Das Human Kapital

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Abstract

This paper hypothesizes that the demise of the 19^{th} century's European class structure reflects a deliberate transformation of society orchestrated by the Capitalists. Contrary to conventional wisdom, it argues that the demise of this class structure has been an outcome of a cooperative rather than a divisive process. The research suggests that the transition from this class structure may be viewed as the outcome of an optimal reaction process of the Capitalists to the increasing importance of human capital in sustaining their profit rates. The paper argues that the process of capital accumulation has gradually intensified the relative scarcity of labor and has generated an incentive to augment labor via human capital accumulation. Due to the complementarity between physical and human capital in production, the Capitalists were among the prime beneficiaries of the potential accumulation of human capital by the masses. They had therefore the incentive to financially support public education that would sustain their profit rates and would improve their economic well being, although would ultimately undermine their dynasty's position in the social ladder. The support for public education is unanimous despite the fact that the Capitalists carry the prime financial burden of public schooling. That is, due to the co-existence of credit market imperfections and capital-skill complementarity, the redistribution associated with public education is Pareto improving. Had Karl Marx been exposed to Gary Becker's Human Capital theory, the socio-political experience of the 20th century might have unfolded in a strikingly different manner.

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1 Introduction

During the nineteenth century, Europe witnessed the onset of the decline of the existing class structure, manifested by fundamental reforms in the education system, political structure, income redistribution, and taxation. This research hypothesizes that, in contrast to the prevailing wisdom, the demise of Capitalists-Workers class structure reflected a deliberate transformation of society orchestrated by the Capitalists in reaction to the increasing importance of human capital in sustaining their profit rates.

The paper argues that the process of capital accumulation has gradually intensified the relative scarcity of labor and has generated an incentive to augment labor via human capital accumulation. Due to the complementarity between physical and human capital in production, the Capitalists were among the prime beneficiaries of the potential accumulation of human capital by the masses. They had therefore the incentive to financially support public education that would sustain their profit rates and would improve their economic well being, although would ultimately undermine their dynasty's position in the social ladder.[1]

In early stages of development, due to the relative abundance of labor and scarcity of capital, augmenting labor via universal human capital accumulation would have had a limited effect on the marginal productivity of capital. The Capitalists therefore had no incentive to financially support the education of the masses in order to sustain their profit rates. In later stages of developments, however, capital accumulation has gradually increased the potential role of human capital in the process of development and its importance in sustaining the rate of return to physical capital. In contrast to physical capital accumulation, however, since human capital is inherently embodied in individuals and is subjected to decreasing marginal returns at the individual level, the accumulation of human capital necessitated investment in the education of a large segment of society.

[1]Since firms have limited incentive to invest in the general human capital of their workers, in the presence of credit market imperfection the level of education will be sub-optimal unless it will be provided publicly.

Moreover, the presence of credit-market imperfections implied that a class society would result in a sub-optimal investment in human capital and consequently a lower rate of return to physical capital.[2] Hence, the emergence of human capital as the prime engine of economic growth may have brought about a non-altruistic change in the attitude of the Capitalists towards public education that planted the seeds for the demise of the exsiting class structure.

Existing theories regarding the fading Capitalists-Workers class structure can be classified into two categories. The Marxist approach argued that the demise of the class society is an outcome of a class struggle between Workers and Capitalists due to a rise in the degree of exploitation of Workers brought about by declining profit rates. The recent political economy approach accepts the basic Marxist premise regarding an increased tension between Workers and Capitalists (Masses and Elite) as the prime catalyst for the diminished class structure. It differs however, in the analysis of the nature of the transition. It argues that the transition in Western Europe during the 19th century is an outcome of deliberate concessions of the elite designed to avert political instability, expropriation, and possibly a revolution. In particular, Acemoglu and Robinson (2000) suggest that the extension of the franchise was a commitment devise to assure future income redistribution from the elite to the masses.[3]

This paper, in contrast, develops a growth model in which the demise of the class structure is an inevitable by-product of a productive cooperation between Capitalists

[2]See Galor and Zeira (1993), Benabou (1996), Durlauf (1996), Fernandez and Rogerson (1996), and Perotti (1996) for the effect of credit markets imperfection, on investment in human capital and economic growth.

[3]More generally, the effect of a social conflict on political, social and educational reforms has been examined by Grossman (1994), Alesina and Perotti (1996), Benhabib and Rustichini (1996), Benabou (1996), Grossman and Kim (1998), and Bourguignon and Verdier (2000). They argue that reforms (equality) diminishes the tendency for socio-political instability and predation, hence it may stimulate investment and economic growth. In particular, Bourguignon and Verdier (2000) and Grossman and Kim (1998) examines in a static setting the potential benefits for the elite from educational reforms. The former suggests that if political participation is determined by the education (socioeconomic status) of citizens, the Elite may not find it beneficial to subsidize universal public education, despite the existence of positive externalities from human capital, whereas the latter argues that education decreases predation.

and Workers, rather than an outcome of a class struggle and socio-political transition. The model demonstrates that in early stages of development, when physical capital is the prime engine of economic growth, society is marked by a stable class structure defined according to ownership of capital. Due to capital-skill complementarity,[4] the accumulation of capital in the process of development rises the importance of human capital accumulation for the process of development and for sustaining the rate of return to physical capital.[5] Once the rate of return to human capital increases sufficiently, Capitalists as well as Workers find it beneficial to institute publicly financed education and the prime characteristics of the Capitalists-Workers class structure vanishes gradually.[6]

The research thus suggest that Karl Marx's highly influential prediction about the inevitable demise of Capitalism, due to declining profit rates, stemmed from an underappreciation of the role that human capital would play in the production process. Had Karl Marx been exposed to Gary Becker's Human Capital theory,[7] the socio-political experience of the 20th century might have unfolded in a strikingly different manner.

Interestingly, the analysis demonstrates that the support for public education is unanimous despite the fact that the Capitalists carry the prime financial burden of public schooling. That is, due to the co-existence of credit market imperfections and capital-skill complementarity, the redistribution associated with public education is Pareto im-

[4]See Goldin and Katz (1998) for evidence regarding capital-skill complementarity.

[5]Durlauf and Johnson (1995), provide empirical evidence for the rise in the return to human capital in early stages of development. The evolution of the returns to skills in the 20th century is analyzed in Goldin and Katz (1999).

