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by

Razmi, Arslan

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Arslan Razmi*

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Abstract

Growth in low-income developing economies with large sectors characterized by underemployment is unlikely to be wage-led in the traditional neo-Kaleckian sense of the term. Output and employment in the sectors of the economy producing non-tradable output could be demand-led, however, and policies directly aimed at more equitable distribution in these sectors could boost long-run growth. Some of the fast growing Asian economies may have been examples of wage-led growth in this rather different sense of the term. Over time, re-distributive measures in the traditional sector, such as land reforms, could lead to faster wage and output growth across the economy.

JEL classifications: F43, O41, O11, E12

Key words: Demand regime, income distribution, wage-led growth, stagnationism, exhilarationism, neo-Kaleckian models, dependent economy models.

*Department of Economics, University of Massachusetts, Amherst, MA 01003; email: arazmi@econs.umass.edu

1 Introduction and Background

With rising inequality and slowing growth across significant parts of the industrialized world, the relationship between income distribution and growth appears to be making a comeback as an issue of *macroeconomic* concern. Researchers working in the Post Keynesian tradition have analyzed this issue actively in recent decades, thanks in large part to a focus on the role of aggregate demand as the main determinant of economic growth. While most of the models beginning with Steindl (1952), and including, among others, Del Monte (1975), Taylor (1983), and Dutt (1984), had a strong stagnationist tilt, Blecker (1989) and Bhaduri and Marglin (1990) raised the possibility of "exhilarationism" or profit-led demand. Although a detailed discussion of these debates is beyond the scope of this paper,[1] it would be useful to re-visit the grounds on which these latter papers extended the neo-Kaleckian framework to make profit-led growth or exhilarationism possible.

Blecker (1989) analyzed the implications of opening up the economy to trade in goods using an "imperfect substitutes" framework whereby the domestically produced good is assumed to be an imperfect substitute for the foreign-made good. Price behavior is modelled as a flexible mark-up factor over average variable costs. Any increase in the real wage resulting from a redistribution is partially or fully passed through to the export price, making domestic goods less competitive internationally. This counters any positive effects on growth through increased utilization and investment. Thus, if the Marshall-Lerner (ML) condition is satisfied,[2] room for stagnationism and wage-led growth narrows.[3] Even an economy that is wage-led in the absence of international trade can therefore turn into a into a profit-led one if a decline in real wages boosts international demand adequately to offset the fall in domestic absorption.

Bhaduri and Marglin (1990) challenged the traditional neo-Kaleckian investment function on the grounds that the separate inclusion of the profit rate and capacity utilization creates a strong accelerator effect. The authors offered an alternative specification involving the profit *share* as an argument instead of the profit rate. An economy, with this modification, can be stagnationist, in the sense that a redistribution towards wages boosts consumption demand sufficiently to boost aggregate demand and utilization, or it can be exhilarationist, whereby such redistribution reduces investment demand sufficiently to lower aggregate demand and utilization. If the redistribution-induced increase in demand is strong enough, utilization rises adequately to dominate the negative direct effect of a lower profit share on investment. Wage-led capital accumulation and growth result. Conversely, growth is profit-led.

Most of the literature arising from these neo-Kaleckian models has centered

[1] Blecker (2002) provides a detailed overview of these theoretical developments.

[2] The ML condition can be stated as follows: assuming initially balanced trade and infinite price elasticities of export and import supplies, a devaluation improves the trade balance if and only if the import and export price demand elasticities sum to greater than one.

[3] Note that these results follow in the particular case where an increase in international competitiveness occurs through wage suppression. An alternative kind of re-distribution that takes the form of a decline in the mark-up over costs generates different results.

around advanced country considerations. This applies to both theory and, perhaps not surprisingly considering data limitations, empirical studies.[4] Several considerations suggest that the standard neo-Kaleckian framework may be inadequate once one turns to the macroeconomic relationship between distribution, demand, and growth in low-income developing economies. First, these economies tend to suffer from shortages of production capacity, specifically capital. In the words of Kalecki (1976)(p. 17), "[U]nemployment and underemployment in underdeveloped countries are of an entirely different nature. They result from the shortage of capital equipment rather than from a deficiency of effective demand." This has been widely recognized in the structuralist literature of past decades. Taylor (1983)(chapter 10), for example, posits a demand-constrained North and a capital-constrained South.[5]

Second, the imperfect substitutes framework may not be the appropriate one for many economically small open developing economies that produce relatively unsophisticated goods, and face many competitors in world markets. For example, it is hard to justify analyzing as imperfect substitutes the everyday garments exported by a number of developing countries. World demand for the typical developing country's manufactured exports is likely to be extremely elastic, as is the world supply curve for its imports. Given the economically small presence of the typical developing country in international markets, price-taking behavior may be a good approximation for most of the tradable sector.[6]

This segues into a third crucial issue. Low income economies are often characterized by *dual* labor and goods market structures. To put it in rather simplistic terms perhaps, a relatively "modern" capitalist sector coexists with varying degrees of comfort alongside a traditional, informal sector. Most industrial goods produced in the relatively modern sector are tradable across international borders. Traditional services and small-scale agriculture are rendered non-tradable by transportation costs and trade barriers. Thus, roughly speaking, one could employ the modern industrial/manufactured goods as a proxy for tradable production while other goods and services could roughly be classified under the non-traded category.

Does the fact that developing countries are typically capital-constrained undermine the relevance of models with less-than-full resource employment? Here another typical feature of low income economies becomes relevant. As pointed out by Lewis (1954) among others, such economies are often characterized by

[4] Of the studies that do include developing countries, Onaran and Galanis (2012) find that Turkey and South Korea are wage-led while Argentina, Mexico, China, India, and South Africa are profit-led. Simarro (2011) conclude, based on their empirical estimates, that for the period 1978-2007, Chinese growth was profit-led. Wang (2009) reached similar conclusions for China for the period 1993-2007. The study also found that "that while the expansion of interregional and international trade plays an important role, it is investment expenditure that determines the profit-led pattern of economic growth."

[5] See also Blecker (1996) and Dutt (2002) for specifications that similarly emphasize this difference between developed and low income economies.

[6] It is pertinent to point out here that what applies to an individual country may not apply to a group of countries. Thus, the developing countries as a whole may influence international prices even if individual countries are price takers. See Razmi and Blecker (2008) for an exploration of the "fallacy of composition" issue.

underemployment, especially in the traditional/rural sector. Modern sector jobs are at a premium, but given their scarcity and the lack of an employment insurance system, work sharing in the rural sector acts as the fallback position. While capital is fully employed, other resources are not. Indeed, the movement of underemployed labor from the rural/traditional sector to higher productivity sectors remains the main development challenge for many low-income economies.

