NBER WORKING PAPER SERIES

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Working Paper 15491
http://www.nber.org/papers/w15491

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
November 2009

For their helpful comments on earlier drafts, the author thanks Sun Go, Maarten Prak, Noam Yuchtman, and conference participants at Queens University in Kingston, at the Instituto de Ciências Sociais in Lisbon, at the Fundación Ramón Areces and Instituto Figuerola in Madrid, and at UC Davis. The usual absolving disclaimer applies. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 15491
November 2009
JEL No. H23,H52,N3,N30,O15

ABSTRACT

This essay proposes a set of non-econometric tests using data on wage structure, school resource costs, public expenditures, taxes, and rates of return to explain anomalies in which richer political units deliver less education than poorer ones.

Both the anomalies of education history, and its less surprising contrasts, fit broad patterns that can be revealed and partially explained using low-tech methods. Over most of human history, contrasts in the output of education were driven mainly by contrasts in the supply of tax support for mass education. Exogenous influences on the demand for, and the private supply of, education played only lesser roles. Pro-growth public education could have emerged a century or two earlier than it did, had the leading countries of Western Europe mustered the political will to fund it. Government underinvestment in mass education is demonstrated for England and Wales between 1717 and 1891. Differences in political support still account for most of today's education anomalies where the contrasts involve less developed regions.

In today's highest-income settings, however, differences in tax funding lose their previous explanatory power. The postwar shift away from strong effects of school resources calls for a renewed introduction of historical context into the "does money matter" debate.

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I. WHY WASN'T, AND ISN'T, THE WHOLE WORLD DEVELOPED?

In an oft-cited presidential address, Richard Easterlin challenged economic historians and development economists to come up with the simplest big reason why most humans have been sentenced to live in poor and underdeveloped economies. Honoring his own question, he suggested a single big issue to pursue. To know why the whole world isn't developed, we should turn more attention to the lack of formal schooling, especially primary school for the masses. Before 1940, less than four percent of the total population was in school in most countries. Some have accelerated since then, and some have not. He did not try to explain this puzzle himself, but only conjectured that "a major shift in political power" caused a positive shift in "the incentive structure" for mass education.[1]

Education cannot be a monocausal explanation for underdevelopment, of course. In the quarter century since Easterlin's address, the search for a top global force behind economic development has turned away from schooling toward other causal forces, especially institutions that secure private property rights. Considerable progress has been made toward identifying historical-statistical instruments that can explain part of the global differences in economic growth over recent centuries.[2] The new empirical institutionalism does agree that the advance of knowledge is crucial to growth, and most empirical tests are sufficiently reduced-form to allow education policy to be part of the causal machinery. Yet the featured mechanisms are the security of private property rights against piracy, theft, and government. Even Gregory Clark's challenge to the role of institutions ignores policies toward formal mass education, although it does introduce a human-capital argument about middle-class values and family size.[3]

Still, there are several reasons for going back to school, so to speak, in the search for better explanations. One is the power of history's raw correlation: every country where the average income has advanced beyond, say, a thousand PPP dollars of 1990 has elevated its schooling, and has done so with public tax money, not waiting for private markets to do the educating. It would strain credibility to argue that this is purely a reverse causation from economic growth to the level and funding of education. Surely, any shock either to the supply of schooling or to output has a cumulative effect on both.

Even the recent studies that have downplayed the role of education in comparative development have confirmed the significance of that role. For example, a landmark article by Mark Bils and Peter Klenow emphasizing that schooling cannot explain even half the postwar differences in growth rates does firmly establish its minority contribution, perhaps as much as a third of all postwar variance in GDP growth.[4]

A second reason to return to the role of formal schooling is that the traditional externalities arguments are now being confirmed by empirical tests. The externalities have proven significantly positive in recent econometric studies, despite the difficulties of measuring external effects.[5]

How could we learn more from the human record about the causes and growth effects of formal education? Given the feedbacks between education and other variables, there are four main kinds of evidence:

(1) randomized natural experiments, the econometric "gold standard" of causal identification;

(2) econometric estimates on panel or cross-sectional econometric samples where the models fail to pass tests of instrument exogeneity and power;

(3) non-econometric quantitative comparisons; and

(4) non-quantitative historical data.

Each of the four kinds of evidence has a contribution to make, because of each trades weaknesses for strengths. Their scientific reliability in identifying causality runs in the order shown here, from (1) to (4). Yet the empirical breadth and suggestive power of their respective databases run in the opposite order. At one extreme, naturalized natural experiments have yielded the most solid evidence on the economic and health effects of formal schooling, exploiting such randomizers as the calendar month of a person's birth or accidents in the sequence in which different U.S. states implemented mandatory schooling laws.[6] The price of this high credibility is the narrowness of the counterfactual question answered (what if no mandatory schooling at that time, or what if the person were born late in the year) and the narrowness of the historical context covered. While the share of history allowing randomized experiments will grow, it will always be a small

share of history. To avoid discarding most of the human record, we must supplement the best narrow tests with use of shakier testing of larger ranges of experience. This paper emphasizes the third technique, namely non-econometric quantitative comparisons, for illuminating the sources and effects of extra formal schooling.

It turns out that low-tech handling of a set of qualitative indicators, buttressed by some accounting measurements, allows us a great deal of causal insight. History has been kind to us: While the different historical indicators might conceivably contradict each other's testimony, they often do not. The power of those raw correlations has already produced strong non-econometric comparative studies of the Americas by the Engerman-Mariscal-Sokoloff team.[7]

The reward for using improved non-econometric evidence is the identification of some clear patterns in the history of education policy failures:

(1) Most of history makes it easy to find and demonstrate cases of underinvestment in primary education, with no clear cases of overinvestment.

(2) For at least three centuries, underinvestment in primary education has been mainly the result of political decision-making, not of private irrationality or of any lack of technology that would reward those with extra schooling. The one clear case of private irrationality is many societies' failure to educate daughters when the law allowed gender equity in schooling and teaching.

(3) Indeed, some governments have even lost net revenue by under-investing in mass education and failing to solve the familiar problem of capital market imperfections. I illustrate with two cases in which the fiscal rate of return on extra schooling exceeded the cost of government borrowing. The risk-aversion argument, which may absolve private individuals from the charge of irrationally passing up large expected returns, does not apply to secure governments.

(4) The clearest failures have been inegalitarian, blocking education for the masses while investing enough public funds in elite education to bid down its returns. In many cases, the inegalitarian bias shows signs of being linked to gender inequity as well. History has still not offered a clear case of egalitarian failure to groom top talent while delivering heaps of tax money to the masses.[8]

(5) Government underinvestment is likely to have occurred in several contexts since the late seventeenth century. In the eighteenth and nineteenth centuries, the secure states of Western Europe, particularly England, could have accelerated mass schooling and growth two centuries before they actually did so. This paper also casts suspicion on postwar governments in Latin America.

(6) Since the 1960s, however, the shortcomings in rich countries' education policies are less clearly related to under-funding. With nearly full enrollments in primary and secondary education, the frontier has shifted from education quantity to quality, and inefficiency is replacing insufficiency as the locus of likely policy error.

II. EXPLAINING ANOMALIES IN PAST EDUCATION PERFORMANCE

Comparative historiography needs additional tools to explain the contrasts that have occurred over a vast, but thinly quantified, historical record. Making the most of the available clues calls for a procedure that delivers clear qualitative conclusions when the data fail to offer a randomized natural experiment. One can find which suspects were responsible for historical contrasts in education outcomes, aided only by some of the suspects' movements, a few clearly valid behavioral assumptions, and some additional contrasts, which we will call "fingerprints".

To launch such a non-econometric inquiry into contrasting education outcomes, we must begin with what we know to be a tight inter-relationship between education achievement and the level of income. Education achievement, or the contribution of education to productive human capital, manifests itself partly in average years of educational attainment and partly in some observable indicators of educational quality, such as test scores. Education achievement can also take forms that do not require formal schooling, though they would be helped by it -- such forms as literacy and numeracy.[9] Any dimension of this achievement (Ed) depends on incomes through these two simultaneous equations, for any polity *i* in time *t*:

$$\overset{(+)}{Ed_{it}} = a_o + a_1 Y_{it} + a_2 X_{it} + e_{ait} \quad \text{and} \tag{1}$$

$$\overset{(+)}{\quad}$$

(2) $Y_{it} = b_o + b_1 Ed_{i,t-1} + b_2 Z_{it} + e_{bit}$.

Here *Ed* is any education performance outcome, *Y* is average income (or its logarithm), and *X* is a vector of exogenous influences on *Ed* -- our leading suspects, it will turn out. The *a*'s and *b*'s are vectors of coefficients, *Z* is a vector of exogenous influences on *Y*, and the *e*'s are error terms. Examples of *X* would be the strength of economic demand for skills, social willingness to educate females, or government policies toward education; and examples of *Z* would be geographic or historical luck, such as natural resources, proximity to foreign markets, or the absence of war. The plus signs over a_1 and b_1 indicate two of our frugal assumptions: outputs of the education sector depend positively on current average income, and income depends positively on the previous generation's education outputs, Ed_{t-1}. Using the assumed linear structure of coefficients, the contrast between any two polities i = *A* and i = *B*, is represented by

(3) $\Delta Ed_t = a_1 b_1 \Delta Ed_{t-1} + a_1 b_2 \Delta Z_t + a_2 \Delta X_t + \Delta e_{at} + a\Delta_1 e_{bt}$ for education, and

(4) $\Delta Y_t = b_1 \Delta Ed_{t-1} + \Delta b_2 Z_t + \Delta e_{b_t}$ for income.

To cut the differences in structure between polities, let us make the comparison contemporaneous, so that either polity had the chance to draw from the same global menu of technologies for providing education and for keeping adults alive and productive.[10]

So far, we have little way of constraining the set of possible explanations of the difference between settings *A* and *B*. To add more information, let us focus only on those contrasts that are education-income *anomalies*, defined as cases where education outcomes are higher in *A* than in *B*, or $\Delta Ed > 0$, even though *B* is richer in terms of income, or $\Delta Y < 0$. Such anomalies, with *A* more educated though *B* is richer, have happened in a sizeable minority of historical settings over the last three centuries. In these anomalous cases, one can rule out either a poverty defense, or a Wagner's Law defense, that the country with less schooling simply could not afford it.[11]

For each of history's anomalies, we now have a slightly narrower set of suspects. Looking back at Equation (4), let us take a case in which *A* was as least as educated at *B* in the previous generation too, and set the *A-minus-B* difference in Equation (4)'s error e_b at zero. Then the only way that *A* could have been poorer than *B*, as the anomaly requires, is for the term $\Delta b_2 Z$ to be negative. That is, the anomaly requires that *A* must have some exogenous disadvantage (natural resources, etc.) unrelated to education. Turning back to Equation (3), our suspicions about how *A* got more education can now focus on the term involving education-specific suspects ($a_2 \Delta X$). It seems safe to conclude that this term $a_2 \Delta X$ plus any lagged advantage in previous education (ΔEd_{t-1}) should share in explaining at least 100 percent of the contrast in education, once we add two reasonable assumptions: (1) the current contrast in education exceeds the income-transmitted effect of any previous education advantage that A had enjoyed ($\Delta Ed_t > a_1 b_1 \Delta Ed_{t-1}$), and (2) the double difference in error terms ($\Delta e_{at} + a\Delta_1 e_{bt}$) is not positive.

The tests still have only very limited power, however, since there can be a number of education-specific suspects within that $a_2 \Delta X$ bundle. Worse, many of these *X* suspects cannot be measured. A prime example would be exogenous differences in social attitudes affecting the private demand for schooling.

Fortunately, the historical record often leaves additional *fingerprints* in the form of other features left by the same education-specific suspects (the *X*'s). There will be several observable features, F_i's, that may be linearly related to the *X*'s, *Z*'s, and other forces *V*'s:

(5) $F_i = c_{io} + c_{i1} X + c_{i2} Z + c_{i3} V + e_{ic}$, or, in the *A-B* contrast,

(6) $\Delta F_i = c_{i1} \Delta X + c_{i2} \Delta Z + c_{i3} \Delta V + \Delta e_{ic}$

The more such additional fingerprints we have, and the more we know about the signs of the coefficients, the more we can infer the ΔX's and their likely roles in making the poorer country the more educated country.

This simple framework leads us part of the way toward causal explanation of anomalous contrasts. The framework has been a parsimonious one, involving only the following kinds of assumptions and information:

(a) the assumption that a greater education of the previous generation of students raises current national product ($b_1 > 0$);

(b) the assumption that greater income raises investment in education ($a_1 > 0$);

(c) the observed anomaly that *A* is more educated than richer country *B*, which allows us to rule out a net explanatory effect of the exogenous non-education influences on income (the ΔZ's);

(d) data on additional fingerprints (the ΔF_i's); and

(e) the assumption that we know the signs of various coefficients, though we lack reliable estimates of their absolute magnitudes.

The sharpness of our explanation will depend on the specifics of each historical comparison. In some cases, we will find too many *X*'s that could contribute uncertain amounts to the observed contrast, and our explanation will remain incomplete. In other lucky "natural experiments", we will be fortunate enough to find only 1-3 suspects guilty, yielding a fairly clear explanation of each contrast. Better still, the clear cases will turn out to have some clear patterns, inviting global conjectures.

III. WHERE WERE THE ANOMALIES?

History has left us enough numbers to sketch a global history of the education anomalies featured in this paper. There are many cases in which a poorer country has higher education outputs than a richer country, even though most comparisons find that richer countries have more schooling.

The anomalies algorithm looks very symmetrical, though my paper title is not. In principal, each anomaly invites these choices between mirror-image interpretations:

- "Richer Country B 'succeeded' in becoming richer, despite less education, due to some wiser use of resources" *versus* "Country B failed on the education front."
- "Country A spent too much tax money on schooling" *versus* "Richer Country B spent too little tax money on schooling".

In each case the second interpretation seems to hold more promise. One reason is that education outcomes are more policy-malleable than oil deposits and other exogenous "Z" influences on income, making for a more inviting research agenda. Another is that the rate of return evidence suggests under-investment failures, not over-investment failures in the education sector. Finally, anomalous successes in test scores (e.g. Finland and Korea in PISA today) seem to depend more on pedagogical efficiencies and ethnic homogeneity than to economic policy, offering less reward for applying economic historiography.

The nature of quantifiable education outputs has drifted over time. Before the mid-nineteenth century the most widely available indicator was literacy. The early literacy history, say between the early seventeenth century and the early nineteenth, contained few anomalies. Broadly, in the centuries before public schooling, those countries with more prosperous middle and upper classes tended to purchase more literacy for their children. The best-known alleged exception is the relatively high rate of literacy in not-so-rich Sweden, the "impoverished sophisticate" of the eighteenth and nineteenth centuries. Yet even here the anomaly was not dramatic, since Swedish children were highly literate but not so highly schooled. That is, they learned to read the Bible, but did not stay in school for many years, as revealed by nineteenth-century data.[12]

From the middle of the nineteenth century to the late twentieth, the most useful indicator of education outputs was the overall enrollment rate for primary and secondary school. Figures 1 through 4 follow this indicator from 1870 to 2000, with the slight twist that the data for 2000 have cumulated earlier enrollments into an overall educational attainment of the entire adult population. Figures 5 through 7 then introduce the kind of education output measure that will dominate discussions of the twenty-first century: Not years of schooling, which are converging over time, but achievement test scores that are designed to measure education quality over the primary and secondary school years.[13]

Within and across the regions of the world, some anomalies have persisted since the mid-nineteenth century, while others have vanished or have appeared only more recently. In the community defined by Northwest Europe and its overseas offshoots, the main past anomaly related to the performance of England and Wales. In the nineteenth century, when England and Wales led in national income, it lagged behind some countries in enrollments. By the late twentieth century, its position -- more precisely, that of the United Kingdom -- had been transformed. As Figures 1 and 2 show for 1870-1900, the United Kingdom as a whole sent a noticeably lower share of children through school than did Canada, the United States, New Zealand and Australia, even though the UK was the richer country in most comparisons. In 1870, Figure 1 allows us a glimpse of how the international contrasts differed for the different nations within the UK. The real anomaly indeed relates to the wealthier English-Welsh part of the Kingdom. Why did it have lower enrollments relative to Scotland, as well as relative to North America and Australasia? This case study will be pursued in Section VI below. For now, the important point to note is that the English lag was indeed temporary. By the late twentieth century the United Kingdom had slightly higher enrollments and adult educational attainments that the United States and the rest (Figure 4), and in the PISA achievement tests of the early twenty-first century Britain's 15-year-olds were in the middle of the OECD cluster (in Figure 5), scoring higher than their U.S. counterparts.