[6]This feature of the model is consistent with Kuznets' (1955) inverted U hypothesis. Time series analysis indicates that the hypothesis is consistent with the experience of most of the developed world that is the focus of this study. See Brenner et. al. (1991) for a most recent sequence of confirming studies covering the British, Swedish, Belgian, German, Australian, Austrian and the American experience. It should be noted that in mature stages of development, however, inequality might widen once again due to skilled or ability-biased technological change induced by human capital accumulation. This line of research was explored theoretically by Galor and Tsiddon (1997), Acemoglu (1998), and Galor and Moav (1998). Nevertheless, in this scenario, the sources of income inequality are less related to class association as reflected by the increased intergenerational mobility (e.g., Galor and Tsiddon (1997), Maoz and Moav (1999), Hasller and Rodriguez-Mora (2000)).

[7]See Becker (1964).

proving.[8] Contrary to conventional wisdom, therefore, the demise of the European class structure in the 19th century has been an outcome of a cooperative rather than a divisive process.

2 Historical Evidence

Historical evidence is consistent with the basic premise that education reforms had been at the heart of the process and they were designed primarily to generate the necessary skills for production, rather than for the sake of enlightenment and socialization of society members. The education system in Europe that had served the elite during most of the nineteenth century was opened to the masses in autocratic societies as well as in societies in the midst of the process of democratization, and it permitted Workers to share the gains from the rapid process of development.[9]

The evidence suggests that education reforms were designed primarily for the creation of the necessary skills for production. This utilitarian viewpoint of education is reflected in a statement of Nicholas I, who came to the throne in Russia 1825: "It is necessary that in every school the subjects of instruction and the very methods of teaching should be in accordance with the future destination of pupils, that nobody should aim to rise above that position in which it is his lot to remain." Furthermore, it is reflected in the order of the secretary of the Committee of Council on Education in England in 1848 whose main object was to encourage the use of education as a means of introducing a measure of order and discipline into the working-class population.

As is apparent from historical evidence from England, France, Germany and Russia, the European experience of the 19th century is consistent with the notion that education reforms had been at the heart of the demise of the European class structure of the 19th century. Education reforms had taken place in autocratic states that had not

[8] It should be noted that, in the model, there are no externalities from human capital accumulation.

[9] For instance, the Gini coefficient for income inequality in England and Wales had declined from 0.627 in 1871 to 0.443 in 1901.

relinquished political power, and they had occurred contemporaneously with political reforms in societies in the midst of the process of democratization.

England had gradually reformed its education system throughout the 19th century. As early as 1833 the government funded voluntary organizations that sponsored primary education. In 1880 education was made compulsory throughout England and Wales, and in 1891 education fees were abolished in nearly all elementary schools. Consequently, school enrollment of 10-year old has increased from 40% in 1870 to 100% in 1900 (Ringer 1979). This timing of the education reforms corresponded to the timing of political reforms. The Reform Act of 1832, nearly doubled the total electorate, but nevertheless only 3% of the entire population had been permitted to vote. The artisans, the working classes, and some sections of the lower middle classes remained outside of the political system. The franchise was extended further in the Reform Acts of 1867 and 1884 and the total electorate had nearly doubled in each of these episodes. Working class voters became the majority in all urban constituencies (Craig 1989).

Russia, as well witnessed major educational reforms during the 19th century, although political reforms were not implemented. Czar Alexander I instituted at the beginning of the 19th century educational reforms where old schools were remodeled and new schools were founded. Schools were designed to be free and under state control and provide utilitarian, scientific, and secular education. Rural peasants were supposed to be taught reading, writing, arithmetic, and elements of agriculture and pupils in the district schools of urban areas and the provincial schools were supposed to be prepared for careers as civil servants or for other white-collar occupations such as law, technology, and commerce. The Czar Alexander II, enacted in 1855 a new system of local government in rural areas with a right to found free schools for the peasantry. The utilitarian trend was evident in the establishment of vocational schools. A period of reaction followed under Alexander III due to the tension between the orthodox clergy and the minister of public

instruction.(Alston 1969).[10]

In France, the foundations for primary schooling were established as early as 1833 where communes were asked to maintain schools and pay for teachers. In 1848 the government had started to finance the cost of educators, but imposed on communes the duty of providing school buildings Finally in 1881-6 the government established compulsory primary schools, abolished fees and abolished distinctively religious teaching. After the 1830 revolution, restrictions limited the electorate to about 0.75% of the population. The 1848 revolution led to the Second Republic with the introduction of short-lived universal voting rights for males. Restrictions on voting rights were re-introduced in 1850, and then after the coup of Louis Napoleon in 1851 and the declaration of the Second Empire in 1852. The liberal phase was renewed from 1860 till democracy was secured in 1877 (Cole and Campbell, 1989).

In Prussia, education reforms had been initiated earlier. In 1717 Frederick William I ordered children to attend school, provided that schools were available. In 1736, he published a decree for the establishment of schools in some provinces. In 1794 Prussian law had recognized the principle of state supremacy in education. In 1834, secondary education was made necessary for candidates for professionals and civil service. Political reforms were instituted by the governing Prussian oligarchy as early as 1848 (Blackbourn, 1998). After 1870 adult males over the age of 25 had the right to vote, although voting was controlled in rural areas by the landlords (Goldstein, 1983). Democracy, however, was established only with the creation of the Weimar Republic in 1919.

3 The Basic Structure of the Model

Consider an overlapping-generations economy in a process of development. In every period the economy produces a single homogeneous good that can be used for consumption

[10]The result was that at the turn of the century nearly 70 percent of Russia's male population was illiterate.

and investment. The good is produced using physical capital and human capital. Output per-capita grows over time due to the accumulation of these factors of production. The stock of physical capital in every period is the output produced in the preceding period net of consumption and human capital investment, whereas the stock of human capital in every period is the aggregate level of public education in the preceding period.

3.1 Production of Final Output

Production occurs within a period according to a neoclassical, constant-returns-to-scale, production technology. The output produced at time t, Y_t, is

$$Y_t = F(K_t, H_t) \equiv H_t f(k_t) = A H_t k_t^{\alpha}; \quad k_t \equiv K_t/H_t; \quad \alpha \in (0,1), \tag{1}$$

where K_t and H_t are the quantities of physical capital and human capital (measured in efficiency units) employed in production at time t, and A is the level of technology.[11] The production function, $f(k_t)$, is therefore strictly monotonic increasing, strictly concave satisfying the neoclassical boundary conditions that assure the existence of an interior solution to the producers' profit-maximization problem.