Finally, developing countries often have problems attracting foreign savings to finance current account deficits. Moreover, with very few exceptions, most of these countries have a hard time borrowing on international markets in domestic currency. These problems are amplified by the fact that the capital goods required by low-income countries are mostly imported. The implication is that the typical developing country faces external constraints that limit the size of current account imbalances that it can sustain. An important adjustment mechanism in response to external imbalances is the real exchange rate, i.e., the price of tradables relative to non-tradables. Even if demand and output is wage-led in the short-run, an economy may run into the external account constraint over time, and how this relative price evolves, either endogenously or under the guiding hand of policy, influences the trajectories of wages and growth.

These factors call for a re-assessment of the framework employed to investigate the relationship between distribution and growth in developing economies. If capital scarcity rather than the degree of capacity utilization is the main issue, then the specification of investment equations (including the Marglin-Bhaduri critique) must be re-evaluated. If price-taking behavior dominates in the tradable sector, then the framework employed by Blecker (1989) and later studies must be re-visited. Razmi (2015) addressed these issues in a stagnationist/exhilarationist context. That paper employed two different versions of the traditional dependent economy framework with tradable and non-tradable sectors: (i) a two-sector framework with traded and non-traded goods, and (ii) a three-sector framework with a non-traded good and two traded goods. The latter, more general, framework incorporates a price-taking tradable goods-producing sector and another sector that produces goods that are imperfect substitutes for goods created by the rest of the world. The main conclusion was that the presence of a price taking tradable goods-producing sector leaves little scope for wage-led growth in the traditional neo-Kaleckian sense of the term.

The present paper uses a framework similar to the two-sector one in Razmi (2015). However, given the purpose of this paper, the wage behavior is modified and worker savings incorporated to analyze and compare the effects of income re-distribution in the two sectors. This allows us to investigate the consequences of policies such as land reforms, and to briefly discuss implications from a historical perspective. Moreover, the behavior of the economy in response to re-distributive shocks over time is studied in much more detail. While wage-led growth in the traditional sense may not be feasible, there are other re-distributive policies that could promote growth through increases in worker incomes, as long as supplementary policies ensure a smooth path of real exchange rate adjustment to avoid prolonged external imbalances.

2 Theoretical Framework

The theoretical model in this paper is largely based on Razmi (2015), modified to allow a more in-depth exploration of key issues. The overall framework is that of the "dependent economy" model with a traded goods sector (or T-sector) and a non-traded goods one (or N-sector).[7] Table 1 provides a summarized description of the variables employed.

The economy under consideration is characterized by underemployment in the rural/traditional/non-tradable sector. The output of this sector (Y_N) is not traded on international markets due to various barriers such as quality standards, transaction barriers, transportation costs, and lack of infrastructure. Production requires a fixed factor (land), and labor (L_N), which earns an "effective" real wage ω_N in terms of the non-tradable good. Labor gets a constant proportion υ of its marginal contribution that is determined by norms, institutions, etc. The rents are captured by the owners of the fixed factor (i.e., the landlords), whose share in output is denoted by R. To summarize:

$$Y_N = AL_N^{\gamma};\ \gamma \leq 1 \tag{1}$$

$$\omega_N = \upsilon\gamma AL_N^{\gamma-1} \tag{2}$$

$$R = 1 - \upsilon\gamma \tag{3}$$

where A is a technological constant and the parameter γ (≤ 1) captures the presence of diminishing returns in this sector.[8]

Developing economies with underemployment are characterized often by work sharing in the absence of public unemployment insurance coverage. An alternative measure of non-traded sector worker income, therefore, takes the empirically measured wage in the traditional sector as an average remuneration, that is, total labor income divided by the number of workers not employed in the formal sector. This 'sharing wage' ($\check{\omega}_N$) is given by

$$\check{\omega}_N = \frac{\omega_N L_N}{L - L_T} \leq \omega_N \tag{4}$$

where L_T is employment in the tradable sector, while L is the total size of the labor force.[9] Depending on institutional and social characteristics, the measured

[7] See Swan (1960) for an early exposition.

[8] It is important to note here that none of the later results regarding steady state accumulation and growth depend on this assumption of diminishing returns, although modifying it will affect the real wage and distribution in the non-tradable sector. The product $\upsilon\gamma$ must be less than one to ensure a positive share of rents.

[9] The total labor force includes the sum of employment in the two sectors as well as the unemployed. It is widely recognized that the terms "unemployment" and/or "underemployment" are much less well-defined in a low-income economy context. Many workers who are unable to find a job in the modern sector may either remain unemployed, or work in the non-tradable sector, often sharing work with family members. These features were highlighted in the seminal contribution of Lewis (1954).

wage in the traditional, non-tradable sector may fall anywhere between the sharing wage $\check{\omega}_N$ and the effective wage ω_N.

The modern sector of the economy, the tradable sector or T-sector, produces internationally tradable output using labor (L_T) and an accumulable factor of production (capital), K, in fixed proportions. In line with traditional structuralist models for the South, the output of the sector is capital constrained.

$$Y_T = \min\left\{\frac{L_T}{a}, \frac{K}{b}\right\} \tag{5}$$

where a and b are technologically determined constants, which for simplicity we will assume to equal unity (i.e., $a = b = 1$). The price of the tradable good, P_T, is internationally given. Workers have some bargaining power in the T-sector, and the real wage ω_T is assumed to be proportional to a benchmark level of worker purchasing power in terms of non-tradables, $\bar{\omega}_T$. It may be more intuitive to think of the real wage being negotiated in terms of both goods in the expenditure basket, but since the price of tradables is given, this is an innocuous simplification within the scope of our analysis. The exogenously given factor of proportionality ϕ captures labor market conditions, institutions, principal-agent problems (efficiency wages) and bargaining in the presence of costly search and relationship-specific investment.[10] Specifically,

$$\omega_T = \phi\bar{\omega}_T;\ \phi > 0 \tag{6}$$

Denoting the real exchange rate (the relative price of tradables in terms of non-tradables) by q, the profit share of tradable output Π is then given by:

$$\Pi = \frac{eP_TY_T - W_TL_T}{eP_TY_T} = 1 - \frac{\omega_T}{q} = 1 - \frac{\phi\bar{\omega}_T}{q} \tag{7}$$

In line with standard structuralist and neo-Kaleckian literature, capitalists and landlords are assumed to save a constant proportion s_π of their income. Workers, on the other hand, save a smaller fraction s_w ($\leq s_\pi$) of their wage income. There is no government spending or taxation.

Consumer preferences reflect an underlying Cobb-Douglas utility function, tradables and non-tradables are substitutes in consumption, and the consumption of non-tradables C_N equals a proportion λ of total capitalist, landlord, and worker consumption:

[10] This specification is different from that employed by Razmi (2015), in that the real *product* wage was assumed fixed there. The modification is useful here since, rather than carrying out thought experiments involving an exogenous increase in the nominal wage in the tradable sector, we are interested here in non-traditional forms of wage-led growth.

