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Exploitation, inequality, and power

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Abstract: The concept of exploitation is central in social and political theory, but there is no precise, widely accepted definition. This paper analyses John Roemer's seminal theory, which construes exploitation as a distributive injustice arising from asset inequalities, with no reference to notions of power or dominance. First, an intertemporal generalisation of Roemer's static economies is set up and several doubts are raised on the claim that exploitation *can* be reduced to a kind of resource egalitarianism. Then, Roemer's philosophical arguments that exploitation *should* be defined as a merely distributive concept are also questioned and it is argued that a notion of power, or dominance, is an essential part of the definition of exploitation. Finally, Roemer's path-breaking methodological claim that standard general equilibrium models can provide robust microfoundations to exploitation and classes is critically analysed.

Key words: Exploitation, inequality, power.

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1. INTRODUCTION

The notion of exploitation is prominent in the social sciences and in political discourse. It is central in a number of debates, ranging from analyses of labour relations, especially focusing on the weakest segments of the labour force, such as children, women, and migrants (see, e.g., ILO, 2005; 2006); to controversies on drug-testing and on the price of life-saving drugs, especially in developing countries;¹ to ethical issues arising in surrogate motherhood (see, e.g., Field, 1989; Wood, 1995). The concept of exploitation is also the cornerstone of Marxist social theory, and it is central in the politics of the Left. In the 2007 programme of the German Social Democratic Party, for example, the very first paragraph advocates a society ‘free from poverty, exploitation, and fear’ (SPD, 2007: 3), and the fight against exploitation is repeatedly indicated as a priority for the biggest party of the European Left. The notion of exploitation is not confined to Marxist approaches, though, and it is extensively discussed in normative theory and political philosophy (see, e.g., Wertheimer, 1996; Wolff, 1999; Bigwood, 2003; and Sample, 2003). Yet, perhaps surprisingly, there is little agreement concerning even the most basic features of exploitive relations, and both the definition of exploitation and its normative content are highly controversial.²

A particularly relevant and contentious question concerns the role of distributive issues, on the one hand, and of relations of coercion, force, or power, on the other hand, in positive and normative exploitation theory. At the most general level, A exploits B if and only if A takes unfair advantage of B. But do exploitive relations mainly, or uniquely, involve some (wrongful) characteristic of the structure of the interaction between A and B (such as asymmetric relations of

power, force, etc.)? Or is exploitation mainly, or uniquely, concerned with some form of (wrongful) inequality (in asset ownership, labour exchanged, etc.)?

A path-breaking answer to the latter questions is provided by John Roemer's seminal theory (Roemer, 1982a, 1988), which represents one of the most rigorous and general approaches to exploitation and class, and a pivotal reference point for debates in political philosophy and in the social sciences. Roemer's approach is a very innovative and controversial contribution to Marxist theory, but it raises a number of substantive and methodological issues that are crucial for all exploitation theorists, and indeed for all social scientists.

Given the richness of Roemer's theory, it is worth rehearsing the main arguments here. Consider an economy with N identical producers who minimise labour, subject to a subsistence requirement, and trade commodities and labour.³ Roemer defines *Marxian exploitation* as an unequal exchange of labour (hereafter UE): an agent is exploited (an exploiter) if and only if she works more (less) time than is embodied in her consumption bundle. If there is differential ownership of productive assets (hereafter, DOPA), Roemer proves that in equilibrium labour time is unequally distributed, and each agent's class and exploitation status is determined by asset ownership: wealthy agents are net hirers of labour (capitalists) and exploiters, poor agents are net sellers of labour (proletarians) and are exploited. Further, the subsistence economy with a labour market is isomorphic to an identical economy with a capital market instead: wealthy agents are net lenders and exploiters, poor agents are net borrowers and exploited.

These results can be extended to accumulation economies and, according to Roemer, show that neoclassical microfoundations can be provided to exploitation

and class. They also prove that the labour market is not ‘intrinsically necessary for bringing about the Marxian phenomena of exploitation and class ... competitive markets and [DOPA] are the institutional culprits in producing exploitation and class’ (Roemer, 1982a: 93). Therefore, exploitation should not be defined as the expropriation of labour at the point of production. The definition that focuses simply on UE – ‘whether or not there is a production relation between the agents in which one “extracts” the labour of another’ (Roemer, 1985: 54) – is preferable.⁴

The UE definition itself is problematic, though, according to Roemer. If agents have heterogeneous labour endowments or preferences, ‘it is possible for some very wealthy producers to be exploited and for some very poor producers to be exploiters’ (Roemer, 1982a: 175).⁵ Therefore, UE exploitation ‘in the general case, is misconceived. It does not provide a proper model or account of Marxian moral sentiments’ (Roemer, 1985: 54). Roemer provides an alternative approach that focuses on property relations, which aims to generalise Marxian exploitation ‘in terms of the institutional variation permitted’ (Roemer, 1982b: 256) and to capture its essential normative content, which is interpreted as requiring ‘an egalitarian distribution of resources in the external world’ (Roemer, 1994: 3).

Consider a private-ownership economy with a set N of agents. The property relations (hereafter, PR) definition of exploitation can be summarised as follows.

DEFINITION 1 (PR). Let $C \subseteq N$ be a coalition and let C' be its complement in N . C is *capitalistically exploited* by C' if and only if there is a hypothetically feasible alternative such that (i) C would improve by withdrawing from the economy with its per capita share of alienable assets; and (ii) C' would be worse off.⁶

Roemer proves that in simple economies PR is equivalent to UE, but unlike the latter, it accurately reflects asset inequalities in more general settings, too. He also constructs a number of examples to argue that whenever they render different answers as concerns the existence of exploitation and the identity of exploited agents, it is PR that captures Marxist normative intuitions (see, e.g., Roemer, 1982d, 1985). Further, according to Roemer, the injustice associated with UE as such is unclear, whereas PR clearly shows the ethical imperative of Marxian exploitation theory, namely the elimination of asset inequalities.⁷

Actually, the PR approach can provide the foundations of an original Marxist theory of distributive justice in capitalist economies that focuses on unequal distributions of endowments. Roemer (1988: 57-69) contends that in capitalist economies asset inequalities derive either from an original accumulation characterised by ‘robbery and plunder’, or from morally arbitrary factors, such as luck, or socially determined saving preferences and skills. In either case, exploitation can be condemned on grounds of *equality of opportunity* and PR identifies a Marxist ethical imperative that requires to eliminate DOPA in order to equalise opportunities. Thus, Marxian exploitation theory ‘directs our moral inquiry into why [DOPA] should constitute injustice’ (Roemer, 1989a: 391) and such concern for asset inequalities is indeed its fundamental legacy.

This paper provides a critical analysis of Roemer’s seminal substantive and methodological claims. From a substantive viewpoint, the main aim is to question the view that exploitation theory reduces to ‘a kind of resource egalitarianism’ (Roemer, 1994: 2) and to underline the relevance of notions of power, force, or dominance. The two main arguments developed by Roemer are analysed in turn.

Sections 2 and 3 discuss the claim that DOPA ‘and competitive markets are sufficient institutions to generate an exploitation phenomenon’ (Roemer, 1982a: 43) and thus exploitation *can* be reduced to a distributive concern for asset inequalities. In section 2, the logical structure of the argument is clarified and some common criticisms of Roemer’s formal approach are analysed. It is argued that wholesale rejections on a priori methodological or exegetical grounds are not compelling, and they do not challenge the core logical argument. In section 3, an alternative, more focused critical approach is developed. It is argued that Roemer’s economies are inherently static and thus seem unsuitable to analyse exploitation as a persistent phenomenon. Then a full dynamic generalisation of Roemer’s models is set up and several doubts are raised on the claim that DOPA and competitive markets are sufficient to generate *persistent* exploitation.⁸

Section 4 analyses Roemer’s second main argument according to which exploitation *should* be defined in purely distributive terms. To be sure, Roemer is quite effective in criticising approaches that focus on domination and direct coercion, and in stressing the relevance of distributive issues in exploitation theory. It is unclear, though, that weaker forms of asymmetric relations between agents should also be ruled out. Section 4 explores the normative foundations of exploitation and argues that purely distributive definitions have too impoverished an informational basis to capture exploitive relations and to distinguish exploitation from other forms of injustice, or wrongs. In particular, a notion of power, or dominance, is an essential part of exploitive relations. Some promising lines for further research in this direction are then briefly discussed in section 5.