A more persistent anomaly is the education underperformance of much of Latin America relative to East Asia and Eastern Europe. So say the available contrasts in all five figures, e.g. in the lower enrollments in the South American countries than in Japan in 1870-1930, when Japan's income was much lower (Figures 1-3). Latin American schooling also lagged behind that of the Caribbean region. That is, the anomalies tended to contrast poorer and better-schooled countries around the Caribbean with richer and less schooled South Americans. Specifically, Costa Rica, Cuba, Jamaica, and Trinidad-Tobago have generally been ahead in education despite their not being as rich as Argentina, Chile, Uruguay, and Venezuela. The most persistent historical anomaly contrasts better-schooled Costa Rica with underperforming Venezuela evident all the way from 1930 (Figure 3) through the test scores of 2006 (Figure 6).

The Middle East also has puzzling contrasts, at least in the data available since the late twentieth century (Figures 4 and 5 again). The better-educated yet poorer countries cluster in Anatolia and the Levant, as shown by the national observations for Jordan, Lebanon, Syria, and Turkey. By contrast, enrollments and test scores tend to be much lower in Tunisia and in the oil-rich countries of North Africa and the Arabian Peninsula, according to data from Algeria, Libya, Saudi Arabia, and Oman.[14] These anomalies are only partly due to differences in the education of females, and call for further explanation.

Africa and Asia have their own output anomalies. These get less attention here, since Africa and Asia are just beginning to participate in international testing programs like PISA. Within sub-Saharan Africa, the South and East tend to be more schooled than the North and West, partly because the North and West still discriminate more against females in education. This produces some education-income anomalies like Figure 4's contrast between Malawi (poorer, more schooled in 1970) and Niger (less poor, less schooled).[15] Within Asia, the main anomalies are success cases, rising above the global draft of education with income. In the early going, Japan achieved far more schooling than its income would have predicted (Figures 2 and 3). In the postwar era, it is joined by Korea, which has combined long average years of schooling with test scores that match or exceed those of any richer Asian country (Figures 4 and 5). And at the poorer end of the spectrum, China has achieved more years of average schooling than any country in South Asia.

The final illustration of revealed output anomalies draws on a present-day American puzzle, which a larger literature, much of it econometric, has already tackled. In Figure 7, as in Figures 5 and 6, the education output measure is a test-score average, but this time the polities are states within the United States rather than nations. The main interregional pattern should be familiar to any student of U.S. education history: despite postwar convergence, the Southeast still has lower incomes and lower test scores than the Northeast and North Central regions. The main anomaly appears in the West: California, Nevada, and Hawaii have peculiarly low test scores for their income levels, and New Mexico also tests poorly relative to lower-income Louisiana. There is something distinctly worse about California's primary-secondary schooling, even after the ethnic

mix and immigrant share have been held constant. So one would gather from a simple comparison of California with middling Texas in Figure 7, and so say several econometric studies.[16] Thus our simple way of mapping anomalies seems to fit the econometric results and institutional realities of this well-documented case. Less resolved, however, is the debate over the underlying *causes* of America's current anomalies in education output, and we return to this debate later.

IV. WHAT HELD BACK MASS EDUCATION? LINING UP THE SUSPECTS

To explain history's education-and-income contrasts, let us begin by lining up the forces most often suspected of holding back education (the ΔX's) as row headings on the left side of Table 1. The suspects are grouped into demand-side and supply-side forces in the market for primary schooling.

The most obvious demand-side force that might have retarded education for millennia would be a lack of demand for the kind of labor that requires literacy, numeracy, and other skills that schools might help to deliver. We naturally, though wrongly, suspect that most of our ancestors were unschooled largely because the economy had no jobs that called for schooling. One might accuse this first suspect if one sought to summarize all history before, say, the Industrial Revolution as a setting in which the backward state of technology forced people to make their living with raw labor. The first row of Table 1 says that such low demand for skills should have raised the relative child (unskilled) wage, lowered the adult gains from education, and lowered all rates of return on education.

In the second row stands its close relative, high demand for child labor (in the less-educated setting *B*). We often believe that children have stayed away from school because their parents felt they could earn good wages at an early age without going to class or studying. In the manufacturing zone of northern England, the Industrial Revolution famously kept children out of school, a problem that provoked a series of child labor laws and compulsory schooling laws.[17] The second row in Table 1 poses ways to test this possibility. If it were the dominant constraint, and other things were equal, we would see higher wage rates for children, less educational attainment, and thus higher

adult-wage gains from skills (ΔW) and higher rates of return for those who invested in education.

Next come some demographic forces that must have played at least a partial role, leaving us the task of deciding how big a role and when. Higher fertility would make it harder for parents in place *B* to afford schooling, even though it would not necessarily affect the market price of schools. Human capital per child would be lowered.[18] Larger families would also supply more children to the low-skill labor market, bidding down the child wage and bidding up the skilled-wage premium among adults once the adult labor supply tilted toward less schooling. The shift toward supplying less skilled workers would also raise the rates of return for those who received extra education.

Another demographic force probably played a major role in delaying the shift toward more schooling. Short adult life expectancy should have shortened the average work career and held down the rates of return on schooling, even though it may also have bid up the wage premium by supplying less skilled labor per year. This prolonged restraint was removed only with the arrival of modern health improvements. As will be argued below, one background reason why educational attainment is higher in Mexico or India today than in England or America back in the early nineteenth century, with roughly comparable incomes, is that Mexicans and Indians can now expect to use their skills over longer careers.[19]

It is particularly natural to attribute the long delay of formal schooling to fundamental social attitudes, represented in Table 1 by the row "family distaste for schooling." This rubric is meant to include a host of inertial instincts that parents might have, such as "Your grandparents didn't need schooling to live a decent life, nor did I, and neither do you" or "Don't try to move into a strange life where you're not wanted". If it were the dominant retarding force in context B, then we should expect to see a persistence of high skill premiums and high rates of return to extra schooling for those few who obtained it.

Discrimination is also a leading suspect, on both the demand side and the supply side of the market for primary schooling. It has checked demand for schooling when employers or powerful competing groups deny a large share of the population its free access to jobs that would use the schooling. Classic examples are refusal to hire women,

or to hire members of a disadvantaged race or caste or tribe. Job market discrimination should raise the skilled wage and raise all rates of return on education for those in the favored group.

On the supply side, discrimination can also be practiced in the education admissions process, by restricting entry from any of the same groups of outsiders. Either kind of discrimination lowers the use of persons with high ability, and drags down outsiders' incentive to get that schooling. It would show up in the data, however, in a deceiving way. The measured skilled wage premiums and the rates of return to education would all look higher, even though the true wage rates and rates of return are lower for those denied access. The literature on rates of return to education has repeatedly reminded us of this point when discussing "screening" and the use of best-schools connections to allocate and restrict top jobs in government or guilds. Where screening is based on ability (innate talent plus parental background), the marginal product of schooling looks deceivingly high because those outside the margin would be less productive. Even in the less ability-biased kinds of discrimination, the returns can still deceive, because competition would have bid down the rates of pay being protected by discriminatory education. When discrimination is a prime suspect, the historian and economist must decide with the help of clues not shown in Table 1. In some cases, that is easy. For example, discrimination against female education retards education and output in ways that are easy to quantify once one has data on education and wages by gender.

Alternatively, schooling may have been blocked through much of history simply because it had a high unit costs (or out-of-pocket costs, or "direct" costs) relative to average income levels. Those high costs could have taken the form of ineffective teaching technology or high prices for such school inputs as teachers, books, paper, and safe buildings. Such a possibility should be weighed by direct observation of high costs, and if possible by weighing their negative effect on the private and social returns to schooling. Indirectly they should also have tended to hold up the pay premiums (ΔW) for those few who acquired the skills anyway.

Schooling will also have been lower in settings where there was less philanthropy to support it. The signs of such a lack of charity are simply its low level and the same

effects that Table 1 showed for family distaste for schooling, except that denial of charity also lowers the private rate of return for those who do get educated.

The final rows in Table 1 examine the imprints of the suspect that will end up being featured in this essay: The relative denial of tax support for basic education. Whatever its causes, it leaves a distinctive set of fingerprints. Without tax support, the private returns to schooling will be lower and the restricted group receiving the schooling will enjoy higher pay premiums. Society as a whole will also get lower returns. Unlike other suspected causes of low schooling, the denial of tax support in one setting relative to another will leave its traces in relatively available fiscal data. Table 1 points this out, by selecting two indicators of tax support for primary schooling, both of which tend to be relatively measurable even for less developed countries and for centuries past. We will look at these tax-support measures more closely when reviewing the evidence.

Looking down the rows of Table 1, one notices that two of the best-known suspects are missing. First, as mentioned when we defined anomalies above, lower income would obviously restrain the demand for education. Yet income should not be listed in Table 1 because it is *too* central, too endogenous to any model of how education interacts with the economy. Income and education have tight simultaneous links, and progress together, as noted earlier. One needs a lucky natural experiment to quantify the education effects of an income shock, or the income effects of an education shock. While some econometric studies have succeeded in exploiting such natural experiments, these studies are few in number and their conclusions quantify what was already known qualitatively: positive income shocks raise investments in education, and positive education shocks (e.g. mandatory schooling laws) raise income, yet the slopes of these relationships are not known so securely that we can simply subtract a known income effect to distill exogenous influences on education. This, again, is why this study focuses on anomalous cases in which education was held back despite a (*B*) polity's having the same or higher income than a polity (*A*) that invested more in education.

Second, what about the familiar problem of credit constraints? Education is an expensive investment, and perhaps the central constraint in all lower-education settings had simply been the fact that poor parents find it harder get financing for their children's education. Credit constraints, like income, are central to any explanation of why the

whole world has had so little education, yet like income they do not belong on the list of exogenous suspects in Table 1. The reason, again, is that they are *too* central to the history of backwardness, and too correlated with income. The poorer a household or a whole society, the harder it is to gain the trust of lenders, for education or any other long-term investment. Other forces must intervene to remove these constraints. One might wish that improvements in the private financial sector would have provided the keys to financing schooling, yet history offers relatively little hope of a low risk premium on private student loans for the masses. Rather the crucial capital for mass private education has been provided by tax-based subsidies. History suggests a corner solution: No country has achieved universal primary education without relying mainly on taxes. Thus for primary education the problem of credit supply lurks in the last rows of Table 1: The issue is why some countries have been slower than others in supplying the tax funding that would solve the credit constraint for primary education.

V. THREE KINDS OF FINGERPRINTS

The clues, or quantitative indicators, listed in Table 1 help us sort among the lined-up suspects. In fact, they also advance our standards for judging the classic fear of "omitted-variable bias". Tests of influences, econometric or otherwise, usually draw the automatic agnostic response that perhaps some other omitted variables have acted as the true hidden causes of movements in the dependent variable. The fingerprint testing introduced here serves to raise the price of agnosticism. Anyone choosing to reserve doubts should explain not only what omitted variables they have in mind but also how these can match the extra fingerprint patterns. The more fingerprint tests we can add, the fewer the number of possible suspects.

Three main types of fingerprints that would be left at the scene by any influence on comparative education outputs are presented as column headings in Table 1.

A. Market Rates

Child wages. The opportunity cost of school children's foregone earnings has dropped with economic development, a rough tendency that partly explains the long

delay in educational attainment. We know that it dropped as nations became rich, because the value of hired child labor became nearly zero by law. Once a nation passed laws making schooling mandatory, there was no employment opportunity during school hours and therefore no opportunity cost.

The importance of that change depends on how much children could earn in the more rural and impoverished settings where they were free to drop out of primary school. The correct answer seems to be that their opportunity costs loomed large as a share of the total cost of going to school. In most of David Mitch's calculations for Victorian England, the opportunity cost was four-fifths of the total cost of attending school. In Lewis Solmon's calculations for the United States in 1880 and 1890, the lost wages were about half the total cost of schooling in the countryside, and well above half in the cities.[20] Awaiting more quantitative data from other settings, we can only conclude that the decline of child labor opportunities was an important part of the rise of schooling. Still, as we shall see in rate-of-return calculations below, even with the higher estimates of the opportunity cost of child labor, extra schooling brought high returns to all parties, leaving us to explore why those returns were often passed up.

Direct School Costs, and the Relative Price of Teachers. Did most of world history deliver so little education because schooling of given quality was more costly and less affordable for a typical family than it has become in today's rich countries? Unencumbered by data, our intuition could run in either direction. Perhaps teachers were an expensive elite in less developed times and regions, and have become cheaper. Or perhaps the opposite, if the quality of schooling declined and/or teachers became scarce with development. We are still far from a global or even multi-national economic history of school costs, and equally far from a global history of teacher pay, the key input price in this sector. Nor is it easy to relate relative teacher wage rates to relative unit costs unless or until one can hold quality constant.

A straightforward answer requires measurement of the average cost of a pupil's week or month in school, relative to a standard income. Such data, in a form that is comparable across countries or decades, are hard to find for any time before the 1980s. It is hard to correct any time series on school costs or fees for the upward drift in quality caused by lengthening of the school year, improvements in teacher quality and pedagogy,

and class size reduction. The problem seems soluble, especially with U.S. historical data, but only after much careful handling.[21] Since the 1980s, the international agencies (OECD, UNESCO, World Bank) have made international comparisons. There are noteworthy differences between countries in unit costs, relative teacher pay, class size, and test scores. Daily school costs per child seem to rise over the course of economic development. The most likely reason, however, is a rise in school quality and not a rise in the price of a given quality of schooling. Curriculum achievement test scores are clearly higher in the richest countries than among test-taking students in developing countries, suggesting an upward drift in the quality of delivery.[22] Yet despite this rise in quality, the direct cost of schooling of given quality, relative to general wage rates, has no clear trend over the course of development.

A Broad Hint from the History of Wage Premiums. Measuring the percentage gain in adult pay that comes with extra education can help us reach an early decision on the top-row suspect, namely a low market demand for skilled labor in the less-schooled settings. As noted, many might suspect that there has been less schooling for centuries because less developed settings had less demand for skilled labor. Perhaps these settings lacked skilled-intensive technology or had low tastes for skill-intensive goods before, say, the Industrial Revolution or the arrival of direct foreign investment from more advanced countries. The lower past demand should have manifested itself in the form of a lower skilled-wage premium, as predicted in Table 1. One might have gathered from the widening of wage gaps in North America and Britain since the 1970s that wages were more equal earlier, supporting the belief that demand for skills were relatively lower in the past.

Yet the growing eclectic sets of data on wage structure cast serious doubt on the notion that skills were less rewarded in less developed settings. Recent international comparisons give a clear result: Less developed settings generally have *higher* wage premiums for higher-skill occupations, and there is no trend toward higher wage premiums, except in countries in transition from communism. For example, Latin American skilled-wage ratios remain above those of the US, especially in low-education Brazil, Guatemala, and Nicaragua. The low-skill-demand argument seems to be wrong in predicting lower wage premiums in less developed settings.[23]

The available fragmentary evidence on movements over history seems to agree with the recent global cross-sections. A first hint comes simply from following American wage history starting from the early nineteenth century. That history suggests wide swings but no clear long run widening.[24] Similarly for Britain, skill premiums showed no clear net movement toward widening wage gaps anytime in the last seven centuries. In the building sector, for example, the skill premiums dropped across the fourteenth century, remained stable until the mid-nineteenth, and then dropped again.[25] Jan Luiten van Zanden has now extended our view of wage premiums in the building sector back to medieval times in Western Europe, with parallel indications from some East Asian data. He finds that wages compressed considerably from the middle ages to early modern times, with no real reversal in recent centuries. [26] Similarly, the skilled wage premium has declined in the building trades of India from the middle of the nineteenth century to the end of the twentieth.[27] While the skill premium in the building trades is not itself a schooling wage premium, nor a technology premium in a newly emerging sector, career choices would have linked the scarcities of skills across sectors.