One could also introduce efficiency wage and fallback wage considerations, as in Razmi et al. (2012). Tradable-sector employment rate L_T/L is the key determinant here of workers' fallback position. The smaller the pool of available labor outside the tradable sector, the greater the bargaining power of workers. Another plausible argument for inclusion in the ϕ-function is the sharing wage $\check{\omega}_N$, which too would reflect the fallback position of workers. The inclusion of this variable would significantly complicate the algebra here. However, I will come back to these issues while qualifying the implications of the analysis in Section 3.3.

Table 1: Definitions of key variables

Variable	Definition
C_i, Y_i	Consumption and output of good i, respectively ($i = N, T$)
T, R	Total rents and rental share of income in the non-tradable sector
Π, r, r^*	Profit share of output and the domestic and world profit rates
ω_i	Real wage in terms of non-tradables in sector i
υ	Worker share of marginal product in N-sector
$\breve{\omega}_N$	Shared wage in the N-sector
I_i	Investment
K	Stock of capital
L_i	Employment in sector i
TB	Trade balance
s_w, s_π	Worker and capitalist saving rates
e, q	Nominal and real exchange rates
P_i	Price of good i
λ	Share of domestic consumption expenditure devoted to non-tradables

$$C_N = \lambda \left[(1 - s_w) \left(\omega_N L_N + \omega_T L_T \right) + (1 - s_\pi) \left(RAL_N^\gamma + q\Pi K \right) \right]$$

and,

$$\lambda = \lambda(q);\ q' > 0 \tag{8}$$

The first half of the expression in the square brackets on the right hand side captures consumption by workers, while the second half represents consumption by landlords and owners of capital. Employing eqs. (1), (2), (3), (5), (6), and (7) allows us to consolidate the above expression, so that

$$C_N = \lambda \left\{ \left[(1 - s_\pi) + (s_\pi - s_w)\upsilon\gamma \right] AL_N^\gamma + \left[(1 - s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T \right] K \right\} \tag{9}$$

A similar expression can be derived for domestic consumption of the tradable good:

$$C_T = (1-\lambda) \left\{ \left[(1 - s_\pi) + (s_\pi - s_w)\upsilon\gamma \right] \frac{AL_N^\gamma}{q} + \left[(1 - s_\pi) + (s_\pi - s_w)\phi \frac{\bar{\omega}_T}{q} \right] K \right\} \tag{10}$$

Finally, let's turn to investment behavior. With a capital constraint, the degree of capacity utilization is no longer a driver of profitability, so that the Marglin-Bhaduri critique does not come into play. Second, as mentioned in Section 3.3, the typical developing country imports a high proportion of it's capital goods so that structuralist literature often simplifies by assuming that

all capital goods are imported. Third, the typical developing economy is likely to be a price-taker in the international market for capital goods. One can, therefore, simplify by assuming that the price of capital goods, P_K, equals that of the other tradable goods. The profit rate r is, under these conditions, interchangeable with the profit share. Investment (I) behavior can, therefore, be specified as follows:

$$\begin{aligned} \frac{I}{K} &= f(r-r^*) = f\left(\frac{eP_TY_T - W_TL_T}{eP_KK} - r^*\right) = f\left(\frac{eP_TK - W_TK}{eP_KK} - r^*\right) \\ &= f\left(1 - \phi\frac{\bar{\omega}_T}{q} - r^*\right);\ f' > 0 \end{aligned} \tag{11}$$

where r^* captures a target benchmark profit rate, or alternatively, the returns to investing abroad, which can be taken as exogenously determined for a small financially open economy. The tradable good can, of course, be exported or consumed domestically. While, as discussed earlier, it is reasonable to assume balanced trade over the long-run, there are likely to be short-run deviations. The trade balance (TB), expressed in terms of tradables, soaks up any differences between income and expenditure in this time frame.

$$\frac{TB}{K} = \frac{Y_T}{K} - \frac{C_T}{K} - \frac{I}{K} \tag{12}$$

where the trade balance is normalized by the capital stock for convenience. Eqs. (1)-(12), which contain 13 endogenous variables (Y_N, L_N, ω_N, $\breve{\omega}_N$, C_N, R, Y_T, C_T, ω_T, π, λ, TB, I/K), complete the framework for our short-run analysis. As discussed below, equation (12) is the T-sector equilibrium condition. The real exchange rate q and the level of capital stock k are pre-determined in the short run. We turn to their behavior shortly One more equilibrium condition is needed to round off our short-run analysis, that for non-tradable market clearing. Given the satisfaction of these conditions, the macroeconomic equilibrium condition is satisfied by Walras's Law.[11]

By definition, the equilibrium condition for non-tradables is given by

$$Y_N = C_N \tag{13}$$

[11] Recall that there are three underlying equilibrium conditions: N-sector clearing, T-sector clearing, and macroeconomic equilibrium, respectively.

$$Y_N = C_N \tag{A}$$

$$Y_T = C_T + TB + I \tag{B}$$

$$Y = Y_N + qY_T = C_N + qC_T + qI + qTB \tag{C}$$

Imposing N-sector clearing on equation (C) yields:

$$Y_T = C_T + I + TB$$

which leads to the trade balance condition. With N-sector clearing, the satisfaction of any one of the two equations (B) and (C) ensures satisfaction of the other.

Substituting from eqs. (1) and (9), yields, after some manipulation:

$$L_N = \left\{ \frac{\lambda \left[(1-s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T \right]}{1 - \lambda \left[(1-s_\pi) + (s_\pi - s_w)\upsilon\gamma \right]} \frac{K}{A} \right\}^{\frac{1}{\gamma}} \tag{14}$$

Output at any instant is determined by the amount of employment which is in turn ultimately determined by demand from the tradable sector. The distributional variables ω_T and R are determined by exogenous variables. The real exchange rate is given in the short run, as is the capital stock. Employment in the non-tradable sector varies to maintain equilibrium. An expansion of the tradable sector (a rise in K), a shift in demand towards non-tradables (a rise in λ) or a decline in either saving rate expands employment in the non-tradable sector. Redistribution of income towards workers in either sector – that is, a rise in ω_T or υ – too expands non-tradable employment, as long as $s_\pi - s_w > 0$. The detailed expressions for these and later comparative statics are presented in the Appendix (see eqs. (A1), (A6), and (A11) in particular). In brief, short-run equilibrium in the non-tradable sector presents a picture consistent with wage-led output growth.

