

# Where Has Modern Equality Come From? Lucky and Smart Paths in Economic History<sup>1</sup>

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## ABSTRACT

The World Top Incomes Project has opened a new global economic history of modern inequality. This essay extends that new history to sketch the combination of historical luck and egalitarian policies that have determined movements in national inequality. The chance to start over with relative equality has been offered by political shocks and by the opening of frontiers. It has famously slipped away in the United States, Australia, and the United Kingdom since the 1970s, while nine Continental countries protected equality with welfare-state transfers. Three East Asian countries protected their equality in a different way, by making people more equal in the marketplace rather than through transfers. The public education part of their strategy offers a clear prescription for developing countries, but raises tougher questions for today's developed countries.

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How could a modern democracy achieve relatively equal incomes, and protect that equality against the inegalitarian trends experienced in so many countries since the 1970s? How did some countries manage to resist the riding tide of inequality? Are there alternative ways to preserve equality in today's environment? Specifically, could a country keep its earned incomes relatively equal before taxes and transfers, approximating "equality of opportunity" rather than equality of post-fisc outcomes?

Historical experience has much to say on these questions, both because we have been living through a rise of inequalities and because we now know so much more about what happened to the inequality of household incomes before the 1970s. This essay uses the new information to explore the combination of luck and policies that has shaped the different national trends in income distribution. While no econometric tests can be offered here, simply noting correlations in the newly expanded historical data sets suggests some testable answers to the questions posed here:

- The shocks of the Great Leveling era, 1910s-1970s, offered a lucky chance to start over with relatively equal household incomes.
- That lucky equality has slipped away in the United States, Australia, and the United Kingdom, partly due to their losing their lead in mass education.
- Given that lucky chance in the 1970s, nine Continental countries protected equality by expanding welfare-state transfers.
- Japan, Korea, and Taiwan protected their equality by making people more equal in the marketplace, rather than through transfers. Their distinctive pre-fisc approach has combined higher quality mass schooling, inheritance taxation, and restrictions on immigration.
- International experience suggests a fiscal strategy to promote income equality through mass education improvements in developing countries. Yet

for already developed countries the road to improved mass learning is not so obvious.

## A whole new economic history of inequality

We are deeply indebted to the World Top Incomes Project (WTIP) for a whole new economic history of modern inequality, and to Thomas Piketty's *Capital* book for a plausible interpretation of that history. Before Anthony Atkinson, Piketty, and Emmanuel Saez formed the WTIP team, we had few measures of inequality movements before 1960, and bad measures for the years since then. Top incomes were hidden from the official statistics. The WTIP team has now delivered plausible estimates covering more than 100 years for dozens of countries. They have also set a new standard in open documentation in the public realm.<sup>2</sup>

Thomas Piketty's *Capital* starts by summarizing that long global history of the shares of incomes going to the top ten percent, top one percent, and even narrower top elites. The book also explains the movements in those top shares in terms of historical luck plus a tendency for wealth to become more concentrated over the generations. That tendency is generalized into a theory that inequality will always rise as long as the rate of return on private wealth ( $r$ ) exceeds the rate of growth of national income ( $g$ ). This rich harvest of historical facts and insights leads to his calls for sustaining equality with policies that redistribute from the rich to the rest, mainly with the high tax rates on top wealth that characterized tax codes in the United Kingdom and the United States from the 1940s through the 1970s. Of all the parts of this tour de force, the one that has drawn the most attention is the part that I will set aside here: The difference between  $r$  and  $g$  lacks predictive power, since both rates are caused by the same outside forces. Piketty himself convincingly

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<sup>2</sup> The WTIP estimates are available at <http://topincomes.parisschoolofeconomics.eu>, and Piketty's interpretation is, of course in his *Capital* (2014). For movements in the inequality of labor earnings, see Atkinson (2008) and the Atkinson-Morelli site [www.chartbookofeconomicinequality.com](http://www.chartbookofeconomicinequality.com).

supplies some of those outside forces, in the form of historical and geographical luck. His sensible historical explanation owes nothing to his  $r > g$  idea, which is redundant.

The data and the interpretations are new, stimulating, and controversial. How can we test them, using history? In what follows, let us restrict our view in three ways. First let us define “equal” as something actually experienced. That is, we constrain “equal” to mean a final-income (post-fisc) gini in the range 23% - 33%, which is historically low. Such settings give better happiness ratings. Second, for relevance to the twenty-first century debate in countries free to debate equality, we should consider only the recent experience of rich democracies, those with average incomes like those of the countries belonging to the OECD since 1980. Finally, we should constrain our tests, and our imagination, to actual historical experience. After decades of experience in a few dozen rich democracies, if a social contract never happened, it probably never will. Neither a strictly leveling policy nor free-market *laissez faire* has ever been practiced in a modern democracy.

Most historical movements in the inequality of people’s incomes are the result of these sources:

- demographic change,
- technological change,
- shifts in other countries’ trade behavior, and
- political change.

At one point or another in *Capital*, Thomas Piketty shows his awareness of all of these. However, he emphasizes the last source, both when offering his explanations of what happened across the 20<sup>th</sup> century and in his final policy proposals.<sup>3</sup> The emphasis on political change works well in explaining the dramatic twentieth-century reversals in inequality. Yet for other tasks he has underemphasized the first three, perhaps to dramatize what is novel in his story. To tell the story of which

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<sup>3</sup> For a more detailed evaluation of Piketty’s choice of points to emphasize, and of the historical inquiries that his work should now stimulate, see my NBER working paper (Lindert 2014).

countries were lucky enough to become relatively equal, and had policies smart enough to stay that way, we need all four, as illustrated in what follows.

## Lucky modern chances for equality

A society must become equal before it can stay equal. When and where did highly developed countries become more equal, and what lucky events gave them that opportunity?

### The Great Leveling, 1910s-1970s

As Piketty has emphasized, Western Europe, North America, and Japan got “lucky”, in the narrow egalitarian sense, by having major wealth-killing shocks, followed by a progressive political environment. The shocks were mainly the result of the two World Wars, combined with the arrival of universal suffrage in the democratic countries. Concentrations of wealth were busted up by wartime confiscations, inflation, and asset-market crashes, and the new political mandate demanded social insurance and protections for organized labor.

In the wake of war and political upheaval, countries on four continents found their incomes more equal in the 1970s than had been true of their grandparents’ generation in the 1910s. Figure 1 dramatizes the pervasiveness of this Great Leveling. Some might object that those who drew up Figure 1 have created a jumble, in which the eye cannot separate the curves for 26 countries.<sup>4</sup> Yet that jumble succeeds in making the key point about the 1910s-1970s era. As Atkinson, Piketty, Saez and the other members of the WTIP have now shown us, 26 countries shared in the Great Leveling. That similarity is especially remarkable since the world’s military, political, and economic shocks took such different forms in these 26 countries – some lost the war, some won it; the war raged on the territory of some but not others; and even the non-combatants differed in their chances to make money on wartime trade.

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<sup>4</sup> Figure 1 is from Roine and Waldenström (2014).

What caused the Great Leveling? In particular, what made it so different from the period since the 1970s, in which countries' inequalities either stayed the same or re-widened? All four of our primary causal forces are suitable candidates here. That rise of mass political voice surely deserves much of the causal credit, as Piketty has implied. A second likely causal force, as Jeffrey Williamson and I have suggested, was that era's slowdown in population growth (less expansion in the numbers seeking work).<sup>5 6</sup> To isolate this demographic force, Figure 2 plots the rate of growth of working-age population against the only inequality parameter we have for several countries since World War I, namely the top one-percent share of incomes developed by the WTIP team. This is not the only way, or even the main way, in which labor supply expansion could widen the income gaps, of course. Labor supply expansion could widen gaps in labor earnings between skilled and unskilled employees, mainly outside of the top one percent elite. Still, let us look at the top one percent share, since the more informative measures of wage inequality are not available back to 1920 or earlier.

Figure 2 shows strong contrasts between the Great Leveling era and the later widening era. For any given rate of growth of the labor force, the rate of change in the top one percent share became 2-3 percent higher per decade after 1970. What lies behind this strong shift from era to era? As already granted, political shifts must have played a role in the leveling era. Yet Figure 2 also shows that labor force growth correlates with income concentration within each of the two eras. Thus far our list of likely causal influences includes both political shocks and labor supply.

A third causal force arises from the international trade context. The effective supply of unskilled labor slowed down between the 1910s and the 1970s not just because of demographics, but also because of the interruption of trade. The World

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<sup>5</sup> Lindert and Williamson (forthcoming, Chapter 8).

<sup>6</sup> One major region did not experience the Great Leveling. In Latin America, income gaps between rich and poor did not narrow over these decades (Astorga (2014) and Williamson (forthcoming)). This difference in inequality trends, however, does not contradict all of the explanations just given for the Great Leveling. In particular, Latin America had faster labor supply growth and slower education improvement than did Europe, North America, or East Asia.

