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# DEPARTMENT OF ECONOMICS

## Working Paper

**Inequality of income and wealth in  
the long run: A Kaldorian  
perspective**

by

Ryoo, Soon

Working Paper 2015-09



**UNIVERSITY OF MASSACHUSETTS  
AMHERST**

# Inequality of income and wealth in the long run: A Kaldorian perspective\*

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May 11, 2015

## Abstract

The paper examines the determinants of income and wealth inequality in a Kaldorian model where the profit share adjusts to clear the goods market and the long-run output-capital ratio is constant. The approach is radically different from both the mainstream approach that stresses properties of production function and the Kaleckian approach that emphasizes the long-run adjustment of utilization. The Kaldorian model is used to identify several developments that may have caused increasing inequality in income and wealth since the early 1980s, including the shift of the power relation in corporate firms in favor of top managerial pay, the decline in the retention rate, increasing share buybacks, rising indebtedness of lower-income households, and the stock market boom in the 1990s. In contrast to Piketty's explanation, the decline in the natural rate of growth reduces inequality of income and wealth in this Kaldorian framework.

**keyword** income and wealth distribution, managerial pay, financialization, stock-flow consistency

**JEL classification** E12, E21, E25, E44

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# 1 Introduction

Increasing inequality in income and wealth since the 1980s has attracted a great deal of attention recently. In particular, Piketty and his colleagues have made impressive contributions to the empirical literature on inequality (Piketty and Saez, 2003, Alvaredo et al., 2014, Piketty, 2014b, Piketty and Zucman, 2014). The interpretation of the empirical findings, however, is not straightforward and Piketty's own explanation based on the Solow-Swan model has been contested<sup>1</sup>.

This paper presents an alternative explanation from a Kaldorian perspective regarding increasing inequality in the US since the early 1980s. In so doing, I extend the Kaldor/Pasinetti model (Kaldor, 1955/56, 1966, Pasinetti, 1962) to include financial stocks and two social classes in a stock-flow consistent model of a corporate economy. Based on the extended Kaldorian model, I analyze how the steady-state income and wealth shares are affected by structural/behavioral parameters, including the shift in the power relation in corporate firms in favor of top managerial pay, financial changes such as the fall in the retention rate of and increasing share buybacks by corporations, increasing indebtedness of lower-income households, the stock market boom in the 1990s and the decline in the natural rate of growth. This analysis suggests that all of these developments – except the last – increase income and wealth inequality in this Kaldorian model. The model developed here has the following key features:

First, the functional distribution of income – the profit share – is determined endogenously by the state of aggregate demand: favorable demand conditions in the goods market allow firms to achieve higher profit margins under nominal wage contracts. My approach takes the functional distribution of income (the profit share) as a key endogenous variable, which is determined through the goods-market equilibrium process. The approach therefore is distinguished from that found in the burgeoning literature on wage-led/profit-led growth (Bhaduri and Marglin, 1990, Blecker, 2002, Lavoie and Stockhammer, 2013, Stockhammer and Onaran, 2013) which, typically in Kaleckian models, examines whether a parametric change in the profit share increases or decreases economic performance (growth and utilization rates).<sup>2</sup>

Second, the model assumes an exogenous long-run output-capital ratio as an approximation of its insensitivity to variations in endogenous forces (e.g., factor prices, demand conditions). The assumption of the insensitivity of the output-capital ratio is

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<sup>1</sup>One may notice that there is an ambiguity regarding how important Piketty's explanation based on the properties of production function (e.g. the elasticity of factor substitution ) is in understanding his empirical account. Piketty's own position appears to have swung and he recently reduced his emphasis on the neoclassical explanation: 'Let me make clear however this [= the explanation of income distribution based on the degree of factor substitution] is not my favored interpretation of the evidence.' (Piketty, 2014a)[p.9]

<sup>2</sup>Some Kaleckian models introduce endogenous changes in mark-ups. Marglin and Bhaduri (1990), for instance, adopt flexible mark-ups and Dutt (1984) takes the mark-up as a state variable the evolution of which depends on the growth rate of capital.

linked to two arguments: (i) capital/labor factor substitutability is limited<sup>3</sup> and (ii) the economy operates on average at the desired rate of utilization in the long run (Harrod, 1939).<sup>4</sup> This feature distinguishes my approach from both Piketty's explanation (that emphasizes strong factor substitution) and the Kaleckian approach (that stresses the endogenous adjustment of capacity utilization even in the long run).

Third, I assume that households are divided into two classes as in many post Keynesian models, but the framework in this paper is more general. In the model with two financial assets (corporate shares and deposits), the two classes both own shares and deposits, and receive wages, dividends and interest income. The explicit introduction of financial assets avoids a pitfall of the conflation of financial wealth and (reproducible) physical capital.<sup>5</sup> The framework allows the study of share ownership and wealth distribution. Pasinetti (1962) is an early study that introduces the dynamics of asset ownership into a two-class Cambridge model.<sup>6</sup> A Classical/Marxian model with varying asset ownership is offered by Michl and Foley (2004) and Kaleckian versions by Dutt (1990), Palley (2005, 2012) and Taylor (2014). In contrast, the present paper examines the issues of equity ownership/wealth distribution in a mature economy using a Kaldorian framework.

Last but not least, I treat labor income for the upper-class households (mostly CEO/managerial pay) as a deduction from profits rather than a deduction from the total wage bill. This approach thus expands the definition of profits to include CEO/managerial pay.<sup>7</sup> The perspective of top management pay as an allocation of profits dates back at least to Marx (1984)[ch 23] and Kalecki (1938)[p.97], but a clear statement of the perspective is also found in Minsky (1986)[p.154]. In contrast, most models in the contemporary post Keynesian literature take top managerial pay as a deduction from the total wage bill. The division of the wage bill into top management pay and the rest is determined by an exogenously given wage premium in some models (Palley, 2005, Lavoie, 2009, Dutt, 2013)<sup>8</sup> or affected by the state of the economy (utilization or em-

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<sup>3</sup>There are many studies that show that the elasticity of substitution between capital and labor is well below unity, including Antràs (2004), Chirinko (2008).

<sup>4</sup>There has been a long debate on the specification of investment behavior in the post Keynesian/structuralist literature. For the literature, see Skott (2012), Hein et al. (2012)

<sup>5</sup>Piketty's conflation of financial wealth and physical capital has been often criticized. See, for instance, Rowthorn (2014) and Galbraith (2014).

<sup>6</sup>Also see Samuelson and Modigliani (1966), Darity (1981) and Fazi and Salvadori (1985) as well as numerous papers in Panico and Salvadori (1993) for the properties of two-class economies.

<sup>7</sup>The conventional measure of the factor share has exhibited little variations in the U.S. This observation is often used to dismiss the significance of the functional distribution of income for understanding increasing income inequality. See Gordon and Dew-Becker (2008) for instance. Once the definition of the profit share is expanded, a notable upward in the profit share can be found since the early 1980s in the U.S economy.

<sup>8</sup>Lavoie (2009) examines the short-run effect of an increase in managerial costs in a Kaleckian model with target return pricing and shows the effect depends on whether the actual utilization rate is greater or lower than the standard rate of utilization. The present paper, however, analyzes the long-run effect

ployment rates) in others (Palley, 2013b, 2014, 2015, Tavani and Vasudevan, 2014).<sup>9</sup> The underlying framework of most models is predominantly Kaleckian where distributional changes can shift the long-run utilization rate permanently (Palley (2013b)'s Kaldorian analysis is an exception). The perspective of taking top management income as an allocation of profits, as I will show, converts an otherwise-symmetric structure of two groups of households into one of the economies which have properties similar to those of Cambridge two-class economies: the movement of the income of the upper class households is closely aligned with the movement of the (expanded) profit share, while that of the rest with the movement of the wage share. Based on this feature, the upper class and the rest will be identified with 'capitalists' and 'workers' respectively throughout this paper.

