

Wealth and Income Inequality in the Twenty-First Century

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What is to be explained?

- Enormous increase in inequality in income and wealth over past third of a century
 - In contrast to Kuznets law, which suggested after a point of time in development, inequality would decrease
 - Kuznet's theory was true when he wrote it
 - "Repeal" began in 70's/80's
- Including a decrease in share of labor
 - In contrast to earlier period when shares were relatively constant
- More money to the very top, more people at the very bottom, and more dispersed distribution

Theories have to be consonant with other “stylized facts”

- Most importantly, Pareto tail to wealth distribution
- And consistent with other on-going changes in the economy

Alternative theories

- There exists an equilibrium wage/wealth distribution
 - What we are seeing is a movement from one equilibrium to another
 - Need to identify factors contributing to movement
- Capitalism is associated with ever-growing inequality
 - There was a short period, after World War II, when this was not true
 - We are now returning to “norm”
- This lecture argues for the former view

Piketty model

- Piketty and others have provided important data through which we can see an increase in inequality, especially at the top
- The question is: how do we explain it? Piketty has offered a particular model
- Capitalists save all (most) of their income
 - So wealth grows at the rate r
 - If $r > g$, their wealth grows faster than the economy,
 - If r does not decline, their income does too

Key assumptions fail

- $s < 1$
- r is endogenous, and *in long run equilibrium* $sr < g$

Other key flaw in analysis

- Confusing wealth with capital
- From national income data, K/Y is actually decreasing in US and other advanced countries (though there are important measurement problems)

Benchmark model

- Traces out evolution of dynasties
 - Assuming neoclassical competitive equilibrium
- Macro-micro consistency—sum of family capital holdings equals aggregate capital
- Alternative assumptions concerning savings, inheritance, and reproduction
 - Solow, Kaldor, Pasinetti
 - Rule based, intertemporal utility maximization
- Benchmark model useful for identifying *what else* is going on

Basic dynamics

- $\frac{d}{dt}(\log k_i) = s_i y_i / k_i - n_i,$

where y_i is the i th family's income (per capita)

$$y_i = w_i + r_i k_i,$$

where w_i is the i th family's wage,

r_i is its return on capital,

k_i is its capital (per capita).

n_i is the i^{th} family's rate of reproduction.

If all families have the same savings, s , wages w , return to capital and n_i

$$d \ln k_i / dt - d \ln k_j / dt = sw(1/k_i - 1/k_j)$$

Complete convergence, regardless of initial wealth distribution

In this case, there is only a centripetal force

Variability

Introducing variability in any of the variables introduces a centrifugal force

- With wage differences and perfect inheritability of abilities, then wealth distribution corresponds to wage distribution
- With Markov model—probability of individual being in any percentile of the distribution depends on wealth (percentile) of parents—there is an equilibrium wealth distribution

$$P^* = MP^*$$

Where P^* is probability distribution and M is Markov matrix

If Markov matrix is generated by benchmark model above, can be shown to lead to Pareto tail distribution

Equilibrium wealth distribution

- In benchmark model there is an equilibrium wealth distribution
- A balancing out of centrifugal and centripetal forces

Diffusion model

Standard diffusion model provides easy way to see relationships

$$dk_t = (sw - \mu k_t)dt + \sigma k_t dZ_t$$

where the risk is associated with the return on capital and is proportional to sr :

$$\sigma = sr\bar{\sigma}$$

and where μ is the drift in the stochastic process

$$\mu = n - sr.$$

Pareto tail

The stationary wealth distribution has a Pareto tail with tail inequality η given by

$$\eta = \frac{\frac{\sigma^2}{2}}{\frac{\sigma^2}{2} + \mu} = \frac{1}{1+D}$$

where

$$D = \frac{\mu}{\left(\frac{\sigma^2}{2}\right)} = 2(n - sr) / \sigma^2$$

But r is endogenous

Using benchmark model above, in stationary equilibrium

$$D^* = 2 \frac{1 - S_k}{S_k^2 n \bar{\sigma}^2}$$

More tail inequality if

- (a) Variance of returns is higher
- (b) Share of capital is higher
- (c) If the elasticity of substitution is less than or equal to unity, a lower savings rate or high n leads to more inequality

Even more Pareto-tail inequality

- If those at the top have assets with higher returns with more variability—evidence that this is true
- What matters is after tax return—so a lowering of tax rate at top increases tail inequality

Those at the top hold more equity

STOCK MARKET WEALTH



Source: Wolff (2012)

Alternative models generate different stationary equilibria

Kaldor/Pasinetti model—fixed savings out of wages (life cycle savings), higher savings rate out of capital (pure capitalists)

Long run equilibrium interest rate determined by capitalists ($r = s_p / n$)

No convergence of capitalists' wealth distribution

Workers wealth given by

$$k_w = s_w w / (n - s_w r).$$

Share of wealth held by workers convergences

Increases with s_w .