Producers operate in a perfectly competitive environment. Given the wage rate per efficiency unit of labor, w_t, and the rate of return to capital, r_t , producers in period t choose the level of employment of capital, K_t, and the efficiency units of labor, H_t, so as to maximize profits. That is, $\{K_t, H_t\} = \arg\max\,[H_t f(k_t) - w_t H_t - r_t K_t]$. The producers' inverse demand for factors of production is therefore

$$\begin{aligned} r_t &= f'(k_t) = \alpha A k_t^{\alpha-1} \equiv r(k_t); \\ w_t &= f(k_t) - f'(k_t)k_t = (1-\alpha) A k_t^{\alpha} \equiv w(k_t). \end{aligned} \tag{2}$$

[11] The abstraction from technological change is merely a simplifying assumption. As will become apparent, the introduction of endogenous technological change would not affect the qualitative results. It should be noted, however, that this simplification is consistent with empirical evidence suggesting that TFP growth over the relevant period for this study is negligible and output growth is based primarily on factor accumulation.

3.2 Individuals

In every period a generation which consists of a continuum of individuals of measure 1 is born. Each individual has a single parent and a single child. Individuals, within as well as across generations, are identical in their preferences and innate abilities. They may differ, however, in their family wealth and thus, due to borrowing constraints, in their capability to finance their offspring's investment in human capital in the absence of public education.

Individuals live for two periods. In the first period of their lives individuals devote their entire time for the acquisition of human capital. The acquired level of human capital increases if their time investment is supplemented with capital investment in education.[12] In the second period of their lives, individuals supply their efficiency units of labor and allocate the resulting wage income, along with their interest income, between consumption and transfers to their children.

An individual i born in period t (a member i of generation t) receives a parental transfer, b_t^i, in the first period of life. A fraction $\tau_t \geq 0$ of this capital transfer is collected by the government in order to finance public education, whereas a fraction $1-\tau_t$ is saved for future consumption. Individuals devote their first period for the acquisition of human capital. Education is provided publicly free of charge.[13] The acquired level of human capital increases with the real resources invested in public education. The number of efficiency units of labor of each member of generation t in period $t+1$, h_{t+1}, is a strictly increasing, strictly concave function of the government real expenditure on education per member of generation t, e_t.[14]

[12]The qualitative results would not be affected if the time investment in education (foregone earnings) is the prime factor in the production of human capital, as long as physical capital would be needed in order to finance consumption over the education period. Both formulations assure that in the presence of capital markets imperfections, investment in human capital depends upon public education in the absence of sufficient family wealth.

[13]As will become apparent, once the level of public education is chosen optimally, individuals have no incentive to acquire private education. Furthermore, in early stages of development, the tax rate τ_t equals zero and individuals therefore do not acquire education.

[14]A more realistic formulation would link the cost of education to (teacher's) wages, which may vary

$$h_{t+1} = h(e_t), \tag{3}$$

where $h(0) = 1$, $\lim_{e_t \to 0^+} h'(e_t) = \gamma < \infty$, and $\lim_{e_t \to \infty} h'(e_t) = 0$.[15] Hence, even in the absence of real expenditure on public education individuals posses one efficiency unit of labor - basic skills.

In the second period life, a member i of generation t supplies the acquired efficiency units of labor, h_{t+1}, at the competitive market wage, w_{t+1}. In addition, the individual receives the gross return on savings, $(1-\tau_t)b_t^i R_{t+1}$. The individual's second period income, I_{t+1}^i, is therefore

$$I_{t+1}^i = w_{t+1}h(e_t) + (1-\tau_t)b_t^i R_{t+1}, \tag{4}$$

where $R_{t+1} \equiv 1 + r_{t+1} - \delta \equiv R(k_{t+1})$.[16]

Preferences of a member i of generation t are defined over second period consumption,[17] c_{t+1}^i, and the transfer to their offspring, b_{t+1}^i. They are represented by a non-homethetic,[18] log-linear utility function that generates the property that the aver-

in the process of development. For instance, $h_{t+1} = h(e_t/w_t)$ implies that the cost of education is a function of the number of efficiency units of teachers that are used in the education of each individual i. As can be derived from section 2.4, under both formulations the optimal expenditure on education, e_t, is an increasing function of the capital-labor ratio in the economy, and the qualitative results are therefore identical.

[15]The assumption $\lim_{e_t^i \to 0^+} h'(e_t^i) = \gamma < \infty$ assures that under some market conditions investment in human capital is not optimal. This assumption is necessary in order to assure that in the early stage of development the sole engine of growth is physical capital accumulation and there is no incentive to invest in human capital. It permits, therefore, a sharp presentation of the results regarding institutional transition.

[16]For simplicity the rate of capital depreciation $\delta = 1$. $\delta \in [0,1]$ would not alter any of the qualitative results.

[17]For simplicity we abstract from first period consumption. It may be viewed as part of the consumption of the parent.

[18]The choice of a non-homothetic utility function is necessary to assure that Workers do not invest in physical capital prior to their investment in human capital – a feature that has no qualitative bearing, but sharpens the presentation of the results. This formulation is consistent with empirical evidence. For example Dynan, Skinner and Zeldes (1996), for evidence that saving rates increase with wealth and Tomes (1981) for evidence that the marginal propensity to bequeath increases with wealth.

age propensity to bequest is an increasing function of wealth, [19]

$$u_t^i = (1-\beta)\log c_{t+1}^i + \beta \log(\overline{\theta} + b_{t+1}^i), \tag{5}$$

where $\beta \in (0,1)$ and $\overline{\theta} > 0$.[20]

Hence, a member i of generation t allocates second period income between consumption, c_{t+1}^i, and transfers to the offspring, b_{t+1}^i. That is,

$$c_{t+1}^i + b_{t+1}^i \leq I_{t+1}^i. \tag{6}$$

A member i of generation t chooses the level of second period consumption, c_{t+1}^i, and a non-negative transfer to the offspring, b_{t+1}^i, so as to maximize the utility function subject to the second period budget constraint (6).[21]

Hence the optimal transfer of a member i of generation t is:

$$b_{t+1}^i = b(I_{t+1}^i) \equiv \begin{cases} \beta(I_{t+1}^i - \theta) & if \quad I_{t+1}^i > \theta; \\ \\ 0 & if \quad I_{t+1}^i \leq \theta, \end{cases} \tag{7}$$

where $\theta \equiv \overline{\theta}(1-\beta)/\beta$. As follows from (7), the transfer rate b_{t+1}^i / I_{t+1}^i is increasing in I_{t+1}^i.

