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ABSTRACT
This paper presents a post Keynesian open economy model to investigate the possible effects of capital flows on capacity utilization and distribution in financially controlled and financially liberalized small open economies. In financially controlled regimes, capital flows increase labor productivity through spillover effects. The increase in labor productivity leads to a decrease in wage share of workers from national income which leads to lower prices. The lower price level in turn results in real exchange rate depreciation and provides higher trade balances through enhanced export competitiveness. In financially liberalized regimes, capital flows result in real exchange rate appreciation, which decreases the cost of foreign borrowing, foreign intermediate goods, and lower wage shares. In line with all these developments, capacity utilization increases, but trade balances deteriorate due to diminished export competitiveness.

KEYWORDS
Aggregate demand; economic growth of open economies; open economy macroeconomics; Post Keynesian; ıncome distribution; real exchange rate

JEL CLASSIFICATION
E120; F430; F410; F620

Introduction

This work presents an open economy post Keynesian model of distribution and growth that captures the effects of the differing nature of capital flows to two types of countries: financially liberalized and controlled. The first type of country pursues financial and trade liberalization, whereas the second one is cautious with respect to financial liberalization and follows trade liberalization. This work is an attempt to take into account two empirical facts about effects of international capital flows, which are not accounted for in standard structuralist theory. Standard structuralist theory assumes exogeneity of labor productivity, whereas new findings show that capital flows usually enhances productivity among financially controlled economies, even in the short-run, through spillover effects (Wooster and Diebel 2010). Second, growing empirical literature suggests domestic

Anil Bolukoglu is at the Department of Banking and Finance, Nevsehir Haci Bektas Veli Universtiy, Nevsehir, Turkey.
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currency overvaluation as a result of excessive capital flows among financially liberalized economies (Reinhart and Reinhart 2008; Ibarra 2011; Ersoy 2013; Magud, Reinhart, and Vesperoni 2014; Blanchard et al. 2017).

Changing types of capital flows to different countries has divergent consequences. Financially liberalized economies experienced nominal exchange rate appreciation during booms in capital flows under flexible exchange rate regimes. The main reason is the dependence of domestic absorption on foreign capital flows. An increase in foreign financial flows usually maintains an elevated level of domestic absorption and results in excessive demand in non-traded goods. Inevitably, this results in higher price levels in these sectors and real exchange rate appreciations under a free exchange rate regime. This has important implications for wage share and real exchange rate dynamics in these countries. Important to note also is that outcomes vary by demand regimes (profit-led or wage-led) (Athukorala and Rajapatirana 2003; Blanchard et al. 2015; Calvo, Leiderman, and Reinhart 1993, 1996, 2009; Lal 1985).

The second type of countries is modeled as a country that applies capital controls and is thus able to channel foreign investments into exporting sectors or to more productive sectors. A lower level of wages attracts capital flows not only for financing needs but also for capacity building and export. Consequently, they enhance the labor productivity levels in these countries and a lower level of productivity depresses wage shares and in turn increases cost competitiveness of the country. In the context of export-oriented growth, trade openness leads to a race to the bottom in growth rates among the industrialized countries (Blecker 2009; Setterfield 2002; Setterfield and Cornwall 2002).

Medium-run equilibrium: wage share and capacity utilization

In this work, it is assumed that dynamics of wage share and capacity utilization determines the medium-run equilibrium of the economy differently from standard structuralist theory. The main reason for investigating wage share and capacity utilization in the medium-run is to illustrate shorter term effects of capital flows on the dynamic relationship between wage share and capacity utilization. The periodization in this work should be understood as subsequent periods after liberalized or managed financial integration to the global finance. The medium-run dynamic relationship between wage shares and capacity utilization does not change between financially controlled and liberalized countries. The following section introduces the dynamics of capacity utilization and wage share, respectively. Model relationships are formulated in a social accounting matrix (SAM) at Appendix A.

