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**Rapid Changes in Inequality:
Present, Past, and Theory**

Ron Rogowski

EUROPEAN UNIVERSITY INSTITUTE, FLORENCE
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LECTURE

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RON ROGOWSKI

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Abstract

Since about 1970, inequality of income and wealth has increased sharply in most industrialized countries – most strongly in the USA and UK, but also in almost all English-speaking countries and, more recently, in Germany, Belgium, Israel, and even Sweden. Expert opinion strongly divides over both the causes and the consequences of this development, and in particular over the link between economics and politics. Among the possible causes most frequently adduced are “globalization,” a more complex (e.g., computer-based) technology, shortcomings in educational policy, and neo-liberal policies. The consequences have been portrayed mostly vividly by writers of fiction but have also interested theorists of economic growth. The present essay seeks to illuminate the issue both theoretically and by comparison with previous periods of rapid change in inequality. A closer examination of the economic, political, and technological effects of the Black Death in Fourteenth Century Europe serves as a “plausibility check” of the general argument.

Rapid Changes in Inequality: Present, Past, and Theory

We all know that inequality has increased sharply in most developed countries over the last few decades. For the U.S., the story is told most eloquently by a single graph that traces the evolution of real wages among the top, the middle, and the bottom deciles (Figure 1). Atkinson and Piketty (2007) show that other English-speaking democracies have followed a similar trend (Figure 2), mostly in contrast to the Continental European democracies (Figure 3). By the somewhat different measure of the Gini index, inequality increased between the early 1980s and 2000 in seventeen of twenty-two advanced or intermediate countries that can be reliably assessed, on average by slightly over ten per cent – but in Germany by 24 per cent, comparable to the longer-term Gini changes in the UK (up 28 percent 1969-1999) and the USA (up 21 per cent 1969-2005).¹

Figure 1:
Indexed Real Wages for U.S. White Males, 1963-97



Figure 1: Changes in the Indexed Value of the 90th, 50th, and 10th Percentiles of the Wage Distribution for White Males, 1963 values normalized to 100. Source: Acemoglu 2002, 16.

1 1980s to 2000 comparisons are from the Luxembourg Incomes Study, <http://www.lisproject.org/keyfigures/ineqtable.htm>.

In the mid-1980s, (West) Germany's Gini index was .268; in 2000, (united) Germany's was .333. Longer-term UK and US comparisons are from U.S. Census Bureau.

Figure 2:
Share of Income Going to Top Decile, Six English-Speaking Countries, 1915-2005

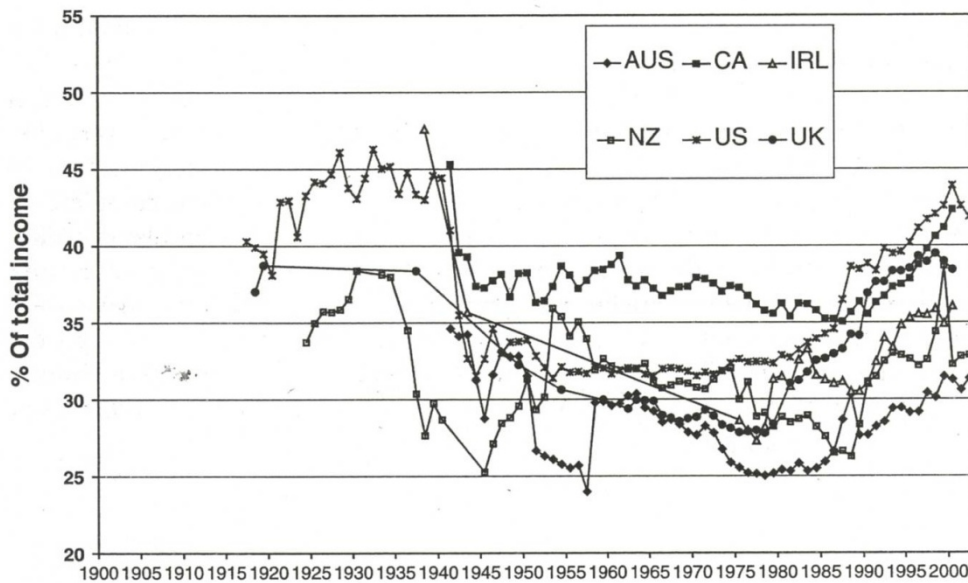
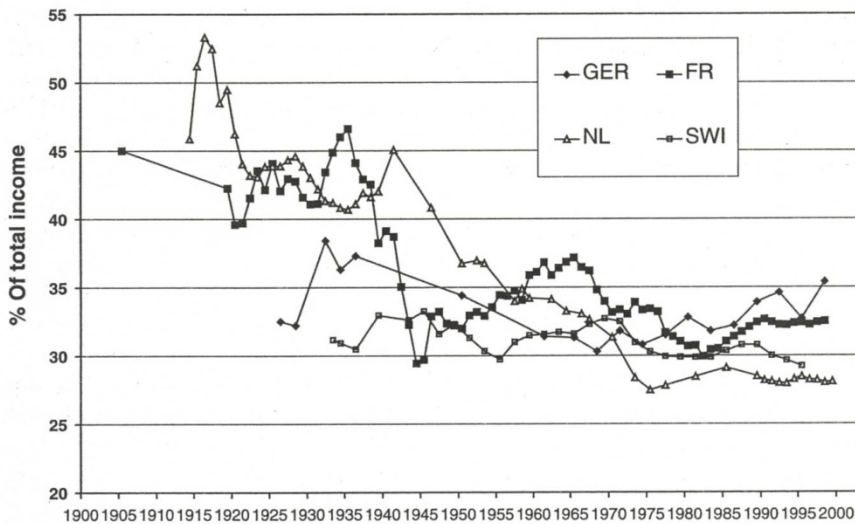


Figure 3:
Share of Income Going to Top Decile, Four Continental European Countries, 1905-2005



Figures 2 and 3: Share of total income received by top decile of earners. Source: Atkinson and Piketty 2007, p. 540.