The paper is structured as follows. Section 2 sets up the model of a corporate economy with two classes. Section 3 highlights the close relation between the functional and the social distribution of income. Section 4 presents main analytic results regarding the determination of income and wealth distribution. Section 5 offers some concluding remarks.

## 2 A model of a corporate economy with two social classes

The economy is assumed to be closed and thus various open economy complications are left out. The role of government is limited to setting the real interest rate at a constant level  $r$  with fiscal dimensions being assumed away. The labor force grows at a constant rate  $n$ . The introduction of exogenous technical progress is straightforward, but I assume the absence of technical progress throughout.

The long-run output-capital ratio is taken as exogenous, reflecting limited factor substitutability and a Harrodian long-run requirement that actual utilization remains at a structurally determined desired rate:

$$\frac{Y}{K} = u^* \tag{1}$$

where  $Y$  = aggregate output;  $K$  = aggregate capital stock. On steady growth paths, the growth rates of output and capital are equal to the natural rate:

$$\hat{K} = \hat{Y} = n \tag{2}$$

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of managerial pay on income and wealth distribution under the assumption that utilization remains at the desired rate throughout.

<sup>9</sup>The neo-Kaleckian three-class model in Palley (2015) is more complicated. CEO/top managerial pay is a fraction of profits with the profit share itself exogenously determined by the degree of monopoly. The wage bill division between middle managers and workers, however, depends on the employment rate for workers. More specifically, a tight market condition for workers squeezes the middle managers' share of the total wage bill with keeping the profit share intact.

where a hat over a variable refers to its growth rate.

Kaldor (1955/56, 1957) argued that the adjustment of income distribution, by making the aggregate saving rate endogenous, brings the warranted growth path into the line with the natural growth rate, but, curiously enough, he presented his ‘Keynesian theory of distribution’ based on the assumption of full employment. Kaldor (1959) later tried to justify the curious assumption but it would be fair to say he did not succeed and could not provide any unified theory that convincingly links his ‘Keynesian theory of distribution’ to the determination of employment. I do not assume full employment in this paper: the applicability of the Kaldorian distributional mechanism is not limited to the state of full employment. Note that the steady growth assumption (2) does not imply full employment but only a constant employment rate (under exogenous technical progress), while the level of the employment rate is left undetermined.

There are at least two approaches that try to fill the lacuna in the Kaldor’s theory. First, Skott (1989, 2012) introduces, along with a Harrodian investment function, the output expansion function that connects firms’ pricing and production decisions to the state of labor market as well as the demand condition in the goods market.<sup>10</sup> Skott shows how Harrodian investment behavior creates instability in the goods market and the feedback from the labor market turns the instability into the bounded fluctuations of the utilization and the accumulation rates around the desired utilization rate and the natural rate of growth, respectively. The focus on steady growth in this paper – (1) and (2) – can be justified if the long-run average values of actual utilization and growth rates are approximately equal to  $u^*$  and  $n$  over the course of cyclical fluctuations.<sup>11</sup> It should be noted that full employment does not follow from this framework: product market equilibrium and firms’ decision to expand production jointly determine the employment rate.

Second, Palley (2013b) has recently proposed a Kaldorian model where the feedback from the labor market works through the technical progress function: an increase in the employment rate speeds up labor-saving technical progress as firms may have a strong incentive to innovate when labor is scarce. In addition, Palley assumes that the employment rate negatively affects aggregate saving: the unemployment rate may proxy for uncertainty and an increase in the unemployment rate thus leads to more precautionary saving. Given this structure, the steady state employment rate will be determined by the demand side as well as by the technical progress function. In the present paper, there is no technical progress and therefore the implications of the

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<sup>10</sup>Formally, Skott consider the output expansion function  $\hat{Y} = h(\pi, e)$  with  $h_\pi > 0$  and  $h_e \leq 0$ . Favorable demand conditions in the product market (high profit share  $\pi$ ) will tend to speed up output expansion whereas tight labor market conditions (high employment rate  $e$ ) constrain output expansion. A behavioral foundation of the specification is discussed in Skott (1989) in detail.

<sup>11</sup>It should be noted that a steady growth path may not even exist: some parameter configurations, along with a particular shape of the output expansion function, may not admit steady growth in the capitalist economy.

Kaldorian distribution mechanism are independent of the issues regarding technical progress.

## 2.1 Firms' financial decisions and managerial pay

The firms' budget constraint is written as

$$pI + W_w + W_c + Div + iM = pY + v\dot{N} + \dot{M} \quad (3)$$

where  $p$  is the price of output,  $I$  real investment,  $W_w$  wages to workers,  $W_c$  top managerial pay,  $Div$  dividends,  $i$  the nominal interest rate,  $M$  bank loans,  $Y$  real output,  $v$  the unit price of stocks, and  $N$  the number of stocks. A dot over a variable refers to the time derivative of the variable. Equation (3) shows that the firms' sources of funds are sales revenue, nets equity issues and borrowing, out of which firms finance investment and pay wages to top managers and workers, dividends to shareholders, and interest on bank loans.

Firms play a central role in the distribution of national income into its different components. The excess of total revenue over wages to workers becomes gross profits  $\Pi$ :

$$\Pi = pY - W_w \quad (4)$$

or alternatively

$$W_w = (1 - \pi)pY \quad (5)$$

where  $\pi$  is the profit share, i.e., the ratio of gross profits to total revenue  $\pi \equiv \Pi/(pY)$ .

As stressed in the introductory section, I treat the labor income of the top income class as an allocation of profits. This approach implies that the definition of profits  $\Pi$  in this paper is broader than that of measured profits based on national accounts where CEO/managerial pay is registered as wages rather than profits.

Firms are assumed to pay a constant fraction  $\lambda$  of profits – net of depreciation and interest payments – to top managers as salaries and bonus.

$$W_c = \lambda(\Pi - \delta pK - rM) \quad (6)$$

The recent evidence that shows the increasing importance of labor income in the top income class (Piketty and Saez, 2003, Mohun, 2006, Bivens and Mishel, 2013) may well be captured by an increase in  $\lambda$ .

The rest of surplus is broken into dividends and retained earnings

$$Div = (1 - s_f)(1 - \lambda)(\Pi - \delta pK - rM) \quad (7)$$



where  $s_f$  is the retention rate.<sup>12</sup>

In addition to the retention/dividend payout policy, firms make decision on equity financing policy. The equity issue policy is captured by an exogenous parameter,  $\hat{N}$ , the growth rate of the number of stocks.  $\hat{N}$  can be either positive or negative (or zero). A negative value of  $\hat{N}$  means the net acquisition of stocks by the firm sector from households (stock buybacks).

## 2.2 Banks

The banking sector is modeled following an endogenous money perspective. Banks set the real interest rate on loans at  $r$ . Banks make loans to firms and accept deposits from households. I assume that the rate of interest on loans equals that on deposits, banks do not hold any other asset than loans, nobody holds cash, and banking does not incur costs other than the interest payments on depositors. Given these assumptions, banks do not make pure profits, their net worth equals zero, and the amount of loans granted then will return to the banking sector as deposits. The banking sector will be fully described by the exogenous real interest rate  $r$  and the following balance sheet relation:

$$M = M_c + M_w \quad (8)$$

where  $M_c$  and  $M_w$  are the level of deposits held by capitalists and workers, respectively.

## 2.3 Capitalists and workers

Capitalists receive managerial compensation  $W_c$  as well as dividends  $Div_c$  and interest income  $iM_c$  and use their income to purchase consumer goods  $pC_c$  and acquire stocks and deposits,  $v\dot{N}_c$  and  $\dot{M}_c$ :

$$pC_c + v\dot{N}_c + \dot{M}_c = W_c + Div_c + iM_c \quad (9)$$

The workers' budget constraint can be written analogously as:

$$pC_w + v\dot{N}_w + \dot{M}_w = W_w + Div_w + iM_w \quad (10)$$

The stock market clearing condition<sup>13</sup> is given by

$$N = N_c + N_w \quad (11)$$

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<sup>12</sup>The interest payments in the firms' decision on managerial pay and dividend payout, (6) and (7), are evaluated at the (exogenous) real interest rate. Household interest incomes (17) as a determinant of their saving/portfolio decisions are also valued at the real interest rate. Given these specifications, household consumption is not influenced by inflation. If the nominal rate is used to evaluate them instead, consumption will be affected by gains or losses from inflation under the assumption of the constant real interest rate, which will make the analysis unnecessarily complicated.