Similar analysis for life cycle model—workers saving for retirement, capitalists saving for future generations

Capital taxation

In benchmark model, capital taxation reduces inequality (increases centripetal force and decreases centrifugal force)

In Kaldor/Pasinetti model, there is full shifting-- after tax return unchanged

- If proceeds are fully distributed to workers, decrease in wages sufficiently great that workers are worse off (even if, under some conditions, share of income increases)
- If sufficient fraction of proceeds are invested in public capital goods, return on capital lowered so that capitalists asymptotically disappear, even if savings rate is unity
 - True even if public capital is not perfect substitute for private capital

Wage dispersion

Wages dispersion can be generated by similar process. Let A be ability:

$$dA_t = -\beta(A - \bar{A})dt + \sigma A_t dZ_{wt}$$

β is the extent of regression towards the mean ($\beta = 0$: there is no regression towards the mean)

A normally distributed

If $w = \ln A$, wages will be lognormally distributed

Wages seemingly more unequally distributed—but wages *as measured* may include rents

Intertemporally utility maximizing dynasties: if w is high, will save knowing that descendants will (on average) be less able

Can derive optimal savings, assuming borrowing constraints (low wage individuals cannot borrow using promise of future generations to repay)

Equilibrium wage and wealth distribution

For small n and r :

- $V_k^2 \approx \frac{V_w^2 s^2}{2(n-sr)(1-\beta+n-sr)}$

Explaining changes in inequality:

- Changes in centripetal and centrifugal forces: changes in intergenerational transmission of advantages, markets, and policy

Changes in intergenerational transmission of advantage

- Lower capital and especially inheritance taxes
 - In US regressive taxation
- Weaker, less equal public education
 - More economic segregation
 - More reliance on private education
- Increased role of connections
 - Internships
- More assortive mating

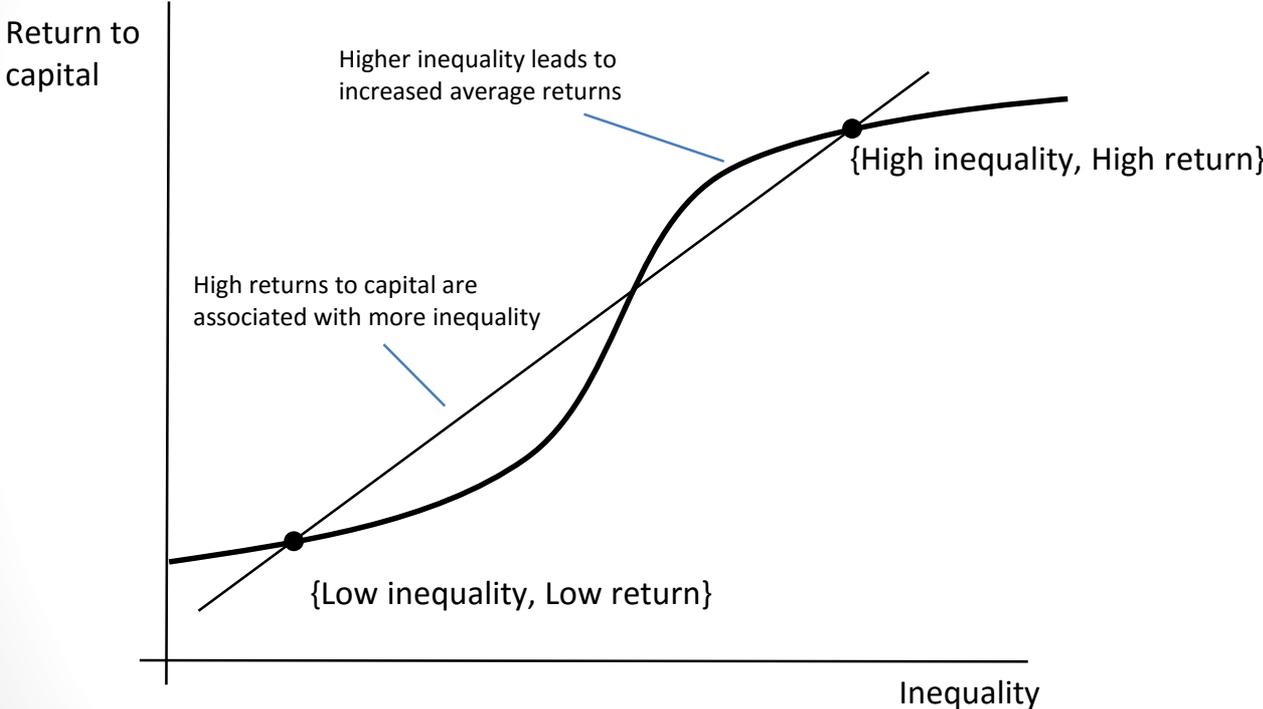
Wealth, knowledge and inequality

- Puzzle: Period of low (negative) real interest rates associated with growth of inequality ($r \ll g$)
- Scarce factor: knowledge
- Knowledge is inequitably distributed
 - With decreasing risk aversion, willing to purchase riskier portfolio
 - Knowledge is a fixed cost: richer individuals purchase more, get higher return for any given risk
 - Advantage increased through insider information
 - Allows them to have a high/high risk portfolio—increasing income inequality at the top

