

## IIPPE Training Workshop in Marxist Political Economy

Session 2: Profitability

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## Reading

- In my opinion, the best general texts on Marx's *Capital* are
  - Duncan K. Foley (1986), *Understanding Capital*, Cambridge Mass and London UK: Harvard University Press
  - Michael Heinrich (2004), *An Introduction to the Three Volumes of Karl Marx's Capital*, New York: Monthly Review Press
- Both put forward particular perspectives, which I think are the most helpful in understanding Marx
- But there is a huge literature, offering a wide variety of other perspectives
- There is no substitute for making up your own mind
- This talk taken almost entirely from Foley (often closely)

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## Structure of Knowledge

- Basic elements: **abstractions** or **determinations**
  - ways of talking about aspects of reality abstracting from whole complex of factors that make up a concrete instance
  - to understand historical specificity of CMP, these abstractions are value, labour, money, commodity
    - of neoclassical economics: to understand resource allocation in any society, focus on preferences, technology, resources and endowments, the market
  - abstractions are **layered** or **ordered**: concrete to abstract, then abstract to concrete
  - starting point important in establishing meaning
- Abstractions constituting a theory define each other
  - cannot understand them outside the system comprising all of them
  - set of ideas concerning value comprise a self-determined system
  - all theories have this self-determined character

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## Explanation and Prediction

- Basic activity of science lies in explaining phenomena
- What is a good explanation of something?
  - use the ordered set of determinations constituting the theory to understand the phenomenon, so that
    - the phenomenon is reproduced by the way in which the determinations of the theory interact
    - the fundamental determinations continue to operate
- In this sense, reality is determined
  - explained *ex post* by the theory
  - given the causes of the phenomenon, 'necessary' or 'inevitable'
- Does not mean future is predetermined
  - after something has happened, all of its determinations have occurred
  - but in the future we have no way of knowing all the determinations that will be active, even if we believe we know some of them

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## Basic Structure of Marx's Theory

- Consider societies in which production is organised through exchange: commodity production
- Special laws (ie fundamental determinations) arise in such societies, pertaining to dual nature of exchanged products (commodities)
  - use-value (any society has useful products)
  - value: exchangeable with other commodities (unique to commodity production)
    - value is created by labour
    - appears in the form of money (which is value separated from any particular commodity)
- LTV: **source of value added of the total mass of commodities produced is the labour expended in producing them**

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## Origin of Profit I

- $M - C - M'$ : money that makes more money: **capital**
- $M - C\{LP, MP\} \dots P \dots C' - M' = M + \Delta M$  **circuit of capital**
  - capitalist production as we observe it
  - $\Delta M =$  **surplus value**
  - process recreates its initial conditions, hence repeats indefinitely
  - conservation of value in exchange  $\Rightarrow$  change in value occurs in P  $\Rightarrow$  there is some commodity that has the power of creating value as it is used up, and more value than it itself possesses
- LTV: this value-creating commodity is the capacity of workers to do useful work; ie labour-power
  - capitalist purchases labour-power at its value for a wage
    - worker has no claim to any part of product or value of product
    - further negotiation: how hard the work, how fast, how safe etc

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### Origin of Profit II

- Historical conditions for emergence of LP as commodity: 2-fold liberation
  - worker must be free to sell LP, not tied to particular labour process (feudalism) or to particular master (slavery). Hence historical destruction of previous modes of production
  - worker must be 'freed' from access to means of production that would allow her not to sell her LP but to produce a commodity she could sell. Hence worker
    - cannot exercise LP on her own behalf
    - is therefore forced to sell LP to gain £ to access consumer goods
- Most important aspect of this process
  - displacement of peasants from traditional access to land
    - enclosures
    - land reforms
    - green revolutions etc

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### Character of Capitalist Production

- Capitalism is a **technically progressive** mode of production
  - theme occurs throughout all of Marx's writings on CMP
    - earlier class societies did not have systematic technical change
    - only capitalism constantly revolutionises its methods of production
- Understanding how capitalism works:
  - **exploitation**: source of surplus value is exploitation of workers
  - **reproduction**: circuit of capital as mode of reproduction
  - **expansion (accumulation)**: effects of technical progress
    - technical progress alters parameters that determine
      - exploitation and circuit of capital
      - rate of surplus value
      - composition of capital outlays (on constant and variable capital)
      - rate of capitalisation of surplus value
      - turnover times of the various phases of the circuit of capital