This paper also analyses Roemer's path-breaking methodological contribution, namely the provision of neoclassical microfoundations to class and exploitation, which makes him one of the most prominent exponents of 'Rational Choice Marxism'.⁹ Section 2 discusses the role of formal models in social theory and it questions a priori criticisms of all attempts to analyse exploitation and class within a broadly defined neoclassical framework. Yet the results presented in section 3 raise serious doubts on the possibility of understanding exploitation and class by means of 'standard general equilibrium models' (Roemer, 1986b: 193).

Finally, it is worth noting that although this paper is not a survey, it does provide the first thorough review of the large literature on Roemer's theory.

2. MODELLING EXPLOITATION

Given the scope and relevance of Roemer's conclusions, it is not surprising that they have generated a vast debate. This section discusses the main criticisms of Roemer's theory, which mostly focus on a priori methodological and exegetical issues. The main aim is to clarify both the logical structure of Roemer's argument that exploitation can be reduced to DOPA, and the critical approach adopted in this paper. The discussion, however, also raises some methodological issues that are central in the social sciences.

A significant number of criticisms question the very role of formal models in the social sciences (and in particular in exploitation theory), and the relevance of the results drawn from them. Some objections reflect a rather popular post-modern epistemological stance that reduces mathematics, and indeed all scientific languages, to mere 'discourses'. Post-modern critics thus deflate the explanatory

power of Roemer's models to the vanishing point, by interpreting mathematics as a form of 'illustration', whereby 'mathematical concepts and models can be understood as metaphors or heuristic devices' (Ruccio, 1991: 36; see also Amariglio, Callari, and Cullenberg, 1989). A well-known problem with this approach is that it is unclear how competing hypotheses can be rationally evaluated, let alone tested. Further, this conception of mathematics reflects the post-modern denial of the explanatory power of theoretical abstractions. Yet the emphasis on rather elusive 'historically concrete social processes' does not lead beyond the formulation of vague, if not empty, general statements, such as that classes 'can be analysed as the determinate result of the entire constellation of social processes that can be said to make up a society or social formation at any point in time; in turn, [they] will be only one of the myriad determinants of those nonclass social processes' (ibid.: 38).

Other critics question Roemer's emphasis on formalism, arguing that it tends to neglect important theoretical and political issues that resist mathematical formulation, whereas some critical facts about capitalism 'can be established without mathematical proof' (Wood, 1989: 47).¹⁰ In a general perspective, these objections may support methodological pluralism, but they do not entail the rejection of formal models. Theoretical abstraction is essential to isolate the core features of a problem and the fundamental causal links, and all explanatory theories – formal or informal – contain assumptions, claims about the conditions under which the explanations hold. Formal modelling is undoubtedly one rigorous way of deriving causal explanations from a clearly stated set of assumptions. To be sure, a model 'is necessarily one schematic image of a theory ... Nevertheless

... the production of different and contradicting models of the same theory can be the very process that directs our focus to the gray areas of the theory' (Roemer, 1981: 3). Further, no argument is provided that conclusively establishes the inherent inadequacy of formal approaches in exploitation theory. From this perspective, the choice of the appropriate analytical framework is more important than abstract discussions on mathematics.

A more focused set of criticisms argue that Roemer's conclusions are wrong, or irrelevant, because *neoclassical* economics fundamentally distorts critical social theory and therefore cannot capture exploitation.¹¹ A proper analysis of this objection, which raises deep issues relating to the role of rational choice theory in the social sciences, goes beyond the boundaries of this paper.¹² One point should be made, however, concerning the use of neoclassical models in critical social theory that is important for the main thread of the argument. To be sure, the objection can be forcefully raised against specific models as 'not all questions of interest in Marxism can be attacked with [general equilibrium models and game theory]' (Roemer, 1982b: 285). For example, Roemer's (1982a) discussion of Marx's theory of history is not entirely compelling, as static general equilibrium models do not seem 'very suitable for founding the theory of history' (Carling, 1997: 771). Yet the general validity of the objection is less clear as it relies on a narrow, if unrealistic, view of neoclassical economics as 'ill-suited to modeling anything but supply, demand, and technical relationships' (Anderson and Thompson, 1988: 225). For instance, the Marxian analysis of relations of power and contractual incompleteness in the labour market – whose absence is often seen as a serious limit of Roemer's theory – can be modelled within a broadly

defined neoclassical framework, as in Bowles and Gintis (1990).¹³ Further, as argued by many of Roemer's critics (e.g., Lebowitz, 1988: 195ff; Schwartz, 1995a: 282), game theory provides a set of tools that can be fruitfully applied to critical social theory. The wholesale rejection of Roemer's theory (and of all attempts at cross-fertilisation) is thus unwarranted, and it seems more fruitful to discuss whether his specific models are appropriate to analyse exploitation.

A third set of criticisms do question the Marxist pedigree of specific assumptions and definitions in Roemer's models. Some critics argue that the Marxian concepts of exploitation and classes cannot be analysed in models in which labour is not traded, or which assume perfect information, perfectly enforceable contracts, and freely available technology.¹⁴ Others contend that in Marx exploitation is central to understand social reproduction and the production of surplus, and 'the important historical aspect of class societies is that exploiting classes, through their control over social surplus production, shape the reproduction of the society' (Foley, 1989: 191). Hence Roemer's emphasis on justice and normative issues is fundamentally misplaced.¹⁵

These critiques raise important questions, but do not seem decisive. Even though critics muster considerable textual evidence against Roemer's reading of Marx, few issues in Marxism can be settled uniquely at the exegetical level, as shown by various endless debates. Many of Roemer's assumptions and results are consistent with Marx's theory. For instance, that exploitation can occur without wage-labour is in line with Marx's analysis of merchant capitalism: if anything, Roemer's 'implicit suggestion that Marx thought that exploitation could take place only through the capitalist wage relation is unfounded' (Foley, 1989: 192).

Further, as acknowledged by various critics, the equilibrium of Roemer's economies arguably 'presents a recognizable version of Marx's theory of capitalism' (ibid.: 189).¹⁶ More importantly, fidelity to Marx's writings is not a major constraint for Roemer (see, e.g., the introduction of Roemer, 1986), and thus a purely exegetical critique arguably misses the point.

A priori criticisms of the ahistorical and abstract nature of the models are not conclusive either. Roemer aims to conduct a logical inquiry into the determinants of exploitation and the models are 'institutional experiments' to answer two questions; 'Which institutions and characteristics of an economy are essential for a conception of exploitation to make sense, and which are incidental? Can we conceive of a theory of exploitation sufficiently general to permit definition even under conditions of considerable institutional variation?' (Roemer, 1982b: 255). Roemer clearly distinguishes the historical and the logical relevance of the results. The core logical argument is the following: 'in the real world we observe X (DOPA), Y (coercion in the labour process), and Z (class and exploitation). We have, if you will, an "empirical proposition" that $X + Y \Rightarrow Z$. Now I construct a model in which the following theorem holds: $X + \text{not } Y \Rightarrow Z$; from this I say that X is the "fundamental" cause of Z in the real world, not Y ' (Roemer, 1992: 152). Hence a forceful critique of Roemer's theory cannot be limited to noting that his models and definitions are ahistorical (Howard and King, 1989; Dymski and Elliott, 1989b); that 'his models abstract misleadingly from the real world features of historical capitalism that connect exploitation to its objectionable effects' (Schwartz, 1995a: 275); that money, hard uncertainty, and institutions, including firms, are absent (Hodgson, 1989); or that unemployment and domination in the

workplace are neglected and the description of the production process is simplistic (Dymski and Elliott, 1989b; Devine and Dymski, 1991; Goldstein, 2006).