<sup>13</sup>The role of the stock market for steady state equilibrium is discussed in Appendix.

Each class receives dividends from firms in proportion to their share of stock ownership. Let us denote the capitalist share of stocks as

$$k \equiv \frac{N_c}{N}. \quad (12)$$

Total dividend income is distributed to two classes accordingly:

$$Div_c = k \cdot Div = k(1 - s_f)(1 - \lambda)(\Pi - \delta pK - rM) \quad (13)$$

$$Div_w = (1 - k) \cdot Div = (1 - k)(1 - s_f)(1 - \lambda)(\Pi - \delta pK - rM) \quad (14)$$

Households' saving/portfolio behavior is specified in terms of their desired stock-flow ratios, as in Skott (1981, 1989) and Skott and Ryoo (2008):

$$vN_j = \alpha_j pY_j \quad (15)$$

$$M_j = \beta_j pY_j, \quad j = c, w \quad (16)$$

where  $Y_j$ 's ( $j = c, w$ ) are capitalist and workers' real income, i.e.,

$$Y_j = (W_j + Div_j + rM_j)/p \quad (17)$$

and  $\alpha_j$ 's and  $\beta_j$ 's are the ratios of stock and deposit holdings to income that each class desires to achieve, respectively. It is assumed that these ratios are attained in steady growth. The desired stock-flow ratios may depend on a number of variables such as the rates of return on various assets and the level and the growth rate of incomes, but comparative statics are particularly simple and transparent if those ratios are taken as exogenous. The results with exogenous stock-flow ratios will carry over to the general case with variable ratios if the effects from induced changes in the ratios are relatively small.<sup>14</sup> I will assume that  $\alpha_j$ 's and  $\beta_j$ 's are exogenous throughout this paper, leaving the cases with endogenous stock-flow ratios for a future study. Another advantage of this approach is that the data on stock-flow ratios are readily obtained from the balance sheets and income data, although the availability of the data on the types of stock-flow ratios relevant for particular theoretical and empirical purposes may vary from case to case.

Given the workers' and capitalists' stock-flow ratios, the aggregate wealth-income ratio will be determined by the stock-flow ratios and the income distribution between workers and capitalists:

$$\frac{vN + M}{pY} = \sum_{j=w,c} \frac{vN_j + M_j}{pY} = \sum_{j=w,c} (\alpha_j + \beta_j) \frac{Y_j}{Y} \quad (18)$$

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<sup>14</sup>Skott (1981, 1989) introduced the stock-flow specification of saving/portfolio behavior. Skott and Ryoo (2008) apply this approach to the study of financialization and find that the effects of financial changes on macroeconomic performance through induced changes in the ratios are small in various models including Lavoie and Godley (2001/02) and Godley and Lavoie (2007).

As shown later, income distribution is endogenously determined by a number of factors, including firms' financial behavior, the share of managerial pay, households' saving behavior and the natural rate of growth. The aggregate wealth-income ratio will be influenced by them, accordingly.

The stock-flow ratios (15) and (16) have immediate implications for consumption behavior. Together with the budget constraints (9) and (10), they can be used to derive steady-growth consumption functions. On a steady growth path, the share of stock ownership  $k$  is constant and, therefore, the growth rates of the number of stocks owned by each class should be uniform:  $\hat{N}_c = \hat{N}_w = \hat{N}$ . A steady state also requires the respective income share of workers and capitalists to be constant. Moreover, the growth rate of real income  $Y_c$  and  $Y_w$  should be the same as the natural rate of growth  $n$ , i.e.,  $\hat{Y}_c = \hat{Y}_w = n$ . Given these requirements, (15), (16), (9), (10) and (17) yield steady-growth consumption functions for workers and capitalists:

$$C_j = (1 - \alpha_j \hat{N} - \beta_j n) Y_j, \quad j = c, w \quad (19)$$

The specific form of the consumption functions has a straightforward interpretation. Household savings take the form of newly acquired financial assets. Since the financial stock-flow ratios are constant along steady-growth paths, the ratio of newly purchased stocks to household income is fully determined by the product of the rate of new issues of equity by firms and the stocks/income ratio,  $\alpha_j \hat{N}$ , and that of newly acquired deposits is by the product of the steady-growth rate of deposits and the deposits/income ratio,  $\beta_j n$ . The sum of  $\alpha_j \hat{N}$  and  $\beta_j n$  can be interpreted as the saving rate of class  $j$ , i.e.,  $s_j \equiv \alpha_j \hat{N} + \beta_j n$ .<sup>15</sup> Using this short-hand notation, the consumption functions can be rewritten as

$$C_j = (1 - s_j) Y_j \quad j = c, w \quad (20)$$

Empirical studies show that the rich have saving rates typically higher than the poor (Carroll, 1998) and I will assume  $s_c > s_w$ .<sup>16</sup> It should be noted, however, that the assumption is not always necessary for the Kaldorian analysis when there exists corporate saving.<sup>17</sup>

It will be convenient to introduce some additional notations. The sum of top management pay and dividends of capitalist households is proportional to the profits net of depreciation and firms' interest payments:

$$W_c + Div_c = [\lambda + (1 - s_f)(1 - \lambda)k](\Pi - \delta pK - rM)$$

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<sup>15</sup>This should not be confused with short-run saving rates. The definition of  $s_j$  is based on steady-state assumptions.

<sup>16</sup>Using the definition of  $s_c$  and  $s_w$ , the assumption  $s_c > s_w$  implies a restriction that  $\alpha_c \hat{N} + \beta_c n > \alpha_w \hat{N} + \beta_w n$ .

<sup>17</sup>One may recall that Kaldor's original justification for high saving out of profits was based on the existence of corporate saving, rather than the difference in personal saving rates between capitalists and workers (Kaldor, 1955/56, 1966).

Let us define

$$a(k) \equiv \lambda + (1 - s_f)(1 - \lambda)k \quad (21)$$

$a(k)$  represents the fraction of net profits that are distributed to capitalist households in the form of managerial pay and dividends.  $a(k)$  refers to the capitalist share of (net) profits. The capitalist share of profits is positively related to their share of stock ownership  $k$ . It is increasing in the share of managerial pay in net profits  $\lambda$  and decreasing in the firms' retention rate.

Next consider the sum of top management pay and *total* dividends:

$$\begin{aligned} W_c + Div_c + Div_w &= [\lambda + (1 - s_f)(1 - \lambda)](\Pi - \delta pK - rM) \\ &= [1 - s_f(1 - \lambda)](\Pi - \delta pK - rM) \end{aligned}$$

The term  $1 - s_f(1 - \lambda)$  can be seen as the firms' gross payout ratio (including managerial pay). I will call  $s_f(1 - \lambda)$  *the effective retention rate* and denote it as

$$s_f^* \equiv s_f(1 - \lambda). \quad (22)$$

### 3 Functional and social distribution of income

Note that the two types of households introduced in the previous section are symmetric except the treatment of the labor income of one class as an allocation of profits. It is this treatment that breaks the symmetry of two classes. This section shows that treating the labor income of one class as an allocation of profits produces the close alignment between functional income distribution (the respective shares of profits and wages,  $\pi$ ) and social distribution of income (income claims of social classes, i.e.,  $Y_c$  and  $Y_w$ ), thereby making the economy akin to Kaldor/Pasinetti-type economies.

