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Some thoughts on the dynamic interaction between the exchange rate
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DEPARTMENT OF ECONOMICS

Working Paper

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**UNIVERSITY OF MASSACHUSETTS
AMHERST**

Is the nature of the demand regime relevant over the medium run? Some thoughts on the dynamic interaction between the exchange rate and demand regimes

Arslan Razmi*

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Abstract

Is growth in capitalist economies wage-led or profit-led? Empirical studies have found conflicting results for different countries and periods. Possible reasons may include differences in the monetary policy/exchange rate regimes across countries and between macro behavior in the short- and medium-runs. I theoretically explore these possibilities using a portfolio balance framework to keep track of asset stocks and wealth effects over time. With fixed exchange rates, the Central Bank's need to intervene in the asset market via official reserve transactions results in assigning a crucial role to the current account in constraining accumulation and output. The binding nature of this constraint vanishes with flexible exchange rates. The most important message that emerges is that, once we impose plausible constraints on dynamic behavior, factors other than the nature of the demand regime determine the effect of redistribution on utilization, income, and accumulation over the medium run. The demand regime loses relevance for reasons that vary with the exchange rate regime.

JEL classifications: F32, F43, E25, E42, E64

Key words: Demand regime, wage-led growth, stagnationism, exhilarationism, neo-Kaleckian models, distribution, portfolio balance model, wealth effects.

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1 Introduction

Growth in Keynesian models is demand-led. In a closed economy, this means that, barring an overwhelmingly strong investment response to demand, redistribution in favor of spenders should boost growth. As pointed out by Blecker (1989) and others, open economy considerations complicate the picture. The effect of re-distribution in a large open economy depends on the response to real exchange rate changes. An increase in the profit share through a higher mark-up results in real appreciation and a decline in external competitiveness. Demand suffers as a result, making profit-led growth less feasible. A decline in the wage too increases the profit share but now makes the economy more competitive, which facilitates profit-led growth. Prospects for wage- or profit-led demand growth (“stagnationism” and “exhilarationism” in the words of Marglin and Bhaduri (1988)) in an open economy, therefore, depend crucially on the source of the re-distribution. An economy that is profit-led when insulated from the rest of the world may well metamorphose into a wage-led open economy.

The strength of the effect of redistribution on competitiveness is only one potential source of differences between open economies. Variation in exchange rate regimes between countries that peg their currencies to a fixed standard and others that let their currency values float in the market – to take polar extremes – is another factor that complicates open economy behavior. Differences may also emerge between short- and longer-run responses of macroeconomic aggregates. In fact these and other factors may at least partly explain the mixed empirical results regarding the nature of the demand and growth regimes.¹

The above discussion makes clear that the traditional mechanism through which redistribution influences the scope for wage-led or profit-led growth in an open economy works through the trade balance. Since capacity utilization is the adjusting variable in such models, a loss of competitiveness results in downward pressure on demand and income. An obvious constraint that is missing from the picture is that of the balance of payments. What follows once redistribution creates a trade surplus or deficit? With fixed exchange rates, the Central Bank would have to defend the value of the currency through official reserve transactions, in the process accumulating or decumulating foreign exchange reserves. This process cannot be expected to last for ever. With flexible exchange rates, the exchange rate would be expected to move in response either to the trade imbalance or the asset accumulation or decumulation entailed by the current account imbalances. Moreover, as private and official asset holdings change, one would expect consumption behavior to be impacted through wealth effects. A careful examination of the relationship between income distribution and demand should, therefore, take these dynamic aspects into account. To the best of my knowledge, only one paper, Razmi (2014), looks at these stock and flow relationships over time. However, this paper limits the analysis to fixed exchange rates, and does not contrast the behavior of macro aggregates under fixed versus floating regimes. The present paper is an attempt to fill these gaps.

¹Cite Blecker (2015) here.

In order to analyze dynamic processes, I incorporate wealth effects ala' Metzler (1951) and portfolio considerations in the spirit of Tobin (1969). This enables the analysis to incorporate balance of payments constraints over time while exploring the stock-flow relationships alluded to earlier. The main results are derived not only for demand and output changes, but also in terms of steady state stocks of real (capital) and financial assets. Perhaps three of these results can be seen as the most important:

1. The nature of the demand regime becomes irrelevant in determining how income redistribution affects the steady state level of output, utilization, capital, and wealth once one extends the basic neo-Kaleckian framework to incorporate plausible constraints on behavior over time. Other factors such as trade behavior assume a pivotal role instead.
2. The nature of the binding constraint on output varies with the exchange rate regime. With fixed exchange rates, the steady state stock of capital can be higher or lower following a re-distribution towards profits depending on whether trade responds more elastically to income or relative price changes. The same factor determines the effect on steady state wealth. With a floating (or flexible) exchange rate, by way of contrast, the relative responsiveness of the trade balance to income and relative price changes ceases to be relevant to the steady state stock of capital, although it continues to matter for the steady state stock of financial assets. Indeed, in the simplest specification, the former is unmoved by re-distribution.
3. Redistribution *toward* profits through a higher mark-up factor reduces steady state utilization regardless of the nature of the demand or exchange rate regimes. Redistribution *away* from profits through higher real wages will have similar consequences.

It may be important to note here that the contrast in the extent to which the external account constraint binds the steady state stock of capital does not arise from the assumption that, with flexible exchange rates, the currency value adjusts to keep the current account balanced. Indeed, the exchange rate is assumed to be determined in the asset markets.

The next section presents broad conceptual details of the framework. Sections 3 and 4 analyze the effects of re-distribution under different exchange rate regimes. Section 5 concludes.