Changes in markets

- Better annuity markets reduce capital accumulation for retirement
- Structured finance allows redistribution of risk—with more risk taken by top
 - Resulting in more tail inequality
- Increased share of capital (induced by changes in technology or changes in behavior) leads to more inequality
- Increased variance in market-relevant abilities leads to increased inequality in wage and wealth distribution
- Multiple general equilibria
 - High risk/high inequality economy—high risk generating higher price of risk generating higher incomes for rich; low risk low inequality economy

Multiple equilibria



Structural transformation towards service sector

- Smaller production units may enable closer attribution of contributions
 - Manufacturing associated with wage compression
- Transformation itself may give rise to inequality—with some individuals better able to make transformation
 - Imperfect capital markets impairing ability of lower income/wealth individuals to make transformation

Changes in public policy

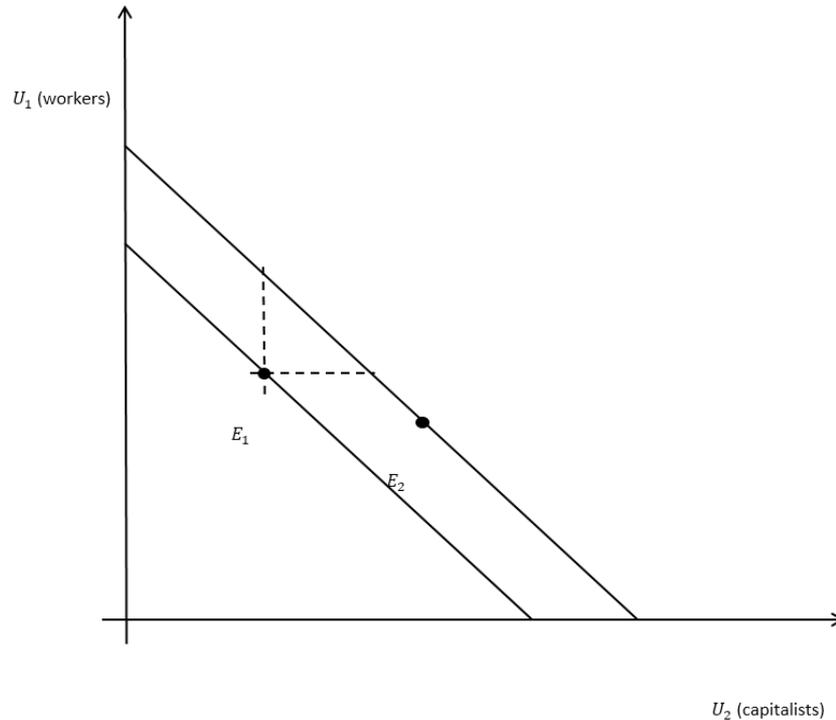
- Public annuities reduce the need for individuals to save for retirement—may reduce wealth inequality from “unintended bequests” but increase wealth inequality between life cycle savers and capitalists
- Taxation of capital and especially bequests
 - Reduction of progressivity—leads to more inequality
- Monetary policy
 - Focus on inflation has led to increased average output gap, lower wages
 - Lower return to debt, higher return to equity—benefiting those at the top relative to life cycle savers
- Weakening public education
- Increased exposure to risks, e.g. associated with liberalization

(other changes in rules of game to be discussed later)