For a given state of functional income distribution and stock ownership ( $\pi$  and  $k$ ), there exists a unique level of income for each class  $y_c$  and  $y_w$  that is consistent with given deposit-income ratios  $\beta_c$  and  $\beta_w$  where  $y_c \equiv Y_c/K$  and  $y_w \equiv Y_w/K$ .<sup>18</sup> Using (5)–(6), (8) and (13)–(17), after appropriate substitution and normalization, the (unique) mapping from the profit share to the distributive shares of capitalists and workers can be written as (see Appendix):

$$y_c(\pi_n, k) = \frac{a(k)(\pi_n - \beta_w r)u_n}{a(k)(\beta_c - \beta_w)r + (1 - \beta_c r)(1 - s_f^* \beta_w r)} \quad (23)$$

$$y_w(\pi_n, k) = \frac{[(1 - \beta_c r)(1 - s_f^* \pi_n) - a(k)(\pi_n - \beta_c r)]u_n}{a(k)(\beta_c - \beta_w)r + (1 - \beta_c r)(1 - s_f^* \beta_w r)} \quad (24)$$

where  $u_n$  is net output,  $u_n \equiv u^* - \delta$ , and  $\pi_n$  is the share of net profit in net output,  $\pi_n \equiv \frac{\pi u^* - \delta}{u^* - \delta}$ . It is readily seen from (23) and (24) that the capitalist income is increasing

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<sup>18</sup>All real variables will be normalized by  $K$  and all nominal variables by  $pK$  from now on.

but the workers' income is decreasing in the net profit share.<sup>19</sup> The positive effect of changes in the profit share on the capitalist income comes primarily from increases in managerial pay and dividend income.

An increase in the profit share reduces wages for workers but this reduction in income will be partially compensated by an increase in dividends. The overall effect will be negative but the precise magnitude depends on the required adjustments in deposit holdings (and the level of firms' debt).

It is also clear from (23) and (24) that a shift in stock ownership toward capitalists, a rise in  $k$ , increases the capitalists' income share but decreases the workers' share.

With the profit share and the share of stock ownership given, the capitalist and workers' incomes are influenced by changes in the firm's retention policy, the share of managerial compensation, the real interest rate, and household saving behavior reflected in  $\beta_j$ 's. Changes in the income of the classes in turn affect aggregate demand, which generates induced changes in the profit share as well as the state of stock ownership. The next section turns to how the profit share and the distribution of income and wealth between the two classes are determined endogenously by the parameters of the model.

## 4 Aggregate demand and distribution

The condition for the equilibrium in the goods market is given by

$$(1 - s_c)y_c(\pi_n, k) + (1 - s_w)y_w(\pi_n, k) + n = u_n \quad (25)$$

where  $s_j \equiv \alpha_j \hat{N} + \beta_j n$ . The profit share adjusts to clear the goods market. The stability of the adjustment process will be ensured if the level of aggregate demand is decreasing in the profit share. The required condition is given by

$$(1 - s_c) \frac{\partial y_c}{\partial \pi_n} + (1 - s_w) \frac{\partial y_w}{\partial \pi_n} < 0 \quad (26)$$

i.e., the increase in capitalist consumption caused by a marginal increase in the profit share does not fully compensate for the reduction of the workers' consumption. Using (23) and (24), condition (26) can be rewritten as

$$(s_c - s_w)a(k) + (1 - s_w)(1 - \beta_c r)s_f^* > 0 \quad (27)$$

The assumption  $s_c \geq s_w$  is sufficient for this condition to be met. Under condition (26), substituting (23) and (24) in (25) and solving the result for  $\pi_n$  gives us the equilibrium

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<sup>19</sup>The denominator of the expressions is positive for all plausible values.

profit share for any given level of  $k$ <sup>20</sup>:

$$\pi_n^*(k) = \frac{(\iota - s_w)[a(k)(\beta_c - \beta_w)r + (1 - \beta_c r)(1 - s_f^* \beta_w r)]}{(s_c - s_w)a(k) + (1 - s_w)(1 - \beta_c r)s_f^*} + \beta_w r \quad (28)$$

where  $\iota$  is the share of net investment in net output,  $\iota \equiv n/u_n$ . Once the Kaldorian mechanism determines the equilibrium profit share for a given state of stock ownership distribution ( $k$ ) via equation (28), the division of income between capitalists and workers is also determined as a function of  $k$ . Substituting (28) back into (23) and (24) gives us:

$$y_c(\pi_n^*(k), k) = \frac{a(k)(\iota - s_w)u_n}{(s_c - s_w)a(k) + (1 - s_w)(1 - \beta_c r)s_f^*} \quad (29)$$

$$y_w(\pi_n^*(k), k) = \frac{[a(k)(s_c - \iota) + (1 - \iota)(1 - \beta_c r)s_f^*]u_n}{(s_c - s_w)a(k) + (1 - s_w)(1 - \beta_c r)s_f^*} \quad (30)$$

The capitalists' income (29) will be strictly positive if and only if

$$\iota > s_w, \quad (31)$$

i.e., the workers' saving rate should not be too large. If the condition is violated, the equilibrium profit share will be too low, the capitalists' income will vanish. This is the familiar viability condition for a two-class economy in the Pasinetti model (Pasinetti, 1962, Samuelson and Modigliani, 1966).

The workers' income (30), on the other hand, will be positive for all possible states of stock ownership distribution if

$$a(1)(s_c - \iota) + (1 - \iota)(1 - \beta_c r)s_f^* > 0. \quad (32)$$

Note that the workers' income (30) decreases as the capitalists' share of stocks ( $k$ ) rises. If the workers' income is positive when all stocks are owned by capitalists ( $k = 1$ ), then it will be positive for any other  $k \in [0, 1]$ , too.

Assuming (31) and (32) are met and denoting as  $x$  the ratio of the capitalists' to the workers' income (the degree of income inequality), equations (29) and (30) give us

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<sup>20</sup>(28) is a generalized version of the Cambridge equation. If the workers' propensity to save is zero (i.e.,  $\alpha_w = \beta_w = 0$ ) and the expression (28) is reduced to a simple version of the Cambridge equation, i.e., the profit rate is determined by the growth rate divided by the saving propensity out of profits:

$$\rho_n \equiv \pi u^* - \delta = \frac{n}{s_\pi^*}$$

where  $s_\pi^* \equiv [s_f^*(1 - \beta_c r) + (1 - s_f^*)(\alpha_c \hat{N} + \beta_c n)] / (1 - s_f^* \beta_c r)$ . Note that  $s_\pi^*$  is affected by  $s_f^*$ ,  $\hat{N}$ ,  $\alpha_c$ ,  $\beta_c$ ,  $r$  and  $n$ .

one relation between income and wealth distribution

$$\begin{aligned}
x &\equiv \frac{y_c(\pi_n^*(k), k)}{y_w(\pi_n^*(k), k)} = \frac{(\iota - s_w)a(k)}{(s_c - \iota)a(k) + (1 - \iota)(1 - \beta_c r)s_f^*} \\
&\equiv F(k; \lambda, s_f, \hat{N}, \alpha_c, \alpha_w, \beta_c, \beta_w, n, r, u^*)
\end{aligned} \tag{33}$$

Equation (33) shows that the degree of income inequality depends on inequality in stock ownership and a number of parameters in this model. A shift in stock ownership toward capitalists raises their income share relative to workers by increasing their share of dividend income, i.e.,  $F'(k) > 0$ .

The other relation between  $x$  and  $k$  is given by ownership equilibrium. Using the definition of  $k$  and  $\alpha_j$ 's:

$$k = \frac{vN_c}{vN_c + vN_w} = \frac{\alpha_c pY_c}{\alpha_c pY_c + \alpha_w pY_w} = \frac{\frac{\alpha_c}{\alpha_w} x}{\frac{\alpha_c}{\alpha_w} x + 1} \equiv G\left(x; \frac{\alpha_c}{\alpha_w}\right) \tag{34}$$

The capitalists' share of stocks is uniquely determined by income distribution between classes. Given the constant stocks/income ratios  $\alpha_c$  and  $\alpha_w$ , an increase in the capitalists' income relative to workers raises the capitalists' stock holdings relative to the workers' stocks, i.e.,  $G'(x) > 0$ .