These changes are all the more dramatic if we put them against the trend of the previous fifty, or even one hundred, years. Certainly since World War I, and by some plausible measures since about 1870, inequality in almost all of the now-industrialized countries had been *declining*. Again, one picture (Figure 4) may be worth several thousand words: this time it is from the fundamental working paper of Scheve and Stasavage 2007. For the years before 1914, we have no data this good; very likely inequality of *wealth* increased in many countries, as industrial fortunes displaced landed ones

(see Piketty 2003 on the evidence for France); but O'Rourke and Williamson (1999) build a compelling case that in almost all European countries between 1870 and 1914, the wage-rental ratio rose – as indeed it had to, since real wages increased (in England, for example, by 90 per cent between 1860 and 1910: Clark 2005, 1325) and returns to land and capital fell, the former more dramatically than the latter. In concrete terms: between 1870 and 1970, with accelerations after 1914 and again after 1945, average workers gained steadily and significantly relative to holders of land and capital, and probably relative also to managers. The broad reversal since 1970 is therefore both startling and significant.

Figure 4:
Share of Income Going to Top Percentile, Thirteen Now-Industrialized Countries, 1900-2000

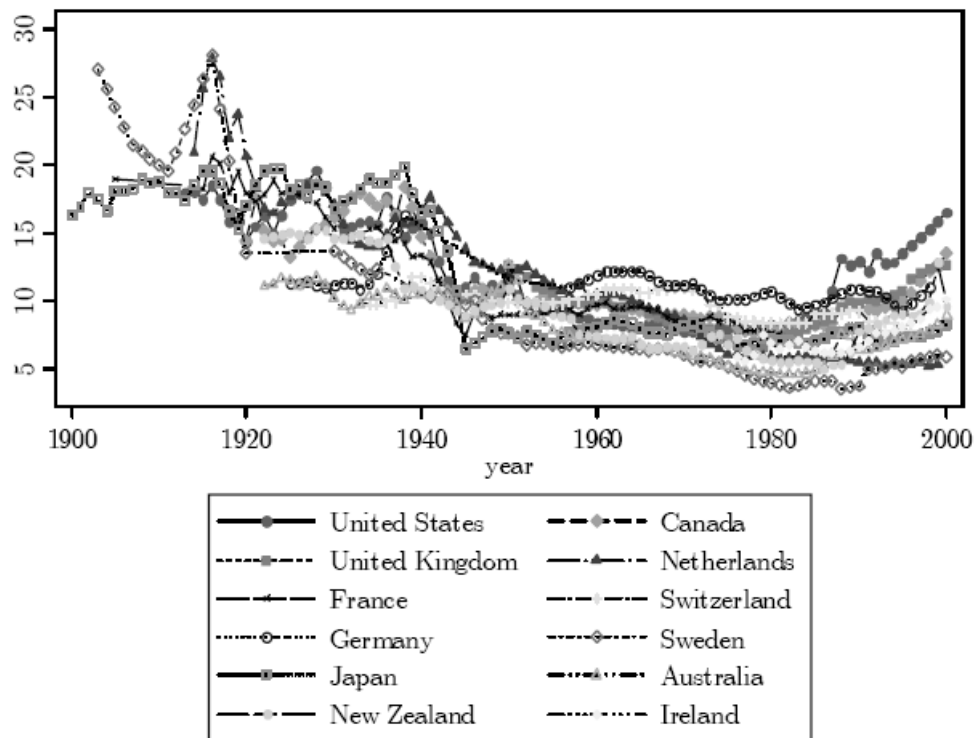


Figure Four: Share of Income Received by Top 1 %. Source: Scheve and Stasavage 2007, 37.

While I'll mainly be concerned with the *causes* of either kind of sudden change – that is, a rapid increase or decrease in inequality that affects many (but often not all) countries and regions – it's worth noting that so far social scientists have paid little attention to the likely *effects* of such a change. The novelists have done better – think of how vividly John Fowles portrays the growing equality of Victorian London (transport, clothing, housing) in *The French Lieutenant's Woman*, or the way Alan Hollinghurst dissects Thatcherite London's growing inequality in *The Line of Beauty* – but standard social-scientific models also have a lot to say about these effects (or so I will argue), and we should begin to take their predictions seriously.

The *causes* of the recent increase in inequality (and of its varying impact on different countries) have however been vigorously, not to say noisily, debated, with at least four (not mutually exclusive) explanations leading the field:

- **skill-biased technological change:** computers and machines replace low-skill labor (secretaries, assembly-line workers) but increase the demand for high-skill workers;²
- **globalization:** increased trade with large low-skill regions (China, India, Southeast Asia) has classical Stolper-Samuelson effects, driving down low-skill wages and increasing high-skill ones (cf. Leamer 1996, Wood 1994);
- **educational failure:** developed-country schools and universities, most notably in the USA but also in the UK, Germany, France, are actually supplying fewer high-skill graduates – or, at a minimum, are losing the “race with technology” (Goldin and Katz 2007), i.e. not supplying enough skills to answer the technological change;
- **governmental policy:** inequality increases where and when “neo-liberal” policies hold sway; where governments try intelligently to redistribute or retrain, inequality holds constant or actually declines (the “Krugman hypothesis;” cf. Alesina and Glaeser 2004).³

To me, the whole debate by now cries out for historical evidence, and indeed raises larger theoretical and historical questions: what, *in general*, can cause rapid changes in inequality across many societies, and what consequences does such a change – a sudden increase or decrease in inequality – usually have?

I’ll proceed in three stages:

1. Lay out a very rough and simple-minded theory of what can cause inequality to change rapidly, based on nothing more sophisticated than the Cobb-Douglas production function everybody learns in Econ 2, and focusing on five classes of possible causes.
2. Outline an equally rough version of the likely effects of such a change. These turn out to be surprisingly broad, affecting not only economics and politics but culture, fertility, and even (maybe!) climate.
3. Give one historical illustration (of several that I am researching), namely the Black Death in early modern Europe.

None of this will permit us a final answer to the overall questions of causes and consequences of changing inequality, but they will at least serve as a starting-point for discussion.

Theory: Causes of Sudden Change

In theory, at least five things can suffice to change inequality significantly over the short term:

1. a direct change in **factor endowments** (i.e., a sudden gain or loss of people, land, capital, or skills);
2. expanded **trade** that effectively changes factor endowments;
3. changed **technology of production** (including changes in transport and communications);
4. changed **technology of predation** (including “military revolutions”); and
5. political **redistribution** (land reforms, wage settlements, transfer payments, etc.).

Let’s consider each, if only briefly.

2 The most persuasive and sophisticated version is Acemoglu 2002, which in addition suggests (a) that globalization has affected inequality largely via skill-biased technological change and (b) that cross-national differences result from an interaction of labor market institutions and skill-biased technological change.

3 For the U.S., Bartels 2004 shows, in effect, that between 1948 and 2000 inequality increased only, and virtually always, under Republican Presidents.