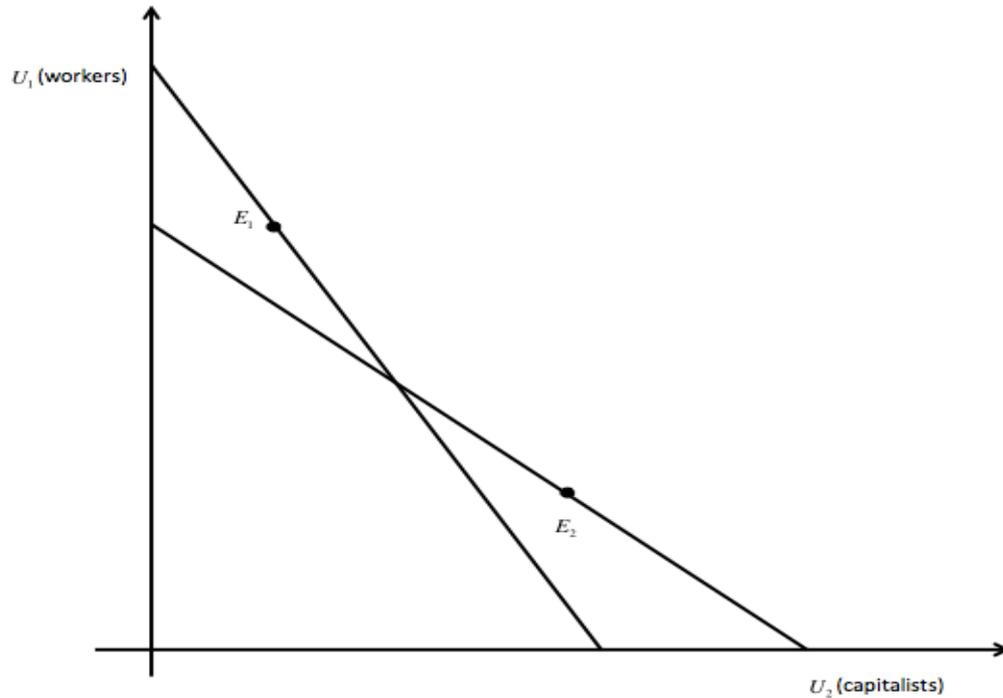
Limiting case: workerless economy

- Imagine a near workerless economy. Would standards of living collapse? Obviously not necessarily: utility possibility curve has moved out, even if competitive equilibrium wage has decreased
- Redistribution (or change in intellectual property rights) would ensure that everyone could be made better off
- If redistribution (changes in intellectual property rights) are costly, so workers' couldn't be fully compensated, it implies that "new" utility possibilities schedule does not lie outside the other, taking into account costs of redistribution
 - Public policy may act to limit change

With redistribution, all groups could be made better off



Technological advance not Pareto improvement



Rents and the Growth in Inequality

- Competitive model cannot fully explain growth in inequality
- Key is growth in rents
 - Land rents
 - Market power rents
 - Intellectual property rents
 - Rent-seeking from public sector

Key observations

- Much of the income of those at the top is capital gains, an increase in the value of existing assets.
- Much of the increase in wealth has been an increase in particular of land values.
- There has been an increase in market concentration in many industries throughout the economy.
- Increases in inter-firm disparities in wages (of individuals of seemingly similar qualifications) account for more of the increase in wage inequality than increases in intra-firm disparities.

Changes in the structure of the economy over the past third of a century associated with an increase in market power

- a) an increase in the importance of sectors with large network externalities, in which naturally there will be one or a few dominant platforms
- b) an increase in the importance of sectors with high fixed costs and low marginal costs (much of the digital and knowledge economy)
- c) an increase in knowledge about how to create, maintain, and extend market power, including the design of contracts that help preclude entry
- d) strengthening of intellectual property rights has enhanced the market power of those who do make advances in knowledge
- e) one of the implications of the move from manufacturing to the service sector economy is an increase in (the average degree of) market power, since services are provided locally, and competition within each locale for the provision of these services may be limited

Increased rents leads to decreased capital accumulation

$$I + \Delta E = s(Y + \Delta E)$$

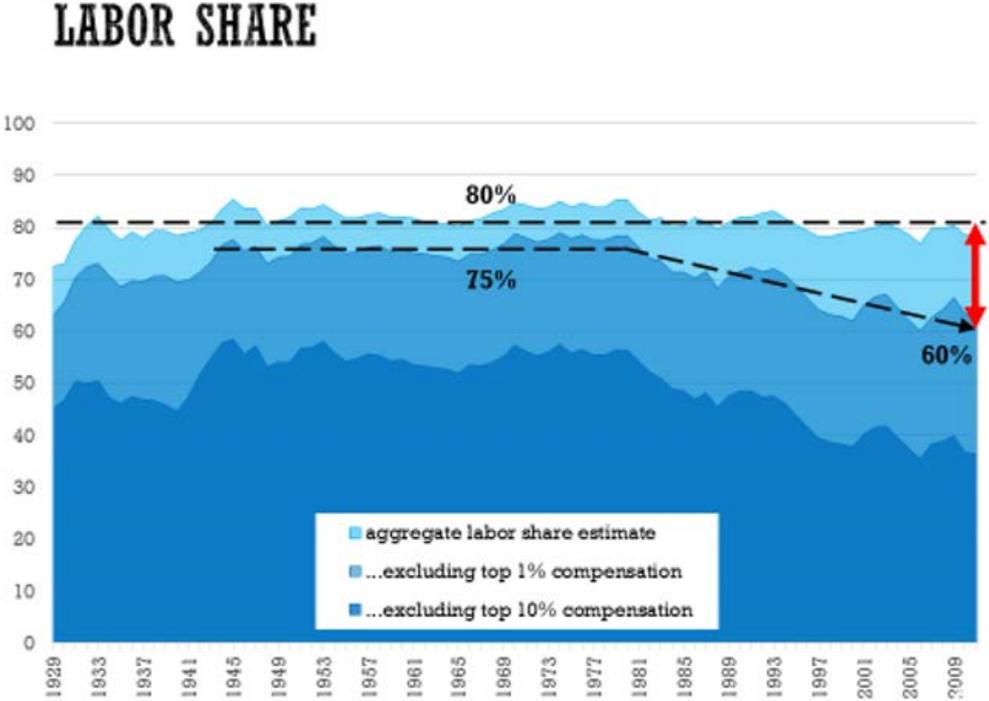
Where I is investment, ΔE is the change in equity value as a result of the (anticipated) increase in market power, Y is national income