Though the wage premium evidence is indirect, apparently earlier and less developed settings gave relatively high rewards to the kinds of skills that schooling helped to develop. The same was probably true in the commercial sphere, where literacy and counting have always been valued. We should look to other suspects, instead of positing that there was less demand for literacy or numeracy in earlier settings.

B. Rates of Return, with Caveats and Global Patterns

Let us turn next to a direct examination of rates of return on education, both as concepts and as empirical measures produced by a scholarly cottage industry in the late twentieth century. The rates of return have typically been used as clues about underinvestment or overinvestment in formal education. Somebody (private and/or public entities) has under-invested in the sense of lowering GDP if the rate of return is too high, and over-invested if they have driven the rate of return to levels that are too low. The vast literature measuring postwar rates has revealed important patterns that probably held throughout modern history. Before viewing these patterns, however, we must note some shortcomings of the conventional measures.

Caveats about Conventional Private and Social Rates. We start with the conventional private and social rates of return, before introducing this paper's new emphasis on the fiscal rate of return. The present value of private benefits is the discounted sum of the extra after-tax income gains from the extra education. Correspondingly, on the cost side, the household incurs out-of-pocket private costs plus the opportunity cost of what the child would have earned in not in school. The internal rate of private return is the rate of discount, r_P, that equates the present values of benefits and costs.

The familiar "social" benefits and costs of giving an individual more schooling are discounted in a similar manner, except that the affected party consists of the household and philanthropic and government sectors together. Again, the internal rate of return is that value of the rate of discount that makes net present value equal to zero. Externalities are ignored here, as they are in all past measurements of the "social" rate of return. I shall also set aside non-economic consumption benefits of education, to instill a bias toward understating some conclusions to be drawn later.[28]

The rate of return estimates must be used with a great deal of caution. The first problem is that the rates are based on a different counterfactual, a different "margin", than what most users of the measures would want. We typically want the rate of return measure to compare the gains and losses from somehow encouraging a marginal child to complete the next step of education. Yet the measure itself does not do that. Rather it gives us what might be called the "average marginal" rate of return on the difference in education at two levels, such as high school graduates versus primary school finishers. The implicit counterfactual is unintended and unattractive: What if we had somehow blocked everybody from getting the high school diploma? Furthermore, as a particular level of education becomes more universally attained, e.g. with almost everybody finishing primary school, the difference in the earnings of the two groups reflects the increasingly atypically nature of those who don't even finish primary school. There is no way to avoid the fact that the marginal returns and costs may not equal the average ones already attained, and we must imagine just how fast the diminishing returns to education might set in as it expands. Such judgments must be reached on a case-by-case basis.

A second problem is that rates of return are typically over-estimated by making the nearly universal assumption that people go to work and capture the extra earnings that their education makes possible. Yet adults, especially females, typically work less than that level at which they would fully reap the rewards of their educational attainment. At the level of the individual, this point matters little, since one can simply assume that every individual was free to choose between paid work and home time, so that education has raised the marginal value of their time whether or not they work for pay. However, if we are interested in effects on the growth of GDP per capita, or in the effects of education on government revenue, the incompleteness of labor force participation means that the economic returns are overstated. In what follows this likely effect of incomplete work will be taken into account.

Two Useful Global Patterns, Despite Another Flaw. Despite these caveats, there is a great deal of useful information in comparing rates of return across contexts. Recent studies have produced the useful rates of private and social return shown in Table 2.[29] Note that Table 2 has three patterns. First, the rates of return are usually higher in poorer countries, as one might expect from the greater severity of credit constraints in poor settings. This suggests what the emerging economic history of wage structure has also suggested: The economic gains from education were probably even higher in that past than they are today. Second, the rate of return is usually higher at the earlier levels of education. The return on primary education exceeds the return on higher education, even without measuring externalities, which should have been larger in primary schooling.[30] Finally, the private rates of return look higher than the social rates because of a questionable decision that the authors have consistently made in defining the private rate.

The first two tendencies offer valuable historical clues that probably extend back for centuries, but the third is misleading. How could the private rate always exceed the social rate, as shown in Table 2? The key assumption relates to the role of government in the private rate calculations. Like most authors calculating private rates of return, George Psacharopoulos and co-authors have deducted government subsidies to education from the private cost side, but ignored the taxes paid on the private benefits side. Their decision to take a short cut was made explicit at least as early as 1981: “Of course earnings [in the social-rate calculation] should be before tax, whereas in the private rate

of return calculation earnings should be after tax. But contrary to popular belief, the post- versus pre-tax treatment of earnings does *not* make a big difference in the rate of return calculation."[31] The same short cut has been taken by most of the rate of return literature, though the difference was quantified in an early study by W. Lee Hansen and also discussed by Gary Becker.[32] Some authors have omitted all taxes from the calculation of private returns, while others only missed indirect taxes, some kinds of wealth tax, and the losses of social program benefits that accompany extra earnings. Early authors (e.g. Hansen, Becker) were in this less-biased category, rightly introducing income tax rates but missing other taxes altogether.

The whole international comparative literature, however, took a step backwards after 1964 by failing to deduct any taxes at all from private returns. Only in 2005 did the OECD re-introduce income taxation and explicitly consider the fiscal rate of return, though they still failed to deduct indirect taxes from the extra earnings.[33]

Overstating the private returns by the amount of direct and indirect taxes paid on extra income misdirects our suspicions. Viewing the persistent gap in private versus social rates of return, one might ask "Why do private individuals constantly under-invest more in education than does society as a whole?" That puzzle would be lessened, however, if the calculations took account of direct and indirect taxes, thus lowering the private rates of return. The numbers need to be worked out, since governments take their bite from every year of a long work career. (The social rates, however, are free from this tax bias.)

The Fiscal Rate of Return. Correctly handling taxes invites a calculation of the fiscal rate of return on extra education attainment and quality. Such a calculation can reveal whether governments have actually passed up large bills on the sidewalk, i.e. large later tax revenues, by refusing to pay smaller amounts to subsidize mass schooling. The fiscal rate of return is the internal rate that equates the revenue gains and the costs that extra education brings to government itself.[34]

In what follows, we will find two historical cases in which the fiscal rate of return on education was quite high, like many of those private and social rates of return. Yet the fiscal measure has some extra strength as a clue revealing past underinvestment in education. It is harder to ignore a high fiscal rate of return, because is a traditional risk

argument is much less applicable on the government side. Traditionally, we look at the high rates of return foregone on private investments and excuse them on the grounds that such investments are very risky, warranting a rate well above the interest rates at which risk-averse private businesses and households might borrow. The traditional argument is certainly valid for private education loans, which repay private lenders only over a whole generation. Yet for a provincial or national government, it seems unlikely that the aggregate future tax returns from investing with subsidies in mass education are so uncertain. Indeed, the uncertainty of the aggregate tax base could even be reduced by subsidizing broad-based education. Calculations for Victorian England and postwar Venezuela will confirm that the governments could have earned higher rates of return than the interest rates they paid on their own debt.

C. The Relative-Public-Inputs Evidence

Next let us turn to Table 1's pair of tax-support clues that allow us a direct view of political and fiscal efforts in support of education. The first clue is a support ratio defined as[35]

$$\text{Tax support ratio for primary pupils} = \frac{(subsidies/attending\_student)}{(income/adult)}$$

This ratio scales the generosity of the subsidy in terms of the population's ability to pay. Such a measure is already displayed in publications by the OECD and UNESCO, as well as in the scholarly literature.[36] What is the norm for this ratio? If it is lower in setting *B* than in higher-education *A*, is that a bad thing for *B*? The answer will depend on whether or not *A* has over-invested in subsidizing and delivering primary education. The empirical literature tends to approve of the levels of primary-education support in today's most-educated societies. Granted, there is a hot debate over whether adding more money would do any good in the public schools of the United States and other OECD countries, with Eric Hanushek supplying an abundance of evidence for the null hypothesis, and there is good reason to wonder whether the subsidies need to be restricted to publicly-*supplied* schooling.[37] Yet nobody in these debates has mustered evidence in favor of actually cutting primary school subsidies or in favor of cutting attendance toward the lower levels of the past. It seems safe, when comparing this ratio between two settings,

to presume that the more educated setting *A* has not yet reached the point of over-investing in primary education, especially since those rates of return continue to run so high (again see Table 2).

A quick examination of Table 3's postwar rates of public support for primary schooling helps to bring this simple public-expenditure fingerprint into focus. Globally, those countries whose children went to school less and got lower test scores (as in Figures 4-6) tended to be countries that were less willing to spend taxes even in relation to their average incomes (here in Table 3). Some of them were poorer, of course, allowing them the excuse that they simply could not afford to spend as high a share of their income on public education. Yet this Wagner's Law variant on the poverty defense falls short in the cases in which richer countries chose to spend less on public schooling. We will find that most of history's anomalies were such cases, with richer countries achieving less education largely because they spent less of their incomes on taxes for schools.

The second selected support measure also reveals much about education finance in the twentieth and twenty-first centuries. It is a double ratio, by level of education:

$$\text{Primary/tertiary double ratio} = \frac{(subsidy/student)\_in\_primary\_education}{(subsidy/student)\_in\_tertiary\_education},$$

where tertiary refers to university education and other training beyond secondary school. The lower this ratio in setting *B* relative to setting *A*, the more favor given by *B*'s governments to higher education.

Again, the ratio cannot be used to judge education policies until we have a norm, a "best" balance between subsidizing primary education and subsidizing tertiary. One guide is that the case for externalities from education spending has been stronger for primary than for higher education. It was primary education that Adam Smith, Thomas Jefferson, and Milton Friedman considered most worthy of subsidy on the ground that mass schooling created citizens and social order, and the econometric evidence cited above also emphasized spillovers from primary and secondary education. Granted, institutions of higher learning in the United States and a few other advanced countries generated great spillover benefits from their Research and Development. Yet the returns from the instructional part of higher education are arguably more private.[38]

By itself, the fact that externalities might be greater for lower levels of education does not tell us the "best" balance of public subsidies. Yet if we accept the notion that the per-student externalities could reasonably be larger at the primary level, then the "best" value of the primary/tertiary ratio should not be below one in any country. Alternatively, in the OECD countries this ratio tends to be one-half (50%), as shown at the top of Table 4. To err on the side of acquitting too many governments of developing countries, let us say that the efficiency norm is 50 percent.

Table 4 reveals that many developing countries spend less than half as much tax money on each primary student as on each student in higher education, causing us to wonder how the case for subsidizing those at the top could be stronger in countries with more illiterates and less research-agglomeration efficiencies of the sort experienced in the world's top research centers. Recent literature has supported these suspicions by finding that inequality in educational attainment, a result fostered by favoring higher education subsidies, has had a negative effect on economic growth since 1960.[39] Note that this primary-versus-tertiary fingerprint offers telling evidence even without an education output anomaly. Countries with relative primary support ratios well below 50 percent in Table 4 cannot use their poverty as an excuse, since the same education budget could have been more productively reallocated from tertiary to primary education. Such cases suggest a policy failure regardless of the nation's income per capita.[40] Table 4 hints that a counterproductive bias in favor of over-subsidizing higher education, and under-subsidizing primary education, is endemic in Latin American, the Caribbean, Africa, South Asia, and Southeast Asia. We return to this point in discussing postwar Latin America.

VI. THREE FINGERPRINTING APPLICATIONS

A. England and Wales 1717 - 1891

A strong illustration of the applicability of this paper's clues in earlier history is provided by English experience between the Glorious Revolution of 1688 and the Fees Act that finally funded universal primary education in 1891. Here is a case that particularly points toward insufficient government support, the suspect at the bottom of

Table 1. By 1688, England was a great power with a secure government and a famously secure revenue base.[41] Yet England and the United Kingdom delivered relatively little tax support for primary schools. Both England-Wales and the Kingdom as a whole lagged behind France and the United States (along with Prussia) until the Fees Act of 1891, despite having a higher income per capita. So testify both the primary-school support ratios (public or total expenditures per pupil, divided by GDP per capita), and also the teacher/pupil ratios.[42] Elsewhere I have conjectured that centralization and restriction of the franchise played important roles in holding Britain behind until the franchise was extended down the social ranks and the demand for schooling became overpowering.[43]

Confirming evidence comes through the availability of micro-studies of education in Victorian England, studies that now make it possible to quantify the returns on primary-school investments in England. David Mitch's work allows us to convert his extensive data on occupational rewards and school costs into rates of return on three years' schooling in the 1820s leading to literacy in adulthood, and Jason Long's matching of children in the 1851 census with adults in 1881 provides a similar view of the returns to completing primary school around mid-century. Table 5 presents estimates of the returns that are conservative in that they are likely to understate some of the gains or overestimate some of the costs.[44] Even with this tilt toward underestimation, the returns are high enough to make some suggestions. The private and social returns are up close to those reported for the 1970s-1990s in Table 2 above, even though the Victorian English population had noticeably shorter careers. One implication of this is that the direct costs and opportunity costs of schooling did not loom large enough to choke off the case for investing in formal primary education. Yes, there was sufficient demand for literacy, despite the likelihood that the demand for child labor held back the progress of schooling in the industrial North for a few decades.

The main innovation in Table 5, however, is the fiscal rate of return. Even with estimates that are probably too pessimistic, it was well above the rate of interest at which Parliament could borrow. The issue returns: Why did Parliament decline to subsidize mass schooling if it would repay Her Majesty's government itself? Indeed, the fiscal indictment stands even when we re-introduce the fact that a grown-up child's labor force

participation would have been only partial, especially for females. Table 5's Row (h.) reports the same rates of return as for 1840, but with the adult earnings increments cut in half. This lowers the rates of economic return on schooling, though not by half the rate itself. The result is still a double-digit rate of return -- either private or social or fiscal -- well above the 4.4 percent rate at which Her Majesty's government could have borrowed. The government appears to have left money on the sidewalk by not investing more in primary education before the Elementary Education Act of 1870 and the more decisive Fees Act of 1891.

The failure may have extended back to the start of the Hanoverian dynasty. As far as we know, the returns and costs of primary education in the eighteenth century should have yielded rates of return at least as high as those in Table 5, given what we know about tax rates, interest rates, and the wage structure. The tax rates paid by laborers were thought by Joseph Massie to be 8 percent, similar to the Victorian rates.[45] Government could also borrow cheaply: The consol rate was below five percent as early as 1717, the fourth Hanoverian year. So as early as 1717, the government could have reaped a significant fiscal return by investing in universal primary education. Finally, the wage structure did not reward education any less in the eighteenth century than later, given the indirect evidence cited when introducing the skilled/unskilled wage ratio in Table 1 above. Thus given the history of tax rates, interest rates, and wage rates, the rates of return back to about 1717 should have been as high as those Victorian rates shown in Table 5. It is fair to ask why Parliament in 1717 could not have enacted something like the Education Act of 1870, followed 21 years later, in 1738, by an analogue to the Fees Act of 1891. The usual explanation just re-poses the same question: Yes, education subsidies were blocked partly by conflicts over the link between education and religion, but these were later resolved in favor of free public schooling. Regardless of what explains the opposition to tax-based schooling, the point remains that the operative constraint that held up the advance of schooling lay in the collective unwillingness to supply taxes.

We cannot extend the same simple indictment back before the late seventeenth century, however. The consol rate was well above five percent under the Stuarts and the House of Orange, largely because the throne could (and did) default on its debts before

1688.[46] Britain and other emerging states were still not secure enough to take a more modern long-run view of the economics of education subsidies. And before the late fifteenth century, regimes were not only insecure but also more rural than the Tory opponents of education in the nineteenth century, and thus had a self-interest that opposed paying taxes to educate peasants to flee or revolt. Yet from the early eighteenth century on, the necessary elements were all in place -- other than political will.

