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ABSTRACT

Artificial Intelligence, the Collapse of Consumer Society, and Oligarchy

This paper examines the potential for automation and artificial intelligence (AI) to induce a broader economic decline, impacting not only labor but also the owners of capital and advanced technology. While automation has traditionally favored skilled over unskilled workers, recent advancements in AI suggest that it could replace skilled labor as well, raising concerns over a diminishing middle class and the viability of mass consumption society. This study proposes a model with non-homothetic preferences and increasing returns technology, positing that in a world where AI eliminates skilled labor, demand for mass-produced goods may fall, destabilizing the very capitalist class reliant on consumer society. Within this framework, political power lies with the "oligarchs," or owners of proprietary technology, who may adopt policies such as Universal Basic Income (UBI) or Post-Fordism to sustain consumer demand and profitability. The analysis explores how oligarchs might use different policy mechanisms, including decisive control or lobbying-based menu auctions, to influence economic outcomes. Findings suggest that policy preferences vary among oligarchs based on their market focus, with luxury producers favoring policies that sustain a middle class and necessity producers inclined to support AI-driven automation under minimal redistribution. The paper provides insights into the complex interactions between technology, income distribution, and political economy under advanced automation.

JEL Classification: O33, D63, J24, E25, D72, L16, P16, H23, D31, D42

Keywords: automation, Artificial Intelligence, income inequality, capitalism, middle class, Universal Basic Income (UBI), Post-Fordism, political economy, consumer society, oligarchs

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1 Introduction

Historically, automation has been thought to be skilled-biased, thus redistributing income away from unskilled workers in favor of skilled workers. While this mechanism raises inequality, it should also raise GDP as automation is a productivity improvement. Furthermore, to the extent that the unskilled can still perform non routine tasks, the effect on their income will be alleviated. More recently, it has been observed that artificial intelligence may also substitute for skilled workers. If so, this is "good news" as it reduces inequality; a new wave of innovation may reverse earlier trends towards greater inequality, while again raising GDP.Finally, it may be believed that automation favors capital at the expense of (both skilled and unskilled) labor. This will alter GDP factor shares in a way that favors capital. However, again, this should raise GDP. Furthermore, since capital is an accumulable factor, its greater return should be offset in the long run by a rise in capital accumulation, which would raise wages. During the transition, at the individual level, and from a life cycle perspective, a greater return to capital partially offsets the fall in labor income.

The scenario considered in this paper is bleaker. Automation may trigger a general economic collapse that will not only harm workers but also the owners of capital and advanced technologies. It is now increasingly documented that AI can substitute skilled workers. The idea pursued here is that this may shrink the middle-class in such a way as to threaten the survival of mass consumption society. Because mass production technology rests on increasing returns to scale, AI may not only have adverse consequences in the aggregate but also turn out as a threat for the capitalism class, whose source of wealth is associated with ownership of mass-produced goods. While, in partial equilibrium, a capitalist may greatly benefit from the cost reductions allowed by AI, in general equilibrium, some capitalists lose because the market base for their products vanishes. This paper considers how capitalists, relabeled "oligarchs" to convey a sense of their political power, may want to influence policy so as to preserve consumer society and therefore maintain their profits.

I consider a world with nonhomothetic preferences and increasing returns technology, based on Saint-Paul (2023); which builds on Murphy et al. (1991). As in those papers, for each good there is a traditional, constant returns technology, which is public, and a modern, increasing returns technology, which is proprietary. This modern technology relies on skilled workers to perform the overhead tasks that are needed to operate. Because of this fixed overhead cost, it is profitable for the owner to operate only if the market size for the good is large enough, which given the structure of preferences based on a hierarchy of needs, depends on the distribution of income, as shown by Murphy et al. I assume that artificial intelligence allows to replace all the skilled workers, which, in partial equilibrium, should benefit the owners of the modern technology. However, in general equilibrium, the middle class of skilled workers disappears. As a result, it is no longer profitable to operate the modern technology in some sectors, while others ("necessities") continue to use it and have higher profits due to the use of AI.

I consider an economy where political power rests with the oligarchs, i.e. the owners of the modern technology. Their interests differ: producers of "necessities" do not value the existence of a large middle class, while producers of "luxuries" do. I assume the oligarchs control policy, by some mechanism, and I analyze their incentives to preserve the consumer society. In particular, I compare two alternative policies. One (Universal Basic Income, UBI) consists in offsetting the distributive effects of AI by redistributing income. By assumption, this redistribution is uniform, because people also are: worker heterogeneity vanishes in a world where people do not acquire any skill since the returns to skills have fallen to zero. The other (Post-Fordism) consists in blocking, or curbing, the use of AI, thus preserving the demand for skilled managerial workers. This could be implemented through regulation or voluntarily. Both policies have the effect of raising the income of workers which raises the market base for mass produced goods. In turn, this benefits some oligarchs whose rents would vanish if the middle class were to shrink by too much.

I consider two alternative decision mechanisms. One possibility is that policy reflects the interests of some "decisive" oligarch, in the fashion of median voter theorems. Another possibility is a world based on lobbying where oligarchs compete for influence by offering rewards to policymakers conditional on their decisions. For this I use the menu auctions paradigm pioneered by Bernheim and Whinston (1986) and Grossman and Helpman (1994).

Results crucially depend on which structure of power prevails, and on the constraints imposed upon redistribution if AI is implemented. Typically, a decisive oligarch can always choose a level of UBI such that people can purchase his product, and this is more advantageous than inefficiently blocking AI. However, if fiscal capacity prevents the oligarch from implementing the corresponding tax rate, he or she will prefer the post-fordist solution. Conversely, under the menu auction paradigm, it is shown that producers of necessities, who cover a larger market, are willing to pay more than producers of necessities to get their preferred policy. As a result, they will force a transition to AI if they expect subsequent redistribution to be not too high. In this case, precisely, producers of luxuries oppose AI since people would then be too poor to purchase their products. On the other hand, if producers of necessities expect taxes to be too high under AI, they will oppose it, while producers of luxuries are more likely to support it in this case. Furthermore, if the tax rate under AI is set under the same menu auction mechanism, then necessities producers will be able to enforce zero redistribution, since redistribution is not needed for people to purchase their products.

1.1 Related literature

To my knowledge, this paper is the first to introduce demand linkages into the political economy of stuctural change. It is related to various strands of literature. First, the literature on nonhomothetic preferences and growth (Murphy et al. (1989), Mani (2001), Matsuyama (2002), Foellmi and Zweimuller (2008), Foellmi et al. (2014)). Second, the large literature on the effects of technical change on income distribution (see, for example, Katz and Murphy (1992), Krusell et al. (2000), Zeira (1998), Caselli (1999), Beaudry and Green (2003)), which has, more recently, specifically focused on automation (Saint-Paul (2007), Acemoglu and Restrepo (2020), Autor et al.(2003), Autor and Solomons (2018)). While this literature's general message is that, contrary to what is assumed in the present paper, automation is biased in favor of skilled labor, things may turn out quite differently with AI which, by construction, is capable of performing skilled tasks.[1] Third, a strand of research focuses on the politics of resistance to technical progress (Krusell and Rios-Rull (1996), Dewatripont and Roland (1992), Bellettini and Ottaviano (2005), Comin and Hobijn (2009), Mukoyama and Popov (2014), Bénabou et al. (2022)).[2] Finally, following progress in robotics, AI and machine learning, a literature has developed focusing on the economics of human replacement (Saint-Paul (2017), Benzell et al. (2019), Korinek and Stiglitz (2019), Trammell and Korinek (2024)) and

[1] See Susskind and Susskind (2016). Even before the recent progresses in AI, there has been a drive to strip down managerial tasks, as discussed by Hamel (2011). Arguably, these trends have, in some countries, been associated with downward pressure on the returns to skills (Argan et al., 2023).

[2] Only a few papers analyze political decisions in oligarchic systems, for example Oechslin (2009).

the references therein). While many neo-classical approaches to AI may predict adverse effects on income distribution and even growth, in particular through savings, the novelty in this paper is the role of the demand channel, which may make AI self-destructive.

While it is unclear how AI can be stopped, the idea that many segments of society are in favor of curbing it, including academics, capitalists and powerful oligarchs who are supposed to gain for it, is not far fetched. See, for example, *Le Monde* (2023)

2 A framework

As in Saint-Paul (2023), preferences are non homothetic and follow a hierarchy of needs specification. Goods are indexed by j and ordered from $j = 0$ to $j = +\infty$. One consumes one unit of each good, starting from the lower ranked goods, until one cannot afford any of the higher ranking goods..

2.1 Preferences and labor supply

Consumers are indexed by their ability (not to be confused with skill) $i \in [0, 1]$; the density of consumers of type i is denoted by $f(i)$. The corresponding c.d.f. is denoted by $F(i)$.The utility function of a consumer with ability i is

$$U(n, s, i) \equiv n - c(i, s),$$

where n is the number of goods being consumed, i.e. the consumer consumes one unit of each good in the interval $[0, n]$, $s \in S$ is the skill level acquired by the consumer, where S is some subset of R which defines the various skill levels, and c is the utility cost of acquiring skill s. I make the following assumptions

ASSUMPTION A1 – $\forall i, \forall s < s'$, $c(i, s) < c(i, s')$

ASSUPTION A2 – $\forall s, \forall i < i'$, $c(i, s) > c(i', s)$

ASSUMPTION A3 – $\forall\ i < i'$, $s < s'$, $c(i, s') - c(i, s) > c(i', s') - c(i', s)$

That is, more able people have lower average and marginal costs of acquiring skills.