Wars and The Revolutions in Russia, China, and elsewhere had a negative effect on trade between countries having lower skills and education and those having more. For the more advanced countries we are following here, the supply of low-skilled foreign labor embodied in such imports as textiles and apparel and primary products was partially blocked, enhancing the advanced countries' wage rates for common labor. Only with the return of globalization after the 1970s did the competition from cheap-labor countries resume its prewar climb, led by China's market reforms since the 1980s and India's opening to trade in the early 1990s.

Finally, even technological change deserves consideration as a fourth cause of the widespread shift from leveling toward widening of wages and incomes. American economic history seems to say that the period from the 1910s to the 1970s was one in which the patterns of technological factor bias did not replace unskilled labor very much, whereas the patterns since the 1970s featured automation and other labor-displacing changes.<sup>7</sup> Since technologies diffuse internationally, the same was probably true of other countries.

Thus for the Great Leveling from the 1910s to the 1970s, there is no mystery about what could have caused it. Rather we have those four good explanations, in terms of politics, demography, trade conditions, and technological bias. All that is lacking is a quantitative basis for deciding among these four.

### Frontier luck

Another stroke of egalitarian luck is to inherit a depopulated land rich in resources, as in Australia, South Africa, and the Americas. Such a frontier can be kept highly egalitarian if ownership of land and natural resources is within the reach of common folk. South Africa and Latin America may have squandered this opportunity immediately, and may never have had equality as defined here.<sup>8</sup> The

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<sup>7</sup> See Goldin and Katz (2008, Chapter 8), and the inter-sectoral evidence on the locus of technological change in Williamson and Lindert (1980: pp. 144-6 and 156-77) and the literature cited there.

<sup>8</sup> The estimation of Latin American inequality movements in the first century of independence is still a work in progress. Estimates of Chilean inequality (Rodriguez

United States squandered it more slowly – twice, as Jeffrey Williamson and I have now documented in a forthcoming book.<sup>9</sup> Figure 3 and 4 show that the concentration of incomes into the top one percent of households, and the gini coefficient of overall inequality, rose twice in American history – from colonial times to the early twentieth century, and again since the 1970s. The two inequality indicators tell similar historical stories, but with one twist. If we follow the concentration of income into the top one percent, as in Figure 3, then the available numbers confirm that American households were more equal than the British or Dutch or Japanese until sometime in the early twentieth century. Yet if we want a measure that reveals income gaps all up and down the income spectrum, such as a gini coefficient, then Figure 4 reports that the Americans were already as unequal as the British or (probably) the Dutch in 1860, just before the American Civil War. While the historical timing looks quite different in these two perspectives, America did lose its relative equality, much as Alexis de Tocqueville had feared and predicted back in the 1830s.

While America's losing equality the first time was inevitable, losing it again was not. The first long rise in American inequality, up to a peak that is somewhere in the 1910-1929 range, was the inevitable result of rapidly settling a rich and sparsely populated frontier, bidding up property values and holding down the rise of wage rates. Yet frontier settlement was over by World War I. Why should the United States, after sharing in the Great Leveling, have experienced one of the world's sharpest rises in inequality since the 1970s? Why couldn't Americans – or Australians or Britons or Canadians – remain as equal in their incomes today as they were in the 1970s?

A first step toward explaining the second widening of American incomes is to note that it was not caused by any movement toward classic discrimination by race or gender. So we can see from the long histories added in Figures 5 and 6, which are a useful by-product of the new (rough) income estimates that Jeffrey Williamson

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Weber, forthcoming) and factor price ratios in five countries (Arroyo Abad, 2013) suggest wide oscillations in income inequality, with no clear trend up to 1910.

<sup>9</sup> Lindert and Williamson *Unequal Gains* (forthcoming, Chapters 5-9).

and I have been able to develop in *Unequal Gains*. In terms of the racial divide, Figure 5's new history of black / white income ratios barely little resemblance to the history of overall income inequality. For example, by 1870, at near-peak inequality, the slave emancipation formalized by the Fourteenth Amendment in 1868 had caused blacks' average incomes to jump by perhaps 30 percent, even though blacks worked less than they had worked as slaves.<sup>10</sup> In the Great Leveling era 1910s-1970s, blacks did make gains relative to whites, but only with a late start, in World War II and the Civil Rights era. The disconnect between racial and overall inequality has continued since the 1970s: The racial income ratios have merely stabilized, contributing nothing to the widening of overall incomes.

The history of women's march toward equal pay, shown in Figure 6, also bears little resemblance to the time path of overall inequality. An even stronger offset to America's recent rise of inequality has been the accelerated narrowing in the gender pay gap. One might have expected women to have fallen further behind, given that they were disproportionately employed in lower-paying jobs in 1970. Contrary to any such expectation, American women have managed to "swim upstream" in these years of rising overall inequality.

Figure 6 makes it clear that women have broken out of the long stasis in their relative pay. Over the 85 years between 1888 and 1973, American women received an average of only three dollars pay for every five dollars pay received by the average male worker. Yet from the 1970s on, or perhaps from 1982 on, women have made very big gains in average pay, swimming upstream against a current of increasing inequality and a conservative resistance to social programs.<sup>11</sup>

What then are the sources of the steeper rise of inequality in the United States since the 1970s, if not any shift toward discrimination or gender? The list of prime suspects includes the four we have surveyed in search of explanations for the contrast between the Great Leveling era and what followed it -- namely political

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<sup>10</sup> Lindert and Williamson (forthcoming, Chapter 6). While blacks' rate of labor force participation dropped with emancipation from slavery, blacks continued to work more than whites, at least as of 1870.

<sup>11</sup> Lindert and Williamson (forthcoming, Chapter 9). Our main source of American women's relative pay is, of course, Goldin (1990).

shocks, labor supply growth, global trade shifts, and technological bias – and adds a fifth: the contribution of education to skills growth, a different dimension of labor supply growth. The relative weights to be given to each of the five will vary with whether we are contrasting American experience since the 1970s with our own Great Leveling or with other countries since the 1970s. Let us turn to each of the five suspects, noting their likely role in these two contrasts.

Faster growth of its labor supply contrasts the United States with the experience in continental Europe and Japan since the 1970s. It correlated not only with America's faster rise in the top income share and gini, as we saw in Figures 3 and 4 above, but also with a faster widening of gaps in wage rates. Yet as Figure 2 also implies, the labor-supply growth of the period since 1970 offers no contrast with the rate of growth of labor supply in the Great Leveling era. Thus labor supply growth helps to explain the international contrasts, but not the change of trend in American inequality.

On the other side of the general labor market, shifts in labor demand, like those in labor supply, help to explain why inequality movements reversed in the United States, but not why they contrast with other countries. A shift in technological bias toward automation and lower demand for low-skilled labor played some role in the trend reversal in American wage gaps, as Claudia Goldin and Larry Katz have shown. Yet neither they nor others have been able to show a contrast in the role of technological bias among rich countries, presumably because the technological bias was shared by advanced market economies around the globe.

The rise of global trade as a share of the economy helps to explain the contrast in America's pay trends over time. Globalization had little impact on American wage or income gaps between 1910 and 1970, yet has been given credit (or blame) for 15-33 percent of the widening of American wage gaps from the 1970s to the early 1990s.<sup>12</sup> The literature shows no clear role of globalization in the contrasts in inequality trends between the United States and others, however.

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<sup>12</sup> Feenstra and Hanson (1999).

As for political shifts away from income-leveling institutions toward free-market economics, they probably played a role both in the temporal change in the United States and in the international contrasts. The relevant political shift in this case was the Thatcher-Reagan assault on labor unions and egalitarian social spending, which made both countries' pay gaps widen, in contrast to stable income distributions elsewhere.

The fifth suspect, the contribution of education to skills growth, can be introduced here, since we have better data on education and skills since 1970s than we had for the Great Leveling era. Sometime around 1970, the United States switched its national trend and its international position in the education component of human capital formation. From around 1850 to around 1970, the United States, along with Canada, had been a world leader in average school enrollments, first in primary schooling and then in the high school wave of the early twentieth century. The growth of average years of schooling attained by adults never slowed down before 1970.<sup>13</sup> The result was egalitarian, because it converted a would-be supply of less skilled workers into a supply of more-skilled workers, bidding down the pay premiums enjoyed by higher-paid groups. The impact of rising education was all the more egalitarian, since the gains in education and skills were greater for previously disadvantaged groups, such as blacks and rural whites.

Then, after 1970, something changed. Our rate of schooling slowed down, and other countries caught up with the United States in average years of schooling for the 15-64 working age population.

The recent rates of change in adults' years of schooling seem to have influenced the rate at which wage gaps have widened. So says Figure 7, which relates the wage gap movements to the change in adults' education attainment between 1970 and 2010, for the ten countries yielding good measures of both. The United States stands out as having the most stagnant growth in education attainment, and one of the fastest increases in wage inequality. To the extent that

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<sup>13</sup> Goldin (1998), Lindert (2004, Chapters 5 and 6 and Appendices A and C), Goldin's education Chapter in Carter *et al.* (2006), Goldin and Katz (2008), Go and Lindert (2010), and Lindert and Williamson (forthcoming, Chapters 8 and 9).

education is something that a society and government could manipulate, then the lack of any growth in years of average schooling may have been a missed opportunity for the United States to protect the relative wage equality it had enjoyed as recently as 1970.