Dynamics of capital utilization

Dynamics of capital utilization is the outcome of effective demand. The framework of effective demand in this work is adopted from Dutt (1990), Blecker (1989), and Taylor (2004). For simplicity, a one-sector open economy is assumed and prices in the industrial sector are defined through a markup on average variable costs. Fixed costs are ignored, and foreign prices are equal to 1. Goods market equilibrium price level is determined by:

$$P = (Wb + ea)(1 + \tau) \tag{1}$$

In Equation (1) $P,\ W,\ b, e, a, \tau$ refers to price level, nominal wages, unit labor requirement for production (inverse of productivity), nominal exchange rate, imported intermediary goods required for one unit of production, and gross profit markup rate, respectively. Profit share (π) is defined as $\frac{\tau}{1+\tau}$. Prices can be defined in terms of profit share as follow:

$$P = (Wb + ea)\frac{1}{1 - \pi} \tag{2}$$

Wage share (ψ) is the total wage payments to workers out of total product (PX) and it is a function of real wages. As productivity increases, wage share tends to decrease. The relationship between real wages and wage shares is shown in Equation (3):

$$\psi = \frac{WbX}{PX} = \omega b \tag{3}$$

Import share (ϕ) is the total payments abroad for intermediary goods and defined in Equation (4) as the function of real exchange rate $\left(q = \frac{e}{p}\right)$ and intermediary goods required for one unit production of final good(a).

$$\phi = \frac{eaX}{PX} = qa \tag{4}$$

As it is shown in Equation (4) import shares are decreasing with real exchange rate appreciation[1] while a is determined exogenously by current production technology and is assumed constant. Profit share (π) is equal to one minus the sum of wage and import shares. In this case prices can be defined as follows:

$$P = \frac{(Wb + ea)}{\psi + \phi} \tag{5}$$

In goods market, prices are determined through wages and exchange rates. Investment is determined positively by an exogenously given parameter, animal spirits (g_0), capacity utilization $\left(u = \frac{X}{K}\right)$, and profit share $(1 - \psi - \phi)$ and negatively by the ratio of net return payments to total outcome (qif). Capacity utilization reflects the secular trend of growth and reflects prospect for profitability of the economy in concert with profit share (Bhaduri and Marglin 1990). The variables i and f are net return on foreign capital and foreign capital stock for financing needs, respectively. Investment must be a function of the share of foreign debts that is not reinvested in the economy (Ω). Net return payments to foreign capital constrain investments through reducing creditworthiness of industrial firms and increasing the risk for solvency of the country. Ndikumana (1999) estimates the importance of foreign debt in conventional q investment equation and finds that foreign debt has a direct and negative impact on investment levels. Even if this finding is valid at the firm level, some of the net return payments made to foreign capital can be re-deposited within the domestic economy as payments to different domestic firms. To take this situation into account, it is important to what extent the net return payments to foreign capital are reinvested in the country. Therefore, the propensity of foreign capital to reinvest their net returns in domestic economy will affect investments negatively. The investment function (g^i) is thus defined as follows:

$$g^i = \frac{\dot{K}}{K} = \frac{I}{K} = g_0 + g_1 u + g_2(1 - \psi - \phi) - g_3 \Omega iqf \tag{6}$$

Savings are the sum of savings of workers and capitalists which are a constant ratio of their income that are shown as s_π and s_w, respectively. The capitalist's marginal propensity to save is assumed higher than that of workers. Total savings are defined in Equation (7).

$$S = s_w \psi X + s_\pi (1 - \psi - \phi) X \tag{7}$$

When Equation (7) is divided by capital stock(K), the saving-capital ratio is found as illustrated in Equation (8).

$$g^s = \frac{S}{K} = \{s_w \psi + s_\pi (1 - \psi - \phi)\} u \tag{8}$$

Current account balance (CA) is the difference between exports (EX) and the sum of imports (qaX) and net foreign capital return payments abroad $(q\Omega if)$.

$$CA = EX - qaX - i\Omega qfX \tag{9}$$

When Equation (9) is divided by the capital stock, current account to capital stock ratio (g^c) is found equal to the exports to capital ratio $(\epsilon(q))$ (a decreasing function of the real exchange rate), minus the imports to capital ratio and return payments to capital ratio. Equation (10) captures g^c.

$$g^c = \frac{CA}{K} = \epsilon(q) - u(qa + i\Omega qf) \quad (10)$$

Goods market equilibrium is defined as level of capacity utilization that makes the sum of g^i and g^c equal to g^s.

$$\Delta = g^i + g^c - g^s = 0 \quad (11)$$

The equilibrium condition at Equation (11) also equates the rate of change in capacity utilization to zero $\left(\frac{\dot{u}}{u} = 0\right)$. The rate of change in capacity utilization can be defined as the function of goods market equilibrium condition when Equations (6), (8), and (10) is substituted into Equation (11).

