Value, price and profit

The transformation problem and its afterlife

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An Introduction to Post Keynesian Economics
and Political Economy
Kingston University 11–13 July 2013

How to use this document

If you are viewing this document on screen you should be using a file called `VPPshow.pdf`; if so, you do not want to try printing from it.
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You may want to print out this file so that the slides are laid out in $n \times 2$ format, where n is the number of rows. If you want to add your own notes 2×2 is good in A4 landscape format; 4×2 in portrait format works if you don't mind small type.

Outline

1. The (so-called) transformation problem
   - Prologue
   - Why it matters: the falling rate of profit
   - The problem posed and answered
   - The problem problematised
2. Marx the temporalist
   - The Temporal Single System Interpretation
   - Is Marx a temporalist?
3. Marx the probabilist
   - Dissolving the transformation problem
   - Econophysics and complexity
   - Is Marx a probabilist?

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. . . and what it's not

- It's about interpretation
  - is Marx a theorist of equilibrium or *disequilibrium*?
    - Compare Keynes . . .
- and disproving claim that Marx's theory is logically incoherent
  - hence allowing his other work to be considered seriously
  - in particular, falling rate of profit as basis of capitalist crisis
- It's *not* about 'correcting' or 'completing' Marx
  - neither new methods nor new solutions
  - not proving Marx's value theory *correct*
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Two quotations. . .

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If M. Proudhon admits that the value of products is determined by labour time, he should equally admit that it is the fluctuating movement alone that in a society founded on individual exchanges makes labour the measure of value. *There is* no ready-made constituted 'proportional relation', but *only a constituting movement*.[1]

[T]he rate of profit . . . seeks the 'ideal' mean position, i.e. a mean position which does not exist in reality. In other words, it tends to shape itself around this ideal as a norm.[2]

[1] *The Poverty of Philosophy*: 71 (emphases added)
[2] *Capital* Vol. III: 273

Value, price and profit
Can labour-time explain exchange value?

Marx simply speaks of 'value theory': is it

- 'labour theory of value'?
  - labour-time *determines* value
    - x hours labour $\Longrightarrow$ y units of value
- 'value theory of labour'? [3]
  - 'how come labour is represented by (exchange) value?'
    - rather than seen directly
- both, because the representation is both quantitative and qualitative
  - the quantity of one kind of thing (ultimately, individual human activity) is represented by quantity of a quite different kind of thing (exchange value)

[3] as suggested by Diane Elson (1979)

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Commodity-owning society

- All agents equal
  - equally commodity-owners
- Workers
  - own their 'labour-power'
  - 'free' in double sense
    - free to sell labour-power to highest bidder
    - free of ownership of means of labour
- Capitalists
  - own the means of labour
    - 'means of production'

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Use-value and exchange-value

- Exchange value
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  - 'use value' merely pre-condition for exchange value
- Value of labour-power?
  - exchange value
    - determined by labour-time needed to produce workers' consumption goods
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Explaining profits

- Workers sell
  - labour-power for agreed time-span
- Capitalists get
  - labour performed in that time
- Profit
  - A: (exchange) value of product
    - determined by labour-time
  - B: value of labour-power
    - paid as wages; determined by value of wage-goods
  - C: value of used-up means of production
  - $A - (B + C)$ = surplus-value = surplus labour-time

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How to increase profits? Install machinery

A paradoxical claim, if labour is the sole source of value?

Q. How to increase surplus-value?

A. Increase surplus labour-time

- Increase total labour? (lengthen working day)
  - limited by 24 hours
- Decrease necessary labour?
  - raise productivity by introducing machinery
  - workers replace the value of their wages more quickly

Why labour-saving machinery does not shorten the working day (as much as it could)

- It saves the capitalist's time, not the worker's

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  - raise productivity by introducing machinery
  - workers replace the value of their wages more quickly

Why labour-saving machinery does not shorten the working day (as much as it could)

- It saves the capitalist's time, not the worker's

Some notation . . .

. . . and some notes

Capital	Result	Rates of . . .	
c = constant [4]		profit	$s/(c+v)$
v = variable [5]	s = surplus value	exploitation	s/v

1. More machinery
   $\Longrightarrow$ increasing the 'organic composition of capital' (c/v)
2. Keep your eye on s/v and c/v . . .

[4] means of production
[5] wages

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Falling sideways? Deriving the LTFRP

The Law of the Tendential Fall of the Rate of Profit

- rate of profit

$$\frac{s}{c+v} \Longrightarrow \frac{s/v}{(c/v)+1} \tag{1}$$

  - . . . and suppose c/v increases?
- *but* counter-acting tendencies
  - increasing rate of exploitation: s/v
    - e.g. speed-up machinery
  - cheapening variable capital: v
  - cheapening constant capital: c
- all of which predicts . . . what?

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Falling upwards! Illustrating the LTFTG

The Law of the Tendential Fall of Things in General

- Obviously this does not refute the law of gravity
- Indeed, it confirms the law by means of the counteracting tendencies
- Without LTFRP, no theory of crisis
  - cyclical
  - breakdown
  - permanent crisis
  - ...or whatever