While Americans' attainment of years of education decelerated around the 1970s, did the quality of that education also decelerate? For a full answer, we would need several decades of scores on achievement tests relevant to career skills. These time series are generally unavailable.<sup>14</sup> We do have international cross-sections of achievement test scores since the 1990s, however. By the end of the twentieth century, the United States was already far below the leaders in the 15-year-old age group's achievement scores for mathematics, reading, and science. The test results hint at stagnation in the quality of the primary and secondary education on which equality depends, though in the absence of comparable achievement test scores before the 1990s, again, we cannot much say about the earlier trends in quality.<sup>15</sup>

### How do you stay equal, after the luck stops?

If the United States, Britain, Canada, and Australia have been unable to sustain the relatively equal distributions of wage earnings and incomes, how have

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<sup>14</sup> The most relevant study of US test scores for those in primary and secondary school are the Iowa test scores analyzed by John Bishop (1989). These imply that the average test scores of young labor force entrants improved from the 1940s until about 1970, then plummeted until the mid-1980s, and then started to rise again. That might suggest that a downturn in the quality of US primary and secondary schooling might help explain the rise in skill premia after the 1970s. However, no other study has been able to deliver similar results because of the paucity of long and consistent time series on achievement test scores.

As an alternative, one might think that the quality of education could be inferred from changes in the rate of return from each stage of extra schooling. However, movements in rates of return reflect not only the quality of learning but also movements in market wages for different skills.

<sup>15</sup> This section's comments on the relative years of schooling and the relative quality of United States will be expanded when we come to discuss the international comparisons built into Table 2 below.

some of today's rich OECD democracies succeeded in sustaining relatively equal distributions of income since the 1970s, when the United States and some others have not?

The different national approaches and outcomes are summarized in Table 1, which divides national experiences into cases where incomes are more unequal or less unequal than (roughly) the post-1980 median distributions. The top row leads off with countries where incomes were redistributed relatively little, leaving inequality high both before and after taxes and transfers. The United States, the United Kingdom, Portugal, and Singapore all practiced minimal redistribution in the face of high inequalities of market incomes.

#### Welfare states have done it

The welfare states of Northern Europe are a well-known success story of achieving post-fisc income equality and lower poverty rates. If we define a progressive welfare state as one that devotes over 20 percent of national income to government social transfers and ends up with a relatively equal distribution of final (post-fisc) income, then there are nine such countries with relative equal incomes, and two marginal countries with social transfers hovering around 20 percent during 1980-2007, as shown in Table 1. Piketty appears to have such countries in mind when emphasizing that progressive redistribution can work in a democracy. One should note that their tax systems are not much more tilted toward taxing top incomes than are the tax systems of lower-spending rich countries. Rather these welfare states tend to achieve their progressivity – i.e. redistribution toward those with lower market incomes – on the social expenditure side, delivering greater transfers as a share of household income to those with lower incomes.<sup>16</sup>

#### Has it ever been done without a welfare state?

Has equality been attained in any way other than through annual redistribution, that is, transfers and progressive income tax year by year? Such a

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<sup>16</sup> Kato (2003), Lindert (2004, volume 1, Chapter 10).

social arrangement would be attractive, as it would mean that each new cohort of adults would experience inequalities derived more from differences in their efforts and less from differences in circumstances beyond their control. While freedom from uncontrolled circumstance could never be complete, it could be minimized by heavily taxing inheritances, to give each generation a less tilted playing field.<sup>17</sup> Such a pre-fisc basis for equality could also reduce the temperature of annual budget fights. Could a country pre-commit to equality by somehow making people more equal in their market incomes, with only modest anti-poverty transfers?

This matters. Suppose that the answer is no. Suppose that no rich democracy has ever achieved “equal” incomes without devoting over 20 percent of GDP to social transfers. Such a history would speak volumes. It would lend support to Thomas Piketty’s final recommendation in favor of stiff taxation at the top and generous transfers to the poor.

Looking next at near neighbors of the progressive welfare state, we find that one group of four countries – Australia, Canada, Ireland, and Switzerland – spent a little less on social transfers than did the welfare states, yet managed to redistribute progressively enough to achieve relatively equal net incomes (gini below 0.34) despite having relatively unequal pre-fisc (market) incomes, with gini coefficients above 0.40 before taxes and transfers. These four targeted the poor relatively effectively, it seems, with their transfers, unlike the Mediterranean and South American countries that channeled a large share of tax funds into pensions for the non-poor, who had worked in formal sectors of the economy.

Let us focus here on the other group of non-welfare states, a group that had less inequality of market incomes to begin with. That is, these countries have kept final incomes relatively equal by having people’s incomes relatively equal (market gini below 0.40) before taxes and transfers. They are the “Pacific Four” in the lower right-hand cell of Table 1 – three high-income East Asians and New Zealand. The

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<sup>17</sup> That is, such an arrangement would, in John Roemer’s words, go beyond mere non-discrimination and take some modest steps toward “equality of opportunity”. See Roemer (1998), whose norms are applied in the context of recent education mobility by Balcázar *et al.* (2015).

inequality parameters on the left side of Table 2 elaborate on their distinctiveness.<sup>18</sup> As of 1980, all four countries had relatively equal income distributions both before and after taxes, and these distributions have remained more equal than in the other rich democracies.<sup>19</sup> As Table 2 suggests, this relative equality still prevails both before and after taxes and transfers, despite some rise in inequality since the 1990s. Of these Pacific Four, however, let us now set aside the complicated and less clear-cut case of New Zealand, and concentrate on the East Asian Three.

Japan, Korea, and Taiwan are the only East Asians with low pre-fisc inequality. Mainland China stands out as a case in which equality was abandoned, having moved from the extreme equalization of the Mao “iron rice bowl” era to today’s national gini coefficients, both pre- and post-fisc, that match or exceed those of the United States. Inequality is also high throughout Southeast Asia and in the tiny financial center city-states, Hong Kong and Singapore.

Our three East Asians all experienced a set of “lucky” accidents that reduced top privileges at different dates before 1980.<sup>20</sup> Japan had egalitarian shocks in two waves. In the late nineteenth century, the Meiji restoration took power and wealth from the daimyo. Then, in 1937-1952, the wealthy Zaibatsu set up in the Meiji reign came under attack, first from the military government and then from the defeat and the American occupation. In Korea’s case, the combination of colonization, World War II, and the Korean War meant that wealth accumulation had to start all over.

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<sup>18</sup> For these four countries, as for all countries, the gini coefficients based on household surveys have understated inequality at the top. This bias in the gini’s has been offset by recent improved measures of top-income-group shares for three of the four (not for Taiwan). In all four cases, however, the available estimates seem to capture a relatively equal distribution within the lower 90% ranks, a tentative view supported by comparisons of data on wage inequality (Atkinson 2008).

<sup>19</sup> I am not the first to notice this contrast. In the 1970s The World Bank Study *Redistribution with Growth* lauded Korea and Taiwan, along with Sri Lanka and India, as examples of growth with equity (Chenery *et al.* 1974, Fei *et al.* 1979). The same theme was taken up again in the 1990s by those viewing the European welfare state from an Asian perspective. See Kwan (1997), Bourguignon *et al.* (1998, 1999) and Jacobs (2000).

<sup>20</sup> The issue of lucky shocks is less clear for New Zealand. While the incomes there are relatively equal even as pre-fisc market incomes, the sources of this outcome are not so clear as in the three East Asian countries.

Inequality in Taiwan was similarly restrained by Japanese occupation. To be sure, 1949 brought a new infusion of Kuomintang wealth, but with limits imposed by the confiscation of their holdings on the mainland. Equally important, the mainland influx brought a large number of small-business entrepreneurs.

Another element of luck for the East Asian Three, though not for New Zealand, was the international trade context they faced from the mid-1950s to the start of the 1980s. In that quarter century they shared the good fortune of being the pioneers, along with Hong Kong and Singapore, in opening up free trade with the huge OECD market at a time when their comparative advantage still lay in exporting manufactures that made extensive use of unskilled labor. Having this head start over other Asian competition allowed them an extra quarter century of relatively egalitarian labor demand patterns. The head start ended with China's opening to trade in the 1980s and India's shedding of "license raj" restrictions in the early 1990s. The rise of Chinese and Indian competition brought harder times for the less skilled in other developing countries after the late 1980s. A good illustration is the fate of Mexico after it unilaterally opened to trade under President Salinas (1988-1994). Instead of bringing an egalitarian gain to the unskilled, which is the Stolper-Samuelson result one might have expected from US-Mexican trade, the freer trade actually caused a widening of wage gaps within Mexico. It was the bad luck of Mexico's unskilled that their opening to trade came during the rise of lower-paid competition from Chinese and Indian manufactures. That is, Mexico had missed the egalitarian head start that Japan, Korea, and Taiwan got between the mid-1950s and the mid-1980s.<sup>21</sup>

By contrast with Mexico and some others, the three East Asian countries managed to maintain relatively equal earnings and incomes even after the low-skilled foreign competition had awakened on Asia's mainland in the 1980s and 1990s. The reason seems to be that these three countries too had changed. Their labor had become sufficiently schooled and skilled that even the median earner was

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<sup>21</sup> On Mexico's wage widening with the opening of trade, see Hanson and Harrison (1999). For a broader multi-country view of the importance of historical timing for the trade-wage link, see Wood (1997) and Lindert and Williamson (2003).

above the rising competition, and these countries' comparative advantage had shifted. Instead of trying to export apparel and cheap toys, they shifted toward importing them, with only a dwindling low-skilled share of the labor force suffering damage from the new competition.