Once L_N has been pinned down, N-sector output and wages can be determined using eqs. (1), (2), (4), and (14).

$$C_N = Y_N = \frac{\lambda \left[(1-s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T \right]}{1 - \lambda \left[(1-s_\pi) + (s_\pi - s_w)\upsilon\gamma \right]} K \tag{15}$$

$$\omega_N = \upsilon\gamma A \left\{ \frac{(1-s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T}{1 - \lambda \left[(1-s_\pi) + (s_\pi - s_w)\upsilon\gamma \right]} \frac{K}{A} \right\}^{\frac{\gamma-1}{\gamma}} \tag{16}$$

$$\breve{\omega}_N = \frac{1}{L - L_T} \upsilon\gamma \left\{ \frac{(1-s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T}{1 - \lambda \left[(1-s_\pi) + (s_\pi - s_w)\upsilon\gamma \right]} K \right\} \tag{17}$$

We can also now derive an expression for total rents accruing to the landlords in terms of the non-tradables,

$$\begin{aligned} T &= RY_N = (1 - \upsilon\gamma)Y_N \\ &= \upsilon\gamma \frac{\lambda \left[(1-s_\pi)q + (s_\pi - s_w)\phi\bar{\omega}_T \right]}{1 - \lambda \left[(1-s_\pi) + (s_\pi - s_w)\upsilon\gamma \right]} K \end{aligned} \tag{18}$$

Non-tradable output and the sharing wage are increasing in K, q, and λ and declining in s_π, and s_W (eqs. (15)), and (17). Changes in these variables have the opposite impact on the effective N-sector real wage in the presence of diminishing returns (i.e.,as long as $\gamma < 1$ in equation (16)). Intuitively, a real depreciation (a rise in q) causes increased spending on non-tradables, due to both income and substitution effects. Since output and employment in the N-sector are demand-led, these move upward, as does the sharing wage. Lower saving by either group has the same impact, as does, a higher tradable sector real wage (as long as $s_\pi > s_w$) . Due to diminishing returns, however, higher

employment corresponds to a lower real effective wage. Increased employment in the modern tradable sector raises the shared wage but leaves the effective real wage unaffected. The former effect follows from the fact that more income is being distributed among fewer people outside the T-sector.

Finally, re-distribution towards wages in the N-sector (an increase in υ), the basis for an important thought experiment in Section 3.2, raises both the effective real wage and the shared wage in the N-sector. Indeed, this is the *only* comparative static amongst the ones discussed that results in a rise in both wages. Given that such a re-distribution raises spending on non-tradables, the rise in the sharing wage is not surprising. That the real wage rises too is a consequence of the fact that while the marginal product of labor declines, workers' share of *each* unit of output rises, and the latter effect dominates.

Domestic consumption of the tradable good can be derived from eqs. (10) and (14).

$$C_T = (1-\lambda)\frac{(1-s_\pi)+(s_\pi-s_w)\phi\frac{\bar{\omega}_T}{q}}{1-\lambda\left[(1-s_\pi)+(s_\pi-s_w)\upsilon\gamma\right]}K \tag{19}$$

Thus, substituting from equations (5), (11), (14) and (19), yields the following expression for the trade balance, i.e., the T-sector equilibrium condition:

$$\frac{TB}{K} = 1-(1-\lambda)\frac{(1-s_\pi)+(s_\pi-s_w)\phi\frac{\bar{\omega}_T}{q}}{1-\lambda\left[(1-s_\pi)+(s_\pi-s_w)\upsilon\gamma\right]} - f\left(1-\phi\frac{\bar{\omega}_T}{q}-r^*\right) \tag{20}$$

An increase in the saving rate of either group has the effect of reducing domestic consumption and thereby generating a trade surplus. A rise in the labor share of output in the N-sector has the opposite effect. A real appreciation (i.e., a decline in q) or an increased real wage in the T-sector have ambiguous effects on the trade balance. Consumption of tradables rises on the one hand while investment declines on the other. Intuitively, a real appreciation makes non-tradables relatively expensive, reducing domestic expenditure on them (both through income and substitution effects). This would negatively affect the trade balance. Tradable sector profitability declines, however, and this would tend to generate a trade surplus. Stability of the long-run system requires the satisfaction of the famous Marshall-Lerner-Bickerdike-Robinson (MLRB) condition so that the spending effect dominates the investment effect and $\partial TB/\partial q > 0$. A significant body of literature finds that this condition is satisfied.[12]

To summarize, our short-run set-up has two equilibrium conditions, one for each sector. Employment in the N-sector, which is demand driven, and the trade balance adjust to ensure market-clearing.

A Longer-Run View

[12] See, for example, Bahmani-Oskoee and Niroomand (1998) for a test of the Marshall-Lerner condition for a large sample of countries. Note that the MLRB condition is less stringent than the ML condition since it does not assume infinite export and import supply elasticities.

In addition to immediate effects, we are also interested in changes over time, especially the effects of re-distribution on growth over a period of time. A note of caution is in order, however, before we proceed. The terms "long-run" and "steady state" as employed in this and subsequent sections refer to periods of logical time long enough so that the variables of interest grow at a constant (exponential) rate. With diminishing returns to labor in the N-sector ($\gamma < 1$), however, there can be no steady state growth in the very long-run, and stationary state scenarios emerge. Our analysis beyond the short run is limited to a low-income economy for as long as it has a pool of underemployed workers, so that output and employment growth are endogenous. Wherever applicable, I will refer to this period of analysis as the "longer-run."

Suppose that the developing economy under consideration is limited by the availability of capital flows to a trade balance $\overline{TB}/K$ over the longer run. This could be zero or, more generally, a non-zero constant. The real exchange rate adjusts in order to satisfy this constraint over time. Using a carat or "hat" to denote the rate of growth allows us to describe the adjustment mechanism as follows:

$$\hat{q} = h\left(\frac{\overline{TB}}{K} - \frac{TB}{K}\right);\ h' > 0 \tag{21}$$

The longer-run set-up thus involves q as a state variable, which adjusts over time to maintain the trade balance. Given the satisfaction of the MLRB condition, $\partial\hat{q}/\partial q < 0$. This is graphically captured by Figure 1 in (q, $\hat{q}$) space. A real depreciation creates a trade surplus. The path of q between the steady states must therefore be downward sloping (i.e., the real exchange rate must appreciate over time along the adjustment path).

A shock to any of the variables that appear in equation (20), such as s_π, R, or ω_T translates into a new steady state corresponding with a new level of the real exchange rate. Given our focus on distributional considerations, I will focus on the latter two shocks. First, however, let's explore the steady state properties of the system.