2 Basic framework

In the analysis that follows, I will consider trade openness in an “imperfect substitutes” framework. The country, in other words, exports a good that is an imperfect substitute for the foreign-made goods that it imports. Thus, the country is not a price-taker in international markets. This specification, which is in keeping with previous literature and the spirit of the demand-led neo-Kaleckian framework, leads to a simple specification where the trade balance

is a negative function of domestic real income Y and, as long as the Marshall-Lerner condition is satisfied, a positive function of relative prices q (i.e., in this context the real exchange rate). Thus,

$$T = T(Y, q); T_Y < 0, T_q > 0 \quad (1)$$

where $q (= eP^*/P)$ is the ratio of the foreign and domestic price levels (P^* and P , respectively) at the nominal exchange rate e (the domestic currency price of a unit of foreign currency). When later normalized by the capital stock, the trade balance function will be expressed with capacity utilization $u (\equiv Y/K)$ as an argument instead of Y , so that $T/K = t(u, q)$. This specification assumes homogeneity with respect to output. Although conceptually problematic,² we will use this notation to stay as close to the traditional neo-Kaleckian specification as possible.

The foreign price level is given (and assumed to be 1 without loss of generality), as is the exchange rate in the case of the fixed regime. Domestic price level behavior is defined in the neo-Kaleckian manner as a mark-up over average variable costs. That is,

$$P = (1 + \tau)wa \quad (2)$$

where τ is the mark-up factor, w is the nominal wage, and a is the unit labor coefficient. The profit and wage shares of output, π and $1 - \pi$, then are given by:

$$\pi = \frac{\tau}{1 + \tau}, 1 - \pi = \frac{1}{1 + \tau}$$

This simple pricing behavior means that the real exchange rate is a function of the profit share and the inverse of unit labor costs (expressed in terms of the foreign price level).

$$q = \frac{wa eP^*}{P wa} = (1 - \pi)z \quad (3)$$

One could follow Blecker (2002), Razmi (2014), and others in introducing partial pass-through of unit labor cost (wa) changes into prices, but I eschew that complication here to focus on the main theme, i.e., the comparison of behavior under fixed versus floating exchange rates. The downside of making this trade-off in favor of complete pass-through is that redistribution can only occur through changes in the mark-up factor. This, however, does not affect our main results as listed in Section 1.

Before we complete the description of the goods market, a quick detour to the asset side would be useful. The economy has three assets: (liquid) money that pays no return, internationally traded bonds that are denominated in foreign

²For example, the assumption of homogeneity has the troubling implication that doubling both output and the capital stock does not affect the magnitude of imports (recall that, in the one country imperfect substitutes framework, output affects the trade balance through imports).

currency, and non-traded equity (claims on real capital). The country is small in the international bond market so that the return to holding bonds, r^* , is given while that to holding equity is r_K .³ Wealth W is the sum of the real values of money balances (M), net domestic holdings of foreign bonds (F), and equity, (K) all measured in terms of the domestic good:

$$W \equiv M + eF + K \quad (4)$$

At a point in time, the allocation of a given wealth portfolio across foreign and domestic assets is a stock equilibrium problem. In line with standard portfolio balance specifications, asset market equilibrium conditions are captured by equations (5)-(7).

$$M = H^M(r_K, r^*)W; \quad H_{r_K}^M, H_{r^*}^M < 0 \quad (5)$$

$$eF = H^F(r_K, r^*)W; \quad H_{r_K}^F < 0, H_{r^*}^F > 0 \quad (6)$$

$$K = H^K(r_K, r^*)W; \quad H_{r_K}^K > 0, H_{r^*}^K < 0 \quad (7)$$

Asset demands are homogenous in real wealth and the asset demand functions capture shares that must add up to unity ($H^M + H^F + H^K = 1$). The signs of the partial derivatives indicate that the assets are gross substitutes; $H_{r_K}^K = H_{r_K}^M + H_{r_K}^F$.⁴ For the floating exchange rate case, I impose the further restriction that portfolio holders are equally sensitive to changes in r_K when deciding their holdings between money and bonds. This has the plausible implication that the own-price elasticity of assets (with respect to r_K) is greater than the cross-price elasticity, and renders the results more compact without loss of generality.

The goods market equilibrium condition involves saving and investment behavior. One could specify investment in the traditional way as a function of the profit share and demand (proxied by income). In our case, however, we have the additional presence of an equity market. Investment would, therefore, be expected to vary negatively with the cost of issuing equity. That is,

$$\frac{I}{K} = i(r_K)\pi u; \quad i_{r_K} < 0 \quad (8)$$

where the right hand side is normalized by K , so that the rate of capacity utilization u is proxied by the ratio of output to the capital stock ($= Y/K$). This simplest of formulations is subject to the Marglin-Bhaduri critique.⁵ However,

³I assume that debt is short-term so that its capital value is essentially independent of the interest rate. Assuming that equity is internationally traded will render the composition of asset portfolios indeterminate.

⁴To keep things simple, these asset demand specifications ignore transactions demand for assets.

⁵See Marglin and Bhaduri (1990).

it has the advantage of greatly simplifying the discussion of the intuition behind the steady state results without much loss of generality. A more general specification that avoids this problem would be:

$$\frac{I}{K} = i(r_K, \pi, u); \quad i_{r_K} < 0, \quad i_\pi, \quad i_u > 0$$

This specification leaves the steady state results largely unchanged in a qualitative sense, and while I will focus on the former specification for the analysis over the next two sections. Appendix B presents the analysis for the latter. I will contrast the two wherever anything of interest is to be gained from doing so.

Only capitalists save and savings are specified as a proportion of profits in the traditional manner. However, the introduction of asset markets and wealth now makes it reasonable to include asset returns and wealth as arguments in the saving function. These arguments determine the proportion of profits that is saved.

$$\frac{S}{K} = s(r_K, r^*, W)\pi u; \quad s_{r_K}, \quad s_{r^*} > 0, \quad s_W < 0 \quad (9)$$

One would expect higher asset returns to encourage more saving. Moreover, if, as suggested by Metzler (1951), savers have a target level of wealth, the propensity to save out of current income will vary negatively with current wealth.