Let Y denote, in general, the empirical features of capitalist economies abstracted away by Roemer. These objections establish that ‘Roemer’s inference is irrelevant for capitalism, because “not Y ” is false for capitalism’ (Roemer, 1992: 150). This is an important point, but it does not challenge the core logical argument. For instance, that ‘observed exploitation *exceeds* [UE exploitation] when forced labour or incomplete markets lead to *additional* exploitation’ (Dymski and Elliott, 1989b: 344, italics added) is entirely consistent with Roemer’s logical claim. Similarly, to underline ‘the essentially different dynamics of exploitation in [empirical labour and credit markets]’ (Hunt, 1986: 125) is not sufficient to challenge the isomorphism result described in section 1 above.

The formal approach developed in the next section aims to provide an immanent criticism of Roemer’s theory that challenges his core substantive argument, and a focused critique of his models that raises doubts on the possibility of analysing exploitation within a standard general equilibrium framework.

3. AN INTERTEMPORAL MODEL OF EXPLOITATION AND CLASS

Roemer’s models can be interpreted either as a succession of one-period economies, or as an infinitely-lived generation; but in either case agents face no intertemporal trade-offs, as both intertemporal credit markets and savings are ruled out. To be sure, ‘constructing a model of capitalism that would reveal its essentially dynamic features is a different task from what mine was’ (Roemer, 1992: 150). Yet, these assumptions seem unduly restrictive if ‘[t]he economic

problem for Marx, in examining capitalism, was to explain the persistent accumulation of wealth by one class and the persistent impoverishment of another' (Roemer, 1982a: 6). In particular, whereas the absence of intertemporal credit markets may be justified in subsistence economies, the impossibility of savings seems unsatisfactory. In this section, an intertemporal generalisation of the subsistence economy is set up to analyse Roemer's theory. Methodologically, an intertemporal model is useful to evaluate the possibility of providing neoclassical microfoundations to persistent exploitation and class. Substantively, it allows one to assess the causal and moral relevance of DOPA, focusing on its role in generating exploitation and classes as persistent features of a competitive economy in which the distribution of productive assets can change over time.

There are two reasons to focus on subsistence economies. First, it is not difficult to extend Roemer's accumulating economies and construct labour-constrained equilibria with profits and exploitation falling to zero. Roemer's results depend on differential ownership of *scarce* productive assets and it is not surprising that exploitation disappears if capital becomes abundant.¹⁷ Second, Roemer's main conclusions do not depend on accumulation and one of his core results is precisely that 'exploitation emerge[s] logically prior to accumulation' (Roemer, 1982b: 264). The analysis of subsistence economies is therefore crucial in order to evaluate the core claim that DOPA and competitive markets are sufficient to generate exploitation.

The model closely follows Roemer (1982a, 1988). There is a sequence of nonoverlapping generations, each with N identical agents. Life duration is T and generations are indexed by the date of birth kT , $k = 0, 1, 2, \dots$ In every period t ,

each agent ν can produce a single good with a standard linear technology (A, L) , where x_t^ν is the output that ν produces working on her own and y_t^ν is the output that ν produces hiring others.¹⁸ Further, ν can sell her labour and z_t^ν is ν 's labour supply at t , whereas $A_t^\nu = Lx_t^\nu + z_t^\nu$ is her total labour expended. The price of the good at t is p_t and the wage rate is w_t . Let ω_t^ν be ν 's capital at t and let $\dot{\omega}_t^\nu$ be the derivative of ω_t^ν with respect to time, that is, ν 's net savings. As in Roemer (1982a, 1988), credit markets do not exist, but the model is generalised by assuming that agents can save and thus face intertemporal trade-offs. In every t , agent ν uses her income to buy her subsistence bundle b and to purchase capital.

Let $z^\nu = \{z_t^\nu\}_{t \in [kT, (k+1)T]}$ denote ν 's labour supply plan; and likewise for x^ν, y^ν , and ω^ν . Let $(p, w) = \{p_t, w_t\}_{t \in [kT, (k+1)T]}$ be the price vector during the lifetime of generation k .¹⁹ Let $\rho \geq 0$ be the rate of time preference. Each ν chooses $\xi^\nu = (x^\nu, y^\nu, z^\nu, \omega^\nu)$ to minimise labour subject to the constraint that in every t : (1) income is sufficient to reach subsistence and for saving plans; and (2) wealth is sufficient for production plans. Further, (3) every ν is required not to deplete her capital at the end of her life. Labour performed in every t should not exceed the endowment, which is normalised to one. Formally, ν solves the minimisation programme MP_ν ,

$$(MP_\nu) \min_{\xi^\nu} \int_{kT}^{(k+1)T} e^{-\rho t} A_t^\nu dt ,$$

$$\text{subject to: } p_t(1 - A)x_t^\nu + [p_t(1 - A) - w_tL]y_t^\nu + w_tz_t^\nu \geq p_t b + p_t \dot{\omega}_t^\nu , \quad (1)$$

$$p_t A(x_t^\nu + y_t^\nu) \leq W_t^\nu = p_t \omega_t^\nu , \quad (2)$$

$$\omega_{(k+1)T}^\nu \geq \omega_{kT}^\nu , \quad (3)$$

$x_t^\nu, y_t^\nu, z_t^\nu, \omega_t^\nu \geq 0$ and $A_t^\nu \leq 1$, all t , and for a given ω_0^ν .

In order to avoid an excess of uninteresting technicalities, it is assumed, as in Roemer (1982a), that agents who are able to reproduce themselves without working use just the amount of wealth strictly necessary to reach subsistence. By stating that wealthy agents do not “waste” their capital, Assumption 1 endows them ‘with embryonic capitalist behavior’ (ibid.: 65). Let $A^v = \int_{t=kT}^{(k+1)T-1} A_t^v dt$.

ASSUMPTION 1: For a given (p, w) , if there is an optimal ξ^v such that $A^v = 0$, then agent v chooses y^v to minimise capital outlay $\int_{t=kT}^{(k+1)T-1} p_t A y_t^v dt$.

As a shorthand notation, let $E(\Omega_{kT})$ denote the economy with technology (A, L) , subsistence bundle b , and distribution of endowments $\Omega_{kT} \equiv (\omega_{kT}^1, \omega_{kT}^2, \dots, \omega_{kT}^N)$. Let $x_t = \sum_{v=1}^N x_t^v$; and likewise for the other variables. For the sake of simplicity, let ‘all t ’ stand for ‘all $t, t \in [kT, (k+1)T]$ ’. Following Roemer (1982a), the equilibrium concept for $E(\Omega_{kT})$ can be defined.

DEFINITION 2. A *reproducible solution* (RS) for $E(\Omega_{kT})$ is a vector (p, w) and an associated set of actions such that

- (i) ξ^v solves MP_v , all v ;
- (ii) $(x_t + y_t) \geq A(x_t + y_t) + Nb + \hat{\omega}_t$, all t ;
- (iii) $A(x_t + y_t) \leq \omega_t$, all t ;
- (iv) $Ly_t = z_t$, all t ;
- (v) $\omega_{(k+1)T} \geq \omega_{kT}$.

Thus, at a RS, (i) every agent must optimise; in every t , there must be enough resources (ii) for consumption and savings, and (iii) for production plans; (iv) the labour market must clear in every t ; (v) every generation must leave to the

following at least as many resources as they inherited. Given the analytical focus on the dynamics of exploitation with persistent capital scarcity, RS's with a stationary path of capital are of focal interest. Formally, let an *interior RS* (IRS) for $E(\Omega_{kT})$ be a RS such that $\dot{\omega}_t^v = 0$, for all v, t , at an interior solution to MP_v .

Let $\lambda = L(1 - A)^{-1}$ be embodied labour and let $\Delta^v = \int_{kT}^{(k+1)T} (A_t^v - \lambda b) dt$. There are two possible extensions of the UE definition, focusing on the amount of labour performed either in each period, or during the whole life of a generation.

