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Financialization, Household Credit and
Economic Slowdown in the U.S.

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Financialization, Household Credit and Economic Slowdown in the U.S.

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Abstract

Three important features of the U.S. economy during the neoliberal era since the mid-1970s have been: (a) growing financialization, (b) increasing household debt, and (c) stagnant real wages for production and nonsupervisory workers. This paper develops a discrete-time Marxian circuit of capital model to analyze the links between these three features and economic slowdown. The discrete-time model is used to address two important theoretical issues of general interest to the heterodox economic tradition: profit-led versus wage-led growth, and the growth-reducing impact of non-production credit. First, it is demonstrated that both profit-led and wage-led growth regimes can be accommodated within the Marxian circuit of capital model. Second, it is demonstrated that the steady-state growth rate of a capitalist economy is negatively related to the share of consumption credit in total net credit, when the total credit is large to begin with. Bringing these two results together, the paper demonstrates that the three characteristics of the U.S economy under neoliberalism can have a growth-reducing impact on a capitalist economy. Hence, this paper offers a novel explanation, rooted in Marx's analysis of the circuits of capital, of the slowdown of the U.S. economy during the neoliberal period.

JEL Codes: B51, E11, O40.
Keywords: financialization, nonproduction credit, circuit of capital, economic growth.

1 Introduction

Between 1948 and 1973, real GDP for the U.S. (measured in 2005 chained dollars) economy grew at a compound annual average rate of about 3.98 percent per annum; between 1973 and 2010, the
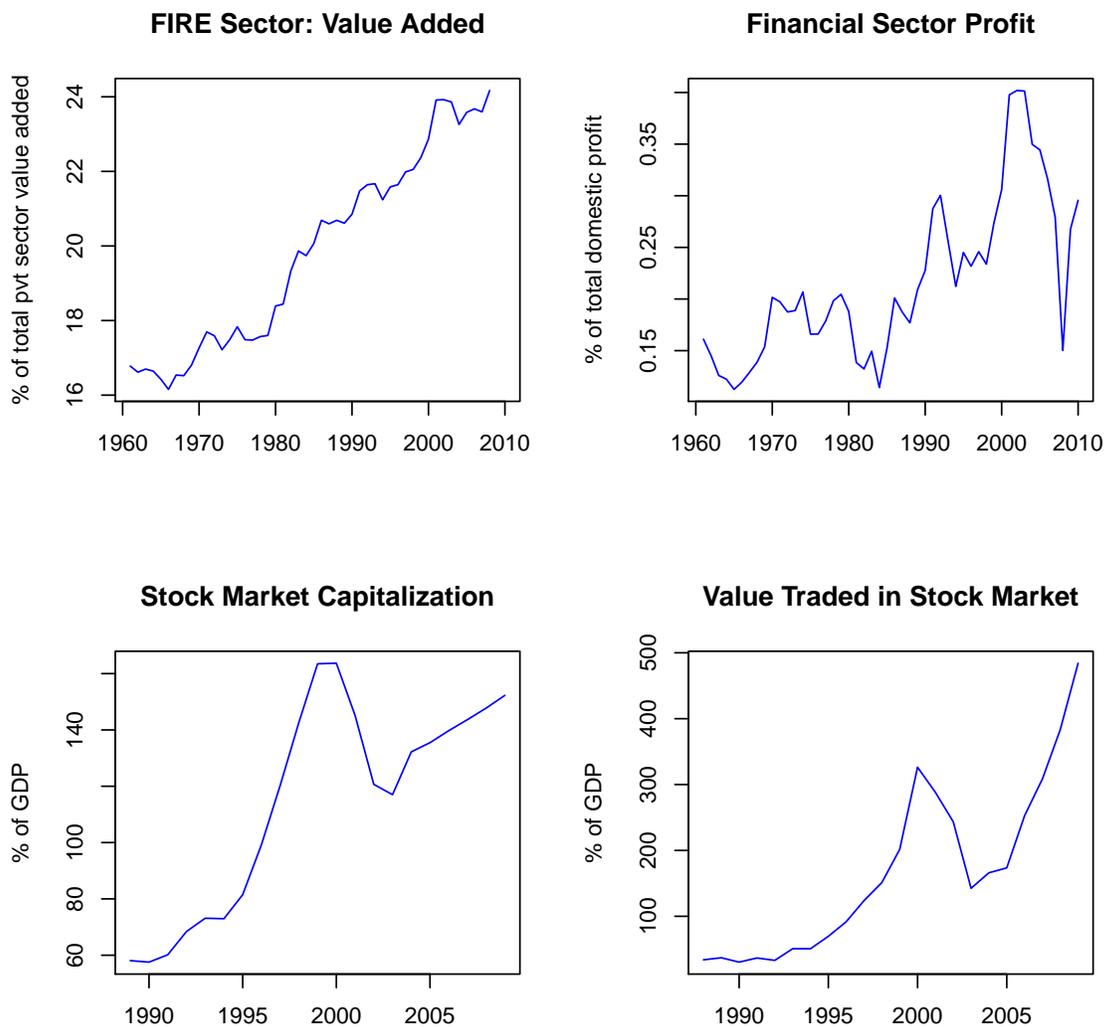
corresponding growth rate was only 2.72 per cent per annum. While the 25 year period of high growth after the Second World War has, with some justification, earned the epithet of the "Golden Age" of capitalism, the period of relative stagnation since the mid-1970s has been characterized by heterodox economists as a neoliberal capitalist regime (Duménil and Lévy, 2004, 2011; Harvey, 2005; Kotz, 2009).

Three characteristics of neoliberal capitalism have attracted lot of scholarly attention. First is the marked trend towards growing financialization of the economy, by which is meant a growing weight of financial activities in the aggregate economy. Figure 1 presents some well-known evidence, for the period 1961-2010, in support of this claim. The top left panel plots the share of value added that is contributed by the FIRE (finance, insurance and real estate) sector in the value added by the total private sector of the U.S. economy: between 1961 and 2008, the contribution of the FIRE sector increased steadily from about 16 per cent to roughly 25 percent. The top right panel gives the share of financial sector profit in total domestic profit income in the U.S. economy, which shows a steady increase since the early 1970s (interrupted briefly in the early 1980s). It is only during the financial crisis in 2007-2008 that this share declined for a brief period; it is noteworthy that the share started a rapid ascent in 2009, and has recovered much of its loss since then. The two figures in the bottom panel provide evidence, for the period 1988-2009, of the growing size of the stock market: both stock market capitalization and total value traded, as a proportion of nominal GDP, has trended up since the late 1980s, providing clear evidence of the growth of financial relative to real activity.

The second notable characteristic of the neoliberal regime has been the veritable explosion of the flow of credit (and the build-up of the stock of debt) in the economy. One important dimension of the growth of credit has been the unprecedented increase in the credit flowing to (working class) households. Figure 2 presents evidence in support of both these claims by plotting the time series of outstanding debt (measured as total credit market liabilities) of three crucial sector of the U.S. economy:the nonfinancial business sector, the household sector, and financial business sector. While the business sectors display an increasing trend since the early 1960s (along with large fluctuations at business cycle frequencies), the household sector debt starts a secular rise since the early 1980s (with almost no business cycle fluctuations), and the financial business sector also displays a secular rise till the onset of the Great Recession. The last chart in Figure 2 plots the time series of the ratio of outstanding household debt and outstanding debt of the nonfinancial business sector. The ratio shows a clear upward trend since the mid-1970s, with household debt increasing from about 85 percent of nonfinancial business debt in the mid-1970s to about 140 percent just prior to the start of the Great Recession.

The third important characteristic of neoliberal capitalism has been stagnation of real wages for the bulk of the working class. In the face of rising productivity, this has entailed a massive redistribution of income away from working class households, leading to widening income and wealth inequality. Figure 3 presents evidence in support of this claim. The top panel plots an index of productivity (measured real output per hour) in the total nonfarm business sector of the U.S. economy. There is an increasing trend in productivity over time, with a marked acceleration in growth since the mid-1990s. This is in sharp contrast to the evolution of real wages of production and nonsupervisory workers plotted in the bottom panel, who comprise about 80 percent of the

FIRE Sector: Value Added

Financial Sector Profit

Stock Market Capitalization

Value Traded in Stock Market

Figure 1: *Growing Financialization of the U.S. Economy, 1961-2010. The top panel gives the share of the financial sector in total domestic profit income; the bottom panel gives the market capitalization (left) and total value of trades (right) as a proportion of GDP. (Source: NIPA Table 6.16B-D for the top right panel, Annual Industry Accounts of the BEA for the top left panel, and World Bank Financial Structure data set for the bottom panel.)*
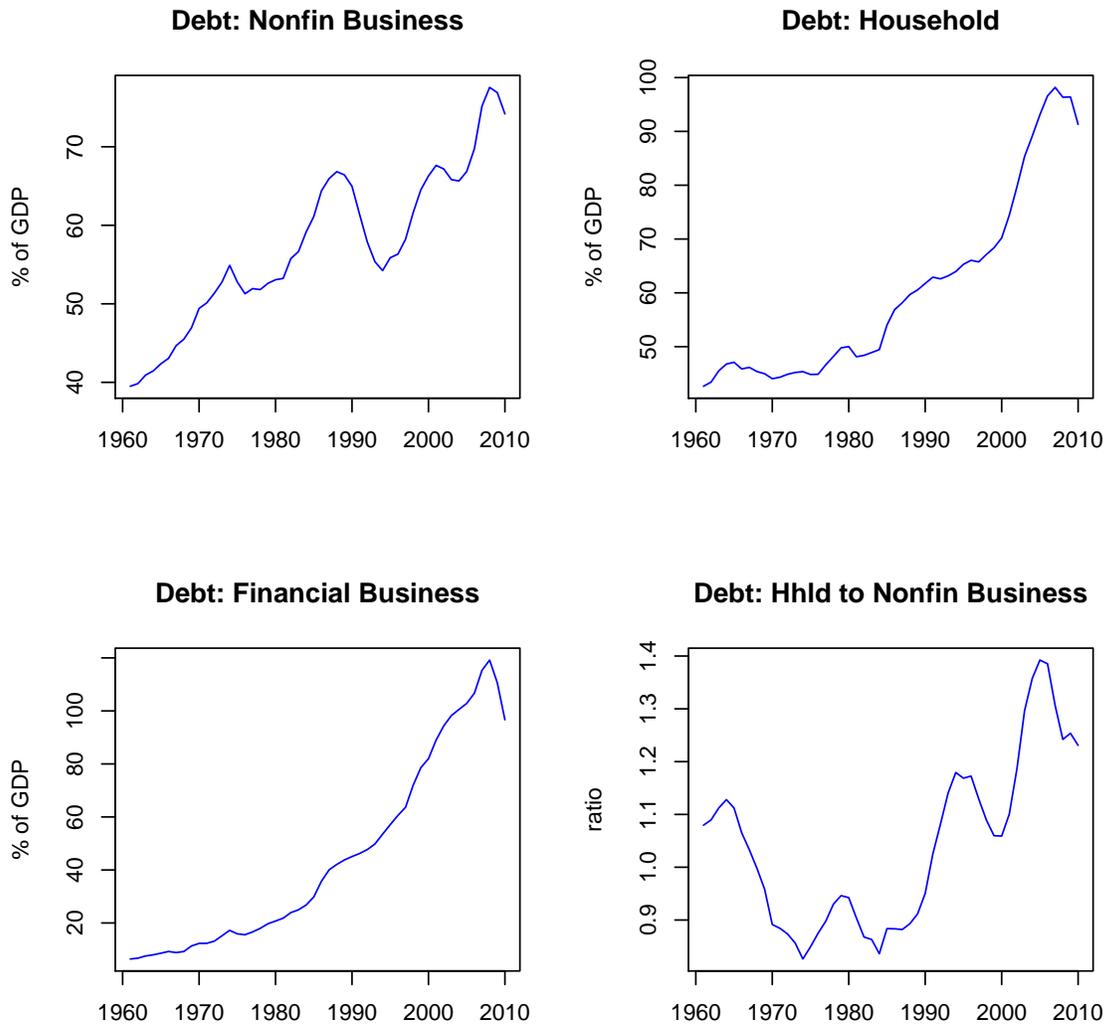
Figure 2: *Growing Debt Levels in the U.S. Economy, 1961-2010. Debt of each sector is measured by total credit market liabilities outstanding. (Source: Flow of Funds Accounts of the United States.)*