$$I = sY - (1 - s) \Delta E,$$

Increased rents as explaining the paradoxes of modern growth

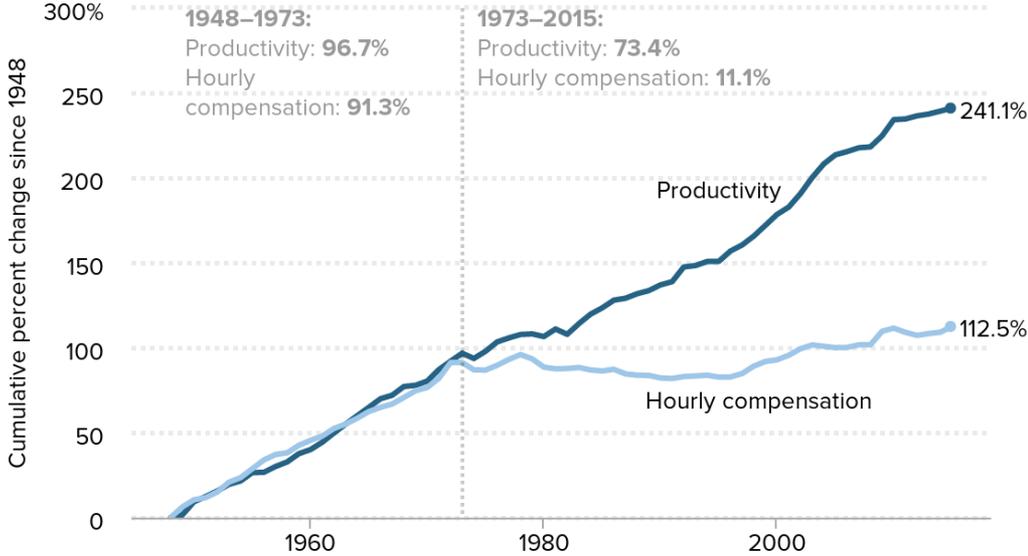
- *If* capital and wealth were the same, then the observed increase in the wealth income ratio should have led to a decreased share of capital, given the wealth of studies suggesting an aggregate elasticity of substitution less than unity
- Should also have also led to an increase in wages
 - Skilled biased technological change only affects *relative* wages, not appropriate weighted average wage
- Disconnect between productivity and compensation
 - No sudden change in technology that can explain sudden change
 - Can be explained by changes in rules, norms, including globalization
- But paradoxes are resolved if we recognize distinction between *wealth* and *capital*.
 - While wealth/income or wealth/per capita has increased, capital/income and capital/per capita has decreased, at least for many advanced countries

Decreased share of labor—especially if one focuses on bottom 99% of labor



Source: Giovannoni (2014) based on NIPA and WTID data

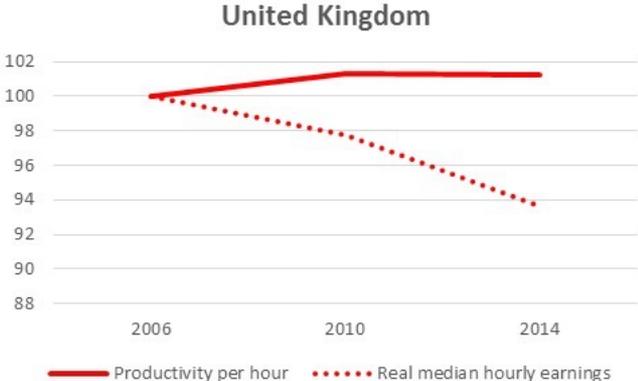
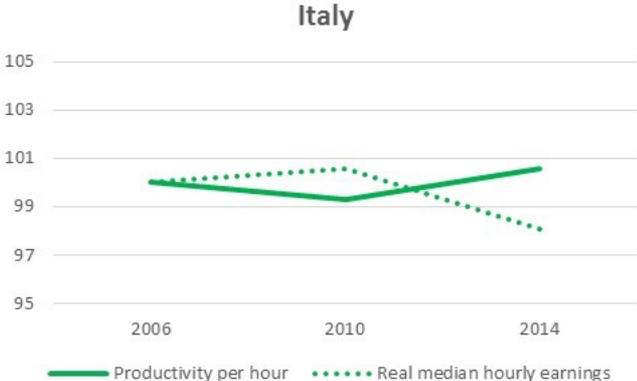
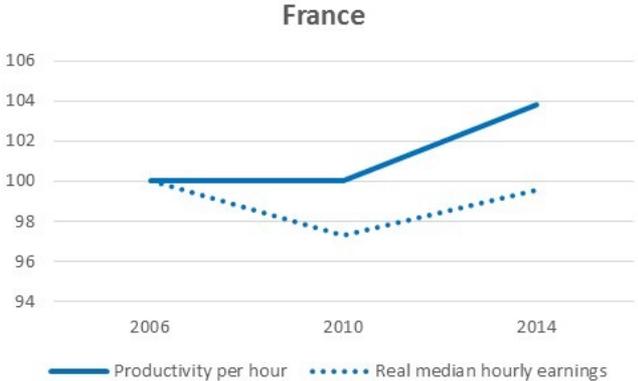
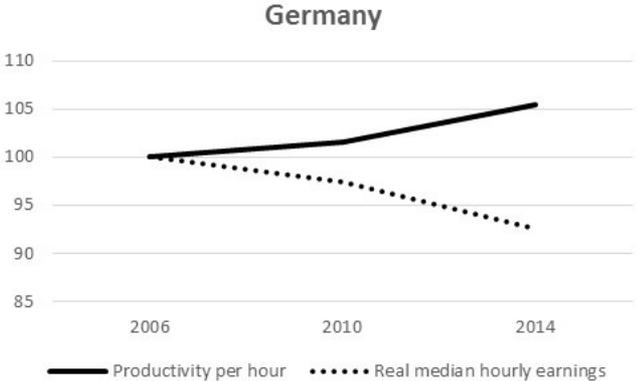
US: Disconnect Between Productivity and a Typical Worker's Compensation, 1948-2015