DEFINITION 3. At a RS for $E(\Omega_{kT})$, agent v is *exploited within period t* , or WP_t *exploited* if $A_t^v > \lambda b$; WP_t *exploiting* if $A_t^v < \lambda b$; and WP_t *exploitation-neutral* if $A_t^v = \lambda b$. Similarly, v is *exploited during her whole life*, or WL *exploited* if $\Delta^v > 0$; WL *exploiting* if $\Delta^v < 0$; and WL *exploitation-neutral* if $\Delta^v = 0$.

By Definition 3, an agent is exploited within period t if the amount of labour she performs in t is higher than the amount of labour embodied in her consumption bundle, and similarly for the WL criterion. Both definitions convey normatively relevant information. The WL definition reflects the intuition that, from an agent's viewpoint, being exploited in every period is certainly worse than being exploited only in some periods. However, it leads to the counterintuitive conclusion that there would be no objection to an economy in which exploitation – no matter how significant and widespread – existed in every period, but the agents' status changed over time so as to equalise the amount of exploitation suffered by everyone. Instead, the WP definition seems more relevant, as it captures the idea that the existence of exploitation is morally relevant per se, and an economy with social mobility is not necessarily just, as long as *some* agent is

exploited. Hence, this paper analyses both definitions, but a special attention is devoted to the *WP* criterion which seems also more natural in an intertemporal setting, since it gives the opportunity to analyse the dynamics of exploitation.

At the solution to MP_ν , $\omega_{(k+1)T}^\nu = \omega_{kT}^\nu$, all ν , and thus generation $k = 0$ can be considered without loss of generality. Further, at an IRS it must be $p_t > 0$ and $w_t > 0$, all t , so that prices can be normalised by setting $w_t = 1$, all t , and the profit rate can be written as $\pi_t = [p_t(1 - A) - L]/p_tA$ at all t . Then, Theorem 1 characterises the *WL* and *WP* exploitation status of each agent ν .²⁰

THEOREM 1. *Let $W_t^* \equiv (p_t - \lambda)b/\pi_t$. At an IRS for $E(\Omega_0)$ such that $\pi_t > 0$, all t : $\Lambda_t^\nu > \lambda b$, all t , and $\Delta^\nu > 0$ if and only if $W_0^\nu < W_0^*$; $\Lambda_t^\nu = \lambda b$, all t , and $\Delta^\nu = 0$ if and only if $W_0^\nu = W_0^*$; and $\Lambda_t^\nu < \lambda b$, all t , and $\Delta^\nu < 0$ if and only if $W_0^\nu > W_0^*$.*

Theorem 1 proves that at an IRS, the *WL* and *WP* definitions are equivalent and the exploitation status of each ν is a function of her initial wealth. Next, classes can be defined based on ‘the way in which an agent relates to the means of production’ (Roemer, 1982a: 70). Let (a_1, a_2, a_3) be a vector where $a_i \in \{+, 0\}$, $i = 1, 2, 3$, and ‘+’ means a non-zero value; let $X^\nu \equiv \int_{t=0}^{T-1} x_t^\nu dt$, and likewise for Y^ν , and Z^ν . Let $\Gamma^\nu \equiv \{(X^\nu, Y^\nu, Z^\nu): \xi^\nu \text{ solves } MP_\nu\}$ and $\Gamma_t^\nu \equiv \{(x_t^\nu, y_t^\nu, z_t^\nu): \xi^\nu \text{ solves } MP_\nu\}$. There are two dynamic extensions of Roemer’s definition of classes.

DEFINITION 4. *At a RS for $E(\Omega_0)$, agent ν is a member of *WP class* (a_1, a_2, a_3) in t , if there is an individually optimal ξ^ν such that $(x_t^\nu, y_t^\nu, z_t^\nu)$ has the form (a_1, a_2, a_3) in t . Similarly, ν is a member of *WL class* (a_1, a_2, a_3) , if there is an individually optimal ξ^ν such that (X^ν, Y^ν, Z^ν) has the form (a_1, a_2, a_3) .*

Following Roemer (1982a), there are five theoretically relevant *WL* classes.

$$C^1 = \{v \in N \mid I^v \text{ contains a solution } (0, +, 0)\},$$

$$C^2 = \{v \in M \mid I^v \text{ contains a solution } (+, +, 0), \text{ but not one of form } (+, 0, 0)\},$$

$$C^3 = \{v \in M \mid I^v \text{ contains a solution } (+, 0, 0)\},$$

$$C^4 = \{v \in M \mid I^v \text{ contains a solution } (+, 0, +), \text{ but not one of form } (+, 0, 0)\},$$

$$C^5 = \{v \in M \mid I^v \text{ contains a solution } (0, 0, +)\}.$$

WP classes C_t^1 - C_t^5 are similarly specified, replacing I^v with I_t^v . Agents in C^1 (C_t^1) are big capitalists, who optimise without working; agents in C^2 (C_t^2) are small capitalists, who do not sell their labour; agents in C^3 (C_t^3) are petty bourgeois, who optimise without using the labour market; agents in C^4 (C_t^4) are small proletarians, who do not hire others; agents in C^5 (C_t^5) are proletarians.

Theorem 2 generalises Roemer's theory of classes: at an IRS, *WP* classes C_t^1 to C_t^5 are pairwise disjoint and exhaustive, *WP* and *WL* class structures coincide, and there is a *WP* and *WL* correspondence between class and exploitation status.

THEOREM 2. *At an IRS for $E(\Omega_0)$ such that $\pi_0 \geq \rho$ and $\pi_t > 0$, all t : (i) For all $1 \leq i < j \leq 5$, $C_t^i \cap C_t^j = \emptyset$ and $\cup_i C_t^i = N$, all t . (ii) Let $W_0^v \neq (p_0 b)/\pi_0$, all v . For all j , if $v \in C_0^j$ then $v \in C_t^j$, all t , and $v \in C^j$. (iii) (Class-Exploitation Correspondence Principle). If $v \in C_0^1 \cup C_0^2$ then $\Delta^v < 0$ and $\Lambda_t^v < \lambda b$, all t ; if $v \in C_0^3$ then $\Delta^v = 0$ and $\Lambda_t^v = \lambda b$, all t ; if $v \in C_0^4 \cup C_0^5$ then $\Delta^v > 0$ and $\Lambda_t^v > \lambda b$, all t .*

By Theorem 2, *WP* classes provide a time-invariant partition of the set of agents based on their position in the labour market. This partition coincides with that identified in Theorem 1: according to both the *WP* and the *WL* criterion, agents in the lower classes are exploited and agents in the upper classes are

exploiters. Theorems 1 and 2 thus provide a complete dynamic generalisation of Roemer: in equilibrium, class and exploitation status emerge endogenously and they are both determined by initial wealth. In Appendix 2, it is proved that if $\rho > 0$, then $\pi_t = \rho$, all t , is an IRS with persistent exploitation, and the intertemporal economy is just a replica of Roemer's static model. However, Theorem 3 shows that, in the absence of time preference, exploitation is not persistent.

THEOREM 3. *Let $\rho = 0$. At an IRS for $E(\Omega_0)$ such that $\pi_t > 0$, all t : (i) for all $v \notin C^l$, if $W_0^v < W_0^*$ then $\dot{A}_t^v < 0$, all t ; if $W_0^v = W_0^*$ then $\dot{A}_t^v = 0$, all t ; if $W_0^v > W_0^*$ then $\dot{A}_t^v > 0$, all t ; (ii) if $T \rightarrow \infty$, $\lim_{t \rightarrow \infty} A_t^v = \lambda b$, and $\lim_{t \rightarrow \infty} W_t^v = \lambda \omega_0^v$, all v .*

Theorem 3 states that if agents can save to choose the optimal intertemporal allocation of labour, and time preference is ruled out, then the rich work more and the poor work less over time, so that *WP* exploitation decreases and it disappears in the limit, even if wealth inequalities and capital scarcity persist. In other words, if D denotes the dynamic features of the economy, Roemer's core logical argument can be stated as ' $X + \text{not } Y + \text{not } D \Rightarrow Z$ as a persistent phenomenon'. Noting that the role of time preference is highly controversial in political philosophy, and that its relevance in exploitation theory is rather dubious, Theorem 3 proves instead that ' $X + \text{not } Y + D \Rightarrow Z$ is not persistent'.