In equilibrium, the price of skills is denoted by ω. Agents are endowed with l units of raw labor, whose wage is normalized to 1. In addition, agents get a lump-sum transfer z from the government. An agent with transfer z and skills s has an income $y = z + l + \omega s$. Let $p(j)$ the price of good j and $P(n)$ the price of consuming the range of goods between 0 and n, that is

$$P(n) = \int_0^n p(j)dj.$$

An agent with income y consumes $n(y)$ goods, where $n(y)$ is defined by

$$n(y) = P^{-1}(y).$$

An agent of type i and transfer z supplies a level of skills given by

$$s(\omega, z, i) = \arg\max_s n(z + l + \omega s) - c(i, s).$$

This allows us to derive the aggregate supply curve for skilled labor

$$S(\omega, z) = \int_0^1 s(\omega, z, i)di.$$

2.2 Technology

Each good can be produced with an old, constant returns technology, which uses c_O units of raw labor to produce one unit of the good. Aternatively, it can be produced with a new technology, which uses $c_N < c_O$ units of raw labor and an overhead of m units of skilled labor. The modern technology for good j is own by an oligarch, who becomes a monopolist if it is profitable to operate the modern technology. If the modern technology is not used, competitive producers using the old technology drive the price to c_O. If the modern technology is used, limit pricing ensures that the price is also equal to c_O. Consequently, $p(j) = c_O$, $P(n) = c_O n$, and skilled labor supply is independent of transfers and given by

$$s(\omega, i) = \arg\max_s \omega s / c_O - c(i, s). \quad (1)$$

Therefore, $S(\omega, z) = \int_0^1 s(\omega, i) f(i) di = S(\omega)$.

Below we will consider the role of AI. While it can be viewed as yet another technology for producing a good, it is treated as an option by the oligarch to replace overhead skilled workers with software, essentially reducing m down to zero. This can only be done within the modern technology, by the oligarch who owns that technology. That is, it is not possible for an entrant to leapfrog the oligarch by using a new, freely available technology that would have the same c_N as the new technology and a zero overhead. AI is controlled by the oligarch and is an alternative way of operating the technology that they own. Consequently, they will appropriate the benefits from AI in a world where it is deregulated. If, under some configurations, they benefit from curbing AI, it cannot be because AI threatens their rents by allowing competitors to use an advanced technology. This is consistent with the focus of this paper: we want to know whether capitalists may want to curb AI or redistribute for the purpose of maintaining a large enough middle class, even though, ignoring that mechanism, those measures would harm them.

2.3 Equilibrium

As in Saint-Paul (2023), the oligarchs are collectively infinitesimal, which captures the fact that they are very few relative to the population and also greatly simplifies the analysis. While they consume a positive mass of goods, they consume an infinite range of goods and account for a negligible share of the total demand for any individual good. Thus, we can ignore the consumption of oligarchs when determining which goods are going to be mass produced.

A consumer consumes good j if and only if $z + l + \omega s(\omega, i) \geq c_O j$. Let $\bar{s}(\omega, .)$ be the lower bound of the inverse correspondence of s w.r.t. i, that is, $\bar{s}(\omega, x) = \inf\{y, s(\omega, y) = x\}$.Then the critical ability level for affording good j

is

$$\begin{aligned} i_C(j,\omega,z) &= 0 \text{ if } j \leq \frac{z+l}{c_O} \\ &= \bar{s}(\omega, \frac{c_O j - z - l}{\omega}) \text{ if } \frac{z+l}{c_O} < j \leq \frac{z+l+\omega s(\omega,1)}{c_O} \\ &= 1 \text{ if } j > \frac{z+l+\omega s(\omega,1)}{c_O}. \end{aligned}$$

The market size for good j is then

$$x(j,\omega,z) = 1 - F(i_C(j,\omega,z)).$$

Clearly, x is nonincreasing in j, due to the hierarchy of needs assumption.

It is profitable to use the modern technology for good j provided net profits are positive, i.e.

$$\pi(j,\omega,z) = x(j,\omega,z)(c_O - c_N) - \omega m \geq 0.$$

Since the LHS is nonincreasing in j, this defines a critical good $j^*(\omega,z)$, such that all goods such that $j < j^*$ are mass-produced, i.e. use the modern technology, while all goods such that $j > j^*$ use the old technology. We have that

$$j^*(\omega,z) = \inf\{j, \pi(j,\omega,z) < 0\}.^3$$

which in turn determines ω through the equiibrum in the market for skills:

$$mj^*(\omega,z) = S(\omega). \tag{2}$$

Profits are taxed at constant rate τ so as to finance the transfer. Therefore, the government budget constraint reads as:

$$\tau \int_0^{j^*(\omega)} \pi(\omega,j)dj = z. \tag{3}$$

[3] If there are discontinuities in the distribution of income, it may be that $\pi(\omega, j^*(\omega)) \neq 0$. In any case, whether or not good j^* is industrialized has no effect of the equilibrium allocation, since that good is of measure zero.

2.4 Political decisions

I assume the power structure lies in the hands of the oligarchs. The motivation is twofold. First, quite arguably, this is a reasonable representation of true power in modern societies. Second, this assumption implies that there is no pure redistributive incentive to tax profits, since those taxes are paid by the oligarchs. Obviously, if the tax were determined by some decisive worker, he would vote for a positive level since it is a direct transfer from oligarchs to workers, irrespective of its general equilibrium effects. Similarly, there is no direct benefit from outlawing AI, since a given oligarch can increase his profits by using this superior technology. Again, a decisive worker with a strictly positive skill level has a vested interest in blocking AI, since its adoption would reduce the skilled wage ω to zero. Here, any redistribution and regulation can only be due to its general equilibrium effects on net profits through the structure of demand, which makes it paradoxically in the interest of some oligarchs.

Under AI, oligarchs decide on the level of redistribution, i.e. on the value of τ. By assumption, the tax on profits τ cannot exceed a maximum level $\bar{\tau}$, which captures the common idea of "tax capacity". Furthermore, under a status quo where AI is not implemented yet, oligarchs also decide on whether or not it should be implemented.[4]

I compare two paradigms. I first assume policy is set by a "decisive" oligarch who produces good j_d.[5]. The equilibrium policy is then just the one that maximizes his profits. I then consider the case where policies are set by lobbying by competing oligarchs. I borrow from the literature on menu auctions, mentioned

[4] For simplicity, I assume that one cannot supplement regulation that blocks AI with redistribution. This clearly biases the results against post-fordism, but numerical explorations suggest that the role of redistribution in sustaining a middle class beyond artificially maintaining a demand for skills through regulation is very small.

[5] Despite the preceding paragraph, this makes it possible to accomodate some power of the workers in collective decisions, by playing on the value of j_d. Since, as will be clear below, the workers' interests are aligned with those of the oligarchs producing the more highly ranked goods, a higher value of j_d can be interpreted as a greater influence of the workers. Nevertheless, the reader should keep in mind that the paper deals with the potential interest of business to impose costs on itself, in the fashion of Henry Ford paying higher wages.

in the Introduction. I then show that, as in this literature, the equilibrium policy maximizes the aggregate profits of the incumbent oligarchs.

3 AI and Universal Basic Income

In this section, I consider an economy such that AI is in use, meaning that overhead costs m are essentially zero, because these tasks are now done by software instead of skilled workers. For technical reasons I will assume that m is positive but infinitesimal, in such a way that it is not profitable to run the advanced technology for a good which is only consumed by an infinitesimal number of oligarchs.

Clearly, the demand for skilled labor in this equilibrium is negligible, and therefore $\omega = 0$. The transfer z paid to workers, if positive, then qualifies as "Universal Basic Income", UBI, since it is paid to all workers, who end up identical, since differences in ability only matter for skill acquisitions, and skills are no longer valued by the market. All workers have the same income, equal to $l + z$, the return to raw labor plus the UBI. Since m is close to zero, it is profitable to industrialize any good with a positive market share. Hence, all the goods consumed by the workers, which have a full market share since workers all earn the same, are industrialized.[6] That is, the number of goods using the advanced technology is

$$j^* = \frac{l + z}{c_O} \tag{4}$$

The profit of a firm such that $j \leq j^*$ is, after taxes

$$\tilde{\pi}_j = (c_O - c_N)(1 - \tau).$$

From (3), the budget constraint of the government is

$$\tau(c_O - c_N)j^* = z.$$

[6] As shown in Saint-Paul (2023), this property characterized an efficient allocation from a utilitarian perspective.

Substituting (4) and rearranging, we can solve for z and then, by using (4) again, for j^* :

$$z = \frac{\tau(c_O - c_N)}{c_O(1-\tau) + \tau c_N} l, \quad (5)$$

$$j^* = \frac{l}{c_O(1-\tau) + \tau c_N}. \quad (6)$$

Note the existence of a "multiplier"

$$\frac{dz}{d\tau} = \frac{\partial z}{\partial \tau} + \frac{\partial z}{\partial j^*}\frac{dj^*}{d\tau} = (c_O - c_N)j^* + \tau(c_O - c_N)^2 \frac{l}{(c_O(1-\tau) + \tau c_N)^2}.$$

Upon impact, an increase in redistribution raises the people's purchasing power. They spend their additional income on new goods, which makes it profitable for the corresponding oligarchs to operate. In turn, as they appropriate the productivity gains from the modern technology due to limit pricing, total profits in the economy go up, which further raise the level of transfer z, and so forth.

An oligarch faces a trade-off: a greater tax τ reduces his net profits, but raises the market share for industrialized goods, through a higher UBI. Clearly, for oligarch j the preferred tax rate is the one which is just high enough for the working class to afford his good, i.e. such that $j^* = j$. This defines that oligarch's preferred tax rate:

$$\tau_j = \min(\max(\frac{c_O}{c_O - c_N} - \frac{l}{j(c_O - c_N)}, 0), \bar{\tau}).$$

Clearly, in the interior zone, this tax rate is increasing in j : The more sophisticated the good produced by the oligarch, the greater the income level of the people must be for them to purchase his product. On the other hand, one has $\tau_j = 0$ for $j < l/c_O$. Even if people are quite poor, deriving income solely from their raw labor endowment, they will all buy necessities, whose market size is maximal even absent redistribution. Furthermore, absent AI necessities producers would sell the same amount at the same limit price but would have to incur the overhead cost. Thus, any oligarch such that $j < l/c_O$ (i) would choose a zero tax rate under AI and (ii) would prefer to allow AI rather than regulate it, at least provided it remains decisive and would pick the tax rate under AI. Indeed, it cannot do better than having no overhead costs, pay no taxes, and sell its good to the entire population.