Note: Data are for average hourly compensation of production/nonsupervisory workers in the private sector and net productivity of the total economy. "Net productivity" is the growth of output of goods and services minus depreciation per hour worked.

Source: EPI analysis of data from the BEA and BLS (see technical appendix of *Understanding the Historic Divergence Between Productivity and a Typical Worker's Pay* for more detailed information)

Europe: Disconnect in Productivity and Compensation

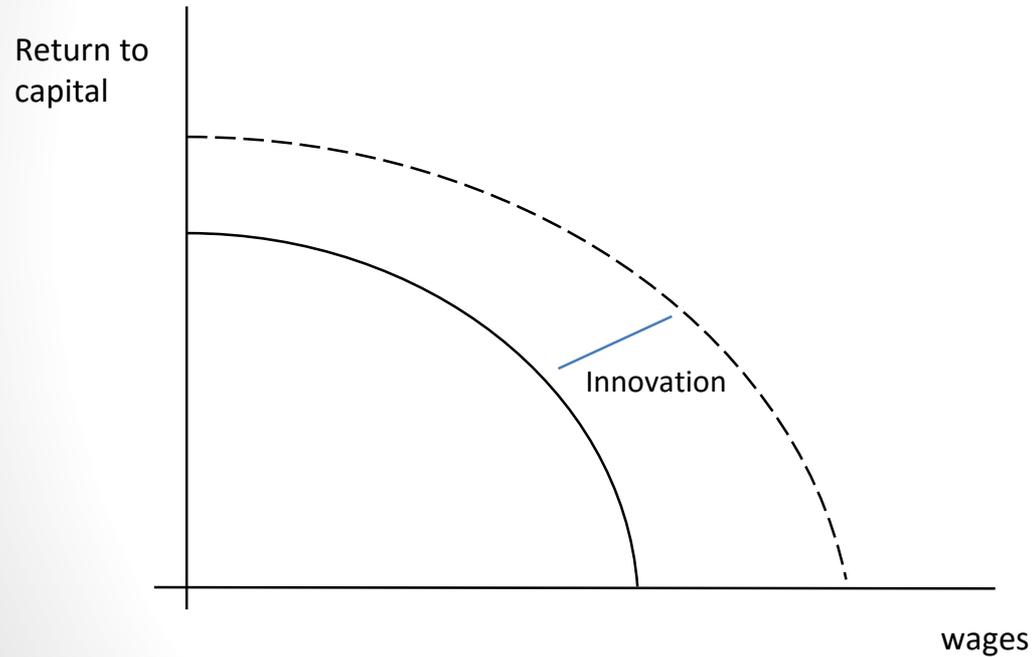


Source: Eurostat.

