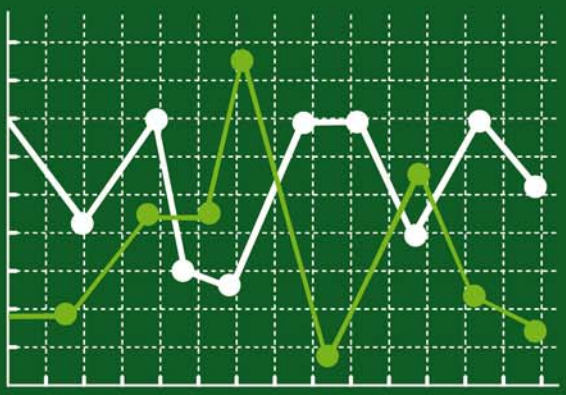
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# Growing Income Inequality as a Challenge to 21st Century Capitalism

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**Abstract**

Income inequality has increased in both developed and developing countries, and this growing inequality is in large part due to a shift in factor shares in favor of capital and to the detriment of labor. Factor shares have varied systematically over the post-World War II period, rising until the late 1970s and then falling until now. Explanations for the decline in labor's share include technical progress, globalization, a decline in labor's bargaining power, and increasing energy prices. These drivers of income change are likely to persist for the foreseeable future, meaning that income inequality will continue to increase. We show that growing inequality tends to reduce political stability and the ability of governments to protect citizens against predation and also to reduce education attainment. Since good institutions and education are key drivers of the growth of total factor productivity, growing inequality thus poses a serious risk for the capitalist system.

Key words: factor shares, labor incomes, globalization, technological progress, energy, economic growth

## I. Introduction

The September 18, 2013 issue of the *Financial Times* published an article reporting that the median income of an American family was less in real terms in 2012 than it had been in 1989 (Harding, 2013). The article further reported that, in 2012 alone, the income of the top 1 percent of the United States population increased by nearly 20 percent while the remainder of the population saw an increase of only 1 percent. These observations are but two stark examples of growing income inequality in the United States, characterized not only by nearly a quarter of a century of stagnant incomes for half the population but also by rapidly growing incomes for a small fraction of the population. Nor is the problem of growing inequality one that is limited to the United States as the Gini coefficient, a widely used measure of income inequality, has increased by 10 percent since the 1980s in all OECD countries.

Observers often attribute such growing inequality to cyclical effects, including the consequences of the recent "great recession". For example, Harding (2013) quotes one observer of the US situation thus: " We just haven't seen enough job growth…There's so much unemployment and so much slack that it's a buyers' market for labour…." In this paper we argue that the growing income inequality is a global phenomenon and that it is due to long-run forces rather than to cyclical factors and that a key driver of growing inequality is the evident shift in the distribution of income between labor and capital. We examine the evidence for a shift in factor income shares in favor of capital and against labor, review some explanations for this shift and discuss what such a shift implies for our perceptions

of capitalism as system that can generate steady improvements in productivity and welfare. We close with some evidence on how growing inequality influences the drivers of economic growth in capitalist economies.

One reason why the distribution of income between labor and capital has not figured as prominently as it should in the discussion of growing income inequality is that it remains a widely accepted belief that the distribution of income between labor and capital is fixed, although this belief has recently been challenged. In the next section, we critically review the evidence for the two sides of the argument and conclude that the evidence is rather clear that, since the end of World War II, if not before, there were large and systematic shifts in the distribution of income between the two factors of production. We also review recent research that seeks to uncover the reasons for these shifts.

**2. Tends in Factor Shares and Their Causes**

A key determinant of the distribution of income in the population is the distribution of aggregate income or GDP between labor and capital. This affects the distribution of income in a fundamental way because, while there is some measure of labor income disparity that reflects differences in wages due to workers' differing skill levels, these differences are much smaller than are the differences among households in the amount of capital that they own. For example, in the sample of 50 developed and developing countries examined in this paper, the Gini coefficient for income is 0.353 while the Gini coefficient for wealth is 0.683. Because the inequality in the distribution of capital among households is much greater than are the differences in their labor incomes, any shift in income shares in favor of capital

must result in greater income disparities. While tax and redistribution policies may mitigate the effects of such shifts in income shares on income inequality, they are not likely to offset them.[1]

The role that the distribution of income between capital and labor plays in growing income inequality has been largely ignored, in part due to the widely-held belief that the distribution of income between labor and capital is fixed. This belief stems in part from Keynes' (1939, p.48) observation that there is a "stability of the proportion of the national dividend accruing to labour, irrespective apparently of the level of output as a whole and of the phase of the trade cycle. This is one of the most surprising, yet best-established, facts in the whole range of economic statistics, both for Great Britain and for the United States. It is the stability of the ratio for each country which is chiefly remarkable, and this appears to be a long-run, and not merely a short-period, phenomenon."[2]

It is not only Keynes' claim that inclines economists to this belief. A second source of this belief is the extensive use of the Cobb-Douglas (CD) production function in economic pedagogy and research. An obvious implication of this function,

$$Y = AK^{\alpha} L^{(1-\alpha)} \qquad \text{Eq. 1}$$

[1] This is all the more the case when we recognize that tax and redistribution policies in many countries favor the wealthy rather than the poor.