In an open economy, national saving need not equal investment, so that the goods market clearing condition, expressed in domestic currency terms, becomes:

$$[s(r_K, r^*, W) - i(r_K)]\pi u - et(u, q) - er^* \frac{F}{K} = 0$$

or, in implicit form,

$$IS(r_K, u, K, M, F, r^*, e, \pi) = 0 \quad (10)$$

Throughout the analysis I assume that the current account balance *initially* equals zero, i.e., $T + r^*F = 0$. The initial net foreign asset position could in theory be positive, zero, or negative ($F \gtrless 0$). In the interest of maintaining focus on the role of exchange rate regimes, I suppose that r^* is negligibly small. Given an initially balanced current account, this means that trade too is initially balanced. Higher cost of equity reduces investment and generates excess supply. The traditional Keynesian stability condition requires a similar outcome from an increase in income. Thus, $IS_{r_K}, IS_u > 0$. A rise in any component of wealth has the opposite effect via the Metzler channel; $IS_M, IS_K, IS_F < 0$. A nominal depreciation raises demand through expenditure-switching, through the wealth channel, and by changing the domestic currency value of income from net foreign lending. The first effect is positive as long as the Marshall-Lerner condition is satisfied. The second effect is unambiguously positive. Finally, since the country is neither a net foreign creditor or debtor, i.e., $F = 0$, the

third effect is negligible. A rise in the international interest rate on borrowing raises the saving rate; $IS_{r^*} > 0$.

The partial with respect to π spotlights the nature of the demand regime. In a wage-led (or stagnationist) regime, a higher mark-up creates excess supply, because of both lower domestic spending and expenditure switching towards foreign goods (so that $IS_{\pi} > 0$). In a profit-led (or exhilarationist) regime, the expenditure switching is more than offset by increased domestic investment demand so that $IS_{\pi} < 0$.

The previous discussion sums up the general contours of the short-run part of the framework. The stocks of assets and thus wealth are pre-determined variables for this time window. Income (or, equivalently, utilization) and equity prices vary, along with the exchange rate (in a floating regime) and the stock composition of privately-held financial assets (in a fixed regime).

Over time, the stocks of assets evolve in response to flows. The stock of financial assets grows (declines) with current account surpluses (deficits) while the stock of capital changes in proportion to investment. I assume away capital depreciation for simplicity although including it will have no qualitative effect on the analysis. The steady state involves constant shares of total wealth being allocated to financial and real assets. It also ensures no net accumulation or decumulation of foreign exchange assets by the country or the Central Bank. Insofar as the mark-up factor and wages are constant, and there is no presumption towards the adjustment of utilization rates towards a desired level, the steady state is better seen as existing over the “medium-run” rather than the long-run. Thus, the analysis involves steady state stocks of assets over the medium-run punctuated by a continuum of short-run equilibria in which asset stocks may deviate from their steady state values but income and asset returns have adjusted to their equilibrium values.

Thus far we have summarized the broad contours of our analysis. The devil is in the details which will vary with the exchange rate regime over the next two sections. Most importantly, with a fixed exchange rate regime, the Central Bank is committed to maintaining the exchange rate, in the process satisfying domestic demand for foreign assets through balance sheet operations. With flexible exchange rates, the absence of such a commitment means that the exchange rate can do some of the heavy lifting involved in adjustment to income re-distribution. The two polar cases give rise to interesting contrasts.

3 Redistribution with fixed exchange rates

With a fixed exchange rate, and at a given level of wealth, the central bank stands ready to accommodate excess private demand for financial assets. In other words, the monetary authorities defend the exchange rate by absorbing any compositional shift within private holdings of financial assets. It is thus the total quantity of financial assets, $V = M + eF$, rather than the composition, that matters, so that equations (5) and (6) can be consolidated into a single equation:

$$V = H^V(r_K, r^*)W \quad (11)$$

Given the wealth constraint expressed by equation (4), which can be re-written as $W \equiv V + K$, eqs. (7) and (11) are not independent, and solving the equity market clearing condition (equation (7)) is adequate by Walras's Law to derive the equilibrium solution for r_K . Once r_K is known, equation (10) then pins down the equilibrium solution for u .

3.1 Short-run comparative statics

Three thought experiments are the most relevant for the purposes of our analysis, the effects of changes in: (i) income distribution, (ii) the stock of financial assets, and (iii) the capital stock. The detailed solutions for these comparative static exercises are provided in the mathematical appendix at the end of this paper. The solutions, expressed in implicit form, are as follows:

$$\bar{r}_K = r_K(V, K, \pi); \bar{r}_{KK} > 0, \bar{r}_{KV} < 0, \bar{r}_{K\pi} \geq 0 \quad (12)$$

$$\bar{u} = u(V, K, \pi); \bar{u}_V > 0, \bar{u}_K, \bar{u}_\pi \geq 0 \quad (13)$$

where overbars indicate short-run equilibrium values. Let's take a look at the intuition underlying each comparative static result.

An expanded supply of financial assets puts downward pressure on return to equity. A lower r_K is required, in other words, to remove excess supply of financial assets through portfolio substitution. This in turn encourages investment and lowers savings. Thus, a higher level of V boosts income through two channels: (i) by boosting investment relative to savings through a lower r_K , and by directly increasing wealth and, therefore, reducing savings through the Metzler wealth effect.

Increased supply of real assets (K) too lowers saving via the wealth effect but has the opposite effect on r_K . The intuition is simple. Portfolio switching is now required *toward* equity rather than away from it to remove the excess supply of K . The net effect on u is, therefore, ambiguous, and depends on the relative strengths of the wealth and investment cost effects.

Finally, income re-distribution toward profits through a higher mark-up factor has no effect in the asset markets.⁶ Thus, equilibrium r_K is unchanged. The only effect is on the goods market where we are now back to the analysis of Marglin and Bhaduri (1988). If the demand-regime is stagnationist (i.e., $(s - i)u - et_qz > 0$), excess supply is generated, so that u declines. An exhilarationist regime produces the opposite result.

⁶This would change if I introduce transactions demand for money and other assets.