Thus for the Victorian period at least, and probably for the whole period from 1717 to 1891, England-Wales and the United Kingdom underperformed in the sphere of education relative to the United States and France. The culprits can be summarized using the line-up of suspects in Table 1. Drawing on data for the Anglo-American anomaly of 1850-1890, the guiltiest suspect appears to have been deficient British (or superior American) political will to pay taxes for primary schools, to judge from those support ratios and from Britain's lower teacher/pupil ratios. Accomplices may have included a high relative wage for child labor in Britain and the higher cost of Britain's (more male) teachers relative to the (more female) primary-school teachers of North America and Australasia.[47] Other suspects are acquitted: Relative to the United States, rich Victorian Britain did not suffer from lower market demand for skills, or higher fertility, or shorter adult life expectancy, or weaker philanthropy.

B. Latin America in the Twentieth Century

The lag in Latin American schooling behind that of North America has been summarized and tentatively explained in a series of writings by the research team of Stanley Engerman, Elisa Mariscal, and Kenneth Sokoloff (EMS). Reaching back to the colonial era for root causes, they argue that low and unequal education, like other symptoms of Latin American inequality in the nineteenth century and early twentieth, stemmed from inequality in political power and landownership. They conclude that

> "although investment in schooling is strongly and positively correlated with per capita income over time and across countries, much variation remains to be explained. Moreover, the extent of inequality in political power, as reflected in the

proportion of the population who can vote, does seem to be associated with lower literacy and schooling rates."[48]

To this Ewout Frankema has now added an important extension of the data on Latin American education since 1870, emphasizing the inequality of education more than its average level.[49]

This section follows their lead, both in focusing on anomalous departures from the income-education correlation and in emphasizing the distribution of political voice. I offer new twists in the geography and historical timing of the Latin lags, especially for the twentieth and early twenty-first centuries, and fresh evidence on the political economy of government failure to subsidize. My tentative conclusions, to be presented elsewhere, are:

(1) If one compares Latin America with the rich industrialized countries, as the EMS team has done, the data neatly fit both their concern and their explanation. Relative to the richer countries, Latin American education has always been low and unequal.

(2) While I think their explanation is the correct one, we must acknowledge that their North-South contrast fits too many hypotheses. In the language of this paper, the fact that Latin America has always been poorer allows critics to resist our hunch that unequal voice is the key. Their lower education attainments do not pose an anomaly.

(3) The search for anomalies yields more fruit, by revealing cases in which a Latin American country has less education, and more unequal education, than poorer countries. There are several such Latin American anomalies. The most dramatic one is a case that has been relatively ignored: Venezuela.[50] This section focuses on that case and finds strong support for indicting a political environment that refused to subsidize mass schooling.

The global positioning of Latin American education achievements can be judged by a renewed look at Figures 2-6 above. The region as a whole indeed had far lower education than Canada, the United States, or Northwest Europe between 1900 and 2006. Relative to countries with similar income per capita, its lag was less dramatic, as the

figures suggest.[51] Latin America's disadvantage might be reinforced a bit if one could adjust the enrollments data for a bias now identified by Frankema. Not only are Latin American enrollments a bit lower, for a given income per capita, but these enrollment rates also consist of a higher share of grade-repeaters dropouts, and a lower share of true primary-school completers, than on other continents. He thus finds that the postwar catching-up in Latin American enrollments may hide a loss in educational quality, relative to other continents.[52]

If Figures 2-6 show that Latin America as a whole has not distinctly lagged all other continents in education attainment, they nonetheless also show some incriminating anomalies. The new clues cast a different light on the Southern cone countries. The Engerman-Mariscal-Sokoloff team described Argentina, Chile, and Uruguay as education leaders in the Latin American context. While that is broadly correct, these three countries provided less schooling than several poorer countries outside South America. As of 1900-1930, enrollment rates in Argentina and Uruguay trailed behind those of both the mother countries (Spain and Italy), and trailed behind those of much poorer Japan, Greece, and (in 1930) Romania. In terms of test scores, Argentina's first entry into the PISA exams, in 2006, yielded lower sample-average scores than those achieved by 15-year-old students in Turkey and Mexico. Thus the position of the Southern Cone countries in education history depends on what other countries we compare them to. On the global level, they have tended to be slight under-achievers relative to countries in other regions with the same incomes.

The most noteworthy anomaly, however, relates to Venezuela, a country whose education history has been seriously under-studied (at least, in the English-language literature). Throughout the twentieth century Venezuela has been a clear Country-*B* "failure" case, a rich country with strangely low education. Despite its oil prosperity after World War I, Venezuela's school enrollment rates in 1930 were no higher than those of much poorer Turkey, and also below those of Mediterranean Europe, as well as such distant poor countries as Japan, Romania, and even Siam (Figure 3). Closer to home, Venezuelan children have been consistently less schooled than those in at least five poorer neighbors: Colombia, Costa Rica, Guyana, Trinidad-Tobago, and Mexico.[53] Even as late as 2006, after decades of oil wealth and after a few years of enrollment

increases under Hugo Chavez, Venezuela's sixth-graders got the second-lowest national average sample score in math and reading out of 16 countries (Figure 6).

Why these anomalies? Why did some many Latin American countries each enroll and teach a lower share of their children than poorer countries? Some initial suggestions can be offered here, ones that will be expanded in later writings.

For all of Latin America, as for Industrial-Revolution Britain, we can reject some natural suspicions. It seems untrue that the relative demand for higher-skilled and higher-educated labor was weaker in Latin America. On the contrary, skill premia seemed as high there as on any other continent.[54] Nor was the use of child labor any greater in Latin America than in South Asia or Africa or the Middle East. There has also little discrimination against female enrollments for at least a century of Latin American history -- certainly not as much as in Mediterranean Europe, the Middle East, Africa, or South Asia.[55]

For Latin America as a whole, as for Industrial Revolution Britain, the main culprit has been a political bias against subsidizing mass schooling. To the evidence already presented by EMS and by Frankema, this section can add two new international clues, one for the start of the twentieth century and another for the later twentieth and the early twenty-first. The start-of-century clue appears in the form of a pair of diagrams, Figures 8 and 9, comparing expenditures across countries around the year 1900. Back then, says Figure 8, Latin America spent about as much *per child of school age* as other regions at the same income levels. The behavior of the data-supplying countries clusters along the same familiar line relating expenditures to income. In this respect, there was nothing different about Latin American school finance, given the levels of income. Figure 9, however, reveals a consistent difference using some of the same data. It decomposes Figure 8's expenditures per child of school age into (expenditures per pupil) times (pupils per child of school age, alias the enrollment rate). The two components are graphed against each other, separately for Latin American and the rest of the world. One would expect the two to rise together as we move from poorer to richer countries, and they do so in Figure 9. Yet the relationship between these two components is different for Latin America: Moving toward the richer and higher-spending countries like Argentina yields much less gain in enrollments per dollar of expenditure per enrolled

pupil, than the same movement (toward the US and New Zealand behavior) in the rest of the world. Given the same resources, Latin American governments somehow delivered more inputs per pupil to a smaller fraction of the school-age population. This appears to be the same sort of elitism in deciding what schooling to supply, and in what neighborhoods, as was emphasized by EMS and by Frankema.

A century later the same elitism seems evident in much of Latin America, even though the locus of power has shifted. A key choice variable in today's education structures is the allocation of public funds between using the same tax money for higher education or using it for primary (and secondary) education. We saw in Table 4 above that countries differ greatly in their choices here. Among the data-supplying countries of Latin America, Table 4 suggests that primary education seems to have been short-changed relative to higher education in Argentina before the return of democracy, in Brazil, in Chile before the *concertación* began in 1990, and in Colombia, Costa Rica, Jamaica, Mexico, and Venezuela (but not in Cuba). Given that the social rates of return run higher for the earlier stages of education in these same countries, their tilt toward higher education appears to have lowered GDP. This testimony from Table 4 agrees with several past studies about Latin America as well as about the Asian and African countries with low relative investments in primary education.[56]

Since Venezuela's low education performance offered the most glaring anomalies in Figures 2-6, its sources need to be identified. Here, even more than in other countries, the culprit seems to have been a political bias against mass education. That bias was spotlighted back in 1959, when Carl Shoup and his collaborators published their task-force study of the whole fiscal structure of Venezuela:

> "Education has such a low priority in the national investment program that the level of education relative to income is one of the lowest in the world. Further progress in the non-petroleum sectors, particularly industry, agriculture, and government, will depend heavily on better education."[57]

So they judged at twentieth-century Venezuela's first sustained switch from *caudillo* rule to democracy. Yet, as we saw in Tables 3 and 4 and in Figures 5 and 6, Venezuela still has not caught up, despite three rounds of sudden enrichment from oil price hikes.

So large were the windfalls passed up by Venezuela's politicians that they may even, like Victorian Britain, have missed a high rate of return to government itself. That is, the fiscal rate of return may have exceeded the opportunity cost of funds. The Venezuelan data in Table 6 suggest that the under-investment may have reached even this extreme, to judge from data circa 1958. The cost of public funds for investments like education was thought to be about 10 percent. On the assumption that people worked full time after their education, not only the rest of society but also the government itself could have reaped a net gain from extra investment in any level of education (far right column). On the pessimistic assumption that people worked only half time, the same would not be true, so that the lost social gains did not translate into losses for government itself.

Such evidence of bias does not emerge in all cases. As Table 6 shows, the same was not true of Mexico around 1963, suggesting that Mexico's bias against subsidizing primary education was less strong. Still, the fiscal rates of return in Table 6 were not negative, which underlines a more basic point: Investing in education did raise revenues for government, contrary to the assumption commonly implied. An open question is why they did not discuss such returns. If they had somehow not thought of the point, why not?

C. Different Fingerprints in Today's Rich Countries

The third illustrative application reveals a developmental shift in the seeming ability of different forces to explain differences in education outputs. For historical settings before the late twentieth century, and continuing into the twenty-first for developing regions, it has been easy to identify insufficient tax support as a prime culprit in poor performances. A key premise of this explanation is, of course, that spending more tax money would keep children in school longer and raise their test scores. This premise is well supported for most history and for most of the world's children today. As we have seen in Figures 8 and 9, enrollments historically responded to raising tax support per pupil or per child of school age. We also saw in Table 2 that raising the levels of education brought higher rates of return in lower

income countries, again pointing to insufficient supply of public funds as the main check on education. For most of modern history, there should have been little doubt that "money matters", both in raising the years of schooling and in raising cognition.

In today's rich countries, however, the money-matters premise is less strong, possibly because we have changed frontiers for primary and secondary education. Once a country has reached full enrollments and high attendance up through age 15, and the average child reaches 8,000 hours of instruction between the 5th and 15th birthdays, adding further tax support can only raise test scores, productivity, and income by improving the quality of learning per hour of contact time. How money translates into quality learning is less obvious.

Figures 10 and 11 offer crude hints about this developmental shift, by graphing recent test scores against expenditures per primary school pupil. Figure 10 notes two different slopes in the international OECD data for 2004-2006. If we include the new test-taking countries Turkey, Chile, and Mexico in the sample, there is still an upward slope: more public expenditures seem to be accompanied by higher test scores. If the PISA tests were given to 15-year-olds world-wide, then most of the test-taking students would yield national averages like those of Turkey, Chile, and Mexico, or further to the southwest in Figure 10, and there would be a even more significant positive slope relating public expenditures to test scores. Yet among the rich OECD core countries (white circles) and formerly communist countries of Eastern Europe (black triangles), the slope between expenditures and achievement scores is nearly flat. Countries spending much more failed to raise their student test scores significantly. Figure 11 finds the same twist among states of the United States. Over all 50 states, there appears to be a significant upslope relating public school expenditures and the NAEP test performance of eighth-graders. Yet the 50-state picture includes several poorer states of the South and West that have not completed the developmental shift. True, their children stay in school past age 15, and their schools run the same 175-180 days per year as in the rest of the country. Yet their lower spending seems to have lowered quality by raising class sizes in the Western states, and in unmeasured ways in the South. Yet when we restrict our view to the more prosperous and established Northeast and North Central regions, the effect of expenditures drops to insignificance, as indicated by the thicker line. Once one looks only at regions where the lowest state average for

expenditures per student is already high, one gets the kind of result that Eric Hanushek repeats so often: no clearly significant effect of spending more.

Once a region's income and educational effort is up in the range where extra expenditures have less certain effect, it should not surprise us to find more abundant clues that something other than expenditures is responsible for those anomalous cases in which rich areas have poorer education performance. And so it seems for two anomalous under-performers in the United States. One is the District of Columbia, where test scores were too low to fit conveniently on Figure 11. Even though the District has a technically high average income, its income inequality is extreme and its school system is stricken with controversy and fighting. Expenditure levels are not the prime suspect.

The other poor performer to be noted here is California, which shares with New Mexico and Hawaii the unenviable position of having low student test scores despite having an average income level. Why are California's test scores worse than those of Texas and North Carolina, with their similar expenditures and similar percentages of ethnic minorities, by about 1.5 standard deviations among state averages? The relatively lower test scores can be only partly due to low expenditures. Despite frequent rumors to the effect that California ranks 49th in education spending per pupil, or in education spending as a share of state income, its expenditures are only moderately low by inter-state standards. In the 2004-2005 school year, California's current expenditures per enrolled student were 91 percent of the national average. The performance looks a bit anomalous for a state with a slightly higher-than-average income, yet California's rank among states was still no worse than 30th.

The input measure that does put California near the bottom of states is not expenditures, but teachers per pupil, the inverse of class size. California ranks 48th, above only Arizona and Utah.

If California pays for fewer teachers for each (say) 100 students than any other state but Arizona and Utah, why were its expenditures not so far below average? California has apparently always ranked near the top in average annual pay for a state's teachers. That may have been true as far back as 1880. With greater certainty, we know that California ranked 2nd-7th among states in average teacher pay since 1939 or earlier, and ranks 3rd by this measure today.[58]

To pin down causes, it also helps to know when California's relative performance sagged, and which suspects would have contributed to this sagging. The anomaly is relatively recent. For relative expenditures per pupil, we know that California's expenditures per pupil ranked as high as 7th back in 1960. Its spending per pupil has been below average only since sometime in the 1980s, reaching a trough at 87 percent of the national average in the mid-1990s, reviving to 96 percent after the dot-com boom centered in Silicon Valley, and sliding down to 91 percent since then.

The simple non-econometric evidence suggests that the California political outcome in school finance is peculiarly inefficient, and not simply by denying funds. While the famous Serrano decisions and Proposition 13 clearly cut expenditures since the 1970s, the story is not simply one of a polity trapped by anti-tax radicals. Rather, California has caught between this force and at least two others since about the 1970s: high immigration and a powerful teachers' lobby. The result combines moderate expenditures with high teacher pay, crowded classrooms, and low test scores.

VII. CONCLUSIONS AND AGENDA

It should now be evident why this paper focuses on revealing failures rather than on revealing successes in education output, and why its title highlights finance rather than learning. The failures appear to spring more from the public finance side, making it easier for economists and economic historians to suggest solutions. By contrast, the success cases probably relate less to economists' comparative research advantage, being due in greater part to differences in pedagogical technique and social environment.

There are sufficient non-econometric tools to exploit and interpret the abundant historical information about the progress of schooling in the data-constrained past. Even without the randomized natural experiments that we prefer, we can identify prime suspects for several cases of failure in education supply.

We can even see some patterns in the preliminary signs. Looking at earlier centuries, it should easier to find cases where education was under-supported rather than over-supported, given the high rates of return not captured. Most visible failures seem to be cases of inegalitarian policy, under-investing in mass primary schooling. So past

scholars have feared, and so say the new indicators especially for Victorian Britain, and possibly for Belgium in the late nineteenth century. We have also raised the possibility that secure Western European states could have accelerated mass education, and economic growth, as much as two centuries earlier than they did. The balance of guilt may be shifting. Our clues from the start of the twenty-first century point less at tax-blocking elites, and more at the messiness of political compromises between them and their opponents.