From a methodological viewpoint, these results raise doubts on the claim that exploitation and classes can be analysed with standard general equilibrium models. Roemer's static economies do not provide convincing support to this claim, because the main propositions depend on two substantial departures from a Walrasian model, namely the absence of intertemporal credit markets and the

impossibility of savings. By Theorem 3, it is sufficient to allow for savings to make exploitation transitory, even though the economy is still far from the Walrasian benchmark. Skillman (1995) suggests that exogenous growth in the labour force, or in labour productivity, and heterogeneous saving preferences might make exploitation persistent, even in a Walrasian model. As noted by Roemer (1988: 60ff) himself, though, the normative relevance of a theory of exploitation critically relying on such exogenous factors would be rather unclear.

From a substantive viewpoint, the above results provide a robust criticism of Roemer's core claim that DOPA is the fundamental cause of exploitation. Theorem 3 proves that this claim crucially depends on some very restrictive assumptions, such as the impossibility of savings. If savings are allowed, DOPA is necessary but not sufficient to generate persistent exploitation, and an emphasis on asset inequalities while exploitation disappears seems misplaced. Therefore, although no general impossibility result is proved, the intertemporal model raises serious doubts on the claim that exploitation theory *can* be reduced to a form of resource egalitarianism focusing on DOPA. Indeed, the above results suggest that DOPA is 'a normatively secondary (though causally primary) wrong' (Cohen, 1995: 199) and that Roemer's arguments in favour of a merely distributive definition of exploitation need further scrutiny.

4. EXPLOITATION, INEQUALITY, AND POWER

Many critics object to a merely distributive definition of exploitation. Levi and North (1982) claim that the coercive role of the state in allocating property rights, and inequalities in political power are central in defining exploitation. This

view seems rather reductive because it is confined to the political realm, and it implies that democracy is sufficient to eliminate exploitation. Other authors insist, contra Roemer, that coercive relations in the labour market and domination in the workplace are necessary ingredients for exploitation, and the normatively relevant issue is that DOPA generates coercion, which in turns yields domination and alienation that harm workers' freedom.²¹ These proposals are not entirely convincing either. An excessive weight is put on coercion, thus suggesting that noncoercive relations are automatically nonexploitive. Instead, as forcefully argued by Roemer, it is desirable to have a theory that can identify exploitation in mutually advantageous trades; 'Capitalism's necessary coercions are economic: ... it can substantially rid itself ... of extra-economic coercions, such as domination in the workplace ... Such a capitalism might be kinder and gentler, as they say, but it would not be socialism' (Roemer, 1989a: 386). Further, in coercion-based approaches the *specific* relevance of exploitation, as distinct from domination and alienation, is unclear, but these notions arguably capture different phenomena and should be kept conceptually distinct (see, Roemer, 1982b: 267ff).

The exclusion of domination in the workplace and of coercion in the labour market may thus be defended on theoretical grounds. It is unclear, though, that weaker forms of asymmetric relations between agents should also be ruled out. The view that 'the principal coercion of any mode of production is in maintaining its property rights, [and] our understanding of power, domination, and coercion can be reduced to a study of the transformation of property' (Roemer, 1982c: 382) seems reductive. Following Elster (1985: 214ff), one may distinguish force, which involves constraints that leave little or no room for choice, from coercion, which

requires in addition the existence of an intentional agent. Reiman proposes that ‘A society is exploitative when its social structure is organized so that unpaid labor is systematically forced out of one class and put at the disposal of another’ (Reiman, 1987: 3). Force is structural both in its origin, in that it is property relations that force labour transfers, not individuals or classes; and in its effects, in that ‘force affects individuals by imposing an array of fates on some group while leaving it open how particular individuals in that group get sorted, or sort themselves, into those fates’ (ibid.: 12). Structural force is compatible with some choice and it ‘is a kind of leverage over people to which they are vulnerable by virtue of their location in the social structure’ (ibid.: 14); although it is exerted by human beings, it need not be exercised intentionally.²² Warren outlines an even weaker, power-inclusive account of exploitation, which ‘focuses on the broad notion of unequal power and not specifically on coercion’ (Warren, 1997: 62). Wood (1995, 2004) and Wolff (1999) also propose weaker approaches in which some form of vulnerability of one of the parties involved is an essential ingredient of exploitive relations – even though they do not provide a precise definition of this concept.

In his models and examples, Roemer rules out all relations of force, power, or vulnerability – for instance, by assuming a subsistence sector that allows individual workers, and sometimes even the whole working class, to exit the proletariat. In Roemer’s theory, agents are compelled to belong to a class ‘in a very weak and unusual sense: being compelled does not consist in having no other option or in having no tolerable option, but simply in having no better option’ (van Parijs, 1986: 477, fn.14). And his approach can only account for forms of unfreedom that seem inadequate in the context of exploitive relations, whereby

'DOPA denies [the exploited] the sort of "positive" freedom involved in having the resources to do as they might, to exercise their options' (Schwartz, 1995a: 300); and for arguably narrow notions of power, such as the power necessary to maintain property relations, as already noted.

According to Roemer (1989b,c), a notion of force is unnecessary to define exploitation: provided DOPA is unjust, wealthy agents exploit poor ones, even if the latter can reach subsistence working on their own, and thus are not forced. The latter argument is intuitively appealing, insofar as it stresses the relevance of distributive issues. Yet, Roemer's purely distributive approach ignores some arguably salient features of exploitive relations.²³ In Roemer's theory, exploitation is not defined relationally: 'The statement "A is exploited by B" is not defined, but rather "A is an exploiter" and "B is exploited"' (Roemer, 1985: 31). It only measures a person's position in the economy with respect to labour flows or, in general, to the relevant index of well-being. Nor does Roemer's theory capture the causal dimension of exploitation, which has to do with the idea of taking advantage of someone, that is, 'when I derive a benefit from another person being placed in such a situation that his best option is to act in a way that is to my benefit' (Elster, 1982: 364).²⁴

The causal and relational dimension of UE, for example, reduces to the fact that, even without a labour market, in equilibrium exploiters work less than the average because the exploited work more: somehow, the latter are working "for" the former (see Roemer, 1982b: 258-9). The causal dimension of exploitation is also difficult to capture within PR, because, as forcefully argued by Elster, counterfactual statements, such as (i)-(ii), cannot capture causality: 'The truth of

“If A had not been present, B would not have been present” is neither necessary nor sufficient for the truth of “A caused B” (Elster, 1982: 367).

But then, the informational basis of purely distributive approaches, such as UE or PR, seems too impoverished to capture exploitive relations and to distinguish exploitation from other forms of injustice or wrongs. If UE is adopted, for example, it is in principle impossible to discriminate between exploitive relations and voluntary labour transfers. More importantly, according to PR – Roemer’s general definition – a diagnosis of exploitation can emerge even if there is no interaction between coalitions, as in the case of two autarchic islands with DOPA; or when the relation of dependence between coalitions is of the wrong kind for it to be a relation of exploitation. In fact, according to (i)-(ii), ‘someone choosing to live austere on the meager interest yielded by a smaller than average capital endowment is ... capitalistically exploited’ (van Parijs, 1986: 476, fn.11). Further, rich puritans exploit spendthrift neighbours if their greater wealth is inspired by the cautionary example of the latter (Elster, 1982), and compulsory support for the children or the needy is exploitive (Kymlicka, 2002: 183). These examples do not carry any resemblance to capitalist/worker relations, but they appear as different instances of the same phenomenon. This is because the merely distributive conditions (i)-(ii) embody a principle of social neutrality, whereby ‘The criterion of exploitativeness is neutral with respect to social features of states, appealing only to their material features’ (Sensat, 1984: 24). Based on the same ‘material’ data, namely DOPA and the resulting welfare inequalities, according to (i)-(ii), the above examples are akin to capitalist/worker relations, which seems a rather unconvincing conclusion.