[2] It is worth noting that Keynes is referring to the share of *"manual labor"* in national income. One of the sources of controversy about the distribution of income between capital and labor is that the distribution is not easy to estimate. Much of the difficulty arises in allocating the income of self-employed individuals who utilize their own capital and land in their businesses or farms. Their aggregate income has to be imputed to capital and labor along rather arbitrary lines. Some of the literature cited in this paper uses data on employees' share of national income, which is easier to measure but obviously misses the income of the self-employed. See Gollin (2002) for a useful discussion of this and other topics related to the measurement of factor shares and their comparability across countries.

where $Y$ is aggregate output, $K$ is the stock of capital and $L$ is labor input, is that, if each factor is paid its marginal product, capital's share will be $\alpha$ and labor's share will be $1-\alpha$. Indeed, the fixity of factor shares in the CD production function was a key implication of this function used by its proponents to overcome the considerable professional resistance that the CD function faced in its early years (Cobb and Douglas, 1928; Douglas, 1976).

The earliest challenges to the belief that factor shares were fixed came from Phelps Brown and Hart (1952) and Solow (1958). Solow, who examined labor's share of income in the United States from the Great Depression to the early post-World war II period, found large fluctuations in labor's share as well as evidence of a secular upward trend in labor's share toward the end of his sample period. In recent years, there has been a renewed interest in examining the distribution of income between capital and labor, and it, too, confirms that factor shares are not constant. Moreover, not only are they not constant, but there appears to be a clearly discernible trend in favor of capital.

Most studies deal with developed countries. Krämer (2011) reports that labor's share in National Income in the G-7 countries has fallen from a peak of 74 percent in 1974 to 64 percent in 2010, meaning that labor receives 10 percent less of National Income than it did some thirty years ago. Guscina (2006) examines a longer time period and reports that, for the OECD countries, labor's share increased steadily from 0.50 in the early 1960s to a peak of nearly 0.58 in the late 1970s and then slid to

less than 0.52 by the end of the century.[3] These results are not driven by events in one of a few large OECD countries, although the findings for individual countries do vary somewhat. Guscina's findings show that, in many OECD countries, labor's share grew up until the end of the 1970s or early 1980s and then declined. Table 1 reports, for a sample of OECD countries, five year averages of labor shares for the starting period of her analysis, for the peak labor share attained in the country and for the ending share. Guscina's results suggest that the upward trend in labor's share that Solow observed at the end of his sample period continued into the 1970s, with labor shares rising, peaking in the late 1970s or early 1980s, and then beginning a secular decline that continues to the end of the sample period. Arpaia and Pichelmann (2008) broadly confirm these findings using annual data for a sample of European countries. Thus, for developed countries, most observers now agree that factor shares are not constant and that the post-World War II period has seen a secular increase in labor's share up until the late 1970s or early 1980s and then a decline up to our time.

Evidence for developing countries is provided by Maarek (2009) who finds that labor's share of income fell by 10 percent of GDP between 1980 and 2000 in lower- and lower-middle income developing countries. Note that this decline is almost identical to that observed by Krämer (2011) for the G-7 advanced economies over a similar period. Only for the upper-middle income countries is the decline in

[3] Differences in labor's share among studies reflect not only different country coverage, but also the fact that some studies allocate proprietors' incomes between capital and labor's shares while others consider wage income only as the variable to be examined.

labor's share less.[4] Diwan (2001) finds that, in Latin American countries, labor's share peaked in 1982 and subsequently declined, while in Africa the peak occurred in 1975 and was also followed by a sharp decline. Rodriguez and Jayadev (2010) provide probably the most comprehensive study of factor shares in terms of country coverage and also one that makes a concerted effort to provide a more comprehensive measure of labor shares. They, too, find a downward trend in all regions of the world after the early 1980s.

Thus, the preponderance of evidence suggests that we can take as a stylized fact that labor' share of income has not been stable in the long run, and that, in both developed and developing countries, it increased up to the late 1970s or early 1980s, and, after that, is has declined sharply, in many countries by as much as 10 percent of GDP.