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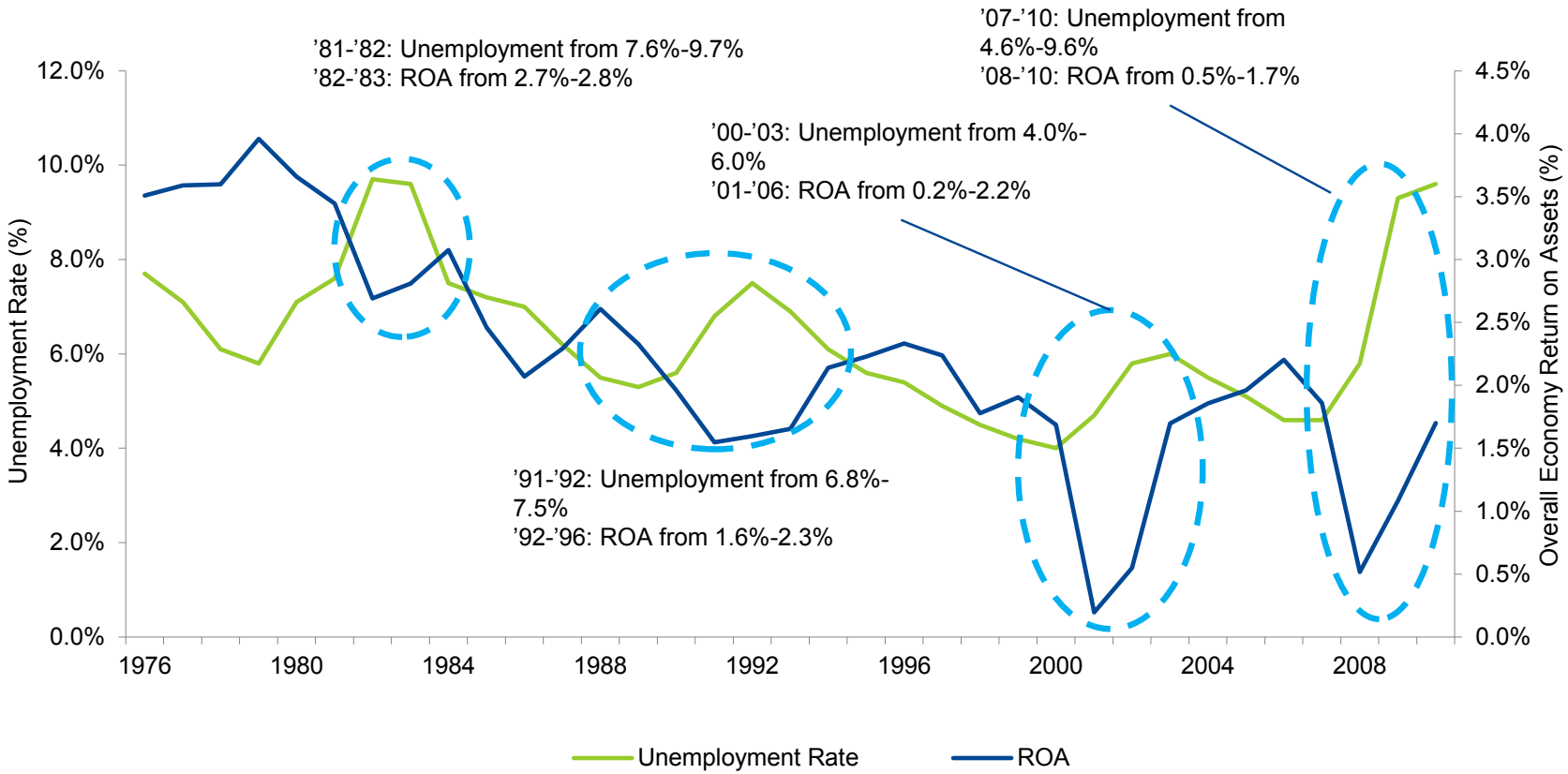
Falling downwards! News from the Edge

Demonstrating the LTFRP

Exhibit 4: ROA and U.S. Unemployment Rate (1976-2010)