These modest early clues point toward at least four areas for further detective work in the history of education finance:

(1) One set of projects relates to the reasons for the delay in Western Europe's public primary schooling. In which cases did those in power pass up productive opportunities because their narrow self-interest opposed educating the masses? In which cases were they not sufficiently secure in their power to believe that the later tax revenues from a more educated population would be theirs to control? For example, could the Dutch Republic have launched free schools in the first half of the 17th century, leading their actual history by two and a half centuries? Might the government budget have been able to spend more on wars with England with the help of the extra taxes raised? Certainly they could have borrowed the extra money, if they chose, at interest rates that were even lower than Britain's consol rate before 1792 and only about one percent above the consol rate for most of the nineteenth century. For France, too, it is possible to argue that political opposition delayed schooling by more than a century.[59]

(2) Another project would pursue whether or not the early failure in public primary education was matched by public health failure. Why were the public improvements in urban sanitation, for example, delayed until the nineteenth century? One possibility is that sanitation, unlike basic education, waited on breakthroughs in knowledge, such as the discovery of the link between water supplies and cholera. If so, policy may have been blameless in this area of public health. An opposing possibility is suggested by Jeffrey Williamson, who notes that some partial advances in English and French urban sanitation dated back to the late seventeenth century and the early eighteenth, suggesting a policy failure of the sort described for primary education in this

paper.[60] Here is a related policy issue for which a broad early history can use non-econometric techniques.

(3) Another research priority is to pursue an issue that is a close relative of this paper's inquiry into mass primary and secondary education: How would one judge the insufficiency or excess of public support for higher education, beyond the few clues suggested by some literature cited here? And does a closer look really substantiate this paper's suspicions against excess spending on tertiary education at the expense of primary and secondary?

(4) Finally, why was the balance of apparent guilt different in the past from today's patterns in the OECD and within the United States? In earlier history, and in developing countries today, the most frequent culprit appears to have been elites' blocking of tax support for schools. So we saw in the case of British education in the eighteenth and nineteenth centuries, and also in the global tendency for social rates of return on still-unachieved schooling to be highest at in poorer countries. In today's OECD countries, however, the cases of clear under-funding of mass education are being crowded out by cases of apparent inefficiency in some polities' delivery of education from historically high budgets. Explaining this long drift from inegalitarian tax-blocking to inefficient political compromise remains high on the research agenda in the history of education.

Table 1. Fingerprints: How Various Forces (Suspects) Would Affect Indicators Indirectly Linked to Primary Schooling

Each cell summarizes a predicted effect of a force that has lowered primary schooling in our featured setting B relative to a higher-education setting A.

	Three kinds of fingerprints (ΔF's) --					
	(1) Market rates			**(2) Measured* rates of return**		
	Wc	C	ΔW	on extra primary education:		
-- left by these forces reducing demand for primary schooling in B:	Child wage	Direct cost of school	Measured* adult wage gains from education	Private rate rP	Social rate rS	Fiscal rate rF
less market demand for skilled labor	UP		down	down	down	down
more demand for child labor	UP		UP	UP	UP	
higher fertility	down		UP	UP	UP	UP
lower adult life expectancy			UP	down (a)	down (a)	down
family distaste for schooling			UP	UP	UP	UP
discrimination in skilled-labor markets			UP	UP	UP	UP
-- and of these forces restricting its supply in B:						
discrimination in school admissions			UP	UP	UP	UP
higher unit costs of schooling		UP	UP	down (b)	down	UP
less philanthropy for primary schooling			UP	down (b)	UP	UP
less political support for tax-based schooling			UP	down (b)	UP	UP

	(3) Support ratios for primary schooling	
	Two additional fingerprints are:	
	(3a) Tax support ratio for primary pupils	(3b) Primary/tertiary double ratio
less political support for tax-based mass primary schooling	down	down
(No other force has a clear predicted effect on the support ratios.)		

Notes to Table 1:

The parameters Wc, C, ΔW, U, and ø are measured relative to the annual income of an individual earnings the lower-education wage rate. In the 19th and earlier centuries, this is an unskilled wage rate in the building trades.

The effects are predicted static general-equilibrium results, including next-generation effects on the educational attainment of the adult labor force.

Blank = no clear direction of effect is implied.

*The distinction between measured average gains in earnings and true marginal gains is especially important in the case of discrimination. Whether the discrimination is in the

labor market or in admissions to educational institutions, it will lower the true marginal rate of return for those discriminated against, though it will raise the average measured return for insiders.
(a) = Reducing life expectancy would initially lower the private and social return to primary education, though the reduction in educational attainment would later offset part of this effect by raising ΔW.
(b) = These initially lower the private return to primary education by raising its cost, though the reduction in educational attainment would later offset part of this effect by raising ΔW.

Fuller definitions of the support ratio indicators (fingerprints):
(3a) Absolute tax support for primary pupils = (tax-based expenditures per primary school pupil) / (GDP per adult).
(3b) Relative tax support for primary pupils = the same double ratio, but divided by the corresponding double ratio for university education.

Imagined exogenous sources of each force, and further explanation of the effects:
More demand for child labor: May be due to shifts toward child-using sectors, such as agriculture. Would lower school attendance, of course, later raising the supply of unskilled adult labor at the expense of skilled labor. So the wage gain ΔW would be raised later.

High unit costs of schooling: May be due to restrictions training fewer teachers, or denying teacher careers to women, or less efficiency in education techniques. By lowering the supply of more educated entrants into the labor force, such cost-push factors will raise the wage gains for those who have the extra schooling.

Less market demand for skilled labor: Could be due to de-skilling shifts in technology. Symmetrically, it can be due to any force that shifts demand toward more skills in Setting A, leaving B behind.

Family distaste for schooling can arise from any cultural source: The most prominent historical variant is aversion to educating females.

Discrimination in skilled-labor markets: Discrimination by gender, class, caste, tribe, or guild connections in occupations other than teaching. The measured private rates of return will reflect the larger wage gains of the favored insiders.

Discrimination in school admissions: Again, discrimination by class, caste, tribe, gender, or guild connections: The effects depend on how negative are the effects on overall attendance. The table shows the effects of simply denying admissions to the outsider groups, without raising the admissions and attendance of favored insiders.

Less political support for tax-based schooling, on the part of those with political influence: This can result from restricted suffrage, or an elite-based autocracy.

Table 2. Average Rates of Return to Investment in Education by Level, 1970s-1990s, by per Capita Income Group

(internal rates of return, in percent per annum)

	Private (overestimated)			Social		
	Primary	Secondary	Higher	Primary	Secondary	Higher
Per capita income group of countries						
High Income	25.6	12.2	12.4	13.4	10.3	9.5
Middle Income	27.4	18.0	19.3	18.8	12.9	11.3
Low Income	25.8	19.9	26.0	21.3	15.7	11.2
World	26.6	17.0	19.0	18.9	13.1	10.8
Individual countries						
Canada 1994		7.8	13.0			
Japan 1976	13.4	10.4	8.8	9.6	8.6	6.9
USA 1987					10.0	12.0
Latin America and the Caribbean						
Argentina 1989	10.1	14.2	14.9	8.4	7.1	7.6
Brazil 1989	36.6	5.1	28.2	35.6	5.1	21.4
Chile 1989	9.7	12.9	20.7	8.1	11.1	14.0
Costa Rica 1989	12.2	17.6	12.9	11.2	14.4	9.0
Dom. Rep. 1989				85.1	15.1	19.4
El Salvador 1990	16.4	13.3	8.0	18.9	14.5	9.5
Guatemala 1989				33.8	17.9	22.2
Jamaica 1989	20.4	15.7		17.7	7.9	
Mexico 1992	11.8	14.6	11.1	18.9	20.1	15.7
Asia						
China 1993	18.0	13.4	15.1	14.4	12.9	11.3
Hong Kong 1976		18.5	25.2		15.0	12.4
India 1995	2.6	17.6	18.2			
Korea, South 1986		10.1	17.9		8.8	15.5
Malaysia 1978		32.6	34.5			
Pakistan 1991	8.4	13.7	31.2			
Philippines 1988	18.3	10.5	11.6	13.3	8.9	10.5
Singapore 1999	22.2	12.9	18.7	16.7	10.1	13.9
Sri Lanka 1981		12.6	16.1			
Thailand 1989	16.0	12.9	11.8			

Sources and notes to Table 2:

Source: For rates of return, Psacharopoulos and Patrinos (2004a, Table A1).

High income group = GDP per capita at or above $9,266 in 1990 PPP dollars, with group mean = $22,530. Low Income group = GDP per capita at or below $755, with mean $363.

The middle income group had a mean income of $2,966, and the world mean was $7,669.

The private rates are overestimated because they assume zero taxation of the extra earnings gained from education. See the text.

Table 3. Primary-School Support Ratios in Core OECD Countries, Latin America, and Asia 1960-2002

The support ratio = (public "current" primary-school public expenditures per pupil) divided by (GDP per person 15 or older)

Region or country	1960-65	1970-75	1985	1995	2002
Core OECD			22.0	23.7	22.8
Canada	21.6	30.4	25.6	28.7	
Japan				20.6	20.8
USA	20.5	25.0	25.2	27.5	28.5
Developing countries				21.3	
Latin America and the Caribbean					
Argentina			7.5	11.4	13.3
Brazil	15.1	14.4		15.7	13.2
Chile	13.0	10.9		16.6	15.2
Costa Rica		25.9	13.2	15.6	
Cuba			22.1	33.4	
Dom. Rep.			6.4	5.1	
El Salvador			5.7	4.8	
Guatemala			7.8	7.6	
Jamaica	11.1	9.8	13.8	16.0	12.3
Mexico	11.4	10.3		18.8	16.9
Venezuela		15.1		8.8	
Asia					
China		6.6	8.9	11.9	
Hong Kong		8.9	10.5	13.3	
India	9.8	10.6	16.6	16.6	15.7
Korea, South	11.0	10.0	19.6	19.8	19.1
Malaysia			21.4	12.8	
Pakistan		16.2	18.1	15.3	
Philippines		15.9	8.7	15.6	18.6
Singapore		10.7	13.2	10.2	
Sri Lanka	24.7	25.4	12.4	11.0	
Thailand			16.3	11.8	

Sources and notes to Table 3:

Sources: OECD *Education at a Glance*, 1992, p. 63 (primary school only); idem, 2005, pp. 172-3; IMF, *International Financial Statistics*, various years; and UN (2001) for age distributions.

The “1985” figure for the OECD core uses data from 1988.

The “1995” figures for the OECD and for developing countries use data from 1999.

The figures for Canada and the United States aggregate secondary education with primary.

Argentina's figures use data from 1984-1985 and 1994-1996 as "1985" and "1986".

See also the notes to Table 4.

Table 4. Which Postwar Governments Have Short-changed Primary Education Relative to Higher Education?

Each cell number is a ratio of (public support of primary education per pupil), as a % of (public support of higher schooling per pupil)
This percentage should be at least 50 (see text)

Region or country	1960-65	1970-75	1985	1995	2002
Core OECD			51.0	43.2	56.1
Canada	25.2	29.8	67.2	63.4	
Japan	90.9	200.0	90.9	108.4	126.6
USA	51.2	81.3	71.3	73.4	77.5
Developing countries				14.7	
Latin America & Caribbean,					
18 countries	6.7	10.6	13.7	17.9	
Argentina	22.2	12.1	31.5	40.1	52.4
Brazil	2.1	8.2		7.2	8.1
Chile	3.9	8.6	9.6	45.5	
Colombia	2.9		17.5	21.7	
Costa Rica	10.9	17.2	12.9	23.1	
Cuba	(1950/55) 71.4		43.5	50.0	
Jamaica	6.5	9.1	4.0	5.5	
Mexico	9.2	9.8	8.5	23.3	29.4
Venezuela	6.5	11.8	11.6	6.8	
Asian developing countries					
China		('75) 0.9	3.2	9.4	7.1
Hong Kong		70.4		84.9	
India	4.2	4.8	11.9	11.0	13.2
Indonesia		9.8	15.0		12.8
Korea, South	45.5	58.8	113.5	263.9	339.8
Malaysia	3.8	5.8	9.5	10.6	17.6
Pakistan		5.8	7.5		
Philippines		130.2	45.7	62.2	29.3
Singapore	13.7	14.7	13.7	23.7	
Sri Lanka	10.4	7.4	14.1	12.1	
Thailand	6.8	8.3	49.9	33.7	32.3
African countries					
Kenya	0.6	0.8	2.3	1.8	
Malawi	0.4	0.4	0.7	0.6	
Tanzania	0.6	0.9	0.7		

Sources and notes to Table 4:

Sources: UNESCO, *World Education Report*, 1991-2000; OECD *Education at a Glance*, (1992, p. 63); Ioschpe (2004, p. 184); and Claudia Goldin's compilations in Carter *et al.*, *Historical Statistics of the United States, Millennial Edition*, vol. 2.

I am indebted to Ewout Frankema for some calculations for 1960/5 through 1990/5, from his paper-in-progress on "Mass Education in Twentieth-Century Latin America: A Quantity-Quality Trade off?", which used UNESCO data. The 1960s and 1970s data for about half the countries are my own calculations from the UNESCO *Statistical Yearbook* and IMF, *International Financial Statistics*. For China and Thailand 2002, Asaoka (2006, p. 42), citing UNESCO Institute of Statistics. For Chile, the 1970/75 figure refers to the post-coup year 1975 only.

Most of the expenditure figures refer to current expenditures, the main exceptions being figures for 2002 and figures for the United States. They omit tax breaks and some household subsidies for education, and they omit capital costs. For 1965-1995 figures, current expenditures unallocated by level of expenditure were spread proportionately across the levels.

Notes on years covered: The years covered in "1960-65" and "1970-75" vary from country to country. The year "1995" is really 1999 in the case of core OECD, Brazil, and developing countries. Korea's figure is so low because of a high private share of tertiary expenditure.

For the United States, the expenditure-per-student numerator ratio combines primary and secondary public schools.

The 1985 figure refers to a 1980-1985 average in the cases of Argentina, Chile, Colombia, Cuba, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Uruguay, Venezuela, and the Africa countries. For Cuba, the 1995 figure is also an average for 1990-1995.

For 2002 the OECD's numbers are based on full-time school year equivalents. Lacking data on private expenditures, the 2002 data for Brazil, Malaysia, and Philippines are for total expenditures, which were predominantly but not completely public. For all other countries in 2002, expenditures for primary schooling had to be allocated between private and public according to the ratios given for the larger aggregate of primary, secondary, and non-tertiary post-secondary education.

The figures for expenditures on tertiary institutions generally include expenditures on research and development, along with expenditures on instruction. For 2002, the instructional shares of the total tertiary budgets were 79% for core OECD countries, and 89% for the USA.

Table 5. Estimated Rates of Return on Literacy and Primary Schooling in Victorian England

	Approximate year of marriage	Population group	Internal rates of return: Private family	Social (all parties)	Fiscal (government)	Public (gov't + donors)	Yield on British government consol securities at start of schooling
			(1) Three year's schooling, achieving signature literacy				
(a.)	1840	Grooms who were sons of laborers	15.3	14.8	16.5	12.9	4.4 in 1821
(b.)	1840	Grooms who were sons of laborers	19.5	19.0	21.2	13.6	4.4 "
(c.)	1840	Grooms from all classes	20.1	19.6	21.5	17.4	4.4 "
(d.)	1868	Grooms who were sons of laborers	11.0	9.9	6.5	6.3	3.4 in 1842.
(e.)	1868	Grooms from all classes	16.5	15.2	11.2	11.0	3.4 "
			(2) State elementary, 3 tax-funded years to learn signature literacy				
(f.)	1840	Grooms who were sons of laborers	16.4	14.8	5.4	5.4	4.4 in 1821
			(3) Six years of elementary school				
(g.)	age 18 in 1860	School attenders of 1851 (Long 2006)	14.0	12.1	7.4	5.8	3.1 in 1851.
(h.)	1840	Labourers' children, 50% in labor force	10.7	10.3	11.8	8.6	4.4 in 1821

Sources and Notes to Table 5:

The two main sources are the studies by David Mitch (1982, 1983, 1984, 1992) and Jason Long (2006). Supporting data on taxes paid by working-class families in the 1830s were taken from Hilditch citing the Poor Law Commission, and for circa 1868 from Baxter (1869, pp. 110-112). The consol interest rates are from Homer and Sylla (1991, pp. 195-196).