## 3. Explaining Why Factor Shares Vary

### *3.1 Technological Change and Changes in Factor Endowments.*

One explanation put forward for these developments is capital accumulation and/or technological change. For these to have an influence on factor shares, however, it is necessary to abandon the CD production function for one where the elasticity of substitution between labor and capital is not constrained to a value of 1, as it is in the CD function. A popular option is the constant elasticity of substitution (CES) production function (Arrow et al. 1961)

[4] For the upper-middle income countries there was reversal of the downward trend in 1989, perhaps due to the effects of the collapse of communism and the transition to a market economy in Eastern Europe and the former Soviet Union if these are included in the group of upper-income developing countries. The transition recession would have reduced profits and thus capital's share, while the end of government allocation of incomes through central planning may have favored labor's share as well. Less is known about the distribution of income in the transition economies, although Growiec (2012) finds that, in Poland, labor's share began to decline after 1999 following seeming increases.

$$Y=A[\alpha(K)^{(\sigma-1)/\sigma} + (1-\alpha) L^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \quad \text{Eq. 2}$$

which can be modified into a version where $A$, technological progress, is labor augmenting or capital augmenting so that

$$Y = [\alpha(A_K K)^{(\sigma-1)/\sigma} + (1-\alpha)(A_L L)^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \quad \text{Eq. 3}$$

where $A_K$ and $A_L$ indicate capital-augmenting and labor-augmenting technical progress respectively. In the CES function, both factor-augmenting technical progress and changes in the capital-labor ratio will change labor's share. Letting $SL$ and $SK$ be labor's and capital's share in national income, and setting $A_L = 0$ to conform to an argument about the effects of technical progress on US labor's share of income that we discuss below, we have

$$\partial SL/\partial A_K = -\alpha(\sigma-1/\sigma) A_K^{-1/\sigma} (K/Y)^{(\sigma-1)/\sigma} \quad \text{Eq. 4}$$

Note that the effect of capital-augmenting technological progress as given by Eq. 4 depends critically on the value of $\sigma$, the elasticity of substitution between labor and capital. If $\sigma < 1$, then capital augmenting technological progress will increase $SL$, but if $\sigma > 1$, $SL$ will decline.

A similar result obtains for the effect of the capital-labor ratio:

$$\partial SL/\partial(K/Y) = -\alpha(\sigma-1/\sigma) A_K^{(\sigma-1)/\sigma}(K/Y)^{-1/\sigma} \quad \text{Eq. 5}$$

If $\sigma < 1$, then SL will increase with an increase in $K/L$, but if $\sigma > 1$, SL will decline.

A popular explanation for the rise and then fall of labor's share of income in the post-World War II period is that, in the first part of this period, technical progress was labor augmenting, leading to rise in labor's share. In the latter part of the period, technological progress was capital augmenting, which would drive labor's share down if $\sigma > 1$. The explanation for the abrupt shift in the nature of technical progress

is the sudden emergence of the personal computer and the information technology (IT) revolution, which created what is often called "The New Economy", which began in the late-1970s, and the many productivity changes, especially in service sectors, associated with it.[5] Jaumotte and Tytell (2007) examine a number of advanced economies and conclude that the IT/technological change phenomenon explains more of the decline in labor's share than do globalization and changes in labor market policies, two other explanations for falling labor shares that we discuss below.

A related argument that also rests on the CES production function is that there were changes in the global capital-labor ratio. What purportedly changed at the time that labor's share began to fall globally was the entry first of China and, later, of Eastern Europe and the countries of the former Soviet Union into full participation in the global economy. As these countries began to fully engage in international trade, the argument goes, because they were relatively labor abundant relative to the rest of the world, the "effective" global capital-labor ratio declined, which caused a fall in labor's share worldwide. Such an explanation has the virtue of explaining developments in both developed and developing countries.

***3.2 Globalization.***

Another explanation for the decline in labor's share is increasing globalization. A report by the International Labor Organization concludes that: "Overall, there is thus compelling evidence that a downward trend in labour shares has begun with the advent of globalization in industrialized and developing countries

[5] See Nordhaus (2002) for estimates of the productivity effects of the New Economy.

alike" (Lübker, 2007). The argument for globalization is complex, and it subsumes some of the third explanation of falling labor shares, a reduction in labor's bargaining power.

The most straightforward explanation of why globalization has resulted in a decline in labor's share, at least in developed countries, is the Heckscher-Ohlin model, which posits that, in trade between labor-abundant and capital-abundant countries, labor's share of income will decline and capital's share of income will increase in the latter. Note that this result holds even if the production technologies for the capital-intensive and labor-intensive goods are CD. Of course, while this explanation explains the decline in labor's share in advanced countries post-1980, its prediction that globalization should also increase labor's share in developing countries contradicts the evidence presented previously.

To overcome this obvious problem, advocates of globalization as a source of falling labor shares have turned to FDI as an explanation for the fall of labor's share in developing countries. Decreuse and Maarekz (2008) and Marek (2009) argue that multinational firms (MNCs) have a productivity advantage over local firms in developing-country hosts. Thus, when MNCs invest in a developing country, they are able to hire workers at the going wage, but because they have higher productivity than do local firms, this shift in employment from local firms to higher-productivity MNCs must mean that output, and thus total income, increases, but profits must grow even more rapidly while labor's income remains constant and, by simple arithmetic, capital's share of income increases and labor's falls. Even if, as is likely to eventually happen, wages begin to increase as more workers are competed away

from local firms or as aggregate labor demand growth produces a general wage increase, it will be some time before labor's share recovers its previous level.

