

# EDUCATION AND 'HUMAN CAPITALISTS' IN A CLASSICAL-MARXIAN MODEL OF GROWTH AND DISTRIBUTION

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Surprisingly, however, education has received little or no attention in classical-Marxian theories of growth and distribution, despite the obvious relevance it has for the dynamics of the capitalist economy and the fair amount of attention being given to it in broader political economy discussions.

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We address these questions by means of an extended classical-Marxian model of growth and distribution.



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- 2 There are fixed coefficients of production. Distribution is not determined by marginal products, rather it is determined by the relative bargaining power of different classes and the economy is characterised by persistent unemployment.
- 3 Consumption and savings habits are determined by class positions. Capitalists and high-skilled workers are assumed to save a fraction of their income, with  $s_c > s_H$ , while low-skilled workers consume their entire income ( $s_L = 0$ ).

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They also help in the process of education, as family members, mentors or educators. We take the view that low-skilled workers are employed in routine production activities, while high-skilled workers are innovators.



# Production

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where  $Y$  is the output of the good,  $K$  is the amount of capital,  $A_L$ , and  $A_H$  denote the productivity of low- and high-skilled labor respectively, and  $f$  is homogeneous of degree one.

# Labour demand

We adopt a reduced form approach and assume that profit maximisation implies:

$$H_P^D = \frac{b(\sigma)K}{A_L}, \text{ where } b(\sigma) = \frac{\alpha_0}{\sigma};$$

$$L^D = \frac{c(\sigma)K}{A_L}, \text{ where } c(\sigma) = \alpha_1 + \alpha_2\sigma,$$

and  $\alpha_0, \alpha_1, \alpha_2$  are positive parameters.

# The government

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The government finances its educational expenditure, devoted entirely to the payment of wages of educators (abstracting from non-wage costs for simplicity),  $\varepsilon w_H H^S$ , by taxing profits, keeping a balanced budget.



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The market for high-skilled workers is flexprice. Thus, given  $H^s$ , at any  $t$ ,  $\sigma$  solves  $(1 - \varepsilon)H^s = b(\sigma)K/A_L$ .

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There exists a value  $\sigma_{min} \geq 1$  such that the supply of high-skilled labor  $H$  changes over time according to  $\frac{dH}{dt} = \theta(\sigma - \sigma_{min})\varepsilon H$ , whenever  $\sigma > \sigma_{min}$

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- 1 the demand for education which, in turn, depends positively on the skill premium, which increases the 'return' to education.
- 2 the size of the stock of high-skilled workers, both by increasing the availability of mentors and educators, and by increasing the support for, and access to, education.
- 3 a parameter,  $\theta$ , which captures the openness of the education system, either through government policy or through the degree of exclusivity of the education system and also, indirectly, the functioning of credit markets, in their role of financing education.

# Consumption and savings

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Let  $r$  be the rate of profit. Total profits net of taxes are:  

$$rK = r(K_C + K_H) = Y - w_L L - w_H(1 - \varepsilon)H - w_H \varepsilon H.$$

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Total savings are  $S = s_C rK_C + s_H(rK_H + w_H H)$ .



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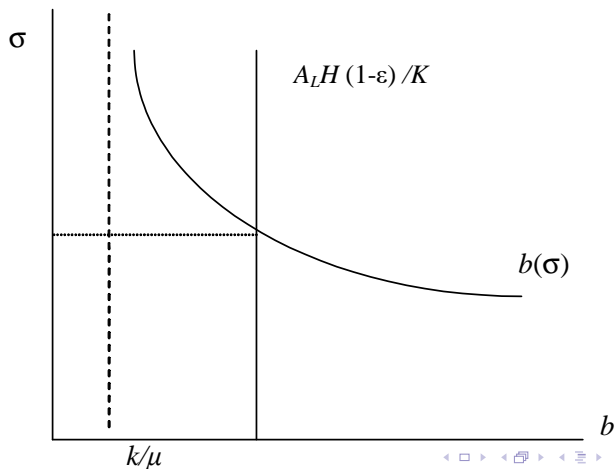
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where  $\Pi = a_K - \lambda \left( \frac{\alpha_0}{1 - \varepsilon} + \alpha_1 \right)$ .