Alternative analytic representation

- The factor-price frontier, the dual to the production function, implies that with technological change, the real wage corresponding to any given real interest rate (return on capital) should increase
 - While the real interest rate has not increased
 - “Safe” return (T-bills) negative
 - Neither has the real wage
- Cannot be explained within standard competitive model
 - Consistent with growth of rents
 - Including rents associated with monopoly power

Factor price frontier



Explaining persistent productivity/profitability differences

- Slow diffusion of knowledge
 - Optimal for firms not to spend the resources to “catch up.”
 - If the pace of innovation increases or the costs of innovation relative to the cost of imitation increases, then there will be greater productivity dispersion

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- An increase in market power
 - It is not the “more productive” firms are producing more “widgets per man hour”
 - Market power enables them to extract more from consumers for each widget sold

Explaining decreasing share of labor

- Weakening of workers' bargaining power
 - (a) An increase in the average unemployment rate, itself a consequence of changed macro-economic policies, in particular, monetary policies focusing on inflation;
 - (b) A change in labor legislation weakening unionization and changing the structure of collective bargaining; and
 - (c) Globalization—increasing the threat of firms to outsource and relocate
- Changes in corporate governance and norms
 - Enabling senior management in a company to increase their share of corporate revenues

Further puzzle: decreasing investment

- In spite of seemingly high *average* returns
- Finance not constraint
 - Large firms sitting on trillions in cash
 - Real interest rates negative
- Increase in market power
 - Marginal return lower relative to average return
- Corporate governance:
 - Short termism
 - Explained by variety of changes in “rules” (tax, accounting) and practices
 - Increase in executive compensation
 - Again explained by variety of changes in “rules” (tax, accounting) and practices
 - Decrease both investment in the future of the company and workers’ compensation

Rent Sharing

- Puzzle: why workers (of a given ability) in high productivity firms get paid more
 - Inconsistent with standard competitive theories
- Efficiency wage theories
 - Turnover costs
 - Information about what is going on inside the firm can leak out
 - Such information can be deleterious to the long term well-being of the firm.
 - Morale
- *Leading to Vertical disintegration*
 - Limit the extent of rent sharing, by engaging in vertical disintegration
 - Workers may be more sensitive to their pay relative to others in the same firm than to others in different firms
- Alternative theory of boundaries of firm
 - Coase: transactions cost
 - Greenwald-Stiglitz: diffusion of knowledge vs. diseconomies of scale

Increased land rents

- Natural result of increased population, increased advantages of agglomeration
- {price, capital accumulation} dynamics are a saddle point
 - Along bubble paths, there will be growing wealth inequality
- If the economy consisted of a single individual, with infinite foresight and full rational expectations, then today, prices would be set correctly
 - Assumptions are not true
 - Economy does not act *as if* they were true.
- Growth of land bubbles is fed by the growth of credit

Credit bubbles

- Growth of credit in most capitalist economies has been delegated to the private sector
 - Restricted entry plus natural barriers to entry provide this sector considerable rents
- Incentives to create a land bubble—in absence of adequate regulation
- Banks allocate capital in a discriminatory way
 - Credit markets characterized by credit rationing
 - Those who get credit enjoy a surplus

Increased political rents (including IPR)

- Direct gifts (agricultural subsidies)
- Tax benefits (e.g. associated with preferential treatment of capital gains or depletion allowances for natural resources),
- Paying more than market prices for some goods (the prohibition of US government from negotiating competitive prices for drugs)
- Selling assets (like natural resources) at below competitive prices.
- Hidden rents(e.g. in the tax code or through the provision of insurance at below market prices, or in banks' access to funds at low interest rates from the Federal Reserve)
- Rents from protection from competition
 - Some rents are an inevitable byproduct of even good regulation, e.g. those that arise from zoning or the construction of public transport;
 - But even then the government could capture much or all of the rents through appropriate taxation or auctions
 - IPR protects from competition—rationale: increased incentives to innovate
 - Poorly designed IPR regime may actually reduce innovation

There may be multiple equilibria (again)

- High levels of economic inequality result in high levels of political inequality,
 - Which result in pro-inequality economic and political systems,
 - And pro-inequality economic and political systems result in higher levels of inequality.
- A country like the US can be trapped in the bad equilibrium.
 - Others have been fortunate to be in a good equilibrium

Simple model

Rent seeking increases as the tax rate decreases

Assumptions:

- Tax benefit b for an industry could be achieved through the expenditure of e
- Industry acts cooperatively in setting e to maximize industry after tax profits (where π gives the maximized value of profits at any level of benefits b)

$$\Pi = (1-\tau)\pi(b(e)) - e,$$

yielding

- $(1-\tau)\pi' b' = 1.$

Sector takes tax rates as given. The solution $\{b^*, e^*\}$ a function of τ

$$b^* = b^*(\tau), \text{ with } b^{*'} < 0$$

It pays to put less effort into getting benefits when tax rate is higher.