On the other hand, if

$$j > \frac{l}{\bar{\tau}c_N + c_O(1-\bar{\tau})} = j_A^+(\bar{\tau}),$$

at the maximum possible tax rate, people will not be rich enough to purchase good j. In this case, the oligarch cannot have any profits in the AI world. While, by continuity, we may assume that such people would pick $\tau = \bar{\tau}$, in fact they are indifferent across all tax rates.

From there one can compute the decisive oligarch's maximum profit in the AI world, assuming $j_d \leq j_A^+(\bar{\tau})$:

$$\pi_A(j_d) = \min(\frac{l}{j_d} - c_N, c_O - c_N).$$

I now consider the equilibrium allocation in the no AI status quo and the incentives for the decisive oligarch to implement AI. I consider two alternative assumptions on skills. First, an economy with only two skill levels, which allows to prove analytical results. Then, an economy with a continuum of skills, where analytical results are incomplete. Finally, for this latter case, I analyze the political outcomes under menu auctions and compare them with the decisive oligarch outcomes.

4 A two-skill economy

4.1 Settings

In this section I consider an economy with two skill levels, 0 and b. The cost of acquiring skills for agent i is

$$c(i, b) = \gamma i^{-\frac{1}{\sigma}}.$$

Becoming skilled entails an additional income equal to $b\omega$, which allows to consume $b\omega/n_O$ additional goods. Hence, agent i becomes skilled iff

$$b\omega/n_O \geq \gamma i^{-\frac{1}{\sigma}},$$

or equivalently

$$i \geq \left(\frac{\gamma c_O}{b\omega}\right)^{\sigma} = h\omega^{-\sigma}.$$

Agents types are uniformly distributed over $[0,1]$, i.ė.$f(i) \equiv 1$. Therefore, the supply of skills is

$$S(\omega) = b(1 - h\omega^{-\sigma}). \tag{7}$$

There are two income classes in equilibrium: a mass of unskilled equal to $h\omega^{-\sigma}$ who supply l units of raw labor, earn l, and consume one unit of each of the first l/c_O goods. A mass of skilled equal to $1 - h\omega^{-\sigma}$ who supply l units of raw labor and b units of skilled labor, earn $l + b\omega$ and consume one unit of each of the first $(l + b\omega)/c_O$ goods. All goods beyond $j = (l + b\omega)/c_O$ are only consumed by a handful of oligarchs and cannot be industrialized.

There are different types of equilibria, depending on where the most highly ranked industrial good j^* lies:

- Type 1 equilibrium: $j^* < l/c_O$
- Type 2 equilibrium: $j^* = l/c_O$
- Type 3 equilibrium: $l/c_O < j^* < (l + b\omega)/c_O$.

In those three types of equilibria, all firms such that $j > l/c_O$ have zero profits. In case 3, this is because all firms such that $j \in (l/c_O, (l + b\omega)/c_O]$ have the same market size, therefore for j^* to be interior to that interval they must be indifferent between using and not using the new technology. Since the old technology sectors within that interval are such that profits are zero for the owner of the new technology, otherwise he would operate it, it must be that profits are also zero for the mass-produced goods such that $j > l/c_O$.

Since all firms such that $j \leq l/c_O$ prefer AI, the only possibility for a post-fordist outcome is if equilibrium is of type 4, i.e.

$$j^* = (l + b\omega)/c_O. \tag{8}$$

I shall therefore limit the analysis to the case where such an equilibrium exists. It is then characterized by two conditions. First, the skilled wage must clear the market for skills, i.e. from (2), (7), and (8):

$$m\frac{l + b\omega}{c_O} = b(1 - h\omega^{-\sigma}) \tag{9}$$

Second, the equilibrium value of ω must be such that the critical oligarch's profits are non negative:

$$0 \leq \pi(\omega, j^*) = (c_O - c_N)(1 - h\omega^{-\sigma}) - m\omega.$$

Using (9) and rearranging, this is equivalent to

$$\frac{b\omega}{c_O - c_N} \leq \frac{l}{c_N}. \tag{10}$$

The following proposition shows that equilibria of type 4 exists for some range of parameter values:

Proposition 1 – Suppose the set of parameters satisfies the following condition:

$$h < \left(1 - \frac{ml}{bc_N}\right)\left(\frac{l}{b}\frac{c_O - c_N}{c_N}\right)^{\sigma}. \tag{11}$$

Then there exists an equilibrium of type 4.

4.2 Post-Fordism

The decisive oligarch will support post-fordism (PF) if he is better-off relative to the introduction of AI. The following proposition can then be established:

Proposition 2 – Assume a type 4 equilibrium exists such that $\omega = \omega^*$. Let

$$\tilde{\tau} = \frac{b\omega^*}{l + b\omega^*}\frac{c_O}{c_O - c_N}.$$

Then:

(i) $0 < \tilde{\tau} < 1$

(ii) If $\bar{\tau} \geq \tilde{\tau}$*, any oligarch such that* $j_d \leq j^*$ *is strictly better-off under AI*

(iii) If $\bar{\tau} < \tilde{\tau}$*, then any* $j_d \in (j_A^+(\bar{\tau}), j^*]$ *is strictly better-off under PF, having strictly positive profits, instead of zero profits under AI.*

Proposition 2 implies that post-fordism dominates redistribution, only if state capacity is not sufficient fo the decisive oligarch to redistribute enough to get a positive market size for his product under AI. Under full state capacity, UBI+AI always dominates PF. As we shall see below, this result is not totally general. It is specific to the two skill structure.

The interpretation is as follows. The market size for any good $j \in (\frac{l}{c_O}, j^*]$ coincides with the number of skilled workers in the economy. In turn, that is equal to the total overhead costs, mj^*, divided by the individual supply of skills, b. At the same time, market sze, i.e. this ratio, must exceed the ratio between a firm's fixed cost, ωm, and its unit markup, $c_O - c_N$. Otherwise, profits would be negative. Consequently, the nonnegative profit condition can be reexpressed as

$$\frac{mj^*}{b} > \frac{\omega m}{c_O - c_N} \Longleftrightarrow \frac{b\omega}{j^*} < c_O - c_N.$$

The left-hand side of the second inequality is the average cost to the oligarchs of a skilled worker, per oligarch. Since one additional skilled worker raises the consumption of any good $j \in (\frac{l}{c_O}, j^*]$ by one unit, the right-hand side, which coincides with the profit margin on one additional unit of the good, is the benefit to those firms of having an additional skilled worker. At the margin of the PF equilibrium, therefore, the decisive oligarch is better-off if the size of the middle-class is artificially raised by δ people, by transferring $z = b\omega$ to each of these people–Note that the LHS of the above equation reflects the assumption that this transfer is paid by all oligarchs, including those with a full market size. Such a transfer leaves j^* unchanged while raising the market size for all goods such that $l/c_O < j \leq j^*$. As a result the preceding inequality is unaffected. Hence, it is profitable for these oligarch to raise δ up to the point where all workers have the same income as the skilled. But this situation mimics the UBI+AI situation with $z = b\omega$. (The only difference is that in the latter case, the skilled do not have to incur the disutility cost of acquiring skills to earn $b\omega$). This explains why the redistributive society dominates the post-fordist society.

5 A continuum of skills

I now assume that skills are continuous and that the disutility of acquiring skill s for agent i is

$$c(i,s) = \gamma i^{-\sigma/\lambda}(s-b)^{1+1/\lambda}.$$

Since the AI world does not use skills, the equilibrium under AI is the same as in Section 3. We now have to characterize the post-fordist equilibrium. Clearly, from the preceding cost function and (1), we get that

$$s(\omega, i) = b + h\omega^{\lambda} i^{\sigma},$$

where $h = \left(\frac{\gamma c_O}{\varepsilon}\right)^{-\lambda}$. The distribution of ability i remains uniform over $[0,1]$. The supply of skills is then given by

$$S(\omega) = b + \frac{h\omega^{\lambda}}{1+\sigma}.$$

The range of goods consumed by consumer i is given by

$$n(l + b\omega + h\omega^{\lambda+1} i^{\sigma}) = \frac{l + b\omega + h\omega^{\lambda+1} i^{\sigma}}{c_O}.$$

The market size for good j is equal to

$$y_j = 1 - \left[\max\left(c_O j - l - b\omega, 0\right) \frac{\omega^{-\lambda-1}}{h}\right]^{\frac{1}{\sigma}}.$$

From there, we can compute the profits of any single firm

$$
\begin{aligned}
\pi_j &= y_j(c_O - c_N) - \omega m \\
&= (c_O - c_N)(1 - \left[\left(\frac{c_O j - l - b\omega}{h}\right)\omega^{-\lambda-1}\right]^{\frac{1}{\sigma}}) - \omega m, \ \frac{l + b\omega}{c_O} = j_C \leq j \leq j^* \\
&= (c_O - c_N) - \omega m, \ j \ \leq j_C. \qquad (12)
\end{aligned}
$$

Equilibrium is determined by the following conditions:

1. Equilibrium in the market for skilled labor. This reads as

$$mj^* = S(\omega) = h\frac{\omega^\lambda}{1+\sigma} + b. \qquad (13)$$

2. The zero profit condition for the critical good j^*. It is equivalent to

$$\frac{\omega m}{c_O - c_N} = 1 - \left[\frac{c_O j^* - l - b\omega}{h}\omega^{-\lambda-1}\right]^{\frac{1}{\sigma}} \qquad (14)$$

The next two propositions show that, under full fiscal capacity, oligarchs at both ends of the ranking of mass produced goods will support a transition to AI. Those with full market share are able to set a tax rate that maintains their consumer base under AI and is less costly to them than the wage cost of skilled workers absent AI. Those near the critical mass produced good j^* are able to set a tax rate that maintains their consumer base, so that their profits are greater than their near-zero profits in the PF world.