## The skill premium in the short run



# The long-run dynamics

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$$\hat{k} = \hat{K}_c - \hat{K} = (s_C - s_H)(1 - k) \left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon) h} \right] + \frac{s_H \lambda \alpha_0}{(1 - \varepsilon)}.$$

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The growth rate of  $h$  is

$$\hat{h} = \hat{A}_L + \hat{H} - \hat{K},$$

or

$$\hat{h} = \Omega + \tau_1 \mu h + \frac{\theta \varepsilon \alpha_0}{(1 - \varepsilon) h} - [(s_C - s_H) k + s_H] \left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon) h} \right].$$

# The isoclines

The  $\hat{k} = 0$  isocline is

$$k = 1 - \frac{s_H \lambda \alpha_0}{(s_C - s_H)(1 - \varepsilon) \left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon) h} \right]}.$$



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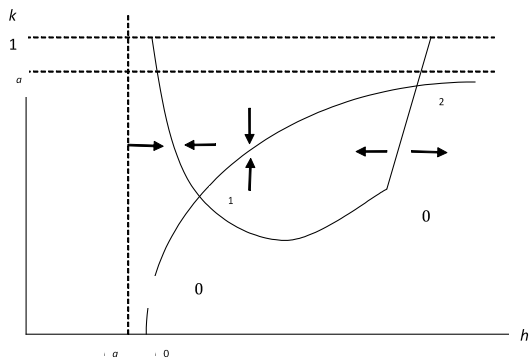
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$$k = \frac{1}{(s_C - s_H)} \left[ \frac{\Omega + \tau_1 \mu h + \frac{\theta \varepsilon \alpha_0}{(1 - \varepsilon)h}}{\left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon)h} \right]} - s_H \right],$$

whenever  $\frac{\alpha_0}{(1 - \varepsilon)h} \geq \sigma_m$ .

# Long-run equilibria



# Growth and distribution

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The income shares of the three classes are:

$$\begin{aligned} i_C &= \left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon) h} \right] \frac{k}{a_K}, \\ i_H &= \left[ \Pi - \frac{\lambda \alpha_2 \alpha_0}{(1 - \varepsilon) h} \right] \frac{1 - k}{a_K} + \frac{\lambda \alpha_0}{(1 - \varepsilon) a_K}, \\ i_L &= \frac{\lambda}{a_K} \left[ \alpha_1 + \frac{\alpha_2 \alpha_0}{(1 - \varepsilon) h} \right]. \end{aligned}$$

# Change in high skilled savings rate

An increase in  $s_H$  shifts both the  $\hat{k} = 0$  curve and the  $\hat{h} = 0$  curve down.  
Hence:

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- The H-workers' share increases and the capitalists' share decreases because of the increase in the share of capital owned by  $H$ -workers.
- The L-workers' share, the growth rates of employment of both kinds of labor, and the skill premium do not change.

# The Pasinetti paradox

The constancy of the long-run equilibrium value of  $h$  with respect to changes in  $s_H$  is very similar to the effect of a change in workers' saving propensity in Pasinetti's (1962) model, the so-called *Pasinetti paradox*.



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In our model, since an increase in  $s_H$  reduces  $k$  but leaves  $h$  unchanged, it has no effect either on the profit rate, or on the growth rates of capital and output. There is also no change in the growth rate of productivity.

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Thus, a change in the H-workers' saving rate has no effect on the rates of profit and growth, exactly as in Pasinetti's model.

The rates of profit and accumulation are unaffected for the same reason as in Pasinetti's model: in the steady state, the accumulation rate is determined entirely by capitalists' saving and accumulation decisions and the profit rate, and a change in the saving rate of H-workers only changes the share of capital they own.

# Human capitalism?

When  $s_H$  rises so much that  $s_H = s_C$ , at any steady state  $k = 0$ : in the limit all capital is owned by H-workers, because although capitalists and H-workers save the same fraction of their profit income, H-workers also save part of their wage income.

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Luxury and conspicuous consumption?