3.2 Evolution over time

Thus far we have established that $\bar{u}(t)$ and $\bar{r}(t)$ define instantaneous (moving) equilibria. Non-zero values of saving and investment mean the stocks of wealth, capital, and financial assets are continuously changing. As far as the rate of utilization is concerned, the short-run framework delivers analysis and conclusions similar to the traditional neo-Kaleckian one.

Consider now the evolution of asset stocks over time. The accumulation of capital stock over time follows the flow of investment defined by equation (8). The path of financial assets, by definition, follows the net foreign asset position, which in turn is defined by the path of the current account flows over time. Thus, the change in financial assets between any two periods is given by, $\hat{V} = S - I = T(Y, q) + er^*F$. Recalling the assumption that $r^* \approx 0$,

$$\begin{aligned}\hat{V} &= \frac{S - I}{V} = \frac{K}{V} \left(\frac{S}{K} - \frac{I}{K} \right) = t(u, q) \frac{K}{V} \\ &= \hat{V}(V, K; \pi)\end{aligned}\tag{14}$$

$$\begin{aligned}\hat{K} &= \frac{I}{K} = i(r_K)\pi u \\ &= \hat{K}(V, K; \pi)\end{aligned}\tag{15}$$

where “ $\hat{}$ ” indicates that the associated variable is expressed in growth rate form, and the right hand side of each equation makes use of eqs. (12) and (13). The wealth shares of financial and real assets are bound from both the lower and upper ends. Over an extended period of time, it is therefore reasonable to assume that these shares are stable. This consideration helps define the steady state as characterized by $\hat{V} = \hat{K} = 0$. Setting $\hat{V} = 0$ also has the additional advantage of ensuring that, over the medium run, the current account is balanced and saving equals investment. Furthermore, this ensures that the Central Bank is not accumulating or decumulating foreign exchange reserves in the steady state. This is realistic since there is a floor to the foreign exchange reserves (in theory zero, but in practice, much higher) that a Central Bank must maintain in order to credibly maintain the exchange rate. Finally, from equation (4), national wealth is also constant in the steady state. With the stock of wealth held constant, so is r_K (see equation (11)). Constant asset stocks and returns to assets then ensure, via the goods market equilibrium condition (equation (10)), that output and the rate of capacity utilization too are unchanging. In sum, the steady state is characterized by:

$$\hat{V} = \hat{K} = \hat{W} = \hat{M} = \hat{F} = \hat{Y} = \hat{r}_K = \hat{S} - \hat{I} = \hat{S} = \hat{I} = 0$$

Is the system dynamically stable? Intuitively, the answer appears to be affirmative. If, in an initial instantaneous equilibrium, (\bar{u}, \bar{r}_K) deliver positive

investment, this raises K , and hence r_K , thus dampening investment. Similarly, if (\bar{u}, \bar{r}_K) deliver current account surpluses, the resulting financial asset accumulation lowers r_K , which has the effect of dampening this accumulation. As seen earlier in Section (3.1), however, the wealth effect complicates matters. This is because accumulation of real and financial assets through investment and external surpluses also increases wealth over time, which tends to increase spending and, therefore, to further magnify investment.

More formally, denoting the reciprocal of the traditional Keynesian multiplier by Λ ($= (s - i)\pi - eT_Y > 0$ from the Keynesian stability condition), the determinant of the endogenous variable Jacobian is given by:

$$\Delta_L^{Fixed} = \begin{vmatrix} \hat{V}_V & \hat{V}_K \\ \hat{K}_V & \hat{K}_K \end{vmatrix} = -\frac{et_u i_{r_K} s_W K}{\Lambda H_{r_K}^K W} \frac{K}{V} \pi^2 u^2 > 0$$

which is unambiguously positive. The trace is given by:

$$Tr^{Fixed} = \frac{\overbrace{\left(\frac{K}{V} et_u + i\pi\right) (s_{r_K} - i_{r_K}) \frac{H^K}{H_{r_K}^K W} - s_W W}^{+/-} - \overbrace{i\pi (s_{r_K} - i_{r_K}) \frac{H^K}{H_{r_K}^K W}}^{+} + \overbrace{i_{r_K} \left(\frac{1 - H^K}{H_{r_K}^K W}\right) \Lambda}^{-}}{\Lambda} \pi$$

which is very likely to be negative. Notice that only the first term in the numerator on the right hand side is ambiguously signed. The remaining terms are negative. More specifically, a *sufficient* (but not necessary) condition for a negative trace is that $|\frac{K}{V} et_u| > |i\pi|$, i.e., roughly trade respond more than investment, in absolute terms, to changes in income. The necessary condition is, of course, much less stringent, and very likely to be satisfied.

3.3 Increasing the profit share

What are the consequences of a policy-induced re-distribution that favors the profit share? As shown in the analysis in Section 3.1, the short-run equilibrium will correspond to a higher or lower level of output and utilization, depending on whether the demand-led regime is wage-led or profit-led in the short-run. This is the traditional neo-Kaleckian result. Unlike most existing literature, however, our analysis here is interested in the *steady state* stocks of capital and the corresponding levels of output and utilization. We are interested, in other words, in the longer run prospects for wage-led or profit-led growth.

Before we discuss the comparative dynamics in more detail, let's take a quick look at the mathematical expressions for the changes in the steady state stocks of capital and financial assets (\tilde{K} and \tilde{V} respectively):

$$\frac{d\tilde{K}}{d\pi} = \frac{(t_q z\pi + t_u u) \left[s_W i - (s_{r_K} i - s i_{r_K}) \frac{H^K}{H_{r_K}^K W} \right]}{\Lambda \Delta_L^{Fixed}} \frac{eK}{V} \pi u \quad (16)$$

$$\frac{d\tilde{V}}{d\pi} = - \frac{(t_q z \pi + t_u u) \left[s_W i + (s_{r_K} i - s_{i_{r_K}}) \frac{1-H^K}{\tilde{H}_{r_K}^K \tilde{W}} \right] e \tilde{K}}{\Lambda \Delta_L^{Fixed}} \frac{\pi u}{\tilde{V}} \quad (17)$$

Consider first the steady state stock of capital. Notice that the terms in the square brackets are both negative, while $t_q z \pi > 0$ and $t_u u < 0$. Whether \tilde{K} is higher or lower following redistribution depends on whether the trade balance is more sensitive to relative price changes (in which case \tilde{K} is lower) or to income changes (in which case \tilde{K} is higher). Put differently, $\frac{d\tilde{K}}{d\pi} \leq 0$ as $|t_q z \pi| \geq |t_u u|$. We turn to the intuition behind this condition shortly.