The egalitarian rise of skills in Japan, Korea, and Taiwan was not all due to luck. These three have had a set of policies that can be viewed as "smart" for the purpose of maintaining equality with low taxes and transfers. This is not to say that all of their social policies were clever, either for leveling incomes or for enhancing growth. One Japanese example is that country's discouragement of female careers until the very end of the twentieth century. Another is Japan's famously huge and intractable pension deficit. The deficit is only modestly equalizing in terms of lifetime incomes, and it has compromised investment. Despite such lapses, however, these three East Asian countries did have other policies that seem to have made even their market, or pre-fisc, incomes more equal. We turn to policies toward public education, inheritance, and labor supply, all of which probably shaped the distinctive low-inequality outcome of the three East Asians.

Most importantly, they have developed public primary and secondary education more successfully than others, thereby holding down the return to skills. Their adult populations have attained as many years of schooling, on the average, as have adults in the other world leaders -- Canada, the United States, and the United Kingdom, as shown in the fourth column of Table 2. Furthermore, something about the East Asians' education systems seems to deliver high achievement test scores, as suggested by the average scores of fifteen-year olds in the PISA tests on mathematics, reading, and science. How such outcomes were achieved is not obvious, and we return to this point in the next section.

A second difference is that unlike most other rich democracies, the East Asians kept steady and substantial inheritance taxes, in the Piketty spirit.<sup>22</sup> Such taxation gives each new generation of adults a more equal start at a low cost. The higher the inheritance and gift taxation, the more a society can make the claim that

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<sup>22</sup> New Zealand, by contrast, repealed its estate duty in 1992.

“each earns his or her own way”. In fact, their top inheritance tax rates are the highest among all the rich democracies, by a slight margin. While every country’s tax code allows heirs to reduce their taxes on inheritances or transfers *inter vivos*, the base rate of 50 percent in Japan, Korea, and Taiwan (and Germany) is the highest among the main countries.<sup>23</sup> By contrast, the corresponding top rate is only 45 percent in France; 40 percent in the United States and United Kingdom; lower top rates for Denmark, Finland, Norway, Italy, and Switzerland; and zero in Netherland, New Zealand, and Sweden.<sup>24</sup>

A third policy that has maintained relative equality in pay within Japan, Korea, and Taiwan relates to immigration. All three are gated communities, blocking large numbers of immigrants from gaining permanent residency. Obviously, their restricting immigration of the less skilled has bought some domestic equality at the expense of global equality. By contrast, the countries of rising inequality since the 1970s, such as the United States and the United Kingdom, have absorbed above-average inflows of immigrants from lower-income countries, helping to maintain global equality while compromising domestic equality.<sup>25</sup>

Thus Japan, Korea, and Taiwan have come up with a policy package that has kept household final incomes nearly as equal, after all taxes and transfers, as have the nine egalitarian welfare states. These three East Asian polities have done so by making people earn market incomes more equally, before taxes and transfers.

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<sup>23</sup> Note an upcoming test case of East Asian taxation of top inheritances: When Korea’s ailing patriarch Lee Kun-hee of Samsung dies, his heirs may have to pay £4,000 million at the statutory 50% inheritance tax rate.

<sup>24</sup> Ernst & Young (2013). The Swiss system is administered at the canton level, with rates ranging from zero percent to 55 percent. As for top income taxes, our three East Asians have top rates above the world median, and similar to other leading countries. Examples from 2010 were: Japan = UK = 50 percent, Taiwan = Switzerland = 40% (France at 41%), and Korea = USA = 35 percent. KMPG Global (2015).

<sup>25</sup> The immigration policy of New Zealand, like those of Australia and Canada and some other destination countries, has tended to follow an intermediate course. The gate is quite open for those with high skills or enterprise wealth, yet remains closed for others.

## Can egalitarian public education be bought?

If the new global view of inequality trends within countries suggests that three East Asian countries have followed an “equality of opportunity” path with more pre-fisc equality and less fiscal redistribution, does their example suggest a strategy for egalitarian growth that others might follow?

It may indeed be possible for other countries to emulate those three key policies regarding mass public education, inheritance taxation, and control of immigration. The three differ, however, in their appeal and their ease of transfer to other settings. To start with the third, the tight restrictions on immigration and naturalization could be emulated by many other countries seeking to protect ethnic homogeneity and workers’ wage rates. That is a melancholy strategy, because it raises global inequality if the foreigners kept out come from low-income settings, and lowers the gated community’s access to new skills and ideas, possibly lowering economic growth. It is, however, a feasible way of defending domestic equality.

Also feasible, and more easily defensible, is the second policy, that of taxing inheritances and intra-family gifts at a high rate, like the 50 percent rate practiced in East Asia. Taxing inheritances should have no negative effects on the level of GDP as long as the (typically small) extra revenues go to reducing some other more distortionary tax or to financing productive public investments. A high rate of taxation on inheritances also has an ethical appeal: One can more easily assert that each new generation of rich really did earn its way if it owed a smaller share of its lifetime resources to inheritance.

The first policy, that of investing more heavily in egalitarian primary and secondary education, funded by taxes, deserves to remain in the spotlight in any debate over alternative paths to equality. Its appeal is obvious: It promotes both equality and growth. Primary and secondary education have historically maintained even higher measured rates of return than higher education, and the empirical literature shows that they bring positive externalities beyond what is usually measured. Yet this appealing prescription has quite different effects in developing

versus developed countries, and even the role of the East Asians in the international contrasts has not been what this appealing prescription might imply.

For a country that is still developing, the case for investing more in mass education is compelling, both today and when today's leading countries were developing in the nineteenth century. In the developing world, public primary and secondary education have been shown to be highly progressive in their incidence, and highly effective in raising GDP. They contrast with subsidies to higher education, which are not progressive, are often even regressive, and have lower average social rates of return.<sup>26</sup> As long as there are more children of school age not yet enrolled in primary and secondary schools, the taxpayers should pay to complete their primary and secondary education.

Indeed, developing countries' taxpayers should invest not only in extra years of schooling but also in raising the quality of that schooling. While returns are harder to measure at this intensive margin than at the margin of extra years of schooling, international evidence suggests a very positive slope of returns for developing countries' investments in the quality of mass education. That suggestion emerges fairly clearly when we compare countries' public inputs into primary education with the "quality" of students' learning as of age 15. Figures 8 and 9 hint at the recent gains in quality – i.e. the PISA achievement scores of 15-year-olds – in relation to raising two measures of inputs. The output measure is the nation's average of nine PISA scores for mathematics literacy, reading literacy, and science literacy in the 2006, 2009, and 2012 testing rounds, shown in both figures and in Table 2. The two internationally available measures of inputs are real PPP dollars of public spending per primary school student in the year 2000 (Figure 8) and teachers per 100 children of primary-school age in 2000 (Figure 9).

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<sup>26</sup> For measures of the progressivity of primary and secondary education, and the non-progressivity (often regressivity) of university education in Latin America, see Lindert-Skoufias-Shapiro (2006), Lustig *et al.* (2014), and the ongoing Commitment to Equity project headed by Nora Lustig (2014).

On its average rates of return around the world, see Psacharopoulos and Patrinos (2004), and the vast earlier literature cited there. Note that the rates of return in this literature refer to extra years of education (the extensive margin) and not to extra inputs for a given number of years (the intensive margin).

Developing countries, shown to the lower left in input-output space in both Figure 8 and Figure 9, could presumably achieve higher learning quality for their 15-year-olds by raising their inputs up to those of, say, the United States, though the usual caveat about correlation and causation applies. Raising the average quality of learning and the number of years of schooling (shown in Table 2) could foster equality in their later earnings, just as it could raise their average productivity. Thus Figure 8 and 9 leave an invitation to developing countries, the same invitation that Latin American governments have historically passed up, underfunding mass education while shifting government expenditures toward non-progressive public pensions.<sup>27</sup> The gains would seem to await them, like money on the sidewalk. Indeed, developing countries in all continents have already been catching up rapidly, expanding enrollments faster than the leading countries did in the nineteenth and early twentieth centuries. That is true even in Latin American, albeit not as rapidly as in East Asia.<sup>28</sup>

Today's already developed countries, however, have not been sent any such invitation to promote equality and efficiency simply by raising inputs into primary and secondary education. Looking either at Figure 8 or at Figure 9, let us imagine what they suggest about Britain's becoming like either Norway (in Figure 8) or Denmark (in Figure 9), pouring more money and more teachers into public primary and secondary education, and resembling these Scandinavian countries in all other relevant ways. Both figures suggest no change at all in PISA scores, our crude proxy for the quality of learning in primary and secondary school. Extra inputs per child make no visible contribution to learning, skills, equality, and productivity. For the already developed countries, we seem to be back to the world of the "does money matter?" debate between Eric Hanushek and his critics. There seems to be a threshold of education development, beyond which the quality returns from extra public spending become more elusive, and more dependent on institutional features

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<sup>27</sup> See again the sources cited in footnote 24, plus DeFerranti *et al.* (2004, Chs. 6, 7, and 9); Frankema (2009); Engerman, Mariscal, and Sokoloff (2009); Lindert (2010); and Arroyo Abad and Lindert (2014).