Assumptions behind the hypothetical calculations, based on parameters in these sources:

Life cycles: All were males who married at the age of 26. Those who married in 1840 were born in 1814, and started their schooling in 1821. They enjoyed enhanced wage rates from 1832 to 1862, except that those in (b.) continued working to 1871. The hypothetical grooms of 1868 were born in 1835, started school in 1842, and enjoyed enhanced earnings from 1853 to 1883. Those attending school in the 1851 census were born in 1842, started their six years of primary schooling in 1848, and enjoyed enhanced earnings from 1860 to 1890.

Weekly child wages during 25 weeks of school each year = 2 shillings for (a.), (c.), (f.), (g.), and (h.); for (b.), 31.25s a week for two years, then twice that for the third year; and three shillings a week for (d.) and (e.).

Total direct cost of schooling = 6d a week for (a.), (c.), (f.), and (h.); 14 s a year for (b.); £1.27 a year for (d.) and (e.); and £1.35 a year for (g.). The part of this cost that was subsidized by government was zero for the 1840 estimates, £0.525 for (f.), and £0.48 for (d.) and (e.).

The adult wage increments for 50 weeks a year, from literacy or primary schooling: (a.), (f.), and the males in (h.) = 2.47 s a week; (b.) = 2.7 s a week for ages 18-26, then 4.54 s a week for ages 27-57; (c.) = 4.66 s; (d.) = 1.86 s; (e.) = 4.18 s; and (g.) = £7.74 a year.

(h.) is the "half-ben" case in which the child is a male-female mix with a 50% earnings rate.

Tax rate paid by working class parents and sons = 5 percent of expenditures for 1840 and 8.96 percent for estimates (d.), (e.), and (g.).

Table 6. Estimated Rates of Return to Investment in Education, Venezuela 1958 and Mexico 1963

		Percentage of direct costs paid for by government	Internal rates of return (%) Private (family & donors)	Social (all parties)	Fiscal (gov't)
A. Assuming males rates of adult earnings					
Venezuela 1958	primary school	53.5	24.0%	21.4%	12.9%
"	secondary	100	17.5%	15.3%	8.8%
"	university	100	25.4%	20.1%	10.2%
Mexico 1963	primary school	58.1	15.1%	14.0%	7.8%
	secondary	81.2	14.9%	13.2%	5.9%
	university	88.5	17.0%	13.9%	3.9%
B. Assuming half these rates of adult earnings (e.g. if women had no career earnings)					
Venezuela 1958	primary school	53.5	14.8%	13.2%	7.6%
"	secondary	100	10.5%	9.1%	4.8%
"	university	100	15.3%	12.0%	5.7%
Mexico 1963	primary school	58.1	10.8%	9.9%	4.9%
	secondary	81.2	10.1%	8.8%	2.9%
	university	88.5	10.3%	7.9%	-0.0%

Sources and notes to Table 6:
The main source for Venezuela is Carl Shoup *et al.* (1959), and for Mexico the works of Martin Carnoy (1964, 1967a, 1967b).

These are supplemented with life-table survival rates based on data from 1959-1961 for Mexico and 1963 for Venezuela. Carnoy conducted his own survey of a few thousand urban Mexican workers and their family members in 1963, and based his published rates of return on these micro-data. By contrast, Shoup and collaborators based their estimates of present values and rates of return for Venezuela on aggregate average relationships of earnings to occupation, age, and schooling.

Both sets of data have been reworked here, however, to refine the fiscal side of education. My retention of most of Carnoy's assumptions yields rates of returns in the same range as his. For Venezuela, however, my rates of return are below the very high estimates announced by Shoup and his collaborators. The main reasons for the discrepancy are that (a) Shoup and collaborators omitted any opportunity costs of the student's time, and (b) they omitted indirect taxation (usually 10-11 percent of income) from their calculations of private and social returns, and omitted any fiscal rates of return. For further details on my re-working of the estimates, download Excel files for Mexico and Venezuela from http://econ.ucdavis.edu/faculty/fzlinder, clicking on "Data and estimates underlying “Revealing Failures in the History of Education Finance.”

Figure 1. Primary and Secondary Enrollments per Child 5-14, in 1870

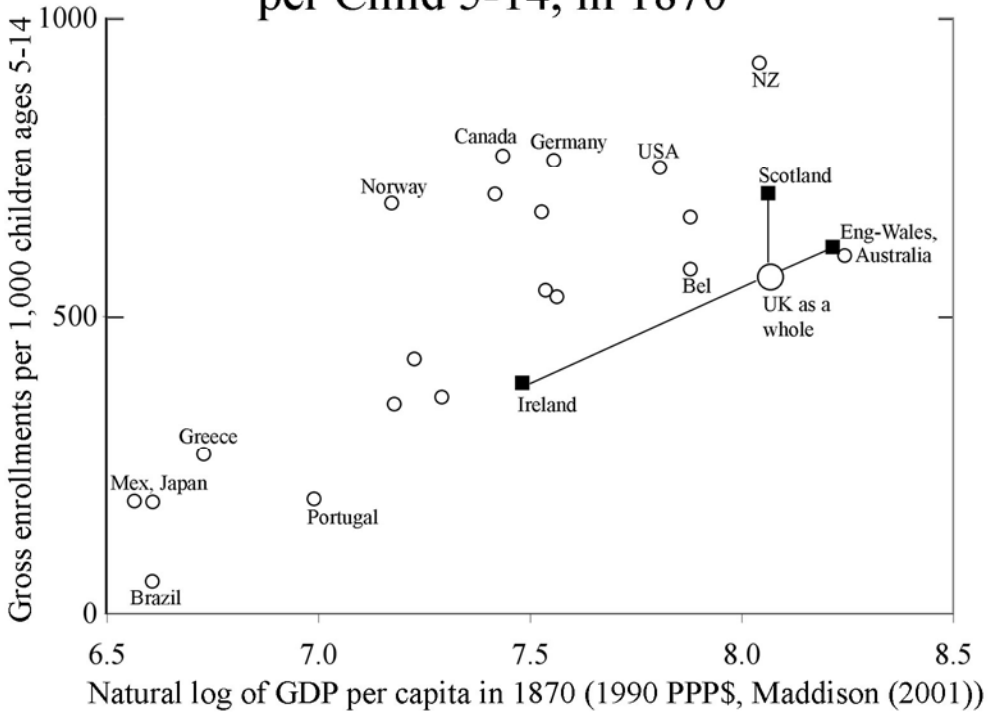


Figure 2. Primary and Secondary Enrollments per Child 5-14, in 1900

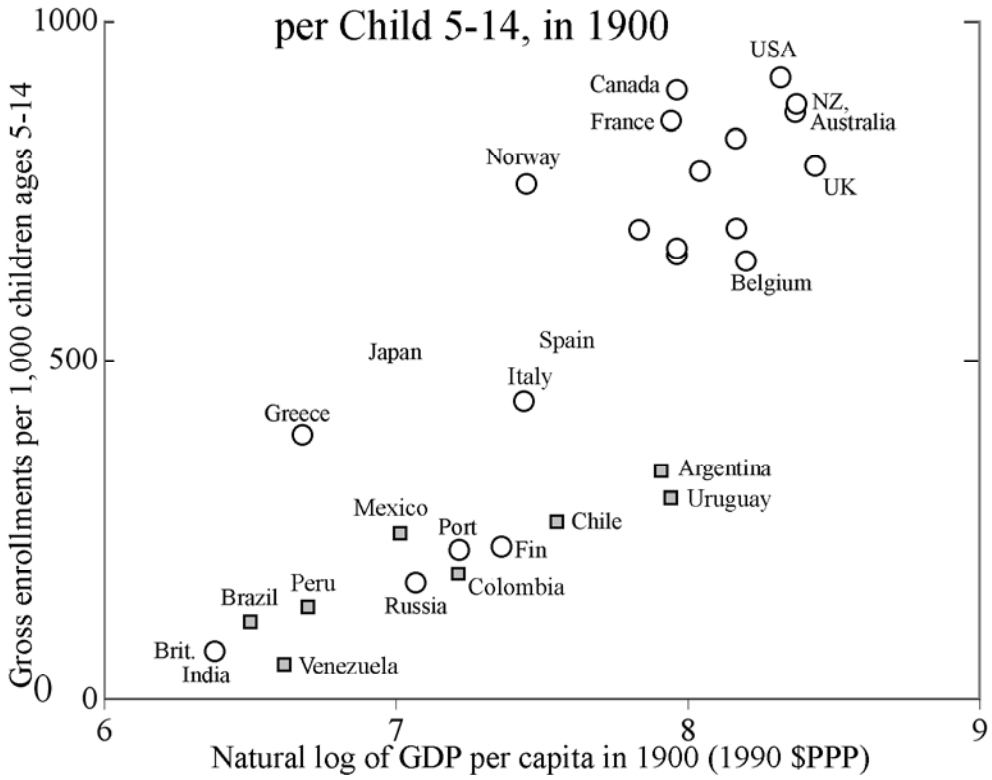


Figure 3. Primary and Secondary Enrollments per Child 5-14, in 1930

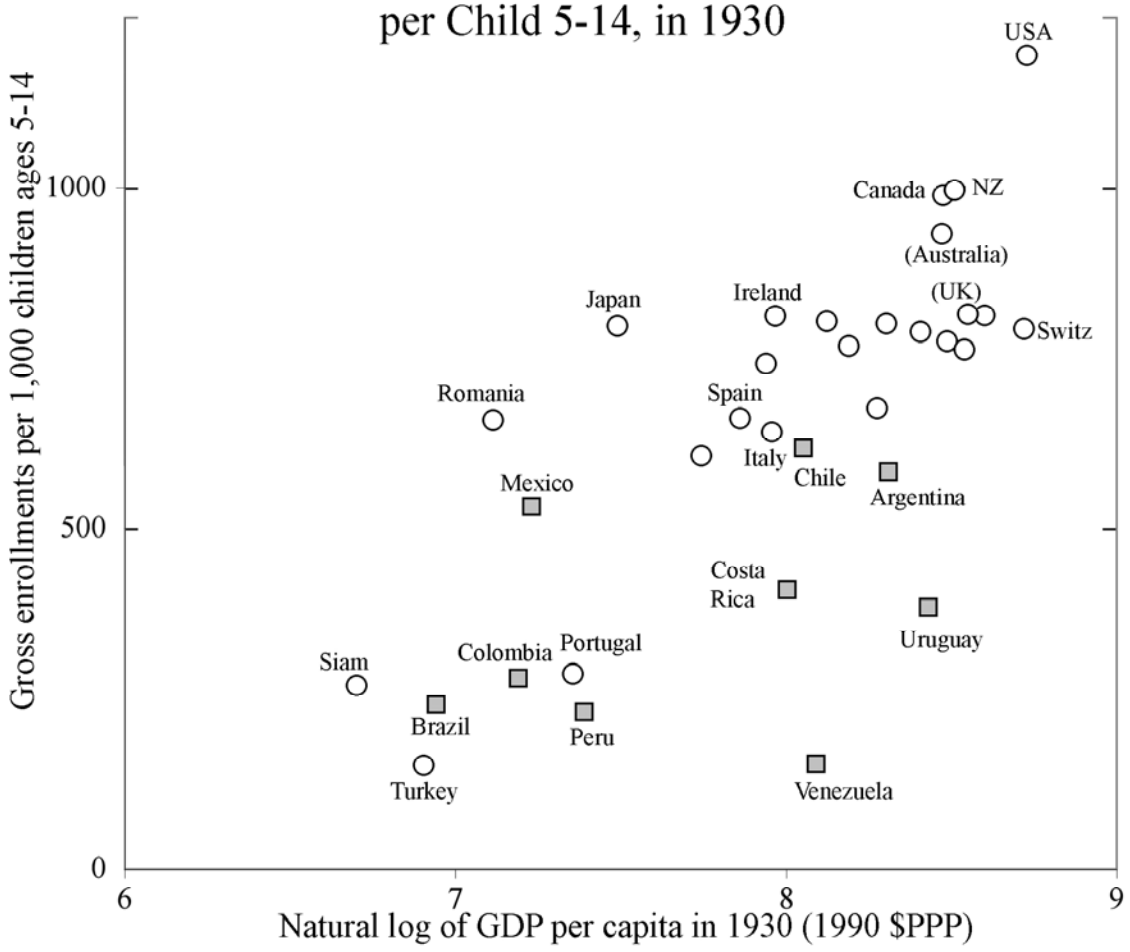


Figure 4. Education Attainment of the 15-64 Age Group, Year 2000

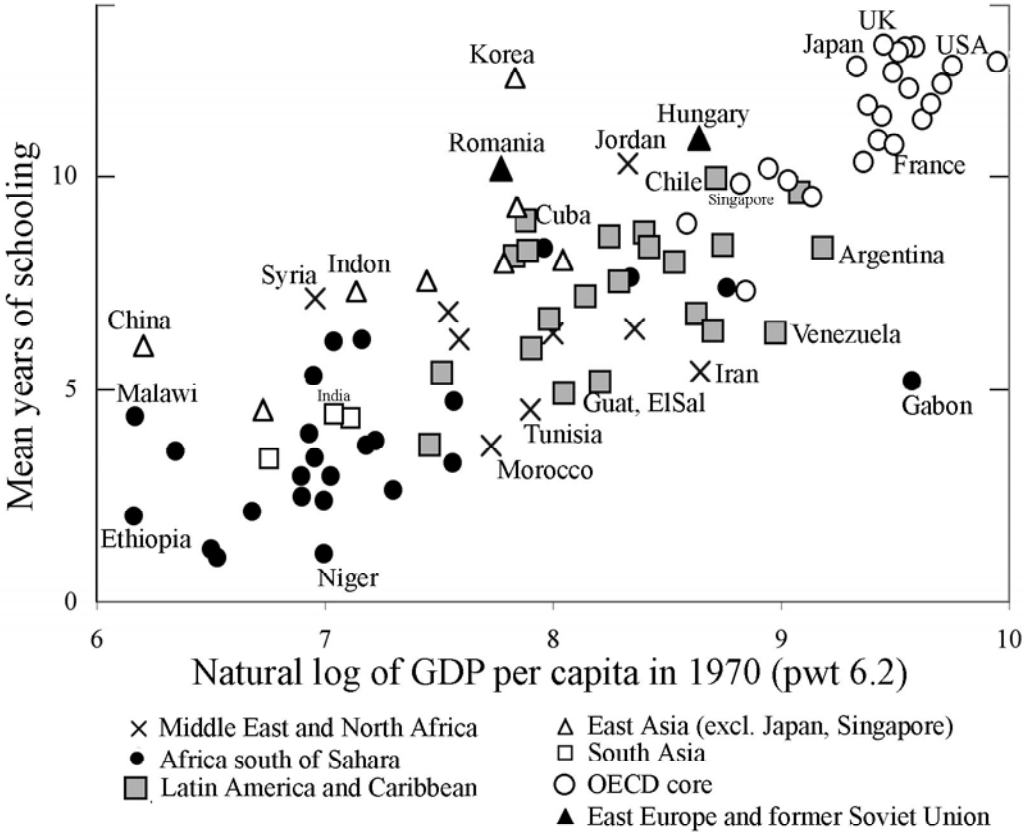
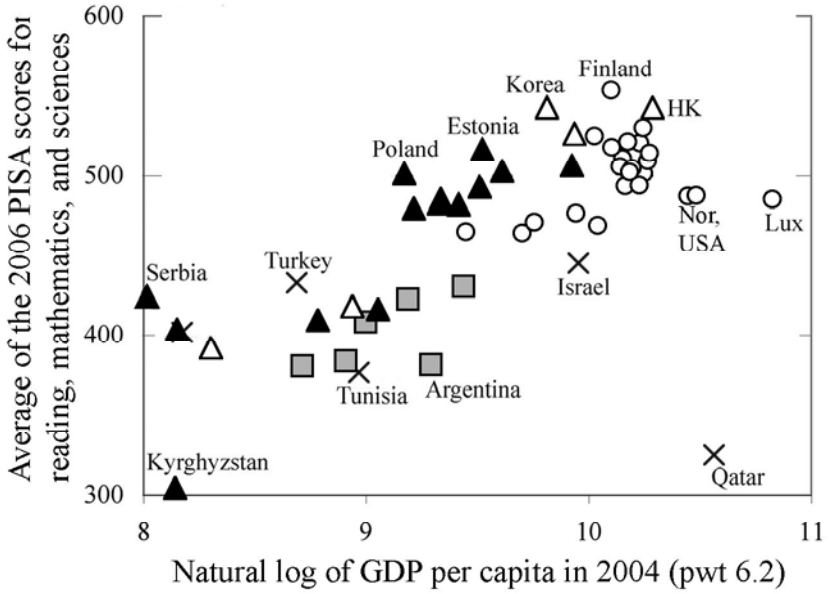