A second argument as to why globalization reduces labor's share is that globalization has made capital much more mobile internationally while labor remains trapped behind national borders. This argument assumes that capital and labor bargain over the distribution of rents. The greater international mobility of capital has reduced the bargaining power of workers and increased that of the owners of capital, resulting in higher shares of income for capital and correspondingly lower shares for labor. Because owners of capital are able to move their assets to another country, the bargaining power of workers in the home country must, in part, reflect the lower wages that are available in other countries should the owner of the financial or physical capital choose to move his production there. Moreover, if the firms in the host country are subject to exogenous shocks such as exchange rate changes or financial crises, the greater bargaining power that capital mobility confers on foreign (and domestic) owners enables then to pass the effects of these shocks on to workers, thus lowering labor's share of income.[6] While the original idea originated with Rodrik (1997), it has been subject to considerable testing by Diwan (2001), Harrison (2002), Lee and Jayadev (2005) and Guscina (2006). These authors' results, for either developed or developing countries, do find that declining labor shares are associated with greater financial openness and with crisis episodes, and that

[6] This view was quite popular during the recent financial crisis in the United States and in Europe as well. The perception was that taxpayers and workers were asked to bear the burden of bailing out firms by means of stagnant wages, high unemployment and higher taxes while the owners of banks and firms were largely protected from the effects of the crisis.

increased labor protection as well as stricter controls on capital flows are associated with higher labor shares.

### *3.3 Labor Market Rigidities*

The third explanation for falling labor shares has elements in common with the argument just discussed that globalization has reduced labor's bargaining power. While admitting that globalization has a role to play in determining labor's bargaining ability, the proponents of this last view consider domestic changes in labor markets as the main source of labor's reduced bargaining power. Part of the explanation lies in labor market reforms that countries have introduced to make their labor markets more flexible (Grömling, 2010, Bental and Demougin, 2006)

Such efforts to liberalize the labor market, including reductions in the barriers to firing workers, to closing plants, to using part-time contracts with limited benefits and job rights, and efforts to limit the power of unions to bargain for their members have been attempted not only in European countries but also in the US and UK. In developing countries, too, workers' rights allegedly have been reduced, particularly with the influx of new workers into urban areas spurred by FDI-led industrialization.

Not only have workers bargaining rights been reduced by new laws and regulations, but they have also been eroded by declining union membership. In the US, Union membership declined from 36% of the labor force in the mid-1950s to around 10% now. Moreover, the growth of the service and public sectors in many countries has changed the nature of the sectors where unions predominate from manufacturing to services, and this may have shifted union membership toward lower-wage and lower-skill workers.

### *3.4 Energy Prices*

Brada (2013) argues that since there was a reversal in the trend in factor shares in both developed and developing countries in the late 1970s, one should look for a causal factor that also was marked by a reversal in trend at about the same time. Figure 1, which shows the price of a barrel of oil in constant year 2000 US dollars, shows that oil prices declined steadily until the 1970s, when the price of a barrel of oil jumped from $16.15 in 1973 to $51.21 in 1974 and then from $46.89 in 1978 to $94.94 in 1979; and it has risen since then, albeit with considerable volatility. Thus the downward trend in oil prices was replaced by an upward trend sometime in the 1970s.

After World War I oil began to displace coal as the4main source of energy, so that now it accounts for about 40% of world energy consumption. Thus, in the more recent period under examination, oil and its price should have had a profound effect on production and factor utilization in global production if we posit a CES production function with energy as an input alongside labor and capital. Moreover, this increase in the price of oil should have affected factor utilization not only in developed countries, which we often see as major consumers of energy, but also in developing countries, which, through the process of globalization that has shifted energy-intensive manufacturing away from developed countries, have also become increasingly dependent on oil as source of energy.

Oil consumption per dollar of GDP worldwide has fallen from 0.116 kilograms per dollar in 1980 to 0.060 kilograms per dollar in 2010 as measured in

2005 purchasing power parity dollars.[7] This implies that changes in the price of energy have led to significant long-term changes in factor utilization. For oil prices to have an effect on labor's share of income, energy has to be included as an input in the production function, and, for energy prices to influence labor's share of income, this needs to be a CES function where the elasticity of substitution between the inputs is not 1. In such a scenario, changes in energy prices and in the amount of energy used in production can affect the income shares of the other two inputs.

### *3.5 Summary*

The foregoing discussion establishes some important conclusions. The first is that the shift in factor shares in favor of capital is a world-wide phenomenon, one that is driven by long-run forces, not by cyclical factors. Thus we should conclude that these forces will continue to further reduce labor's share of income in the foreseeable future because increasing energy scarcity and growing energy demand will continue to increase energy prices; because globalization, both in terms of the volume of international trade and in terms of the volume of FDI, will continue to grow; and because technological progress, especially in the IT sector, will continue to play a major role in many economies. Even though the explanations provided above may not apply equally to all countries or to all of the period since the late 1970s, they do offer compelling explanations for this phenomenon.