Proposition 3 – Assume $\bar{\tau} = 1$*. In equilibrium, any oligarch with a full market share, i.e. such that* $j \leq j_C$*, if decisive in the AI world, is better off under AI than under PF.*

Proof – See Appendix.

Proposition 4 – In equilibrium, the following inequality holds

$$j^* < j_A^+(1) = l/c_N.$$

That is, if $\bar{\tau} = 1$, then in equilibrium any oligarch with positive profits will also have positive profits under AI, if decisive.

Proof– See Appendix.

Corollary – If $\bar{\tau} = 1$, there exists a range of goods $[j_0, j^*]$ such that all oligarchs in this range prefer AI, if decisive.

Proof – Immediate from the continuity of the above defined profit function and the fact that $\pi_{j^*} = 0$.

Note that the results provided by Propositions 3 and 4 are incomplete. It may be that for some values of $j \in (j_C, j_0)$, PF is preferable. However, an attempt to construct equilibria with this property, by numerically solving for the equilibrium for a large number of distinct parameter sets, proved totally unsuccessful.

The preceding discussion suggests that a decisive oligarch will prefer to implement AI and supplement it with redistribution rather than opt for the post-fordist solution and artificially maintain the middle classes in cognitive occupations that could be easily displaced by AI. Intuitively, the wage bill transferred to the skilled workers under PF is higher that the maximum tax receipts one would get under AI. Two important things should be kept in mind, though. First, the former solution may only viable with high tax rates that may exceed state capacity.[7] Second, if $j_d < j^*$, the range of industrialized goods under AI, which coincides with the rank of the decisive oligarch j_d, will typically, despite UBI, be lower than under PF, and may even be much lower – however, the oppositive may also hold since from Proposition 4 one may have $j^* < j_d \leq j_A^+(1)$.

[7] PF may also be preferred if it has better commitment properties than UBI. In some sense, a post-fordist arrangement which bans the advanced technology is a commitment device to redistribute enough money to the middle class by hiring them to perform tasks that are necessary for production. One interpretation is that one may free ride on paying profit taxes, while the skilled workers must be paid their market wage for production to take place under PF (importantly, though, it must be that free-riding on the AI ban under PF is harder than free riding on the profit tax under AI).

6 Menu auctions

I now analyze a different political system based on menu auctions (Bernheim and Winston (1986), Grossman and Helpman (1994)).

Each oligarch is a lobbyist who offers contingent contributions to the policymaker. The payment takes place contigent on the policy maker taking the associated action.

Below I try to construct an equilibrium where the status quo is PF and it is maintained by the lobbying activities of oligarchs.

I assume, quite naturally, that all (i) an oligarch j is organized if and only if $\pi_j > 0$.[8] Furthermore, a contribution cannot be negative.

6.1 Setup

Each industrial firm j offers a menu to the policymaker. The policy makers gets x_j if the status quo is maintained, i.e. AI is blocked, and y_j if AI is authorized. If AI is blocked, the equilibrium is the one analyzed in Section 5 above. If not, some tax rate τ prevails and therefore equilibrium is determined as in Section 3. The value of j^* is determined by (6) and the corresponding profits for $j \leq j^*$ are

$$\pi_{Aj} = (1 - \tau)(c_O - c_N).$$

The policymaker is purely self-interested and picks the policy which maximizes his private rents. I will denote the allocation under PF by $\mathcal{P}$ and the allocation under AI by $\mathcal{Q}(\tau)$, where the depency on τ will be omitted whenever convenient. The equilibrium value of any variable in one of those two allocations will be denoted with a dot, that is, for example, the profits of firm j under AI will be denoted by $\mathcal{Q}.\pi_j$.

[8] Consequently, there is no presumption that the outcome is optimal, as industries that are too small for the modern technology to be in use cannot influence policy outcomes.

Intuitively, however, this assumption would make a difference only in the case where the tax rate under AI would be large enough so as to broaden the range of mass-produced goods compared to PF. Otherwise, the non operative oligarchs under PF would also have zero profits under AI, and would not contribute to either outcome. However, as shown below, the tax rate under AI would be zero if it were the outcome of menu auctions.

Equilibrium definition — The following extends the concepts discussed in Bernheim and Whinston and Grossman and Helpman to the case of a continuum of lobbyists:

Definition 1 – A menu auction politico-economic equilibrium (MAPEE) is a x-uple $(\mathcal{P}, \mathcal{Q}, x, y, D)$ *such that*

(i) $\mathcal{P}$ *is an equilibrium allocation in the sense of Section 5, and* $\mathcal{Q}$ *and equilibrium allocation in the sense of Section 3;* x *and* y *are piece-wise continuous mappings from* $[0, \mathcal{P}.j^*]$ *to* $\mathbb{R}^+$, $j \longrightarrow x_j$, $j \longrightarrow y_j$; $D \in \{\mathcal{P}, \mathcal{Q}\}$.

(ii) If $D = \mathcal{P}$ *(resp.*$\mathcal{Q}$ *) then*

$$\int_0^{\mathcal{P}.j^*} y_j dj \leq \int_0^{\mathcal{P}.j^*} x_j dj (\text{resp. } \int_0^{\mathcal{P}.j^*} y_j dj \geq \int_0^{\mathcal{P}.j^*} x_j dj \ ).$$

(iii) $\forall j$,

$$(x_j, y_j) \in \arg\max_{(\tilde{x}, \tilde{y})} I_j(\tilde{x}, \tilde{y}).(\mathcal{P}.\pi_j - \tilde{x}) + (1 - I_j(\tilde{x}, \tilde{y}))(\mathcal{Q}.\pi_j - \tilde{y}), \tag{15}$$

where $I_j(\tilde{x}, \tilde{y})$ *is an indicator function defined as follows:*

$$\begin{array}{lll} (1) \text{ if } \int_0^{\mathcal{P}.j^*} y_j dj & < & \int_0^{\mathcal{P}.j^*} x_j dj, \text{ then } I_j = 1 \\ (2) \text{ if } \int_0^{\mathcal{P}.j^*} y_j dj & > & \int_0^{\mathcal{P}.j^*} x_j dj, \text{ then } I_j = 0 \\ (3) \text{ if } \int_0^{\mathcal{P}.j^*} y_j dj & = & \int_0^{\mathcal{P}.j^*} x_j dj \text{ , then } I_j(\tilde{x}, \tilde{y}) = I(\tilde{y} - y_j \leq \tilde{x} - x_j) \\ \quad (\text{resp. } I_j(\tilde{y} - y_j & < & \tilde{x} - x_j)) \text{ if } D = \mathcal{P} \text{ (resp. } D = \mathcal{Q}). \end{array}$$

Remarks – We assume continuity in the *equilibrium* mappings x and y so as to avoid anomalous situations where, for example, they could take a positive value over a set of measure zero, and be equal to zero elsewhere. However, when an individual agent j deviates from this equilibrium, the alternative values for x_j and y_j, denoted above by tildas, deliver an alternative schedule which is not continuous, and differs from the equilibrium one on a set of measure zero, i.e. the singleton $\{j\}$. The indicator function $I()$ defines how the deviation by a single agent affects equilibrium outcomes, which can only happen at the margin of a situation where the decision maker is indifferent between the two alternatives. In this case, even an infinitesimal increment of the contribution by any agent for a different outcome from the equilibrium one will force a change in the policymaker's choice. This is essentially what statement (iii) is saying.

The next two propositions replicate the properties established in the above mentioned literature. Proposition 5 characterizes some essential properties of the reward structure in an equilibrium that supports a post-fordist status quo. In particular, claim (i) implies that the total contributions for each policy must be equal, otherwise contributors to the winning PF outcome could reduce their offers. Claim (iv) implies that those oligarchs who lobby in favor of AI and UBI must offer all their rents from switching to AI to the policymaker, otherwise it would be rational for them to force the AI outcome by offering a marginally higher reward. This property forces the oligarchs to "reveal" their gains from switching to AI, by offering to transfer them to the policymaker. Consequently, the equilibrium policy is the one that maximizes aggregate profits, as shown formally in Proposition 6.

Proposition 5 – Assume the following

$$\exists j \leqslant \mathcal{P}.j^*,\ \mathcal{Q}.\pi_j > \mathcal{P}.\pi_j$$

Assume there exists a MAPEE such that $D = \mathcal{P}$*, then*

(i) $\int_0^{\mathcal{P}.j^*} y_j dj = \int_0^{\mathcal{P}.j^*} x_j dj > 0$

(ii) $\forall j \leqslant \mathcal{P}.j^*,\ x_j y_j = 0$

(iii) $y_j = 0 \Longrightarrow \mathcal{P}.\pi_j - x_j \geq \mathcal{Q}.\pi_j$

(iv) $y_j > 0 \Longrightarrow y_j \geq \mathcal{Q}.\pi_j - \mathcal{P}.\pi_j$

Proof – Since $D = \mathcal{P}$, we must have that $\int_0^{\mathcal{P}.j^*} y_j dj \leq \int_0^{\mathcal{P}.j^*} x_j dj$. Assume $\int_0^{\mathcal{P}.j^*} x_j dj = 0$. Then $\int_0^{\mathcal{P}.j^*} y_j dj = 0$. Since x and y are assumed continuous, it follows that one must have $x_j = y_j = 0$, $\forall j$. Let j such that $\mathcal{Q}.\pi_j > \mathcal{P}.\pi_j$. Then there exists $\tilde{y}_j > 0$ such that $\mathcal{Q}.\pi_j - \tilde{y}_j > \mathcal{P}.\pi_j - x_j = \mathcal{P}.\pi_j$. By (iii) in the above definition, it follows that $I_j(0, \tilde{y}_j) = 1$ and therefore that $I_j(0,0).\mathcal{P}.\pi_j + (1 - I_j(0,0))\mathcal{Q}.\pi_j = \mathcal{P}.\pi_j < \mathcal{Q}.\pi_j - \tilde{y}_j = I_j(0,\tilde{y}_j).\mathcal{P}.\pi_j + (1 - I_j(0,\tilde{y}_j))(\mathcal{Q}.\pi_j - \tilde{y}_j)$, a contradiction. This proves that $\int_0^{\mathcal{P}.j^*} x_j dj > 0$.