On any steady growth path, the two relations (33) and (34) must be mutually consistent. The steady growth value of the capitalist share of stocks is the fixed point of  $G(F(k))$ , i.e.,

$$k^* = G(F(k^*)). \tag{35}$$

Appendix shows that there exists a unique solution  $k^* \in (0, 1)$  under the assumptions (31) and (32).

The solution for  $k$  then fully determines the profit share as well as the income distribution between workers and capitalists via (28) and (33). The capitalists' share of *wealth* is also easily obtained using (15) and (16):

$$\frac{vN_c + M_c}{vN_c + M_c + vN_w + M_w} = \frac{(\alpha_c + \beta_c)x^*}{(\alpha_c + \beta_c)x^* + (\alpha_w + \beta_w)}. \tag{36}$$

The expression (36) shows that for given stock-flow ratios, any factor that increases income inequality  $x^*$  will also raise wealth inequality.

Figure 1 illustrates the determination of income distribution and stock ownership in the steady state. The  $FF$  curve – ‘income distribution curve’ – depicts the level of the workers' income relative to capitalists' determined by the Kaldorian mechanism for each state of stock ownership, equation (33). The  $GG$  curve – ‘stock ownership distribution curve’ – represents the distribution of stock ownership implied by desired stock-income ratios at each state of income distribution, equation (34). Given the functional form of

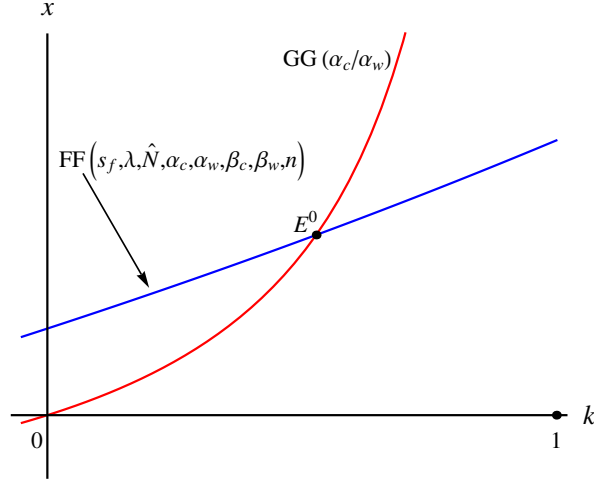


Figure 1: Income distribution and stock ownership in the steady state

(33) and (34) and assumptions (31) and (32), the stock-ownership distribution curve  $GG$  is steeper than the income distribution curve  $FF$  at the intersection (see Appendix).

Macroeconomic implications of parametric changes for income and wealth distribution can be readily derived. A visual inspection of (33) and (34) reveals that  $s_f$ ,  $\lambda$ ,  $\hat{N}$ ,  $\beta_c$  and  $\beta_w$  and  $n$  shifts only the income distribution curve  $FF$  whereas stocks/income ratios  $\alpha_c$  and  $\alpha_w$  affect both curves. Comparative statics regarding  $\alpha_c$  and  $\alpha_w$  result in various cases depending on the patterns of the shift in both relations.

Formally, the long-run effects of any parameter  $z \in \{s_f, \lambda, \hat{N}, \beta_c, \beta_w, n, \alpha_c, \alpha_w\}$  on equilibrium income and stock-ownership distribution  $x^*$  and  $k^*$  are represented by

$$\frac{dx^*}{dz} = \frac{\frac{\partial F}{\partial z} + F'(k^*)\frac{\partial G}{\partial z}}{1 - F'(k^*)G'(x^*)} \quad (37)$$

$$\frac{dk^*}{dz} = \frac{\frac{\partial G}{\partial z} + G'(x^*)\frac{\partial F}{\partial z}}{1 - F'(k^*)G'(x^*)} \quad (38)$$

The denominator is always positive because the income distribution curve ( $FF$ ) is flatter than the stock-ownership distribution curve ( $GG$ ). Therefore, for the parameters that only shifts the income distribution curve  $FF$  (i.e.,  $s_f$ ,  $\lambda$ ,  $\hat{N}$ ,  $\beta_c$  and  $\beta_w$  and  $n$ ), the sign of  $\frac{dx^*}{dz}$  and  $\frac{dk^*}{dz}$  immediately follows that of  $\frac{\partial F}{\partial z}$  because  $\frac{\partial G}{\partial z} = 0$ . In other words, any factor that increases the capitalists' share of income for a given  $k$  will shift up the income distribution curve from  $FF^0$  to  $FF^1$ . In the new steady state  $E^1$  the capitalists' share of income and wealth both will increase (see Figure 2). The effect on the income distribution curve of those parameters are as follows:



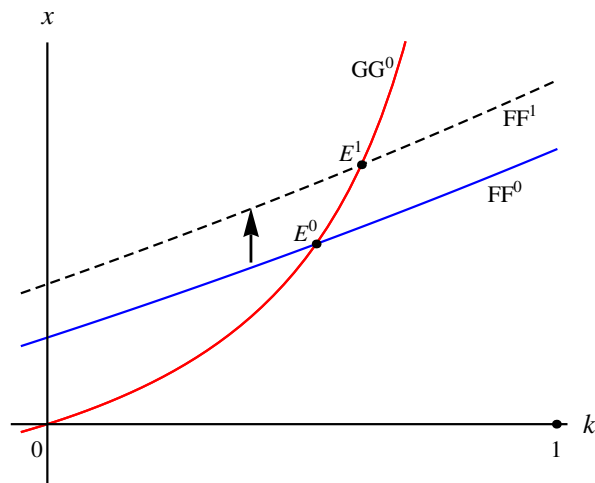


Figure 2: Parametric shift in favor of the capitalist share of income for a given state of stock-ownership distribution (a rise in  $\lambda$  and  $n$ ; a fall in  $s_f$ ,  $\hat{N}$  and  $\beta_w$ )

**A shift of power relations in corporations in favor of top managerial pay, a rise in  $\lambda$ , raises the capitalists' share of income and wealth:**

$$\frac{\partial F}{\partial \lambda} = \frac{s_f(1-\iota)(1-\beta_c r)x^{*2}}{(\iota-s_w)a(k^*)^2} > 0$$

An increase in  $\lambda$  represents a structural shift of power relations in corporations in favor of CEO/managerial pay. For a given profit share, such an increase in  $\lambda$  reduces retained earnings as well as dividend incomes. The workers' income decreases due to the reduced dividends, but the capitalists' income will increase as the increase in managerial pay more than offsets the decline in dividend income. The initial impact effect that favors capitalists may be reinforced or partially offset by an endogenous increase or decrease in the profit share. One may expect that given the capitalists' saving rate higher than the workers' the initial shift of income distribution in favor of capitalists must reduce consumption demand and the equilibrium profit share. This reasoning is not always valid, however. The reduction in retained earnings due to a rise in the executives' claim on profits means that the increase in the capitalists' income must be larger than the reduced amount of the workers' income.<sup>21</sup> The overall effect on aggregate demand for a given profit share will be ambiguous, but under plausible parameter values an increase in consumption demand is a possible outcome and the equilibrium profit share can increase.<sup>22</sup>

<sup>21</sup>Note that  $y_f + y_c + y_w = u_n$  where  $y_f$  is the retained earnings scaled by capital stock.

<sup>22</sup>In a corporate economy with retained earnings, a rise in  $\lambda$  represents an income transfer away from the corporate sector, making the income transfer from capitalist households to workers a positive-sum

The general lesson is that the existence of retained earnings in corporate economies tends to reinforce the initial distributional impact of a structural shift in favor of top management. As the above partial derivative confirms, the capitalists' income share will be higher for a given  $k$  unambiguously after the endogenous adjustment of the profit share. The increase in the capitalists' share of income shifts stock ownership toward capitalists for given desired stock-flow ratios. The adjustment of the distribution of stocks – the rise in  $k$  – redistributes dividend incomes in favor of capitalists and further increases their income share. The capitalist share of income and stocks thus will be higher in the new steady state.