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U.S. workforce. The hourly real wage has barely increased between the early 1970s and the late 2000s; the weekly real wage has in fact declined during this period.

The main question that this paper wishes to explore is the possible connections between the slowdown in economic growth on the one hand and the three characteristics of neoliberal capitalism on the other? Heterodox economists have been interested in this question for at least the last three decades, and the main contribution of this paper is to extend that literature by presenting a theoretical model to address this question. Building on and extending Foley (1982, 1986a), this paper develops a discrete-time Marxian circuit of capital model to analyze the link between financialization, nonproduction credit and economic growth. It is demonstrated that increasing financialization and the growth of household credit (a component of nonproduction credit) can reduce the growth rate of a capitalist economy. Hence, this paper offers a novel explanation, rooted in a Marxian circuit of capital macroeconomic analysis, for the slowdown of the U.S. economy during the neoliberal era.

The rest of the paper is organized as follows. Section 2 introduces the Marxian circuit of capital model and offers a discussion of one of the crucial conceptual innovation of the model: time lag structures. Section 3 sets up and solves the baseline model (i.e., model without aggregate demand considerations). Section 4 extends the baseline model by explicitly incorporating aggregate demand; a classic "realization problem" result is proved here. Section 5 presents the main results of the paper about wage-led versus profit-led growth regimes, and the growth-reducing impact of nonproduction credit; these results are then used to answer the motivating question behind the paper. The last section concludes the discussion with three policy recommendations.

2   Circuit of Capital

The determining motive of capitalist production is profit. In Volume I of *Capital*, Marx provided a consistent explanation of the phenomenon of profit, at the aggregate level, as arising from the exploitation of the working class by capitalists through the institution of wage labour. To establish this path-breaking result, Marx borrowed, and further extended, the labour theory of value of classical political economy.

Marx demonstrated that the classical economists' category of value is nothing but objectified (socially necessary, abstract) labour, that value is expressed through the social device of money (so that money is intrinsic to commodity production) and that capital is self-valorizing value (Marx, 1992). Capital, self-expanding value, was represented by Marx as:

$$M - -C \cdots (P) \cdots C' - -M'. \tag{1}$$

In this well-known formula, M represents the sum of money that a capitalist enterprise commits to the process of production by purchasing commodities C. C is composed of two very different kinds of commodities, labour power and the means of production. These are brought together in the process of production, represented by P, which leads, after a period of time (the production time) to the emergence of finished products, C'. These commodities are then sold in the market for a sum of money $M' = M + \Delta M$, to not only recoup the original sum thrown into production but also a surplus ΔM, the proximate determinant of the whole process.

Productivity (Outpur per Hour): Non Farm Business
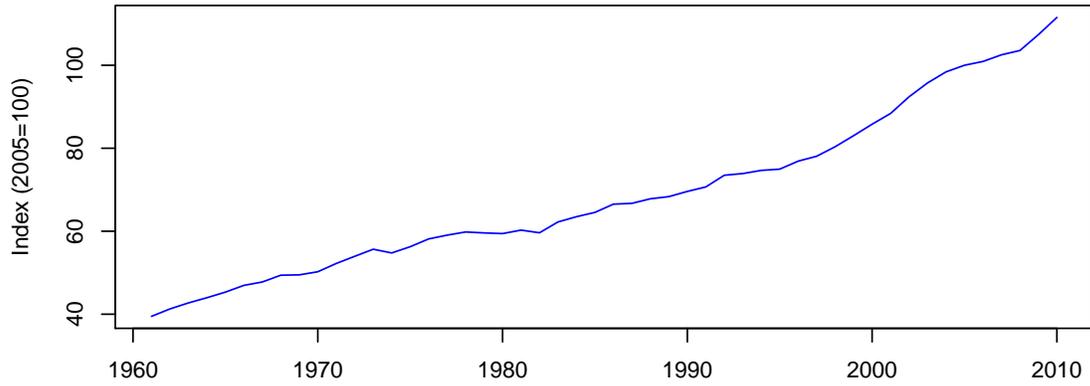
Hrly Wage: Prod & Nonsup Wrks
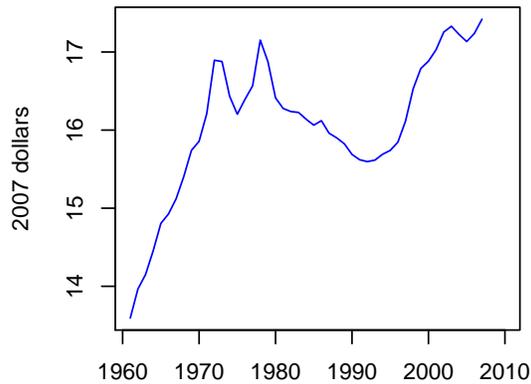
Wkly Wage: Prod & Nonsup Wrks
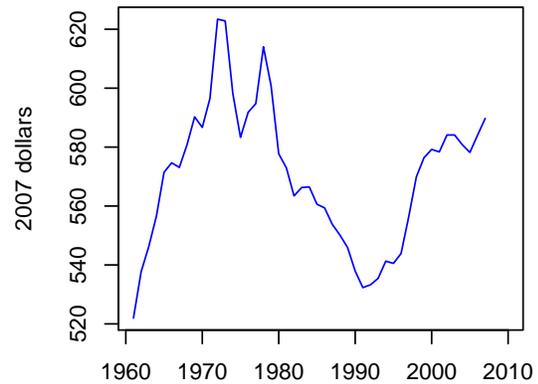
Figure 3: *Working Class Income in the U.S. Economy, 1961-2010. The top panel gives an index (2005=100) of output per hour for the nonfinancial business sector in the U.S.; the bottom panel gives the real (in 2007$) hourly (left) and weekly (right) wages of production and nonsupervisory workers in the U.S. (Source: Bureau of Labour Statistics.)*

Marx's analysis in Volume I of *Capital* (Marx, 1992) demonstrated that the secret of surplus value that leads to the self-expansion of capital is the exploitation of labour by capital. In Volume II of capital (Marx, 1993), he highlighted the fact that the process of self-valorization of capital can only complete itself by traversing a circular movement, during which value assumes and discards three different forms. Marx called this circular movement of value the circuit of capital, where

> ... capital appears as a value that passes through a sequence of connected and mutually determined transformations, a series of metamorphoses that form so many phases or stages of a total process. Two of these phases belong to the circulation sphere, one to the sphere of production. In each of these phases the capital value is to be found in a different form, corresponding to a special and different function. Within this movement the value advanced not only maintain itself, but it grows, increases its magnitude. Finally, in the concluding stage, it returns to the same form in which it appeared at the outset of the total process. This total process is therefore a circuit (Marx, 1993, pp. 133).

The two phases of circulation that Marx refers to are M–C and C'–M' in (1), which together with the process of production, P, comprise the circuit of capital. Hence, the flow of value that comprises the circuit can be broken up into three distinct phases (or stages):

1. the flow of capital outlays to start the production process, M–C;

2. the flow of finished commodities emerging from the process of production impregnated with surplus value, (P)–C'; and

3. the flow of sales, C'–M', which sets the stage for another round of capital outlays and production.

As a representation of the flow of value through the capitalist economy, the circuit of capital model highlights two crucial aspects of the self-expanding flow of value. First, it pays close attention to the forms that value assumes and discards, at different stages of the circuit, as it attempts to expand itself quantitatively (a dialectical interaction of quality and quantity). Second, it highlights the crucial aspect of turnover, of how the different forms of value complete their own circuits at different speeds and how capital re-creates its own conditions of existence and growth.

Attending carefully to the issue of aggregation, the circuit of capital model in Volume II of *Capital*, can be extended to an ensemble of capital or even the whole capitalist economy. The analytical move to construct a circuit of capital model for the aggregate economy involves dealing with at least two conceptual issues. The first issue that one needs to deal with is the cross sectional heterogeneity across capitalist enterprises. At any point in time, different individual capitalist enterprises would be at different stages of the three phases of their individual circuit.

> In so far as each of these circuits is considered as a particular form of the movement in which different individual industrial capitals are involved, this difference also exists throughout simply at the individual level. In reality, however, each individual industrial capital is involved in all the three [phases] at the same time. The three circuits,

the forms of reproduction of the three varieties of capital, are continuously executed alongside one another. One part of the capital value, for example, is transformed into money capital, while at the same time another part passes out of the production process into circulation as new commodity capital ... The reproduction of the capital in each of its forms and at each of its stages is just as continuous as is the metamorphosis of these forms and their successive passage through the three stages. Here, therefore, the entire circuit is the real unity of its three forms (Marx, 1993, pp. 181).