Factor endowments. To fix ideas, think initially of an extremely simple economy in which there are only two inputs to (“factors of”) production, say land and labor, and only one output, or product, let’s say grain.⁴ Then, all else equal, the price of land will rise (i.e., a hectare will trade for more hours of labor) as land becomes scarcer, and the wages of labor (in those same real terms) will rise as labor becomes scarcer; in short, land prices will fall, and wages will rise, as the **land-labor** ratio (e.g., the number of acres or hectares per worker) increases. Product per worker will also rise, since each worker now has more land and labor concentrates on the most productive land.⁵ When landowners become poorer, and workers richer, we normally say that society has become more equal: hence as the land-labor ratio rises, society becomes more equal; as it falls, society becomes more unequal.⁶ To say the same thing more succinctly, and only slightly more technically: inequality in such a society varies **inversely with the land-labor ratio**.

We don’t ordinarily think of land-labor ratios as changing in the short run, but historically – including some quite recent history – they have often done so. A society can acquire more land by conquest or annexation (until about 1890, the U.S. “open frontier”), or can lose land by secession, annexation, or expulsion. Even within stable borders, a country can rapidly gain population from immigration, increased fertility, or improved nutrition or health; or can rapidly lose people to disease (as we’ll see in the case of the Black Death), war, or emigration. So we’d expect countries that gain land or lose population to become more equal, and ones that lose land or gain population to become – barring other changes – more unequal.

Trade. But countries need not actually change their own endowments of land or labor to experience rapid changes in inequality. If they suddenly begin to trade with countries whose factor endowments are quite different from their own, the same results ensue; the results are “as if” their own endowments had changed. To take a classic example: suppose that Japan (with little land and lots of labor) opens to trade with Australia (lots of land, little labor). Our supposed single good, grain, will have been very expensive in Japan (many hours of labor to buy one bushel) but very cheap in Australia (perhaps a single hour of labor will have bought many bushels of grain). Japan of course will now import grain from Australia:⁷ real grain prices will fall in Japan but rise in Australia. In Japan, real wages will rise (an hour of labor will buy more grain) and real land prices will fall; in Australia, real wages will fall and real land prices will rise. And hence, just as if land or labor had actually moved, Japan will rapidly become a more equal society, Australia a more unequal one.⁸

Similarly, if existing trade between such differently-endowed regions collapses, for whatever reason – war, sanctions, a drastic increase in the cost of transport – both societies become poorer, but

4 Here I present the basic ideas as intuitively as possible. The extremely simple economic model behind it involves only a production function characterized by constant returns to scale and diminishing marginal returns. The familiar example is Cobb-Douglas: where Y is total product, T is units of land, L is units of labor, and A is total factor productivity, $Y = AT\alpha L^{1-\alpha}$, where $0 < \alpha < 1$. Then the rent of land is its marginal product, $r = \partial Y / \partial T = \alpha A (L/T)^{1-\alpha}$, the wage of labor is its marginal product, $w = \partial Y / \partial L = (1-\alpha)A (T/L)\alpha$, and the rent-wage ratio is simply

$$r/w = \frac{\alpha}{1-\alpha} (L/T).$$

5 Turning again to the simple production function, product per worker is $y = Y/L = A(T/L)\alpha$, clearly increasing in the land-labor ratio.

6 It also matters, of course, if there is a single landowner or many. For present purposes, we simply hold the number and relative size of landholdings constant and consider only the effect of changes in the ratio of land prices to wages.

7 The acute reader will of course ask what Japan will use to pay for this grain. To make the story work, we have to complicate our model by adding a second, more labor-intensive product, e.g. furniture: Japan then exports furniture but imports grain, while Australia does exactly the opposite.

8 In an argument that goes back to Ricardo, both societies however are better off. That is, the gains to Japanese workers exceed the losses to Japanese landowners, just as the gains to Australian landowners exceed the losses to Australian workers. This does not change the basic story about inequality in both societies.

the one with the high land-labor ratio (in our example, Australia) becomes more *equal*, the one with the lower land-labor ratio (here, Japan) becomes *more unequal*.

These same basic points hold even if we complicate our picture of the economy to include such other inputs as physical capital (tools, machines, improvements in irrigation or soil) and human capital (acquired skills and education). I discuss both at greater length below, but in general:

- whatever makes labor *scarcer* relative to these other factors, or whenever a society opens trade with a society more abundant in those other factors (or ceases trade with one less abundant in them), relative wages rise and the society becomes more *equal*;
- whatever makes labor *more abundant* relative to those other factors, or whenever a society opens trade with a more labor-abundant economy (or ceases to trade with a less labor-abundant one), relative wages fall and the society becomes more *unequal*.

Technology of production. Innovations respond to price signals: as land becomes more expensive, producers face increased incentives to invent, adopt, or adapt land-saving technologies – i.e., (to continue with our two-input picture) methods of producing the same amount of food with the same labor and less land. A familiar historical example is the introduction of new crops (Diamond 1999, chap. 10), and particularly the adoption of the more land-efficient potato (an import from the New World) by land-scarce regions of Europe (cf. Braudel 1992, 167ff.). Occasionally, however, a “breakthrough” technology so radically transforms needed inputs, or so drastically lowers barriers to trade, as to change relative factor prices almost overnight.

Example: suppose that a new crop or technique, adopted because it promised some marginal improvement, in fact enables farmers to produce four times as much grain on an acre of land, while keeping all other inputs (particularly labor) exactly the same. The effect is as if the available amount of land had quadrupled,⁹ and the effect on relative wages, land prices, and per-capita output is the same: wages and per-capita output rise, land prices fall.

Technological effects can also be indirect. Suppose that crops and agricultural techniques do not change, but that radical improvements in transportation (bigger ships, better navigation, railroads) so radically lower shipping costs as to suddenly open trade with a large region whose land-labor ratio is ten times that of one’s own country. As we’ve seen, the effect is again exactly the same as if one’s own endowment of land had grown: wages and per-capita consumption rise, land prices fall, inequality decreases.