$$\begin{aligned} \frac{\dot{u}}{u} &= \Gamma(\Delta)\frac{\dot{u}}{u} = \Gamma\left(g^i + g^c - g^s\right) \\ \frac{\dot{u}}{u} &= \Gamma(g_0 + g_1 u + g_2(1 - \psi - \phi) - g_3\Omega iqf + \epsilon(q) \\ &\quad - u(qa + i\Omega qf) - \{s_w\psi + s_\pi(1 - \psi - \phi)\}u) = 0 \end{aligned} \quad (12)$$

Equation (12) illustrates the rate of change in capacity utilization from which an effective demand curve $(\dot{u}(\psi) = 0)$ can be derived. The steady state capacity utilization in the short-run (u_{ss}) can be illustrated as follows:

$$(\dot{u}(\psi) = 0)\ \ u_{ss} = \frac{g_0 + g_2(1 - \psi - \phi) - g_3 i\Omega qf + \epsilon(q)}{\{s_w\psi + s_\pi(1 - \psi - \phi)\} + \ (qa + i\Omega qf) - \ g_1} \quad (13)$$

The slope of the effective demand $\left(\frac{\partial u_{ss}}{\partial \psi}\right)$ is as follows:

$$\frac{\partial u_{ss}}{\partial \psi} = \frac{(s_\pi - s_w) - g_2}{\{s_w\psi + s_\pi(1 - \psi - \phi)\} + \ (qa + i\Omega qf) - \ g_1} \quad (14)$$

Equation (14) illustrates the goods market equilibrium from which an effective demand curve $(\dot{u} = 0)$ can be derived. The slope of the $(\dot{u} = 0)$ curve will determine the demand regime of the economy. The denominator in Equation (14) must be higher than zero to sustain stability in the medium run $\left(\frac{\partial \dot{u}}{\partial \mathrm{u}} < 0\right)$; that is, the Keynesian stability condition. Under this condition if $(s_\pi - s_w) - g_2$ is smaller than zero, the effective demand will be negatively sloped. Negatively sloped IS demand regimes are named "profit-led," whereas positively sloped ones are "wage-led." Effective demand can be considered as "wage-led" when positive effects of higher wage shares on consumption exceeds negative effects on investment and trade balances, and as "profit led" when investment is more responsive to profits (Blecker 2016a; Onaran and Galanis 2013). Kiefer and Rada (2015) investigate 13 OECD countries based on Goodwin-Cycles and conclude that these countries are weakly profit-led. Blecker (2016b) opposes the

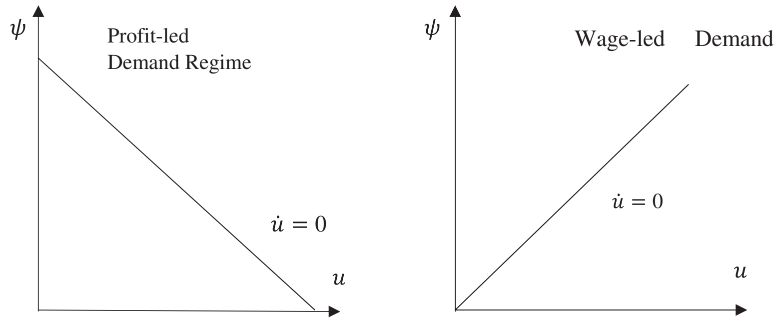

Figure 1. Profit versus Wage led demand regimes.

results of Kiefer and Rada and claims that profit-led growth-demand is valid only for the medium-run, but in longer time periods the demand of US is wage-led. Wage-led and profit led demand regimes are illustrated through $\dot{u} = 0$ curves in Figure 1. This work analyzes these two demand regimes.

Wage share dynamics

Wage shares are determined through both medium- and short-run determinants. In the medium-run capacity utilization and in the short-run, conflicting claims and capital flows became partial determinants. An abstract version of wage share dynamics can be illustrated as follows:

$$\psi = \frac{Wb}{P}$$
$$\frac{\dot{\psi}}{\psi} = \frac{\dot{W}}{W} + \frac{\dot{b}}{b} - \frac{\dot{P}}{P} \tag{15}$$

The percentage change in wage share $\left(\frac{\dot{\psi}}{\psi}\right)$ is equal to difference between the sum of percentage change in nominal wages $\left(\frac{\dot{W}}{W}\right)$ and change in the unit labor requirement $\left(\frac{\dot{b}}{b}\right)$ and inflation $\left(\frac{\dot{P}}{P}\right)$.