The issue of cross sectional heterogeneity can be dealt with by aggregating across individual circuits of capitals at any point in time over the three phases to arrive at corresponding aggregate flows:

1. the aggregate flow of capital outlays

2. the aggregate flow of finished commodities

3. the aggregate flow of sales.

The second issue is more subtle but also more important. As stressed by Marx in chapter 12–14 of the second volume of *Capital* (Marx, 1993), the process of production and circulation takes finite amounts of time, which can be termed production and circulation time respectively. The sum of the two is what Marx calls "turnover time":

...the movements of capital through the production sphere and the two phases of the circulation sphere are accomplished successively in time. The duration of its stay in the production sphere forms its production time, that in the circulation sphere its circulation time. The total amount of time it takes to describe its circuit is therefore equal to the sum of its production and circulation time (Marx, 1993, pp. 200).

Thus, for instance, a sum of money laid out as capital outlays will only emerge as finished products with a definite time lag; the finished products will be sold only with a definite time lag; and the sales revenue will be recommitted to production, once again, with a finite time lag. Thus, each of the three phases of the circuit come with its own time lag.

The existence of time lags have two important implications. First, they establish definite relationships between each of the flows (involved in the three phases of the circuit) over time. Second, non-zero time lags imply that at any point in time, there will be a build-up of stocks of value, in three different forms (corresponding to the three flows), in the economy: productive capital, commercial capital and financial capital.

It lies in the nature of the case, however, that the circuit itself determines that capital is tied up for certain intervals in particular sections of the cycle. In each of its phases industrial capital is tied to a specific form, as money capital, productive capital or commodity capital. Only after it has fulfilled the function corresponding to the particular form it is in does it receive the form in which it can enter a new phase of transformation (Marx, 1993, pp. 133).

Aggregating across individual capitalist enterprises at any point in time, we can arrive at the corresponding aggregate stocks of value:

1. the aggregate stock of productive capital (inventories of unfinished products, raw materials and undepreciated fixed assets);

2. the aggregate stock of commercial (or commodity) capital (inventories of finished products awaiting sales); and

3. the aggregate stock of financial capital (money and financial assets).

The circuit of capital model can, therefore, be conveniently represented as a circular flow of expanding value with three nodes (representing stocks of value) connected by three flows. Figure 4, drawn from Foley (1986b), is a graphical representation of the circuit. It is important to note that each element of the circuit of capital corresponds to observable quantities in real capitalist economies. While the flows of value in the circuit are recorded in the profit-loss statements of capitalist enterprises, the stocks are recorded in their balance sheets. This implies that a circuit of capital model can be empirically operationalized and used to study tendencies in "actually existing capitalism".

An elegant continuous-time formalization of Marx's analysis of the circuits of capital was developed in Foley (1982, 1986a). This model was empirically operationalized for the U.S. manufacturing sector in Alemi and Foley (1997) and has been used recently in dos Santos (2011) to study the impact of consumption credit on economic growth. Matthews (2000) develops an econometric model of the circuit of capital model. A different, but related, strand of the literature emerged from Kotz (1988, 1991), who used a circuit of capital model to analyze crisis tendencies within capitalist economies. Loranger (1989) used the circuit of capital model to offer a new perspective on inflation.

This paper builds on and extends the approach in Foley (1982, 1986a) by developing a discrete-time version of the circuit of capital model. In terms of theoretical developments, it is argued in this paper that the circuit of capital model offers a distinctive approach to analyzing macroeconomic behaviour of capitalist economies, which is different from both the neoclassical and Keynesian approaches. The neoclassical approach focuses on supply-side issues to the virtual neglect of demand-side factors; hence it is one-sided. The Keynesian approach restores the importance of demand-side issues within macroeconomics but, in turn, neglects the centrality of the profit-motive (the need for the generation and realization of surplus value) in driving the capitalist system. Hence, the Keynesian approach is one-sided too, because it overlooks the constraints that are imposed on the capitalist system due to the blind drive for surplus value even in the absence of aggregate demand problems. By transcending both kinds of one-sidedness, the Marxian circuit of capital model offers a distinctive framework for macroeconomic analysis of capitalist economies which accords centrality to the generation and circulation of surplus-value.

2.1 Time Lag Structure

One of the main conceptual innovations of the circuit of capital model is the time lag structures that attach to each of the three phases of the circuit. To conceptualize the time lag structures rigorously
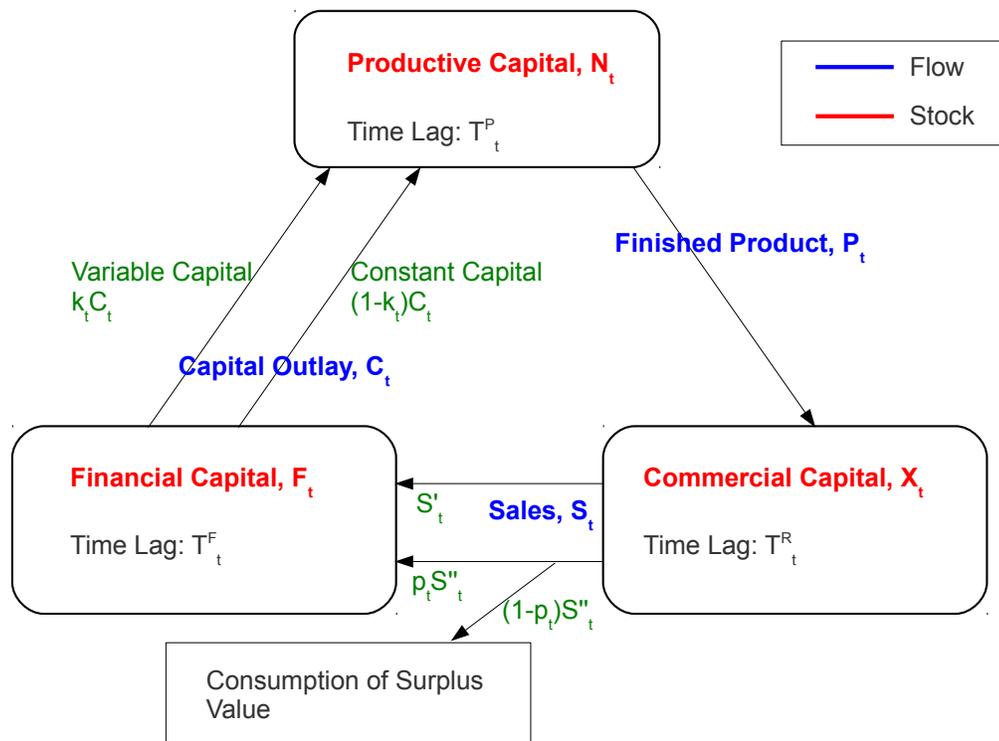
Figure 4: *The Circuit of Social Capital: A snapshot of the macroeconomy in period t, which shows the stocks of value at the beginning of the period, and the flows of value that occur within the period. (Source: Foley (1986b).)*

and to develop the rest of the argument in this paper, we will work in a discrete-time setting. The main reason to choose a discrete-time set-up over a continuous-time set-up, as in Foley (1982, 1986a), is that all economic variables are recorded only at discrete points in time. Since empirical operationalization of the Marxian circuit of capital model will need to work with discrete-time data, it seems analytically suitable to develop the model in a discrete-time set-up from the outset.

In a discrete-time setting, we can use a value emergence function (VEF) to capture the time lags involved in the different phases of the circuit of capital in the most general fashion. The VEF gives the time structure of emergence of value within the circuit of capital for value that has been injected into the circuit in some past time period. To fix ideas, suppose the process of injection of value occurred in period t'; then the most general form of a VEF would be the function $a_{t-t';t'}$, which represents the fraction of the injected value that emerges in the circuit $(t - t')$ periods later. Since all the value that was injected in period t' has to eventually emerge back into the circuit, we have

$$\sum_{t'=0}^{\infty} a_{t-t';t'} = 1. \tag{2}$$

There are four different ways to operationalize the VEF.

1. Fixed Time Lead (FTL): This is the simplest VEF, where value emerges after a fixed number of periods, T say, all at once;

2. Variable Time Lead (VTL): In this case we relax the assumption that the time structure of emergence is fixed across periods so that the value emerges, all at once as before, but after a variable number of periods, T_t say, i.e., value committed into the circuit in period t emerges T_t periods later;

3. Finite Distributed Lead (FDL): In this case we relax the assumption that the value emerges all at once (which, for instance, is clearly relevant to the case of investment in long-lived fixed assets); hence value emerges gradually but over a finite number of future periods.

4. Infinite Distributed Lead (IDL): This generalizes FDL further by allowing the injected value to emerge gradually over all future periods.[1]

Returning to (2), it is obvious that for FTL, $a_{T;t'} = 1$, and for VTL $a_{T_{t'};t'} = 1$ so that the sum in (2) will have only one term (the only difference being the time dependence of $T_{t'}$ in the case of VTL). For FDL and IDL, on the other hand, the sum will have a finite and infinite number of terms, respectively.

We can now use the VEF to conceptualize the time lag structures involved in the circuit of capital. Let us start by looking back, from the vantage point of period t, and consider value injections (capital outlays, say) t' periods ago. Let us denote this value injection into the circuit in period $(t - t')$ by $C_{t-t'}$. Now consider the VEF for period $(t - t')$, $a_{t';t-t'}$, which gives the fraction of value committed in period $(t - t')$ that emerges back into the circuit t' periods later, i.e., in period

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[1] Foley (1982) uses a continuous-time analog of the IDL-type VEF.

t. Hence, the product of the two, $a_{t';t-t'}C_{t-t'}$, represents the quantum of value emerging in period t due to value thrown into the circuit in period $(t-t')$. In the most general case, i.e., using a IDL type of VEF, the flow of value emerging in period t will be the result of values injected into the circuit in *all* past periods (because value emerges, with an IDL type of VEF, over an infinite number of future periods). If we denote the flow of value emerging in period t as P_t (flow of finished products, say), then

$$P_t = \sum_{t'=t}^{t'=\infty} a_{t';t-t'}C_{t-t'}. \tag{3}$$

It can be seen immediately that with a FDL type of VEF, the sum in (3) will only have a finite number of terms. With a FTL type of VEF, on the other hand, the sum would have only one term, giving us $P_t = C_{t-T}$; and with a VTL, we would have $P_t = C_{t-T_t}$ (the only difference being the time dependence of T_t with a VTL)[2].

While the IDL provides the most general mathematical way to formulate a VEF, in the sense of imposing least restrictions on the VEF, a FDL is conceptually sufficient for the analysis of value flows in capitalism. The only distinction between the IDL and the FDL is that the latter assumes the existence of a *finite number* of periods, no matter how large, at the end of which the relevant value emergence process has completed itself; the IDL assumes, on the contrary, that no such finite number exists.