In the steady state, the real exchange rate is constant, trade is balanced and the economy is growing at a constant rate. In addition, the steady state is characterized by:

$$\gamma\hat{L}_N = \hat{C}_N = \hat{C}_T = \hat{Y}_N = \hat{Y}_T = \hat{K} \tag{22}$$

In other words, the growth rates of sectoral output, consumption, and capital stock growth are identical. This is not surprising given the balanced trade constraint in the steady state. To see why, consider that q is constant in the steady state, as are ω_T, and, from equation (8), λ, and, therefore, from equation (20), TB. Since the saving rates and N-sector distributional parameters are exogenous, equation (11), (14), and (19) imply after log-differentiation that:

$$\hat{L}_N = \frac{1}{\gamma}\hat{K},\ \hat{C}_T = \hat{K} = \frac{I}{K} \tag{23}$$

Log-differentiating equation (9) and substituting for $\hat{L}_N$ from equation (23) yields,

$$\hat{C}_N = \hat{K} \tag{24}$$

To sum up again, relative prices are rigid in the short-run and L_N adjusts in response to excess demand or supply in the non-tradable sector, which is demand-led. The trade balance TB adjusts in response to tradable sector disequilibria. Relative prices adjust over time in response to trade imbalances.

What are the prospects for wage-led growth in this stylized economy? This is the question to which we now turn.

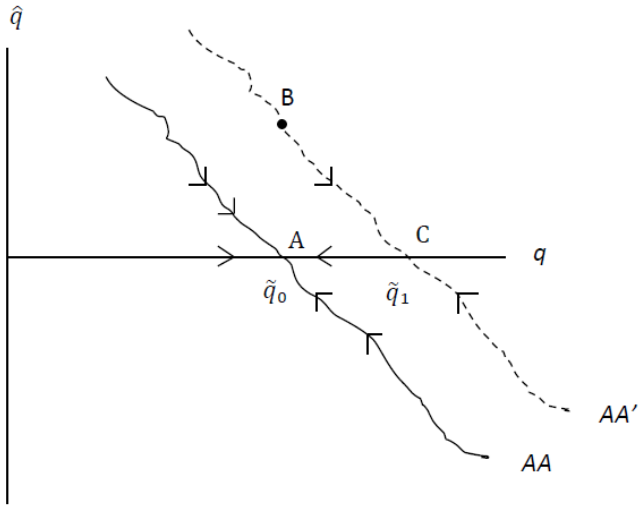

Figure 1: The dynamics of the long-run set-up.

3 Distribution and Growth

We are now in a position to compare the effects of redistribution in the two sectors. We will start with the tradable sector and then move to the non-tradable one. In the process, we will notice some interesting differences emerge, both in the short run and over time.

3.1 Raising the real wage of T-sector workers

First, consider the consequences of wage-led growth in the traditional sense of the term, i.e., through an increase in the modern sector wage, either through a rise in the benchmark wage $\bar{\omega}_T$ via an upward nominal movement, or a rise in

ϕ. Equations (14) and (15) make it clear that re-distribution towards the group with a lower propensity to save expands output and employment in the non-tradable sector. Higher employment means a lower effective real wage in the N-sector, thanks to diminishing returns (equation (16)). However, equation (17) tells us that the extra output generated translates into a higher sharing wage. Thus, average living standards for workers rise in both sectors in the short run. On the external front, the immediate result of the re-distribution away from savers is to boost the consumption of tradables, and therefore, based on equation (20), to create a trade deficit. This means that the system jumps from a point like A in Figure 1, where $\hat{q} = 0$ to a point such as B where $\hat{q} > 0$.

Over time, the excess demand for tradables, manifested by the trade deficit, leads to relative price movement via equation (21). This is captured by the real depreciation shown in the movement from point B to point C in Figure (1). A higher (depreciated) real exchange rate is now consistent with the new steady state. This higher real exchange rate gives a further boost to spending on the non-tradable good, both due to income and substitution effects. The end result is higher output and sharing real wage in the N-sector.

How is the steady state level of growth in the modern sector – and hence in the traditional sector – affected? Here a look at equation (11) is required. Recall that the initial increase in the real wage leads eventually to a depreciated real exchange rate. The effect on the steady state rate of accumulation, therefore, depends on which variable increases more in proportional terms. In other words, is the rise in q sufficient to more than offset the initial rise in ω_T, leaving us with a lower steady state real wage and a higher rate of accumulation? The following mathematical expression for the proportional change in the steady state value of $\bar{\omega}_T/\tilde{q}$, based on eqs. (20) and (21), shows that this is not the case.

$$\left.\frac{\bar{\omega}_T}{\tilde{q}}\frac{d\tilde{q}}{d\bar{\omega}_T}\right|_{\hat{q}=0} = \frac{(1-\lambda)S - f'\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]}{(1-\lambda)S + \lambda'\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)\left[\frac{1-(B+S\upsilon\gamma)}{1-\lambda(B+S\upsilon\gamma)}\right]\frac{q}{\bar{\omega}_T} - f'\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]}$$

where a '~' over a variable denotes its steady state value, $B = 1 - s_\pi$ and $S = s_\pi - s_w$. The expression above simplifies to the following condition:

$$\left.\frac{\bar{\omega}_T}{\tilde{q}}\frac{d\tilde{q}}{d\bar{\omega}_T}\right|_{\hat{q}=0} \gtrless 1 \text{ iff } \lambda'\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]\frac{q}{\bar{\omega}_T} \lessgtr 0$$

which is not satisfied as long as tradables and non-tradables are substitutes in consumption. Thus, $\left.\frac{\bar{\omega}_T}{\tilde{q}}\frac{d\tilde{q}}{d\bar{\omega}_T}\right|_{\hat{q}=0} < 1$. Intuitively, a look at equation (20) reveals that the real exchange rate influences the trade balance through a wider variety of channels than the T-sector real wage.[13] A smaller increase in the

[13] One way to see this directly is to consider the case where $s_\pi - s_w = 0$, i.e., there is no saving rate differential between the two classes. A rise in the T-sector real wage in this case no longer has an effect on the trade balance while a change in q still does, thanks to income and substitution effects.

steady state value of q, therefore, suffices to correct the trade imbalance created by income re-distribution. This means that the real T-sector wage is higher, and accumulation lower, in the new steady state.

In sum, the benefits of re-distribution for T-sector workers in our framework spill over to workers outside this sector – in the form of a higher sharing wage – through the aggregate demand channel. This may not be a sustainable growth strategy however, given that the steady state rate of accumulation declines.[14] In terms of the political economic repercussions, the main distributional conflict is between capitalists on the one hand, and workers and landlords on the other.