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### Macro vs. Micro

- Marx often not explicit about level of aggregation
  - frequently explains aggregate behaviour of a system by discussing a typical or average element of it
    - eg 1<sup>st</sup> 3 chs. of CI: laws that apply to a typical or average commodity, meaning the aggregate of all social production. Most unlikely to apply to any real commodity with all its peculiarities
    - eg whole of CI: written in terms of a typical or average capital, meaning aggregate capital (or scale model of aggregate capital)
- **Fundamental determinations generally show themselves in aggregate or average behaviour of a system**

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### The Rate of Profit

- Fundamental determinations generally show themselves in aggregate or average behaviour of a system
- Hence, in system about making money, trends in rate of profit in economy as a whole indicate relative success or failure in making money
- Rate of profit defined as
 
$$\frac{\text{total profit}}{\text{total expenditure on inputs necessary to produce those profits}}$$
- Hence Marx's definition:
  - rate of profit = total surplus value ÷ capital advanced

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### Concepts I

- Capitalist advances (money) capital to purchase
  - labour-power (lp)
    - cost to capitalist for each unit of lp is vlp
    - vlp < value created by using that lp in production process
    - hence money spent to purchase lp called **variable capital (v)** since its value expands in production
  - nonlabour means of production
    - their value appears unchanged in the price of the finished commodity; hence called **constant capital (c)**
    - two types
      - raw materials and other inputs totally used up in the production period so that all their value is transferred: called **circulating constant capital**
      - equipment and buildings that last longer than the production period, so that a fraction of their value is transferred each period of production: called **fixed constant capital**
- Value added is variable capital (v) + surplus value (s)

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### Absolute and Relative Surplus Value

- Amount of social surplus value depends on
  - total social labour time
  - partitioning of that time between paid and unpaid labour (determined by vlp)
- To increase social surplus value
  - increase total social labour time, holding paid labour time constant
    - called **absolute surplus value**
    - arises because, given means of subsistence necessary to maintain standard of living, workers can physically provide more or less labour time to social production
      - class struggle: how much labour time extracted in exchange for wage?
  - reduce that part of total social labour time that is paid, holding total labour time constant
    - called **relative surplus value**
    - arises because, given standard of living, labour time required to produce consumer goods in this standard of living falls (via technical changes that increase labour productivity)

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## Concepts II

- Total price of commodities =  $c + v + s$
- Capital advanced =  $c + v$
- Value added =  $v + s$
- Rate of surplus value:  $e = s/v$
- Composition of capital:  $k = c/v$ 
  - can be alternatively specified as  $k = v/(c + v)$ , so that  
 $k = (1 - k)/k$  and  $k = 1/(k + 1)$
- Mark-up over costs:  $q = s/(c + v)$ 
  - if there is no fixed capital, then this is also the rate of profit ( $r^*$ )
    - $r^* = q = e/(k + 1)$  or  $r^* = q = ek$
- If there is fixed capital, then total value tied up in production process is  $K$ , and the rate of profit relates  $s$  to the whole capital advanced to appropriate it
  - define rate of turnover of capital  $n = (c + v)/K =$  ratio of flow of capital advanced to stock of capital tied up in production circuit
    - $r = s/K = [s/v][v/(c + v)][(c + v)/K] = ekn = qn$
    - $r = [\text{rate of surplus value}][\text{composition of capital}][\text{rate of turnover}]$

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## Relative Surplus Value I

- Dynamic of capitalist production: new methods of production continually developed and older ones scrapped
- Why? Competition as war fought through productivity rises
  - innovation (often involving larger scale of production) enables more use-values to be produced in given period of time
  - in given period of time, total value produced is constant (LTV)
  - so value of each individual use-value falls
  - innovating capitalist can
    - undercut rivals and expand market share
    - gain extra profits through unequal exchange until innovation generalised across competitors
- Cost-reducing innovations can be applied in any area of production and to any costs
- Marx concentrated on labour-economising innovations

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## Relative Surplus Value II

Paid labour time	←	Unpaid labour time	Working day
Wages (variable capital)	←	Profits (surplus value)	Value added
Necessary labour	←	Surplus labour	Reproduction

$v/p$

- $v/p$  regulated by snlt required to produce commodities necessary for workers to maintain average standard of living
- $v/p$  divides working day into what accrues to working class and what is appropriated by capitalist class
- Reduction in snlt required to produce these commodities reduces  $v/p$  and increases  $e$

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## Relative Surplus Value III