Roemer acknowledges that (i)-(ii) are insufficient to define exploitation and argues that ‘the missing clause ... concerns the dominance of the exploiter over the exploited’ (Roemer, 1982d: 304, fn.12). The counterexamples are ruled out, according to him, if the following condition is added in Definition 1: (iii) S' is in a relation of dominance to S . Given Roemer’s emphasis on the distributive aspects of exploitation, the addition of (iii) is rather puzzling. To be sure, Roemer does not provide a precise definition of (iii) and oscillates between including it (Roemer, 1982a,e) or not (Roemer, 1982b, 1985, 1988), thus suggesting that (iii) has not the same logical status as (i)-(ii) and that its function is *only* to rule out ‘examples that are “noneconomic” in some sense’ (Roemer 1982d: 313, fn.24), or even ‘pathological’ (Roemer, 1982a: 195).²⁵ Welfare benefits or child support, though, do not seem ‘pathological’ or ‘noneconomic’ in *any* relevant sense. Moreover, a generic appeal to an undefined notion of dominance is unsatisfactory, and there are conceivable definitions of (iii) such that the above counterexamples remain valid; for example, in the case of compulsory welfare payments.²⁶ A precise notion of dominance seems thus a necessary part of Definition 1. Yet, dominance is not consistent with Roemer’s theory and many of his conclusions.

To begin with, several of Roemer’s examples should be reconsidered in the light of (iii). Take for instance Karl who consumes little, does not work, and lends his little capital to rich Adam who works and consumes more, and pays interest to Karl (Roemer, 1985: 58ff). According to UE, Karl exploits Adam even if Adam is wealthier, but, suggests Roemer, this conflicts with our moral intuitions. Instead PR gives the right verdict: ‘Adam is unjustly gaining from the flows between him and Karl, if the initial distribution of stocks is unjust against Karl’ (Roemer, 1985:

60). At a closer inspection, it is unclear that this example sheds *any* light on exploitation. If dominance is essential to define exploitation, it should be explicitly included. In the absence of dominance, the example may be capturing some form of injustice, but not an exploitive relation between Adam and Karl. As argued by Reiman (1987: 25ff), this kind of example may show at most that PR is a better *distributive* definition than UE, but then the problem may be the distributive approach itself. UE may render the wrong judgment because it does not include dominance, or power, not because it is uncorrelated with DOPA.²⁷

More importantly, Roemer's attempts to include dominance are 'ad hoc since they are disconnected from the "ethical imperative" he identifies as the basis of exploitation theory' (Kymlicka, 2002: 204 fn.13). As acknowledged by Roemer (1982b: 277, fn.15), because dominance is undefined 'the addition of [(iii)] is ad hoc ... (With respect to our earlier discussion domination exists at the point of maintaining property relations.)' As a definitional requirement, (iii) sits uneasily with the claim that exploitation should, or can, be reduced to a kind of distributive injustice and Roemer's attempts to capture the interaction between coalitions in (iii) seem inevitably inconsistent with the main thrust of his approach.

In later contributions, Roemer has acknowledged the limits of PR and has proposed that 'an agent is exploited in the Marxist sense, or capitalistically exploited, *if and only if PR holds and the exploiter gains by virtue of the labor of the exploited*' (Roemer, 1989c: 96). According to him, in fact 'the expenditure of effort is characteristically associated with exploitation' (ibid.: fn.11). This is almost a U-turn. First, Roemer (1989b: 258) admits to be 'now less convinced of PR's superiority to UE' and under the revised definition an allocation is deemed

exploitive if *both* PR and UE diagnose it (Roemer, 1989b: 260; 1989c: 96). Second, the information set necessary to evaluate exploitation is significantly enlarged and the emphasis on effort may be read as an implicit acknowledgment of the importance of the causal dimension of exploitation. Yet, the revised definition remains purely distributive, consistently with the ethical imperative of Roemer's theory, and thus in the light of the above discussion, it should not be surprising that it is vulnerable to counterexamples (see, e.g., Reiman, 1990: 106-7). Therefore it seems necessary to go beyond Roemer to incorporate a notion of power, or dominance, in exploitation theory.

5. CONCLUSION

Roemer's theory is an important and insightful contribution, and it sets an unsurpassed standard of rigour in exploitation theory. Rather than the last word on exploitation, though, this paper suggests that it should be considered as a starting point for further research. If, as forcefully argued by Roemer, distributive issues are crucial, it may be unsatisfactory to regard exploitation as being more 'a description of the process to which producers are subject – forced surplus transfer – than of its outcome' (Schwartz, 1995b: 160).²⁸ However, this paper argues that exploitation is not reducible to a kind of resource egalitarianism. Asset inequalities are necessary but not sufficient to yield persistent exploitation, and DOPA seems a causally primary but normatively secondary wrong. Actually, the view that exploitation should be defined in purely distributive terms is questioned, and it is argued that distributive approaches are at best incomplete, and a notion of power, or dominance, is necessary to define exploitation.

Although this paper does not aim to provide a full-fledged alternative to Roemer's theory, in the rest of this section some lines for further research are briefly discussed, which lead beyond a distributive conception of exploitation. A particularly interesting approach, proposed (in slightly different versions) by various scholars, defines exploitation as involving both the outcome *and* the structure of the interaction between agents. For example, according to Warren (1997: 63), 'exploitation involves inequality on both ends of exchange: inequality defining the context of the exchange (that is, [DOPA]) and inequality defining the outcome (that is, unequal performance of labor)'. In this perspective, 'it is not unequal power itself that is supposed objectionable, but rather the fact that one person gains unjustly through the exercise of power (whether coercive or uncoercive) over another' (ibid.: 62). From a positive viewpoint, this approach allows for a more complex, and arguably more satisfactory account of the causal relation between DOPA – and the associated unequal power – and the unequal exchanges to which it gives rise. Thus, exploitation diagnoses the process through which 'certain inequalities in incomes are generated by inequalities in rights and powers over productive resources: the inequalities occur, in part at least, through the ways in which the exploiters, by virtue of their exclusionary rights and powers over resources, are able to appropriate labour effort of the exploited' (Wright, 2000: 1563).

From a normative viewpoint, unlike in Roemer's theory, this approach allows for the 'distinction between exploitation and the conditions of exploitation' (Warren, 1997: 56).²⁹ Hence asset inequalities are questionable because they create the exploitive conditions necessary for the transfer of labour to occur, that

is, for the asymmetric relations of power that control over productive assets brings. So, even if DOPA arises in morally unobjectionable ways, this does not mean that the wage relation is not exploitive. ‘Even if one did not unfairly create a situation in which one has greater economic power ..., it might still be objected that it is wrong to take advantage of such a situation’ (ibid.: 66). This provides a rationale for the claim that the socialisation of assets is not just one of the possible means to reach an egalitarian allocation. It is an essential ingredient to eradicate exploitation by removing ‘the leverage that ownership of means of production gives owners over nonowners’ (Reiman, 1987: 29), independently of how DOPA was created. This kind of leverage is different from domination in the workplace, but also from coercion in the protection of property rights, as it would obtain even if all agents respected property rights willingly.

These proposals have not yet attained a degree of mathematical rigour comparable with Roemer’s theory, and this is probably due to the difficulty of modelling power, or dominance, within exploitive relations. Consistently with the methodological discussion in section 2 above, however, it is possible to indicate two formal approaches, within a broadly defined neoclassical tradition, that may be worth exploring. The first approach, already mentioned in section 2, is the theory of contested exchange proposed by Bowles and Gintis (1990), given its emphasis on contractual incompleteness and conflicts of interests between parties. Another approach that seems particularly promising in the light of the analysis of this paper, is the *property rights theory of the firm* (Hart, 1995). Given its concern with power and the emphasis on the role of physical assets in explaining hierarchical relations and the existence of firms, the property rights approach may

provide an interesting analytical and theoretical framework to analyse exploitive relations which goes beyond purely distributive views and is consistent with the idea that asset inequalities are causally primary, but normatively secondary.