Next, assume $\int_0^{\mathcal{P}.j^*} y_j dj < \int_0^{\mathcal{P}.j^*} x_j dj$. Let j such that $x_j > 0$. Since $I_j(x,y) = 1$, $\forall x, y$, it follows that the RHS of (15) is higher for any alternative $\tilde{x}_j < x_j$, which is again a contradiction. This proves (i).

To prove (ii), just note that the I_j function only depends on $x - y$. For any j such that $x_j y_j > 0$. For $\varepsilon > 0$ small enough, we have that $\tilde{x}_j = x_j - \varepsilon > 0$, $\tilde{y}_j = y_j - \varepsilon > 0$, and $I_j(\tilde{x}_j, \tilde{y}_j) = I_j(x_j, y_j)$. Clearly, then, the RHS of (15) goes up by ε if (x_j, y_j) is replaced by $(x, y) = (\tilde{x}_j, \tilde{y}_j)$, a contradiction.

Next, let j such that $y_j = 0$. Assume $\mathcal{P}.\pi_j - x_j < \mathcal{Q}.\pi_j$. Let $\tilde{y}_j > 0$ such that $\mathcal{P}.\pi_j - x_j < \mathcal{Q}.\pi_j - \tilde{y}_j$. From (i), already proved, and the equilibrium definition, it must be that $I_j(x_j, \tilde{y}_j) = 0$, while $I_j(x_j, 0) = 1$. Then we note that $I_j(x_j,0).(\mathcal{P}.\pi_j - x_j) + (1 - I_j(x_j,0))\mathcal{Q}.\pi_j = \mathcal{P}.\pi_j - x_j < \mathcal{Q}.\pi_j - \tilde{y}_j = I_j(x_j,\tilde{y}_j).(\mathcal{P}.\pi_j - x_j) + (1 - I_j(x_j,\tilde{y}_j))(\mathcal{Q}.\pi_j - \tilde{y}_j)$, a contradiction. This proves (iii).

Now let j such that $y_j > 0$. Then, by (ii), $x_j = 0$. For any $\tilde{y}_j > y_j$, we have that $I_j(0, \tilde{y}_j) = 0$. Since $I_j(0, y_j) = 1$, from (15) it must be that $\mathcal{P}.\pi_j \geq \mathcal{Q}.\pi_j - \tilde{y}_j$, $\forall \tilde{y}_j > y_j$. Thus, by continuity, $y_j \geq \mathcal{Q}.\pi_j - \mathcal{P}.\pi_j$.

QED

Proposition 6 – A MAPEE exists such that $D = \mathcal{P}$, if and only if aggregate profits of the organized oligarchs are higher under the status quo, that is

$$\int_0^{\mathcal{P}.j^*} \mathcal{Q}.\pi_j dj \leq \mathcal{P}.\Pi = \int_0^{\mathcal{P}.j^*} \mathcal{P}.\pi_j dj \tag{16}$$

Proof – First,let us prove that this is necessary. Set $D = \mathcal{P}$. From Proposition 5, (iii), we know that (since $x_j = 0$ for $y_j > 0$)

$$\int_0^{\mathcal{P}.j^*} x_j dj \le \int_{y_j=0} (\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j)\, dj$$

and, from (iv)

$$\int_0^{\mathcal{P}.j^*} y_j dj \ge \int_{y_j>0} (\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j)\, dj$$

Since the two LHS are equal, it follows that

$$\begin{aligned} \int_{y_j>0} (\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j)\, dj &\le \int_{y_j=0} (\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j)\, dj \\ &\Longrightarrow \int_0^{\mathcal{P}.j^*} \mathcal{Q}.\pi_j dj \le \int_0^{\mathcal{P}.j^*} \mathcal{P}.\pi_j dj. \end{aligned}$$

Next, we prove that it is sufficient. Assume that (16) holds. We construct the equilibrium as follows. For any j, we set $y_j = \max(\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j, 0)$. Let $S = \{j, y_j = 0\}$. Then

$$\int_{[0,\mathcal{P}.j^*]-S} y_j dj = \int_{[0,\mathcal{P}.j^*]-S} (\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j) dj \le \int_S (\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j)\, dj$$

Let

$$\theta = \frac{\int_{[0,\mathcal{P}.j^*]-S} (\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j) dj}{\int_S (\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j)\, dj}.$$

For $j \in S$, set

$$\begin{aligned} x_j &= \theta\, (\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j) \text{ and} \\ y_j &= 0. \end{aligned}$$

For $j \in [0, \mathcal{P}.j^*] - S$, set $x_j = 0$.

Since $\mathcal{P}$ and $\mathcal{Q}$ are, by assumption, equilibrium allocations in their respective regimes, since $\mathcal{Q}.\pi$ is piecewise continuous and $\mathcal{P}.\pi$ is continuous, the constructed $x()$ and $y()$ are also piecewise continuous. Thus conditions (i) in Definition 1 hold. Furthermore, by construction

$$\begin{aligned}\int_0^{\mathcal{P}.j^*} x_j dj &= \int_S x_j dj = \theta \int_S \left(\mathcal{P}.\pi_j - \mathcal{Q}.\pi_j\right) dj \\ &= \int_{[0,\mathcal{P}.j^*]-S} (\mathcal{Q}.\pi_j - \mathcal{P}.\pi_j) dj = \int_{[0,\mathcal{P}.j^*]-S} y_j dj \\ &= \int_0^{\mathcal{P}.j^*} y_j dj,\end{aligned}$$

which proves (ii) in Definition 1.

Now let $j \in S$. We have that $\mathcal{P}.\pi_j - x_j = (1-\theta)\mathcal{P}.\pi_j + \theta \mathcal{Q}.\pi_j$. Since $\mathcal{P}.\pi_j > \mathcal{Q}.\pi_j$, this is stricly greater than $\mathcal{Q}.\pi_j$. Consider an alternative offer $(\tilde{x}, \tilde{y})$. Assume $I_j(\tilde{x}, \tilde{y}) = 1 = I_j(x_j, 0)$. Then it must be that $\tilde{x} - \tilde{y} \geq x_j - y_j = x_j$. Since $\tilde{y} \geq 0$, it follows that $\tilde{x} \geq x_j$. Since the RHS of (15) is then equal to $\mathcal{P}.\pi_j - \tilde{x}$, it cannot exceed $\mathcal{P}.\pi_j - x_j$. Now assume $I_j(\tilde{x}, \tilde{y}) = 0$. The RHS of (15) is then equal to $\mathcal{Q}.\pi_j - \tilde{y} < \mathcal{Q}.\pi_j < \mathcal{P}.\pi_j - x_j$. Thus the equilibrium menu auctions are optimal for those agents.

Now let $j \in [0, \mathcal{P}.j^*] - S$. These agents are such that $x_j = 0$. Their net payoff in (15) is therefore $\mathcal{P}.\pi_j$. For any alternative $(\tilde{x}, \tilde{y})$ such that $I_j(\tilde{x}, \tilde{y}) = 1$, the payoff is $\mathcal{P}.\pi_j - \tilde{x}_j \leq \mathcal{P}.\pi_j$. Consider $(\tilde{x}, \tilde{y})$ such that $I_j(\tilde{x}, \tilde{y}) = 0$. It must be that $\tilde{y} - \tilde{x} > y_j - x_j = y_j = \mathcal{Q}.\pi_j - \mathcal{P}.\pi_j$. Therefore, $\mathcal{Q}.\pi_j - \tilde{y} < \mathcal{P}.\pi_j - \tilde{x} \leq \mathcal{P}.\pi_j$. Thus the equilibrium menu auctions are also optimal for those agents. Consequently, (iii) holds, which completes the proof.

QED

As a consequence of Proposition 6, we have to compare aggregate profits between the PF world and the AI world. This is achieved by Proposition 7.

Proposition 7 – (i) For any $\bar{j}$, the expression

$$\Pi_A(\bar{j}, \tau) = \int_0^{\bar{j}} \mathcal{Q}.\pi_j dj$$

is a continuous, decreasing function of τ such $\Pi_A(\bar{j}, 1) = 0$

(ii) For any PF equilibrium allocation $\mathcal{P}$, the following inequality holds:

$$\Pi_A(\frac{l}{c_O}, 0) = \mathcal{Q}(0).\Pi > \mathcal{P}.\Pi$$

(iii) Consequently, there exists a unique $\hat{\tau} \in (0,1)$ such that A MAPEE exists such that $D = \mathcal{P}$, if and only if $\tau \geq \hat{\tau}$.

This proposition tells us that post-fordism will be enforced by lobbyists, only if they expect enough redistribution to take place under AI. This stands in sharp contrast to the decisive oligarch paradigm. A decisive oligarch such that $j_d > l/c_O$ will enforce PF only if state capacity sets a low enough maximum tax rate under UBI. This is because a high enough level of UBI is needed for the oligarch to be operative under AI, otherwise its profits are zero and therefore inferior to what he gets under PF. Here, however, competition among lobbyists delivers the outcome with the highest aggegate profits. Somewhat strikingly, claim (iii) in Proposition 7 implies that aggregate profits are higher under AI with no redistribution, even though the size of the industrial sector may be much lower than under PF. In other words, if τ is low, producers of goods with a low j are willing to contribute more to implement AI than producers of goods with a high j can pay for the post-fordist status quo. While an increase in redistribution benefits some oligarchs (who would enforce UBI if pivotal), it harms them as a whole. If UBI is expected to be too costly, then the post-fordist status quo will prevail.