3.2 A change in distributional norms in the N-sector

Now consider how an increase in the worker share of N-sector income, i.e., a rise in υ plays out. Again, re-distribution towards spenders helps raise N-sector output through the demand channel. Unlike the redistribution previously analyzed, the sharing real wage *and* the effective real wage both rise in the short-run, the direct effect of the redistribution dominating the effect of diminishing marginal product in the latter case. Landlords suffer because, although the output of non-tradables rises, their share per unit of output has declined, and, as shown in the appendix, this latter effect dominates (see equation (A9)). This boon to N-sector workers spills over to capitalists in the T-sector, without hurting workers, as the real exchange rate depreciates over time in response to the trade deficit created. This means also that the initial boost to N-sector worker incomes gets magnified over time thanks to expenditure-switching towards non-tradables. The change in the steady state level of the real exchange rate is positive, as shown by the following expression:

$$\left.\frac{d\tilde{q}}{d\upsilon}\right|_{\hat{q}=0} = \frac{\lambda(1-\lambda)\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)\frac{S\gamma}{1-\lambda(B+S\upsilon\gamma)}}{(1-\lambda)S\phi\frac{\bar{\omega}_T}{q^2}+\lambda'\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)\left[\frac{1-(B+S\upsilon\gamma)}{1-\lambda(B+S\upsilon\gamma)}\right]-f'\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]\phi\frac{\bar{\omega}_T}{q^2}}$$

In terms of Figure 1, the analysis is quite similar to that provided in the previous sub-section, with the real exchange rate beginning its depreciation following the trade deficit created by the initial shock, and continuously depreciating towards a new higher steady state level.

How are T-sector workers and capitalists affected? The real wage is rigid in terms of non-tradables, so that the nominal wage follows the price of non-tradables down. Put differently, the real wage falls in terms of tradables. This means that profitability improves. Unlike the earlier case where income was initially re-distributed to T-sector workers, the steady state rate of accumulation gets a boost. Unlike that case, the main distributional conflict is now between

[14] Notice that the negative effect on steady state accumulation would be even greater if the T-sector real wage were rigid in terms of the tradable good, as in Razmi (2015), since in this case the resulting real depreciation will not mitigate the effects on investment through a lower T-sector nominal wage.

Table 2: Summary of effects on different groups or variables

Experiment		ω_N	$\breve{\omega}_N$	T	L_N	ω_T	I/K
$\uparrow \bar{\omega}_T$ or $\uparrow \phi$	Short-run	$-$	$+$	$+$	$+$	$+$	$-$
	Steady state	$-$	$+$	$+$	$+$	$+$	$-$
$\uparrow \upsilon$	Short-run	$+$	$+$	$-$	$+$	0	0
	Steady state	$+/-$	$+$	$+/-$	$+$	0	$+$

capitalists and workers on the one hand, and landlords on the other. Opposition to re-distribution lacks a constituency in the modern/urban sector in this case.

To sum up, the two kinds of re-distribution discussed here have contrary effects insofar as their consequences for steady state capital accumulation are concerned. Moreover, the effects on functional classes are not identical. Table 2 summarizes this discussion for convenience. From the perspective of a capital-constrained low-income economy, the implications for development are likely to be quite important over time.

3.3 Alternative specifications of T-sector wage behavior

Before we explore wage-led growth further from a development perspective, let's briefly examine the effects of specifying different labor market behavior in the modern sector. Suppose the T-sector wage is negotiated in terms of tradable goods rather than non-tradable ones. Re-distribution towards T-sector workers in this case would have the same enhancing effects on incomes outside the T-sector – for similar demand-driven reasons – but will lower the steady state rate of capital accumulation and output growth even more. This is because in this case the resulting real depreciation will not mitigate the effects on investment through a lower T-sector nominal wage.

What about our second thought experiment involving re-distribution in the N-sector? Again, the resulting increase in demand and real depreciation will benefit N-sector workers and, thanks to their increased purchasing power in terms of non-tradables, T-sector workers. The steady state level of investment, however, is no longer positively influenced. Indeed, it is unchanged. Thus, the positive effect of N-sector redistribution on steady state investment does not survive this change in specification. However, as development literature going back to Ricardo (1821) has recognized, workers mostly consume "necessities," which in low-income economies mainly consist of non-tradables. Specifying real wages as negotiated in terms of non-tradables is a reasonable first approximation. Nothing would change qualitatively in our benchmark analysis of Sections 3.1 and 3.2 if we were to specify real wages as being set in terms of a basket consisting of both goods, instead of a subset thereof.

More realistically, one would expect ω_T to be a function, both on efficiency wage and bargaining position grounds, of the sharing wage in the N-sector and the scarcity of labor available from outside the T-sector.

$$\omega_T = \phi(\check{\omega}_N, L_T/L)\bar{\omega}_T;\ \phi_{1,2} > 0$$

How would such a specification affect our main results regarding steady state accumulation and growth? Once T-sector employment is an argument in the ϕ-function, either directly or through the presence of $\check{\omega}_N$, a steady state rate of accumulation ceases to exist even in its qualified sense here.[15] A long-run stationary state exists if the total labor supply L is given. However, these mechanisms are likely to work slowly in a low income country with large pools of underemployment. Our benchmark steady state analysis is likely to be useful over significant periods of time.

Let's turn finally to the case where workers in the two sectors are perfect substitutes so that steady state wages equalize. This case is implausible on empirical grounds given the complementarities between human and physical capital, and the resources involved in training workers for modern sector jobs. If, however, wages do equalize the tendency, as long as there is significant underemployment, would be towards convergence to the sharing real wage in the N-sector. This means that, (a) a steady state rate of accumulation would cease to exist, and (b) raising wages in the N-sector will now hurt accumulation over time. For the reasons stated above, this scenario is of limited interest in low-income economies.

3.4 Bottlenecks in the N-sector

In his analysis of developing economies, Kalecki (1976) placed significant emphasis on supply-side bottlenecks in the production of "necessities" (mainly basic agricultural output). Other prominent structuralist economists in the Latin American tradition echoed similar concerns in the post World War II years.[16] While we do not carry out a detailed steady state analysis here, a quick investigation may be interesting. In our framework, such bottlenecks could be incorporated by having the real exchange rate adjust instead of N-sector employment to clear the market for non-tradables in the short run. Re-distribution towards workers in the T-sector (via an increase in the nominal wage) would then generate excess demand for non-tradables, resulting in inflation, real appreciation, diversion of demand away from non-tradables, and rising T-sector wages in terms of tradables. The trade balance will develop a deficit and investment will suffer over time. As in the case of our original framework, growth led by wage increases in the T-sector is not a sustainable policy.

But what about re-distribution toward workers in the N-sector? Here the analysis leads to conclusions that deviate from our original framework. Most importantly, wage-led growth is no longer an option. Why? Just as in the case where re-distribution is carried out in the T-sector, the result is excess demand for non-tradables, a trade deficit, and real appreciation in the short run.

[15] See eqs. (5), (17), and (20).

[16] See Baer (1967) and Boianovsky (2012) for surveys.

The latter affects investment negatively, unlike in our benchmark framework of Section 2, where there is no appreciation in the short run.

In sum, bottlenecks in the N-sector make wage-led growth less likely regardless of the sector where income redistribution originates. Thus, the option of pursuing wage-led growth based on re-distribution in the N-sector may be more feasible in the early stages of development, when there is considerable underemployment, so that employment (L_N) rather than the relative price of non-tradables adjusts in the short run.