Technology of predation. By what the late Jack Hirshleifer succinctly called “technologies of appropriation, conflict, and struggle” (Hirshleifer 1995, 27; cf. Hirshleifer 1991), groups or individuals take what others have produced, or appropriate others’ productive resources (e.g. labor, land). Presumably, as in Hirshleifer’s models, effort is allocated rationally between production and predation, i.e. so as to equalize the marginal return from each. Technologies of predation, like those of production, respond to the relative scarcity of inputs, so that when labor becomes relatively abundant (all else equal, eras of increasing *inequality*) leaders seek labor-intensive technologies (e.g., of military combat: *hoplites*, much later the *tercio* and the *levée en masse*), but when labor grows scarce (periods

9 Well, not quite: this kind of technical innovation actually changes the exponents on the production function – in our Cobb-Douglas example, the α – and thus the shares of total production going to owners of each factor. (Recall that, if $Y = AT\alpha L^{1-\alpha}$, share αY of total production goes to land, share $(1-\alpha)Y$ to labor. [The total return to land is just the rent of land times total available land, i.e. rT , which simple algebra reveals to be $\alpha AT\alpha L^{1-\alpha} = \alpha Y$; similar total return to labor is just the wage times total available labor, or wL , which by the same kind of arithmetic turns out to be $(1-\alpha)Y$.] Thus, reversing the process, we can estimate the actual value of a particular exponent by looking at its actual shares in total national income – and see, for example, that the industrial revolution has reduced the rental exponent on land to less than .05. Clark 2007, 280. And such a change in exponents radically changes the rental-wage ratio without actually changing factor endowments, as the formula presented earlier – $r/w = \frac{\alpha}{1-\alpha} (L/T)$ – makes clear.

of decreasing inequality) they pursue land- or capital-intensive technologies (in the first case armored knights; in the second gunpowder, tanks, aircraft).

Just as in production, however, “breakthrough” technologies of predation can overshoot the original incentives or need, transforming resource endowments, relative demand for factors, or allocation between predation and production – or all three at once. Again, some examples:

- Innovations of weaponry, tactics, or transport (moving troops by horse, train, or ship) can enable one group to conquer others and appropriate:
 - their land (by expulsion or extermination: the Europeans in North America, probably also the Bantu displacement of Khoisan and Pygmies after 3000 B.C. in sub-Saharan Africa: Diamond 1997, chap. 19),
 - their labor (by serfdom or slavery: many ancient empires), or
 - some of each (the Europeans in South America, the ancient Romans).

Annexations of land raise the land-labor ratio and make the annexing societies more *equal* (modern North America and Australia); *enslavements of conquered peoples* make labor more plentiful (and lower the wage rate), thus rendering the conquering societies more *unequal* (Republican Rome after the Second Punic War).¹⁰

Breakthroughs in the technology of predation, as in those of production, can suddenly *change demand for factors* – particularly when the new technology is so efficient as to shift a lot of effort from production to predation. Thus the abundance of labor in ancient Greece (around 600 B.C.) encouraged the crucial military innovation of the *hoplites*, or massed citizen-infantry, which replaced the more capital-intensive armored cavalry of aristocrats portrayed in the *Iliad*. But, by making effective military force cheaper and combat more decisive, this change probably led to more frequent wars and higher overall military effort (cf. Hirshleifer 1995, 30-33); and, precisely because the new technology was so labor-intensive, it greatly increased the demand for labor, thus – along with simultaneous expansions of trade – making the affected societies more equal.

While hoplites spread rapidly to all of the city-states of ancient Greece, the Roman innovation of a professional, well-drilled, heavy infantry (under Gaius Marius: just before 100 B.C.) was so one-sided and successful as (a) to enable Rome to extend its conquests steadily into most of Europe, the Near East, and Northern Africa; and (b) to draw much of Roman effort out of production and into predation, focusing on the conquest of new territories (to provide farmland for retiring soldiers) and the capture of new slaves. Despite the labor-intensity of the new technology of predation, the constant inflow of new slaves kept labor cheap and inequality high in the Empire.¹¹

Is capital different? Thinking just of the land-labor ratio provides vivid and intuitively appealing insights, but land has become almost insignificant in overall production: in present-day England, for example, rents of agricultural land total 0.2 per cent of national income (vs. almost a quarter in 1750), and even urban land rents amount to only 4 per cent (Clark 2007, 198-99 and 280).¹² What matters for modern-day production is **capital**, both physical (machinery, computers) and human (skills, training, know-how). In most present-day advanced economies, the share of physical capital in total income is between 20 and 30 per cent, and a plausible estimate puts the share of human capital in U.S. total income at 26 per cent (vs. 20 per cent for physical capital) (Clark 2007, 200-202). Since the

10 I remain puzzled, like most others, by the strange economics of slavery and serfdom. We may want to discuss this further in Q and A. For an interesting model, in which slavery arises and disappears endogenously, see Lagerlöf 2003.

11 Milanovic *et al.* (2007, Table 2 and Figure 6) estimate that in Rome around 14 A.D. about a quarter of income went to the top 2 per cent, with the Gini index of the time attaining 60-75 per cent of its conceivable maximum.

12 Recall (above, fn. 9) that the share of a factor in total income, at least in the production function we are assuming here, reveals the relative productivity of that factor, i.e. its exponent in the production function. If we now assume a three-factor Cobb-Douglas function, $Y = AT^{\alpha}K^{\beta}L^{1-\alpha-\beta}$, the statistics on current national income indicate that $\alpha < .04$.

cross-national and over-time correlations between endowments of physical and human capital are almost perfect,^{13,14} and since we have other reasons to believe that they are highly complementary in production (see, e.g., Alvarez Albelo 1999, Galor and Moav 2004), we can regard both as part of a single, comprehensive concept of “capital,” which in developed economies probably accounts for about half of total income.¹⁵

Nonetheless, and bracketing out the difficult question of why societies save and invest at such different rates, all of our previous expectations about effects on inequality continue to hold:

Factor endowments. An increase in the K/L ratio, i.e. the endowment of capital per worker, raises wages, lowers returns on capital, and makes society *more equal*.¹⁶ *Output per worker* – roughly equivalent to per capita social product – also *rises*, since each worker has more equipment and skills. Whether the physical capital comes from domestic accumulation or foreign investment, the training of one’s own citizens or the immigration of high-skill foreigners, is irrelevant: the society still becomes more equal. Equally irrelevant is the question of whether the endowment ratio is raised by increasing the numerator or decreasing the denominator, i.e. by the *emigration* of one’s own low-skill workers – which, as O’Rourke and Williamson (1999, chaps. 7, 8, and 13) demonstrate, probably contributed most to the rapid equalization of northern European societies in the nineteenth century and remains today a powerful source for equalization in such sending countries and regions as Mexico, Central America, and large parts of Africa.