It is always possible to set taxes so as to obtain the same aggregate profits under UBI as under PF. For this, one just has to set total UBI equal to the amount transferred to the skilled in the PF allocation, i.e. to the sum of fixed costs. By construction, from the demand side, the total number of units of the goods consumed, and therefore sold, will be the same; so will variable costs, while total taxes will be equal to total fixed costs. Consequently, it must be that aggregate profits are higher under UBI for some range of not too high tax rates.

6.2 The collapse of redistribution under lobbying

Claim (i) in Proposition 7 suggests that, to the extent that menu auctions lead to a situation that maximizes the aggregate profits of the oligarchs, they will contribute so as to make sure that $\tau = 0$ under AI. In this subsection, I validate this claim.

Let us assume that the equilibrium value of τ is a menu auction equilibrium. Since there are now more than two options, we need to specify the equilibrium concept rigorously.

6.2.1 Equilibrium concepts.

I assume that the menu of policy choices is discrete, that is, the policy maker chooses $\tau = n/k, i = 1, ..., k$. I assume that an interval $[0, j_O]$ of oligarchs is organized, where j_O may be endogenized. Each organized oligarch offers a mapping $x_j : \{1, ..., k\} \longrightarrow \mathbb{R}^+$ such that $x_j(n)$ rewards the policymaker for implementing $\tau = n/k$.

Definition 2 – A MAPEE is a tax rate $\tau^* = n^*/k$ *and a collection of mappings* $x_j()$, *for* $j \in [0, j_O]$, *such that*

(i) $n^* \in \arg\max_n \int_0^{j_O} x_j(n)dj = M$

(ii) $\forall j, \forall \tilde{x}_j() : \{1, ..., k\} \longrightarrow \mathbb{R}^+, \forall p \in \arg\max_{n \in M} \tilde{x}_j(n) - x_j(n)$, $Q(\frac{p}{k}).\pi_j - \tilde{x}_j(p) \leq Q(\tau^*).\pi_j - x_j(n^*)$.

Property (i) tells us that the policymaker picks a value of τ that maximizes total contributions. Property (ii) tells us that an oligarch cannot be made better-off by offering a different reward schedule $\tilde{x}_j$ (which may or may not change the policymaker's choice). As above, since an oligarch is infinitesimal, it can only impose an outcome among the policymaker indifference set M. Relative to the equilibrium outcome, the policy-maker will pick the outcome that maximizes the premium offered by the deviating policymaker, $\tilde{x}_j(n) - x_j(n)$. That outcome cannot make the deviating oligarch strictly better-off than in equilibrium.

Following Grossman and Helpman (1994), I will also impose that, regardless of outcomes, an oligarch does not reward a policy that would make him worse-off than the equilibrium. This is the concept of truthfulness.

Definition 3 – A ***truthful*** *MAPEE is a MAPEE such that*

$$\forall j, n,\ x_j(n) \geq 0,\ \text{and } (\mathcal{Q}(\tau^*).\pi_j - x_j(n^*) - \mathcal{Q}(\frac{n}{k}).\pi_j + x_j(n)) \geq 0,\ \text{WALOE.}$$

Corollary – If $x_j(n)x_j(n') > 0$, *then* $Q(\frac{n}{k}).\pi_j - x_j(n) = Q(\frac{n'}{k}).\pi_j - x_j(n')$

Definition 4 – A MAPEE is ***minimal*** *if*

$$n^* = \min M$$

Lemma – Any MAPEE is minimal

Proof – Assume $\exists n, n \in M, n < n^*$. We can apply (ii) in Definition 2 to the case where $\tilde{x}_j() = x_j()$, in which case $\max_{n' \in M} \tilde{x}_j - x_j = M$, so that we must have

$$\forall j, \mathcal{Q}(\frac{n}{k}).\pi_j - x_j(n) \leq \mathcal{Q}(\tau^*).\pi_j - x_j(n^*). \tag{17}$$

By definition of M,

$$0 = \int_0^{j_O} (x_j(n^*) - x_j(n)).$$

Integrating (17) we then get that

$$\begin{aligned} 0 \quad &\leq \quad \int_0^{j_O} \mathcal{Q}(\tau^*).\pi_j dj - \int_0^{j_O} \mathcal{Q}(\frac{n}{k}).\pi_j dj \\ &\iff \quad \Pi_A(j_O, \tau^*) \geq \Pi_A(j_O, \frac{n}{k}), \end{aligned}$$

which, since $n/k < \tau^*$, contradicts Proposition 7, (i). QED.

Proposition 8 – Any truthful MAPEE is such that $\tau^* = 0$.

Proof – Assume $\tau^* > 0$, compare with $n = \tau = 0$. Integrating the last condition in Definition 3, we get that

$$\begin{aligned} \Pi_A(j_O, \tau^*) - \int_0^{j_O} x_j(n^*)dj - \Pi_A(j_O, 0) + \int_0^{j_O} x_j(0)dj \quad &\geq \quad 0 \Longrightarrow \\ \int_0^{j_O} x_j(0)dj \quad &\geq \quad \int_0^{j_O} x_j(n^*)dj + \Pi_A(j_O, 0) - \Pi_A(j_O, \tau^*) \\ &> \quad \int_0^{j_O} x_j(n^*)dj \end{aligned}$$

which contradicts (i) in Definition 2. QED

Therefore, we have shown that if, under AI, redistribution is left to lobbying, the capitalists with full market size ("necessities" producers) will outbid those more sophisticated firms who need redistribution to survive and force an outcome with zero redistribution, no middle class, and where only necessities will be mass produced.

6.3 Existence values

While aggregate profits are larger under AI, since $\tau = 0$, the size of the mass production sector and the number of oligarchs who benefit from it is much smaller than under post-fordism. In this section, I extend the model by assuming that oligarchs derive a positive rent v from the fact that their business is operating at a nonnegative profit. Thus, for $j < j^*$, the payoff is now $\tilde{\pi}_j = \pi_j + v$ instead of π_j.

One can prove that if v is not too large, zero redistribution again achieves maximum aggregate payoffs under AI. At the same time, since more sectors are industrialized under PF, total existence values are higher relative to AI, which boosts the willingness to pay for the status quo of those oligarchs who would be wiped out under AI. This raises the possibility of Proposition 7 to be overturned, as shown in Proposition 9:

Proposition 9 – Assume $v < c_N$. Let $x = 1 - \frac{\omega m}{c_O - c_N} \in (0,1)$. Assume the PF allocation is such that the following condition holds:

$$c_O < x^{\sigma} \left((1+\sigma)c_O - \sigma x(c_O - c_N) \right) \tag{18}$$

Then:

(i) The function

$$\tilde{\Pi}_A(\bar{j}, \tau) = \int_0^{\bar{j}} \mathcal{Q}.\pi_j dj + \min(\bar{j}, j_A^+(\tau))v$$

is continuous, strictly decreasing in τ, strictly increasing in $\bar{j}$ for $\bar{j} \leq j_A^+(\tau)$, and constant in $\bar{j}$ for $\bar{j} > j_A^+(\tau)$

(ii) There exists $\hat{v} \in (0, c_N)$ such that if $v > \hat{v}$ then the following inequality holds:

$$\max \tilde{\Pi}_A = \tilde{\Pi}_A(\frac{l}{c_O}, 0) < \int_0^{\mathcal{P}.j^*} \mathcal{P}.\tilde{\pi}_j dj$$

(iii) Consequently, for any $v > \hat{v}$, for any $\tau \in (0,1)$, A unique MAPEE exists such that $D = \mathcal{P}$.

Remark – Under the assumption that $v < c_N$, based on claim (i), Proposition 8 could be extended here: one can show that the only truthful MAPEE over τ under AI is such that $\tau = 0$.

It is not difficult to show that (18) may hold for a wide range of parameter values. In the Appendix, it is shown how such equilibria may be constructed for arbitrary values of c_O, c_N, l, λ, m and σ by appropriately choosing the remaining parameters b and h.

7 Conclusion

The astounding pace of progress in artificial intelligence has resurrected worries about the end of work. Some people call for an egalitarian society based on universal basic income, while others think regulation should curb the use of AI. This paper has examined those issues from the perspective of a ruling class of capitalist oligarchs, whose rents come from their ownership of modern mass production technologies. While, in partial equilibrium, they would benefit from AI as replacement of the knowledge workers they need to operate their business, in general equilibrium massive use of AI might be self defeating because it would lead to a collapse of the middle class of skilled workers and therefore of the market base for mass produced goods. It is in the interest of oligarchs to deal with this issue, but their interests differ greatly depending on how their product in positioned in the hierarchy of needs.

The results crucially depend on two parameters. First, the nature of political competition between oligarchs. Second, the margin of manoeuver regarding redistribution.

If influence depends on the number of agents exerting influence ("one person, one vote"), AI will prevail and be supplemented with UBI, provided fiscal capacity is large enough to fund for such UBI. If fiscal capacity does not allow for enough redistribution, then the oligarchy may want to curb AI so as to maintain a high enough demand for skilled workers, so as to preserve the market base for mass produced goods.

If influence is chiefly driven by monetary contributions ("one dollar, one vote"), AI is likely to prevail and no UBI will be implemented, because producers of necessities, who do not value the existence of a large middle class, will outbid producers of more sophisticated goods in the competition to obtain one's most preferred outcome. However, if some degree of redistribution is inevitable in the AI world, for example due to popular pressure, then it will be in the interests of producers of necessities to block AI to avoid such redistributive pressure, while, on the contrary, AI would be more welcome to producers of sophisticated goods because redistribution will raise the demand for their product. However these results would be qualified if operating a mass production firm yielded a fixed rent to the owner, in addition to profits, in which case the willingness to pay by producers of sophisticated goods to block AI would go up, since they would disappear under AI.