- Does not necessarily mean a fall in wages
  - productivity increases can lead to
    - increases in number of use-values consumed by workers (ie real wage rises) at same time as
    - fall in  $v/p$
  - eg Fordism
    - conscious choice of US capitalists in early 20C to increase wages (and hence workers' standard of living) in newly developed continuous line processes (Henry Ford at Dearborn, MI)
    - why?
      - to create a mass market for consumer durables and
      - because productivity increases > wage increases,  $e$  increased

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## Relative Surplus Value IV

- Technical innovations reduce snlt required to produce use-values
- Only benefit is temporary one to innovator, because competition forces prices in the aggregate to reflect values
- Indirect effect of innovation is to cheapen means of subsistence that workers consume
- This allows
  - rise in workers' standard of living
  - or
  - fall in  $v/p$  (and hence rise in  $e$ )
  - or
  - some combination of the two (hence some rise in  $e$ )
- But because  $v/(c + v)$  falls [or equivalently  $c/v$  rises], after all adjustments have occurred, mark-up on costs  $s/(c + v)$  falls

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## The Big Picture: Earlier

- Initially, capitalists take over the technical methods of production inherited from previous modes of production
  - formal subsumption of labour to capital
  - production of absolute  $s$  predominates
- In these methods
  - labour employed ineffectively, so large surplus labour times not possible
  - very little capital outlays required on anything except labour
  - hence
    - rate of exploitation: relatively low  $e$
    - composition of capital: relatively high  $k$  (or low  $k$ )
    - markup on costs:  $q$  can still be high since  $q = ek$
    - rate of profit: as long as turnover  $n$  not too slow,  $r$  can still be high

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### The Big Picture: Later

- Capital accumulation proceeds, and transforms methods of production
  - real subsumption of labour to capital
  - production of relative surplus value predominates
- In these methods
  - much larger quantities (and somewhat larger values) of nonlabour inputs
  - much higher labour productivity
  - much larger surplus labour times
  - hence, even if real standard of living rises in the process,
    - rate of exploitation: relatively high  $e$
    - composition of capital: relatively low  $k$  (or high  $x$ )
    - markup on costs:  $q$  lower since although  $q = ek$ , composition of capital dominates
    - rate of profit: for given turnover  $n$ ,  $r$  lower

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### Summary So Far

- This historical pattern of change is not accidental or random, but a systematic effect of capital accumulation, through its technical progressivity
- Characteristic pattern of dev't of capitalist society
  - rising labour productivity
  - rising real wages, but at a slower rate
  - hence rising rate of surplus value
  - falling proportion of capital outlays devoted to wages
  - lower markup and lower rate of profit
- All of these are aspects of inner tendency of capitalist development: accumulation through technical progressivity
  - whole pattern known as LTRPF
- Broadly historically correct, except great controversy over last part: does  $r$  fall?

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### Ricardo and Falling Rate of Profit I

- Marx did not discover LTRPF
- Took it as a stylised fact established by Smith and Ricardo
  - so when Marx talks of LTRPF as the most important discovery of modern political economy, he means its importance in Smith and Ricardo
- Marx's discussion is through a critique of Ricardo
- Consider a one good economy of corn
- Capitalist farmer advances wages in kind (corn) so that workers can eat while they are producing a new harvest of corn
  - this is the only capital outlay in the model
  - size of corn wage allows workers to survive at a constant population level (Malthusian principle)
    - too high, and population will grow, driving down wage
    - too low, and population will shrink, driving up wage

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### Ricardo and Falling Rate of Profit II

- Consider least productive land in use
  - zero rent
  - surplus corn = output of corn – subsistence wage (in corn)
  - rate of profit = this surplus corn/wages
    - because wages are the only capital advanced
  - in Marx's terms
    - turnover time assumed = 1
    - composition of capital  $k = 1$  (and  $\kappa = 0$ )
    - $s/v = r = s/(c + v)$  because  $c = 0$
  - this determines rent on more productive land
    - if worker produces more than (wage + profit earned on wage), excess is appropriated by landlord as rent

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### Ricardo and Falling Rate of Profit III

- Labour value of corn =  $snlt$  required to produce a unit of corn on the least productive land in use
  - if less productive (currently idle) land were to come into use, corn production would take longer (since the land is less productive) and  $snlt \uparrow$
  - because equilibrium wage = constant amount of corn, then wage will come to represent more value ( $vlp \uparrow$ )
- Then
  - accumulation of capital  $\Rightarrow$  [total wages that can be advanced as variable capital by capitalists]  $\uparrow \Rightarrow$  demand for labour  $\uparrow$
  - wages  $\uparrow$  temporarily and population  $\uparrow$  (Malthus)
  - population  $\uparrow \Rightarrow$  demand for corn  $\uparrow \Rightarrow$  less productive land taken into cultivation  $\Rightarrow snlt$  of corn  $\uparrow$  and  $vlp \uparrow$
  - $r \downarrow$  because corn surplus over wage on less productive land falls