Changes in nominal wages $\left(\frac{\dot{W}}{W}\right)$ are assumed to be the outcome of a bargaining process by workers. Workers are interested in their real wage but can bargain through nominal wages and target a wage share (ψ_w) that provides an equal growth between realwages and productivity changes. Workers' bargaining power over nominal wage setting is also negatively affected by the unemployment rate or positively correlates with capacity utilization (u) (Taylor 2004). In the short-run, the real exchange rate also determines the actual price of worker's imported consumption goods and workers react to changes in real exchange through demanding higher nominal wages. Under these conditions, $\frac{\dot{W}}{W}$ can be illustrated for both countries as follows:

$$\frac{\dot{W}}{W} = \theta_1(\psi_w - \psi) + \theta_2 q + \theta_3 u \tag{16}$$

Change in the nominal wage of both countries depends on the adjustment rate of actual wage shares to targeted wage shares and the real exchange rate in the short-run. In the medium-run, nominal wages are positively related to capacity utilization which affects the bargaining power of workers.

Prices are determined through the markup decisions of firms. Actual prices converge to this targeted level of wage shares (ψ_f) by firms $\left(\frac{\dot{P}}{P} = \delta(\psi - \psi_f)\right)$ (Blecker 2011). Targeted wage shares are determined through targeted markup rates which are a positive function of the real exchange rate $\left(\psi_f = 1 - \pi_f = \frac{1}{1+\tau_f(q)}\right)$. There is not a one to one relationship between real exchange rates and markup rates due to the exchange rate pass through problem. A change in exchange rates is not fully reflected through prices, due to competition and the bargaining power of workers. Real exchange rate appreciation increases the targeted markup rate, however it must be less than the rate of appreciation itself (Arestis and Milberg 1993). For analytical purposes, the targeted wage share $\psi_f = z - \gamma q$ is assumed to be a parameter that varies negatively with market power of firms. Price inflation can thus be written as follows for both countries:

$$\frac{\dot{P}}{P} = \delta(\psi - \psi_f) = \delta(\psi - z + \gamma q) \tag{17}$$

Lastly rules for unit labor requirement are different for liberalized and controlled economies. The following subsections show differential productivity rules for each cases.

Wage share dynamics in liberalized economy

For liberalized economies changes in the unit labor requirement is assumed to be determined by the negative of productivity changes and considered exogenously determined as is assumed in standard structuralist macroeconomics.

$$\frac{\dot{b}}{b_{|liberal}} = -\varepsilon \tag{18}$$

As a result wage share dynamics for liberalized economics can be shown by substituting Equations (16), (17), and (18) into (15).

$$\frac{\dot{\psi}}{\psi}_{|liberal} = \theta_1(\psi_w - \psi) + \theta_2 q + \theta_3 u - \varepsilon - \delta(\psi - z + \gamma q)$$
$$\frac{\dot{\psi}}{\psi}_{|liberal} = \theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \varepsilon - (\delta + \theta_1)\psi \tag{19}$$

The steady state level of wage shares of liberalized economies is illustrated at Equation (20):

$$\psi_{ss|liberal} = \frac{\theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \varepsilon}{(\delta + \theta_1)} \tag{20}$$

Wage shares dynamics in controlled economy

Because foreign capital is directed to exporting sectors promoting labor productivity, the change in the unit labor requirement becomes a negative function of the share of foreign capital stock in output. Wooster and Diebel (2010) reviews the empirical literature on technological spillovers from foreign direct investment to domestic firms and uses meta-regression analysis with 141 spillover effects detected by 32 empirical analysis and find the presence of foreign firms increases productivity of domestic firms. However, this finding is only among Asian countries and most are controlled economies. Based on this empirical finding, it is assumed that the stock of foreign capital in controlled economies positively affects labor productivity across the whole economy. Therefore, change in the unit labor requirement becomes a negative function of the share of foreign capital stock in output.