For the steady state stock of financial assets, again the relative trade elasticities matter, but now in addition, the magnitude of the wealth effect on savings plays a role as well. The combination of a large relative price effect on the trade balance and a strong wealth effect will lead to a higher steady state stock of financial assets. Other combinations will yield different outcomes.

Let's turn to the underlying intuition to explain why these results follow from our framework. The key relationship driving the steady state results is the current account balance expression on the right hand side of equation (14). With a fixed exchange rate, internationally determined bond returns, and negligible investment income, there is only one degree of freedom here. For the current account to be balanced following a real appreciation (i.e., a rise in q), utilization must be lower in the new steady state. Stated differently, for equation (1) to hold from one steady state to another,

$$\frac{du/u}{d\pi/\pi} = \frac{t_q z \pi}{t_u u} (< 0) \quad (18)$$

This relationship determines the proportional change in utilization required to maintain the current account as we move from the old steady state to the new one following redistribution. If $|t_q z \pi| > |t_u u|$, that is, if the trade balance is more sensitive to relative prices than to utilization, the latter needs to fall more than proportionately to the rise in profit share so that the volume of profit (πu) declines. Equation (15) then tells us that the steady state returns to equity must be lower. This, in turn, implies, given equation (12), that the steady state stock of capital too be lower. Turning to savings, since the volume of profits and the returns to holding equity have both declined, equation (9) tells us that the stock of wealth too must be lower in the new steady state.

By contrast, if $|t_q z \pi| < |t_u u|$, u needs to fall *less* than proportionately to the rise in π so that the volume of profit (πu) rises. This means, from equation (15), that the steady state returns to equity must rise and so, therefore, must the stock of physical capital. This in turn means that the stock of wealth must also be higher in the new steady state to maintain saving at its steady state level (eqs. (9) and (14)). The stock of financial assets may decline or rise in both cases.

To sum up, with a fixed exchange rate, the current account imposes a binding constraint on output and the steady state level of capital stock. Steady

state utilization unambiguously declines to maintain current account balance in response to redistribution-induced real appreciation. The magnitude of this decline, which depends on the relevant trade elasticities, then determines whether the steady state level of capital stock and wealth are higher or lower. The nature of the demand regime, that is whether $(s - i)u - et_qz \leq 0$, does not matter.

Table 1 summarizes the steady state results.

Table 1: Comparative dynamics

	Fixed exchange rate		Floating exchange rate	
	$ t_qz\pi > t_Yu $	$ t_qz\pi < t_Yu $	$ t_qz\pi > t_uu $	$ t_qz\pi < t_uu $
\tilde{K}	-	+	0	0
\tilde{V} or \tilde{F}	+/-	+/-	-	+
\tilde{W}	-	+	0	0
\tilde{u}	-	-	-	-
\tilde{r}_K	-	+	0	0
$\pi\tilde{u}$	-	+	0	0
\tilde{Y}	-	+/-	-	-
\tilde{e}			+	-

*Assumes a relatively weak wealth effect on savings

4 A floating regime

Unlike the fixed exchange rate case, the Central Bank no longer commits to defending the value of the currency. This removes the role of the current account as the determinant of output changes following redistribution. As we will see shortly, this role is now played by steady state investment behavior. Note that this happens in spite of the fact that the exchange rate is not assumed to adjust to balance the external account. Rather, it is determined here in the asset markets.

The basic set-up, as defined by equation (1)-(10) remains the same as before. In order to focus on comparing exchange rate regimes, I assume static expectations, so that, with uncovered interest parity holding, the domestic interest rate on bonds continues to be tightly bound to the international one. Given the change of exchange rate regime, some variables undergo a functional identity change. Since the Central Bank does not intervene in the foreign exchange market, the nominal exchange rate takes the place of M as the endogenous variable, and liquid money and net holdings of foreign assets can no longer be amalgamated into a single variable. Two out of the three asset market equilibrium conditions (5)-(7) are now independent. The exchange rate adjusts along with r_K to maintain equilibrium in these markets. Income is then determined

in the goods market by equation (10). The short-run model retains its recursive nature.

4.1 Short-run adjustments

Again, three comparative statics help complete the analysis for this paper:

(i) Increased net holdings of foreign assets has no effect on returns to equity, thanks to the homogeneity embedded in equation (6). The exchange rate adjusts downward instead, proportionally to the initial change in F . This is a standard result in open economy macro literature. The real appreciation, in turn, causes reduced demand for domestic goods as long as the Marshall-Lerner condition is satisfied. Output and utilization decline as a result. Notice that the latter results are the opposite of what we got in the fixed case.

(ii) Unlike the case of increased foreign asset holdings, the exchange rate does not bear the entire burden of adjustment in the asset markets when the stock of physical capital increases. Rather, the excess supply of equity puts upward pressure on r_K . This means that the effect on the exchange rate and output are both ambiguous. Consider first the former. Increased r_K creates an excess supply of foreign assets which tends to appreciate the exchange rate. The increase in wealth resulting from the higher K , on the other hand, generates increased demand for foreign assets, which tends to depreciate the exchange rate. The net effect is determined by the relative strengths of the two effects. Mathematically,

$$\frac{d\bar{e}}{dK} = \frac{H^F - H^M}{1 + H^M - H^F} \frac{1}{F}$$

The denominator is always positive. The numerator is negative if domestic residents hold a greater share of liquid money than foreign assets in their wealth portfolio. I assume this to be true from now on, on grounds of both plausibility and simplicity, although this does not affect any of the steady state results. Thus, $d\bar{e}/dK < 0$. This is consistent with the Balassa-Samuelson and the Bhagwati-Kravis-Lipsey effects.