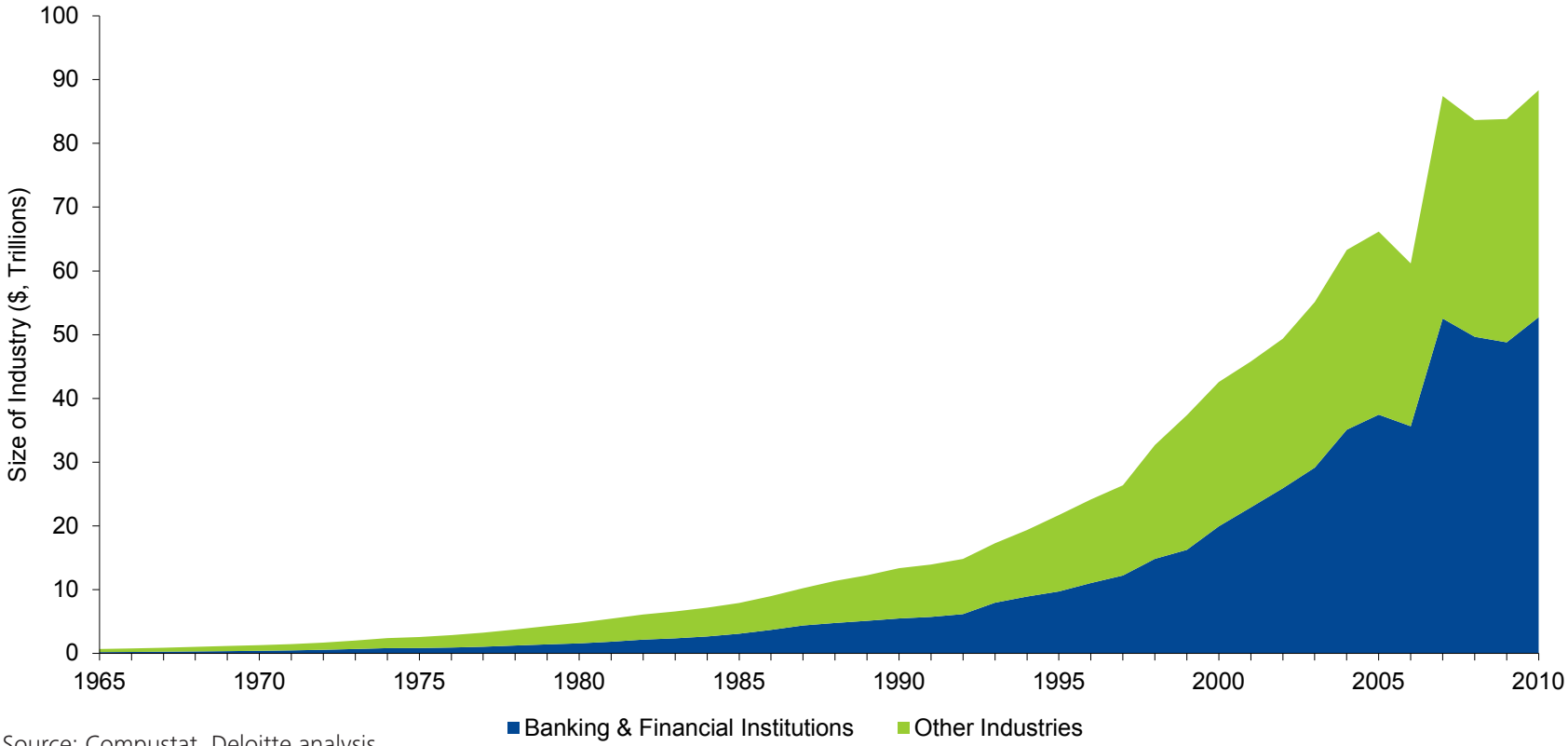


Source: U.S. Bureau of Labor Statistics, Compustat, Deloitte Analysis

The inexorable rise of capital

Falling downwards! News from the Edge 2

Exhibit 90: Asset Base ($, Trillions), U.S. Economy and Banking Industry (1965-2010)

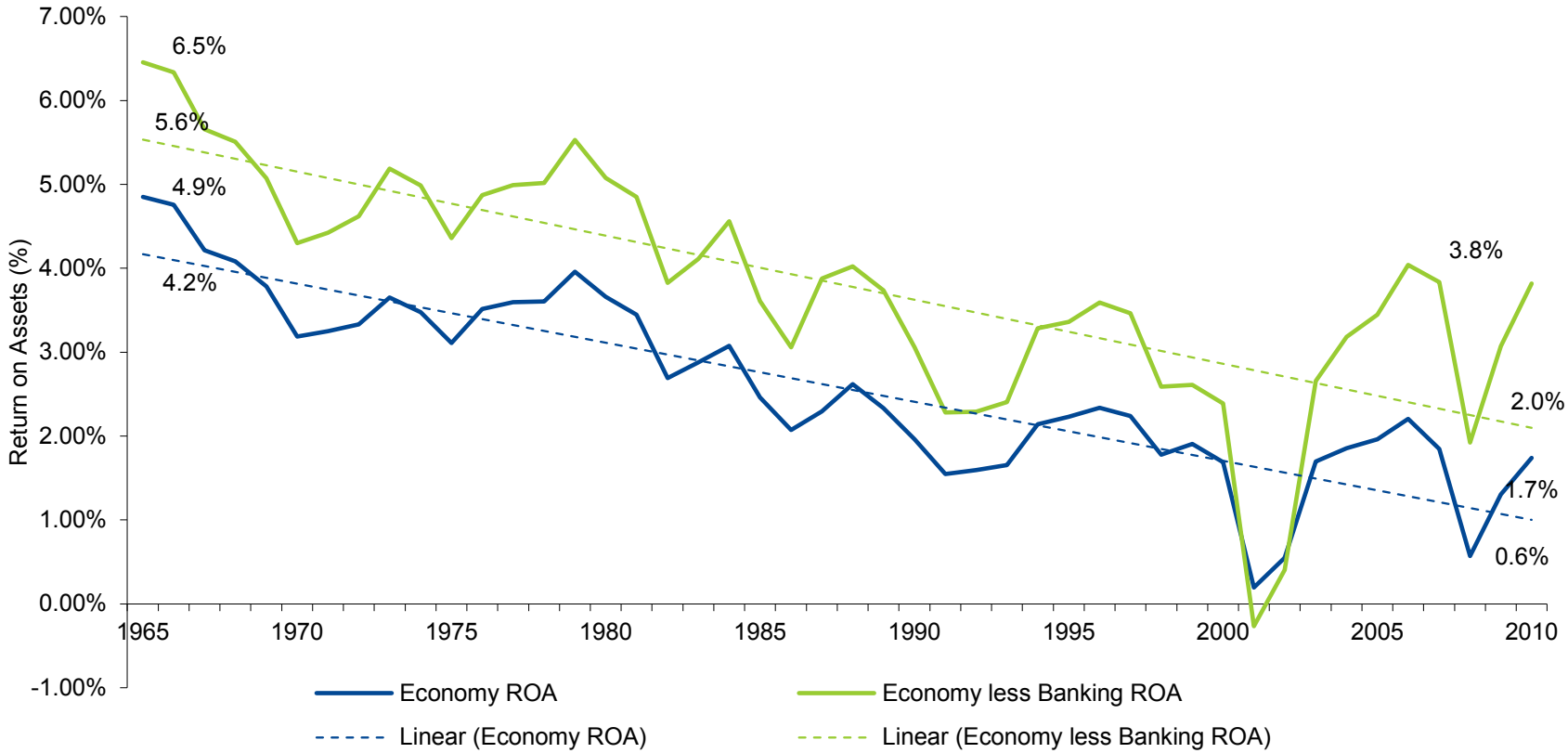


Source: Compustat, Deloitte analysis

It's not (just) financialisation

Falling downwards! News from the Edge 3

Exhibit 91: ROA for the U.S. Economy (1965-2010)