The second conclusion is that the two-factor Cobb-Douglas production function may not be an adequate representation of the relationship between aggregate inputs and output for two reasons. The first is that the elasticity of substitution

[7] http://oilprice.com/Energy/Oil-Prices/The-Global-Economy-is-Now-More-Vulnerable-to-Oil-Prices-than-Ever.html

between capital and labor may not be equal to one, and the second is that energy may need to be included in the aggregate production function as an input. In the next section of this paper, we examine the implications of this conclusion for our understanding of economic growth.

## 4. Do We Need a Reinterpretation of Modern Growth Theory?

By modern growth theory we mean the narrative established by our profession that, prior to the industrial revolution, economic progress, as measured by per capita income, was quite slow, but that it accelerated dramatically with the onset of the industrial revolution in the United Kingdom, spread to Europe and North America and then became a worldwide phenomenon. Per capita incomes thus rose rapidly and these increases were fueled, not, as originally thought, by capital accumulation but rather by gains in total factor productivity, also early on called technological progress.

The seminal empirical contribution that defined the study of modern economic growth was that of Solow (1957) who used a CD production function to estimate that, of the entire change in output per worker in the US economy in the first half of the 20th century, about 13 percent was due to increases in capital per worker and the remaining 87 percent was due to an increase in total factor productivity (TFP). Thus, accurately measuring the sources of TFP growth is critical to the understanding of modern economic growth and of differences in per capita income levels and growth rates between countries.

Prescott (1998) describes well the implications of Solow's work. In about 1800, per capita incomes were roughly the same in major civilizations around the

world, and they had grown only slowly. After 1800, in Europe, per capita income growth increased by twenty-fold per century. Since the end of World War II, there has been an acceleration of per capita income growth elsewhere, especially in Asia. Because the main source of this growth has been, and is, TFP improvements, any understanding of the link between the characteristics of the capitalist system and TFP growth would constitute an important understanding of capitalism as an economic system. Moreover, as both Prescott (1998) and Hall and Jones (1999) forcefully demonstrate, TFP not only explains cross-country differences in the growth of per capita income, it largely determines the international differences in the levels of per capita income as well. For example, Hall and Jones show that, of the 35-fold difference in per capita incomes between Niger and the United States, 12 percent is accounted for by differences in per capita endowments of capital, 25 percent is accounted for by differences in human capital and the remaining 63 percent is accounted for by differences in TFP.

Thus, if we could discover the sources of TFP differences between countries and over time, we would have a clearer picture of the future of 21st century capitalism. The mainstream literature suggests that environmental factors such as natural resources are not important determinants of TFP, nor are starting conditions, because all countries started from more or less the same level. Location appears to play a mixed role; somewhat controversially, location near the equator may not be a source of low TFP or its growth, while having a coast line appears to have a positive effect on TFP. Policy, with the exception of Prescott (1998), does not appear much in this work, and thus the major explanatory factor has been institutions, as Hall and

Jones (1999), Frankel and Roemer (1999), Djankov et al. (2003) and many others argue.

Attempts to link TFP to institutions is most evident in the work of Hall and Jones (1999). They take a sample of countries and show that the differences in per capita income are largely the result of differences in TFP. They posit that differences in TFP are the outcome of what they call differences in social infrastructure, by which they mean institutions that provide protection from predation by government and by other individuals. The authors of the study recognize that causality is not unidirectional and that countries with higher per capita incomes are likely to also have better institutions. Thus, in their empirical work they use two-stage least squares estimation. Their results are clear: differences in institutions explain differences in TFP, and differences in TFP explain (most of) the differences in per capita incomes and of their growth over time.

A key question then is whether these conclusions hold if we allow for other forms of the production function suggested above. One simple test would be to see whether Solow's findings of the importance of TFP growth would be overturned by inclusion of energy in the production function. The period examined by Solow was a period of rapidly increasing energy use in the US economy. For the period Solow examines, 1909 to 1949, a two factor CD production function concludes that 70 percent of the growth of total output is due to gains in TFP. Using a simple three factor (labor, capital and energy) CD production function for computational ease, we calculate that only 50 of the growth of output is explained by gains in TFP, with the rapid growth of energy inputs accounting for the difference. Thus, including energy

in the production function still leaves TFP gains as a major driver of gains in aggregate output, and, while mitigating somewhat the claims of modern growth theory, it essentially leaves them unchanged.

## 5. The Income Distribution and the Drivers of TFP Growth

Once we accept that TFP gains are at the heart of the success of the capitalist system, we need to examine what the drivers of TFP growth are and how changes in the distribution of income impact them. One driver already mentioned above is the quality of institutions, especially those that protect individuals against predation by other individuals and by government. Jones and Hall (1999) in their work explicitly single out measures of the risk of expropriation, bureaucratic quality, provision of law and order, corruption, and government repudiation of contracts as important indicators of protection against domestic predation, and openness to trade, low tariffs, etc., as protection against external predation as the institutions that are or relevance to TFP growth. A second driver of TFP growth and levels is education. A number of country studies including Fleisher et al. (2011) and Schiff and Wang (2004) show quite convincingly that TFP and its growth are strongly influenced by the educational attainment of workers and managers alike.

