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The social architecture of capitalism

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Abstract

A dynamic model of the social relations between workers and capitalists is introduced. The model self-organises into a dynamic equilibrium with statistical properties that are in close qualitative and in many cases quantitative agreement with a broad range of known empirical distributions of developed capitalism, including the power-law firm size distribution, the Laplace firm and GDP growth distribution, the lognormal firm demises distribution, the exponential recession duration distribution, the lognormal–Pareto income distribution, and the gamma-like firm rate-of-profit distribution. Normally these distributions are studied in isolation, but this model unifies and connects them within a single causal framework. The model also generates business cycle phenomena, including fluctuating wage and profit shares in national income about values consistent with empirical studies. The generation of an approximately lognormal–Pareto income distribution and an exponential–Pareto wealth distribution demonstrates that the power-law regime of the income distribution can be explained by an additive process on a power-law network that models the social relation between employers and employees organised in firms, rather than a multiplicative process that models returns to investment in financial markets. A testable consequence of the model is the conjecture that the rate-of-profit distribution is consistent with a parameter-mix of a ratio of normal variates with means and variances that depend on a firm size parameter that is distributed according to a power-law.

Keywords: Econophysics; Macroeconomics; Economic distributions

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1. Introduction

The dominant social relation of production within capitalism is that between capitalists and workers. A small class of capitalists employ a large class of workers organized within firms of various sizes that produce goods and services for sale in the marketplace. Under normal circumstances capitalist owners of firms collect revenue and workers receive a share of the revenue in the form of wages.

Over the last hundred years or more the number and type of material objects and services processed by capitalist economies have significantly changed, but the social relations of production have not. Marx [1] proposed the distinction between the forces of production and the social relations of production to convey this idea. The existence of a social relationship between a class of capitalists and a class of workers mediated by wages and profits is an invariant feature of capitalism, whereas the types of objects and activities subsumed under this social relationship is not.

The social relations of production constitute an abstract, but nevertheless real, enduring social architecture that constrains and enables the space of possible economic interactions. These social constraints are distinct from any natural or technical constraints, such as those due to scarcities or current production techniques. Therefore, unlike many economic models that theorise relations of utility between economic actors and scarce commodity types (i.e., actor to object relations studied under the rubric of neo-classical economics), or theorise relations of technical dependence between material inputs and outputs (i.e., object to object relations studied under the rubric of neo-Ricardian economics) the model developed here entirely abstracts from these relations and instead theorises relations of social dependence mediated by value (i.e., actor to actor relations, arguably a defining feature of Marxist economics). The model ontology is therefore quite sparse, consisting solely of actors and money. The aim is to concentrate as far as possible on the economic consequences of the social relations of production alone, that is on the enduring social architecture, rather than particular and perhaps transitory economic mechanisms, such as particular markets, commodity types and industries. As the worker–capitalist relation is dominant in developed capitalism the model abstracts from land, rent, states and banking. There are important causal relationships between the forces and relations of production, but in this paper they are ignored.

In what follows a dynamic, computational model of the social architecture of capitalism is defined and a preliminary analysis given. It replicates some important empirical features of modern capitalism.

2. A dynamic model of the social relations of production

The elements of the model are a set of N economic actors (labelled $1, \ldots, N$). Each actor i at time t holds a non-negative endowment of paper money, $m_i(t) \in \mathbb{R}^+$, measured in 'coins'. Mechanisms that alter the money supply are ignored and therefore the total money in the economy is a finite constant M, such that $\sum_{i=1}^{N} m_i(t) = M$. Each actor i has an integer *employer index*, $0 \leqslant e_i(t) \leqslant N$ and $e_i(t) \neq i$,