There are a number of studies on financialization, including (Epstein, 2005, Stockhammer, 2004, Skott and Ryoo, 2008, van Treeck, 2009, Hein, 2012, Palley, 2013a). Among many developments associated with financialization, the retention rate of non-financial corporations in the US decreased significantly in recent decades: the U.S. corporations have paid out the greater portion of their earnings to their shareholders in the recent decades. The rate of net equity issues by non-financial corporations was small but positive on average in the 1950s and 1960s, but the figures turned to large negative numbers since the early 1980s. In other words, an increasing part of corporate earnings has been distributed to shareholders in the form of stock buybacks in the recent decades. The following results show that a fall in  $s_f$  and  $\hat{N}$  unambiguously increases the capitalists' share of income and wealth.

**A fall in the retention rate ( $s_f$ ) raises the capitalists' share of income and wealth:**

$$\frac{\partial F}{\partial s_f} = -\frac{(1-\lambda)[\lambda+(1-\lambda)k^*](1-\iota)(1-\beta_{cr})x^{*2}}{(\iota-s_w)a(k^*)^2} < 0$$

An increase in the dividend payout to households – a fall in  $s_f$  – raises consumption and aggregate demand for a given profit share (and  $k$ ). The product market equilibrium requires the profit share to rise to eliminate excess demand. The endogenous increase in the profit share raises the capitalists' income relative to the workers' income. The capitalists' income share increases and the resulting increase in their share of stock holdings strengthens the impact effect. In the new steady state, the capitalists' share of income and wealth will be higher.

**An increase in stock buybacks – a fall in the rate of net equity issues ( $\hat{N}$ ) – increases the capitalists' share of income and wealth:**

$$\frac{\partial F}{\partial \hat{N}} = -\frac{\alpha_c x^{*2}}{(\iota-s_w)k^*} < 0$$

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transfer: for any given profit share the rise in  $\lambda$  must raise the capitalists' income *more than* the reduced amount of the workers' income. Therefore the rise in  $\lambda$  can increase aggregate demand for a given profit share.

An increase in stock buybacks can be captured by a decline in the rate of equity issue by firms ( $\hat{N}$ ). A fall in  $\hat{N}$  decreases the saving rates  $s_j \equiv \alpha_j \hat{N} + \beta_j n$  by reducing the fraction of the household income devoted to the acquisition of newly issued stocks is  $\alpha_j \hat{N}$  on a steady growth path. Consumption demand by both classes will increase and an increase in the profit share is required to maintain the product market equilibrium. The change in the functional distribution of income will shift income and wealth from workers to capitalists.

**A reduction in the long-run growth rate ( $n$ ) *reduces* the capitalists' share of income and wealth:**

$$\frac{\partial F}{\partial n} = \frac{x^*}{(\iota - s_w)y_w^*} (1 - \beta_w y_w^* - \beta_c y_c^*) > 0 \text{ if } 1 - \beta_w y_w^* - \beta_c y_c^* > 0$$

It is straightforward to see that a fall in  $n$  reduces the left-hand side of (25) – aggregate demand – directly by bring down steady-growth investment demand relative to capital stock. The fall in  $n$ , however, decreases the saving rates of capitalists and workers by reducing their net acquisition of deposits, thereby affecting aggregate demand positively. The former effect will outweigh the latter unambiguously as long as the firms' debt-capital ratio is below unity: since  $\frac{M}{pK} = \beta_c y_c + \beta_w y_w$ , the effect of a change in  $n$  on the left-hand side of (25) can be written as

$$-\frac{\partial s_c}{\partial n} \cdot y_c - \frac{\partial s_w}{\partial n} \cdot y_w + 1 = -(\beta_c y_c + \beta_w y_w) + 1 = 1 - \frac{M}{pK} > 0$$

if  $M/pK < 1$ . A reduction in the natural rate of growth therefore leads to a net decrease in aggregate demand relative to normal capacity output and causes the equilibrium profit share to fall for any  $k$ . Lower growth thus shifts the income distribution curve downward. The capitalists' share of income and wealth will decrease. Note that this result is opposite to Piketty's argument that low growth is a source of increasing inequality. Piketty's explanation is based on the assumption that, with the aggregate saving rate taken as constant, product market equilibrium is attained through the adjustment of the capital-output ratio ( $1/u$  in our framework) in response to an exogenous change in  $n$ . Given his Solow-Swan framework, a fall in  $n$  raises  $K/Y$  which, under perfect competition, raises the profit share if the elasticity of factor substitution is greater than unity. The Kaldorian framework here is very different. I have taken  $K/Y$  as exogenous and the aggregate saving rate is endogenous. The endogenous adjustment of the aggregate saving rate comes through the adjustment of income distribution. A fall in  $n$  requires the aggregate saving rate to fall, which takes place through a fall in the profit share. In this Kaldorian framework, the reasons for increasing inequality therefore should be found somewhere else rather than the fall in the natural rate.

**A fall in the workers' deposits/income ratio ( $\beta_w$ ) raises the capitalists' income and wealth shares.**

$$\frac{\partial F}{\partial \beta_w} = -\frac{nx^*}{\iota - s_w} < 0$$

The effect of changes in interest bearing assets or liabilities on aggregate demand is typically ambiguous in post Keynesian models with differential saving rates of two classes. The ambiguous long-run effect on aggregate demand of a rise in the workers' indebtedness, for instance, appears in Dutt (2006), Palley (2010), Ryoo and Kim (2014). The same kind of ambiguity also characterizes the present model: for a given  $k$ , the effect of  $\beta_j$ 's on the profit share are ambiguous. A fall in  $\beta_w$ , for example, tends to decrease aggregate demand through a transfer of interest income away from workers who have a low saving rate, but it can stimulate aggregate demand by reducing the workers' saving rate. To understand the latter, recall that  $s_w \equiv \alpha_w \hat{N} + \beta_w n$ : a fall in  $\beta_w$  means a decline in the workers' net acquisition of deposits (or an increase in net borrowing) and thus a fall in the saving rate. The effect on aggregate demand and the profit share can be either way for a given  $k$  and the induced effect coming from the adjustment of  $k$  further complicates the net outcome.

Interestingly, in spite of the ambiguity regarding the effect on demand and functional distribution, the effect of changes in  $\beta_w$  on the *class-share* of income and wealth ( $x^*$  and  $k^*$ ) is clear-cut: a decline in the workers' deposits/income ratio – or an increase in the workers' debt/income ratio – reduces the workers' income relative to capitalists unambiguously. A fall in  $\beta_w$  creates a transfer of interest income away from workers (or increases the burden of debt service if the fall in  $\beta_w$  primarily reflects an increase in debt/income ratio) for a given profit share. The impact negative effect of a fall in  $\beta_w$  on the workers' share of income is strong enough and cannot be overturned by the derived effect from changes in the profit share, as the above partial derivative confirms. The distribution curve  $FF$  will shift upward unambiguously, which raises the steady state values of the capitalists' share of income and wealth.<sup>23</sup>

**The effect of changes in the stock-income ratio ( $\alpha_c$  and  $\alpha_w$ ): distributional implications of the stock market boom in the 1990s** Changes in stocks/income ratios shift both the income distribution and the stock-ownership distribution curves. In addition, the effect of  $\alpha_j$  on the capitalists' income share for a given  $k$  depends on the sign of the rate of equity issues:

$$\frac{\partial F}{\partial \alpha_c} = -\frac{\hat{N}x^{*2}}{\iota - s_w} > 0 \quad \text{if } \hat{N} < 0 \quad (39)$$