<sup>28</sup> For a broad historical and global perspective on enrollment rates, see Clemens (2004).

of the education delivery system rather than on extra money and extra teachers. Certainly for the United States and other leading countries, the gains from higher budgets are more elusive than they were before the 1960s, when the extra resources went into expanding enrollments.<sup>29</sup> The gains from putting extra resources into public schooling are thus obvious when society pushes at the education “quantity” margin, getting the massed more fully enrolled in primary or secondary school, than when society pushes at the quality margin.

As already hinted, even the role of our three East Asians in the international contrasts disrupts the usual story about committing more resources to education. Japan, Korea, and Taiwan show a curiously efficient performance in Figures 8 and 9, with top test scores and low inputs per child. Indeed, the share of national income spent on public education is not high in Japan, Korea, or Taiwan.<sup>30</sup> So while East Asians’ performance does support the usual story relative to developing countries – the East Asians spend more per student than the average developing country, and

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<sup>29</sup> On the clear gains from extra public education expenditures for the US cohorts educated before the mid-1960s (i.e. the birth cohorts up to 1950), see Loeb and Bound (1996).

For the post-1970 era, the “does money matter” debate has rested for some time in the same stalemate position it had reached when aptly summarized by Burtless (1996). However, two NBER working papers by Jackson, Johnson, and Persico (2014, 2015) have now succeeded in isolating the effects of exogenous changes in school spending per pupil caused by court-ordered school finance reforms since the 1970s. The reform-induced increases (decreases) in school expenditure per pupil cause significant gains (losses) in education attainment and earnings, especially for students from lower-income backgrounds. This significant effect contrasts, of course, with the developed-country flatness of Figures 8 and 9. The contrast can be interpreted as a result of differences in counterfactuals. Figures 8 and 9 can only compare broad differences in the entire environments of education in different countries (e.g. with counterfactuals like “what if Britain were like Denmark”), without achieving identification of the effects of specific institutional shocks.

<sup>30</sup> This sentence is based on the shares of all government expenditure in GDP for 2010 given by Unesco ([data.uis.unesco.org](http://data.uis.unesco.org)), except that for Taiwan, the source is the *Taiwan Statistical Data Book for 2014*, which gives all expenditures on “education, science, and culture”. Even though the Taiwan expenditure measure seems to cast a wider net, its 2010 share of all such government spending was only 4.0 percent, versus 5.4 percent for government education expenditure in the United States.

get good test-score results – their contrast with other developed countries unplugs any simple prescription about spending more.

To view the flipside of the same coin, a puzzling inefficiency in delivering education seems to be one of the reasons that the United States, the United Kingdom, and Canada have experienced rising income inequality since the 1970s. All three countries spend high shares of GDP on public education, yet they have turned in mediocre test scores on PISA and TIMSS since these tests became widespread. If the test results bespeak an effect on the supply of skills, then inefficient public education in these countries, especially in the United States, may be one of the culprits in skills deceleration and the widening of the gaps in wage rates and market incomes.

## Implications and agenda

Thomas Piketty's book has implied that you can have more egalitarian redistribution without compromising the level or growth of GDP. He has underlined this point by reminding us that the era in which the top tax rates on income and inheritance were at their peak in four leading countries was also the era in which those countries enjoyed their fastest growth in GDP per capita.<sup>31</sup>

The econometric evidence continues to favor a softer variant on his view on the growth issue.<sup>32</sup> While history does not yield randomized trials, it consistently has failed to reveal any clear effect on GDP of any of these social choices. In this sense of no clear effect on GDP of the range of social policies actually practiced since 1960, smart egalitarian policies seem to be a “free lunch”. There is no evidence that real-world countries face any “trade-off between efficiency and equity”, when becoming either a welfare state or a country that keeps incomes relatively equal by equalizing people's market incomes. That is where the debate about equality and

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<sup>31</sup> Piketty, *Capital* (2014, Chapter 14).

<sup>32</sup> The latest tests are offered in Ostry *et al.* IMF paper 2014. For a summary and extension of earlier tests, see Lindert (2004, Chapters 10 and 18).

growth seems to stand, now that Thomas Piketty and the rest of the World Top Incomes Project team have taken the debate to a whole new level.

Yet a new frontier has been opened in the history of income inequality. Could the same post-fisc equality have been achieved, without affected GDP, by following the alternative path of relying on pre-fisc equality? That is, could one have achieved the welfare state's equality of outcomes, and at least the same GDP per capita, without such large fiscal redistributions? The number of rich democracies crossing the egalitarian finish line by this alternative path is not so great as the number of welfare states. Still, a top research priority is to press on with the task of explaining the differences in performance in the sectors that enhance – and equalize --the human productivity of the broader population. How did the three East Asians do it, if not by spending more than other developed countries? The debate over the sources of inequality brings us back to the unresolved issue of how to make efficient public investments in human beings.

\* \* \* \* \*

Figure 1. Income Shares Received by the Top 1 percent in 26 Countries, 1870-2010

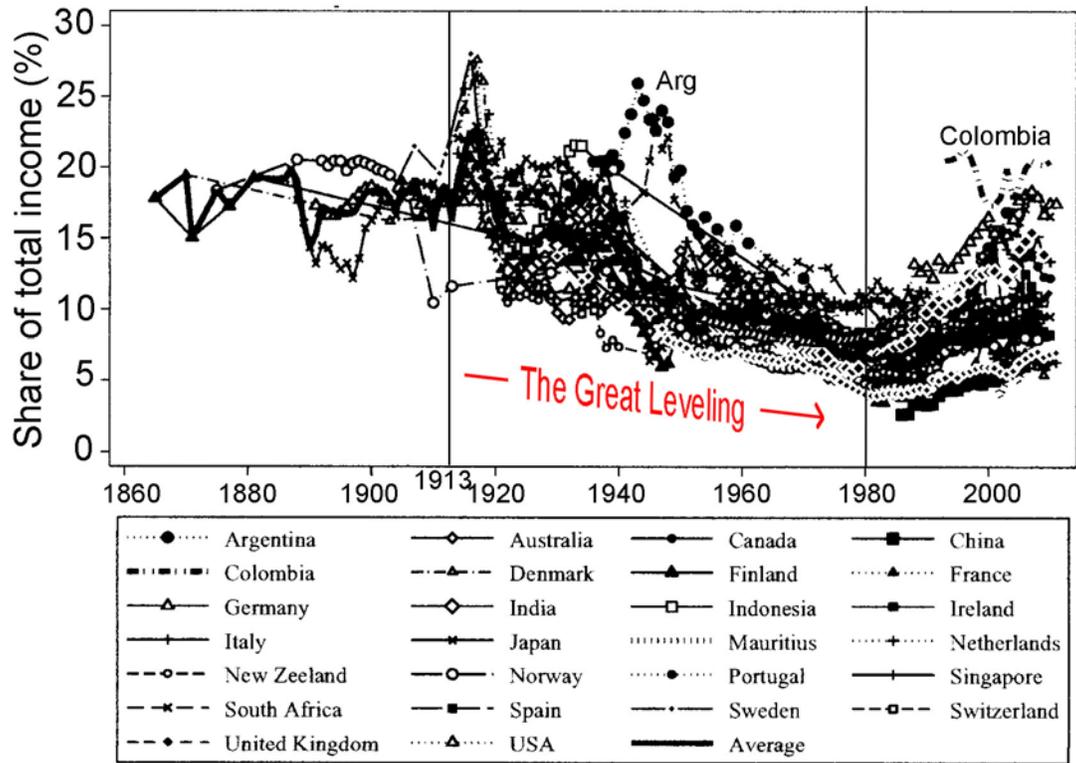


Figure 2. How the Top One-percent Share Related to Labor force Growth, 1920-1970 versus 1970-2010

