Technical Change, Income Distribution and Profitability in Multisectoral Linear Economies

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Introduction

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Marx's law of falling rate of profit

- failed empirical prediction (e.g., Acemoglu & Robinson, 2015)
- inconsistent theory (e.g., van Parijs, 1980)

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The point is whether there exists such an economic force driving down profitability, no matter how it may be counteracted by institutions and politics.

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A theory of falling profit rate due to rising OCC is "not even a *possibility* under the condition of competitive capitalism" (van Parijs, 1980, p. 1).

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- the profit rate falls if the wage-profit ratio is unaffected
- if the profit rate does not fall, then wage-profit ratio, or equivalently, labor share declines.

Model

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- Let w_i be the wage rate in industry i and

$$W = \begin{bmatrix} w_1 & 0 & \cdots & 0 \\ 0 & w_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & 0 \\ 0 & 0 & \cdots & w_n \end{bmatrix}$$

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- In the special case $\mathcal{E}(A, L, b)$, the economy with constant real wage b, we have $w_i = pb, \forall i$

Long-run Outcome

Definition
Given the economy $\mathcal{E}(A, L)$ with W, the profile (p, π, γ) defined by (1) and (2) is called the *long-run outcome*.

We focus on the long-run outcome with uniform rate of profit π such that

$$p = (1 + \pi)(pA + WL) \tag{1}$$

and define the wage-profit ratio γ by

$$\gamma_j = \frac{w_j L_j}{\pi(pA^j + w_j L_j)}, \forall j \tag{2}$$

Technical Change

Definition

Consider a technical change in sector i from (A^i, L_i) to (A^{*i}, L_i^*).

It is *viable* if it is cost-reducing under current prices

$$pA^{*i} + w_i L_i^* < pA^i + w_i L_i.$$

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Define the organic composition of capital (OCC) in sector i by

$$q_i = \frac{pA^i}{pA^i + w_i L_i}$$

Effects of Technical Change on Income Distribution and Profitability

Three Scenarios

With viable CU-LS technical change $(A, L) \to (A^*, L^*)$, compare the long-run outcomes

1. Okishio's scenario: fixed real wage

$$\mathcal{E}(A, L, b) \to \mathcal{E}(A^*, L^*, b): \quad (p, \pi, \gamma) \to (p^*, \pi^*, \gamma^*)$$

Notations: γ: wage-profit ratio; π: profit rate; b: fixed real wage; W: wages

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2. Sraffian scenario: fixed profit rate

$$\mathcal{E}(A, L) \text{ with } W \to \mathcal{E}(A^*, L^*) \text{ with } W^*: \quad (p, \pi, \gamma) \to (p^*, \pi, \gamma^*)$$

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3. Marxian scenario: fixed wage-profit ratio

$$\mathcal{E}(A, L) \text{ with } W \to \mathcal{E}(A^*, L^*) \text{ with } W^*: \quad (p, \pi, \gamma) \to (p^*, \pi^*, \gamma)$$

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Main Results ▸ Propositions

Table 1: Effects of viable CU-LS technical change in sector i on income distribution and profitability.

	Composition of Capital (q_i)	Wage-Profit Ratio (γ_i)	Profit Rate (π)
▸ Okishio's scenario	$\uparrow$	$\downarrow$	$\uparrow$
▸ Sraffian scenario	$\uparrow$	$\downarrow$	—
▸ Marxian scenario	$\uparrow$	—	$\downarrow$

Discussion and Conclusion

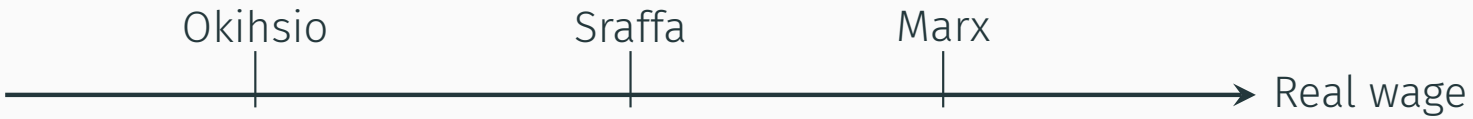
Discussions

Figure 1: The three benchmarks, four regimes and the crisis tendencies.