[19] This formulation is consistent with the classical viewpoint (e.g., Adam Smith (1776) and was further interpreted and developed by Keynes (1920), Lewis (1954), Kaldor (1957), and Bourguignon (1981)), according to which, saving rates are an increasing function of wealth, and inequality therefore channels resources towards individuals whose marginal propensity to save is higher, increasing aggregate savings and capital accumulation and enhancing the process of development in its early stages. A choice of an homothetic utility function would not affect the results regarding the effect of capital skill-complementarity on institutional transition.

[20] This form of altruistic bequest motive (i.e., the "joy of giving") is the common form in the recent literature on income distribution and growth. It is supported empirically by Altonji, Hayashi and Kotlikoff (1997). Utility from net transfers would reduce the amount of intergenerational transfers but would not affect the qualitative results. In particular, under utility from net transfers equation (7) below would be

$$b_{t+1}^i = b(I_{t+1}^i, \tau_{t+1}) \equiv \begin{cases} \beta(I_{t+1}^i - \theta/(1-\tau_{t+1})) & if \quad I_{t+1}^i > \theta/(1-\tau_{t+1}); \\ \\ 0 & if \quad I_{t+1}^i \leq \theta/(1-\tau_{t+1}), \end{cases}$$

[21] It should be noted that the transfer, b_{t+1}^i, is necessarily non-negative due to the assumption that the offspring has no income in the first period of life.

3.3 Physical Capital, Human Capital, and Output

Let B_t denote the aggregate level of intergenerational transfers in period t,

$$B_t = \int_0^1 b_t^i di.$$

A fraction τ_t of this capital transfer is collected by the government in order to finance public education, whereas a fraction $1-\tau_t$ is saved for future consumption.[22] The capital stock in period $t+1$, K_{t+1}, is therefore

$$K_{t+1} = (1-\tau_t)B_t, \tag{8}$$

whereas the government tax revenues are $\tau_t B_t$.

Since population is normalized to 1, the education expenditure per young individual in period t, e_t, is therefore,

$$e_t = \tau_t B_t, \tag{9}$$

and the stock of human capital in period $t+1$, H_{t+1}, is therefore

$$H_{t+1} = \int_0^1 h_{t+1}^i di = h(e_t) = h\left(\tau_t B_t\right). \tag{10}$$

Hence, the capital-labor ratio $k_{t+1} \equiv K_{t+1}/H_{t+1}$ is,

$$k_{t+1} = \frac{(1-\tau_t)B_t}{h(\tau_t B_t)} \equiv k(\tau_t, B_t), \tag{11}$$

where $k(0, B_t) = B_t$, $\partial k(\tau_t, B_t)/\partial \tau_t < 0$, and $\partial k(\tau_t, B_t)/\partial B_t > 0$.

and the output per-worker in period $t+1$ is

$$y_{t+1} = A[(1-\tau_t)B_t]^{\alpha} h\left(\tau_t B_t\right)^{1-\alpha} \equiv y(\tau_t, B_t). \tag{12}$$

[22] As will become apparent, this linear tax structure is the simplest structure that would generate the transition from a class society. Furthermore, it would assure that the chosen level of taxation is independent of the structure of the political system. That is, independent of the distribution of political power or voting rights among members of society.

3.4 Optimal Taxation

Given that the indirect utility function is a strictly increasing function of the individual's second period wealth, the optimal tax rate, τ_t^i, from the viewpoint of member i of generation t, (and hence the optimal expenditure on education, $e_t = \tau_t^i B_t$ from the viewpoint of this individual, given B_t) would maximize the individual's second period wealth, I_{t+1}^i.

$$\tau_t^i = \arg\max[w_{t+1}h(\tau_t^i B_t) + (1-\tau_t^i)b_t^i R_{t+1}], \tag{13}$$

where $w_{t+1} = w(k_{t+1})$ and $R_{t+1} = R(k_{t+1})$.

As follow from (13), noting (2) and (11) the optimal tax rate from the viewpoint of a member i of generation t, τ_t^i, is given by[23]

$$\begin{aligned} w(k_{t+1})h'(\tau_t^i B_t) &= R(k_{t+1}) \quad for \quad \tau_t^i > 0 \\ w(k_{t+1})\gamma &\le R(k_{t+1}) \qquad for \quad \tau_t^i = 0, \end{aligned} \tag{14}$$

where $k_{t+1} = k(\tau_t, B_t)$. Hence, given B_t, τ_t^i is determined independently of b_t^i, and is therefore identical for all i.[24] That is $\tau_t^i = \tau_t^*$ for all i. Furthermore, there exists a unique capital-labor ratio $\widetilde{k}$, below which $\tau_t^i = 0$. That is, $R(\widetilde{k}) = w(\widetilde{k})\gamma$.

Lemma 1 *(a) The optimal tax rate in period t, τ_t^*, from the viewpoint of each member of generation t is equal and uniquely determined.*

$$\tau_t^* = \tau(B_t) \begin{cases} > 0 \quad for \quad B_t > \widetilde{k} \\ = 0 \quad for \quad B_t \le \widetilde{k}; \end{cases}$$

[23] Substituting (2) and (11) into (13),

$$\tau_t^i = \arg\max(1-\tau_t^i)^\alpha h(\tau_t^i B_t)^{1-\alpha} {B_t}^\alpha [1-\alpha+\alpha b_t^i/B_t].$$

The conditions in (14) follow from the optimization problem above, using (2).

[24] The unanimous agrement on the tax rate is a result of the linear tax rate and the unit elasticity of substitution between human and physical capital in production. If the elasticity of substitution would be larger than unity, then the poor would prefer higher taxes, whereas if the elasticity of substitution is smaller than unity, then the poor would prefer lower taxes.

$\widetilde{k} = \alpha/(1-\alpha)\gamma$.

(b) The optimal expenditure on public education, $e_t = \tau(B_t)B_t \equiv e(B_t)$ from the viewpoint of each member of generation t is strictly increasing for $B_t > \widetilde{k}$.