To understand why the effect on output is ambiguous, recall again that output is pinned down in the goods market once e and r_K have been determined in the asset markets. This means that the appreciated equilibrium value of the exchange rate and the higher r_K both lower the equilibrium value of output. The increase in wealth, by contrast reduces savings, generates demand, and boosts output. Equilibrium output rises in the presence of a strong wealth effect and falls otherwise.

(iii) Finally redistribution in favor of profits has no effect on the asset markets. The effect on output is exactly identical to that in the fixed case, i.e., negative if the demand-regime is wage-led and positive otherwise. In the short-run at least the demand regime matters.

The discussion above can be encapsulated by equations (19)-(21). More detailed mathematical expressions are provided in the appendix.

$$\bar{r}_K = r_K(F, K, \pi); \bar{r}_{KK} > 0, \bar{r}_{KF} = 0, \bar{r}_{K\pi} = 0 \quad (19)$$

$$\bar{e} = e(F, K, \pi); \bar{e}_K < 0, \bar{e}_F (= -e/F) < 0, \bar{e}_\pi = 0 \quad (20)$$

$$\bar{u} = u(F, K, \pi); \bar{u}_F < 0, \bar{u}_K, \bar{u}_\pi \geq 0 \quad (21)$$

Before, we turn to exploring the evolution of income flows and asset stocks over time, it would be useful to look at the current account again. Recall that it is given by $eT(u, q) + er^*F$. With e pre-determined under a fixed exchange rate, and international investment income flows negligible (because $r^* \approx 0$), a real appreciation has to be offset by a fall in income to maintain current account balance. This is no longer true under a flexible exchange rate regime since now changes in stocks and asset returns influence the path of the exchange rate. As pointed out earlier, the current account, therefore, no longer directly constrains the path of output and accumulation. In terms of steady state analysis, this is the major difference between the two exchange rate regimes.

4.2 Back to the medium-run

Since the Central Bank now controls the availability of money and foregoes official reserve transactions, it is the stock of net foreign holdings rather than that of financial assets that evolves in line with current account imbalances. The other equations of motion remain the same as in the fixed case.

Again, the accumulation of capital stock over time follows the flow of investment defined by equation (8). The net foreign asset position evolves in line with the saving-investment gap. Thus, the change in financial assets between any two periods is given by $\hat{F} = S - I = T(Y, q) + er^*F$. Or,

$$\begin{aligned} \hat{F} &= \frac{S - I}{F} = \left(\frac{S - I}{K} \right) \frac{K}{F} = \left[t(u, q) + er^* \frac{F}{K} \right] \frac{K}{F} \\ &= \hat{F}(F, K; \pi) \end{aligned} \quad (22)$$

$$\begin{aligned} \hat{K} &= \frac{I}{K} = i(r_K)\pi u \\ &= \hat{K}(F, K; \pi) \end{aligned} \quad (23)$$

Again, the steady state is characterized by stock and flow equilibrium so that

$$\hat{K} = \hat{W} = \hat{F} = \hat{Y} = \hat{r}_K = \hat{S} - \hat{I} = \hat{S} = \hat{I} = 0$$

The determinant of the endogenous variable Jacobian is given by:

$$\Delta_L^{Flex} = \frac{\overbrace{s_W i W}^{-} + \overbrace{(s_{r_K} - s_{r_K} i) \frac{H^M}{H_{r_K}^F W}}^{+}}{\Lambda(1 + H^M - H^F)} \frac{e t_q K}{F^2} \pi^2 u$$

which is positive as long as the wealth effect is not too strong (for reasons discussed intuitively in the fixed exchange rate case). The presence of a sufficiently strong wealth effect would lead to saddle path (in)stability. Since the aim here is to compare regimes and steady states, I focus on the stable case. Loosening the assumption of static expectations would make the saddle path case an interesting one for future work to pursue.

The trace is given by:

$$T_r^{Flex} = \frac{\overbrace{\left\{ [(s_{r_K} - i_{r_K}) i \pi F + i_{r_K} K e t_u] \frac{H^M}{H_{r_K}^F W} - s_W i F \right\}}^{+/-} \pi u - \overbrace{t_q q (H^M - H^F)}^{+}}{\Lambda(1 + H^M - H^F) F}$$

which is negative unless the term involving s_W dominates the other terms. Thus, a not too strong wealth effect on savings ensures a negative trace and a positive endogenous variable determinant.

4.3 The comparative dynamics of re-distribution - again

As shown in the analysis in Section 4.1, the system yields the traditional neo-Kaleckian result in the short-run equilibrium, whereby the change in output depends on whether the demand regime is profit- or wage-led. As we saw earlier, this result does not carry through to the medium-run in the fixed exchange rate case. Are things different under a flexible regime?

Before we discuss the comparative dynamics in more detail, let's take a quick look at the mathematical expressions for the changes in the steady state stocks of capital and financial assets (\tilde{K} and \tilde{F} respectively):

$$\frac{d\tilde{K}}{d\pi} = 0 \tag{24}$$

$$\frac{d\tilde{F}}{d\pi} = - \frac{t_u u + t_q z \pi}{t_q q \pi} F \tag{25}$$

The major difference from the fixed case is that the steady state level of capital stock is immune to income re-distribution. Why is that the case? To understand the intuition, recall that the current account no longer directly constrains the level of output. That burden now falls on investment behavior. Income re-distribution and output change affect both saving and investment in the same direction but changes in returns to equity affect them in the opposite

direction.⁷ This implies that the saving and investment behavior requires a given steady state level of r_K . Finally, recall from the previous sub-section that the equilibrium level of r_K changes in response to changes in the capital stock but remains unchanged following changes in net foreign assets. In other words, an unchanged steady state level of r_K requires an unchanged steady state level of capital stock (although the stock of financial assets can change). This explains the striking result encapsulated by equation (24).