To abandon a purely distributive perspective may lead to assign a more limited scope to exploitation theory, and this may be considered as a shortcoming. Some authors already deem Roemer's theory insufficiently general because it is insensitive to non-class forms of exploitation, such as gender disadvantage (Jacobs, 1996); or 'job exploitation' – unequal material advantages between employed and unemployed workers (van Parijs, 1986). If exploitation theory is understood as a general theory of justice, as Roemer himself sometimes seems to suggest (e.g., Roemer, 1988: 134), these objections may be relevant. They are less persuasive if exploitation is seen as one, albeit a central one, of the wrongs that may characterise economic relations. To say 'that all forms of injustice are forms of exploitation is not to gain insight but to lose a word' (Kymlicka, 2002: 184).

APPENDIX 1: PROOFS OF FORMAL RESULTS

In order to prove Theorems 1-3, some preliminary results must be established. First, it is immediate to show that, under Assumption 1, at the solution to MP_ν , the revenue constraint (1) binds, for all ν, t . Next, Lemma 1 proves that at an IRS, the profit rate is nonnegative and the wealth constraint (2) binds at all t for all agents who work at the solution to MP_ν .

LEMMA 1. *Let (p, w) be an IRS for $E(\Omega_0)$. Then $\pi_t \geq 0$, all t . Furthermore, if $\pi_t > 0$, all t , then $p_t A(x_t^\nu + y_t^\nu) = W_t^\nu$, all t , for all ν such that $\Lambda^\nu > 0$.*

Proof. If $\pi_t < 0$, some t , then individual optimisation implies $x_t^\nu + y_t^\nu = 0$, all ν , contradicting Definition 1(ii), given $b > 0$. Next, if $\pi_t > 0$, all t , but $p_t A(x_t^\nu + y_t^\nu) < p_t \omega_t^\nu$, some t , then it is possible to increase y_t^ν thus making the net revenue constraint slack at t without increasing Λ_t^ν , which contradicts individual optimisation. ■

Lemma 2 proves a necessary condition for a price vector to be an IRS.

LEMMA 2. *At an IRS for $E(\Omega_0)$ with $\pi_t > 0$, all t , $\dot{p}_t = (\rho - \pi_t)p_t$, all t .*

Proof. Consider agent ν who works at the optimum. (The existence of such ν is guaranteed by Definition 1(ii), noting that $b > 0$.) Because constraints (1) and (2) bind, MP_ν can be reduced as follows.

$$(MP_\nu) \min_{\xi^\nu} \int_0^T e^{-\rho t} \Lambda_t^\nu dt,$$

$$\text{subject to:} \quad \dot{\omega}_t^\nu = \pi_t \omega_t^\nu + (\Lambda_t^\nu / p_t) - b, \tag{A1}$$

$$\omega_T^\nu \geq \omega_0^\nu, \omega_t^\nu \geq 0, \text{ and } \Lambda_t^\nu \leq 1, \text{ all } t, \text{ and for a given } \omega_0^\nu.$$

The Hamiltonian of MP_ν is $H = e^{-\rho t} \Lambda_t^\nu + \mu_t [\pi_t \omega_t^\nu + (\Lambda_t^\nu / p_t) - b - \dot{\omega}_t^\nu]$ and the first order conditions are (A1) and

$$e^{-\rho t} = \mu_t / p_t, \quad (\text{A2})$$

$$\dot{\mu}_t = -\mu_t \pi_t. \quad (\text{A3})$$

Differentiating (A2) with respect to t and using (A3) gives the desired result. ■

Remark: If $1 \geq p_t b - \pi_t p_t \omega_t^\nu \geq 0$ all t , standard results in dynamic optimisation guarantee that the first order conditions are also sufficient.

Proof of Theorem 1. At an IRS, $\Lambda_t^\nu = \max \{0, p_t b - \pi_t p_t \omega_t^\nu\}$, all t, ν , and thus at any t , $\Lambda_t^\nu = \lambda b$ if and only if $W_t^\nu = W_t^*$. By the strict monotonicity of Λ_t^ν in W_t^ν , at all t , it follows that $\Lambda_t^\nu > \lambda b$ if and only if $W_t^\nu < W_t^*$ and $\Lambda_t^\nu < \lambda b$ if and only if $W_t^\nu > W_t^*$. But then the result follows immediately by noting that at an IRS, if $W_0^\nu = W_0^*$ then $W_t^\nu = W_t^*$, all t , if $W_0^\nu > W_0^*$ then $W_t^\nu > W_t^*$, all t , and if $W_0^\nu < W_0^*$ then $W_t^\nu < W_t^*$, all t . ■

Proof of Theorem 2. Part (i). At all t , let $W'_t = p_t A(1 - A)^{-1} b$. As in Roemer (1982a, Appendix 2.1), it is possible to prove that at an IRS at all t : $C_t^1 = \{\nu \in N: W_t^\nu \geq (p_t b) / \pi_t\}$, $C_t^2 = \{\nu \in N: (p_t b) / \pi_t > W_t^\nu > W'_t\}$, $C_t^3 = \{\nu \in N: W_t^\nu = W'_t\}$, $C_t^4 = \{\nu \in N: W'_t > W_t^\nu > 0\}$, and $C_t^5 = \{\nu \in N: W_t^\nu = 0\}$.

Part (ii). First, it is immediate to prove that at an IRS, $\nu \in C_t^j$, all t , if and only if $\nu \in C^j, j \in \{1, 5\}$. Next, consider classes $j = 2, 3, 4$. At an IRS, $W_0^\nu < W'_0$ implies $W_t^\nu < W'_t$, all t , $W_0^\nu = W'_0$ implies $W_t^\nu = W'_t$, all t , and $W_0^\nu > W'_0$ implies $W_t^\nu > W'_t$, all t , but then the result follows by part (i).

Part (iii). It follows by part (ii) and Theorem 1, noting that $W_t^* = W_t^v$, all t . ■

Remark: The assumption $W_0^v \neq (p_0 b)/\pi_0$, all v , is only to rule out the nongeneric case of agent v with $v \in C_0^1$ but $v \in C_t^2$, all $t, t > 0$, at an IRS with $\pi_0 > \rho$.

Proof of Theorem 3. Part (i). At an IRS, $\Lambda_t^v = p_t b - \pi_t p_t \omega_0^v$, all t , and all $v \in C^1$.

Differentiating the latter expression with respect to time, one obtains $\dot{\Lambda}_t^v = \dot{p}_t b - \dot{\pi}_t p_t \omega_0^v - \pi_t \dot{p}_t \omega_0^v$, all t, v , which can also be written as $\dot{\Lambda}_t^v = \dot{p}_t [b - (L/p_t A) \omega_0^v - \pi_t \omega_0^v]$, all t, v . The result follows noting that by Lemma 2 $\dot{p}_t < 0$, all t , and the sign of the square brackets is equal to the sign of $W_0^* - W_0^v$.

Part (ii). Using the definition of π_t into the condition in Lemma 2, noting that $\rho = 0$, it follows that $\dot{p}_t = -p_t(1 - A)A^{-1} + LA^{-1}$, and the only dynamically stable steady state of the latter equation is $p_t = \lambda$. Then the result follows noting that if $T \rightarrow \infty$, then $p_t \rightarrow \lambda$ implies $C^1 = \emptyset$. ■

APPENDIX 2: EXISTENCE OF AN IRS

In this appendix, the existence of an IRS is proved for economies with initial capital $\omega_0 = \omega^* \equiv A(1 - A)^{-1}Nb$: ω^* is the minimum aggregate amount of capital necessary for a RS to exist. This is arguably the theoretically relevant case: if the RS is interpreted as a steady state, as in Roemer (1982a, 1988), then given the subsistence assumption, it is legitimate to assume that total capital in the economy is exactly equal to the amount necessary for reproduction. Furthermore, the case $\omega_0 = \omega^*$ represents the strongest form of capital scarcity. Let $\pi^m = (1 - A)A^{-1}$: by assumption, $\pi^m > 0$ and it is possible to define the interval $D = [0, \pi^m)$.