Figure 5. PISA Averages for 15-Year-Olds in 2006, vs. Income Levels in 2004



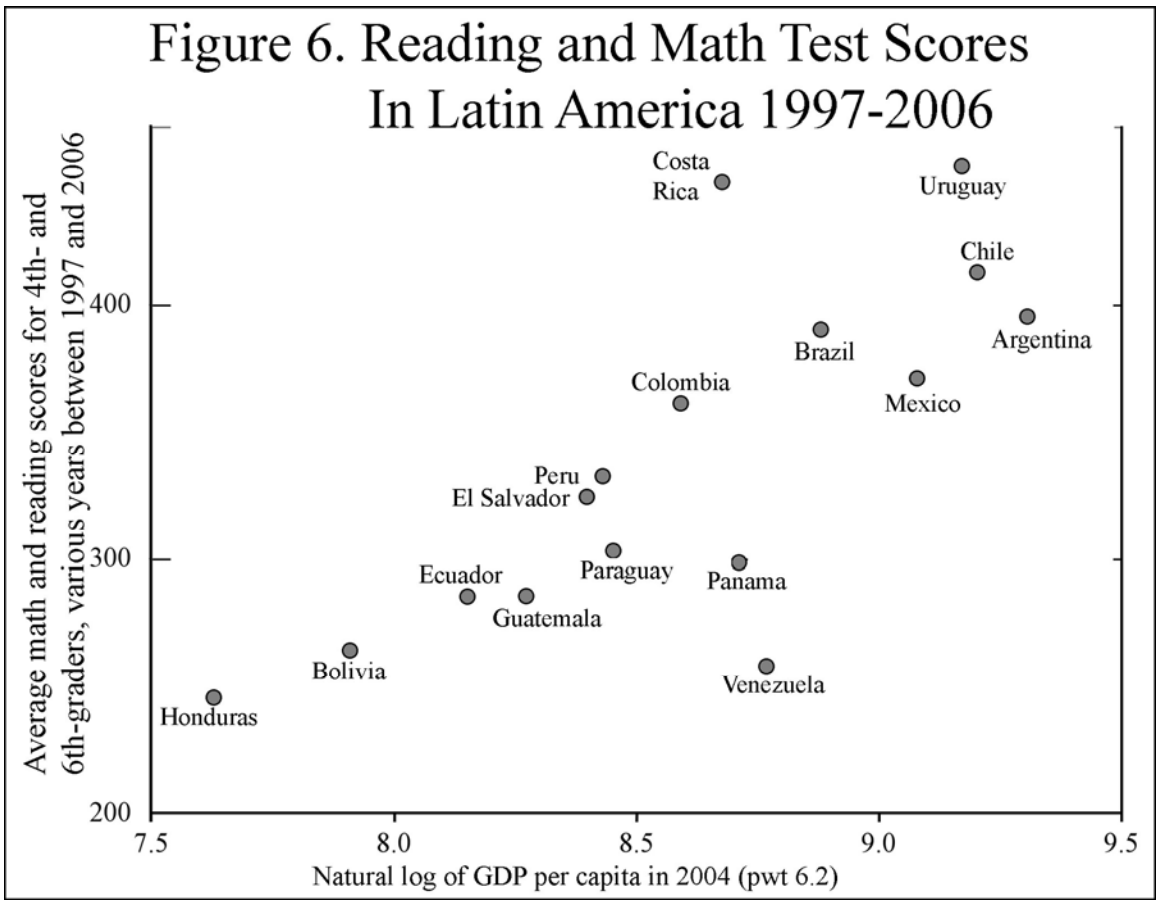


Figure 6. Reading and Math Test Scores
In Latin America 1997-2006
Average math and reading scores for 4th- and
6th-graders, various years between 1997 and 2006
200
300
400
7.5
8.0
8.5
9.0
9.5
Natural log of GDP per capita in 2004 (pwt 6.2)
Costa
Rica
Uruguay
Chile
Argentina
Brazil
Colombia
Mexico
Peru
El Salvador
Paraguay
Panama
Ecuador
Guatemala
Bolivia
Venezuela
Honduras

Figure 7. Reading and Math Test Scores by U.S. State, 2005

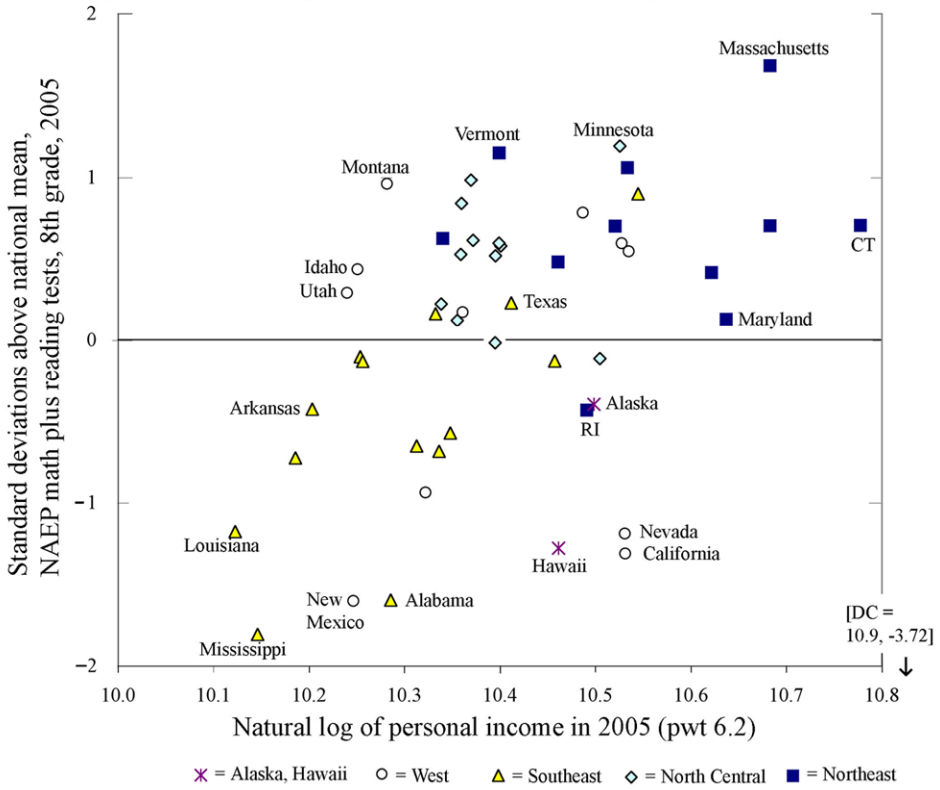


Figure 8. Primary School Expenditures per Child Ages 5-14 vs. GDP per Capita, c1900

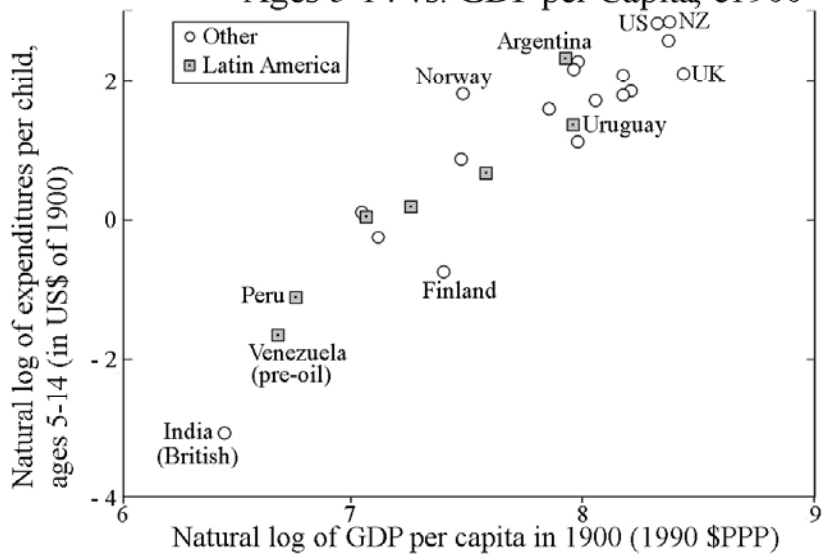


Figure 9. Primary School Enrollment Outcomes vs. Expenditures per Pupil, c1900

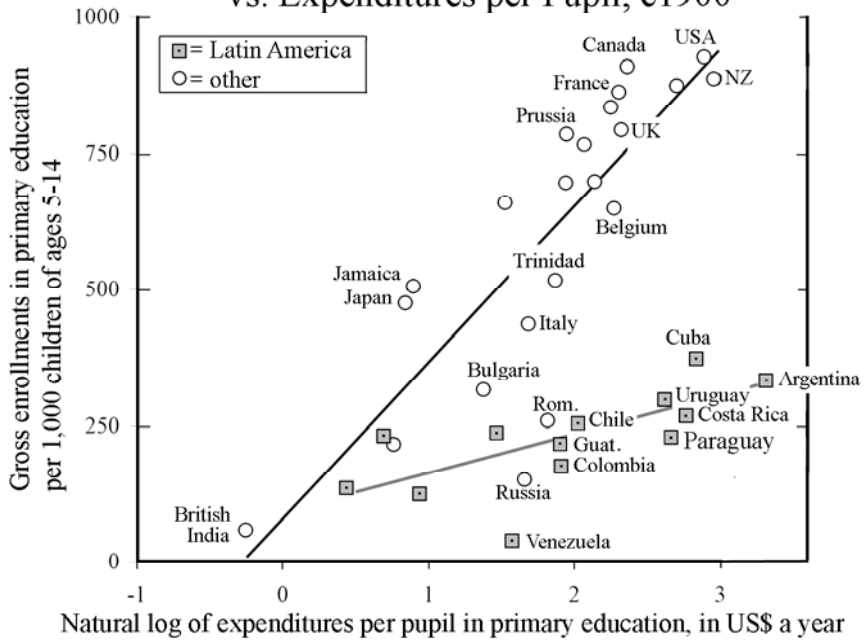


Figure 10. PISA Averages for 15-Year-Olds in 2006, vs. Public Expenditures Per Primary Pupil 2004

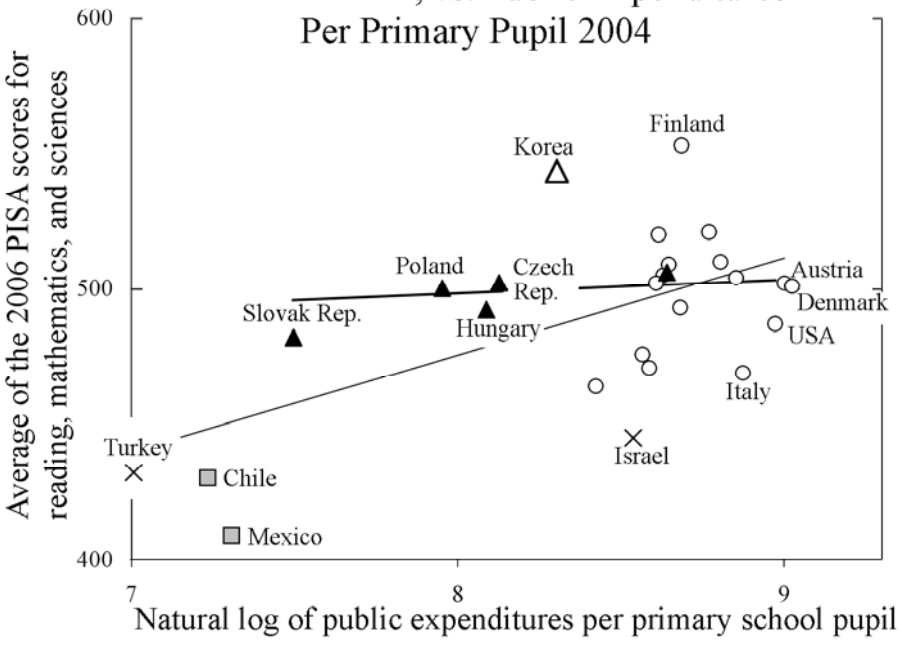
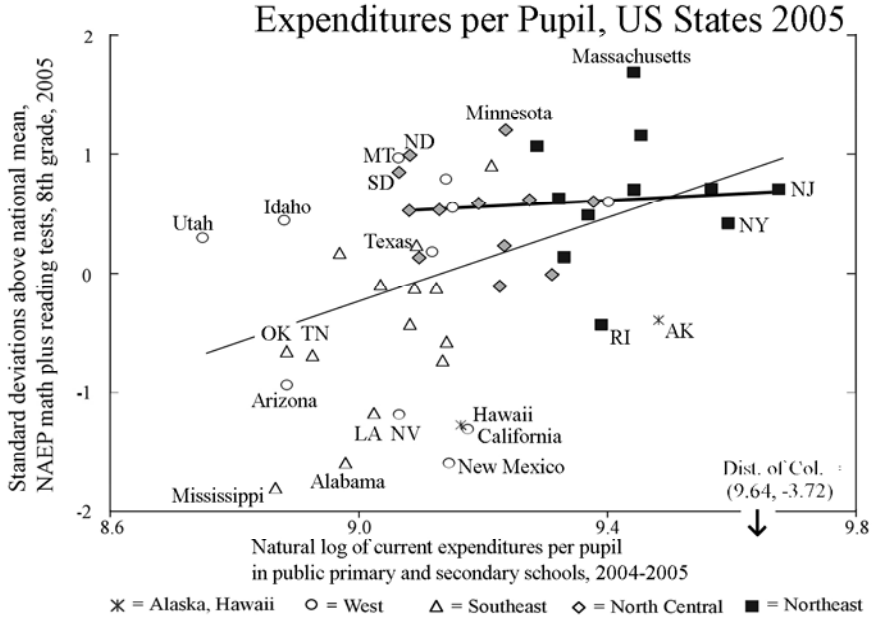


Figure 11. Test Scores in 8th Grade vs. Public Expenditures per Pupil, US States 2005



SOURCES AND NOTES TO FIGURES 1-10

All of the numbers used in the figures will be posted at http://econ.ucdavis.edu/faculty/fzlinder.

Figures 1-3:

The estimates of GDP per capita in 1870, 1900, and 1930 in 1990 international PPP dollars are those of Angus Maddison (1995 and 2001). The enrollments data are derived from other sources in Lindert (2004, Volume 2, Appendix A), from the Banks post-1815 data base, and from Benavot and Riddle (1988), in that order of priority. In some cases where it was impossible to obtain the 5-14 population denominator from the Lindert sources or from Banks, I used the school age population denominator from Benavot and Riddle, introducing some differences in the ratio definition.