8 Appendix

8.1 Proof of Proposition 1

Assume (11) holds. Let $\omega_{\min} = h^{1/\sigma}$. Let

$$\omega_{\max} = \frac{l(c_O - c_N)}{bc_N}.$$

Observe that from (11), we have that $\omega_{\min} < \omega_{\max}$. Let

$$\Delta(\omega) = m\frac{l + b\omega}{c_O} - b(1 - h\omega^{-\sigma}).$$

Clearly, $\Delta(\omega_{\min}) > 0$. From (11) again, $\Delta(\omega_{\max}) < 0$. By continuity, $\exists \omega^* \in (\omega_{\min}, \omega_{\max}), \Delta(\omega^*) = 0$. Clearly, (9) is satisfied at $\omega = \omega^*$. By construction, so is (10) since $\omega^* < \omega_{\max}$. QED

8.2 Proof of Proposition 2

1. That $\tilde{\tau} > 0$ is obvious. By construction (10) holds at $\omega = \omega^*$. It is immediate to check that this is equivalent to $\tilde{\tau} < 1$. This proves claim (i).

2. Observe that at $\bar{\tau} = \tilde{\tau}$, $j_A^+ = j^*$. Since j_A^+ is an increasing function of $\bar{\tau}$, $j^* \leq j_A^+$ for any $\bar{\tau} \geq \tilde{\tau}$. Therefore, for any $j_d \leq j^*$, net of taxes profits under AI are equal to $\pi_A(j_d)$. We know that oligarchs such that $j_d \leq l/c_O$ prefer AI. Consider some $j_d \in (l/c_O, j^*]$. He will favor PF provided

$$\pi(\omega^*, j_d) = (c_O - c_N)(1 - h\omega^{*-\sigma}) - m\omega^* \geq \pi_A(j_d) = \frac{l}{j_d} - c_N. \quad (19)$$

Since the RHS is decreasing in j_d, this holds for some j_d if and only if it holds for $j_d = j^* = (l + b\omega^*)/c_O$. Furthermore, from (9),

$$\begin{aligned} \pi(\omega^*, j_d) &= (c_O - c_N)m\frac{l + b\omega^*}{bc_O} - m\omega^* \\ &= \frac{m}{bc_O}\left[(c_O - c_N)l - c_N b\omega^*\right]. \end{aligned}$$

Thus, (19) can be rewritten as

$$\begin{aligned} \frac{m}{bc_O}\left[(c_O - c_N)l - c_N b\omega^*\right] &\geq \frac{lc_O}{l + b\omega^*} - c_N \iff \\ \frac{m(l + b\omega^*)}{bc_O} &\geq 1 \iff \\ 1 - h\omega^{*-\sigma} &\geq 1, \end{aligned}$$

where (9) has been in used in the last step. Since this is obviously impossible, this proves (ii).

3. If $\bar{\tau} < \tilde{\tau}$, $j_A^+ < j^*$. Thus all oligarchs such that $j_d \in (j_A^+, j^*]$ make zero profits under AI. Since their profits are strictly positive under PF, this proves point (iii) with $j_{\min} = j_A^+$.

QED

8.3 Proof of Proposition 3

Any equilibrium must satisfy

$$\omega m \leq c_O - c_N. \tag{20}$$

Eliminating j^* between (14) and (13), we see that the following must hold:

$$h = \omega^{-\lambda-1} \frac{m(l + b\omega) - c_O b}{-m\left(1 - \frac{\omega m}{c_O - c_N}\right)^{\sigma} + \frac{c_O}{\omega(1+\sigma)}}. \tag{21}$$

Recall that $h > 0$. Let $\theta = \frac{\omega m}{c_O - c_N}$. We note that the denominator has the same sign as $-(c_O - c_N)\theta(1-\theta)^{\sigma} + c_O/(1+\sigma)$. Minimizing with respect to θ, we see that this expression exceeds $-\frac{c_O - c_N}{1+\sigma}(\frac{\sigma}{1+\sigma})^{\sigma} + \frac{c_O}{1+\sigma}$, which is always positive.

Therefore, in any equilibrium, it must be that the numerator is positive too, i.e.

$$m > \frac{bc_O}{l + b\omega}. \tag{22}$$

The most highly ranked good with a full market share is given by $j_C = (l + b\omega)/c_O$. Among those, j_C would implement the highest tax rate, and therefore earn the lowest profits, if it were decisive under AI. As long as $\bar{\tau} = 1$, and $j_C \leq l/c_N$, this maximum profit is given by

$$\pi_A(j_C) = \frac{l}{j_C} - c_N.$$

This is greater than this firm's profits under PF if and only if

$$\begin{aligned} \pi_A(j_C) &> c_O - c_N - \omega m \Longleftrightarrow \\ \frac{l}{j_C} &> c_O - \omega m \Longleftrightarrow (22). \end{aligned}$$

To complete the proof, we need to rule out the case where $j_C > l/c_N$. For this to hold, it must be that $(l + b\omega)/c_O > l/c_N$, or equivalently

$$l(c_O - c_N) < c_N b\omega. \tag{23}$$

At the same time, (22) must hold, as well as (20). For these two relationships to be compatible with each other, we need that

$$\frac{bc_O}{l + b\omega} < \frac{c_O - c_N}{\omega} \Longleftrightarrow l(c_O - c_N) > c_N b\omega,$$

which clearly contradicts (23).QED

We first start to construct a situation where oligarch j_C would get positive profits under AI, that is $j_C \leq j_A^+(\bar{\tau})$, i.e.

$$\bar{\tau} \geq \frac{c_O}{c_O - c_N}\frac{b\omega}{b\omega + l}.$$

For PF to be preferable for j_C, it must be that

$$\begin{aligned} \pi(\omega, j_C) &= c_O - c_N - \omega m > \frac{l}{j_C} - c_N = \frac{lc_O}{l + b\omega} - c_N \Longleftrightarrow \\ m &< \frac{bc_O}{l + b\omega}. \end{aligned} \tag{24}$$

If this inequality holds, clearly, PF would dominate AI for j_C for any $\bar{\tau}$, since for $\bar{\tau} < \frac{c_O}{c_O - c_N}\frac{b\omega}{b\omega + l}$, oligarch j_C makes zero profits under AI. Furthermore, this would be also true for any $j_d < j_C$ such that $\pi(\omega, j_d) > \frac{l}{j_d} - c_N \Longleftrightarrow j_d > j_{crit} = \frac{l}{c_O - \omega m}$.

From there, one has to make sure that $h > 0$, which can be guaranteed by selecting an appropriate value for σ. Since the numerator is positive, we need to check that the denominator is positive too. Since $\omega m < c_O - c_N$, the denominator converges to m as $\sigma \longrightarrow \infty$. Therefore, it is always possible to pick a high enough value of σ to have $h > 0$.

Now assume that (24) is violated. Then j_C can only be worse-off under AI if it gets zero profits, i.e. if $\bar{\tau} < \frac{c_O}{c_O - c_N}\frac{b\omega}{b\omega + l}$. In such a situation, the numerator of h is negative. Therefore, its denominator must be negative too. Since it is equal to $-c_O/\omega$ for $\sigma = 0$, by continuity one can always pick a low enough value of σ to make sure that $h > 0$.

9 Proof of Proposition 4

Eliminating the constant h between (13) and (14) we get that the following must hold

$$(1+\sigma)\left(1 - \frac{\omega m}{c_O - c_N}\right)^{\sigma}\omega = \frac{c_O j^* - l - b\omega}{m j^* - b}$$

Observe that $\max_{x\in[0,1]} x^{\sigma}(1+\sigma)(1-x) = \left(\frac{\sigma}{1+\sigma}\right)^{\sigma} < 1$. Applying this to $x = 1 - \frac{\omega m}{c_O - c_N}$ we have that

$$\frac{c_O j^* - l - b\omega}{m j^* - b} < \frac{\omega}{1-x} = \frac{c_O - c_N}{m}.$$

Rearranging, this is equivalent to

$$j^* < \frac{l}{c_N} - b\left(\frac{c_O - c_N - \omega m}{m c_N}\right) \leq \frac{l}{c_N}.$$

QED

10 Proof of Proposition 7

From (6) we know that $\mathcal{Q}.j^* = \frac{l}{c_O(1-\tau)+\tau c_N}$. Next, note that:

$$\begin{aligned} \Pi_A(\bar{j},\tau) &= \frac{l(1-\tau)}{c_O(1-\tau)+\tau c_N}(c_O - c_N) \text{ if } \tau \leq \frac{c_O}{c_O - c_N} - \frac{l}{\bar{j}(c_O - c_N)} \\ &= \bar{j}(1-\tau)(c_O - c_N) \text{ if } \frac{c_O}{c_O - c_N} - \frac{l}{\bar{j}(c_O - c_N)} < \tau \leq 1. \end{aligned}$$

which satisfies the required properties in (i) trivially.

This proves (i).

