appears fairly appropriate in the cross-country context studied. Although it would be better to have a relative-price index for K-12, such disaggregated price measures are scarce. As suggested in note 8, some caution is appropriate in using even the overall price-level indices for education.
14. Expenditure (PQ) equals the product of price (P) and quantity (Q), and price elasticity of demand is defined as $(dQ/dP)(P/Q)$. It is easy to show that if demand is "elastic" in the sense that the absolute value of price-elasticity exceeds one (1), expenditure falls with an increase in price, and the opposite is true if demand is "inelastic" in the sense that the absolute price-elasticity is smaller than one.
15. Note that it is difficult to draw strong conclusions about overspending or underspending even by considering these regression residuals. For example, Japan may seem to underspend because of a shorter compulsory schooling cycle or because its expenditure is more effective in some sense. Similarly, Sweden may overspend because of high costs of busing or room/board expenses. For a reliable determination of overspending or underspending, richer data and more elaborate models are needed.
16. For model 2 of Table 3, the appendix provides an illustrative comparison of PPP-based residuals with those obtained from regression of conventional dollar expenditures on GDP *per capita* derived from conventional (market) exchange rates. Although the position is broadly similar in the two sets, the U.S. ranks even lower in terms of residuals from conventional dollar measures, and the scenario resembles that suggested by Rasell and Mishel (1990).

17. The large change for New Zealand occurs probably because of the huge divergence (mentioned in note 8) between its PPPE and PPPY and hence its unusual value of RPE which is dropped in model 2.
18. In a different and much more sophisticated framework, that considers income and growth paths in the context of dynamic optimization, Lucas (1988, p. 26) indicates that there may be substantial underinvestment in human-capital formation in the United States.

REFERENCES

- BEHRMAN, J.R. (1987) Schooling in developing countries: Which countries are the over- and underachievers and what is the schooling impact? *Economics of Education Review* 6(2), 111–127.
- BRIMELOW, P. (1990) American perestroika? *Forbes*, May 14, 1990, 82–86.
- KRAVIS, I.B., HESTON, A. and SUMMERS, R. (1982) *World Product and Income*. Baltimore: Johns Hopkins University Press.
- LUCAS, R.E., JR (1988) On the mechanics of economic development. *Journal of Monetary Economics* 22(1), 3–42.
- OECD (1987) *Purchasing Power Parities and Real Expenditures 1985*. OECD, Paris.
- OECD (1989) *National Accounts*. Main Aggregates Volume 1. 1960–1987. OECD, Paris.
- PERELMAN, L.J. (1990) The “Acanemia” Deception. Hudson Institute Briefing Paper No. 120, Indianapolis, IN.
- RAM, R. (1991) Public Educational Expenditures in Industrialized Countries: An Analytical Comparison. MacArthur/Spencer Series Number 19, Center for the Study of Educational Finance, Illinois State University, Normal, IL.
- RASELL, M.E. and Mishel, L. (1990) Shortchanging Education. Economic Policy Institute Briefing Paper, Washington, DC.
- SCHULTZ, T.P. (1988) Expansion of public school expenditures and enrollments: Inter-country evidence on the effects of income, prices, and population growth. *Economics of Education Review* 7(2), 167–183.
- UNESCO (1989) *Statistical Yearbook 1989*. UNESCO, Paris.
- U.S. DEPARTMENT OF EDUCATION (1990) Shortchanging Education: A Case Study in Flawed Economics. Mimeo, Washington, DC.
- ZYMELMAN, M. (1976) Patterns of Educational Expenditures. World Bank Staff Working Paper No. 246, Washington, DC.

APPENDIX

Comparison of expenditure-GNP ratio, expenditure per student, and regression residuals of model 2 (of Table 3) with conventional and PPP exchange rates, 1985

K-12 expenditure/GNP ratio (%)				K-12 expenditure per student				Regression residuals			
ordinary ratio		PPP ratio		PPP exchange rate		market exchange rate		PPP exchange rate		market exchange rate	
Country	per cent	rank	per cent	Country	rank	Country	rank	Country	rank	Country	rank
Ireland	5.45	1	7.77	1	3683	1	3627	2	Sweden	1	637
Sweden	5.31	2	5.38	4	3215	2	3046	4	Switzerland	2	612
Denmark	4.72	3	5.66	3	3192	3	2843	6	Denmark	3	224
Norway	4.70	4	4.99	5	3177	4	3177	3	Austria	4	442
Canada	4.45	5	4.18	8	3076	5	3782	1	Belgium	5	246
Belgium	4.27	6	4.36	7	2899	6	2909	5	Finland	6	131
Finland	4.13	7	4.64	6	2497	7	2002	8	U.K.	7	230
France	4.07	8	3.99	11	2394	8	2306	7	Ireland	8	74
U.S.A.	4.06	9	4.06	10	2251	9	1641	13	Norway	9	-52
Austria	4.06	9	3.87	12	2234	10	1677	10	Canada	10	-65
Netherlands	3.98	11	3.87	13	2032	11	1643	12	Netherlands	11	-74
Australia	3.65	13	4.15	9	1983	12	1720	9	Australia	12	-169
U.K.	3.56	14	3.75	14	1956	13	1502	15	France	13	-123
New Zealand	3.28	15	7.02	2	1864	14	1572	14	U.S.A.	14	-522
Japan	3.24	16	3.07	15	1805	15	1676	11	Japan	15	-471
Germany-FRG	3.01	17	2.86	16	1231	16	823	17	Germany-FRG	16	-373
Switzerland	3.68	12	—	—	1161	17	887	16	New Zealand	17	-309

Note: "PPP ratio" of expenditure to GNP is calculated by multiplying the ordinary ratio with PPPY/PPPE, where PPPE denotes PPP exchange rate for education and PPPY stands for PPP exchange rate for GDP. These are taken from OECD (1987, pp. 24-25), which provides estimates of sectoral PPPs for ICP expenditure categories. PPPE for Switzerland is not reported in the cited source. Ordinary expenditure/GNP ratios for K-12 (and the corresponding ranks) are the same as in Table 1; PPP dollar values of expenditure per student (and the corresponding ranks) are the same as in Table 2; and PPP regression residuals (and the corresponding ranks) are the same as in model 2 of Table 3. Market exchange rates are taken from OECD (1989, p. 151). Additional details are available from the author.