The reason that the UK dot fails to look like a weighted average within the triangle formed by England-Wales, Ireland, and Scotland seems to be that the GDP per capita and the enrollment rates are based on different weighting schemes (total population versus population 5-14).

Figure 4:

The estimates of GDP per capita in 1970 in 1990 international PPP dollars are taken from the Penn World Tables, version 6.2, measure rgdpch. The same source is used for GDP per capita in Figures 5-7.

As a proxy for enrollments sometime around that 1970 date, I used the educational attainment of the 15-64 age group, as measured thirty years later, in 2000. These year-2000 data are drawn from http://soto.iae-csic.org/Data.htm , accessed 18 June 2009. This source is cited, and the estimates explained, in Cohen and Soto (2007).

Figure 5:

The average reading, mathematics, and science achievement scores of 15-year-olds are from the PISA 2006 exams (OECD, PISA 2007).

Figure 6:

The Reading and Math scores are combinations of different LLECE 1997 scores and SERCE 2006 scores, from Hanushek and Woessmann (2009b, Appendix Table A1).

Figure 7:

From National Assessment of Educational Progress (NAEP) for 2005, I averaged scores for reading and math for 8th graders, after converting each into separate standard deviation units in the distribution of averages across states. The source is http://nces.ed.gov/quicktables, Table 129, accessed June 2009.

Figures 8 and 9:

The enrollment rates are from the same sources listed above for Figures 1-3. The current expenditures per pupil, expressed in US dollars, are taken from US Commissioner of Education, *Annual Report 1899-1900*, pp. 2618-2621: "Elementary Education in Foreign Countries": and US Commissioner of Education, *Annual Report 1900-1901*, pp. 2483-5: "Statistics of Elementary Education in Foreign Countries." These can include

private expenditures in some cases, though differences in public expenditures probably dominate the expenditure differences shown here.

Figure 10:

The PISA scores for 2006 are from the same source as listed for Figure 7. The public expenditures per primary pupil in the school year 2004-2005 are from OECD *Education at a Glance 2007*.

Figure 11:

The test scores are the same as those used in Table 7. Current expenditures per pupil in public primary and secondary schools for the academic year 2004-2005 are from http://nces.ed.gov, accessed 16 March 2009.

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ENDNOTES

[1] Easterlin (1981). For updates on the global advance of school enrollments, see Benavot and Riddle (1988) and Clemens (2004).

[2] A classic non-econometric single-country study is North and Weingast (1989), with revisions by Clark (1996). The econometric testing of institutional influences from earlier centuries has been led by De Long and Shleifer (1993); Acemoglu, Johnson, and Robinson (2001, 2002); and Acemoglu and Johnson (2005).

[3] Clark (2007).

[4] Bils and Klenow 2000. Similarly, the refreshingly iconoclastic work by Lant Pritchett on international macro-estimates of the effects of education does not deny its positive role (Pritchett 2001, 2008).

[5] On the civic participation effects of schooling, see Dee (2004) and Milligan, Moretti, and Oreopoulos 2004. On its crime prevention effect, see Lochner and Moretti (2004). Currie and Moretti (2003) and other studies find positive effects of schooling on health. Other studies use production-function econometrics to capture the productivity effects of spillovers that leave no specific imprint (Moretti 2004a, 2004b, and a survey in 2006). See also the surveys by Krueger and Lindahl (2001) and McMahon (2004).

The natural-experiment study by Acemoglu and Angrist (2000) emphasized the low statistical significance of externalities from the extra schooling triggered by compulsory schooling laws. Yet they authors acknowledge that their point estimates still include enough externalities to justify noticeable subsidies, and that their experiment was limited to externalities from secondary education alone.

[6] See, for example Angrist and Krueger (1991), Acemoglu and Angrist (2000), and Lleras-Muney (2005).

[7] Mariscal and Sokoloff (2000), Engerman, Mariscal, and Sokoloff (forthcoming). The present author's transatlantic empirics are also comparative and reach conclusions like those of the Engerman-Mariscal-Sokoloff team, but tend to rely more on panel-data econometrics, with the usual caveats about exogeneity and instrument power (Lindert 2004, Chs. 5 and 15).

[8] If there are exceptions in which society over-invested public funds in primary education rather than higher education, they would probably be highly egalitarian communist regimes, such as Cuba under Castro. Yet I am not aware of any study that has quantified such overinvestment in basic education.

[9] Lack of numeracy is demonstrated in the aggregate by age heaping, the tendency to round numbers off to integers ending in 0 or 5. See Baten and Crayen (2008) and A'Hearn, Baten, and Crayen (2009).

[10] The underlying structure shaping education outcomes might conceivably involve different *a*'s and *b*'s in the two polities. If so, any judgment of the education performance of *B* should use a counterfactual drawing on the coefficients from *B*, posing questions of the form "If *B* had had *A*'s values of the independent variables Ed_{t-1}, *Z* and *X*, how would its education outcome have differed, in our view, given *B*'s own structure?"

[11] The poverty defense argues that exogenous income determinants (in the Z vector) have lowered education simply because the income elasticity of education is positive. The Wagner's Law defense excuses the poorer and lower-education country even from spending as great a share of its income on

public services (in this case, public education). Applying either of these defenses requires that the less educated country be the poorer one, which is ruled out in the cases defined as education anomalies here.

[12] Sandberg (1979), Lindert (2004, v. 2, Appendix A).

[13] The larger tables behind Figure 1-5, complete with the countries whose dots are unlabeled, will be posted at http://econ.ucdavis.edu/faculty/fzlinder. The sources for enrollments 1870-1930 are those reported in Lindert (2004, v. 2, Appendix A). The educational attainments of adults in 2000 are from http://soto.iae-csic.org/Data.htm (accessed 18 June 2009), as described in Cohen and Soto (2007). The PISA test scores for 2006 (with some splicing from PISA 2003 scores, as in the case of the US reading scores) are from the online version of OECD *Education at a Glance 2007*. The GDP per capita estimates for 1870-1930 are from Maddison (2001), and those for 1970 and 2004 are from Penn World Table 6.2.

[14] In addition to the sources cited in the preceding footnote, see the UN's Arab Human Development Report (2005).

[15] According to Penn World Table 6.2, Niger's income per capita has now sunk sufficiently since about 1990 for Mawali to catch up.

[16] Hoxby (1998), Grissmer *et al.* (2000), and other sources cited in Lindert (2004, Ch. 6).

[17] Tuttle (1998, 1999).

[18] Lindert (1978, Chs. 6, 7).

[19] Even a relatively unhealthy country today, like Burkina Faso, is arguably on the same enrollment trajectory, and the same life expectancy, as were England and America at nineteenth-century dates with comparable PPP incomes per capita. For the enrollment comparison, see Clemens (2004, especially Tables 10, 11). Life expectancy from birth in Burkino Faso was about 44 years at the end of the twentieth century, versus 40 in England in 1851 or 38 in the United States in 1850 (Wrigley and Schofield 1981, Table A.3; Carter *et al.* (2006, volume 1, pp. 447-448). The adult life expectancies were probably also similar.

[20] Mitch (1982, 1984, and 1992) and Solmon (1970, 1975).

[21] For United States, one could start with the data series in Claudia Goldin's education chapter in volume 2 of Carter *et al.* (2006), and consult Solmon (1970, 1975) for detailed cost estimates by state in 1880 and 1890.

[22] In addition to the correlations shown in Figures 5 and 6, see Tan and Mingat (1992), OECD (various years), and UNESCO (various years). IQ scores have also been correlated with economic development, both internationally in recent years and across the 20th century in each of several OECD countries (Flynn 1984, 1987, 2000). It remains to be seen how much the improvement in IQ scores relates to schooling and how much to such other factors as health or learning the test.

[23] For a global cross-section from 1988-1992 data, see Freeman and Oostendorp (2000, especially Table 3). On Latin America, see Frankema (2009, ch. 4), De Ferranti et al. (2004, p. 316).

[24] Williamson and Lindert (1980), Margo's wage chapter in Carter *et al.* (2006), Williamson (2006), Goldin and Katz (2008, esp. Chapter 8).

[25] Clark (2007, Chapter 8). Looking at several sectors rather than just the building trades, Phelps Brown (1977) and Williamson (1982) find no clear movements in skill premia since the eighteenth century.

[26] Van Zanden (2009a, 2009b).

[27] Van Leeuwen (2007).

[28] For explicit treatment of non-economic returns from education, see Becker (1963), Mitch (1982, 1992), Haveman and Wolfe (1984), and Oreopoulos and Salvanes (2009).

[29] This paper uses only the "full method" cross-sectional estimates based on monetary benefits and costs, avoiding any rates of return in the tradition of Jacob Mincer. The Mincerian estimates never explore the costs of education, or who paid for them, and instead use extra years of schooling as a cost proxy. Such an approach is a non-starter here, given this paper's desire to focus more attention on who paid whom for the schooling. In addition, the Mincerian estimates have come in for serious econometric criticisms regarding their functional form (e.g. Heckman, Lochner, and Todd 2008), and often yield unstable estimates.

[30] As Lant Pritchett has pointed out (2001, 373, note 6), the higher rate of return on primary education derives not so much from a higher percent pay increase in later life as from the simple fact that the opportunity cost of the child's time is so much lower in the earlier years of the education cycle.

[31] Psacharopoulos (1981, p. 323). Emphasis in the original.

[32] Hansen (1963, esp. p. 136), Becker (1964, esp. p. 167).

[33] OECD (2005, pp. 125-126).

[34] In an open economy, one would have to lower the tax rate to reflect partial losses due to an average rate of brain drain. This paper deals mainly with large-country cases, where this effect would be negligible. One might also worry that the calculations need to include any crowding out or crowding in of private education from the extension of government subsidies. Yet the calculations applied in this paper assume that the government subsidizes all schools, as in a voucher plan, so that substitution between public and private schools has less relevance. One must also not overlook something obvious to the historian: In most settings where public subsidies were not provided, private schooling was also lacking for most children. This would have limited the amount of crowding out.

[35] One can choose variants on this basic measure, depending on practicalities and purpose. They fall into three main categories: (1) tax effort, (2) absolute public inputs per child, and (3) relative public inputs per child (the "support ratio" featured here). Each has its strengths and weaknesses.

(1) Tax effort is conveniently measured by the share of national income devoted to subsidizing primary education. This straightforward ratio unfortunately can be raised or lowered just by diffrences in the share of population that is school-aged, making a country look less generous when in fact it simply has fewer children (e.g. nineteenth-century France).

(2) The absolute public inputs of subsidies per child are closer to the input concept preferred by the production-function literature in the economics of education. These inputs can be measured per enrolled pupil, per attending pupil, or per child of school age. The last denominator has the advantage and disadvantage of including the enrollment or attendance rate in the measure. That is good or bad depending

on whether enrollment and attendance were driven by the supply of student slots (our present purpose) or the parental demand for slots.

(3) The relative public inputs per child is captured by the "support ratio" of (subsidies/child) to (GDP per capita or per adult of working age). It best dramatizes the departures from the usual positive Wagner's Law relationship of tax effort to income per capita. Here again its "child" measure can refer to enrolled students, attending students, or children of school age. The choice again depends on which of these comes closest to tracking the supply of subsidies as opposed to parental demand. My choices in the text reflect my hunches about how best to proxy the public supply-of-subsidies side.

[36] In cases of discriminatory access to subsidized schools, one must avoid the pitfall of mis-applying the subsidies per favored-group student to the larger population or its incomes. For example, one must take care not to use the wrong data from the American post-bellum South or from South Africa under apartheid. Separate support ratios must be applied to different groups, and compared with the incomes of the relevant taxpayers.

[37] Hanushek and Woessmann (2008, 2009, and forthcoming).

[38] For the debate over whether externalities are truly greater in higher education, and how this might hinge on the degree of separability of research from instruction, see Birsdall (1987, 1996) versus Psacharopoulos (1996). See also Behrman (1996) on the methodological difficulties involved.

[39] Castelló and Doménech (2002).

[40] The comparison with current leading-country practice can be doubted and replaced with an opposing infant-industry or Gerschenkronian argument in favor of tilting toward investments in higher education in developing countries. Given that higher education calls for very high fixed costs before its research and instruction can compete with the leading foreign universities, it might be more necessary for higher education than for primary education to have the government force its growth with heavy subsidies. The present paper can only pose this possibility, and not yet resolved it.

A key clue to the validity of the infant-industry or Gerschenkronian argument would be whether or not countries that caught up in the past and became educational leaders did it by tipping government subsidies away from primary education and toward higher education, like some of today's developing countries covered in Table 4. A good case study would be North America and Australasia, which had to catch up with Britain, France, and Germany in the nineteenth century. While I am still gathering data on American university finance between the Civil War and World War II, it seems that the Northeastern states achieved their global prominence in higher education with primary/tertiary ratios above the text 50% threshold, to judge from the data for 1850 and from 1950 on. The Southern and Western states usually had lower primary/tertiary ratios, but also failed to catch up to the Northeast.

[41] O'Brien (1988), Brewer (1989), North and Weingast (1989), Schultz and Weingast (1998).

[42] Specifically, the United Kingdom's public support ratio for primary schools was the lowest of five data-supplying countries in 1870 and the lowest of seven data-supplying countries in 1900. In terms of primary-

school teachers per 100 pupils, the UK ranked fifth out of seven data-supplying countries in 1870, and 8th out of 16 data-supplying countries in 1900. See Lindert (2004, Volume 2, Appendices A and C).

[43] Lindert (2003; 2004, Chapters 5 and 15). See in particular Figure 5.3 (p. 97), which reveals a tax-support anomaly about England that corresponds to the education output anomaly of Figures 1-3 in this paper.

[44] The estimates based on David Mitch's data fall within the range of possible private and social rates of return he staked out (Mitch 1982, 1984, 1992). Professor Mitch suggests that my estimate based on Jason Long's work may have been too pessimistic in assuming that it would take six years of primary school to achieve the kind of wage gains estimated by Long. I am grateful to him for his advice on these estimates.

[45] Massie (1761).

[46] Homer and Sylla (1991, Chs. 8-9); Clark (1996), Dincecco (2009a, 2009b).

[47] Go and Lindert (2010, Table 2). For further prewar data on females' shares of primary teach, and their relative salaries, see the two "female teachers" files in http://econ.ucdavis.edu/faculty/fzlinder .

[48] Mariscal and Sokoloff 2000; Engerman, Mariscal, and Sokoloff, forthcoming. The quotation comes from the latter.

[49] Frankema 2009, Chapter 4.

[50] Nugent and Robinson (forthcoming) are also urging the shift of more attention to the development policy failures of Venezuela since it fell under dictatorships in the early twentieth century.

[51] The relative position of Latin America for given income per capita is less dramatic in Figures 2 and 3 than in Frankema's 4.1 because of a difference in samples. Figures 2 and 3 include more countries from outside of the OECD core, some of which had enrollment deficiencies similar to those of Latin America.

[52] *Ibid.* [Frankema 2009, Chapter 4].

[53] To add the lag behind Guyana to the contrasts in Figures 2-6, see the Unesco Institute of Statistics homepage: http://stats.uis.unesco.org/unesco/ReportFolders /ReportFolders.aspx. See in particular the secondary school enrollment rates documented between 1970 and 2000.

[54] For differences in national wage structures 1988-1992, see Freeman and Oostendorp (2000, especially Tables 3, 4).

[55] Frankema (2009, Table 4.2).

[56] On Brazil, Mexico, and Chile, see Ioschpe (2004), and Lindert, Skoufias, and Shapiro (2006). On Asia, see Tan and Mingat (1992).

[57] Shoup *et al.* (1959), p. 409.

[58] Lewis Solmon (1975) gives data on direct resources costs per public elementary school pupil in 1880. California ranked second to Colorado in such costs per pupil. This was likely a wage effect at least as much as a small-class-size effect. For teacher pay by state in the most recent years, see www.nces.ed.gov/quicktables.

[59] Dincecco (2009a, especially Figures 1-2).

[60] Williamson (1990, Ch. 10, especially pp. 281-297).