4 Broader Implications

A major argument emerging from the last section is that re-distribution toward workers may have different effects depending on their sector of employment. Specifically, re-distribution in the T-sector undermines long-run growth prospects by directly reducing profitability. These consequences may not follow from re-distribution in the N-sector. Indeed, if T-sector wages are even partly fixed in terms of "necessities" or N-sector goods then investment will get an upward push as long as the real exchange rate moves in an equilibrating manner, due either to market forces or the visible hand of policy makers.

Re-distribution in the T-sector may be popular amongst a vocal constituency (i.e., the urban workers), and it does give a boost to demand in the short run in our framework, but the decline in investment means that the boom is unlikely to be sustained. Several historical examples come to mind, some of them from Latin America. For instance, Rapetti (2012) compares the rapid growth episodes in Chile and Argentina, starting in the mid-80s and 2000s, respectively. Both episodes followed balance of payments and financial crises, so that there was considerable slack in the economy in the initial phases of each episode. Both episodes involved large initial devaluations and a policy to maintain an undervalued real exchange rate. With similar initial conditions, the subsequent trajectories, however, diverged over time. A factor that drove the separate trajectories was the way macroeconomic policy was conducted. While Argentina followed expansionary monetary, fiscal, and wage policies that meant that, as output and employment growth accelerated, wage and price inflation followed and the real exchange rate appreciated, Chilean policy makers, by contrast, managed to moderate wage and price inflation, and were able to sustain the expansion of output and the capital stock for a much longer period.[17] Policy makers could, of course, attempt to counter this by guiding the path of the real exchange rate in such a way as to counter the effect on profitability. For example, a central planner could employ the nominal exchange rate as an instrument for real undervaluation in order to maintain profitability over time.[18] But, apart

[17] Also see Frenkel and Rapetti (2012) for a detailed discussion of these and other historical episodes in Latin America.

[18] Razmi et al. (2012)) discuss this issue in more detail. With the level of investment and the trade balance as two targets, policy makers require two instruments. The real exchange rate could serve as one such instrument.

from potentially setting off a depreciation-inflation-depreciation cycle, it would also undermine the initial re-distribution.

Our analysis points to an alternative, i.e., pursuing reforms in the N-sector that re-distribute income towards wages. Given wage indexation, this will leave real wages (in terms of non-tradables) unaffected in the T-sector. If relative prices move in an equilibrating manner over time, the resulting real depreciation will actually raise profitability and investment. A possible historical example may be the land reforms carried out in East Asia prior to their growth accelerations. A vast and growing body of literature has studied the Asian "miracle" economies to help understand the nature of growth in low income settings. One feature that appears to be shared by several of these cases is the implementation of genuine land reforms that made income distribution in the rural areas more equitable on the eve of the initial growth takeoffs. As Stiglitz (1996) (p. 167) notes,[19] in "Korea, Japan, and Taiwan (China), land reforms – at least partially imposed from outside – were important in the initial stages of development." Land reforms considerably weakened the landlords and, when accompanied by other measures, prevented runaway food price inflation during the growth process.

Redistribution affects demand and growth in neo-Kaleckian models because of saving differentials between functional classes. This is also true for most of the results in the present analysis,[20] but presents us with an interesting nuance in the sense that redistribution in the N-sector – raising υ in the context of the present framework – may have another advantage over raising ω_T. The latter has an effect on N-sector wages *only* if there is an economically significant saving differential, i.e., $s_\pi - s_w > 0$. If both classes have similar saving rates, one can see, based on the relevant expressions in the Appendix, that re-distribution in the T-sector has no effect on workers outside the T-sector (who may be the bulk of the potential labor force). In mathematical terms, $d\omega_N/d\bar{\omega}_T = d\check{\omega}_N/d\bar{\omega}_T = 0$ when $s_\pi = s_w$. Re-distribution in the modern sector, in other words, does not generate income in the rural sector if the saving behavior does not differ between the classes. Re-distribution in the non-tradable sector, on the other hand, translates into a proportional increase in the income received by the bulk of the workforce ($d\omega_N/d\upsilon = \omega_N/\upsilon$ and $d\check{\omega}_N/d\upsilon = \check{\omega}_N/\upsilon$ when $s_\pi = s_w$). Furthermore, there is no impact on the trade balance in this case. The high worker saving rates with typically moderate trade imbalances in some East Asian countries during their rapid growth phases suggest that this factor may have played a significant role.

Political economy aspects are, of course, rather important here. Redistribution in the traditional sector benefits not only workers across the board, but also capitalists, at the expense of landlords. This poses challenges if the landlords are strong, as is likely to be the case in underdeveloped economies. Indeed, as alluded to by the quote from Stiglitz (1996) above, reforms have often been forced through by outsiders. Similarly, between urban and rural workers, the

[19] See also Wade (1990) for Taiwan and Amsden (1989) for South Korea.

[20] A look at the Appendix helps quickly distinguish the results which get annulled when $s_\pi = s_w$ from the ones that do not.

former are likely to be better organized and more vocal. Direct re-distribution in the modern sector may, therefore, be politically more appealing. In our framework, this helps both landlords and workers in the short run, although steady state growth is negatively affected. This may be one of the many instances where political factors push policy in directions that would leave almost everyone worse-off in the long run.

5 Concluding Remarks

Low income countries have characteristics which encourage us to re-visit the standard neo-Kaleckian framework and the associated debate pertaining to wage- versus profit-led growth. This paper is an effort in that direction. Many low-income countries have dual economies with contrasting sectoral characteristics. The results of income re-distribution can be quite different depending on whether it takes place in the traditional/rural/non-tradable sector or the modern/capital-intensive/tradable one. Policies that induce rapid wage increases in the tradable sector may, for example, quickly undermine long-run growth prospects. In our framework this does not occur through the traditional mechanism as developed by Blecker (1989) and others. Rather, the fact that our low-income economy is a price-taker in international markets means that, other things held constant, higher wages in the tradable sector undermine profitability. With full utilization of capital, this decline in profitability translates into lower investment. Longer term steady state accumulation suffers.