$$\frac{\dot{b}}{b}_{|controlled} = -\sigma f \tag{21}$$

In the financially controlled case, as distinct from the financially liberalized countries, capital flows have spillover effects across the economy which decreases unit labor requirement. As opposed to standard structuralist theory, capital flows increase labor productivity at host country in the short-run since real wage growth lags productivity growth. In addition, the productivity varies in the long-run by supply side conditions, however in the case of managed capital flows this effect can be much quicker at the host country since it is a transfer of the existing technology. Based on this fact, wage share dynamics is differentiated in financially controlled countries as follows:

$$\frac{\dot{\psi}}{\psi}_{|controlled} = \theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \sigma f - (\delta + \theta_1)\psi \tag{22}$$

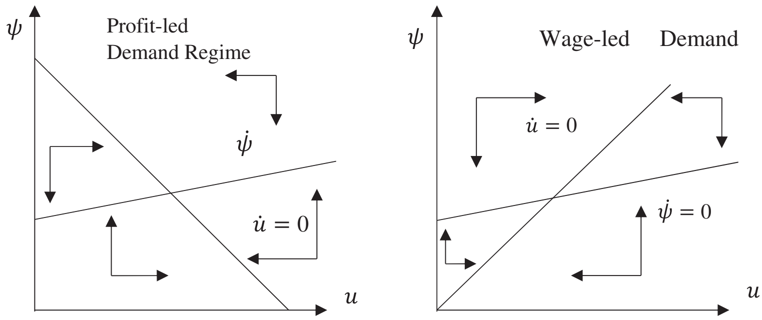

Figure 2. Medium-run equilibrium under wage-led (right) and profit-led (left) demand regimes.

Steady state values of wage shares (ψ_{ss}) among controlled countries are shown in Equation (23).

$$\psi_{ss|controlled} = \frac{\theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \sigma f}{(\delta + \theta_1)} \tag{23}$$

In both Equations 20 and 23, the coefficient of the real exchange rate $(\theta_2 - \delta\gamma)$ is considered positive meaning the bargaining power of workers over real exchange rate appreciation is stronger than the ability of capitalists to reflect changes in current account balances. The main reason for this assumption is the demonstration effect of the development process. According to Cardoso and Faletto (1979), the demonstration effect is the modernization of consumption patterns as the result of relatively increasing income of urban working population which in turn motivates the import of consumption goods and brings the development path to a halt. This, consequently, leads to higher nominal wage demands from workers springing from real exchange rate adjustments.

In the medium-run, both sets of countries have a positively sloped distributive curve ($\dot{\psi} = 0$) that is $\frac{\partial\psi_{ss}}{\partial u} = \frac{\theta_3}{\delta+\theta_1}$. Effective demand and the distributive curve forms a 2×2 model and solution to this model is the medium-run equilibrium for both sets of countries. The real exchange rate (q) is assumed stable and effective in the short-run. The stability conditions of this model is investigated for both profit-led and wage-led demand regimes in the Appendix B. In the case of profit-led the system is found stable. Wage-led demand regimes are also found stable, provided that utilization curve has a higher value of slope than distributive curve.

Figure 2 shows the medium-run equilibrium condition for wage-led and profit-led demand regimes. A shift in effective demand curve ($\dot{u} = 0$) results in higher equilibrium wage shares and capacity utilization in both demand regimes, while a shift in distributive curve ($\dot{\psi} = 0$) leads to lower wages and higher capacity utilization in profit-led demand regime and to lower wage shares and lower capacity utilization in wage-led demand regimes. The equilibrium is determined through short-run steady state values of real exchange rate, capital flows, and wage shares. The following section investigates short-run equilibrium.

Short-run equilibrium: wage shares, real exchange rate and capital flows

The short-run equilibrium between wage shares, real exchange rate, and capital flows determine the steady state values of the variables that again determines the short-run equilibrium by increasing or decreasing effective demand and distributive curve.