Note: The change in real wage, profit rate and labor share after CU-LS techncial change in the four regimes

	I	II	III	IV
Real wage	↓	↑	↑	↑
Profit rate	↑	↑	↓	↓
Labor share	↓	↓	↓	↑

Discussions



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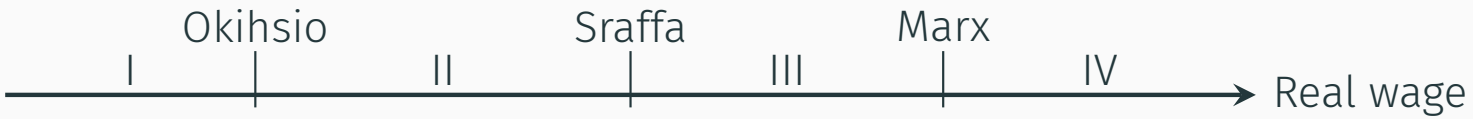

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Take-home message

1. It is possible to have a consistent theory of falling profit rate due to rising OCC, distinguished from the profit-squeeze argument.

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2. Any viable capital-using and labor-saving technical innovation will lead to either the falling rate of profit or a declining labor share. $\longrightarrow$ Dilemma

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Take-home message

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2. Any viable capital-using and labor-saving technical innovation will lead to either the falling rate of profit or a declining labor share. $\longrightarrow$ Dilemma

Further Research

1. Empirical study to identify the regimes
2. Endogenous technical change

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Thank you!

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Appendix: Main Results - Okishio's Scenario

Okishio's Theorem

◂ Back

Let (p, π, γ) be the long-run outcome of the economy $\mathcal{E}(A, L, b)$. Consider a technical change in sector i from (A, L) to (A^*, L^*), and let (p^*, π^*, γ^*) be the long-run outcome of $\mathcal{E}(A^*, L^*, b)$. Then $\pi^* > \pi$ if and only if the technical change is viable.

Proposition

Let (p, π, γ) be a long-run outcome of the economy $\mathcal{E}(A, L, b)$. Consider a viable CU-LS technical change in sector i from (A, L) to (A^*, L^*), then for the outcome (p^*, π^*, γ^*) of the economy $\mathcal{E}(A^*, L^*, b)$, we have falling wage-profit ratio in that sector, $\gamma_i^* < \gamma_i$. Moreover, the organic composition of capital rises, that is, $q_i^* > q_i$.

Appendix: Main Results - Sraffian Scenario

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Let (p, π, γ) be the long-run outcome of the economy $\mathcal{E}(A, L)$ with I. Consider a viable technical change from (A, L) to (A^*, L^*), and let (p^*, π, γ^*) be the long-run outcome of the economy $\mathcal{E}(A^*, L^*)$ with I, then $p^* < p$.

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Appendix: Main Results - Marxian Scenario

Proposition Back

Let (p, π, γ) be the long-run outcome of the economy $\mathcal{E}(A, L)$ with W. Consider a technical change from (A, L) to (A^*, L^*), then there exists a new diagonal matrix W^* such that (p^*, π^*, γ) is the long-run outcome of the economy $\mathcal{E}(A^*, L^*)$ with W^*.

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Let (p, π, γ) be the long-run outcome of the economy $\mathcal{E}(A, L)$ with W. Consider a viable CU-LS technical change from (A, L) to (A^*, L^*) and let (p^*, π^*, γ) be the new long-run outcome of the economy $\mathcal{E}(A^*, L^*)$ with W^*. Then $\pi^* < \pi$ and $q_i^* > q_i$.