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<sup>23</sup>The effect on  $x$  of changes in the capitalists' deposits/income ratio ( $\beta_c$ ) is ambiguous even for a given  $k$ , however:

$$\frac{\partial F}{\partial \beta_c} = -\frac{[(1 - \iota)s_f^* r - na(k^*)]x^{*2}}{(\iota - s_w)a(k^*)} \geq 0$$

$$\frac{\partial F}{\partial \alpha_w} = -\frac{\hat{N}x^*}{\iota - s_w} \quad \text{if } \hat{N} < 0 \quad (40)$$

When the rate of net equity issues is positive  $\hat{N} > 0$ , a higher stocks/income ratio means a higher saving rate and depresses effective demand for a given  $\pi$  and  $k$ . The profit share  $\pi$  must decrease to maintain the product market equilibrium, which will reduce the capitalists' share of income for a given  $k$ . When  $\hat{N} < 0$ , however, keeping the ratio of stocks to income at a higher value implies a lower saving rate, thereby leaving more income for consumption. The profit share required for the product market equilibrium for a given  $k$  increases as a result and so does the capitalists' share of income. The effect of changes in  $\alpha_j$  on demand and the profit share will be neutral if  $\hat{N} = 0$ .<sup>24</sup> As pointed out already, the average value of  $\hat{N}$  was nearly zero during the Golden Age of Capitalism, but has been negative substantially since the early 1980s due to the surges in stock buybacks. Thus for our purpose, the case of  $\hat{N} < 0$  is of particular interest.<sup>25</sup> The stock market boom, in the 1990s, can be captured by large increases in  $\alpha_c$  and  $\alpha_w$  under the condition  $\hat{N} < 0$ . In the present model, such a development boosts aggregate demand for a given profit share and the increase in effective demand must raise the profit share and the capitalist share of income for a given state of equity distribution between classes. The income distribution curve, the  $FF$  curve, therefore will shift upward. The final outcome depends on how the  $GG$  curve is affected. Interestingly, the recent data by Saez and Zucman (2014) implies that  $\alpha_c/\alpha_w$ , the only factor that determines the position of the  $GG$  curve, has exhibited little variation since the early 1980s.<sup>26</sup> Thus the qualitative effect may well be approximated by Figure 2. The stock market boom in the 1990s therefore appears to have contributed to increasing share of capitalists' income and wealth.

## 5 Conclusion

The Kaldorian perspective in this paper places corporate firms at the center of the process of income distribution. A pillar of the Kaldorian distribution mechanism is

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<sup>24</sup>The dependence of the effect of changes in stocks/income ratios on demand has long been recognized since Skott (1981, 1989).

<sup>25</sup>Increasing stock buybacks and stocks/income ratios may reinforce each other and create a positive feedback. Stock repurchases by corporations tend to raise stock prices and create capital gains and the rate of return on stocks. This in turn justifies the households' attempt to raise the level of stock holdings relative to their income. The resulting increase in aggregate demand and profitability relaxes the firms' budget constraint, which validates the firms' lax financial practices (stock buybacks). I explored how such a positive feedback can generate 'Minskian long waves' in Ryo (2010, 2013a,b).

<sup>26</sup>Using the data in Saez and Zucman (2014), a ballpark estimate of  $\alpha_c/\alpha_w$  in the period since the 1980s is the order of 10 if the capitalist class in this model can be identified with the top 1% class.

the perspective that wage contracts are written in the nominal term and the normal functioning of labor market is not characterized by real wage bargaining.<sup>27</sup> Under this condition, favorable demand conditions in the goods market permit firms to achieve higher profit margins through pricing. Using Minsky's expression, prices in the capitalist economy are the 'carriers of profits'. Firms play a pivotal role in determining the functional distribution of income via their pricing behavior. In addition to the role of firms in determining the functional distribution of income through pricing, corporations influence the division of aggregate income into corporate saving and personal income. Outside the Modigliani-Miller world, changes in the corporate saving rate – their retention/payout policies – and equity issue policies have strong implications for the state of effective demand. I have suggested that the corporate decisions over CEO/managerial compensations can be viewed as part of firms' saving decisions, i.e., the decision on the effective retention rate. An increase in an allocation of profits to top management pay amounts to a reduction in the effective retention rate and increase total household income. Therefore its effect on aggregate demand is not necessarily contractionary although the capitalists' households have a saving propensity higher than workers. The structural shift in the power relation within corporations in favor of top management pay unambiguously increases the capitalists' share of income and wealth in our framework. Perhaps more importantly, the effect is reinforced by the other structural/behavioral changes. A reduction in the firms' retention rate tends to increase aggregate demand and the profit share, which in the end leads to a rise in the capitalists' share of income and wealth. Corporate decisions on equity issues also affect aggregate demand and income distribution by influencing personal saving rates. In corporate economies, saving does not usually take the form of direct ownership of physical capital but the ownership of financial assets. Household saving in the form of stocks can increase in so far as corporations provide positive net issues of equity in aggregate. Since the 1980s, net new issues of equity have been substantially negative, which has contributed to lower saving rates. This must have had a positive effect on aggregate demand and profit margins.

Turning to the household side, the stock market boom in the 1990s created a strong stimulus to aggregate demand under the condition that the greater portion of corporate stocks was retired in the form of stock buybacks, leading to the falling household saving rate. Rising debt/income ratios of low-income households – a fall in  $\beta_w$  – also unambiguously raises the capitalists' share of income and wealth in this model.

A fall in the natural growth rate, in contrast to Piketty's argument ('capital is back because slow growth is back'), causes the capitalists' share of income and wealth to fall

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<sup>27</sup>In the *General Theory*, Keynes saw the assumption of real wage bargaining fundamental in the classical theory of full employment. The lack of mechanisms or institutions in the capitalist economy that can enforce into wage contracts real wages derived from workers' intertemporal choices over leisure/labor was a basis of Keynes's rejection of the 'second postulate' of the classical theory of full employment (Keynes, 1964[1936]).

in this Kaldorian framework.

Overall, various structural and behavioral changes I have highlighted in this paper – except the fall in the natural rate – appear to have exerted the forces that stretch long-run aggregate demand upward. An increase in long-run aggregate demand, in a Kaldorian model of this kind, translates into an increase in the share of profits and the capitalists’ share of income and wealth.<sup>28</sup> The Kaldorian perspective that stresses the distributional consequences of aggregate demand has received little attention in the existing literature: in most mainstream analyses, aggregate demand is irrelevant in the long run; the majority of Kaleckian analyses are inclined to discover the stagnationary effect of an exogenous increase in inequality on utilization and accumulation.

The collapse of the Golden Age has been often identified as the start of the transition to a stagnationary phase that suffered from a chronic deficiency of aggregate demand. Along this line, increasing income inequality is often viewed as one of the *causes* of low aggregate demand and slow growth, primarily on the ground that the rich have lower propensities to consume than the poor.<sup>29</sup> The perspective presented here provides an alternative hypothesis: increasing inequality may have been strongly *induced* by the collapse of the structure that ensured the stability of demand generation during the Golden Age. From this perspective, the Kaldorian distributional mechanism exerted its force at the full strength after the end of the Golden Age: shifts in the power and the behavioral relation that favored capitalist households tended to be validated through their effects on aggregate demand and profit margins. There was a downward shift in the long-run accumulation rate during the last three decades, but such a contractionary force appears to have been even more than offset by the expansionary effects from the other developments discussed above.

The analysis in this paper has many limitations. The analysis, first, has focused primarily on the link between aggregate demand and distribution, but left out a detailed analysis of the effects on the employment rate.<sup>30</sup> Next, the focus of the analysis on steady growth paths may be unsatisfactory especially from a Minskian perspective of long waves (Minsky, 1964, 1995, Palley, 2011, Ryoo, 2010, 2013a,b): the long-run movement of aggregate demand and distribution may be better described as subsequent phases of endogenous long swings rather than the movement across steady growth paths. The Minskian perspective brings to the fore the issues regarding the sustainability of a

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<sup>28</sup>Booming asset markets increase realized capital gains and tend to amplify the underlying trend of increasing income inequality.