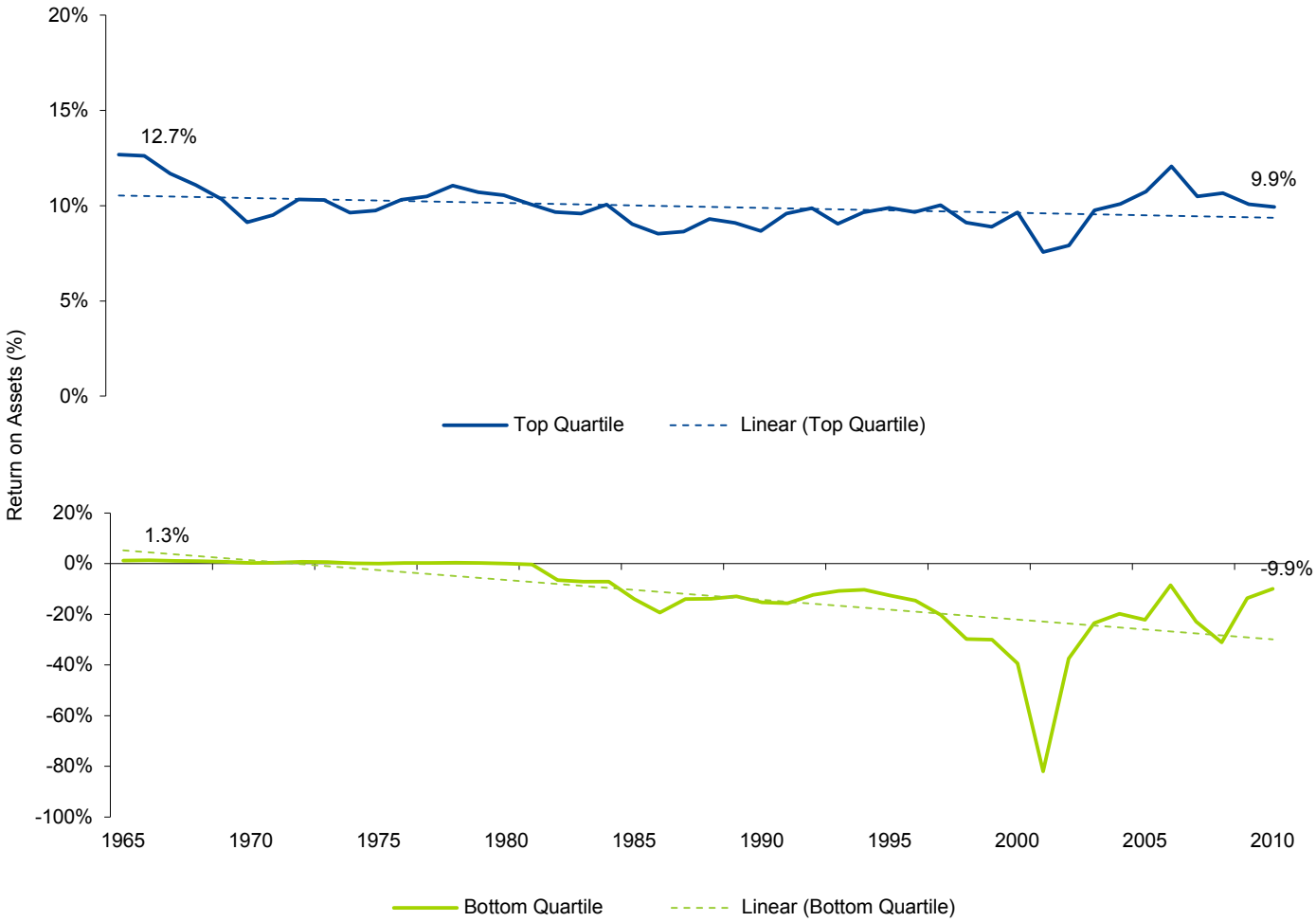


Source: Compustat, Deloitte analysis

From him that hath not shall be taken away . . .

Falling downwards! News from the Edge 4

Exhibit 92: Economy-wide ROA by quartile (1965-2010)



Source: Compustat, Deloitte analysis

The transformation problem 1

More notation—and assumptions and conditions

Production			**Market**
Capital	Results	Rates of . . .	
c = constant [6]	w = value	profit: $s/(c+v)$	p = price
v = variable [7]	s = surplus value	exploitation: s/v	π = profit

- Assumptions
  - Competition equalises market profit rate, $\pi/(c+v)$
  - Equal rate of exploitation
- Conditions
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The transformation problem 2

Disintegration of the Ricardo school

However,

- Value $\neq$ price, especially $\neq$ *market* price
- $\exists$ different 'compositions of capital' (c/v) in different industries
- $\Longrightarrow$ different ratios imply unequal profit rates
  - *if* labour time *directly* determines exchange value

Ricardo aware of the problem, but neither he nor followers had an answer

- '93 per cent' labour theory of value [8]
- Disintegration of Ricardo school [9]

[8] Stigler t.b.a.

[9] *Theories of Surplus Value* Ch.20, ¶ 2(a)

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Engels' prize essay competition

Set in the Introduction to *Capital* II (1884)

- Winner: Peter Fireman
- Runner-up: Conrad Schmidt
- Booby prize: George Steibeling

Notes for solution

- Two distinctions between value and price
  - Qualitative: ways of measuring—labour-time and money
    - 'Price, taken by itself, is only the monetary expression of value.'[1]
  - Quantitative: 'value produced' *vs.* 'value received'
    - value determined by labour-time
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[1] 'Value, Price and Profit', p. 1

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Marx's answer
Capitalist communism

- 'Prices of production'
  - re-distribute surplus value to equalise profit rates

Branch	c	v	s	w	π	p	$c:v$	$\frac{s}{c+v}$	$\frac{\pi}{c+v}$
1	54	6	12	72	15	75	9:1	20%	25%
2	16	4	8	28	5	25	4:1	40%	25%
$\sum$	70	10	20	100	20	100	7:1	25%	25%

- Three equalities:
  - Total surplus value = total profit
  - Total price = total value
  - Value rate of profit = price rate of profit

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Bortkiewicz's problem

Supposed proof of 'internal contradiction'

Period	Dept.	r	c	v	s	w	π	p	$\frac{s}{(c+v)}$	$\frac{\pi}{(c+v)}$
	I		280	72	48	400	88	440	13.6%	25.0%
1	II		80	96	64	240	44	220	36.4%	25.0%
	III		40	72	48	160	28	140	42.9%	25.0%
	$\sum$		400	240	160	800	160	800	25.0%	25.0%