Is the FDL restrictive? In the case of circulating capital, it is immediately obvious that an FDL is appropriate. In the case of fixed capital too, an FDL is appropriate. This because the distinction between fixed and circulating capital is only a matter of degree; for the former, the turnover time is a finite multiple of the turnover time for the latter. "The part of the capital value that is fixed in the means of labour circulates, just like any other part . . . the whole of the capital value is in constant circulation, and in this sense, therefore, all capital is circulating capital" (Marx, 1993, pp. 238). But then what is the distinction between fixed and circulating capital? According to Marx, the distinction resides in the different ways in which the two circulate.

> But the circulation of the part of the capital considered here [i.e., fixed capital] is a peculiar one. In the first place, it does not circulate in its use form. It is rather its value that circulates, and this does so gradually, bit by bit, in the degree to which it is transferred to the product that circulates as a commodity. A part of its value always remains fixed in it [i.e., in the means of labour that is the material expression of fixed capital] as long as it continues to function, and remains distinct from the commodities that it helps to produce. This peculiarity is what gives this part of constant capital the form of *fixed capital*. All other material components of the capital advanced in the production process, on the other hand, form, by contrast to it, circulating or *fluid capital* (Marx, 1993, pp. 238) (emphasis in original).

Thus, all capital is, from the perspective of circulation, circulating capital. But circulating capital transfers its value to the product in a finite number of periods; the value emergence process

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[2]Note that, in a discrete-time setting, a VEF is a probability mass function over the positive integers; in a continuous-time setting, it is a probability density function over the positive real line.

completes itself in a finite number of periods. Hence, an FDL-type VEF is conceptually sufficient to deal with the analysis of capitalism.[3]

But we can move one step further. Any FDL-type VEF is analytically equivalent to a VTL-type VEF. This is because it is always possible to represent the gradual emergence of value entailed by a FDL-type VEF with a all-at-once emergence entailed by a VTL, where the time lead in the VTL measures the "average" of the total (finite) number of periods for which a FDL-type VEF allows nonzero value emergence. Thus, if a general FDL-type VEF, $a_{i;t'}$, entails complete value emergence over the M periods following the injection into the circuit, then we can always find a number M' such that

$$M' = \frac{1}{M} \sum_{i=1}^{M} i \times a_{i;t'} \times \mathbb{1}_{[a_{i;t'} \neq 0]}, \tag{4}$$

where $\mathbb{1}_{[a_{i;t'} \neq 0]}$ represents an indicator function picking up the periods of nonzero value emergence between period $(t' + 1)$ and $(t' + M)$. Thus, the FDL-type VEF, $a_{i;t'}$ (with $i = 1, 2, \ldots, M$), is equivalent to the VTL with time lead M'. Therefore, a VTL-type VEF can be used to develop a Marxian circuit of capital model which, without sacrificing any of the analytical strengths of Foley (1982), comes with the tractability of Foley (1986b, chap. 5). The next section develops such a model.[4]

3 The Model without Aggregate Demand

3.1 Basic Set-up

The circuit of capital model, represented graphically in Figure 4, involves three flow variables: C_t, the flow of capital outlays; P_t, the flow of finished products; and S_t, the flow of sales. Assuming a VTL-type VEF underlying each of the three flows, we can posit T_t^P, T_t^R and T_t^F, to denote the production, realization and finance lags, respectively, in period t.[5]

The production lag of T_t^P periods mean that the flow of finished products in any period is equal to the flow of capital outlays T_t^P period ago:

$$P_t = C_{t-T_t^P}. \tag{5}$$

In a similar manner, the presence of the realization lag implies that the flow of sales in any period is equal to the flow of finished products T_t^R periods ago:

$$S_t = (1 + q_{t-T_t^R})P_{t-T_t^R}, \tag{6}$$

---

[3]A more sophisticated treatment of the depreciation of fixed capital might require some modification of FDL-type VEF; this is left for future research.

[4]The main difference of the model in this paper with the model in Foley (1986b, chap. 5) is that I use a VTL-type VEF while Foley (1986b, chap. 5) uses a FTL-type VEF. The VTL-type VEF allows the time lags to be endogenized but a FTL-type VEF does not. Hence, the former can be used to study out-of-steady-state behavior and the phenomenon of crisis, for which purpose the latter cannot be used.

[5]This section will rapidly go over the basic concepts related to the circuit of capital; for a more detailed exposition, see Foley (1986a).

where $q_{t-T_t^R}$ is the mark-up over cost in period $(t - T_t^R)$ arising from the exploitation of labour by capital.[6] The mark-up over cost is defined as the product of the rate of exploitation, e_t, and the share of capital outlays devoted to variable capital, k_t (see Foley, 1986b, chap. 2).

It is useful to break up the flow of sales into two parts

$$
\begin{aligned}
S_t &= (1 + q_{t-T_t^R})P_{t-T_t^R} \\
&= P_{t-T_t^R} + q_{t-T_t^R}P_{t-T_t^R} \\
&= S_t' + S_t'' \\
&= \frac{S_t}{1 + q_{t-T_t^R}} + \frac{q_{t-T_t^R} \times S_t}{1 + q_{t-T_t^R}}
\end{aligned}
$$

where S_t' is the flow of sales corresponding to the recovery of capital outlays, and S_t'' is the part of sales flow that corresponds to the realization of surplus value.

Capital outlays, in turn, are financed by the flow of past sales but only with a time lag, the finance lag, T_t^F; hence,

$$
C_t = S_{t-T_t^F}' + p_{t-T_t^F}S_{t-T_t^F}'', \tag{7}
$$

where T_t^F is the finance lag (the number of periods that is required for realized sales flows to be recommitted to production), and $p_{t-T_t^F}$ is the fraction of surplus value that is recommitted to production in period $(t - T_t^F)$, the rest being consumed by capitalist households, unproductive labour and the State.

Positive production, realization and finance lags imply that there will be build-up of stocks of value at any point in time. If N_t denotes the stock of productive capital in period t, then the accumulation (or decumulation) of the stock of productive capital will be given by

$$
\Delta N_{t+1} = N_{t+1} - N_t = C_t - P_t. \tag{8}
$$

Similar, letting X_t denote the stock of commercial capital, we will have

$$
\Delta X_{t+1} = X_{t+1} - X_t = P_t - \frac{S_t}{1 + q_t} = P_t - S_t'\left\{\frac{1 + q_{t-T_t^R}}{1 + q_t}\right\}. \tag{9}
$$

If F_t denotes the stock of financial capital in period t, then

$$
\Delta F_{t+1} = F_{t+1} - F_t = S_t' + p_tS_t'' - C_t. \tag{10}
$$

The basic circuit of capital model is defined by the six equations, (5) through (10), q_t, p_t and the three lags T_t^P, T_t^R, T_t^F being the parameters governing the behaviour of the system.

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[6]Surplus value is generated in production and realized through circulation. Thus, we could count the surplus value in the flow of finished commodities or in the flow of sales. In this paper, we have adopted the convention of valuing the flow of finished commodities *at cost*; hence, we account for the surplus value in the flow of sales, S_t.

3.2 Baseline Solution: Expanded Reproduction

On a steady state growth path, all the flow and stock variables of the circuit of capital model grow at the same rate and the parameters are constant over time. Thus, on a steady state growth path

$$p_t = p; q_t = q$$

and the three time lags are constant across time periods:

$$T^P_t = T^P; T^R_t = T^R; T^F_t = T^F.$$

What determines the rate of profit? How fast does such a system expand? Is the rate of expansion related to the exploitation of labour and the periodicity of the flow of value? These questions were analyzed by Marx in Part Two of Volume II of *Capital* and are presented here as

Proposition 1. *On a steady state growth path with time-invariant parameters, the system represented by (5) through (10), grows at the rate g given by*

$$g = \frac{pq}{T^F + T^R + T^P},$$

and the aggregate rate of profit is given by

$$r = \frac{q}{T^F + T^R + T^P},$$

so that the "Cambridge Equation" holds true: $g = p \times r$.

The proof appears in the Appendix but here let us note that this result is crucial for the Marxian understanding of capitalism. This is because it provides an intuitive explanation for the rate of profit in capitalism, arguably the most important variable governing the dynamics of the system.

The result shows clearly that the rate of profit rests on two factors, the rate at which surplus value is extracted from labour (captured by q), and the speed with which each atom of value traverses the circuit of capital (captured by what Marx termed the turnover time of capital, $T^F + T^R + T^P$). Social relations of production and class struggle impacts q through the rate of exploitation, e; technological factors relating to production impacts both q (through the proportion of capital outlays devoted to variable capital, k) and the production time lag T^P, and technological factors relating to circulation impacts the time lags, T^R and T^F. Thus, this formulation makes it clear that the rate of expansion of the system is directly impacted by the rate of profit, while the rate of profit, in turn, is affected by both social and technological factors.

How does the rate of expansion of the system respond to changes in the distribution of aggregate income? Is the system a wage-led or profit-led growth regime, where a wage-led (profit) regime displays positive growth effects of a redistribution of income towards workers (capitalists)? It can be seen that the baseline Marxian circuit of model (without aggregate demand) is a pure profit-led regime. This can be immediately seen from Proposition 1: $\partial g / \partial q = p/(T^F + T^R + T^P) \geq 0$. Hence, a shift in the income distribution towards the capitalist class increases the growth rate of the system

in the baseline model.[7] This is certainly not analytically satisfactory from a heterodox perspective; it seems intuitive that growth-impacts of income distribution in capitalist economies should allow for both wage-led and profit-led growth regimes (Bhaduri and Marglin, 1990; Foley and Michl, 1999; Taylor, 2006). We will see in a later section, and this is one of the main results of this paper, that this is indeed so: as soon as we incorporate aggregate demand in the circuit of capital model, we recover the possibility of both wage-led and profit-led growth.

4   The Model with Aggregate Demand

The results in Proposition 1 were derived under the admittedly unrealistic assumption that an adequate amount of aggregate demand was forthcoming in each period to realize all the value contained in the commodities offered for sale.[8] This is unrealistic because, under capitalism, there is no automatic mechanism to ensure that aggregate demand will equal aggregate supply (the total value contained in the commodities offered for sale). To explore this issue we need to explicitly account for the sources of demand.

4.1   The Realization Problem

What are the sources of demand in a closed capitalist economy?