Equally, whatever *decreases* a society’s endowment of comprehensive capital per worker makes it *more unequal* (and, of course, poorer on average). Wars destroy physical capital,¹⁷ “brain drain” or low-skill immigration diminishes average human capital, failures of educational supply retard new human-capital investment.¹⁸

A particularly marked feature of economies over the last century and a half has been the growing ease with which *physical capital* can move, via cross-border investment, between countries. Between 1840 and World War I, the U.S. financed much of its industrialization with British capital; from 1975 until the present, China has similarly relied on foreign investment to achieve rates of growth that would otherwise scarcely be conceivable (Huang 2003). Over only the last twenty years, new information technology has made it even easier to trade many varieties of *human capital* via “outsourcing”: tax preparers, technical support staff, code-writers, radiologists, and even personal

13 Since physical capital investments can respond more quickly to incentives, and since the rent of physical capital will ordinarily be increasing in endowments of human capital, it’s likely that changes in human capital cause, or at least lead, investments in physical capital. But cf. Alvarez Albelo 1999, who argues that physical capital accumulates more slowly than human capital. Galor and Moav 2004, esp. p. 26, take a more nuanced view: historically, physical capital accumulated first, raising the marginal product of human capital and thus leading to investment in it; but in today’s LDCs, and with a pool of readily deployable international capital, human capital may well lead investment in physical capital.

14 The almost perfect correlation may be changing, to the advantage of human capital. More on this below.

15 Or, to put the same point in a different language: if we define comprehensive capital, K , to be the combination of physical and human capital, the overall production function of advanced economies is roughly approximated by $Y = A\sqrt{KL}$, and of course per-worker production Y/L would then be just the square root of per-worker comprehensive capital. Some other estimates place the coefficient on comprehensive capital even higher.

16 Cross-sectional evidence is consistent with this. We observe the highest Gini coefficients in the poorest societies, i.e. normally those with the lowest per-capita endowments of human and physical capital. Thus many sub-Saharan African countries have values in the .6 - .7 range, with even South Africa showing, in one U.N. study, a Gini coefficient of .578 in the year 2000.

17 “According to the best available estimates, one-third of [France’s] capital stock was destroyed during World War I and about two-thirds during World War II.” Piketty 2003, 1020.

18 Thus Goldin and Katz attribute much of the growing skill premium in U.S. wages to a slowdown, beginning around 1980, in the growth of supply of college graduates. Goldin and Katz 2007, esp. p. 21.

assistants can live in Bangalore, Shanghai, or Accra but work in New York, London, or Los Angeles. Their skills migrate, even if they physically do not – with exactly the effects we would anticipate from physical migration, i.e. higher returns to human capital in the sending countries, lower returns in the receiving ones.

Trade in products. Just as trade with a more land-abundant economy effectively expands a society's supply of land, so trade with a more capital-abundant (i.e., normally a wealthier) economy effectively expands its pool of human and physical capital, with the predictable effects: such trade raises local wages, lowers local returns on human and physical capital, and thus makes the home society *more equal*, while of course raising real per-capita income. Trade with a more labor-abundant (i.e., poorer) economy has just the reverse effect: wages at home fall, returns to (locally abundant) human and physical capital rise, and the society becomes *more unequal*, even as (the magic of trade) it becomes on average *richer*, i.e. per capita real income rises.

Technology. Price signals become even clearer: in labor-scarce economies, innovators seek labor-saving technologies (scanners in supermarkets, containers on freight ships); in ones scarce in physical or human capital, technologies that require less of those. Thus the early innovations of the Industrial Revolution, whether in spinning and weaving or in assembly lines and interchangeable parts, were specifically designed to obviate artisanal skills and permit the substitution of unskilled (and often illiterate) workers for craftsmen (Acemoglu 2002, 8-9; Galor and Moav 2004, 3).

Exactly as in agriculture, such technological innovations can “overshoot,” radically changing the inputs required for production and thus the returns to suppliers of those inputs. Early industrialization so expanded the demand for unskilled labor as to more than double the real wages of the unskilled, even in labor-abundant England, between 1800 and the 1870s (Clark 2005, 1325) and to stimulate a massive migration of low-skill workers from labor-abundant to labor-scarce regions of the world (O'Rourke and Williamson 1999, chaps. 7 and 8). Whether the present-day “information revolution” constitutes a similar but opposite kind of technological overshooting, which reduces unskilled wages and makes advanced societies more unequal, remains, as already noted, a topic of intense controversy. Good reasons to doubt the simplest versions of this story – the computer as *machina ex deo* – are advanced by Acemoglu 2002, 34-5.

Redistribution. Public or private force can of course redistribute wealth and transfer income, either upward (as in the *ancien régime*: Przeworski 2007) or downward (as proposed by the Gracchi of ancient Rome and practiced in the modern welfare state: Alesina *et al.* 2001), and whether by taxation or regulation (e.g., centralized wage bargaining and wage compression). The modern state has developed capacities undreamt of before 1900 (Lindert 2004), and it seems clear that government intervention restricts both the level and the growth of inequality (see, e.g., Gottschalk and Smeeding 1997, esp. 673; Alesina *et al.* 2001, 11-12), helping particularly the poorest decile. Indeed, some have attributed virtually all of the change in inequality in the Twentieth Century to redistribution, or (as in Switzerland or the U.S.) its absence or abandonment (Dell *et al.* 2007). But at other junctures efforts to redistribute, even when politically victorious, seem to have had little long-run effect – or but a slight one in comparison to larger economic trends. We'll return to this question below.

Redistribution however is itself strongly affected by a society's degree of inequality – but in exactly the opposite direction from the classic Meltzer-Richard prediction:¹⁹ in fact, more unequal societies (and, holding equality constant, poorer ones) *redistribute less*. This is what Peter Lindert rightly calls the “Robin Hood paradox,” and by now it is supported by both a wealth of cross-national and over-time evidence (see particularly Lindert 1996, 15-18; Lindert 2004, 1: 15-16) and Lindert's

19 The Meltzer-Richard hypothesis follows directly from the median-voter theorem: if, in a democracy, the median voter determines policy, then the more the median voter's income falls below that of the average voter (i.e., the more unequal the society), the more the median voter should prefer redistribution. Meltzer and Richard 1981.

adaptation of the Becker pressure-group model (Lindert 2004, 2: 7-8), which suggests essentially that the poor lack the resources to mobilize politically.

Theory: Consequences of Sudden Change

From the perspective adopted here, a rapid change in inequality involves a shift in relative prices, i.e. of wages as against returns to other factors. As such, it will inevitably affect, at a minimum:

- the inputs used in production;
- the pace of technological innovation;
- patterns of consumption, including especially uniformity or diversity of tastes;
- cultural differences within the society;
- the political mobilization of workers and the relative “left-right” balance of politics;
- institutions, including those governing property and labor.