- With sale at values simple reproduction is possible
  - e.g., in Dept. I the value of output ($w = 400$) equals total quantity of used-up means of production: $c = 400$
- But if Dept. I output sells at prices of production ($p = 440$)
  - some will go unsold, since constant capital expenditure $c = 400$, and production will contract

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  - e.g., in Dept. I the value of output ($w = 400$) equals total quantity of used-up means of production: $c = 400$
- But if Dept. I output sells at prices of production ($p = 440$)
  - some will go unsold, since constant capital expenditure $c = 400$, and production will contract

Bortkiewicz's problem

Supposed proof of 'internal contradiction'

Period	Dept.	r	c	v	s	w	π	p	$\frac{s}{(c+v)}$	$\frac{\pi}{(c+v)}$
	I		280	72	48	400	88	440	13.6%	25.0%
1	II		80	96	64	240	44	220	36.4%	25.0%
	III		40	72	48	160	28	140	42.9%	25.0%
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Bortkiewicz's solution

Walrasian 'marxism'

Alfred Marshall said once of Ricardo: 'He does not state clearly, and in some cases he perhaps did not fully and clearly perceive how, in the problem of normal value, the various elements govern one another mutually, not successively, in a long chain of causation.' This description applies even more to Marx . . . [who] held firmly to the view that the elements concerned must be regarded as a kind of causal chain, in which each link is determined, in its composition and its magnitude, only by the preceding links . . . Modern economics is beginning to free itself gradually from the successivist prejudice, the chief merit being due to the mathematical school led by Leon Walras.[11]

[11] Bortkiewicz (1952:23-24)

System	Branch	vpu	c	v	s	w	$\frac{s}{c+v}$
Value	1	1	96	10	14	120	13.2
	2	1	12	20	28	60	87.5
	Total		108	30	42	180	30.4

	Branch	ppu	c'	v'	π	p	$\frac{\pi}{c'+v'}$
Bortkiewicz	1	1.75	168	7	35	210	20
	2	0.70	21	14	7	42	20
	Total		189	21	42	252	20
Moszkowska-Winternitz	1	1.25	120	5	25	150	20
	2	0.50	15	10	5	30	20
	Total		135	15	30	180	20
`New and improved'	1	1.50	144	6	30	180	20
	2	0.6	18	12	6	36	20
	Total		162	18	36	216	20

Simultaneism $\Longrightarrow$ physicalism

Steedman's 'physical quantities approach'

- Simultaneism: requirement that per-unit input prices (or values) must equal per-unit output prices (or values)
- Physicalism: sole proximate determinants of values, relative prices, profits, and rate of profit are technology and real wages

	Corn	Price (or value)	Capital
Input	10 bushels	\$6/bushel	$\$6 \times 10 = \$60$
Output	12 bushels	\$5/bushel	$\$5 \times 12 = \$60$
Input	10 bushels	\$5/bushel	$\$5 \times 10 = \$50$
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The Temporal Single System Interpretation

Freeing economics from the simultaneist prejudice

Bortkiewiczian transformation problem is a problem because simultaneism

- leads to physicalism
  - leaves out labour values
- either implies static economy
- or contrary to physics
  - capitalists can't go back in time to purchase new outputs at old values/prices
    - contrary to second law of thermodynamics

Take output prices (of production) as input values in next period

- Because capitalists lay out value in form of money to purchase inputs

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Bortkiewicz refuted

Bringing back time—and giving up equilibrium

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	$\sum$		400	240	160	800	160	800	25.0%	25.0%
	I	66	308	66	54	428	102	476	14.4%	27.3%
2	II	44	88	88	72	248	48	224	40.9%	27.3%
	III	30	66	66	54	164	30	140	49.1%	27.3%
	$\sum$	140	440	220	180	840	180	840	27.3%	27.3%

r = residual proceeds ('revenue', in Marx)

‘It is always possible to go wrong’

. . . and many readers have

As the price of production of a commodity can diverge from its value, so [can] the cost price of a commodity, in which the price of production of other commodities is involved ... . It is necessary to bear in mind this modified significance of the cost price ... if the cost price of a commodity is equated with the value of the means of production used up in producing it, it is always possible to go wrong. (Capital, Vol. III, p.309, New York, Vintage Books, 1981.)

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However . . .

- the price of production of a commodity that diverges in this way from its value enters as an element into the cost-price of other commodities ... [hence] ... a divergence from the value of the means of production consumed may already be contained in the cost price, quite apart from the divergence that may arise for the commodity itself from the difference between average profit and surplus value [12]

[12] *Capital* III: 309

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Hence we are considering two different questions[13]

Marx what is the relation between values and prices in the same economy at two points in time?

- divergence ‘already contained in the cost-price’ (period 0)

Bortkiewicz what is the relation between prices in two different economies at the same point in time?

- difference between the surplus value and profit (period 1)

See also a telling passage from *Theories of Surplus Value*[14]

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Farjoun and Machover
Giving up (empirical) profit-rate equalisation

Dissolving the transformation problem

- Temporal Single System refutes claims of logical inconsistency in Marx's theory
- Farjoun and Machover drop profit rate equalisation
  - empirical approach, but also changes logic of problem
- demonstrate probabilistic correspondence of value and price categories
- appeal to statistical mechanics for hypothesis about profit rate *distribution* . . .
  - . . . which is that it should be gamma distribution

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Economics and physics

Laws of Chaos (1983)