What determines the change in the steady state stock of financial assets. Here trade elasticities become relevant again. Notice first from equation (23) that, since the steady state level of r_K is unchanged, a re-distribution toward profits must result in an equiproportional decline in the steady state level of utilization so that the volume of profits ($\pi\tilde{u}$) is unchanged. This means, from equation (9) that the steady state level of wealth is unchanged. With \tilde{W} and \tilde{K} unchanged, the value of foreign assets measured in domestic currency $\tilde{e}\tilde{F}$ too must be the same. Given the homogeneity built into equation (6), any change in F is, therefore, accompanied by offsetting movements in the exchange rate. This is the key to understanding what happens to \tilde{F} . To understand the intuition better, let's re-visit equation (18). If $|t_q z \pi| > |t_u u|$, then re-distribution towards profits creates a current account deficit. As the net foreign asset position deteriorates along the transition path, the excess demand for foreign assets appreciates the exchange rate. The end result is a lower steady state value of \tilde{F} accompanied by a depreciated nominal exchange rate. If $|t_q z \pi| < |t_u u|$, then the opposite results hold; an appreciated exchange rate co-exists with an improved net foreign asset position in the new steady state. The right half of Table 1 summarizes these results.

5 Implications and concluding remarks

The seminal contribution of Marglin and Bhaduri (1988) showed that the nature of the demand regime determines the effects of exogenous changes in income distribution on output and utilization. The analysis presented here qualifies those results by demonstrating that while this may be true in the very short run, the evolution of asset stocks and returns over time in the presence of plausible constraints on aggregate behavior render the nature of the demand regime irrelevant. I then extend the analysis by comparing the short- and medium-run consequences of income re-distribution under different exchange rate regimes. In each case, the outcome in terms of the steady state values of output, utilization, asset stocks, and wealth depend on constraints other than those imposed by the nature of the demand regime. Moreover, with flexible exchange rates, income re-distribution may have no impact on the steady state levels of capital and wealth in the medium-run.

A note of caution before concluding. One can see from Table 1 that re-distribution towards profits results in a decline in steady state utilization regardless of exchange rate regime. Does this mean that demand in the medium-run

⁷See eqs. (8) and (9).

is always profit-led? The answer is no. One would get the same results were one to re-distribute towards wage income through a higher nominal wage.⁸ The key take away here is that the demand regime and the form that re-distribution takes do not matter over time. Other structural constraints prevail instead.

The analysis carried out here is highly stylized; the aim was to analyze steady state changes under different exchange rate regimes in the most direct way, after minimizing the number of moving parts that would add useful, but only tangentially interesting detours to the analysis. Noteworthy assumptions include: (i) only capitalists save, (ii) a negligibly low international interest rate on short term bonds, ($r^* \approx 0$), (iii) no transactions demand for money or other assets, and (iv) static expectations. Perhaps it would be useful to briefly re-visit these assumptions to explore the robustness of our results. The first assumption is a standard one in neo-Kaleckian literature and weakening it by assuming a non-zero saving rate out of wages (i.e., $s_W > 0$) will make the analysis substantially more complicated, since one would have to separately keep track of wealth by ownership. The second and third assumptions *could* qualitatively affect the results, which, in the case of assumption (ii) will now depend on whether the country starts out as a net foreign debtor or creditor (i.e., whether $F \gtrless 0$). Assumption (iv) finally will not affect the analysis in the case of a credibly fixed exchange rate. It may affect the analysis in the case of a floating regime, in terms of the stability of the steady state. However, it will not affect the steady state solutions. Future work should explore some of these avenues. Furthermore incorporating imported inputs so that the profit share is affected by exchange rate changes may also yield additional insights. It should be emphasized here, however, that none of these extensions will affect the most striking result of the paper, i.e., that plausible restrictions on the evolution of stock variables render the nature of the demand regime, classified as wage-led or profit-led, irrelevant to steady state outcomes.

6 Appendix A

This Appendix presents the detailed mathematical results from the main text in cases where they were not provided earlier.

Section 3.

The detailed expressions for the various comparative static results are as follows (where $\Lambda = (s - i)\pi - eT_Y > 0$ is the inverse of the traditional Keynesian multiplier term):

$$\begin{aligned} \frac{d\bar{r}_K}{dV} &= -\frac{H^K}{H_{rK}^K W} < 0 \\ \frac{d\bar{u}}{dV} &= -\frac{s_W - (s_{rK} - i_{rK}) \frac{H^K}{H_{rK}^K W}}{\Lambda} \pi u < 0 \\ \frac{d\bar{W}}{dV} &= 1 \\ \frac{d\bar{r}_K}{dK} &= \frac{1 - H^K}{H_{rK}^K W} > 0 \end{aligned}$$

⁸ Although to analyze this experiment, one would have to complicate the analysis by introducing partial pass-through from wage costs into prices as in Blecker (2002).

$$\begin{aligned}
\frac{d\bar{u}}{dK} &= -\frac{s_W + (s_{rK} - i_{rK}) \frac{1-H^K}{H^K W}}{\Lambda} \pi u \geq 0 \\
\frac{d\bar{W}}{dK} &= 1 \\
\frac{d\bar{r}_K}{d\pi} &= 0 \\
\frac{d\bar{u}}{d\pi} &= -\frac{(s-i)u + et_q z}{\Lambda} \geq 0 \\
\frac{d\bar{W}}{d\pi} &= 0
\end{aligned}$$

For the comparative dynamics part, the following partials follow from equations (14) and (15):

$$\begin{aligned}
\hat{V}_V &= \left(et_u \frac{\partial u}{\partial V} \right) \frac{K}{V} \\
\hat{V}_K &= \left(et_u \frac{\partial u}{\partial K} \right) \frac{K}{V} \\
\hat{V}_\pi &= \left(et_u \frac{\partial u}{\partial \pi} - et_q z \right) \frac{K}{V} \\
\hat{K}_V &= \left(i_{rK} u \frac{\partial r_K}{\partial V} + i \frac{\partial u}{\partial V} \right) \pi \\
\hat{K}_K &= \left(i_{rK} u \frac{\partial r_K}{\partial K} + i \frac{\partial u}{\partial K} \right) \pi \\
\hat{K}_\pi &= \left(\pi \frac{\partial u}{\partial \pi} + u \right) i
\end{aligned}$$