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### Ricardo and Falling Rate of Profit IV

- Eventually 'Stationary State'
  - population so large that worker on the marginal (least productive) land produces just enough to pay his own wage
    - no surplus at all; hence no profit, so that  $r$  falls to 0
    - no accumulation at all
    - whole social surplus product accrues to landlords as rent on the more productive units of land
- Hence the "dismal science" of political economy
- Ricardo's theory
  - Malthusian wage mechanism
  - diminishing returns to agriculture with a constant technology
  - if technological change raised labour productivity on *all* land, then  $r \uparrow$  and accumulation could proceed further

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### Marx's Critique of Ricardo

- Marx's main criticism
  - Ricardo ignores technically progressive character of CMP
    - quite wrong to suppose constant level of technique
    - Ricardo's explanation of  $r_{\downarrow}$  is driven by  $e_{\downarrow}$ , but this wrong
    - $e_{\uparrow}$  with technical progress (production of relative surplus value)
    - because Ricardo's assumptions make  $r = e$ , just not possible in Ricardian system to have  $r_{\downarrow}$  and  $e_{\uparrow}$
    - Ricardo's mistake: neglect of constant capital
- Marx's puzzle
  - how to explain falling rate of profit as consequence of technical progress
    - note postulate is that it does in fact fall

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### Marx's Answer

- Assuming constant turnover time,  $r \propto s/(c + v)$ , not  $s/v$ 
  - $r \propto s/(c + v) = (s/v)[v/(c + v)] = ek$
  - $e_{\uparrow}$  and  $k_{\downarrow}$  by larger proportion  $\Rightarrow r_{\downarrow}$
  - or
  - $r \propto s/(c + v) = (s/v)/[(c/v) + 1] = e/(\kappa + 1)$
  - $e_{\uparrow}$  and  $\kappa_{\uparrow}$  by larger proportion  $\Rightarrow r_{\downarrow}$
- Marx argues that what actually happens is
  - capitalism revolutionises production techniques in pursuit of greater labour productivity (production of relative surplus value)
  - this increases  $s/v$
  - process involves large increases in nonlabour inputs
  - so  $r$  falls

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### Dialectical Denouement

- Progressive side to capitalism
  - revolutionises production
  - develops productive forces
  - unleashes human potential
- Process involves reducing human labour to minimum
- But only human labour provides the surplus value that is rationale for existence of capitalist relations
- So developing productive forces by reducing human labour cuts away at social basis of capitalism in unpaid labour-time
  - development of capitalist forces of production erodes capitalist relations of production
- This contradiction appears as LTRPF

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### Anticipation of a Problem

- Earlier stage:
  - $e$  low and  $k$  high (or  $\kappa$  low) does not logically imply  $q$  high
    - might be true historically, but not logically necessary
- Later stage:
  - $e$  high and  $k$  low (or  $\kappa$  high) does not logically imply  $q$  low
    - might be true historically, but not logically necessary
- That is:
  - since  $r = [s/v][v/(c + v)] = ek$
  - if  $e_{\uparrow}$  and  $k_{\downarrow}$ , how do we know that  $r_{\downarrow}$ ?
  - or
  - since  $r = [s/v]/[(c/v) + 1] = e/(\kappa + 1)$
  - if  $e_{\uparrow}$  and  $\kappa_{\uparrow}$ , how do we know that  $r_{\downarrow}$ ?

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### Capitalists' Behaviour I

- Production of relative surplus value  $\Rightarrow e_{\uparrow}$
- Change in composition of capital ( $\kappa_{\uparrow}$  or  $\kappa_{\downarrow}$ )  $\Rightarrow r_{\downarrow}$
- So why do capitalists voluntarily adopt techniques that lower their rate of profit?
- Marx's answer: distinguish
  - short run self-interest of individual capitalists
  - long run results for capitalist class as a whole

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### Capitalists' Behaviour II

- Individual capitalist innovates to lower costs and acquire competitive advantage over rivals
  - innovation reduces  $s/v$  to produce the commodity, so its social value falls
  - backwardness of competitors holds market price above value
  - for the innovator, price > value
  - innovator earns super-profits at the going price of the commodity
  - hence realises surplus value produced elsewhere in system
  - once other capitalists realise they are losing market share and profit, they will adopt the innovation
    - no choice; competition forces them to do so
  - so competition then forces down the price of the commodity
- End result: innovation generalised; new lower value and price; no super-profits; maybe changes in market shares to individual capitalists