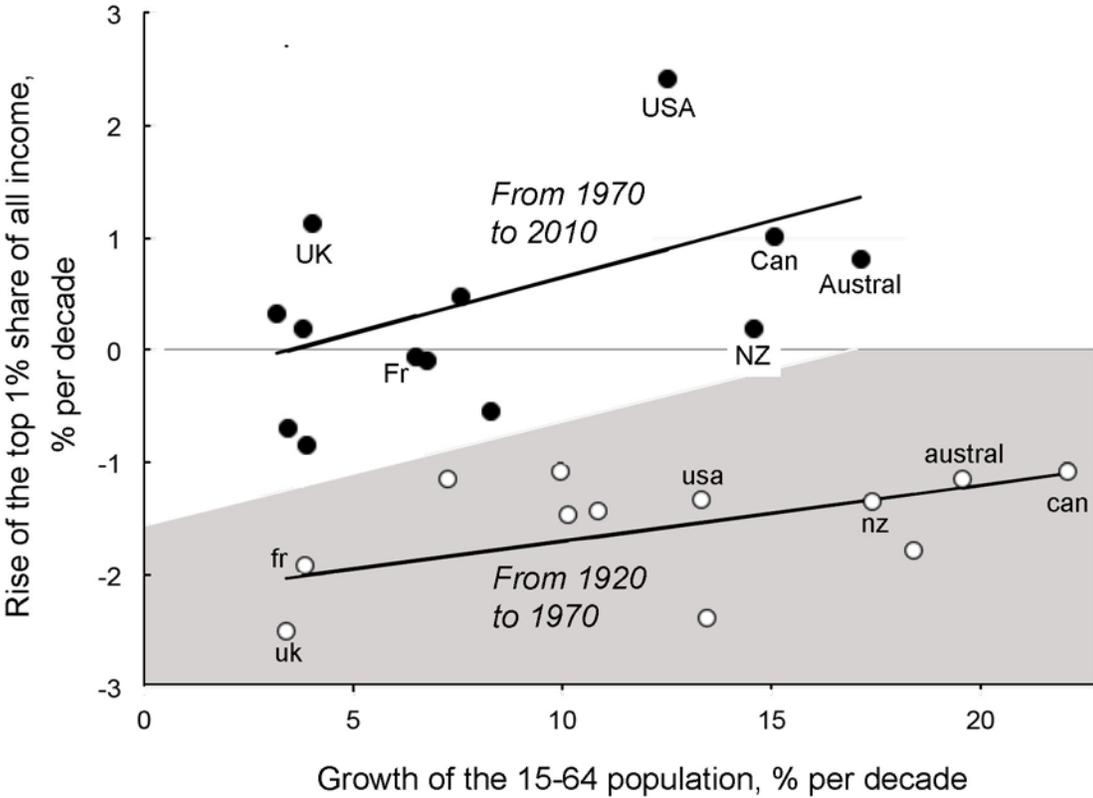


Figure 3. Top One Percent's Share of Income in Four Countries, in Recent Centuries

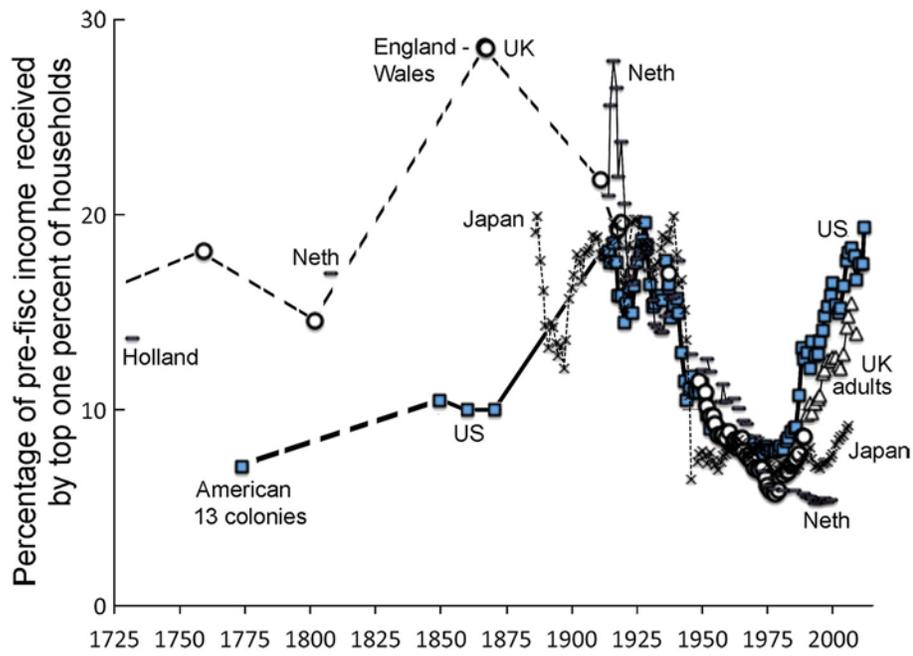


Figure 4. Income Inequality in America, Britain, and the Netherlands 1732 - 2010

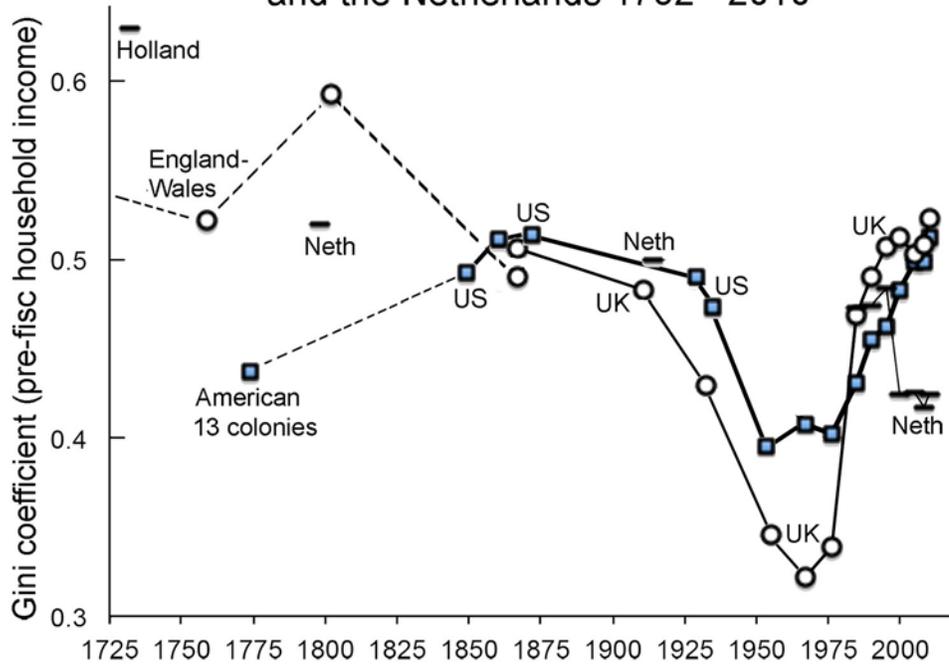


Figure 5. Black / White Ratios of Earnings per Worker and Income per Capita, 1774 - 2010