Proof. Noting (2),(11) and (14) it follows from the properties of $h(\tau_t B_t)$ that τ_t^* is uniquely determined by B_t and $e'(B_t) > 0$, where as follows from the definition of $\widetilde{k}$ and (2), $\widetilde{k} = \alpha/(1-\alpha)\gamma$. □

Hence, since the optimal tax rate in period t is identical from the viewpoint of each member of generation t, it follows that under any political structure, the chosen tax rate in period t is

$$\tau_t = \tau_t^* = \tau(B_t). \tag{15}$$

Proposition 1 *The tax rate in period t, τ_t is*

$$\tau_t \quad \begin{cases} > 0 \quad for \quad k_{t+1} > \widetilde{k} \\ \\ = 0 \quad for \quad k_{t+1} \leq \widetilde{k}. \end{cases}$$

Proof. Since $h(0) = 1$, it follows from (11) (14) and Lemma 1 that $k_{t+1} = B_t$ for $B_t \leq \widetilde{k}$ and hence for $k_{t+1} \leq \widetilde{k}$. Thus the Proposition follows. □

Corollary 1 *The chosen level of taxation in every period maximizes output per-worker in the following period. That is,*

$$\tau_t = \arg\max y_{t+1} \equiv \arg\max y(\tau_t, B_t).$$

Proof. Maximizing $y(\tau_t, B_t)$ with respect to τ_t yield the optimality conditions given by (14). That is, the optimality conditions for the desired level of taxation from the viewpoint of each individual. □

Hence, as long as the rate of return to human capital is lower than the rate of return on physical capital (i.e., as long as $k_{t+1} \leq \widetilde{k}$) the chosen level of investment in public education is zero – the level of investment maximizes output per-worker. Once

the rate of return to human capital equals the rate of return on physical capital (i.e., once $k_{t+1} > \widetilde{k}$) the chosen investment in public education is positive and it maximizes output per-worker.

4 The Dynamical System

Suppose that in period 0 the economy consists of two groups of individuals in their first period of their lives - Capitalists and Workers. They are identical in their preferences and differ only in their initial wealth. The Capitalists, denoted by R (Rich), are a fraction λ of all individuals in society, who equally own the entire *initial* stock of wealth. The Workers, denoted by P (Poor), are a fraction $1-\lambda$ of all individuals in society, who have no ownership over the *initial* physical capital stock.[25] Since individuals are initially homogenous *within* a group, the uniqueness of the solution to their optimization problem assures that their offspring who acquire the same level of education and are taxed equally are homogenous as well . Hence, in every period a fraction λ of all adults are homogenous descendents of the Capitalist, denoted by members of group R, and a fraction $1-\lambda$ are homogenous descendents of Workers, denoted by members of group P.

The optimization of groups P and R of generation $t-1$ in period $t > 0$, determines the aggregate intergenerational transfers in period t, B_t.

$$B_t = \int_0^1 b_t^i di = \lambda b_t^R + (1-\lambda) b_t^P \equiv B(b_t^R, b_t^P), \tag{16}$$

where b_t^i is the intergenerational transfer of individual i in period t; $i = P, R$.

Hence, as follows from (11), (15), (16), and Proposition 1

$$k_{t+1} = \frac{[1-\tau(B_t)]B_t}{h[\tau(B_t)B_t]} \equiv \kappa(b_t^R, b_t^P), \tag{17}$$

[25] As will become apparent this class distinction will dissipate over time. In particular, descendents of the working class will ultimately own some physical capital.

where as follows from (2) and (14), $\partial\kappa/\partial b_t^i > 0$, $i = R, P$, Furthermore, $\kappa(0,0) = 0$ (since in the absence of transfers and hence savings the capital stock in the subsequent period is zero).

Since members of group R equally own the entire *initial* stock of wealth in period 0 and members of group P have no ownership over the initial stock of wealth, it follows that $b_0^R > 0$ and $b_0^p = 0$. Furthermore, it is assumed that

$$b_0^R < \widetilde{k}/\lambda. \tag{A1}$$

As established in Lemma 2, and consistently with empirical evidence about the process of development, this assumption assures that in early stages of development there is no investment in public education.

Lemma 2 *Under A1,*

$$k_1 < \widetilde{k}.$$

Proof. Since $b_0^p = 0$, (11),(16) and Lemma 1, given the properties of (3), imply that $k_1 = B_0 = \lambda b_0^R$. Hence it follows from Assumption A1 that $k_1 < \widetilde{k}$. □

The evolution of transfers within each group $i = R, P$, as follows from (7), is given by

$$b_{t+1}^i = \max\{\beta[w(k_{t+1})h(\tau(B_t)B_t)) + (1-\tau(B_t))b_t^i R(k_{t+1}) - \theta], 0\}; \qquad i = R, P. \tag{18}$$

Since $B_t = B(b_t^R, b_t^P)$ and $k_{t+1} = \kappa(b_t^R, b_t^P)$, it follows that the dynamical system is uniquely determined by the sequence $\{b_t^P, b_t^R\}_{t=0}^{\infty}$ such that

$$\begin{aligned} b_{t+1}^P &= \psi^P(b_t^R, b_t^P); \\ b_{t+1}^R &= \psi^R(b_t^R, b_t^P), \end{aligned} \tag{19}$$

where $b_0^p = 0$ and $b_0^R > 0$.

5 The Process of Development

This section analyzes the endogenous evolution of the economy from early to mature stages of development. As will become apparent, if additional plausible restrictions are imposed on the basic model, the economy endogenously evolves through two fundamental regimes:

- Regime I: In this early stage of development the rate of return to human capital is lower than the rate of return to physical capital, and there is no investment in education.
- Regime II: In these later stages of development, the rate of return to human capital increases sufficiently so as to generate support for public education.

5.1 Regime I: Physical Capital Accumulation

Regime I is defined as the time interval $0 \leq t < \widetilde{t}$, where $\widetilde{t}+1$ is the first period in which the capital labor ratio exceeds $\widetilde{k}$ (i.e., $\widetilde{t}$ is the first period in which investment in human capital takes place). In this early stage of development the capital-labor ratio in period $t+1$, k_{t+1}, which determines the investment in public education in period t, is lower than $\widetilde{k}$. As follows from Proposition 1 and Corollary 1, the tax rate is zero, there is no public education, and both groups of individuals acquire only basic skills. That is, $H_{t+1} = h(0) = 1$.

Let $\check{k}$ be the level of the capital-labor ratio such that $w(\check{k}) = \theta$. As follows from (4), $\check{k}$ is the critical level of the capital-labor ratio in time $t+1$ below which in the absence of public investment in education in period t individuals who do not receive transfers from their parents in period t do not transfer income to their offspring in period $t+1$. That is, $I^i_{t+1} \leq \theta$ and therefore $b^i_{t+1} = 0$.

In order to assure that investment in human capital will begin in a period where

the poor do not invest in physical capital, it is assumed therefore that[26]

$$\widetilde{k} \leq \check{k}. \tag{A2}$$

As follows from (2), $\check{k} = [\theta/(1-\alpha)A]^{1/\alpha}$. Since $\widetilde{k} = \alpha/(1-\alpha)\gamma$, Assumption A2 implies therefore that $\gamma > (\alpha^{\alpha}(1-\alpha)^{1-\alpha}A/\theta)^{1/\alpha}$.