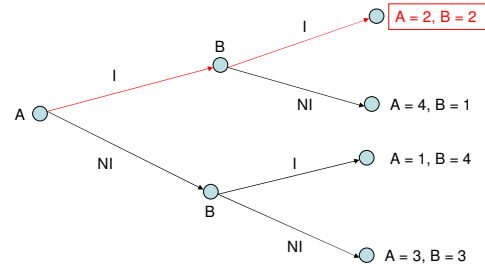
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### Capitalists' Behaviour III

- Classic prisoner's dilemma game
  - 2 capitalists: A and B
  - 2 strategies: innovate (I) and do not innovate (NI)
    - strategy is a complete plan of action specifying what to do in each possible contingency
  - payoffs in terms of rankings of outcomes
  - 4 possibilities:
    - A: I and B: NI      payoffs: A = 4; B = 1
      - super-profits and market share to A
    - A: NI and B: I      payoffs: A = 1; B = 4
      - super-profits and market share to B
    - A: NI and B: NI      payoffs: A = 3; B = 3
    - A: I and B: I      payoffs: A = 2; B = 2
      - (I, I) is worse than (NI, NI) because of more expensive nonlabour inputs

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### Capitalists' Behaviour IV: Sequential Game



- Exactly symmetrical if B is first mover
- Each has a dominant strategy
- Equilibrium: A plays Innovate and B responds with Innovate, for payoffs (A = 2, B = 2)
- Both do better by Not Innovating, but this is not possible.

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### Capitalists' Behaviour V: Simultaneous Game

		Capitalist B	
		Innovate	Do not innovate
Capitalist A	Innovate	2, 2	4, 1
	Do not innovate	1, 4	3, 3

- From A's perspective:
  - if B = I, A should innovate because  $2 > 1$
  - if B = NI, A should innovate because  $4 > 3$
  - so whatever B does, rational for A to innovate
- From B's perspective:
  - if A = I, B should innovate because  $2 > 1$
  - if A = NI, B should innovate because  $4 > 3$
  - so whatever A does, rational for B to innovate
- Each has dominant strategy to innovate; outcome is (2, 2) [Nash equilibrium]
- (NI, NI) is better for both (3, 3), but unattainable
- So individual profit seeking capitalists make rational decisions that reduce their  $r$

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### Numerical Example I: Initial Situation

- Assumptions
  - Ricardo's corn economy, with prices  $\propto$  values, and factor of proportionality = 1, so that 1 labour unit = £1
  - turnover time = 1, so that total capital invested = total cost
- Technology
  - 8 units of labour use 2 units of corn to produce 6 units of new corn
- Values
  - so 8 units of labour produce 4 units of net output corn
  - labour value of unit corn = 2 labour units, and its price = £2
- Prices
  - suppose wage = £0.5 per unit of labour-power
    - ⇒ so workers can buy 0.25 unit of corn
  - total cost of producing 6 units of corn = £8
    - labour cost: (quantity 8) x (wage £0.5) = £4
    - corn cost: (quantity 2) x (price £2) = £4
  - total revenue of producing 6 units of corn = £12
    - ⇒ profit = revenue - cost = £12 - £8 = £4
    - ⇒  $r = (£4)/ (£8) = 50\%$
  - rate of surplus value =  $s/v = (\text{profit } 4)/(\text{wage cost } 4) = 100\%$

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### Numerical Example II: Individual Capitalist Innovates

- Technological innovation
  - pre-innovation: 8 units labour use 2 units corn to produce 6 units corn
  - innovation: 3 units labour uses 3 units corn to produce 6 units corn
    - note: less labour input and more nonlabour input
- Total cost for innovator : £1.5 labour cost + £6 corn cost = £7.5
- Total revenue for innovator: £12
- Total profit for innovator = £4.5 [was £4]
- Rate of profit for innovator
  - = (profit)/(capital outlay or total cost) =  $(£4.5)/ (£7.5) = 60\%$
  - compared with 50% prior to innovation
- Hence super-profit to innovator
- Hence strong incentive to innovate

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### Numerical Example III: All Capitalists Innovate