> In so far as the capitalist simply personifies industrial capital, his own demand consists simply in the demand for means of production and labour-power ... In so far as the worker converts his wages almost wholly into means of subsistence, and by far the greater part into necessities, the capitalist's demand for labour power is indirectly also demand for the means of consumption that enter into the consumption of the working class Marx (1993, pp. 197).

In a capitalist economy closed to trade and *without the mechanism of credit* available to workers and capitalists, there are three sources of aggregate demand, all deriving from expenditures of capitalist enterprises: (a) the part of capital outlays that finances the purchase of the non-labour inputs to production (raw materials and long-lived fixed assets), (b) the consumption expenditure by worker households out of wage income, and (c) the consumption expenditure of capitalist households, unproductive labour and the State out of surplus value. Thus, if D_t denotes aggregate demand in period t, then

$$D_t = (1 - k_t)C_t + E_t^W + E_t^S \tag{11}$$

where E_t^W denotes consumption expenditure out of wage, E_t^S denotes consumption expenditure out of surplus value, and C_t denotes capital outlays (as before).

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[7]An increase in the mark-up is a way to capture the shift of income towards the capitalist class.

[8]In this paper we will abstract from changes in the value of money.

Just like the recommittal of surplus value designated for production occurs with a time lag, the finance lag T_t^F, consumption expenditure out of wages and surplus value will also occur with a time lag. If T_t^W denotes the time lag of expenditure out of wages, then

$$E_t^W = k_{t-T_t^W} C_{t-T_t^W};$$

similarly, if T_t^S denotes the time lag of expenditure out of surplus value, then

$$E_t^S = (1 - p_{t-T_t^S}) S''_{t-T_t^S}.$$

Note that the three spending lags, T_t^F, T_t^W and T_t^S are crucial variables of the system. When the system is out of steady state, an increase in any of the spending lags implies that the amount of aggregate demand is falling relative to supply so that the ability of capitalist enterprises to sell finished products declines; when these fall, the opposite is implied. Thus, these spending lags can be understood as aggregate demand parameters of the system (Foley, 1986a, pp. 24).

After incorporating the spending lags, the expression for aggregate demand becomes

$$D_t = (1 - k_t)C_t + k_{t-T_t^W} C_{t-T_t^W} + (1 - p_{t-T_t^S}) S''_{t-T_t^S}. \tag{12}$$

On a steady state growth path, the time lags of expenditure will be constant, i.e., $T_t^W = T^W$ and $T_t^S = T^S$, so that

$$D_t = (1 - k)C_t + kC_{t-T^W} + (1 - p)S''_{t-T^S}. \tag{13}$$

Hence, on a steady state path with growth rate g,

$$
\begin{aligned}
D_0 &= (1-k) + \frac{k}{(1+g)^{T^W}} + \frac{(1-p)S''_0}{(1+g)^{T^S}} \\
&= \left[1 - k\left\{1 - \frac{k}{(1+g)^{T^W}}\right\}\right] + \frac{q(1-p)}{(1+g)^{T^S+T^P+T^R}} \\
&= \frac{1}{(1+g)^{T^P+T^R}}\left[1 - k\{1 - \frac{1}{(1+g)^{T^W}}\}\frac{1}{(1+g)^{T^F}}\right] \\
&\quad + \frac{1}{(1+g)^{T^P+T^R}} \times q\left[\left\{1 - k[1 - \frac{1}{(1+g)^{T^W}}]\right\}\frac{p}{(1+g)^{T^F}} + \frac{1-p}{(1+g)^{T^S}}\right] \\
&< \frac{1}{(1+g)^{T^P+T^R}} \times (1+q) \\
&= S_0, \tag{14}
\end{aligned}
$$

where the strict inequality holds when g, T^F, T^W, T^S are all strictly positive and the third line uses (29). This classic result about realization problems in capitalist economies, proved in Foley (1982) in a continuous-time setting and in a different, but related, framework in Kotz (1988), is summarized here as

17

Proposition 2. *In a capitalist economy where all capital outlays are financed from past sales revenue and there is no consumption credit in the economy there will always be insufficient aggregate demand relative to the flow of sales on any steady state growth path with a positive growth rate unless the three spending lags, T^F, T^W and T^S, are identically equal to zero.*

Since the spending lags cannot all be identically equal to zero, capitalist economies without the mechanism of credit will be perpetually plagued with the problem of insufficient aggregate demand. While this crucial insight about capitalist economies is usually attributed to Keynes (1936), it is interesting to note that Marx anticipated more or less the same result half a century ago:

> The capitalist casts less value into circulation in the form of money than he draws out of it, because he casts in more value in the form of commodities than he has extracted in the form of commodities. In so far as he functions merely as the personification of capital, as industrial capitalist, his supply of commodity-value is always greater than his demand for it...What is true for the individual capitalist, is true for the capitalist class (Marx, 1993, pp. 196-7).

How does a capitalist economy solve the realization problem? There are at least two ways to "solve" the realization problem. First, in a commodity money system, the production of the correct amount of gold (the money commodity) can cover the deficiency in aggregate demand (because the money commodity does not need to be sold to realize the value contained in it). Second, in a non-commodity money system, new borrowing by households and capitalist enterprises can bridge the gap between aggregate supply and demand. Since, unlike Marx's times, we no longer operate in a commodity money system, we will only deal with the case of new borrowing.

4.2 Solution to the Realization Problem with Credit

To allow for positive amounts of *net credit* in the system in each period, let B_t denote the new borrowing by capitalists to finance capital outlays, i.e., production credit, so that

$$C_t = S'_{t-T_t^F} + p_t S''_{t-T_t^F} + B_t. \tag{15}$$

On a steady state growth path, the time lags are constant across periods, so that

$$C_t = S'_{t-T^F} + p_t S''_{t-T^F} + B_t. \tag{16}$$

On simplification, this gives,

$$1 = B_0 + \frac{(1+pq)S_0}{(1+q)(1+g)^{T^F}}, \tag{17}$$

where B_0 is the amount of production credit in the initial period as a proportion of capital outlays; we will assume that $0 \leq B_0 < 1$, where the strict inequality ensures that production credit is never larger than capital outlays. Similarly, let B'_t denote new borrowing by households (worker, capitalist or the State) to finance consumption expenditure, i.e., consumption credit, so that aggregate demand becomes

$$D_t = (1 - k_t)C_t + k_{t-T_t^W}C_{t-T_t^W} + (1 - p_t)S''_{t-T_t^S} + B'_t. \tag{18}$$

If, on a steady state growth path, the realization problem is to be solved every period by new borrowing, i.e., if new borrowing is to cover the gap between sales and production, we must have

$$S_t = D_t \quad \text{which implies} \quad S_0 = D_0.$$

Using (17) and simplifying, this gives

$$S_0 = D_0 = \frac{1 - k\left\{1 - \frac{1}{(1+g)^{T^W}}\right\} + B_0'}{\left\{1 - \frac{q(1-p)}{(1+q)(1+g)^{T^S}}\right\}},$$

where B_0' denotes the amount of consumption credit in the initial period as a ratio of capital outlays. Substituting for S_0 from (17) gives us the characteristic equation of the system with positive net credit

$$1 = B_0 + \frac{(1+pq)}{(1+g)^{T^F}} \times \frac{1 - k\left\{1 - \frac{1}{(1+g)^{T^W}}\right\} + B_0'}{\left\{1 - \frac{q(1-p)}{(1+q)(1+g)^{T^S}}\right\}}. \tag{19}$$

Re-arranging the characteristic equation, we see that the value of the steady state growth rate, g^*, solves

$$H(g; p, q, k, T^W, T^S, T^F, B_0, B_0') \equiv F(g; p, q, T^S, T^F) - G(g; p, q, k, T^W, B_0, B_0') = 0, \tag{20}$$

where

$$F(g; p, q, T^S, T^F) = (1+g)^{T^F}(1+q) - \frac{q(1-p)}{(1+g)^{T^S - T^F}} \tag{21}$$

and

$$G(g; p, q, k, T^W, B_0, B_0') = \frac{(1+pq)(1 - k + B_0')}{1 - B_0} + \frac{k(1+pq)}{(1 - B_0)(1+g)^{T^W}}. \tag{22}$$

It is obvious that (20) defines the steady state growth rate as an implicit function of the parameters of the system. Hence, we can use the Implicit Function Theorem (IFT) to work out the effects of changes in the parameters on the steady state growth rate, i.e., comparative dynamic results. But to apply the IFT we must prove two things: (a) that a solution to (20) exists, and (b) that the partial derivative of $H(g; .)$ with respect to g evaluated at the solution is nonzero.[9] Both these results are given as

Lemma 1. *There exists a unique nonnegative value g^* that solves the system represented in (20), i.e,*

$$H(g^*; p, q, k, T^W, T^S, T^F, B_0, B_0') = 0.$$

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[9]There are several versions of the IFT; for the results in this paper the version available as Theorem 15.2 in Simon and Blume (1994) is used.

Moreover,

$$\frac{\partial H}{\partial g}(g^*; p, q, k, T^W, T^S, T^F, B_0, B_0') < 0.$$

The algebraic proof appears in the Appendix; note here that the unique steady state solution for (20) can be represented graphically by Figure 5, where the existence and uniqueness of the solution follows because $G(0) > F(0)$ and $G'(g) < F(g)$ (see the proof of Lemma 1 in the Appendix for details). This immediately allows us to derive some interesting results about comparative steady-state growth paths, which are summarized as

Proposition 3. *Let g^* represent the unique, nonnegative solution of (20). The following comparative dynamics results hold true:*

1. *If B_0 (new borrowing to finance capital outlays) increases ceteris paribus then the steady state growth rate of the system, g^*, increases.*

2. *If B_0' (new borrowing to finance consumption expenditures) increases ceteris paribus then the steady state growth rate of the system, g^*, increases.*

3. *If either of the spending lags, T^W, T^S, T^F, increase ceteris paribus then the steady state growth rate of the system, g^*, falls.*

4. *If the proportion of capital outlays devoted to variable capital, k, increases ceteris paribus then the steady state growth rate of the system, g^*, falls.*

Proof. When B_0 or B_0' increases, one can immediately see, using (22), that the G-curve in Figure 5 shifts upwards. Hence, the steady state growth rate g^*, which corresponds to the intersection of the G and F curves, increase. Thus, the level of credit (new borrowing) in the economy is positively related to the steady state growth rate.

When T^F (finance lag) or T^S (spending lag for expenditure out of surplus value) increase, one can see, using (21), that the F-curve in Figure 5 shifts upwards. On the other hand, when T^W (spending lag for expenditure out of wages) increases, it follows from (22) that the G-curve shifts downward. Hence, in all the three cases the value of g^* falls. Thus, lengthening of the spending lags reduces the rate of growth of the economy.