As we have just seen, experience indicates also that such a change will also influence

- levels of redistribution.

By many accounts, changes in inequality will also affect

- the rate of economic growth.

Because increasing *equality* means an increase in the relative wage, it stimulates the substitution of other factors for labor: the search for labor-saving technical innovations, and the erosion of barriers to labor mobility. Tastes converge with incomes, eroding distinctions of consumption and culture (e.g., accent, or even language) – albeit often with a lag of a generation or two. Economic equality brings with it powerful pressures for political equality (Boix 2003, Przeworski forthcoming), sometimes violently resisted. Increased relative wages also stimulate labor organization and encourage political leaders to alter property relations that waste labor. However paradoxically, increasing equality, controlling for other factors, also stimulates greater efforts at political redistribution.

Increasing *inequality* should have just the opposite effects: labor is substituted for other factors, incentives rise for technical innovations that use land or capital more efficiently, institutions that waste labor are tolerated but barriers to efficient use of capital are eroded, tastes and cultures diverge (with snobbery becoming more pronounced), labor organization weakens, and political participation is restricted. Efforts at redistribution, and actual mechanisms of redistribution, weaken.

Does a change in inequality affect the rate of capital accumulation and hence of economic growth? Kuznets (1955), applying the classical assumption that higher earners saved more, argued that inequality was good for growth; but virtually every empirical study has found the opposite (Benabou 1996). Yet the earliest stages of the Industrial Revolution occurred in a period of great inequality;²⁰ and, as we have seen above, its central innovations consciously replaced expensive craft skills with cheap unskilled labor. The most persuasive hypothesis is now that of Galov and Moav (2004): that inequality stimulated growth in the early Industrial Revolution but, because of the growing importance of human capital and credit constraints to its formation, has impeded it in more recent times.

20 Cf. Clark 2007, 36. In 1740, perhaps three-quarters of all wealth in England was owned by the top 5 per cent, vs. about half for smaller samples (London, Suffolk) in earlier centuries (Clark 2007, 281). More impressionistically, the period of the “Whig Aristocracy,” reaching its height after the death of Queen Anne (1711), is traditionally seen as one of great inequality of wealth: see for example Plumb 1967.

Our predictions about causes and consequences of inequality are thus reasonably clear. Are they supported by the evidence? As a first plausibility check, we examine a particularly clear-cut historical case, in which factor endowments changed suddenly in a whole continent: Europe in the wake of the Black Death of the fourteenth century.

Changing Factor Endowments: The Black Death

By the dawn of the Fourteenth Century, Europe's population had risen from its medieval nadir of perhaps 25 million in the time of Charlemagne to between 70 and 100 million (Herlihy 1984; Russell 1976, 36; Fischer 1996, 44). Population pressure had led first to a "frontier movement" that exhausted available lands, then to sharp increases in land rents (and the price of land-intensive food) and falling real wages.²¹ Inequality was seen by contemporaries as extreme (North and Thomas 1973, chaps. 5-6; Fischer 1996, 26-9). Then, in two great strokes, the Great Famine of 1315-22 and the Black Death of 1348-51 (with intermittent recurrences) killed roughly two-thirds of the population, perhaps as much as half in the Black Death alone. It seems certain that Europe in 1420 had barely a third as many inhabitants as in the early 1300s (Herlihy 1997, 17); in England, Gregory Clark contends, the population peaked in 1310 at about six million and fell by 1450 to just over two million (Clark 2007, 30). Obviously the region's endowments of land and (for the most part) physical capital did not change, so the capital-labor and land-labor ratios roughly tripled.²²

Standard economics tells us what "should" happen in such a case:²³ wages will have risen (in real terms, probably by at least 40 per cent), rents on land and capital will have fallen (probably by about half, again in purchasing power), per-capita output (and thus average standard of living) will have increased, and nominal prices will have risen (the same money chased fewer goods). Land-intensive goods (notably food) should have cheapened relative to more labor-intensive ones (manufactures, construction, hand-copied books). Inequality should have declined drastically: the rental-wage ratio will have fallen (as the previous numbers imply) to less than a third of its former level. Political and social equalization should have ensued. And as wages rose and land rents fell, we should observe both massive substitution of land and capital for labor and increased incentives to labor-saving innovations.

The best data that historians have been able to retrieve suggest that, if anything, theory underestimates what actually happened. Between the 1320s and the 1380s, Gregory Clark's authoritative time-series (Clark 2005, Table A2) shows, the purchasing power of craftsmen's daily wages rose by 55 per cent (from an index of 41.3 to 63.9), while helpers' (i.e., unskilled laborers') real wages rose by over 90 per cent (indices of 32.5 to 62.4). At their post-plague peak, between 1440 and 1460, craftsmen's real wages had increased by 90 per cent over their pre-plague nadir; helpers' wages, by an astonishing 145 per cent. Herlihy observes more generally of Europe in this period that "wages in the towns soared, to two and even three times the levels they had held in the crowded thirteenth century" (Herlihy 1997, 48).

21 By Clark's estimate, real wages of both skilled and unskilled workers fell in England by about a third between the 1250s and the 1320s, and Fischer holds that over the century 1220-1320 real wages in most of Europe fell by 25 to 40 per cent: Clark 2005, Table A2; Fischer 1996, 26.

22 But because the death rate was highest in the crowded cities, and perhaps particularly in universities and monasteries, the ratio of human capital to labor may actually have declined: more on this below.

23 In the simplest Cobb-Douglas production function, $Y = AK^\alpha L^{1-\alpha}$, per-worker production is $y = Y/L = A(K/L)^\alpha$, and α empirically approximates a third; so a tripling of the capital-labor ratio would imply about a 45 per cent increase in per-capita output. Similarly, the wage is the marginal product of labor, $\partial Y/\partial L = (1-\alpha)A(K/L)^\alpha$, so wages would rise exactly in proportion to output; and the rent of capital is its marginal product, $\partial Y/\partial K = \alpha A(L/K)^{1-\alpha}$, which would go to $(1/3)^{2/3}$ of its former level, or about half. The rental-wage ratio is linear in the labor-capital ratio

($r/w = [\alpha/(1-\alpha)](L/K)$), so it declines by exactly the same amount – two-thirds – as the labor-capital ratio itself.