Dynamics of foreign capital

The nature of foreign capital flows to financially liberal and controlled countries are intrinsically different. Foreign investments that are directed to financially liberalized countries are often market seeking and used for financing needs due to external imbalances and are not constrained by capital controls. These types of foreign flows are not so different from portfolio investments in terms of the behavior and the outcome, real exchange rate appreciation. The dynamics of foreign capital flows as the share of total outcome can be summarized as follows:

$$\frac{\dot{f}}{f} = \alpha_1(u - u_f) + \alpha_2(i - i_f) + \alpha_3(f_c - f) \tag{24}$$

The first term on the right-hand side of Equation (24) captures the effect of higher growth compared to foreign countries on foreign debt. The first two variables on the right-hand side of Equation (24) captures the traditional pull-push factors. The difference between foreign capacity utilization (u_f) and domestic capacity utilization (u) (that is kept constant in the medium-run) effects capital flows positively. Increases in u results in higher demand for import goods and increases the demand for foreign financing. A decrease in u_f pushes foreign debt and capital to countries which experience higher u. A higher level of u is also an indicator of debt sustainability and soundness of the economy. The second term is the difference between domestic and foreign interest rates. A decrease in foreign interest rates (i_f) results in higher foreign debt available for countries that apply higher interest rates. The last term introduces the effect of fundamentalist investors. As stock of foreign capital arrives at a critical value that is considered as "sustainable," the total positive effect of increasing f is diminishing and beyond this point total effect becomes negative. Capital account liberalization usually pushes f_c to higher levels and leads to booms in foreign financing (Calvo, Leiderman, and Reinhart 2009; Harvey 2009).

The steady state level of foreign capital stock among financially liberalized countries is:

$$f_{ss} = \frac{\alpha_1(u - u_f) + \alpha_2(i - i_f) + \alpha_3 f_c}{\alpha_3} \tag{25}$$

Foreign capital flows that are directed at financially controlled countries used to be resource seeking and flow to countries with cheap resources (including labor). Differently from financially liberalized countries, these flows are constrained by capital controls and will be treated as exogenously determined by the central authority. In this case, capital flows join dynamic relationship through their effects on the growth of productivity of labor as it is mentioned in the previous section in Equation (21). Growth rate of labor productivity will be equal to foreign capital stock that is allowed by the central government $\left(\frac{\dot{b}}{b} = \sigma\overline{f}\right)$. Foreign capital in financially controlled countries effect the short-run equilibrium through wage share.

Real exchange rate dynamics

Real exchange rate dynamics becomes prevalent in short-run analysis. In the short-run, wage shares, capital flows, and real exchange rates determine the steady state values of these variables and in the medium-run, wage share and capacity utilization adjust to these values through capacity utilization.

As is explained above, because of a lack of capital controls and the market-seeking nature of foreign capital, financially liberalized countries experience real exchange rate appreciation through nominal exchange rate appreciation; whereas capital inflows help countries to run current account deficits and hence sustain higher investment levels without sacrifice of social consumption. However, this increase in demand for domestic currency denominated loanable funds and shares leads to real appreciation in domestic currency. Under a free exchange rate regime this happens in the form of nominal exchange rate appreciation since there is no foreign exchange controls applied (Ibarra 2011; Ayhan Kose et al. 2009).

Although existence of capital controls may prevent controlled economies, spillover effects of foreign capital increases labor productivity and hence decreases the wage share in these countries. Financially controlled countries follow a real exchange rate targeting policy in the presence of capital controls. Dynamics of the real exchange rate can be decomposed into two effects; the nominal exchange rate dynamics $\left(\frac{\dot{e}}{e}\right)$ and price inflation $\left(\frac{\dot{p}}{p}\right)$. Price inflation is illustrated in Equation (17).

In the financially liberalized case a change in the nominal exchange rate becomes a function of existing foreign capital stock and increases in foreign capital due to capital flows leads to increases in the nominal exchange rate. Percentage changes in the nominal exchange rate become a function of the foreign capital stock $\left(\frac{\dot{e}}{e} = -\mu f\right)$. Equation (26) captures the dynamics of real exchange rate among financially liberalized countries.

$$\frac{\dot{q}}{q} = \frac{\dot{e}}{e} - \frac{\dot{P}}{P}$$
$$\frac{\dot{q}}{q_{liberai}} = -\mu f - \delta(\psi - z + \gamma q) \tag{26}$$
$$\frac{\dot{q}}{q_{liberal}} = -\mu f - \delta\psi + \delta z - \delta\gamma q$$