- Pre-innovation: 8 units labour use 2 units corn to produce 6 units corn
- Innovation: 3 units labour uses 3 units corn to produce 6 units corn
  - 3 units of labour produce 3 units net output corn
    - ⇒ labour value of unit corn = 1 labour unit
  - and
  - assuming proportionality factor of 1 doesn't change
  - price of unit of corn = £1
  - costs for typical producer = £4.5
    - labour costs: 3 units labour at £0.5 per unit = £1.5
    - corn costs: 3 units corn at £1 per unit = £3
      - NB: now accounting for corn at its new price
  - revenue = 6 units corn at £1 per unit = £6
    - profit = £6 - £4.5 = £1.5
    - rate of profit =  $(£1.5)/ (£4.5) = 33.3\%$  [was 50%]
  - rate of surplus value =  $s/v = (1.5)/(1.5) = 100\%$

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### Numerical Example IV: Slightly Hidden Features

- Pre-innovation:
  - wage =  $v/p = £1/2$ , and price of corn is £2
  - worker can buy 1/4 unit of corn (real wage)
  - $e = s/v = 1$  (ie 100%)
  - $\kappa = c/v = 4/4 = 1$ , or  $k = 4/8 = 0.5$
  - $r = e/(\kappa + 1) = ek = 0.5$  (ie 50%)
- After innovation is generalised:
  - wage =  $v/p = £1/2$  (unchanged), and price of corn is £1 (fallen)
  - worker can buy 1/2 unit of corn, so real wage has risen
  - $e = s/v = 1$  (ie 100%): unchanged
  - $\kappa = c/v = 3/1.5 = 2$ : risen or  $k = 1.5/4.5 = 0.33$ : fallen
  - $r = e/(\kappa + 1) = ek = 0.33$  (ie 33.3%): fallen
- Allowed real wage to rise, and have held  $e$  (and  $v/p$ ) constant

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### Numerical Example V: Slightly Hidden Assumption

- Suppose instead  $s/v$  constant, we had held real wage constant
- Pre-innovation real wage = 0.25, so if post-innovation real wage is to be 0.25, and post-innovation price of corn is 1, post-innovation money wage (and  $v/p$ ) must fall from £0.5 to £0.25
- Labour costs = £0.25 x 3 = £0.75
- Corn costs (as before) = £3
- Profit = revenue – costs = 6 – 3.75 = 2.25
- $e = s/v = 2.25/0.75 = 3$  (ie 300%): risen
- $v/p = 0.25$ : fallen
- $\kappa = c/v = 3/0.75 = 4$ : risen or  $k = 0.75/3.75 = 0.2$ : fallen
- $r = e/(\kappa + 1) = ek = 0.6$  (ie 60%): risen

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### Numerical Example VI: Conclusion

- When we hold  $s/v$  constant,
  - $v/p$  is held constant
  - money wage is held constant
  - real wage rises (Marx never seems to recognise this)
  - rate of profit falls
- When we hold real wage constant,
  - $v/p$  falls
  - money wage falls
  - rate of surplus value rises
  - rate of profit rises
- So it matters what is held constant

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### Countertendencies I

- Basic tendency for capitalist production: to increase labour productivity by substituting nonlabour inputs for labour inputs
  - if  $v/p$  held constant, the rate of profit will fall
- Real historical experience more complex
- Qualifications to basic tendency called **countertendencies**
  - determinations that offset or modify the basic determination
- Example of layered determinations of theory to recreate concrete phenomenon
- What if later determinations produce phenomena that appear to contradict the fundamental determinations?
  - only an apparent contradiction as long as the explanation is consistent with the structure of the theory
  - then fundamental determinations continue to be valid and to operate in the more complex situation

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### Countertendencies II

- Marx suggests 5:
  - $s/v \uparrow$  as result of  $v/p \downarrow$  because of rising labour productivity
    - already analysed by Marx in discussion of relative surplus value
  - depression of wages below  $v/p$ 
    - capitalists gain temporary advantage
  - cheapening of constant capital
    - general increase in labour productivity  $\Rightarrow$  lower value and price of elements of constant capital
      - in eg above, if, post-innovation, corn was valued at its pre-innovation price, fall in  $r$  would have been much bigger
  - relative overpopulation
    - unemployment  $\uparrow$  as workers are displaced by technical change, weakening bargaining power of employed and putting downward pressure on wages
  - foreign trade
    - obtaining cheaper elements of constant capital and/or means of subsistence will reduce production costs, supporting  $r$

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### Tendency and Countertendencies

- Complex picture
- Technical progressivity of capitalism
  - constant increases in labour productivity via, typically, increases in nonlabour inputs
  - if  $v/p$  remains constant, LTRPF
- Inherent countertendencies
  - as labour productivity increases
    - pressures for  $v/p$  to fall (even if real wage is rising to some extent)
    - pressures for  $c$  to fall
- Law of tendency like law of gravity
  - buildings and people stand up despite gravity
  - cannot understand these offsetting processes without first understanding law of gravity
- If periods of capital accumulation do *not* produce falling  $r$ , need to focus attention on what is happening to
  - $v/p$
  - value of elements of constant capital

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## Inevitability of Falling Rate of Profit?