- large systems of independent agents sound like markets
- large systems of independent atoms sound like ideal gas
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- 'econophysics' *terminology* coined by Stanley *et al.* (1992)
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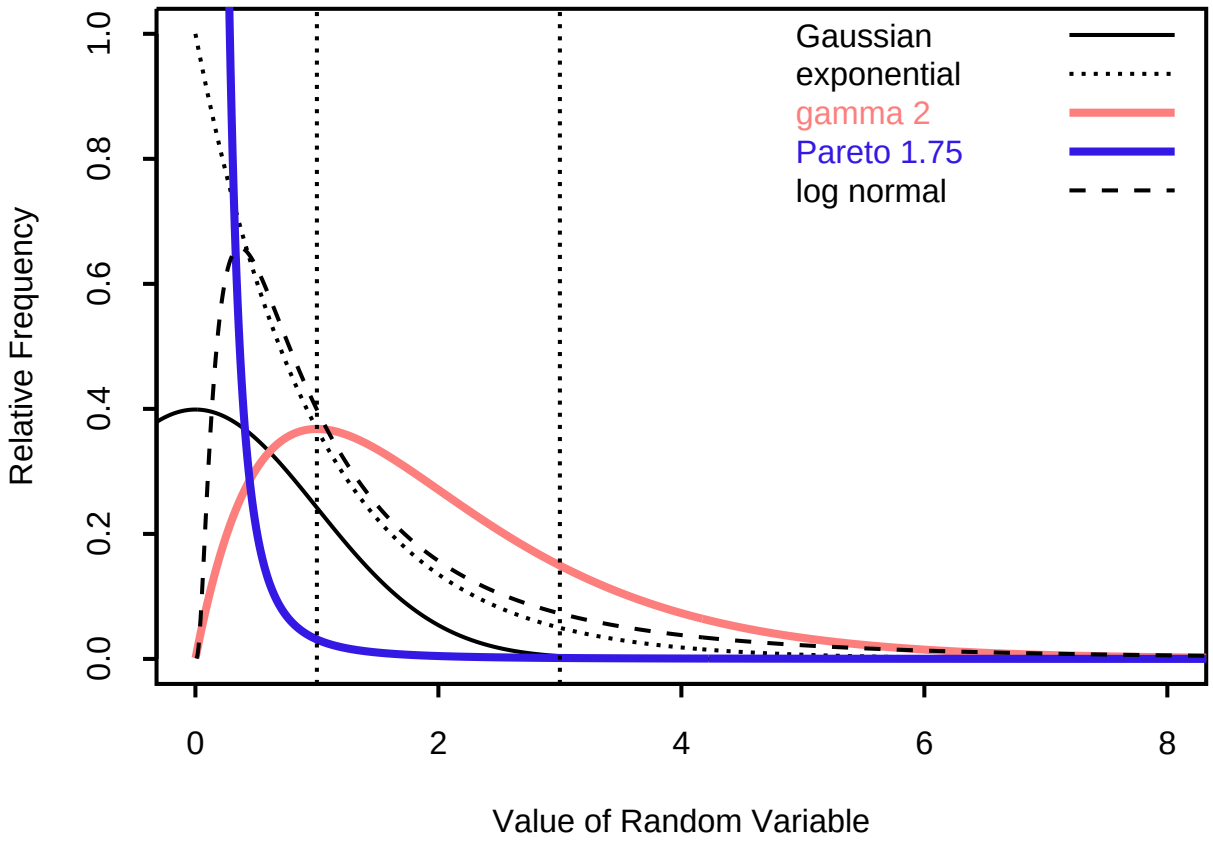
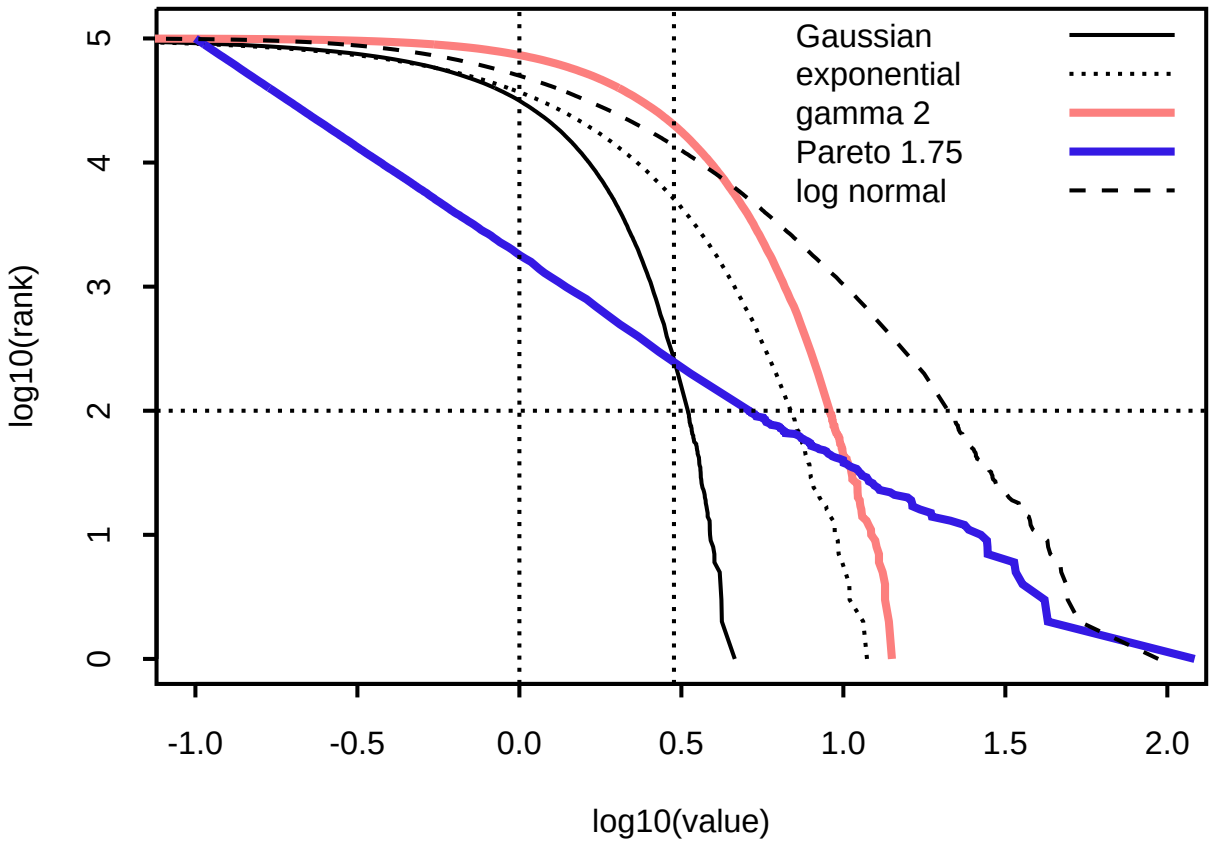
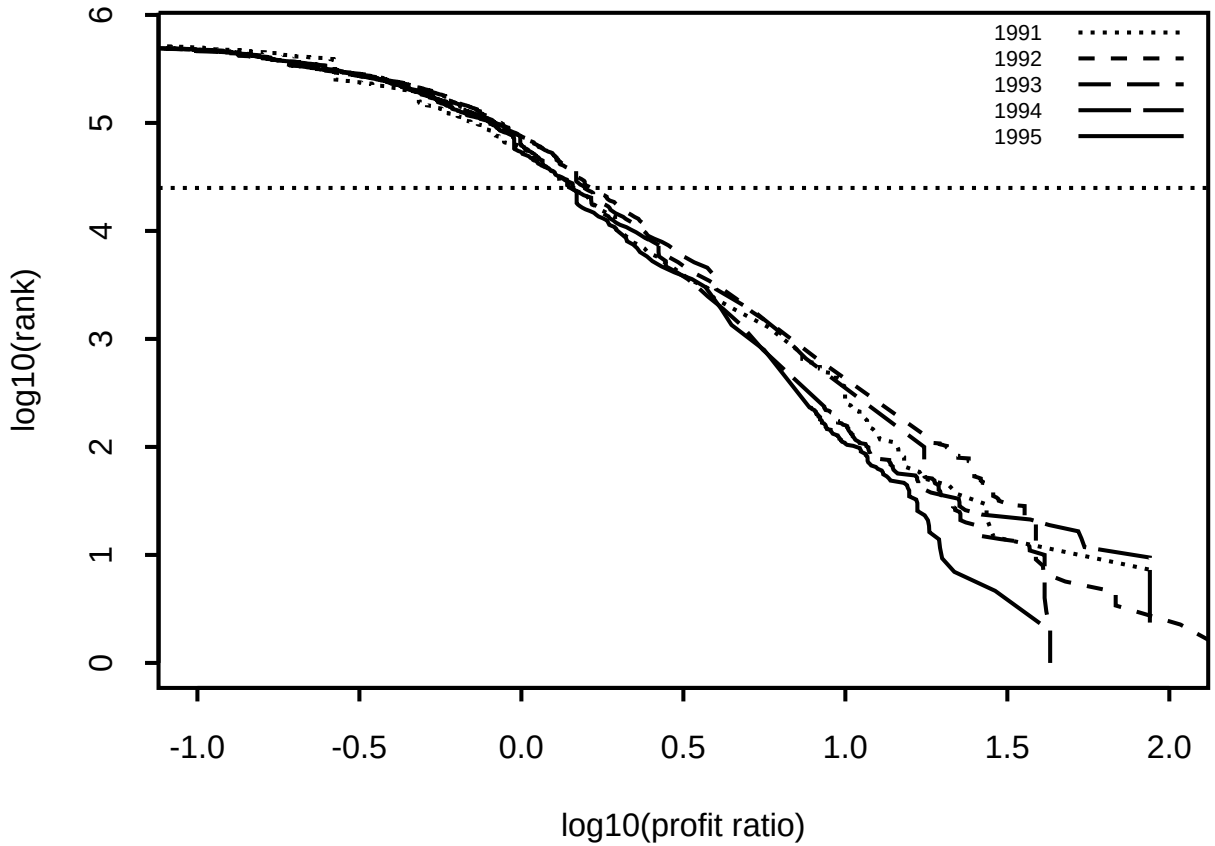
Comparing distributions: densities