If good institutions and education promote the growth of TFP, then the question for 21st century capitalism is: how does growing income inequality influence these two drivers of TFP growth? To answer that question we examine the relationship between the two causal factors identified, institutional quality and educational achievement, and income inequality.

We measure income inequality by the Gini coefficient (multiplied by 100 for comparability with other variables). Institutional quality is measured by the World Bank's Political Stability and Absence of Violence/Terrorism index. This index is useful both because there is broad county coverage and because it is a good measure of institutional quality. Governments that are not subject to overthrow or terrorism and violence are able to provide a social framework where rational economic activity can flourish and private property is protected. Countries subject to political instability are likely to have institutions that are repressive, arbitrary and that tend to extract the benefits of business activity either for the government or for terrorist groups that operate within society, and they are unlikely to be able to provide security to property owners. We expect that countries with greater income inequality will have less political stability. In part this is because large differences in income distribution breed social and political resentment, which often puts the government's legitimacy into question among large parts of the population. Stark income differences are often safeguarded by repressive government measures and rent seeking, which then breed further unrest and encourage the formation of groups that undertake social protest, sometimes by violent means, in order to undermine the ruling regime. Moreover, in such an environment, rational economic activity is often replaced by patronage, rent seeking and extractive taxes and regulatory policies. Of course, countries that are better off are better able to provide for security and to ameliorate social conflicts because of their higher incomes, which provide the means for maintaining social peace. Thus the relationship between income distribution and

political stability must account for inter-country differences in per capita income levels.

The second driver of TFP growth is education. Education is important because it is the main creator of human capital and also because the ability to create and implement technological advances requires ever-evolving skills among both workers and managers. Rather than using measures such as expenditures on education, which can mask large differences in expenditures by the wealthy and the poor, or the proportion of the population with secondary or tertiary education degrees, which often lack comparability across countries, we use the OECD's Assessment in Reading, Mathematics, and Science which measures 15-year-old students' performance in reading, mathematics, and science. This measure is preferable for several reasons. First, it has a much higher degree of cross-country comparability because it uses the same measure for all students. Second, it is sensitive to the distribution of educational opportunity because overspending on good educational outcomes by wealthy parents combined with low spending and ineffective schooling by less well-off students leads to lower educational achievement than is attainable in a system where all students are able to pursue educational opportunities according to their abilities. As with political stability, we should expect that better-off countries would achieve higher scores on such tests because they are able to devote more resources to education, and so we investigate the link between inequality and educational outcomes while controlling for cross-country differences in income.

We collected the requisite data for a sample of 50 including most OECD member countries and a selection of middle-income and developing countries for which data were available (see Appendix A). Because observations on some variables were not available for the same year for all countries, the latest year available was used. Means and maximum and minimum values are reported in Table 2. To allow for nonlinearities in the relationships estimated, variables were transformed into their logs.

Our specification for political stability and absence of violence is

$$\ln(stab_i) = a_0 + a_1 \ln(GINI_i * 100) + a_2 \ln(GDPC_i) + a_3 \ln(voice_i) + a_4 \ln(gc_i) + u \qquad \text{Eq. 6}$$

where $stab_i$ is the political stability and absence of violence percentile ranking for country $i$, and $voice_i$ is the percentile rank for the rating of the country in terms of voice and government accountability, both obtained from the World Bank Governance indicators. $GDPC_i$ is real GDP per capita in constant PPP prices and $gc_i$ is total government spending as a share of GDP (in percentage points) both from the World Bank Development Indicators Database. Because wealthier countries are able to spend more resources on controlling violence and threats to government stability, we expect that the coefficient for $GDPC_i$ is positive. Also, governments that spend a greater proportion of GDP in providing either security or institutions such as courts, etc. that protect against expropriation or that devote more money to redistributive policies should also experience greater stability, leading to a positive coefficient for $gc_i$. The variable $voice_i$ indicates the extent to which citizens and the press are able to express their political preferences and the extent to which they are able to hold the

government accountable for its actions. A higher rating should lead to greater stability, since open discourse and political accountability tend to reduce the incentives of people to engage in terrorism and efforts at undermining the government. Finally the Gini coefficient, which measures income inequality, should have a negative coefficient because greater inequality undermines support for the existing regime among large parts of the population and also because it may reflect the exploitative nature of the government.

The specification for educational achievement is given by:

$$\ln(Educ_i) = \mathrm{b}_0 + b_1 \ln(GINI_i * 100) + \mathrm{b}_2 \ln(GDPC_i) + b_3 \ln(pubspe_i) + v \quad Eq.7$$

In Equation 7, $pubspe_i$ is total public spending on education as a share of GDP although we also experiment with spending in primary education and in secondary as shares of GDP per capita as possible explanatory variables. We expect that higher-income countries and countries with higher levels of $pubspe_i$ should achieve better educational outcomes. Income inequality, however, may lead to a mismatch between individuals' innate abilities and the amount of education they receive, leading to poorer achievement outcomes *ceteris paribus*.