Lemma 3 *Under Assumptions A1 and A2,*

$$b_t^P = 0 \quad for \quad 1 \leq t \leq \widetilde{t}$$

Proof. As follows from Proposition 1, the definition of $\widetilde{t}$, and Assumption A1 that assures that $\widetilde{t} > 1$, for $0 \leq t < \widetilde{t}$, there is no investment in public education and hence $h_{t+1} = 1$. Hence, since Assumption A2 implies that $k_t \leq \check{k}$ and therefore $w(k_t) \leq \theta$, it follows that $b_{t+1}^P = \max[\beta[w(k_{t+1}) - \theta]\ , 0] = 0$ if $b_t^P = 0$. Since $b_0^P = 0$ it follows therefore that $b_t^P = 0$ for $1 \leq t \leq \widetilde{t}$. □

As follows from (16),(17), proposition 1, and Lemma 3, the capital-labor ratio in period $t+1$ is

$$k_{t+1} = \kappa(b_t^R, 0) = \lambda b_t^R \quad \text{for} \quad t \in [0, \widetilde{t}) \tag{20}$$

and the level of output per-worker in period $t+1$, y_{t+1}, as follows from (1), (20), is[27]

$$y_{t+1} = A[\lambda b_t^R]^{\alpha} \quad \text{for} \quad t \in [0, \widetilde{t}). \tag{21}$$

The Dynamics of Output Per-Worker

As follows from (19) and Lemma 3, the evolution of the economy is given by

$$\left.\begin{array}{l} b_{t+1}^R = \psi^R(b_t^R, 0) = \max[\beta[w(\lambda b_t^R) + b_t^R R(\lambda b_t^R) - \theta], 0]; \\ b_{t+1}^P = 0, \end{array}\right\} \quad for \quad t \in [0, \widetilde{t}) \tag{22}$$

[26]This assumption is designed to simplify the presentation of the results. As will become apparent, even if Assumption A2 would be violated, the Capitalists would have an incentive to support the education of Workers.

[27]Note that since the size of the population is 1, $Y_{t+1} = y_{t+1}$.

where $b_0^R > 0$ is given. Hence in Regime I the dynamical system is fully determined by the evolution of transfers across members of group R.

Alternatively, the evolution of the entire dynamical system in Regime I can be represented by the evolution of output per-worker. Since the aggregate income of group R is $(\lambda(1-\alpha)+\alpha)y_t$, (where α is the share of capital in total output that is fully owned by group R and $\lambda(1-\alpha)$ is the labor share of group R), it follows from (7) (21) and (22) that the evolution of output per-worker in the time period $t \in [0, \widetilde{t})$ is,

$$y_{t+1} = \max\left[A\{\beta\{[\lambda(1-\alpha)+\alpha]y_t - \lambda\theta\}\}^{\alpha}, 0\right] \equiv \phi^I(y_t), \quad for \quad y_t \in [0, \widetilde{y}), \tag{23}$$

where $\widetilde{y} = A\widetilde{k}^{\alpha}$.

In order to assure that the economy would ultimately take off from Regime I to Regime II (i.e., in order to assure that consistently with empirical evidence the process of development is marked by human capital accumulation) it is assumed that the technology is sufficiently productive. That is,

$$A > \widetilde{A} \tag{A3}$$

where $\widetilde{A}$ is the critical level of technology such that $\phi^I(\widetilde{y}) = \widetilde{y}$.[28]

Lemma 4 *Under Assumptions A2 and A3, there exists* $\underline{y} \in (0, \widetilde{y})$; $\widetilde{y} = A\widetilde{k}^{\alpha}$, *such that the properties of* $\phi^I(y_t)$ *in the interval* $y_t \in [0, \widetilde{y}]$ *are*

[28] As follows from (23)

$$\widetilde{A} = \frac{1 + \lambda(1-\alpha)^{\alpha}\beta\gamma^{\alpha}\theta\alpha^{-\alpha}}{\beta(\alpha + (1-\alpha)\lambda)}.$$

It should be noted that a sufficiently high level of A that satisfies Assumption A3 does not violate Assumption A2. An increase in A and γ^{α} holding their ratio unchanged, does not affect A2 and increases A relative to $\widetilde{A}$.

$$\phi^I(y_t) = 0 \qquad for \quad y_t \leq \underline{y}$$

$$\partial\phi^I(y_t)/\partial y_t > 0 \qquad for \quad \underline{y} < y_t \leq \widetilde{y}$$

$$\partial^2\phi^I(y_t)/\partial[y_t]^2 < 0 \qquad for \quad \underline{y} < y_t \leq \widetilde{y}$$

$$\phi^I(y_t) > y_t \qquad for \quad y_t = \widetilde{y}$$

Proof. As follows from (23), $\phi^I(y_t) = 0$ for $y_t \leq \underline{y} = \lambda\theta/(\lambda(1-\alpha)+\alpha)$, and $\partial\phi^I(y_t)/\partial y_t > 0$, and $\partial^2\phi^I(y_t)/\partial[y_t]^2 < 0$ for $\underline{y} < y_t \leq \widetilde{y} = A\{\alpha/[(1-\alpha)\gamma]\}^{\alpha}$. Consistently with Assumption A2, there exist a sufficiently small γ such that $\widetilde{y} > \underline{y}$.[29] Furthermore, Assumption A3 assures that $\phi^I(y_t) > y_t$ for $y_t = \widetilde{y}$ □

Corollary 2 *Under Assumptions A2 and A3, the dynamical system $\phi^I(y_t)$ has two steady-state equilibria in the interval $y_t \in [0, \widetilde{y}]$; A locally stable steady-state, $\overline{y} = 0$, and an unstable steady-state, $\overline{y}^u \in (\underline{y}, \widetilde{y})$.*

Figure 1 depicts the properties of $\phi^I(y_t)$ over the interval $y_t \in (0, \widetilde{y}]$. If $y_t < \overline{y}^u$ then output per worker contract over time and the system converges to the steady-state equilibrium $\overline{y} = 0$. If $y_t > \overline{y}^u$ then output per worker expand over the entire interval $(\overline{y}^u, \widetilde{y}]$, crossing into Regime II. Hence, in order to assure that the process of development takes off it is assumed that

$$y_0 \in (\overline{y}^u, \widetilde{y}). \tag{A4}$$

implying that $b_0^R \in ([\overline{y}^u/A\lambda^{\alpha}]^{1/\alpha}, [\widetilde{y}/A\lambda^{\alpha}]^{1/\alpha}) = ([\overline{y}^u/A\lambda^{\alpha}]^{1/\alpha}, \widetilde{k}/\lambda)$. Hence, Assumption A1 is a subset of Assumption A4.