Comparing distributions: Zipf plots



Time variation in Gillman 4 profit rate



Profit rates and power-laws

It's the tails that matter, not the cats

- Power-law tails found for all profit-rate definitions
  - . . . also widely accepted as stylized fact about returns to financial assets
  - . . . and for many key variables, such as wealth and income

[T]his reflects an underlying heterogeneity in the population . . . . The fat tails mean that a relatively small number of events, or people or something, have a big influence. And I think most of our theories of price changes, of changes in investment in response to different conditions are deficient because they don't take account of the shapes of the distributions. (Kenneth Arrow[15])

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- Complex systems: order an 'emergent property' of large systems of independent agents
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- power law tails an indicator of 'criticality'
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Early years
The doctoral dissertation

- well-known that aim is to justify human free-will against determinism
- less appreciated: that method is to praise Epicurus's views on chance
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- *spontaneous* deviation, deduced dialectically from *concept* of the atom

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Early years
First steps in political economy

The true law of political economy is chance, from whose movement we . . . isolate certain factors arbitrarily in the form of laws.[16]

. . . it is precisely these fluctuations [in supply and demand] that force the price to conform to the cost of production. In the totality of this disorderly movement is to be found its order.[17]

If M. Proudhon admits that the value of products is determined by labour time, he should equally admit that it is the fluctuating movement alone that in a society founded on individual exchanges makes labour the measure of value. *There is* no ready-made constituted 'proportional relation', but *only a constituting movement*.[18]

[16] 'Notes on James Mill'
[17] *Wage Labour and Capital*
[18] *The Poverty of Philosophy*: 71 (emphases added)

Grundrisse: complexity and emergent properties

. . . as much as the individual moments of this movement arise from the conscious will and particular purposes of individuals, so much does the totality of the process appear as an objective interrelation, which arises spontaneously from nature. . .

Their own collisions with one another produce an **alien** *social power standing above them, produce their mutual interaction as a process and power independent of them.* . . .