We now prove (ii). For this, first compute the aggregate profits of all the oligarchs under PF. From 12 we get (dropping $\mathcal{P}$ from the notation without ambiguity):

$$\begin{aligned}
\Pi_{PF} &= \int_0^{j^*} \pi_j dj = \frac{l+b\omega}{c_O}(c_O - c_N - \omega m) \\
&\quad + \int_{\frac{l+b\omega}{c_O}}^{j^*} \left((c_O - c_N)(1 - \left[\left(\frac{c_O j - l - b\omega}{h} \right) \omega^{-\lambda-1} \right]^{\frac{1}{\sigma}}) - \omega m \right) dj \qquad (25) \\
&= j^*(c_O - c_N - \omega m) - (c_O - c_N)\omega^{-\frac{1+\lambda}{\sigma}} h^{-\frac{1}{\sigma}} \int_{\frac{l+b\omega}{c_O}}^{j^*} (c_O j - l - b\omega)^{\frac{1}{\sigma}} dj \\
&= j^*(c_O - c_N - \omega m) - (c_O - c_N)\omega^{-\frac{1+\lambda}{\sigma}} h^{-\frac{1}{\sigma}} \left[\frac{\sigma}{(1+\sigma)c_O} (c_O j - l - b\omega)^{\frac{1+\sigma}{\sigma}} \right]_{\frac{l+b\omega}{c_O}}^{j^*} \\
&= j^*(c_O - c_N - \omega m) - \frac{\sigma(c_O - c_N)\omega^{-\frac{1+\lambda}{\sigma}} h^{-\frac{1}{\sigma}}}{(1+\sigma)c_O} (c_O j^* - l - b\omega)^{\frac{1+\sigma}{\sigma}} . \qquad (26)
\end{aligned}$$

From (14) we get, first, that

$$(c_O j^* - l - b\omega)^{\frac{1+\sigma}{\sigma}} = \left(1 - \frac{\omega m}{c_O - c_N}\right)^{1+\sigma} \omega^{\frac{(1+\lambda)(1+\sigma)}{\sigma}} h^{\frac{1+\sigma}{\sigma}}$$

and, second, that

$$j^* = \frac{1}{c_O}\left(l + b\omega + \left(1 - \frac{\omega m}{c_O - c_N}\right)^{\sigma} \omega^{1+\lambda} h\right). \qquad (27)$$

Substituting into (26), we get

$$\Pi_{PF} = \frac{c_O - c_N - \omega m}{c_O}\frac{l+b\omega}{c_O} + \frac{(c_O - c_N)\omega^{1+\lambda} h}{c_O(1+\sigma)}\left(1 - \frac{\omega m}{c_O - c_N}\right)^{1+\sigma}$$

Since $j^* > l/c_O$, clearly, from the above, $\Pi_A(\frac{l}{c_O}, 0) = \Pi_A(\mathcal{Q}.j^*, 0) = \frac{l(c_O - c_N)}{c_O}$. Thus

$$\begin{aligned}
\Pi_{PF} &< \Pi_A(\mathcal{Q}.j^*, 0) \Longleftrightarrow \\
Y &= \frac{(c_O - c_N)b\omega}{c_O} - \omega m \frac{l+b\omega}{c_O} + \frac{(c_O - c_N)\omega^{1+\lambda} h}{c_O(1+\sigma)}\left(1 - \frac{\omega m}{c_O - c_N}\right)^{1+\sigma} < 0.
\end{aligned}$$

Consider the expression

$$X = \frac{(c_O - c_N)\omega^{1+\lambda} h}{1+\sigma}\left(1 - \frac{\omega m}{c_O - c_N}\right)^{1+\sigma} .$$

Substituting (21), we find that

$$\begin{aligned}
X &= (c_O - c_N)\frac{m(l+b\omega) - c_O b}{-m x^{\sigma}(1+\sigma) + \frac{c_O}{\omega}} x^{1+\sigma} \\
&\propto \frac{x^{1+\sigma}}{a - (1+\sigma)x^{\sigma}},
\end{aligned}$$

where $a = \frac{c_O}{\omega m} > 1$.

Computing the derivative with respect to σ and simplifying its numerator we get that

$$\frac{dX}{d\sigma} \propto a \ln x + x^{\sigma}.$$

Since $x < 1$, this expression is decreasing in σ. Its value at $\sigma = 0$ is $a \ln x + 1$, which is positive iff

$$\ln x > -\frac{1}{a} \Longleftrightarrow 1 - \frac{\omega m}{c_O - c_N} > \exp(-\frac{\omega m}{c_O}) \Longleftrightarrow 1 - z > \exp(-\beta z),$$

where $z = \frac{\omega m}{c_O - c_N} \in [0,1]$ and $\beta = \frac{c_O - c_N}{c_O} \in [0,1]$. Yet the function $f(z) = 1 - z - \exp(-\beta z)$, for $z \in [0,1]$, is such that $f(0) = 0$, $f(1) = -\exp(-\beta) < 0$ and $f'(z) = -1 + \beta \exp(-\beta z) < 0$ Consequently, $1 - z < \exp(-\beta z)$. Therefore, $\ln x < -\frac{1}{a}$, implying $\frac{dX}{d\sigma} < 0$, $\forall \sigma \geq 0$. Hence, X is maximum at $\sigma = 0$, implying that

$$Y < Z = \frac{(c_O - c_N)b\omega}{c_O} - \omega m \frac{l + b\omega}{c_O} + \frac{(c_O - c_N)}{c_O} \frac{m(l + b\omega) - c_O b}{-m + \frac{c_O}{\omega}} \left(1 - \frac{\omega m}{c_O - c_N}\right).$$

We can check that the terms in b on the RHS cancel out and that

$$Z = \frac{\omega}{c_O} ml \left(\frac{c_O - c_N - \omega m}{c_O - \omega m} - 1\right) < 0.$$

This proves that $\Pi_{PF} < \Pi_A(\mathcal{P}.j^*, 0)$ for any equilibrium.

Finally, claim (iii) derives straightforwardly from claims (i) and (ii), and Proposition 6..

QED.

11 Proof of Proposition 9

(i) – Observe that

$$\begin{aligned} \tilde{\Pi}_A(\bar{j}, \tau) &= \frac{l(1-\tau)}{c_O(1-\tau) + \tau c_N}(c_O - c_N) + \frac{lv}{c_O(1-\tau) + \tau c_N} \text{if } \tau \leq \frac{c_O}{c_O - c_N} - \frac{l}{\bar{j}(c_O - c_N)} \\ &= \bar{j}(1-\tau)(c_O - c_N) + v\bar{j} \text{ if } \frac{c_O}{c_O - c_N} - \frac{l}{\bar{j}(c_O - c_N)} < \tau \leq 1. \end{aligned}$$

The second expression is decreasing in τ. Computing the derivative of the first expression with respect to τ, one can check that it has the same sign as $v - c_N$. So it is decreasing too. The othe claims hold trivially.

(ii) – From (i), it follows that

$$\max \tilde{\Pi}_A = \tilde{\Pi}_A(j_A^+(0), 0) = \tilde{\Pi}_A(l/c_O, 0) = \frac{l(v + c_O - c_N)}{c_O}. \tag{28}$$

Following the same steps as in the proof of Proposition 7, we can compute aggregate profits augmented by existence values in the PF world:

$$\begin{aligned} \tilde{\Pi}_{PF} &= \int_0^{j^*} \tilde{\pi}_j dj \\ &= (c_O - c_N - \omega m)\frac{l + b\omega}{c_O} + \frac{(c_O - c_N)\omega^{1+\lambda} h}{c_O(1+\sigma)} x^{1+\sigma} \qquad (29) \\ &\quad + \frac{v}{c_O}\left(l + b\omega + x^\sigma \omega^{1+\lambda} h\right). \qquad (30) \end{aligned}$$

We can see that $\partial\tilde{\Pi}_{PF}/\partial v > \partial\tilde{\Pi}_A(l/c_O, 0)/\partial v$. From Proposition 7, at $v = 0$, $\tilde{\Pi}_{PF} < \tilde{\Pi}_A(l/c_O, 0)$. To prove point (ii), we need to compare $\tilde{\Pi}_{PF}$ with $\tilde{\Pi}_A(l/c_O, 0)$ at $v = c_N$. Assuming this and rearranging, we see that

$$\begin{aligned} \tilde{\Pi}_A(l/c_O, 0) &< \tilde{\Pi}_{PF} \Longleftrightarrow \\ (l + b\omega)\omega m &< c_O b\omega + x^\sigma \omega^{1+\lambda} h \frac{c_O + \sigma c_N - \omega m}{1+\sigma}. \end{aligned}$$

Using (21), rearranging, and simplifying, this inequality is equivalent to

$$c_O - \omega m x^\sigma (1 + \sigma) < x^\sigma \left(c_O + \sigma c_N - \omega m\right),$$

which is clearly equivalent to (18). Hence, if (18) holds, the quantity $\tilde{\Pi}_{PF} - \tilde{\Pi}_A$ is monotonically increasing in v over $[0, c_N]$, negative for $v = 0$, and positive for $v = c_N$. This proves (ii).

As in Proposition 7, claim (iii) derives straightforwardly from claims (i) and (ii), and Proposition 6.

QED

12 Constructing post-fordist equilibria

Start with a given set of values for c_O, c_N, l, λ, m and σ. Let $f(x)$ denote the RHS of (18). Observe that $f' > 0$ for $x \in [0,1]$. Also, $f(0) = 0 < c_O < c_O + \sigma c_N = f(1)$. There is a unique x_m such that $f(x_m) = 0$, and (18) holds for any $x \in (x_m, 1)$. Pick any x in this interval. Let us construct an equilibrium such that

$$\omega = (1-x)(c_O - c_N)/m.$$

Pick any $b \in (0, \frac{ml}{c_O - m\omega})$. Pick h according to (21). By construction, $h > 0$.

Let j^* be determined by (27). It is straightforward to check that, by construction, the two equilibrium conditions (14) and (13) hold.

The critical value of v, denoted by v_m, beyond which $\tilde{\Pi}_{PF} > \tilde{\Pi}_A(l/c_O, 0)$ can then be obtained from (28) and (29)

$$v_m = \frac{l\omega m - (c_O - c_N)xb\omega - \frac{(c_O - c_N)\omega^{1+\lambda}h}{1+\sigma}x^{1+\sigma}}{b\omega + x^\sigma \omega^{1+\lambda}h}.$$

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