5.2 Regime II: Education and Decline of the Class Structure

In these mature stages of development, the rate of return to human capital increases sufficiently so as to induce human capital accumulation via public education, and the

[29] If $\underline{\gamma} < \gamma < \overline{\gamma}$ where $\underline{\gamma} = [\alpha^{\alpha}(1-\alpha)^{1-\alpha}A/\theta]^{1/\alpha} < \overline{\gamma} = [\alpha^{\alpha}(1-\alpha)^{1-\alpha}A/\theta + \alpha^{1+\alpha}(1-\alpha)^{-\alpha}A/\lambda\theta]^{1/\alpha}$, then Assumption A2 and $\widetilde{y} > \underline{y}$ are satisfied simultaneously. Furthermore, as discussed in the previous footnote, Assumptions A3 and $\widetilde{y} > \underline{y}$ are mutually consistent.

process of development is fueled by human capital as well as physical capital accumulation. In stages I of Regime II, the economy witnesses the birth of public education. The Capitalists invest in human capital as well as in physical capital, whereas workers acquire education financed by the Capitalists but their income level is not sufficiently high so as to permit physical capital accumulation. In stage II, as income increases the economy witnesses the demise of the class society. All individuals acquire human capital as well as physical capital and the income gap between the classes is narrowed and eliminated in the long-run.

5.2.1 Stage I: The Birth of Public Schooling

Stage I of Regime II is defined as the time interval $\widetilde{t} \leq t < \widehat{t}$, where $\widehat{t}$ is the first time period in which members of group P transfer income to their offspring which permit investment in physical capital. In this time interval the marginal rate of return on investment in human capital is equal to the rate of return on investment in physical capital. Although workers acquire education financed by the Capitalists, their income level is not sufficiently high so as to permit transfer to their offspring.

As follows from (16),(17), proposition 1, and Lemma 3, the capital-labor ratio in period $t+1$ is

$$k_{t+1} = \kappa(b_t^R, 0) = \frac{(1-\tau_t)\lambda b_t^R}{h(\tau_t \lambda b_t^R)} \quad \text{for} \quad t \in [\widetilde{t}, \widehat{t}) \ . \tag{24}$$

where $\partial\kappa(b_t^R, 0)/\partial b_t^R > 0$. The level of output per-worker in period $t+1$, y_{t+1}, as follows from (1) and (24), is

$$y_{t+1} = A[(1-\tau_t)\lambda b_t^R]^{\alpha}[h(\tau_t \lambda b_t^R)]^{1-\alpha} \quad \text{for} \quad t \in [\widetilde{t}, \widehat{t}). \tag{25}$$

The Dynamics of Output Per-Worker

As follows from (19) the evolution of the economy in the time interval $\widetilde{t} \leq t < \widehat{t}$ is given

by

$$\left.\begin{array}{l} b_{t+1}^R = \psi^R(b_t^R;0) = \beta[w(k_{t+1})h(\tau_t\lambda b_t^R) + (1-\tau_t)b_t^R R(k_{t+1}) - \theta]; \\ b_{t+1}^P = \psi^P(b_t^R;0) = 0. \end{array}\right\} \quad for \quad t \in [\widetilde{t},\widehat{t}) \tag{26}$$

Alternatively, the evolution of the entire dynamical system in Regime I can be represented by the evolution of output per-worker. Since the aggregate income of group R is $(\lambda(1-\alpha)+\alpha)y_t$, as is the case in Regime I, it follows from (7) (21) and (26) that the evolution of output per-worker in the time period $t \in [\widetilde{t},\widehat{t})$ is,

$$\begin{aligned} y_{t+1} &= A\{(1-\tau_t)\beta\{[\lambda(1-\alpha)+\alpha]y_t - \lambda\theta\}\}^\alpha\{h(\tau_t\beta\{[\lambda(1-\alpha)+\alpha]y_t - \lambda\theta\})\}^{1-\alpha} \\ &\equiv \phi^{II}(y_t) \qquad\qquad for \qquad y_t \in [\widetilde{y},\widehat{y}), \end{aligned} \tag{27}$$

where $\widetilde{y} = A\widetilde{k}^\alpha$, $\tau_t = \arg\max \phi^{II}(y_t)$, and $\widehat{y} = \theta/(1-\alpha)$, is the critical level of the output per-worker such that the income level of individuals who do not receive transfer from their parents (i.e., members of group P) equals θ. As follows from (4), as long as $y_t < \widehat{y}$, members of group P do not transfer income to their offspring. Hence, since $\widetilde{y} = A\{\alpha/[(1-\alpha)\gamma]\}^\alpha$, it follows from assumption A2 that $\widehat{y} > \widetilde{y}$.

In order to assure that the economy would ultimately take off from Stage I to Stage II within Regime II it is assumed that the technology is sufficiently productive. That is,

$$A \geq \widehat{A} \equiv 1/\beta\alpha \tag{A5}$$

where as follows from (27) and Corollary 1, $\widehat{A}$ is a sufficiently high level of technology such that $\phi^{II}(\widehat{y}) > \widehat{y}$.[30]

If Assumption A5 is violated then there are two feasible scenarios. The economy may converge to a steady-state equilibrium in the interval $(\widetilde{y},\widehat{y})$ with public education,

[30] Assumptions A3 and A5 imply that $A \geq max[\widetilde{A},\widehat{A}]$, where $\widetilde{A} < \widehat{A}$ if and only if $\gamma < (\alpha^{\alpha-1}(1-\alpha)^{1-\alpha}/\beta\theta)^{1/\alpha}$.

where individuals are identical in their level of human capital and in their wage income, but they differ in their level of wealth. Alternatively, the economy may proceed, nevertheless, to a long-run steady-state equilibrium above $\widehat{y}$, where as will become apparent offspring of Capitalists and workers are indistinguishable.

Lemma 5 *Under Assumptions A2 and A5, the properties of* $\phi^{II}(y_t)$ *in the interval* $y_t \in [\widetilde{y}, \widehat{y}]$ *are*

$$\begin{aligned} &\partial\phi^{II}(y_t)/\partial y_t > 0 \\ &\partial^2\phi^{II}(y_t)/\partial y_t^2 < 0 \\ &\phi^{II}(y_t) > y_t \end{aligned}$$

Proof. Follows from (27), Assumptions A2 and A5, and the concavity of $h(e)$, noting that $\tau_t = \arg\max y_{t+1}$. □

Corollary 3 *The dynamical system* $\phi^{II}(y_t)$ *has no steady-state equilibria in the interval* $y_t \in [\widetilde{y}, \widehat{y}]$.