Circulation as the first totality among the economic categories is well suited to bring this to light. [19] (emphases added: 'alien' is Marx's emphasis)

[19] *Grundrisse* pp.196–197

Probability density functions: *Capital* Volume III

- on the 'equalization' of profit rates

Between those spheres that approximate more or less to the social average, there is again a tendency to equalization, which seeks the 'ideal' mean position, i.e. a mean position which does not exist in reality. In other words, it tends to shape itself around this ideal as a norm. [20]

- introduces extended discussion that is verbal description of probability density

[20] *Capital* III: p.273

Probability density functions: *Capital* Volume III

- on the 'equalization' of profit rates

Between those spheres that approximate more or less to the social average, there is again a tendency to equalization, which seeks the 'ideal' mean position, i.e. a mean position which does not exist in reality. In other words, it tends to shape itself around this ideal as a norm. [20]

- introduces extended discussion that is verbal description of probability density

[20] *Capital* III: p.273

The central limit theorem: *Capital* Volume I

Edmund Burke, that famous sophist and sycophant, goes so far as to make the following assertion, based on his practical observations as a farmer: that 'in so small a platoon' as that of five farm labourers, all individual differences in the labour vanish . . . Compare Quételet

But if the 12 men are employed in six pairs, by six different 'small masters', it will be entirely a matter of chance whether each of these masters produces the same value, and consequently whether he secure the general rate of surplus-value. . . . The inequalities would cancel out for the society as a whole, but not for the individual masters. [21], emphasis added???

[21] *Capital* I: p.xxx

Marx and Quetelet

- *citations* are scanty—but highly significant
- *influence* seems great, although little noticed
- *concrete evidence*: two notebooks, one noting Quetelet's *Treatise*, another dealing with a later work
- *inferential evidence*
  - 'Peuchet' on suicide: Quetelet and 'statistical fatalism'?
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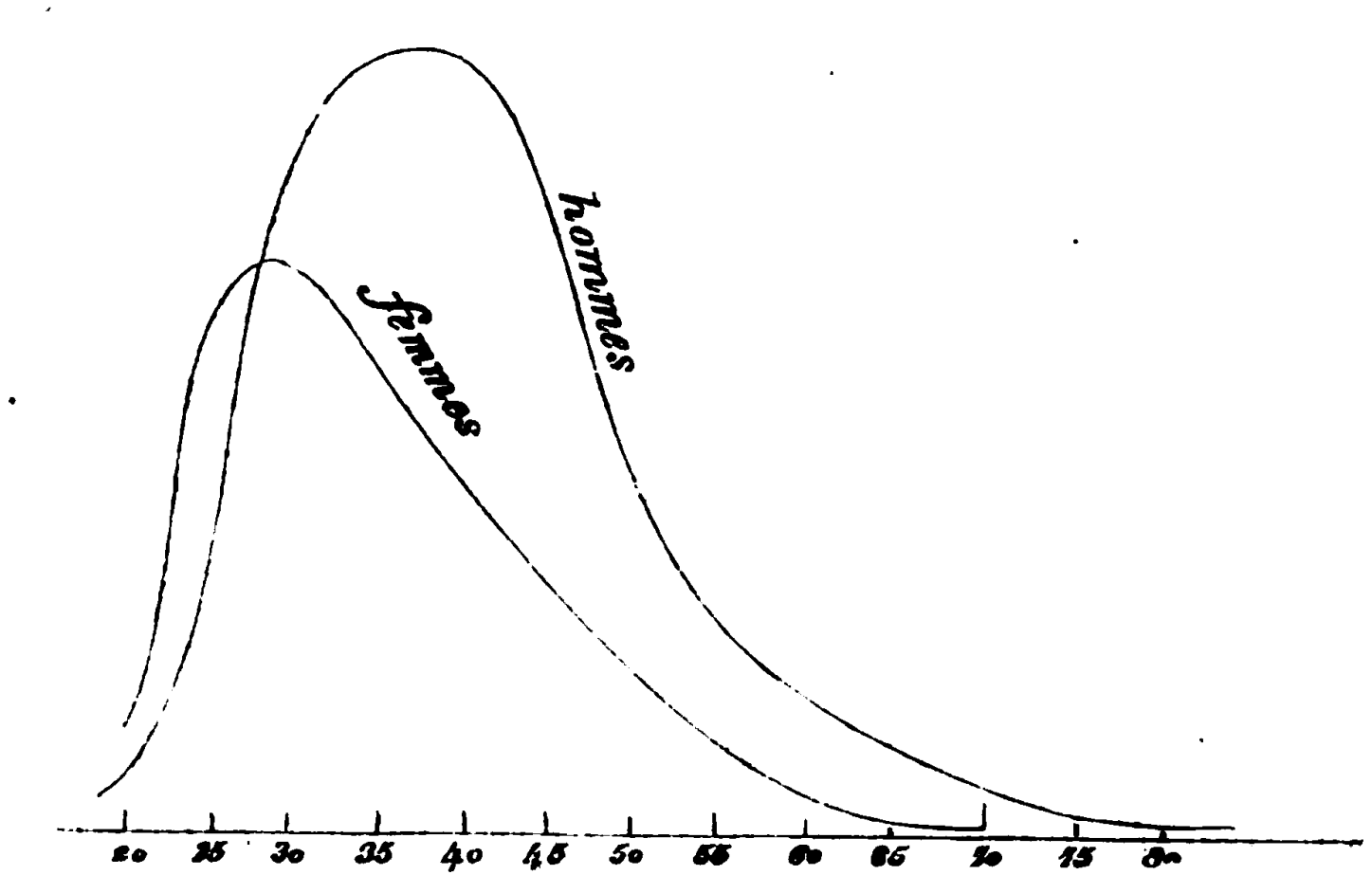
What Marx saw in Quetelet



Conclusion

- Marx's value theory is dynamic, non-equilibrium theory
- Marx's critics are entitled to their own theories, but not to claim that his is inconsistent
- Marx's probabilism should inspire 21st century marxists

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Big Game...
I'm told they're very timid, so we mustn't do anything to startle them or make them run away...