These increases in real terms were accompanied, as theory would predict in a time of specie-based currency, by a general inflation of nominal prices. Matteo Villani, writing in 1363, noted of Florence immediately after the Plague, “Most things cost two times or more what they cost before the epidemic. And labor, and the manufacturers of every art and profession increased in disorderly fashion to double the price . . .” (quoted in Herlihy 1997, 46-7). Up to about 1300, the growing purchasing power of bullion had set off an orgy of silver prospecting and mining throughout Europe (Spufford 1988, chap. 5), increasing the money supply sufficiently to set off an earlier wave of inflation, most notably in England in 1305-10 (Fischer 1996, 32). As bullion now lost purchasing power, mining was sharply curtailed and the minting of new coins virtually ceased (*idem*, p. 48): the money supply stabilized, and may even have contracted, as suddenly silver and gold that traded for fewer real goods were more widely used for ornamental purposes.

Rates of return on land in England, which had peaked at around 12 per cent annually in the thirteenth century, fell after the Black Death to 5-6 per cent (Clark 2007, 168-9). The rent of capital followed suit: “Rates of interest fell by 50 per cent in France and the Low Countries in the century from 1370 to 1470” (Fischer 1996, 55). Putting the wage and rent changes together, we see that the rent-wage ratio fell by even more than theory would have predicted, perhaps – if Clark’s figures for England are correct – to as little as a fifth of pre-Plague levels.²⁴

The pre-existing political situation was one of extreme inequality – serfdom, despite frequent commutations to money rents, survived in some form almost everywhere – and of course landowners and urban elites used their political power to impede adjustment and try to redistribute income upwards. Wage controls were imposed on rural laborers in England (Ordinance of Labourers, 1349; Statute of Labourers, 1351) and some of the Italian city-states (most notably Florence); and on urban workers in France, Aragon, and Castille (Cohn 2007, esp. 460-8). City-states like Orvieto, Siena, Pisa, Venice, and Milan took a more free-market approach, as did the Low Countries (Cohn 2007, 461-2 and 473ff.). Yet almost everywhere in western Europe, these laws were quickly overthrown or abandoned, mostly through “cut-throat competition for scarce labor” (Cohn 2007, 470, sometimes abetted by violent resistance (the French *jacquerie* of 1358, the English Peasants’ Rebellion of 1381, the 1378 Florentine Revolt of the *Ciompi*).²⁵ Landlords and employers who failed to increase wages simply lost their workers. By the early 1400s serfdom – the strongest political expression of Medieval inequality – was dead, or at least a dead letter, virtually everywhere in Western Europe (Fischer 1996, 48-9, summarizing a line of work from Postan onwards; for a partially dissenting view, with critiques, see “the Brenner debate” as summarized in Aston and Philpin 1987).

Europe was enough of a single market that these effects seem to have followed, even in places that the Plague largely spared (Cohn 2007, 457-60). Consumption also converged. As ordinary folk grew prosperous enough to dress and consume like their betters, elites imposed sumptuary laws; these also failed (Herlihy 1997, 47-8).

As striking as the changes in economic, political, social, and legal inequality were the effects of greater equality on technology, culture, diet, religion, and even climate. The great increase in wages and decrease in rents immediately impelled several other changes,²⁶ including

- the predicted substitution of capital or land for labor, i.e. a shift away from more labor-intensive production (weaving, the cultivation of grain) and toward more land- or capital-intensive efforts (pasturage, use of animal power);

24 As noted above, Clark finds that real rents fell to less than half of former levels, while helpers’ real wages increased by a factor of 2.5. This implies that the r/w ratio dropped to about a fifth of its earlier level.

25 On events in England, see particularly Hilton 1973.

26 My description here relies heavily on the brilliant and authoritative account of Herlihy 1997, chap. 2, as well as on the earlier and still classic discussion of North and Thomas 1973, chap. 7.

- a more protein-rich diet, especially among the poor, as (land-intensive) meat and dairy products became cheaper relative to more labor-intensive grain; and richer and warmer clothing, as wool (from sheep) grew cheaper relative to linen (from flax);
- more exact measurement of labor inputs, including time worked, and hence widespread introduction of clocks;²⁷
- because the death rate was even higher among the urban and literate population, increased returns to human capital and increased incentives to acquire literacy and other skills;
- increased incentives to labor-saving innovations or adaptations, including most importantly
 - Gutenberg’s moveable-type printing,²⁸ which in turn expanded literacy by making literature cheaper and more varied: by 1500, somewhere between 8 and 20 *million* books, including 30,000 new titles, had been published;²⁹
 - Labor-saving improvements in maritime transport (Herlihy 1997, 50), leading to bigger ships, smaller crews, the ability to remain longer at sea – and, in short order, improved navigational techniques (of which more below).

Indirectly, the population losses and declining inequality impelled even farther-ranging social, cultural, and ecological change.

- Increased per-capita wealth likely meant **increased trade**.³⁰ As wages rose and the cost of rents and food fell, commoners’ budgets incorporated greater variety and quality of goods, many of them from abroad. Trade was further stimulated by the great variation in local death rates – over 70 per cent in some places, under 10 in others – increasing the range of factor endowments. The demand for foreign goods further inspired innovation in **shipping and navigation**; and in this sense the fifteenth-century voyages of discovery and their own technological consequences (e.g., introduction of new crops and products) were also an indirect product of the Black Death.
- The high death rates in existing universities and the increased returns to human capital spurred an **expansion of education**, including the founding of some twenty-five new universities – in fact, every university east of the Rhine and north of the Alps – and an untold number of new vernacular-based grammar schools, between 1350 and 1500 (Herlihy 1997, 69-71; cf. Grendler 1989, chaps. 10 and 11).
- The decimation of the clergy led to widespread recruitment of ill-educated priests; and the decline in rentals reduced the income from Church lands, inspiring popes and bishops to such inventive new exactions as the sale of indulgences. The ignorance and corruption of the official Church, combined with the growing literacy and erudition of the laity, paved the way for the **Reformation**.
- Culturally, the decline in inequality produced major **linguistic change**: the newly literate groups everywhere demanded, and printing produced and standardized, works in the vernacular, not in the Latin of the traditional elites; while efforts of newly wealthy masses to acquire not only the dress but the accents of their “betters” probably produced the Great Vowel Shift that differentiates modern from early English.

27 “The first new technology of the plague years was time-keeping – mechanical clocks and hourglasses.” Lienhard 1987. More generally, see Landes 2000.

28 Because of the close proximity in which monks lived, and because monasteries frequently tended the sick or served as places of refuge for those fleeing the plague, the death rate among monks – who also staffed the scriptoria – was particularly high. Thus the relative price of manually copied literature probably increased even more.