# A more open education system

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- The L-workers' share falls because of the substitution in production away from them towards H-workers;
- The effect on the H-workers' income share is ambiguous since they gain from a higher profit rate but lose from a smaller capital share. The skill premium declines.

# A stronger working class

An increase in  $\lambda$  shifts the  $\hat{k} = 0$  curve downwards, but shifts the  $\hat{h} = 0$  curve upwards. Hence

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- $\frac{dk}{d\lambda} \geq 0$  and  $\frac{dh}{d\lambda} > 0$ ;
- The growth rate of the economy falls if the direct effect of the increase in  $\lambda$  on  $r$  is not offset by the increase in  $h$  (decrease in  $\sigma$ );

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An increase in  $\lambda$  shifts the  $\hat{k} = 0$  curve downwards, but shifts the  $\hat{h} = 0$  curve upwards. Hence

- $\frac{dk}{d\lambda} \geq 0$  and  $\frac{dh}{d\lambda} > 0$ ;
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- The capitalist share will decrease if the direct negative effect of the increase in  $\lambda$  on  $r$  is stronger than the indirect positive effect via the skill premium;
- The effect on the high-skilled income share is ambiguous: they gain from the increase in the base wage and from the increase in employment (decrease  $\sigma$ ), but lose due to the decrease in  $\sigma$  itself.



# Divided loyalty

This analysis has important implications for the bargaining power of workers vis-à-vis capitalists. The fact that  $H$ -workers receive wages as well as profits implies that they can have divided loyalties. The “class struggle” variable provides a floor to the wage of  $H$ -workers but also affects the profit share, and it has a negative impact on the equilibrium skill premium.

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On the one hand,  $H$ -workers are interested in increasing  $\lambda$  to increase the floor for their wages, and possibly to increase their share of capital (if  $\frac{dk}{d\lambda} < 0$  holds), and in this way share interests with  $L$ -workers.

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On the other hand, as owners of both physical and human capital, they are interested in higher profits and might prefer a higher skill premium (depending on the employment effects), and so, given  $\frac{dh}{d\lambda} > 0$ , prefer a lower level of  $\lambda$ , sharing interests with capitalists.

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This exacerbates the ideological effects of education and the belief in higher social mobility, as well as a decrease in working class solidarity as a result of the emergence of the labor aristocracy, all of which are likely to reduce the workers' bargaining power (see Dutt and Veneziani 2010).

## Conclusions: what we've done

This paper develops a classical-Marxian model with workers' savings to examine the growth and distributional consequences of greater openness in the education system.

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In the model the resultant expansion of education allows more low-skilled workers to become high-skilled workers if they want to obtain education and, in terms of broader political economy considerations, it can affect the state of class struggle.

In so doing, this paper has attempted to fill a lacuna in the literature on the classical-Marxian approach, which has neglected the formal analysis of the effects of education and skill formation on distribution and growth, an issue which many observers find to be a central feature of contemporary capitalist knowledge-based economies.



## Conclusions: the basic model

We show that an expansion in education has a positive effect on the growth rate of the economy, but because of its distributional consequences: in our model it results in a rise in the profit rate due to a fall in labor costs, which increases saving and investment, and also in a shift in capital ownership towards capitalists with a higher propensity to save.

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Regarding classes and distribution, the increasing importance of education and skills produces some changes in capitalist economies, but need not alter their essential features.

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- H-workers become not only human capitalists but also owners of capital and recipients of profits.
- Moreover, their interests may become aligned to those of capitalists.

## Conclusions: the basic model

Capitalists can also protect their interests in maintaining their share of capital by saving at a higher rate – perhaps by increasing retained earnings – and by encouraging the growth of conspicuous consumption among H-workers.

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The ethical case against inequality remains strong to the extent that human capitalists also become owners of capital and because obtaining education is not simply a matter of choice, given difficult environmental circumstances, a low-quality basic education, and a relatively closed higher education system.

Yet, the possibility of change induced by policies is likely to be weakened by the fact that high income workers who are human capitalists may see their interests being aligned to capitalists, rather than to the rest of the workers.