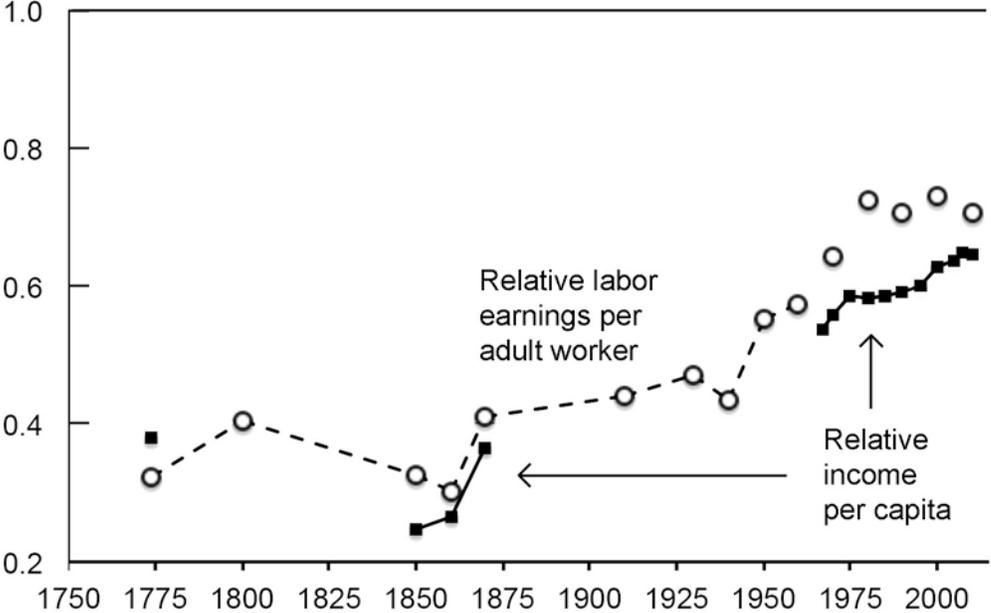


Figure 6. Female / Male Wage Ratios  
in the United States, 1820 - 2010

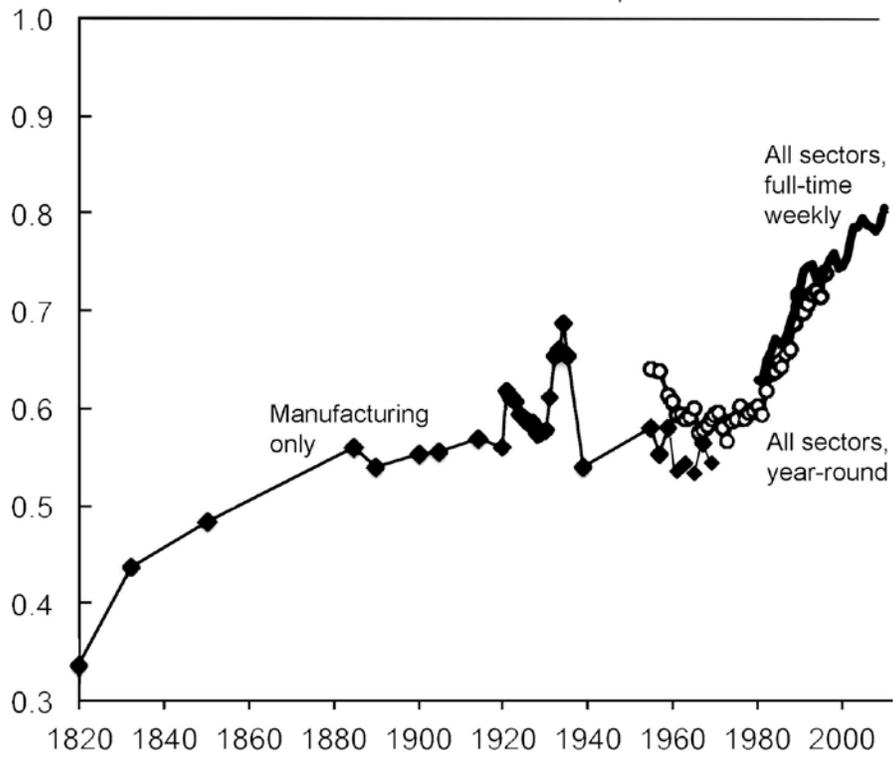


Figure 7. Rise in Wage Inequality 1977-2007 versus Growth in Education Attainment

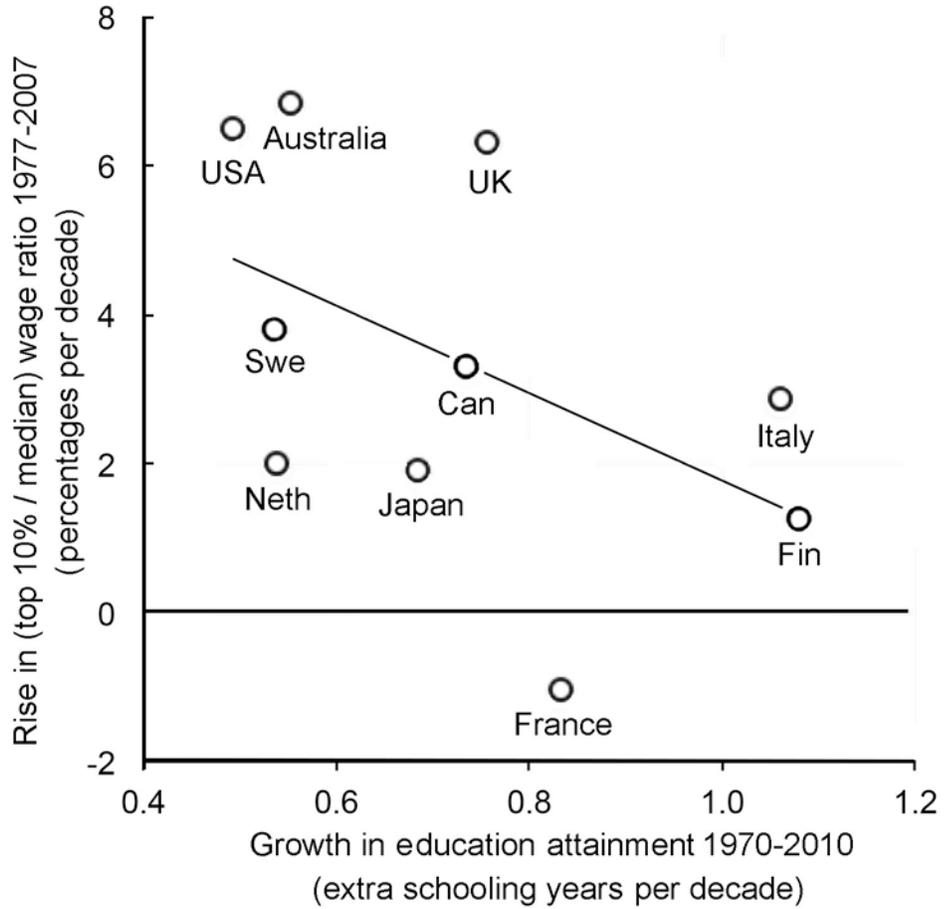


Figure 8. Real Government Expenditure per Primary-School Pupil, 2000, and PISA Scores 2006-2012

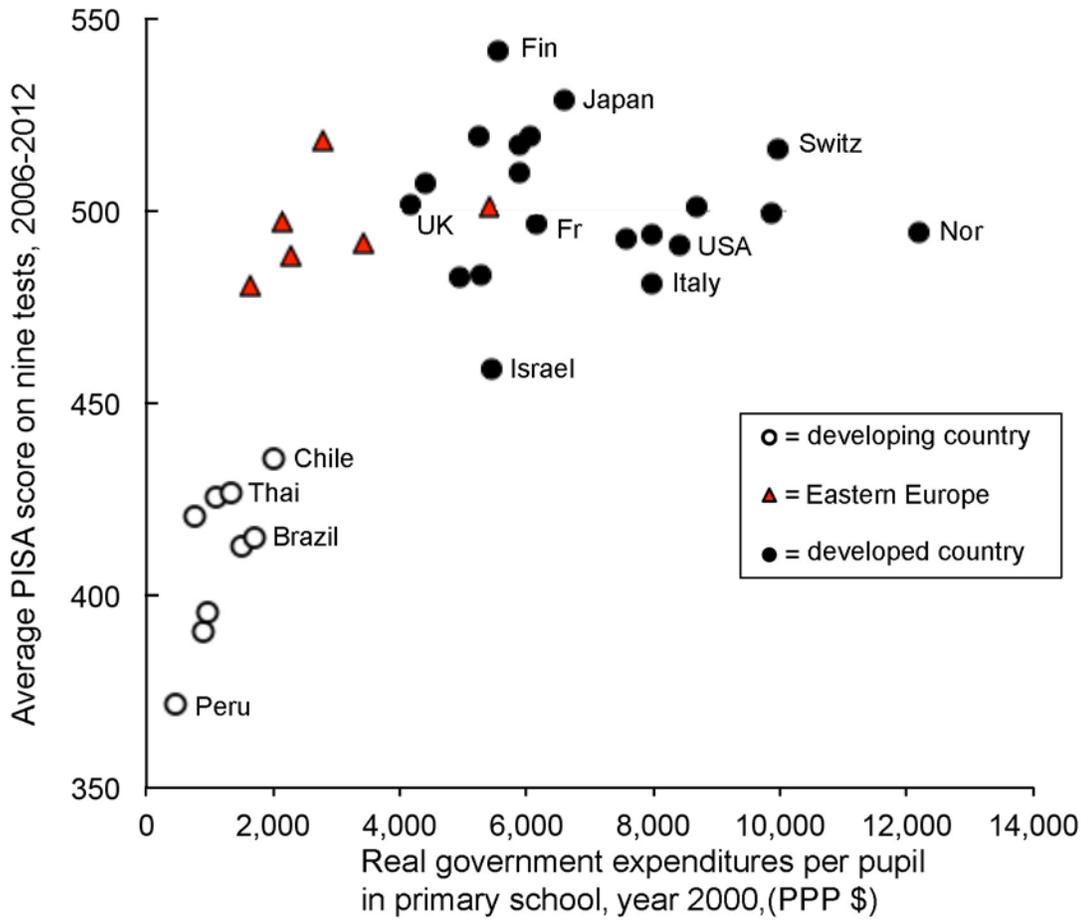
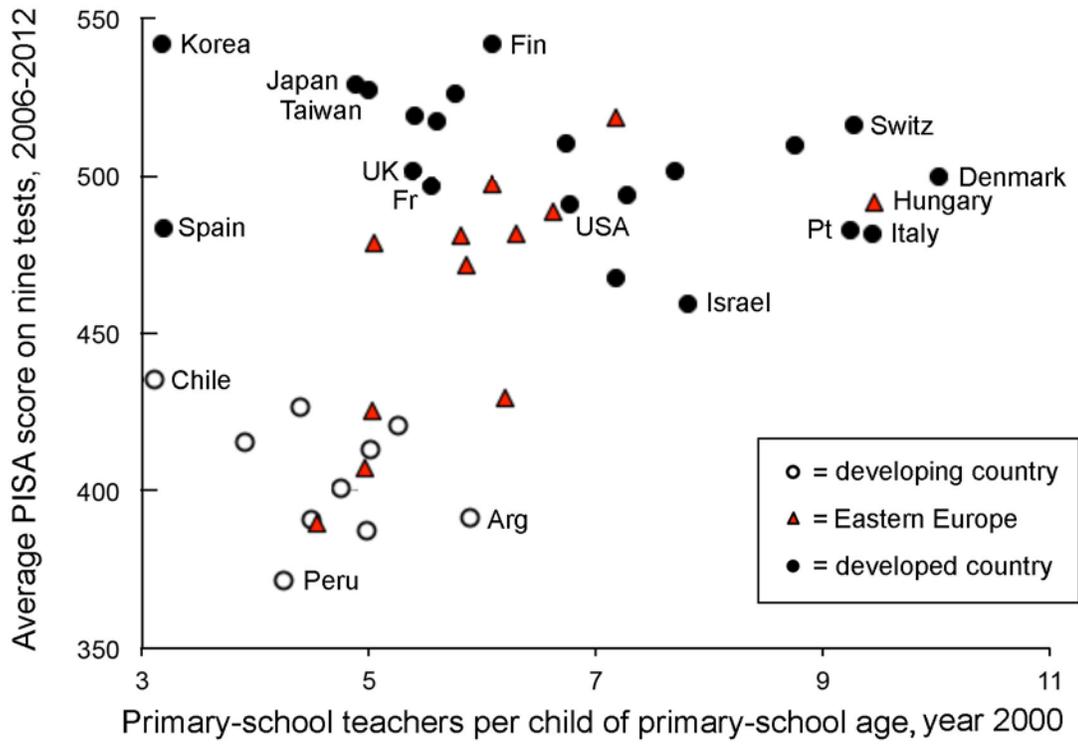