- Is LTRPF inevitable, a necessary tendency of CMP?
  - if so, it constitutes an internal (or essential) barrier to accumulation (not a contingent external one to be eliminated)
- Two criticisms
  1. does technical progress have to take the form of substituting nonlabour for labour inputs?
    - cost-cutting capitalists are interested in *any* reduction of costs
    - may be other kinds of technical change than labour-saving-and-means-of-production-using
  2. why is  $s/v \uparrow$  (because of technical change) a countertendency, rather than part of the basic tendency?
    - discussion of relative surplus value seems to imply that rises in labour productivity  $\Rightarrow v/p \downarrow$  and  $s/v \uparrow$
- Both criticisms seem correct
- Is this a problem?

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## What Did Marx Mean? Hegelian Tradition

- In Hegelian tradition, what really happens has special status
  - we first become aware through observation of real cases as contingent possibilities
  - only later, through theoretical analysis, do we understand the full determinations of these real cases
  - in that sense, what is 'possible' is developed into something that is 'necessary'
- Does not mean we can deduce pattern of capital accumulation from axioms
- Rather means we can rationally explain patterns of capital accumulation within the framework of the theory

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## What Did Marx Mean? Centrality of Value

- Marx does not focus on the real use-values produced and circulated (cf most later economics)
- Rather, he insists on centrality of production and circulation of value
- $v/p$  divides value added between capitalists and workers
- Hence from perspective of LTV, sensible to consider first what happens when  $v/p$  is presumed constant
- Changes in  $v/p$  arising from labour productivity  $\uparrow$  are not automatic
  - involve (often substantial) social and economic conflict
- So not arbitrary to consider
  - first, changes in labour productivity than initiate process
  - then second, effects of those changes

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## Possibility of Falling Rate of Profit?

- Okishio's critique
  - on Marx's assumptions, rate of profit must *rise*
  - so falling  $r$  not only not necessary; not even possible
- Consider
  - economy in equilibrium: all capitalists earn same rate of profit (and rate of turnover is 1)
  - possibility of adopting new technique earning a super-profit at existing prices
    - $\Rightarrow$  cost of production of new technique  $<$  cost of production of current technique, both evaluated at existing prices
    - any such new technique is called *viable*
- Okishio's theorem:
  - if capitalists adopt a *viable* technique
  - and
  - if the real wage remains constant
  - then
  - in the new equilibrium, the new  $r$  cannot be lower than the initial  $r$

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## Proof of the Okishio Theorem

- Can be proved in very general models of production
- Basic issues can be demonstrated in a simple one good model
- Assumptions
  - one commodity model (like Ricardo's corn model above)
  - money wage =  $w$
  - real wage =  $b = w/p =$  amount of corn that can be purchased at the going price of corn  $p$
  - prices proportional to values with factor of proportionality = 1
    - so that labour values = prices

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## Proof of the Okishio Theorem I

- Current technique
    - $n$  units of labour and  $a$  units of corn produce 1 unit of corn
    - $\Rightarrow$  net output of corn =  $(1 - a)$
    - $\Rightarrow$  labour value of 1 unit of corn =  $n/(1 - a) =$  its price  $p$
- Suppose  $w$  can purchase  $b$  units of corn at price  $p$ , so that  $w = pb$
- Then real wage  $b = \frac{w}{p} = \frac{w(1-a)}{n}$
- Profit per unit of corn = revenues – costs
- $$= p - (pa + wn) = p - (pa + pbn) = p(1 - a - bn)$$
- Rate of profit:
- $$r = \frac{p(1 - a - bn)}{(pa + pbn)} = \frac{1 - a - bn}{a + bn} = \frac{1 - (a + bn)}{a + bn} = \frac{1}{a + bn} - 1$$

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### Proof of the Okishio Theorem II