When k, the proportion of capital outlays devoted to variable capital, increases the G-curve shifts down, as can be seen using (22). Hence the intersection of the F and G curves shifts to the left, which implies that the steady state growth rate g^* falls. $\square$

These comparative dynamics results can be re-stated more concretely with reference to two imaginary capitalist economies. First, between two identical capitalist economies, the one with higher amounts of credit will be on a higher steady-state growth path; this is simply because net credit solves the problem of insufficient aggregate demand by reducing the realization lag.

Second, the economy where a higher share of capital outlays is devoted to purchasing the non-labour inputs to production will have a lower rate of growth. This is because variable capital is the source of surplus value, the source of expansion of the system. Hence, a lower share devoted

$G(0) = (1+pq)(1+B'_0)(1-B_0)^{-1}$

$F(g;p,q,T^F,T^C)$

$F(0) = 1+pq$

$G(g;p,q,k,B_0,B'_0,T^W)$

g^*

g
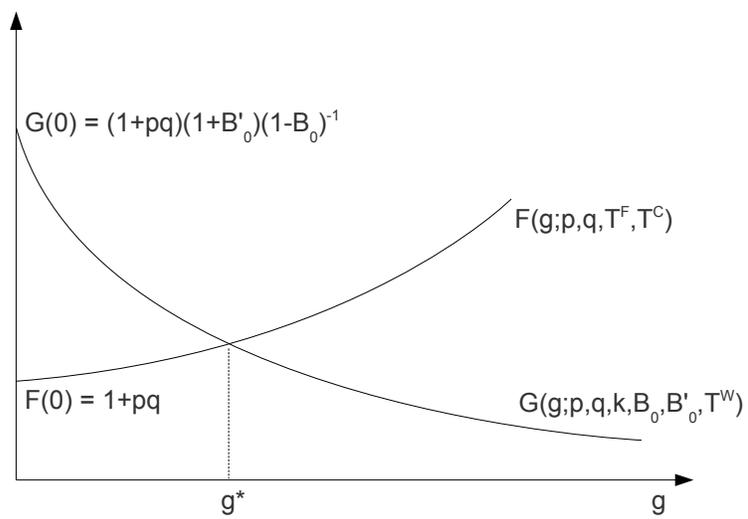
Figure 5: *Steady State Growth Rate of the System*

to variable capital will proportionately reduce the source of surplus value, and by implication, the source of expansion of the system.

Third, the economy with lower s lapendinggs will have a higher rate of profit and expansion. This is because lower time lags allows each atom of value to traverse the circuit in lesser time (by reducing the realization lag) and thereby self-valorize itself in lesser time. Hence, the system grows faster per unit of time.

5 Main Results

We are now in a position to use the discrete-time Marxian circuit of capital that has been developed in the previous sections, to establish the two main results of this paper: (a) growth impacts of changes in the class distribution of income, and (b) growth impacts of non-production credit. This will then allow us to answer the main question: what is the link between financialization, nonproduction credit and economic growth?

5.1 Wage-led versus Profit-led Growth Regimes

Analyzing the impact of changes in the distribution of income between social classes on the rate of growth of the capitalist system has been one of the critical features that distinguish the heterodox tradition in macroeconomics from the mainstream, neoclassical, one (Foley and Taylor, 2006). The basic heterodox idea that distinguishes it from the neoclassical tradition is to see wages as playing a dual role in capitalist economies. One the one hand it appears as a cost to capitalist enterprises and impacts the rate of profit, investment decisions and thereby aggregate demand (profit effect); on the other hand, it furnishes the revenue to finance consumption expenditures by worker households, thereby functioning as a crucial component of aggregate demand (wage effect). Hence, a shift of income towards the worker class has an ambiguous effect on the overall expansion of the system, depending on whether the wage effect is stronger than the profit effect.[10]

In the Marxian circuit of capital model, this issue can be addressed by analyzing the effect of changes in the mark-up over costs, q, understood as a proxy for the share of total income accruing to the non-working class. Since the mark-up is $q = ek$, an increase in the rate of exploitation e increases q and captures the shift in income away from productive workers, assuming that the proportion of capital outlays devoted to variable capital, k, remains unchanged. Increases in q, therefore, can capture the increasing share of income appropriated by the capitalist class. How does this impact the growth rate of the system? We have already seen that the baseline Marxian circuit of capital model (without taking account explicitly of aggregate demand) is a pure profit-led growth regime. This result changes as soon as we bring aggregate demand into the picture.

To see this we can once again use the IFT on (20) to find the impact of changes in q on the steady state growth rate of the system.[11] Let x denote the vector of parameters, i.e., $x =$

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[10]There is a huge, and growing, body of literature devoted to the issue of wage-led versus profit-led growth regimes; see Bhaduri and Marglin (1990), Foley and Michl (1999, chap. 9), Taylor (2006), Bhaduri (2008) and the references therein for a relatively comprehensive list of contributions to this emerging area of research.

[11]Note that Lemma 1 allows us to use the IFT.

$(p, q, k, T^W, T^S, T^F, B_0, B'_0)$, g stand for a generic growth rate and g^* denote the steady state growth rate of the system; then, using the IFT on (20) we have

$$\frac{\partial g}{\partial q}(g^*; x) = \frac{\frac{\partial H}{\partial q}(g^*; x)}{[-\frac{\partial H}{\partial g}(g^*; x)]}.$$

Since, by Proposition 1, $\frac{\partial H}{\partial g}(g^*; x) < 0$, we have

$$\text{sgn}(\frac{\partial g}{\partial q}(g^*; x)) = \text{sgn}(\frac{\partial H}{\partial q}(g^*; x)).$$

Using (22) and (21), we have

$$\frac{\partial g}{\partial q}(g^*; x) = \frac{1}{(1 - B_0)}\left\{1 - k\left[1 - \frac{1}{(1 + g)^{T^W}}\right] + B'_0\right\} - (1 + g)^{T^F}\left\{1 - \frac{1 - p}{(1 + g)^{T^S}}\right\}. \tag{23}$$

This allows us to provide sufficient conditions for a wage-led and a profit-led growth regime as

Proposition 4. *Suppose g^* denotes the steady state growth rate of the system represented by (20). If the finance lag is large enough, then the system is wage-led, i.e.,*

$$\text{if} \quad T^F > \frac{\ln(1 + B'_0) - \ln(1 - B_0)}{\ln(1 + g^*)} \approx \frac{B_0 + B'_0}{g^*} \quad \text{then} \quad \frac{\partial g}{\partial q}(g^*; x) < 0.$$

If the finance lag is small enough, then the system is profit-led, i.e.,

$$\text{if} \quad T^F < \frac{\ln(1 + B'_0 - k') - \ln(1 - B_0) + \ln(p/p')}{\ln(1 + g^*)} \quad \text{then} \quad \frac{\partial g}{\partial q}(g^*; x) > 0,$$

where

$$p' = 1 - \frac{1 - p}{(1 + g)^{T^S}} \quad \text{and} \quad k' = k\left\{1 - \frac{1 - p}{(1 + g)^{T^W}}\right\}.$$

Proof. The proof follows immediately from (23). □

This proposition has at least two important implications. First, it demonstrates that the Marxian circuit of capital model is not a pure profit-led growth regime once aggregate demand has been explicitly modeled within the system. Since Volume II of *Capital* deals explicitly with issues of aggregate demand and its relation to problems of realization, the common Keynesian assertion that Marxian economics lacks a proper appreciation of demand factors is erroneous. By demonstrating that the Marxian circuit of capital model allows for a wage-led growth regime, Proposition 4 reinforces the Marxian case.

Second, it delivers the fairly intuitive result that the size of the finance lag, T^F, determines whether the system is profit-led or wage-led as far as growth is concerned. If, to start with, the finance lag is large relative to total new borrowing in the system normalized by the steady state growth rate, then a shift of income away from wages would be tantamount to shifting income

towards economic agents who wait for a relatively longer period before converting realized sales revenues into new capital outlays. Hence, the level of aggregate demand would fall and the speed with which value traverses the circuit go down. This would lead to a fall in the rate of profit and the steady state growth rate. If, on the other hand, the finance lag is relatively small the opposite happens: the rate of profit and the rate of growth increases when income is shifted away from workers and towards capitalists.

5.2 Growth Impacts of Rising Consumption Credit

The consolidation of the neoliberal regime in the U.S. and elsewhere, since the early 1980s, went hand in hand with the growing dominance of finance over the economy.[12] One peculiar form of this dominance has been the explosion of debt levels, relative to aggregate income flows, in these advanced capitalist countries. As summarized in Figure 1, a large part of the new borrowing has been incurred by working-class households (a component of consumption credit), as opposed to capitalist enterprises (production credit). Though the growth-reducing impact of financialization has been recently analyzed (Onaran et al., 2011), very few studies have been devoted to understanding the impact of consumption credit on growth.

An exception is dos Santos (2011), which has used a continuous-time Marxian circuit of capital model to demonstrate that the "maximal" rate of growth of a capitalist economy is negatively impacted by the growth of consumption credit.[13] This paper strengthens the result in dos Santos (2011) by demonstrating that the growth-reducing impact of consumption credit affects the actual growth rate too. This is important because the result about maximal growth rates does not imply the same about actual growth rates: an economy might have a lower maximal rate of growth compared to another at the same time as having a higher actual rate of growth.

While, according to Proposition 3, the growth of any kind of credit increases the growth rate of the economy, increases in the *share* of consumption credit *ceteris paribus* has an adverse impact on the steady state growth rate. To see this formally let us re-write the quantity of new consumption credit in the initial period as

$$B_0' = \lambda Z_0,$$

and the quantity of production credit as

$$B_0 = (1 - \lambda)Z_0,$$

where Z_0 is the total amount of new borrowing in the economy in the initial period (relative to capital outlays) and $0 \leq \lambda \leq 1$ is the share of consumption credit in the total amount of new borrowing. To analyze the impact of changes in the share of consumption credit, we need to re-write (20) using λ and Z_0 in place of B_0' and B_0:

$$H(g; p, q, k, T^W, T^S, T^F, Z_0, \lambda) = F(g; p, q, T^S, T^F) - G(g; p, q, k, T^W, Z_0, \lambda) = 0. \tag{24}$$

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[12]For a detailed analysis of the rise and consolidation of neoliberalism, see Duménil and Lévy (2004).

[13]The maximal growth rate of the system is the rate at which it grows when the realization lag is zero. Since the realization lag is bounded below by zero, the maximal rate of growth defines the upper bound of the rate of expansion of the system.