From the foregoing discussion, it is clear that GDP per capita is not a truly exogenous variable and that there is some measure of simultaneity between it and both government stability and educational attainment. Therefore, we use two-stage least squares (2SLS) estimation with instrumental variables to control for the endogeneity of GDP per capita. We select our instruments following the literature on the relationship between total factor productivity and institutions. The first variable we use is the $\ln(latitude)$ obtained from Glaeser et al. (2004). The second variable

is the Mincerian measure of human capital calculated as in Hall and Jones (1999) according to the following formula: $h = \exp(0.134 * yr_{sch_{pri}} + 0.101 * yr_{sch_{sec}} + 0.068 * yr_{sch_{ter}})$. The completed years of schooling at different levels are from the Barro-Lee dataset, and it is calculated for the population aged over 25 years. The third variable is a democratic dummy equal to one if country has been democratic since the 1950s. Our estimations were performed using the ivreg2 routine in Stata. We provide two tests of the validity of our instruments in Tables 3 and 4, which present our regression results. Both the weak identification test based on the Cragg-Donald Wald F-statistics and the Sargan overidentification tests validate our instruments. Moreover, a comparison of the OLS and 2SLS estimates shows that the adjustment for the effect of simultaneity between the dependent variables and per capita GDP is appropriate.

The parameter estimates, based on data obtained for a sample of 50 countries listed in Appendix A are reported in Table 3 for Equation 7 and Table 4 for Equation 8. Both equations yield coefficients that are generally significant and the adjusted $R^2$ is satisfactory for cross-section regressions. From Table 3 it is evident that our priors on the signs of the coefficients are validated. Countries with higher per capital GDPs and higher government expenditures tend to have greater political stability. This is to be expected because countries with higher per capital incomes can devote more resources to maintaining social order and on redistribution and because greater government expenditures can provide a safety net for low-income citizens. Greater voice for citizens and government accountability also tend to stabilize the

government. The effect of greater income inequality, however, reduces stability, as we expected.

Table 4 reports the results for educational attainment. While the effects of per capita GDP and expenditures on education tend to be sensitive to the specification used, the negative effect of income inequality on educational attainment is unambiguous.

Most important for our argument is the fact that the coefficient for the Gini coefficient is negative and significant in both regressions. Thus, greater income inequality reduces political stability and educational achievement. This is a troubling result when we recall that the shift in income shares in favor of capital is a global phenomenon, that the shift in favor of capital has been quite large in the past quarter century and that the forces that seem to be causing this shift in factor shares are not diminishing and in fact may continue to strengthen in the future. Thus, we may expect that a major challenge for both developed and developing countries will be to mitigate the effects of factor share shifts in favor of capital on income distribution and to seek ways to avoid a rise in political instability and to promote better and more equal education opportunities for young people. If these efforts do not succeed, then the gains in TFP that have made capitalism such a successful economic system may fade away.

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Table 1 - Employee Compensation/National Income in Selected OECD Countries (5-year average in %)

| Country | 1966-70 | 1976-80 | 1996-2000 |
|---|---|---|---|
| Belgium | 48 | 57 | 50 |
| France | 52* | 56** | 52 |
| Germany | 52 | 58** | 54 |
| Ireland | 50 | 63 | 50 |
| UK | 59 | 62 | 54 |
| US | 63 | 67** | 64 |

Notes: * = 1971-75, ** = 1981-85
Source: Guscina (2006)

Table 2.- Summary Statistics for Sample of 50 Countries

| | Mean | Maximum | Minimum |
|---|---|---|---|
| Gini coefficient x 100 | 35.3 | 54.7 | 24.4 |
| Political stability[a] | 78.4 | 100 | 34.3 |
| Educational attainment[b] | 61.5 | 100 | 17.1 |
| GDP per capita (PPP$) | 30697 | 107476 | 2038 |
| Voice and accountability[b] | 70.4 | 100 | 1.9 |
| Government spending/GDP (%) | 18.6 | 28.4 | 10.2 |
| Public spending on education as share of GDP (%) | 5.0 | 8.0 | 2.7 |
| Pub. Spending per pupil at Primary/GDP capita (%) | 18.7 | 37.3 | 6.8 |
| Pub. Spending per pupil at Secondary/GDP capita (%) | 22.3 | 34.6 | 4.9 |
| Human capital (Mincerian measure) | 3.3 | 4.6 | 1.7 |

Notes: a = index with 100 as most stable, b = index with 100 as highest achievement.
Sources: Gini coefficients from http://www.oecd-ilibrary.org/sites/factbook-2011-en/03/05/01/index.html?itemId=/content/chapter/factbook-2011-31-en and http://data.worldbank.org/data-catalog/world-development-indicators. Educational attainment from: www.pisa.oecd.org/, GDP per capita is PPP US $ from http://data.worldbank.org/data-catalog/world-development-indicators.