Section 4.

$$\begin{aligned}
\frac{d\bar{r}_K}{dF} &= 0 \\
\frac{d\bar{e}}{dF} &= -\frac{e}{F} < 0 \\
\frac{d\bar{u}}{dF} &= -\frac{e(T+t_q q)}{\Lambda F} < 0 \\
\frac{d\bar{W}}{dF} &= 0
\end{aligned}$$

$$\begin{aligned}
\frac{d\bar{r}_K}{dK} &= -\frac{H^M}{(1+H^M-H^F)H^F r_K W} > 0 \\
\frac{d\bar{e}}{dK} &= \frac{H^F - H^M}{(1+H^M-H^F)F} > 0 \\
\frac{d\bar{u}}{dK} &= -\frac{\left[s_W - (s_{rK} - i_{rK}) \frac{H^M}{H^K W} \right] \pi u + t_q q \frac{H^M - H^F}{F}}{\Lambda(1+H^M-H^F)} \geq 0 \\
\frac{d\bar{W}}{dK} &= \frac{1}{1+H^M-H^F} > 0
\end{aligned}$$

$$\begin{aligned}
\frac{d\bar{e}}{d\pi} &= 0 \\
\frac{d\bar{r}_K}{d\pi} &= 0 \\
\frac{d\bar{u}}{d\pi} &= -\frac{(s-i)\pi + et_q z}{\Lambda} \geq 0 \\
\frac{d\bar{W}}{d\pi} &= 0
\end{aligned}$$

For the comparative dynamics part, the following partials follow from equations (22) and (23):

$$\begin{aligned}
\hat{F}_F &= e \left(t_u \frac{\partial u}{\partial F} - \frac{t_q q}{F} \right) \frac{K}{F} \\
\hat{F}_K &= e \left(t_u \frac{\partial u}{\partial V} + t_q q \frac{\partial e}{\partial K} \right) \frac{K}{V} \\
\hat{F}_\pi &= e \left(t_u \frac{\partial u}{\partial \pi} - t_q z \right) \frac{K}{F} \\
\hat{K}_F &= i \pi \frac{\partial u}{\partial F} \\
\hat{K}_K &= \left(i_{rK} u \frac{\partial r_K}{\partial K} + i \frac{\partial u}{\partial K} \right) \pi \\
\hat{K}_\pi &= \left(\pi \frac{\partial u}{\partial \pi} + u \right) i
\end{aligned}$$

7 Appendix B

This Appendix presents the steady state results for the case where the investment function addresses the Marglin-Bhaduri critique, and is given by:

$$\frac{I}{K} = i(r_K, \pi, u); \quad i_{r_K} < 0, \quad i_\pi, \quad i_u > 0$$

A Fixed Exchange Rate Regime

$$\frac{d\tilde{K}}{d\pi} = \frac{t_q z \pi \left[s_W i_u u + (s_{i_{r_K}} - s_{r_K} i_u u) \frac{H^K}{H_{r_K}^K W} \right] + t_u u \left[s_W i_\pi \pi + (s_{i_{r_K}} - s_{r_K} i_\pi \pi) \frac{H^K}{H_{r_K}^K W} \right] eK}{\Lambda \Delta_L^{Fixed'}} \frac{eK}{V}$$

$$\frac{d\tilde{V}}{d\pi} = - \frac{t_q z \pi \left[s_W i_u u - (s_{i_{r_K}} - s_{r_K} i_u u) \frac{1-H^K}{H_{r_K}^K W} \right] + t_u u \left[s_W i_\pi \pi - (s_{i_{r_K}} - s_{r_K} i_\pi \pi) \frac{1-H^K}{H_{r_K}^K W} \right] eK}{\Lambda \Delta_L^{Fixed'}} \frac{eK}{V}$$

where $\Delta_L^{Fixed'} = -\frac{e t_u i_{r_K} s_W \pi u}{\Lambda}$.

Again, the steady state result for the capital stock depends on $|t_q z \pi| \geq |t_u u|$, as in the baseline specification in the main text. The result for the steady state stock of financial assets is more involved, and, again, as in the baseline specification, may have either sign. The results remain independent of the nature of the demand regime.

A Flexible Exchange Rate Regime

$$\frac{d\tilde{K}}{d\pi} = \frac{s(i_\pi \pi - i_u u) t_q q eK}{\Lambda \Delta_L^{Flex'}} \frac{eK}{F}$$

$$\begin{aligned} \frac{d\tilde{F}}{d\pi} = & - \frac{1}{\Lambda \Delta_L^{Flex'} (1 + H^M - H^F)} \left\{ t_q z \pi \left[s_W i_u u + (s_{i_{r_K}} - s_{r_K} i_u u) \frac{H^M}{H_{r_K}^M W} \right] \right. \\ & \left. + t_u u \left[s_W i_\pi \pi + (s_{i_{r_K}} - s_{r_K} i_\pi \pi) \frac{H^M}{H_{r_K}^M W} \right] + \left[s(i_\pi \pi - i_u u) \frac{t_q q}{eF} (H^M - H^F) \right] \right\} \frac{eK}{F} \end{aligned}$$

where $\Delta_L^{Flex'} = \frac{(s_{i_{r_K}} - s_{r_K} i_u u) \frac{H^M}{H_{r_K}^M W} + s_W i_u u}{\Lambda(1 + H^M - H^F)F} e t_q \pi$.

Barring the special case where $i_\pi \pi = i_u u$, the steady state stock of capital does change in response to redistribution (unlike the result in the main text). The effect on the steady state stock of financial assets is ambiguous, as in the main text, and depends partly on the relative trade elasticities. The nature of the demand regime remains absent as a determinant.

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