The absence of wage-led growth originating from re-distribution in the tradable sector does not render re-distribution universally harmful during early phases of growth. Other avenues exist and may have played a role in important historical instances, such as the successful growth episodes experienced by several East and South East Asian economies. Raising the share of income going to workers in the non-tradable sector can raise steady state accumulation, in addition to generating employment through the demand channel. The increase in steady state investment results from the real depreciation induced by the excess domestic demand for tradables (i.e., trade deficits). This of course requires that either the adjustment mechanism whereby relative prices change in response to trade deficits occurs smoothly, or in the absence of smooth adjustment, policy makers step in to ensure adjustment in the required direction. Given existing evidence, complementary monetary, fiscal, and national saving policies are likely to be required to guide the trajectories of the real exchange rate and external imbalances. Indeed, the evidence suggests that governments often employ these instruments, with varying degrees of success, to influence exchange rates.[21] The case for re-distribution in the N-sector is weakened if lack of exchange rate ad-

[21] See, for example, the 'fear of floating' literature inspired by Calvo and Reinhart (2002), who show that, in the aftermath of the Asian crises, developing countries have systematically intervened in the foreign exchange market to manage the behavior of exchange rates. Levy-Yeyati and Sturzenegger (2007) find that such interventions have aimed to maintain competitive exchange rates or to avoid overvaluations.

justment in the face of external imbalances hinders growth, as has been the case in several developing countries that experienced stop-and-go cycles during which foreign exchange shortages typically led to abrupt downturns instead of smooth exchange rate depreciations.

Several caveats apply here some of which such as the possibilities of disruptive adjustment to external balances and rapidly rising tradable sector wages in response to improving fallback positions we have already discussed. The case for re-distribution in the rural sector is stronger in the initial phases of development when underemployment is significant. As the pool of these workers shrinks with expansion of the modern sector, prices rather than quantities are likely to respond to excess demand in the short-run. The resulting real appreciation could neutralize any boost to investment in the modern sector. Section 4 briefly discussed this mechanism in the context of Latin American economies. We have not explicitly considered the role of government spending and taxation. Also, we have ignored the role of technological change, learning externalities, and economies of scale. To the extent that these latter factors are present to a greater degree in the tradable sector, their incorporation amplifies concerns about the negative impact of re-distribution in that sector on investment. Productivity change in early stages of development largely results from moving workers from low productivity traditional sectors to high productivity modern ones. Our analysis of changes in the steady state rate of investment suggests, therefore, that we may be capturing important elements of economic evolution. Our focus, in any event, is the scope for *wage*-led growth rather than technological change. Nevertheless, the analysis here is intentionally partial and incomplete, and future empirical work should explore the robustness of the case made in favor of the limited applicability of the traditional wage-led growth argument to developing countries.

6 Mathematical Appendix

This section presents detailed expressions for the comparative static results discussed in Section 2 of the main text.

First some notation to avoid clutter. Let $B = 1 - s_\pi$ and $S = s_\pi - s_w$. The consequences of various shocks on the short-run equilibrium values of the key endogenous variables are as follows:

$$\frac{dL_N}{dq} = \frac{1}{\gamma} L_N^{\frac{1}{\gamma}} \left\{ \frac{B}{Bq + S\phi\bar{\omega}_T} + \frac{\lambda'}{\lambda\left[1 - \lambda\left(B + Sv\gamma\right)\right]} \right\} > 0 \tag{A1}$$

$$\frac{d\omega_N}{dq} = -\frac{1-\gamma}{\gamma} \omega_N L_N^{\frac{1-\gamma}{\gamma}} \left\{ \frac{B}{Bq + S\phi\bar{\omega}_T} + \frac{\lambda'}{\lambda\left[1 - \lambda\left(B + Sv\gamma\right)\right]} \right\} < 0 \tag{A2}$$

$$\frac{d\check{\omega}_N}{dq} = \check{\omega}_N L_N^{\frac{1-\gamma}{\gamma}} \left\{ \frac{B}{Bq + S\phi\bar{\omega}_T} + \frac{\lambda'}{\lambda\left[1 - \lambda\left(B + Sv\gamma\right)\right]} \right\} > 0 \tag{A3}$$

$$\frac{dT}{dq} = \omega_N L_N^{\frac{1}{\gamma}} \frac{1-\upsilon\gamma}{\gamma} \left\{ \frac{B}{Bq + S\phi\bar{\omega}_T} + \frac{\lambda'}{\lambda\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]} \right\} > 0 \tag{A4}$$

$$\frac{d(TB/K)}{dq} = \frac{(1-\lambda)S\phi\frac{\bar{\omega}_T}{q^2} + \lambda'\left[\frac{1-B-S\upsilon\gamma}{1-\lambda(B+S\upsilon\gamma)}\right]\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)}{1-\lambda\left(B+S\upsilon\gamma\right)} - f'\phi\frac{\bar{\omega}_T}{q^2} \gtrless 0 \tag{A5}$$

$$\frac{dL_N}{d\upsilon} = \lambda L_N \frac{S}{1-\lambda\left(B+S\upsilon\gamma\right)} > 0 \tag{A6}$$

$$\frac{d\omega_N}{d\upsilon} = \frac{1-\lambda\left(B+S\upsilon\right)}{1-\lambda\left(B+S\upsilon\gamma\right)}\frac{\omega_N}{\upsilon} > 0 \tag{A7}$$

$$\frac{d\check{\omega}_N}{d\upsilon} = \frac{1-\lambda B}{1-\lambda\left(B+S\upsilon\gamma\right)}\frac{\check{\omega}_N}{\upsilon} > 0 \tag{A8}$$

$$\frac{dT}{d\upsilon} = -\gamma\frac{1-\lambda(B+S)}{1-\lambda\left(B+S\upsilon\gamma\right)}\frac{\omega_N L_N}{\upsilon} < 0 \tag{A9}$$

$$\frac{d(TB/K)}{d\upsilon} = -\frac{(1-\lambda)\left(B+S\phi\frac{\bar{\omega}_T}{q}\right)}{\left[1-\lambda\left(B+S\upsilon\gamma\right)\right]^2}\lambda S\gamma < 0 \tag{A10}$$

$$\frac{dL_N}{d\bar{\omega}_T} = \frac{1}{\gamma}L_N^{1-\gamma}\frac{\lambda S\phi}{1-\lambda\left(B+S\upsilon\gamma\right)}\frac{K}{A} > 0 \tag{A11}$$

$$\frac{d\omega_N}{d\bar{\omega}_T} = -\frac{\upsilon(1-\gamma)}{L_N}\frac{\lambda S\phi}{1-\lambda\left(B+S\upsilon\gamma\right)}K < 0 \tag{A12}$$

$$\frac{d\check{\omega}_N}{d\bar{\omega}_T} = \frac{\check{\omega}_N}{L_N^{\gamma}}\frac{\lambda S\phi}{1-\lambda\left(B+S\upsilon\gamma\right)}\frac{K}{A} > 0 \tag{A13}$$

$$\frac{dT}{d\bar{\omega}_T} = \frac{(1-\upsilon\gamma)\lambda S\phi}{1-\lambda\left(B+S\upsilon\gamma\right)}K > 0 \tag{A14}$$

$$\frac{d(TB/K)}{d\bar{\omega}_T} = -\left[\frac{(1-\lambda)S}{1-\lambda\left(B+S\upsilon\gamma\right)} - f'\right]\frac{\phi}{q} \gtrless 0 \tag{A15}$$

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