Figure 9. Teachers per 100 Children of Primary-School Age, Year 2000, and PISA Test Scores 2006-2012



Sources and notes to Figures 8 and 9 (see also the sources and notes to Table 2):

The PISA score dependent variable for 2006-2012 is from OECD (2006-2012). Nine scores were averaged together to reduce the effects of possible biased sampling in any one exam. Some countries did not take all nine exams (e.g. no 2006 reading tests for the United States), and for these the remaining six or eight test scores were averaged.

The Eastern European countries are noted separately in Figures 8 and 9 because they inherited a mandate for mass education from their years in the Soviet orbit, thus raising the quantity and quality of their schooling for given levels of GDP per capita.

The two different input measures (data.uif.unesco.org) have their advantages and disadvantages. The real expenditure measure covers all expenses in the numerator, which is more intuitive, yet has a less appropriate deflator and denominator. Figure 8's use of a GDP deflator understates differences in the price of school inputs, which consists mainly of teacher wages, and their denominator (primary students) misses those who were not in school, a problem in developing countries. Figure 9 simplifies by using the number of teachers as the only input, partly solving the deflator problem, and uses all children of primary-school age as the denominator. The corresponding OECD measures, from its *iLibrary and Education at a Glance*, given broadly similar, but not identical, data for primary school inputs, using per-pupil measures.

The use of input data from 2000 refers to a year in which the PISA exam takers of 2012 were as young as 3 years old. Yet the input levels correlate very strongly, across countries, regardless of the choice of input year near the start of this century. Using, say, input data for 2003 would have given the same qualitative results.

Table 1. Rich Democracies that Have and Have Not Kept Incomes “Equal” since 1980

	Was this a Welfare State 1980-2007?		
	Yes	Marginal	No
Unequal before and after redistribution	..	UK	Portugal, Singapore, USA
Unequal before, equal after (highly progressive redistribution)	Austria, Denmark, Finland, France, Germany, Italy, Norway, Spain, Sweden	Greece, Netherlands	Australia, Canada, Ireland, Switzerland
Equal before, unequal after	..	..	..
Equal before and after	Belgium	..	Japan, Korea, Taiwan, NZ

Sources and notes to Table 1:

The sources are Solt (2014) for standardized gini coefficients, OECD iLibrary for social expenditures (excluding education) as a share of GDP, and Polity IV on democracy. In February 2015 it will be possible to crosscheck the Solt Standardizations against a revised “webtab” set of estimates from the Luxembourg Income Study site.

Unequal before redistribution = a gini coefficient of pre-fisc market income of 0.40 or greater. Equal before = the same gini < 0.40.

Unequal after = a gini coefficient of post-fisc net income ≥ 0.34.

Equal after = a gini coefficient of post-fisc net income < 0.34.

A country's “welfare state” status is here defined by its average share of social expenditure in GDP. “Yes”, welfare state = above 21 percent, “no” = below 19 percent, “marginal” = 19-21 percent.

The time span “since 1980” emphasizes conditions in the non-recession era 1995-2007. The categorizations would have looked much the same starting in 1980, except that the inequality of pre-fisc incomes would have been lower before 1995 than after that year.

The Polity index rates Korea as a democracy since 1989, and Taiwan as a democracy since 1992. Singapore is still not a democracy.

Table 2. Income Inequality and Education Attainments  
in Three Kinds of Rich Democracies, Year 2010

Country	Mkt gini	Net gini	Top 10% share (%)	Years of schooling	PISA 2006-12 9-score ave.
<i>(1) Welfare states --</i>					
Austria	42.6	27.4	n.a.	11.7	501
Denmark	46.7	25.3	26.9 (a)	12.3	500
Finland	45.1	25.6	32.5	12.3	542
France	46.1	30.0	32.7	11.4	497
Germany	48.2	28.6	n.a.	12.7	510
Italy	47.2	32.7	33.9	11.0	481
Spain	40.9	33.3	32.1	10.3	483
Norway	36.9	23.1	28.0	12.7	494
Sweden	48.5	25.8	28.3	12.1	494
<i>(2) The Pacific four --</i>					
Japan	36.3	29.4	40.5	13.1	529
Korea	35.4	32.0	43.3	13.3	542
Taiwan	32.4	29.6	n.a.	13.3 (c)	527 (d)
New Zealand	35.4	31.1	29.2 (a)	12.5	519
<i>(3) Other rich democracies --</i>					
Australia	43.3	33.3	31.0	13.2	517
Belgium	33.1	25.2	n.a.	11.4	510
Canada	42.8	31.4	40.1	13.3	526
Greece	43.1	33.3	n.a.	10.7	468
Ireland	45.2	29.4	36.1	10.6	507
Netherlands	39.3	27.0	30.7	11.5	519
Portugal	50.4	33.3	n.a.	7.9	483
Switzerland	40.7	29.8	33.2	12.6	516
UK	47.4	35.7	38.1 (a)	13.3	501
USA	46.9	37.3	46.4	13.2	491

[Table 2, continued]

Country	Mkt gini	Net gini	Top 10% share (%)	Years of schooling	PISA 2006-12 9-score ave.
<i>(4) Not rich and/or not a democracy –</i>					
Philippines	47.6	50.2	n.a.	8.6	n.a.
China	47.9	47.4	n.a.	6.8	n.a.
Hong Kong	47.7	44.9	n.a.	n.a.	547
Thailand	49.0	51.9	n.a.	8.5	426
Malaysia	49.7	45.6	n.a.	10.2	413
Singapore	46.8	43.3	39.6	11.2	549
Indonesia	49.4	49.2	n.a.	8.0	387
India	50.7	49.7	n.a.	5.3	n.a.
South Africa	61.8	59.4	16.8	8.8	n.a.
Argentina	41.2	39.9	9.2	8.3	391
Brazil	50.4	46.7	n.a.	8.2	396
Colombia	50.5	48.3	20.5	7.8	391
Costa Rica	46.3	45.1	n.a.	7.7	427
Mexico	46.4	44.1	n.a.	8.4	415
Uruguay	46.5	41.9	14.3	9.0	420

Sources and notes to Table 2:

(a) Counting all adults, even those who were not household heads or tax filers. These estimates overstate the shares slightly.

(b) With a Polity “democracy” score of only 2, and an autocracy score of 4, in the year 2010, Singapore does not qualify as a democracy, yet is included here to meet the likely demand for comparisons involving that country.

“Welfare states” are those for which social expenditures were more than 20% of GDP, using the OECD definition that excludes public education.

The market gini (pre-fisc) and net gini (post-fisc):

These are standardizations of selected WIID estimates on the internet site of Frederick Solt (2014). See also Solt (2009). They are based on household surveys, and do not include the upward adjustment of top incomes based on tax data. The gini coefficients refer to the year 2009 for the Philippines, China, and India.

Top 10% shares:

The World Top Income Project site ([topincomes.gmond.parisschoolofeconomics.eu](http://topincomes.gmond.parisschoolofeconomics.eu)), using the (pre-fisc) shares without capital gains. The top 10% shares refer to the year 2009 in the cases of Finland, France, Ireland, Italy, and Switzerland.

Years of schooling:

Source: <http://soto.iae-csic.org/Data.htm>, accessed 18 June 2009, results for the over-15 population. See also Cohen and Soto (2007), with projections to 2010.

(c) For Taiwan, the *Taiwan Statistical Data Book 2014* gives shares of the over-15 population having attained different levels of education. While this measure cannot be matched to that of Cohen and Soto, comparison of the Taiwan shares with those of countries in the Cohen-Soto study suggests that Taiwan's adult education attainment is between that of Korea (13.3) and the United States (13.2).

PISA scores 2006-2012:

OECD, [www.oecd.org/pisa](http://www.oecd.org/pisa). The exams are given to 15-year-olds in randomly sampled school districts. Scores above 502 are significantly above the international average among the countries administering the test. These are simple averages of the test scores on mathematics, reading, and science in 2006, 2009, and 2012, with these gaps in coverage: no test scores in 2006 for Costa Rica, Malaysia, Philippines, and Singapore; none in 2009 for Austria; and no reading test score in the United States for 2006.

(d) The test scores for Taiwan refer to "China – Taipei".

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