Nominal exchange rates among financially controlled countries are modeled as a managed exchange rate regime in an analogous way to Blecker (2011). The real exchange rate adjusts to the level of the monetary authorities' short-run target for the real exchange rate $\left(\frac{\dot{e}}{e} = \beta(\overline{q} - q)\right)$. Real exchange rate dynamics for these countries are defined as follows:

$$\frac{\dot{q}}{q_{controlled}} = \frac{\dot{e}}{e} - \frac{\dot{P}}{P}$$
$$\frac{\dot{q}}{q_{controlled}} = \beta(\overline{q} - q) - \delta(\psi - z + \gamma q) \tag{27}$$
$$\frac{\dot{q}}{q_{controlled}} = \beta\overline{q} - \delta\psi + \delta z - q(\beta + \delta\gamma)$$

The steady state value of the real exchange rate for financially liberalized and controlled countries are captured by Equations (28) and (29).

$$q_{ss_{liberal}} = \frac{-\mu f - \delta\psi + z}{\gamma} \tag{28}$$

$$q_{ss_{controlled}} = \frac{\beta\overline{q} - \delta\psi - \delta z}{(\beta + \delta\gamma)} \tag{29}$$

Short-run equilibrium

Equations (20), (24) and (26) form a 3×3 dynamic system for liberalized countries while (23) and (24) form a 2×2 dynamic system for financially controlled countries. Table 1 illustrates this system of equations. As is illustrated in the table, capital flows effect distribution through the real exchange rate among financially liberalized countries. In the controlled case, foreign capital effects distribution directly through its effects on productivity. These two divergent effects of foreign capital have different outcomes.

Table 1. System of equations for financially liberalized and controlled countries.

System of equations in short-run equilibrium	
Financially liberalized countries	Financially controlled countries
$\frac{\dot{\psi}}{\psi} = \theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \varepsilon - (\delta + \theta_1)\psi$	$\frac{\dot{\psi}}{\psi} = \theta_1\psi_w + \delta z + (\theta_2 - \delta\gamma)q + \theta_3 u - \sigma\bar{f} - (\delta + \theta_1)\psi$
$\frac{\dot{f}}{f} = \alpha_1(u - u_f) + \alpha_2(i - i_f) + \alpha_3(f_c - f)$	$\frac{\dot{q}}{q} = \beta\bar{q} - \delta\psi - \delta z - q(\beta + \delta\gamma)$
$\frac{\dot{q}}{q} = -\mu f - \delta\psi + \delta z - \gamma\delta q$	

Short-Run equilibrium of financially liberalized countries

Short-run equilibrium of financially liberalized countries is the outcome of the dynamic relationship between capital flows, real exchange rate and wages shares. Firstly, the relationship between capital flows $(\dot{f} = 0)$ and real exchange rate $(\dot{q} = 0)$ is of interest. Capital flows are modeled to respond to factors like differences between domestic and foreign capacity utilization, interest rate differentials and critical values of foreign capital for financing needs. Steady state values of foreign capital $\left(f_{ss}\left(q_{ss}, \overline{\psi}_{ss}\right)\right)$ and of foreign exchange $\left(q_{ss}\left(f_{ss}, \overline{\psi}_{ss}\right)\right)$ show the equilibrium in capital markets and foreign exchange markets (Equations (24) and (28)). The slope of $\dot{f} = 0$ and $\dot{q} = 0$ are as follows:

$$\left(\dot{f} = 0\right) \; \frac{\partial f}{\partial q} = 0 \tag{30}$$

$$(\dot{q} = 0) \; \frac{\partial q}{\partial f} = -\frac{\mu}{\gamma} < 0 \tag{31}$$

The foreign exchange nullcline $(\dot{q} = 0)$ has a negative relationship with capital flows suggesting increasing foreign capital results in real exchange rate appreciation among financially liberalized countries. The capital flows nullcline $(\dot{f} = 0)$ is fixed at the level of f_{ss} and is not a function of q_{ss}. Figure 3 illustrates foreign exchange and capital flows curves for financially liberalized countries. The stability condition of the dynamical system of equations for financially liberalized countries are investigated in the Appendix B and found stable. An upward shift in the capital flows curve $(\dot{f} = 0)$ results in an appreciated real exchange rate and a higher level of foreign capital for financing needs. A shift in the foreign exchange curve $(\dot{q} = 0)$ does not change f_{ss} but results in a depreciated real exchange rate.