Figure 1 depicts the properties of $\phi^{II}(y_t)$ over the interval $y_t \in [\widetilde{y}, \widehat{y}]$. The transfers within each dynasty of type R expand over the entire interval crossing into Stage II.

5.2.2 Stage II: The Demise of the Class Society

Stage II of Regime II is defined as $t \geq \widehat{t}$. In this time interval all individuals acquire education and transfer income to their offspring.

As follows from Corollary 3, in stage II of Regime II the level of output per-worker exceeds $\widehat{y}$ and the wage income of members of all individuals exceeds θ. Hence, it follows from (16) and (7), that

$$B_t = \lambda b_t^R + (1-\lambda) b_t^P = \beta[y_t - \theta]. \tag{28}$$

The capital-labor ratio in period $t+1$, as follows from (11) and (28), is therefore

$$k_{t+1} = \tfrac{(1-\tau_t)\beta[y_t-\theta]}{h(\tau_t\beta[y_t-\theta])} \quad \text{for} \quad t \in [\widehat{t}, \infty) \ . \tag{29}$$

and the level of output per-worker in period $t+1$, y_{t+1}, as follows from (1) and (29), is

$$y_{t+1} = A[(1-\tau_t)\beta[y_t - \theta]]^{\alpha}[h(\tau_t\beta[y_t - \theta])]^{1-\alpha} \quad \text{for} \quad y_t > \widehat{y}. \tag{30}$$

The Evolution of Output Per-Worker

The evolution of output per worker, Y_t, in Stage II of Regime II, is independent of the distribution of intergenerational transfers and hence the dynamical system can be represented by the evolution of output per-worker. As follows from (1) and (29), the evolution of output per worker over the time interval $t > \widehat{t}$ is

$$y_{t+1} = A[(1-\tau_t)\beta[y_t - \theta]]^{\alpha}[h(\tau_t\beta[y_t - \theta])]^{1-\alpha} \equiv \phi^{III}(y_t) \quad \text{for} \quad y_t > \widehat{y}. \tag{31}$$

where $\tau_t = \arg\max \phi^{III}(y_t)$, and therefore $\partial\phi^{III}(y_t)/\partial y_t > 0$. Furthermore, it follows from the concavity and the boundary conditions of $h(e)$ and the aggregate production function that $\partial^2\phi^{III}(y_t)/\partial y_t^2 < 0$, and $\lim_{y_t\to\infty} \partial\phi^{III}(y_t)/\partial y_t = 0$.

Corollary 4 *Under A2-A4, y_t increases monotonically in Stage II of Regime II and converges to $\overline{y} > \widehat{y}$.*

Proof. Follows directly from the properties of $\phi^{III}(y_t)$. □

Proposition 2 *Under A2-A4, the economy converges to a steady-state equilibrium in which the income gap between the offspring of the Capitalist and the Workers is eliminated.*

Proof. As follows from the properties of (9),(15),(28),(29) and Corollary 4, the economy converges to a unique steady-state vector $(\overline{y}, \overline{k}, \overline{\tau}, \overline{h})$. Since

$$b_{t+1}^i = \beta[w(k_{t+1})h_{t+1} + (1-\tau_t)b_t^i R(k_{t+1}) - \theta] \quad for \quad t > \widehat{t}\ , \qquad i = P.R \tag{32}$$

where as follows from (14) $h_{t+1} = h(k_{t+1})$ and $\tau_t = \tau(k_{t+1})$ and therefore

$$b^i_{t+1} = \zeta(b^i_t, k_{t+1}). \tag{33}$$

Hence, given $\overline{k}$ it follows that, in the steady state, $b^i = \overline{b}^i$ where $\overline{b}^i = \zeta(\overline{b}^i, \overline{k})$, otherwise (since $\partial\zeta(b^i, \overline{k})/\partial b^i \geq 0$) either [$b^i$ decreases (increases) for all i and thus k decreases (increases)] or [b^R increases indefinitely and b^P decreases to zero, and thus k increases] in contradiction to the stationarity of $\overline{k}$. Hence, $\overline{b}^R = \zeta(\overline{b}^R, \overline{k})$, $\overline{b}^P = \zeta(\overline{b}^P, \overline{k})$, and $\overline{k} = \kappa(\overline{b}^R, \overline{b}^P)$. Since $b^P > 0$, the steady-state equilibrium is $(b^R, b^P) >> 0$, where $b^P = b^R$ since ζ is independent of $i = P, R$. □

6 Concluding Remarks

This paper hypothesizes that the demise of the class structure that existed in Europe in the 19th century may reflect a deliberate transformation of society orchestrated by the Capitalists. In contrast to the prevailing wisdom, the research suggests that the transition from the European class structure of the 19th century may be viewed as the outcome of an optimal reaction process of the Capitalists to the increasing importance of human capital in sustaining their profit rates. The paper argues that the process of capital accumulation has gradually intensified the relative scarcity of labor and has generated an incentive to augment labor via human capital accumulation. Due to the complementarity between physical and human capital in production, the Capitalists were among the prime beneficiaries of the potential accumulation of human capital by the masses. They had therefore the incentive to financially support public education that would sustain their profit rates and would improve their economic well being, although would ultimately undermine their dynasty's position in the social ladder. The support for public education is unanimous despite the fact that the Capitalists carry the prime financial burden of public schooling. That is, due to the co-existence of credit market imperfections and capital-skill complementarity, the redistribution associated with public

education is Pareto improving. Unlike the conventional wisdom, therefore, the demise of the Capitalists-Workers class structure has been an outcome of a cooperative rather than a divisive process.

The paper argues that the massive reforms in the education system across the continent had been at the heart of the process that has lead to the decline of the exisitng class structure. The political reforms that accompanied education reforms can be viewed as an attempt by the Capitalist to broadened the coalition that support public vocational (utilitarian) education against the wishes of the Clergy as well as the Land Lord for whom human capital was less complementary in production.

The study suggests a novel hypothesis regarding the causes of persistence differences in the structure of society, institutions and economic performance across countries. It proposes that these cross country differences may reflect initial differences in land abundance. In particular, the paper suggests that in land abundant societies with a high degree of polarization (e.g., some Latin American Countries), education reforms would be delayed, due to the lower degree of complementarity between human capital and land, and thus the process of development would be slowed and polarization would persist longer.

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Figure 1