Table 3: Parameter Estimates for Equation 7
Dependent variable: *ln* Stab

| | (OLS) | (2SLS) |
|---|---|---|
| ln(gini*100) | -0.168 | -0.223* |
| | (0.122) | (0.121) |
| ln(GPDc) | 0.083*** | 0.070** |
| | (0.023) | (0.030) |
| ln (voice) | 0.111*** | 0.141*** |
| | (0.027) | (0.030) |
| ln (govt. spending) | 0.245** | 0.204* |
| | (0.097) | (0.104) |
| Constant | 2.945*** | 3.246*** |
| | (0.640) | (0.645) |
| R-squared | 0.746 | 0.740 |
| Cragg-Donald Wald F stat | | 20.7 |
| Sargan statistic (p-value) | | 6.32 (0.042) |

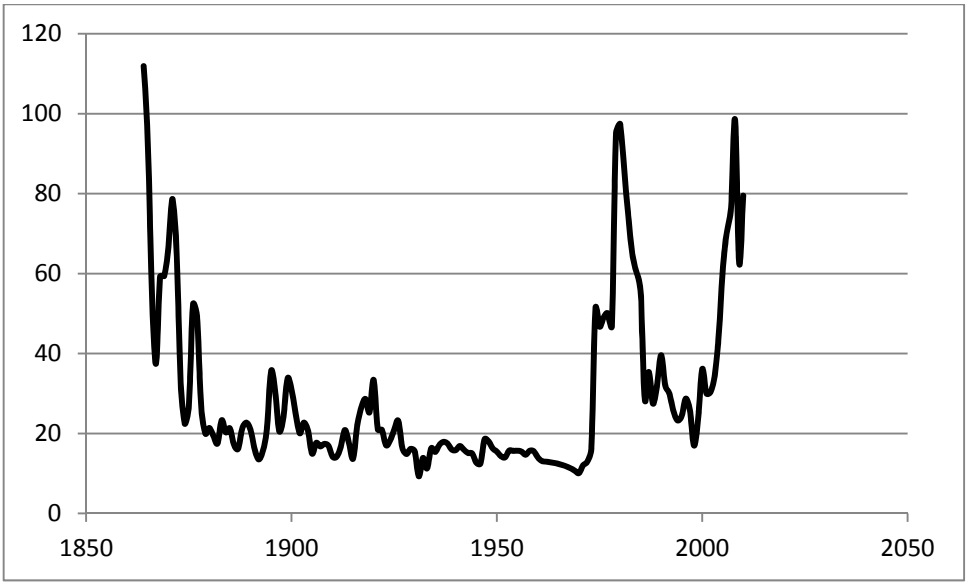
Note: The 2SLS estimation uses ln(*latitude*), *h* and *democratic* as instruments for ln(*GDPc*). Standard errors are in parentheses. Significance levels are: * 10%, ** 5% and ***1%.

Table 4: Parameter Estimates for Equation (8)
Dependent variable: *ln* Educ

| | (OLS-1) | (OLS-2) | (2SLS-1) | (2SLS-2) |
|---|---|---|---|---|
| ln(gini*100) | -0.535** | -0.484** | -0.589** | -0.639*** |
| | (0.225) | (0.222) | (0.229) | (0.231) |
| ln(GPDc) | 0.129*** | 0.131* | 0.103* | 0.018 |
| | (0.038) | (0.068) | (0.053) | (0.091) |
| ln (pub. Spending on educ) | 0.001 | | 0.007 | |
| | (0.038) | | (0.037) | |
| ln( pub_exp_prim_educ) | | 0.059 | | 0.032 |
| | | (0.150) | | (0.146) |
| ln( pub_exp_sec_educ) | | 0.179 | | 0.315* |
| | | (0.151) | | (0.164) |
| Constant | 4.677*** | 3.756*** | 5.091*** | 5.109*** |
| | (1.047) | (1.267) | (1.170) | (1.436) |
| R-squared | 0.490 | 0.658 | 0.485 | 0.623 |
| Cragg-Donald Wald F stat | | | 18.872 | 14.104 |
| Sargan statistic (p-value) | | | 1.93 (0.16) | 0.917 (0.34) |

Note: The 2SLS estimations use ln(*latitude*) and *democratic* as instruments for ln(*GDPc*). Standard errors are in parentheses. Significance levels are: * 10%, ** 5% and ***1%.

**Figure 1**
**Crude Oil Price (2000 US$/ barrel)**




Source: http://www.quandl.com/BRP-British-Petroleum/CRUDE_OIL_PRICES-Crude-Oil-Prices-from-1861

## Appendix A
## Countries Used for Estimation of Income Inequality Effects

Argentina, Armenia, Australia, Austria, Belgium, Cameroon, Canada, Chile, China, Costa Rica, Croatia, Czech Republic, Denmark, Ecuador, Estonia, Finland, France, Germany, Guatemala, Hungary, Iceland, India, Ireland, Italy, Jamaica, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malaysia, Netherlands, New Zealand, Norway, Poland, Portugal, Russian Federation, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Sweden, Switzerland, United Republic of Tanzania, United Kingdom, United States of America, Uruguay, Uzbekistan.