29 The estimate of eight million is from Eisenstein 1993, 13-17; higher estimates apparently originate with Lenhart 1935 but are now widely accepted, see e.g. Norman 2005, Timeline 1500-1549.

30 On this point I depart from North and Thomas, who emphasized the growing trade of the thirteenth century and the volume of international trade “probably declined” after 1350. North and Thomas 1973, chaps. 6 and 7, esp. p. 75.

- The demand for more capital-intensive technology extended also to the realm of combat, contributing to the **military revolution**: it is only after 1350, for example, that gunpowder, cannons, and (after 1400) firearms begin to be used extensively in warfare (Herlihy 1997, 51).

Other effects attributed to the Black Death may be idiosyncratic, i.e. not a general effect of increased equality (though this, too, deserves discussion). Whether as an extended effect of printing and the military revolution, as a way of achieving labor economies of scale in governance, or for unrelated causes, a century after the Black Death, roughly from 1450 to 1500, came “an age of strong and successful state-building” (Fischer 1996, 56), identified with such rulers as Ivan the Great, Louis XI, Henry VII, and Ferdinand and Isabella; even the Venetian Republic and the Ottoman Empire greatly extended their sway.

Most controversially, it even seems likely that the population losses of this period led to **global cooling**. Deaths were not limited to Europe; millions also died in China and India, where the Plague may well have originated (see, e.g., Diamond 1997, 206). As millions of square miles of cropland throughout the world returned to pasture or forest, CO₂ levels in the atmosphere declined, and with them global temperatures (van Hoof 2004). This in turn may have produced the “little ice age” that impeded northern European production for the next century and a half – but encouraged the crucial introduction into European agriculture of the nutritionally superior potato, which could grow well even in climates that had become too cool for the cultivation of grain.

So what does this quick overview of the Black Death permit us to conclude? Four things, I think.

1. A direct change in factor endowments – in this case, a drastic reduction in labor, hence an increase in the capital/labor and land/labor ratios – indeed suffices to change inequality quickly and significantly.
2. At least in the circumstances of Western Europe – Eastern Europe remains a different case, worth discussion in the light of more recent research – efforts at impede the rise in wages, or to redistribute upwards, turned out to be futile. Though wage and consumption controls were widely attempted, and though the regimes of this period heavily regulated the economy (e.g., via guilds), the change in rents, wages, and the rental-wage ratio continued mostly unabated. A major reason for this failure was competition among employers (i.e., the ineffectiveness of their own efforts to regulate or to collude) and, relatedly, the ability of workers to escape the jurisdictions or landlords who attempted to cap wages.
3. The resultant change in inequality had virtually all of the effects that theory would lead us to expect, particularly as regards factor substitution, patterns of consumption, incentives to innovation, and political and institutional change.
4. As just suggested, innovation was mostly driven by, rather than driving, change in inequality. Nonetheless the change in inequality in this period drove three likely “breakthrough” technologies that went on to change demand for factors (albeit usually with a significant lag). These were (a) **printing**, (b) **gunpowder**, and attendant changes in military technology, and (c) **navigation and shipping** – which, by eventually opening regular trade with very differently-endowed areas, effectively changed Europe’s own endowments (though here the full effect did not emerge until centuries later).

Conclusion

It helps our understanding of both the causes and the consequences of the recent growth in inequality (and of the highly differentiated cross-national response to it) if we regard it in the light of (a) a more general, if still quite simple, theory of (change in) inequality and (b) comparison with other historical cases of rapid increase or decrease in inequality. Both the theory and the first slice of historical evidence presented here suggest: (a) that changing endowments and trade patterns are

likelier exogenous sources of long-term change than technology, which (with rare exceptions of “overshooting”) is likelier to be endogenous; and (b) that, in any world of competitive jurisdictions, efforts to impede adjustment, or to redistribute income, are unlikely to be effective in the long term.

If we apply this back to our current situation, including the evidence that inequality is now growing in countries that had previously resisted the tide (Belgium, Germany, Sweden, probably soon France), we can draw the (still very tentative) conclusions that:

1. trade in products and factors, plus direct change in factor endowments (e.g., migration, educational failures, or the “baby bust” in many societies), is a likelier source of change than either neo-liberal policies or some independent technological revolution; and
2. the change is exogenous and likely to be held back only temporarily by regulatory or redistributive efforts (wage compression, direct transfers). At the same time,
3. national baseline differences – greater equality in the Nordic countries, greater inequality in the UK and USA – will likely persist, particularly where these affect the nature and distribution of human capital.

Among the *consequences* of current developments, again if past and theory are any guide, will be:

1. weakened formation of human capital (because of remaining credit constraints – i.e., the rich, lacking security, will not lend to finance the education of the poor); hence the educational shortfall rightly emphasized by Goldin and Katz (2007) may well be a consequence, as well as a cause, of growing inequality;
2. a further weakening of the Left, and of organized labor, in politics, accompanied by a fractionalization of labor, particularly in high human-capital specializations, into narrower unions – with, again, the turn to the Right being more a consequence than a cause of the rise in inequality (for cross-national evidence that rising inequality has usually preceded rising Right strength, see Macrae 2004);
3. greater use of (now cheaper) unskilled labor in nontraded sectors, e.g. personal care, gardening, domestic service;³¹
4. more rapid innovation of technologies that can replace (now dearer) skilled labor, e.g. web-based streaming of lectures by pricier professors, software that can produce most routine legal documents;
5. most controversially, likely some restriction of political participation, or to put it bluntly some “rollback” of democracy, perhaps by greater delegation to agencies (courts, commissions, central banks) independent of control by directly elected politicians.

None of this, of course, is proven. It is only a thesis, and I welcome discussion of it (and the alternatives).

31 When the last U.S. Fruit of the Loom factory was closed in Texas, the few displaced workers who found new jobs – often after several failed attempts at retraining and at considerably lower wages – either in menial health-care tasks, particularly among the growing ranks of the elderly, or in construction, both essentially non-traded sectors. Boo 2004.

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The War on Terror between the Sacred and the Profane

Lecture, 27 September 2007, RSCAS
http://cadmus.eui.eu/dspace/bitstream/1814/7745/3/RSCAS_DL%202007_01.pdf

Ron Rogowski

Rapid Changes in Inequality:

Present, Past, and Theory

Distinguished Lecture, 14 May 2008
<http://hdl.handle.net/1814/8647>