<sup>29</sup>The popularity of the discourse on ‘wage-led growth’ seems to reflect such a perspective (Lavoie and Stockhammer, 2013).

<sup>30</sup>In the Skott model, the employment rate is jointly determined by the profit share and the shape and the position of the output expansion function. With the output expansion function given, a rise in the profit share leads to an increase in the employment rate, but the assumption that the output expansion function remains unchanged over the past decades is heroic. Institutional details and power relations in the labor market as well as capitalist dynamism may have changed and affected the output expansion function.

prolonged upward stretch of aggregate demand and income inequality.<sup>31</sup> The analysis, third, has paid little attention to the issues of government policies.<sup>32</sup> Finally, the analysis has assumed that the economy is mature so that long-run growth is constrained by the availability of labor, and therefore the results cannot be directly applicable to Lewis-type dual economies.

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<sup>31</sup>In stylized models, I analyze how distribution and aggregate demand interact to create the long-run cyclical movement of distributive shares (Ryoo, 2014, Ryoo and Kim, 2014).

<sup>32</sup>The link between inequality and long-run movements of aggregate demand that I have stressed in this paper, along with the Minskian perspective of long waves, suggests that the policies and the institutions that help prevent aggregate demand from getting into upward or downward instability – financial regulation, for instance – may be crucial not only for its own sake but also for the issues of income inequality.



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## Appendix

**Derivation of (23) and (24)** Substituting (5), (6), (13) and (14) into (17), we then obtain:

$$\begin{aligned} pY_c &= [\lambda + k(1 - s_f)(1 - \lambda)](\Pi - \delta K - rM) + rM_c \\ pY_w &= (1 - \pi)pY + (1 - k)(1 - s_f)(1 - \lambda)(\Pi - \delta K - rM) + rM_w \end{aligned}$$

Using (8) and (16) and dividing through by  $pK$ , we get:

$$\begin{aligned} y_c &= [\lambda + k(1 - \lambda)(1 - s_f)][\pi u^* - \delta - r(\beta_c y_c + \beta_w y_w)] + r\beta_c y_c \\ y_w &= (1 - \pi)u^* + (1 - k)(1 - \lambda)(1 - s_f)[\pi u^* - \delta - r(\beta_c y_c + \beta_w y_w)] + r\beta_w y_w \end{aligned}$$

Defining  $a(k) \equiv \lambda + k(1 - \lambda)(1 - s_f)$  and  $s_f^* \equiv s_f(1 - \lambda)$ , and rearranging the terms,

$$\begin{aligned} \begin{pmatrix} 1 - \beta_c r[1 - a(k)] & a(k)\beta_w r \\ \beta_c r[1 - a(k) - s_f^*] & 1 - \beta_w r[a(k) + s_f^*] \end{pmatrix} \begin{pmatrix} y_c \\ y_w \end{pmatrix} \\ = \begin{pmatrix} a(k)(\pi u^* - \delta) \\ u^* - \delta - [a(k) + s_f^*](\pi u^* - \delta) \end{pmatrix} \end{aligned}$$

Solving the system of equations for  $y_c$  and  $y_w$  yields:

$$\begin{aligned} y_c &= \frac{a(k)[\pi u^* - \delta - \beta_w r(u^* - \delta)]}{a(k)(\beta_c - \beta_w)r + (1 - \beta_c r)(1 - s_f^* \beta_w r)} \\ y_w &= \frac{(1 - \beta_c r)[u^* - \delta - s_f^*(\pi u^* - \delta)] - a(k)[\pi u^* - \delta - \beta_c r(u^* - \delta)]}{a(k)(\beta_c - \beta_w)r + (1 - \beta_c r)(1 - s_f^* \beta_w r)} \end{aligned}$$

Applying the definitions  $u_n \equiv u^* - \delta$  and  $\pi_n \equiv \frac{\pi u^* - \delta}{u_n}$  results in (23) and (24).

**Existence and uniqueness of the steady state** Equation (34) can be rewritten to  $x = \frac{\alpha_w k}{\alpha_c(1-k)}$ , which must be consistent with equation (33). We then have:

$$\frac{(\iota - s_w)a(k)}{(s_c - \iota)a(k) + (1 - \iota)(1 - \beta_c r)s_f^*} = \frac{\alpha_w k}{\alpha_c(1 - k)}$$

The solution to this equation can be found by looking at:

$$q(k) \equiv \alpha_c(1 - k)(\iota - s_w)a(k) - \alpha_w k[(s_c - \iota)a(k) + (1 - \iota)(1 - \beta_c r)s_f^*] = 0$$

$q(k)$  is continuous and quadratic in  $q$  and we have:

$$\begin{aligned} q(0) &= \alpha_c(\iota - s_w)a(0) > 0 \quad \text{under condition (31)} \\ q(1) &= -\alpha_w[(s_c - \iota)a(1) + (1 - \iota)(1 - \beta_c r)s_f^*] < 0 \quad \text{under condition (32)} \end{aligned}$$

By the intermediate value theorem, the continuity of  $q(k)$  ensures the existence of  $k^* \in (0, 1)$  such that  $q(k^*) = 0$ . The continuity of  $q(k)$  implies that there exist an odd number of  $k^*$ 's in  $(0, 1)$ . Since  $q(k)$  is quadratic in  $k$ ,  $k^*$  must be unique in  $(0, 1)$ . Because  $q(0) > 0 > q(1)$ ,  $q(k)$  must cut the  $k$ -axis from the above at  $k = k^*$ . In other words,  $q'(k^*) < 0$ . It can be checked that  $q'(k^*) < 0$  implies that  $G'(x^*)F'(k^*) < 1$ : the  $FF$  curve is flatter than the  $GG$  curve at the intersection as in Figure 1.

**Equilibrium in asset markets** There are two financial assets held by households (stocks and deposits). Equilibrium in asset markets is represented by (8) and (11), which, together with (15) and (16), implies that

$$vN = \alpha_c p Y_c + \alpha_w p Y_w \quad (\text{A1})$$

$$M = \beta_c p Y_c + \beta_w p Y_w \quad (\text{A2})$$

Condition (A2) has been already used for the derivation of (23) and (24) and therefore steady growth equilibrium  $(x^*, k^*)$  is consistent with condition (A2).

I have also used the stock market equilibrium condition (11) to establish steady growth equilibrium  $(x^*, k^*)$ , but the equilibrium in the stock market itself is achieved through the adjustment of stock prices via (A1). It follows from (A1) that on the steady growth path:

$$(v/p)^* = (\alpha_c Y_c^* + \alpha_w Y_w^*)/N = (\alpha_c y_c^* + \alpha_w y_w^*)K^*/N^*$$

On the steady growth path,  $y_c^*$  and  $y_w^*$  are constant. Since the growth rate of  $N$  is exogenously given by  $\hat{N}$  and capital stock grows at  $n$  in steady growth equilibrium, the steady growth path will be supported by a constant rate of real capital gains, i.e.,  $(v/p)^*$  will grow at  $n - \hat{N}$  on the steady growth path. The role of stock prices here is essentially the same as that of the valuation ratio ( $= vN/pK$ ) in Kaldor (1966).

A stock-flow consistent feature of the model can be checked by inspecting the budget constraints. Adding up (3), (9) and (10) and rearranging the terms, we have:

$$p(C + I - Y) + v(\dot{N}_c + \dot{N}_w - \dot{N}) = \dot{M} - \dot{M}_c - \dot{M}_w + i(M_c + M_w - M)$$

Stock-equilibrium (8) and (11) implies flow-equilibrium:  $\dot{M} = \dot{M}_c + \dot{M}_w$  and  $\dot{N} = \dot{N}_c + \dot{N}_w$ . Thus asset markets clearing requires that  $C + I = Y$ , i.e., the equilibrium in the product market.