The F-curve does not depend on the quantity of new borrowing; hence it remains the same as before

$$F(g; p, q, T^S, T^F) = (1 + g)^{T^F}(1 + q) - \frac{q(1 - p)}{(1 + g)^{T^S - T^F}},$$ (25)

but the G-curve changes to

$$G(g; p, q, k, T^W, Z_0, \lambda) = \frac{(1 + pq)}{1 - (1 - \lambda)Z_0}\left\{1 - k + \lambda Z_0 + \frac{k}{(1 + g)^{T^W}}\right\}.$$ (26)

Using the IFT on (24), we have

$$\frac{\partial g}{\partial \lambda}(g^*; x) = \frac{\frac{\partial H}{\partial \lambda}(g^*; x)}{[-\frac{\partial H}{\partial g}(g^*; x)]}.$$

Since $\frac{\partial H}{\partial g}(g^*; x) < 0$, the sign of $\frac{\partial g}{\partial \lambda}(g^*; x)$ is the same as the sign of $\frac{\partial H}{\partial \lambda}(g^*; x)$. But

$$\frac{\partial H}{\partial \lambda}(g^*; x) = \frac{(1 + pq)Z_0}{[1 - (1 - \lambda)Z_0]^2} \times \left\{k - \frac{k}{(1 + g^*)^{T^W}} - Z_0\right\},$$ (27)

which gives us one of the key results of this paper: when the economy is operating with high levels of total credit, an increase in the share of consumption credit *ceteris paribus* will depress the steady state growth rate. We can state this result more formally as

Proposition 5. *Let Z_0 denote the level of total net credit in the economy, and λ denote the share of consumption credit, with $(1 - \lambda)$ denoting the share of production credit. If*

$$Z_0 > k\left\{1 - \frac{1}{(1 + g)^{T^W}}\right\}$$

then

$$\frac{\partial g}{d\lambda}(g^*; x) < 0.$$

Proof. The proof follows immediately from (27). □

What does this result imply? If we compare two identical capitalist economies (having the same amounts of total net credit), one with a higher share of consumption credit than the other, then Proposition 5 shows that the economy with a higher share of consumption credit can be expected to be on a lower steady state growth path than the other economy.

To understand the logic of this result, it is important to distinguish between consumption and production credit. By definition, only production credit finances capital outlays. Hence, it is only production credit that creates the flow of value for the creation of surplus value. Hence, only production credit has the capacity to increase the size of value flowing through the circuit, and thereby expand the size of the system. Thus, while consumption credit solves the realization

problem by reducing the realization lag, it cannot increase the size of the system by facilitating the generation of more surplus value (which production credit does). Since, when comparing steady state growth paths, the time lags are assumed constant, a higher share of consumption credit will reduce the rate of growth of the system.

An interesting corollary of Proposition 5 arises if the time lag for spending out of wages is "small": increases in the share of consumption credit is *always* growth-reducing. To see this note that if $T^W = 0$, then by Proposition 5 it follows that $\frac{\partial g^*}{d\lambda}(g^*; x) < 0$ for any positive amount of total net credit $Z_0 > 0$. Thus, if workers spend their wage income immediately, i.e., in the period in which they earn it, then an increase in the share of consumption credit will take the economy to a lower steady state growth path as long as there was positive net credit to begin with.

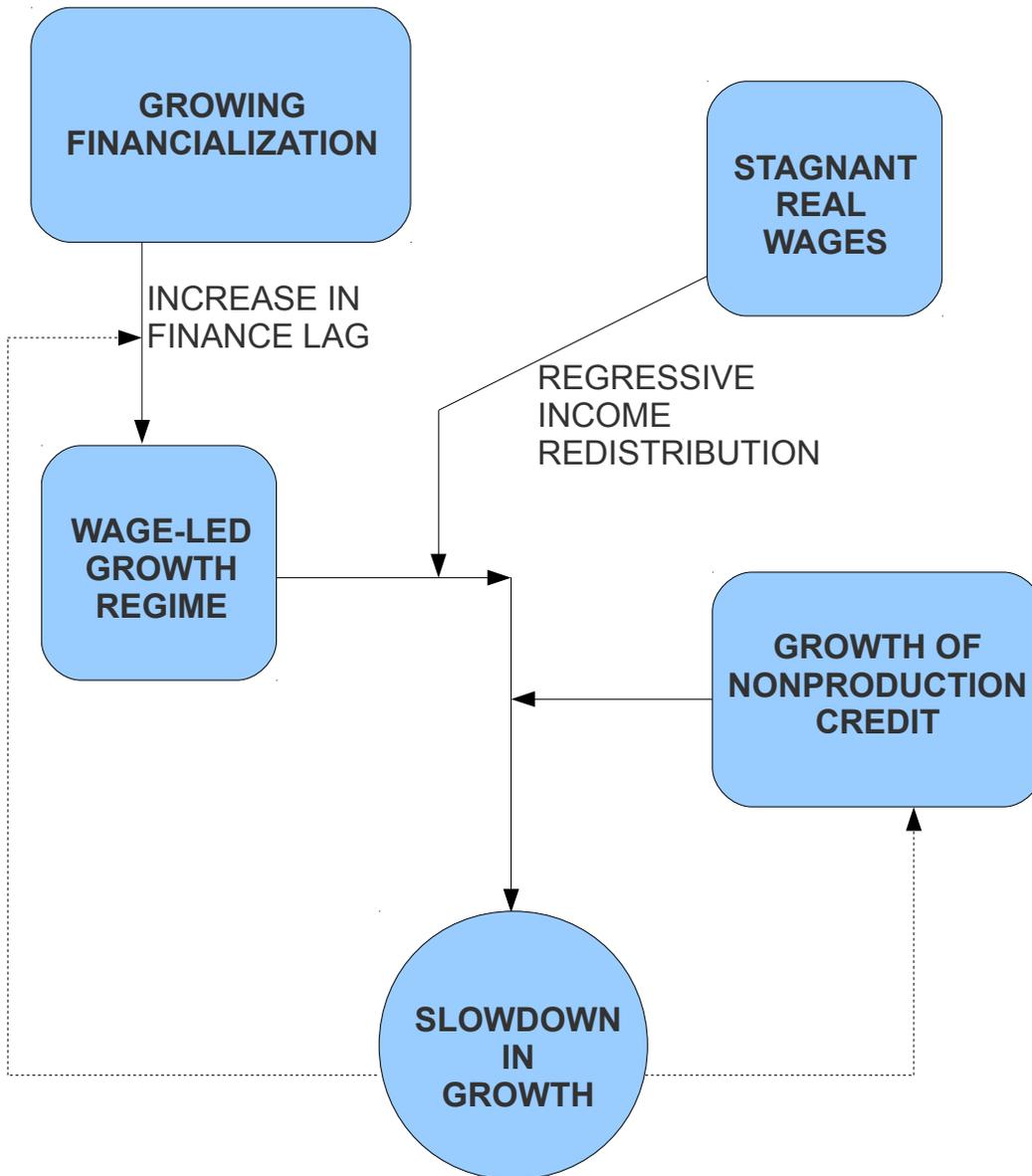## 5.3   U.S. Growth Slowdown under Neoliberalism

With the two results in hand, we can now proceed to address the question that motivated this paper: what is the link between financialization, growth of nonproduction credit and the rate of growth of capitalist economies?

It is worthwhile recalling that heterodox economists are largely in agreement that the world economy entered a period of structural crisis in the late 1960s and early 1970s. Neoliberalism was fashioned as a response to this structural crisis by the upper fractions of the ruling classes in the core of the global capitalist economy.

The neoliberal form of capitalism that took root in the early 1980s, symbolized by Reaganomics in the U.S. and Thatcherism in the U.K., soon came to assume some characteristic features. Key among them, as argued earlier, were the growing financialization of the economy, the steady growth of (working class) household credit as a share of total flow of credit and the weakening bargaining power of labour vis-a-vis capital. The main results in this paper show that the confluence of these three factors will *ceteris paribus* lead to a slowdown in real economic growth, and is summarized in Figure 6.

Growing financialization of the economy, evidence for which was presented in Figure 1, leads to an increase in the finance lag, T^F. This is because, at the aggregate level, growth of financial activities merely lead to a re-circulation of money capital, via financial asset purchase and sale, within the "money capital" node (see Figure 4). Money capital is not used for making capital outlays to purchase the means of production and labour-power. Sales revenue is, instead, used to purchase financial assets, often for speculative purposes.

A firm, instead of making real investments (to purchase labour power and means of production), uses sales revenue to purchase financial assets. There are two important points to consider about this. First, recalling Marx's critique of Say's Law we know that the flow of sales need not immediately lead to a new round of capital outlays. So, what does the capitalist do with the money form of value that she has after the sales are done? She can just hoard it as cash reserves (something that large corporations are doing right now in the U.S.) or she could use it to purchase financial assets. In either case, the capital outlays are deferred; hence, the finance lag increases. Second, every financial asset has a corresponding liability, so that aggregating over the assets and liabilities give us a sum of zero. This is consistent with the idea that the stocks of financial assets do not

Figure 6: *Chain of Causation underlying the Slowdown in U.S. Growth in the Neoliberal Era. Dotted arrows represent possible feedback loops that might give rise to crises in the system in the absence of strong circuit breakers.*

represent accumulated stocks of value flowing through the circuit of capital. Hence, an accumulation of financial stocks do not directly disturb the stock-flow relationships underlying the circuit of capital. But purchase of financial assets require finance, and if money is used to finance these purchases, it will lead to a deferral of capital outlays. The net result is an increase in the finance lag at the aggregate level.[14]

The weakening bargaining position of the working class vis-a-vis capital had several aspects: increasing flexibilization of the labour market, wage suppression, weakening of institutions of collective bargaining like trade unions, gradual retreat of the State from social provisioning of public goods and welfare measures. This had at least two important effects.

First, wage suppression and the decline of the welfare State led to a gradual redistribution of income towards the capitalist class, and especially towards the upper fractions of the capitalist class (Piketty and Saez, 2003). In terms of the parameters of the circuit of capital model, the shift in income distribution away from the working class can be captured by a rising mark-up, q.

Second, stagnant wages increased the demand for net credit by working class households to maintain historical patterns of consumption growth. Increasing supply of credit for working class households was aided by rapid financial deregulation since the early 1980s (**?**). The net result was a steady increase of nonproduction (or consumption) credit in the total annual flow of new borrowing in the economy, leading to rising ratio of household to nonfinancial business debt. This can be captured within the circuit of capital model by an increase in λ.