- New technique
    - $n^*$  units of labour and  $a^*$  units of corn produce 1 unit of corn
    - cost of producing 1 unit of corn =  $wn^* + pa^*$ 
      - note: prices are still those of the old technique equilibrium
  - Technique is viable if it has lower costs of production
 
$$wn^* + pa^* < wn + pa$$
- Since  $p = \frac{n}{1-a}$ , and  $w = pb = \frac{n}{1-a}b$ , substitute for  $p$  and  $w$  and cancel common terms so that the viability condition becomes  $a^* + bn^* < a + bn$
- Once new technique adopted by all, new price (and value) of 1 unit of corn  $p^* = \frac{n^*}{1-a^*}$
- The constant real wage  $b$  now costs  $p^*$ , so that the money wage must be  $w^* = p^*b$
- Profit per unit of corn = revenues - costs  
 $= p^* - (p^*a^* + w^*n^*) = p^*(1 - a^* - bn^*)$
- Rate of profit:
- $$r^* = \frac{p^*(1 - a^* - bn^*)}{(p^*a^* + p^*bn^*)} = \frac{1}{a^* + bn^*} - 1$$

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### Proof of the Okishio Theorem III

Viability condition :  $a^* + bn^* < a + bn$

Rate of profit before innovation :  $r = \frac{1}{a+bn} - 1$

Rate of profit after innovation is generally adopted :  $r^* = \frac{1}{a^* + bn^*} - 1$

So for any viable technique ,  $r^* > r$

Conclusion:

with the real wage held constant, innovation cannot lower the rate of profit

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### How Important is the Okishio Theorem?

- 2 issues
  - doctrinal:
    - essential for Marx's argument that real wage be held constant?
      - no
        - Marx's focus is on the  $v/p$ , not the real wage, because the  $v/p$  divides value added into value accruing to the working class and value appropriated by the capitalist class
  - empirical:
    - have real wages been constant in times of technical change?
      - no
        - typical patterns of accumulation involve  $v/p \downarrow$ ,  $s/v \uparrow$ , real wage  $\uparrow$
        - hence impossible to say a priori how technical change affects  $r$

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### Holding $v/p$ Constant

- Holding  $v/p$  constant amounts to
    - holding money wage constant, and
    - keeping factor of proportionality between values and prices = 1
- Original technique: profit per unit of corn:  $p - pa - wn$
- and rate of profit:  $r = \frac{p - (pa + wn)}{pa + wn} = \frac{p}{pa + wn} - 1$
- Substitute for  $p$  from  $p = \frac{n}{1-a}$  and simplify, so that  $r = \frac{1}{a(1-w) + w} - 1$
- New technique:  $r^* = \frac{1}{a^*(1-w) + w} - 1$
- Hence  $a^* > a \Rightarrow r^* < r$
- Many viable new techniques have  $a^* > a$ , which only requires  $pa^* + wn^* < pa + wn$
- $\Rightarrow \frac{a^* - a}{n - n^*} < \frac{w}{p}$  See Numerical Example I-V above, in which this condition is satisfied:  $(3 - 2)/(8 - 3) = 0.2 < 0.25$

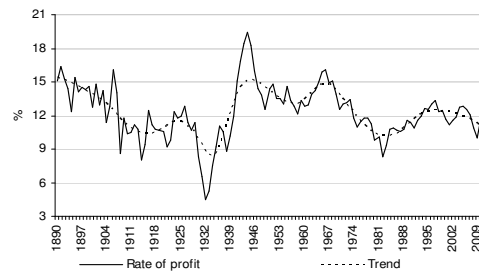
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### Conclusion I

- How do capitalist economies develop as capital accumulates?
- Technical progressivity leads to
  - rising productivity of labour
  - rising rate of surplus value
  - rising real wage
  - falling ratio of production wages to total capital outlays
  - falling rate of profit
- Overwhelming empirical support for first 4 in this list
- Falling rate of profit much more controversial
  - no *a priori* deduction possible
  - movement in  $r$  depends upon
    - pattern of technical change
    - how changes in values affect  $v/p$  and constant capital

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### Conclusion II



Long run empirical evidence for the US economy not easy to interpret

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### Take-home

- Theoretically, does the rate of profit tend to fall?
  - movements in rate of profit are determined by
    - type of technical change
      - labour-saving & means-of-production-using (Marx)
      - labour-saving & means-of-production-saving
      - labour-using & means-of-production-saving
    - how increases in productivity impact on the value of the means of production
    - how increases in productivity impact on the value of labour power and hence the rate of surplus value
  - but LTRPF is a way of organising analysis of rate of profit
  - Marx's vision of capitalist accumulation prescient
    - including his vision of technical progress as labour-saving-and-means-of-production using
    - but his argument about necessity or inevitability needs approaching with care
- Empirically, does the rate of profit tend to fall?
  - evidence is mixed
    - in some periods, yes, but in others, no