LEMMA 3: Let $\lambda b < 1$. Let $p = (1 + \pi)pA - L$. There exists a $\pi^* \in \mathcal{R}_+$ such that $0 \leq pb - \pi\omega^v \leq 1$, all v , for all $\pi \in [0, \pi^*] \subset D$

Proof. Let $h^v(\pi) \equiv pb - \pi\omega^v$: $h^v(\pi)$ is a continuous function and $h^v(0) = \lambda b$, all v .

Since $0 < \lambda b < 1$ then there is a largest interval $[0, \pi^*]$ such that if $\pi \in [0, \pi^*]$ then $0 \leq h^v(\pi) \leq 1$, all v . ■

It is now possible to prove the existence of an IRS.

THEOREM A.1: Let $\omega_0 = \omega^*$ and $\lambda b < 1$. Let π^* be defined as in Lemma 3. (i) Let p_ρ solve $p_\rho = (1 + \rho)p_\rho A - L$. If $\pi^* \geq \rho > 0$, then the vector (p, w) such that $w_t = 1$, $\pi_t = \rho$, and $p_t = p_\rho$, all t , is an IRS for $E(\Omega_0)$. (ii) If $\rho = 0$, then for all $\pi_0 \in [0, \pi^*]$ and associated $p_0 = (1 + \pi_0)p_0 A - L$, the vector (p, w) determined by $w_t = 1$, $\dot{p}_t = -\pi_t p_t$, and $p_t = (1 + \pi_t)p_t A - L$, all t , is an IRS for $E(\Omega_0)$.

Proof. Part (i). 1. Since $\pi_t = \rho$ and $p_t = p_\rho$, all t , by construction $0 \leq p_t b - \pi_t \omega^v \leq$

1 , all t, v , and $\dot{p}_t = (\rho - \pi_t)p_t = 0$, all t . Then, by Lemma 2, it is immediate to prove that the set $O^v(p, w) = \{\xi^v \geq 0 \mid \omega_t^v = \omega_0^v, Lx_t^v + z_t^v = p_t b - \pi_t p_t \omega^v$, and $p_t A(x_t^v + y_t^v) = p_t \omega^v$, all $t\}$ solves MP_v , for all v .

2. By choosing $\xi^v \in O^v(p, w)$ for all v , conditions (i) and (v) of Definition 2 are satisfied. Summing over v , one obtains $A(x_t + y_t) = \omega^*$, all t , and $x_t + y_t = (1 - A)^{-1}Nb$, all t , so that conditions (ii) and (iii) are also satisfied. Finally, by summing the agents' revenue constraints it follows that $z_t - Ly_t = 0$, all t .

Part (ii). The proof is as in Part (i), noting that $\pi_t \in [0, \pi^*]$, all t . The latter result in turn follows noting that $\pi_0 \geq 0$ implies $p_t \geq \lambda$ and $\pi_t \geq 0$, all t , and for any $\pi_t \in [0, \pi^*]$, $\dot{\pi}_t \leq 0$, all t . ■

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¹ In a section devoted to ‘Ethical Issues’, the Investigation Committee on the clinical trial of the drug ‘Trovan’ conducted by Pfizer in 1996 in Kano (Nigeria) argue that ‘Compensations to the participants were minimal or non existent, as such a clear case of exploitation of the ignorant was established’ (Federal Ministry of Health of Nigeria, 2001: 88).

² For a review of some of the debates in exploitation theory, see Nielsen and Ware (1997).

³ See Roemer (1982a). The subsistence model is analysed thoroughly in section 3 below. For a more detailed informal exposition, see Roemer (1988) and Mayer (1994).

⁴ Actually, UE exploitation (but not classes) emerges in a precapitalist subsistence economy in which agents only trade physical goods, inputs and outputs (Roemer, 1982a, Chp.1).

⁵ The same conclusion holds, in a more general setting, if agents are identical but labour supply is inelastic with respect to wealth at equilibrium prices (see Roemer, 1985, 1986).

⁶ The notion of improvement may refer to some objective measure of well-being and does not necessarily entail the adoption of subjective moral criteria. For a discussion of subjectivist and objectivist approaches in normative theory, see Roemer and Veneziani (2004).

⁷ The PR approach can be extended to other forms of exploitation by focusing on other types of endowments an agent may have (see, e.g., Roemer, 1982a, Chp.7). For example, *feudal exploitation* derives from an unequal distribution of feudal privileges, whereas *socialist exploitation* is due to an unequal distribution of inalienable assets, such as skills.

⁸ A similar approach is adopted by Veneziani (2005). In this paper, however, a continuous time setting is adopted, which provides a neater framework of analysis. Furthermore, unlike in Veneziani (2005), this paper explicitly analyses the crucial role of time preference.

⁹ For a thorough analysis of ‘Rational Choice Marxism’, see Veneziani (2008).

¹⁰ See also Dymski and Elliott (1989b) and Ripstein (1989). An interesting discussion of the limits of formal models in critical social theory is in Mayer (1994) and Levine (2003).

¹¹ See, e.g., Anderson and Thompson (1988), Mandel (1989), Wood (1989), Hunt (1992).

¹² For a detailed methodological discussion, see Veneziani (2008).

¹³ Yoshihara (1998) provides an interesting synthesis of Roemer’s approach and of Bowles and Gintis’ (1990) theory of contested exchange.

¹⁴ See Reiman (1987), Anderson and Thompson (1988), Lebowitz (1988), Dymski and Elliott (1989a,b), Devine and Dymski (1991), Schwartz (1995a), Diquattro (1998).

¹⁵ See also Anderson and Thompson (1988), Dymski and Elliott (1989a,b), and Wood (1989).

¹⁶ See also Howard and King (1989: 397ff), and Devine and Dymski (1991: 236).

¹⁷ See, for instance, Devine and Dymski (1991), even though their analysis is not entirely compelling because they do not model the behaviour of capitalists. See Roemer (1992).

¹⁸ A one-good economy is analysed only to avoid a substantial number of technicalities. However, both the statements and the proofs of the main results are formulated so as to suggest the direction for generalising the model to the n -good case.

¹⁹ The index k is not included in order to avoid notational confusion.

²⁰ The proofs of all formal results are in the appendix.

²¹ See Wright (1982), Hunt (1986), Anderson and Thompson (1988), Dymski and Elliott (1989a,b), and Devine and Dymski (1991).

²² A similar view is proposed by Schwartz (1995b: 175ff).

²³ It is telling that, contrary to his theoretical claims, in his verbal descriptions Roemer often evokes the notions of power or force (e.g., Roemer, 1982a: 81; 1982b: 278; 1989a: 383).

²⁴ A similar point is made by van Parijs (1986: 476, fn.11) and Buchanan (1987: 129).

²⁵ Actually, Roemer has proposed a number of slightly different versions of conditions (i) to (iii), but the distinctions are not relevant for the main thread of the argument. For a discussion, see, e.g., Mayer (1994) and Kymlicka (2002).

²⁶ Wright (1982: 328) also argues that according to (i)-(ii)-(iii), prison wardens exploit prisoners.

²⁷ Various authors have actually questioned the theoretical relevance of Roemer's examples, which often contain insufficient information to draw any firm conclusions – as acknowledged by Roemer himself (Roemer, 1989b) – or theoretically doubtful assumptions, such as radically heterogeneous preferences. See, e.g., Mayer (1994: 116-7) and Schwartz (1995a: 295).

²⁸ See also Sensat (1984), Reiman (1987), Foley (1989), Wolff (1999), and Wood (1995, 2004).

²⁹ See also Reiman (1987: 26; 1989: 311-2, 318) and Schwartz (1995b: 166-8, 174).