Bringing these three factors together, we can see the effect on growth. Proposition 4 shows that as the finance lag increases, the economy is gradually transformed from a profit-led into a wage-led growth regime, the shift being cemented after a certain threshold is crossed by the finance lag. With the economy operating in a wage-led growth regime, a redistribution of income away from the working class will depress the steady state growth rate, which is precisely what a wage-led growth regime entails.

An increase in the share of nonproduction credit, captured by an increase in λ, will also independently depress the steady state growth rate of the economy by Proposition 5. Hence, the two effects reinforce each other leading to a sharp decline in the steady state growth rate of the economy.

Even though this paper deals with comparative steady state growth paths, it is worth noting that there is likely to be interesting "feedback loop" like dynamics hidden in the system that might give rise to crises, in the absence of strong "circuit breakers". For instance, the initial slowdown caused by a sift in income distribution under a wage-led regime might have two important feedback loop type effects for the out-of-steady-state behaviour of the system.

First, the fall in the growth rate might increase the finance lag further as capitalist enterprises, faced with declining demand, defer capital outlays. Second, the system might respond to falling aggregate demand (due to stagnant wages) by increasing the flow of credit to worker households, reducing the growth rate further. An increase in the share of nonproduction credit and an increase in the finance lag come together to further reduces the growth rate.[15]

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[14] For a summary of recent debates on the economic effects of financialization see Stockhammer (forthcoming).

[15] This out-of-steady-state behaviour will be explored in future research.

6 Conclusion

Marx's analysis of the circuits of capital in Volume II of *Capital* offers a unique framework for macroeconomic analysis of capitalist economies. Building on Foley (1982, 1986a), this paper develops a discrete-time version the Marxian circuit of capital model. Two theoretical results of interest to a wide variety of heterodox economists are proved using this model.

First, it is demonstrated that the Marxian circuit of capital model allows both wage-led and profit-led growth regimes, a topic of lively research among heterodox macroeconomists. The crucial parameter of the system that determines whether a capitalist economy will be wage-led versus profit-led is the length of the finance lag (the period of time that elapses between realization of value, and surplus-value, through sales and its recommittal into production). When the finance lag is large, the economy is more likely to be wage-led; when the finance lag is small, the economy is more likely to be a profit-led growth regime.

Second, it is demonstrated that non-production credit has a negative impact on the rate of growth of the system. Between two identical capitalist economies, the one with a higher proportion of non-production credit in total net credit will have lower steady state growth rate.

Both these results are then brought together to offer a novel explanation of the slowdown of the U.S. economy in the neoliberal era since the mid-1970s: growing financialization increased the finance lag and pushed the economy towards a wage-led growth regime; redistribution of income away from workers, then, led to a fall in growth. The slowdown was further reinforced by an increase in the share of nonproduction credit.

There are three straightforward policy implications of this analysis. First, the growth of financialization has to be reversed. This will involve, among other things, re-regulating the financial sector, especially the shadow banking sector. Second, the neoliberal redistribution of income has to be undone and significantly reversed. This will mean the adoption of robust, progressive redistribution policies, favoring the working population. Third, credit has to be channeled back into the productive sector. This could easily tie up with the requirements of re-tooling the U.S. economy to make it "greener".

Appendix

Proposition 1. On a steady state growth path with time-invariant parameters, the system represented by (5) through (10), grows at the rate g given by

$$g = \frac{pq}{T^F + T^R + T^P},$$

and the aggregate rate of profit is given by

$$r = \frac{q}{T^F + T^R + T^P},$$

so that the "Cambridge Equation" holds true: $g = p \times r$.

Proof. Repeated substitutions into the equations relating the three basic flows comprising the circuit of capital, (5), (6) and (7), allow us to solve for the rate of steady state growth of the system. By definition, we have

$$
\begin{aligned}
C_t &= S'_{t-T^F} + pS''_{t-T^F} \\
&= \frac{S_{t-T^F}}{1+q} + \frac{pqS_{t-T^F}}{1+q} \\
&= \frac{(1+pq)}{1+q}S_{t-T^F} \\
&= \frac{(1+pq)}{1+q} \times (1+q)P_{t-T^F-T^R} \quad \text{(using (6))} \\
&= (1+pq)C_{t-T^F-T^R-T^P} \quad \text{(using (5))}.
\end{aligned}
\tag{28}
$$

If the system grows at the rate g every period, then

$$
C_t = C_0(1+g)^t;
$$

hence, substitution in (28), gives

$$
C_0(1+g)^t = (1+pq)C_0(1+g)^{t-T^F-T^R-T^P}.
$$

Taking logarithms of both sides and simplifying gives us the characteristic equation of the system

$$
1 = \frac{1+pq}{(1+g)^{T^P+T^R+T^F}}.
\tag{29}
$$

This gives us the growth rate of the system as

$$
\ln(1+g) \approx g = \frac{\ln(1+pq)}{T^F+T^R+T^P} \approx \frac{pq}{T^F+T^R+T^P}.
\tag{30}
$$

An immediate corollary is that the system does not grow when all the surplus value is consumed (simple reproduction). According to the notation of the model, simple reproduction requires $p = 0$. But, if $p = 0$, this implies, by (28), that $g = 0$.

The second part of the proposition requires us to compute the rate of profit, and this, in turn, requires us to compute the *size* of the flows and stocks of value on the steady state growth path. Since the steady state growth rate of the system has been computed, the size of the flows and stocks in any given period is completely determined by its size in the initial period, i.e., period 0. But we can only compute the size of the stocks and flows relative to each other; hence, we will normalize the flow of capital outlays in period 0 to unity, i.e., $C_0 = 1$, and compute the other flows and stocks relative to C_0.

Since, according to (5), the flow of finished products (valued at cost) and the flow of capital outlays are related as

$$
P_t = C_{t-T^P},
$$

so, on the steady state growth path,

$$P_0(1 + g)^t = C_0(1 + g)^{t-T^P}.$$

Hence,

$$P_0 = \frac{C_0}{(1 + g)^{T^P}} = \frac{1}{(1 + g)^{T^P}}. \tag{31}$$

In a similar manner, using (6), we see that

$$S_0 = (1 + q)\frac{C_0}{(1 + g)^{T^P+T^R}} = \frac{1 + q}{(1 + g)^{T^P+T^R}}, \tag{32}$$

which implies that

$$S_0' = \frac{1}{(1 + g)^{T^P+T^R}}, \tag{33}$$

and

$$S_0'' = \frac{q}{(1 + g)^{T^P+T^R}}. \tag{34}$$

The size of the stocks of value in the initial period can be computed in a similar manner. According to (8), the stock of productive capital changes period t as:

$$\Delta N_{t+1} = N_{t+1} - N_t = C_t - P_t.$$

Hence

$$N_t[(1 + g) - 1] = C_t - P_t$$
$$N_0(1 + g)^t g = C_0(1 + g)^t - P_0(1 + g)^t$$
$$N_0 = \frac{1 - P_0}{g}. \tag{35}$$

Using (31) this becomes

$$N_0 = \frac{1}{g}\left\{1 - \frac{1}{(1 + g)^{T^P}}\right\}. \tag{36}$$

In a similar manner, using (9), we can compute the size of the stock of commercial capital in the initial period as

$$X_0 = \frac{1}{g(1 + g)^{T^P}}\left\{1 - \frac{1}{(1 + g)^{T^R}}\right\}; \tag{37}$$

and using (10), we can compute the size of the stock of financial capital in the initial period as

$$F_0 = \frac{1}{g} \left\{ \frac{1 + pq}{(1 + g)^{T^P + T^R}} - 1 \right\}. \tag{38}$$

This allows us to compute the aggregate rate of profit, i.e., the rate of profit that the total social capital earns in a period

$$r_t = \frac{S''_t}{N_t + X_t + F_t}.$$

On a steady state growth path, the rate of profit is constant and is given by

$$r == \frac{S''_0}{N_0 + X_0 + F_0}.$$

Using the expression for S''_0 from (34), N_0 from (36), X_0 from (37) and F_0 from (38), we get the "Cambridge equation"

$$r = \frac{g}{p}.$$

Since $g = pq/(T^P + T^R + T^F)$, we get

$$r = \frac{q}{T^P + T^R + T^F}, \tag{39}$$

which completes the proof. □

Lemma 1. There exists a unique nonnegative value g^* that solves the system represented in (20), i.e,

$$H(g^*; p, q, k, T^W, T^S, T^F, B_0, B'_0) = 0.$$

Moreover,

$$\frac{\partial H}{\partial g}(g^*; p, q, k, T^W, T^S, T^F, B_0, B'_0) < 0.$$

Proof. Let x denote the vector of parameters, i.e.,

$$x = (p, q, k, T^W, T^S, T^F, B_0, B'_0).$$

Note that, as long as $0 \le B_0 < 1$ and $0 \le B'_0 < 1$, $H(0; x) > 0$. This is because

$$1 + pq = F(0; x) \le G(0; x) = (1 + pq) \times \frac{1 + B'_0}{1 - B_0}.$$

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Moreover $H(g; x)$ is a monotonically decreasing function of g. This can be seen from the fact that

$$\frac{-k(1 + pq)T^W}{(1 - B_0)(1 + g)^{T^W+1}} = \frac{\partial G}{\partial g}(g; x) < 0,$$

and

$$\frac{\partial F}{\partial g}(g; x) = \frac{T^F(1 + q)}{(1 + g)^{T^F+1}} - \frac{q(1 - p)(T^F - T^S)}{(1 + g)^{T^F+T^S+1}}$$

$$= \frac{1}{(1 + g)^{T^F+1}} \left\{ T^F + q \times T^F \left[1 - \frac{1 - p}{(1 + g)^{T^S}} \right] + \frac{q(1 - p)T^S}{(1 + g)^{T^S}} \right\} > 0,$$

so that

$$\frac{\partial H}{\partial g}(g; x) = \frac{\partial G}{\partial g}(g; x) - \frac{\partial F}{\partial g}(g; x) < 0.$$

Hence, there exists a nonnegative and unique value of g which solves (20). The solution can also be represented graphically as Figure 5, where the intersection of the two curves give the steady state growth rate, g^*, and changes in the parameters shift the curves to produce new steady-state growth rates.

The second part of the Proposition follows immediately. Since $\frac{\partial H}{\partial g}(g; x)$, holds for an arbitrary g, it must also hold for $g = g^*$. Hence,

$$\frac{\partial H}{\partial g}(g^*; p, q, k, T^W, T^S, T^F, B_0, B'_0) < 0$$

which completes the proof. □

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