Rent seeking decreases as tax rate increases

Rents defined as the difference between what profits would have been at $b=0$ and at b^*

$$(1) \quad R = \Pi(b^*) - \Pi(0) = R(\tau)$$

Hence Rents increase as the tax rate decreases

$$(2) \quad dR/d\tau < 0$$

Lobbying for a low tax rates

With high rents corporations strive for lower tax rates

- Corporate lobbying E . Tax rate depends on lobbying effort: $\tau(E)$, $\tau' < 0$, $\tau'' > 0$
- $\text{Max } (1 - \tau) \Pi(b^*) - E$

Taking b^* as given yields E^* is solution to

$$(3) \quad -\tau' \Pi^* = -\tau' \{R + \Pi(0)\} = 1.$$

yielding

$$d \ln E / d \ln R = R / \xi (R + \Pi(0)) > 0$$

where $\xi = -d \ln \tau' / d \ln E > 0$. Thus,

$$(4) \quad d \ln \tau / d \ln R = -\eta d \ln E / d \ln R = -\eta R / \xi (R + \Pi(0))$$

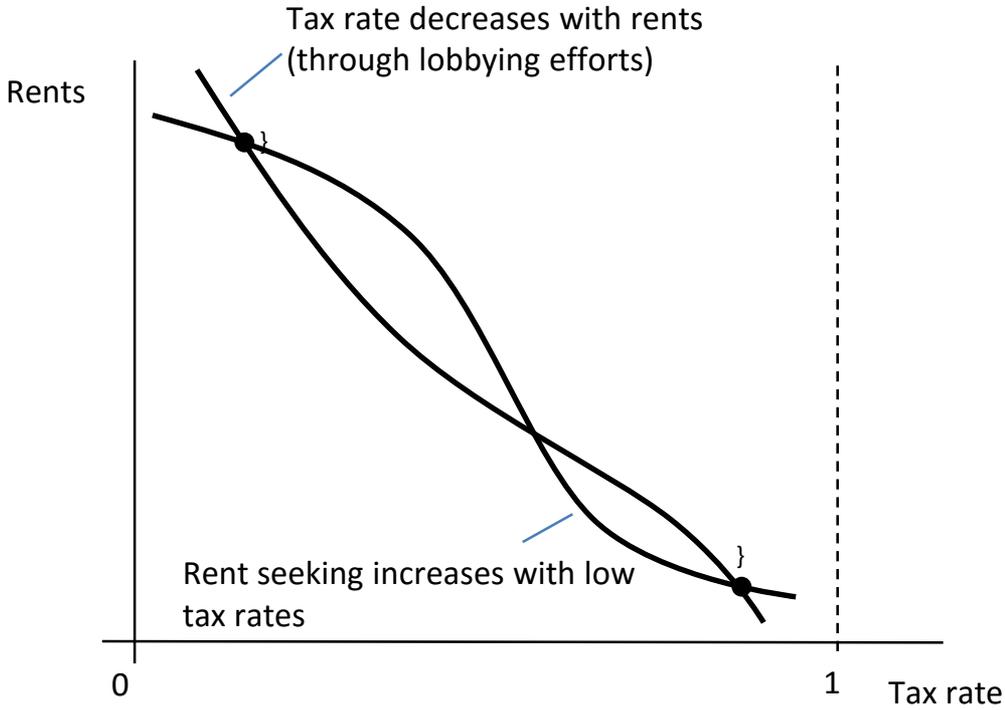
where $-\eta = d \ln \tau / d \ln E$.

The lower the rents, the higher the equilibrium corporate income tax rate.

Full market equilibrium

- Equilibrium simultaneous solution to (1) and (3)
- Using (2) and (4) there can be multiple equilibria
- The economy can be trapped in a bad equilibrium, with (corporate) tax rates inducing high levels of rent seeking (equation 1); and high levels of rents inducing high levels of effort at lowering the corporate income tax—and achieving that (equation 3).

Multiple equilibria



Concluding remarks

Usefulness of benchmark model for studying dynamics of inequality

- Seeing growth of inequality of wealth as a move from one equilibrium to another
- Identifying centripetal and centrifugal forces
- Explaining increase in inequality as an increase in centrifugal forces exceeding the changes in centripetal forces (indeed, these have weakened)

Analysis suggests that changes in technology have played only a limited role

- And even that can be thought of as *endogenous*
- In standard models normal economic forces would have worked to have limited tendencies towards greater inequality
 - As share of capital increases, move towards labor augmenting technological progress which if elasticity of substitution is less than unity, would have led to an increase in the share of labor

Inequality has been a choice

- A result of policies
- How the “rules” of the market economy have been written and implemented
 - Including corporate governance, monetary policy, intellectual property, and anti-trust
- Much of the increase of inequality is a result of an increase in rents
 - Including and especially rents associated with market power
- These rents increase inequality, reduce economic efficiency, and slow growth
 - With increases in capitalized value of rents “crowding out” real capital accumulation

Endogenous economic and political equilibrium

- But these choices themselves need to be viewed as endogenous, as part of a political and economic equilibrium
- We have constructed several models where there are multiple equilibria
 - One with low inequality, another with high inequality
- Economic inequality leads to political inequality
 - With high levels of political inequality rules of game are set to favor the rich
 - Giving rise to and supporting high levels of economic inequality
- Some countries seemed to be trapped in the high inequality equilibrium, others to be in the low inequality equilibrium.

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