The real exchange rate determined by foreign exchange and capital flows in turn determines the distribution of the economy. As mentioned earlier, the real exchange rate affects distribution both through bargaining power of workers and pricing decisions of industrial firms. Figure 3 illustrates the relationship between wage share curve $(\dot{\psi} = 0)$ and foreign exchange rate curve $(\dot{q} = 0)$. The resultant equilibrium real exchange rate effects the distribution of the economy. As mentioned earlier, real exchange rate effects wage share through the demand of workers for foreign goods and the

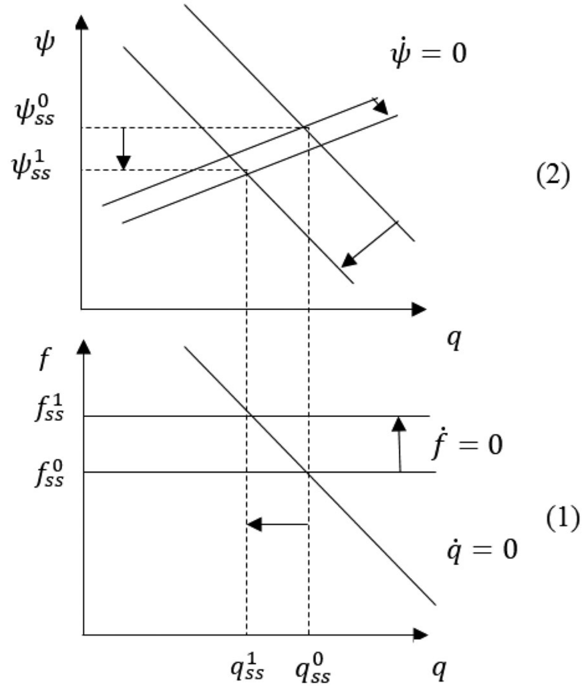

Figure 3. Short-run dynamics between wage-shares, real exchange rate, and capital flows for financially liberalized countries.

pricing decision of industrial firms. As the real exchange rate appreciates, workers' incentives to bargain for higher nominal wages decline and industrial firms target a lower level of markup as imported intermediate goods become cheaper.

Slopes of wage share and foreign exchange rate curve are found through Equations (20) and (28) as follow:

$$(\dot{\psi} = 0)\ \frac{\partial \psi}{\partial q} = \frac{(\theta_2 - \delta\gamma)}{(\delta + \theta_1)} > 0 \tag{32}$$

$$(\dot{q} = 0)\ \frac{\partial q}{\partial \psi} = -\frac{\delta}{\gamma} < 0 \tag{33}$$

The slope of the distribution curve is greater than zero as shown in Equation (32). As urban populations increase, the consumption pattern is modernized and increasing the demand for foreign goods. In contrast, industrial firms cannot reflect changes in the real exchange rate directly because of the exchange rate pass through problem. It is assumed that demands of workers for foreign goods is stronger than industrial firms. Along the wage share curve, real exchange rate depreciation increases the demand for higher nominal wages to adjust for consumption of foreign goods. The slope of the foreign exchange curve $(\dot{q} = 0)$ is negative. As wage shares decline, prices follow and that in turn results in real exchange rate appreciation as is shown in Equation (28).

Short-run dynamics between capital flows, the real exchange rate, and the wage share are illustrated in below graph at Figure 3 for financially liberalized countries. An increase in capital flows due to any exogenous shock from decreasing foreign capacity utilization, foreign interest rates, optimistic foreign investors and increasing domestic interest rates, shifts the capital flows curve ($\dot{f} = 0$) upwards. This results in an appreciated real exchange rate (q^1_{ss}) and higher available foreign capital for financing needs (f^1_{ss}). This new equilibrium results in a leftward shift of the foreign exchange curve and a rightward shift of the distribution curve in the upper diagram. The shift in the foreign exchange curve is bigger than the shift in the distribution curve. The main reason for this is the diminishing bargaining power of workers on nominal wages. The more appreciated real exchange rate makes import consumption goods cheaper and this fact results in a decrease in nominal wages. As nominal wages decrease the wage share adjusts to a lower steady state equilibrium level (ψ^1_{ss}).

Short-run equilibrium of financially controlled countries

In the case of financially controlled countries, capital flows are exogenously determined by the central authority (in the very abstract case) and affect productivity changes. An increase in productivity due to a higher level of foreign capital leads to a lower wage share shown in Equation (22). Figure 4 illustrates the short run relationship between the real exchange rate and wage shares and shows the effect of an increase in capital flows on wage shares and the real exchange rate. In the controlled case Equations (22) and (27) forms a 2×2 dynamic system, which is found

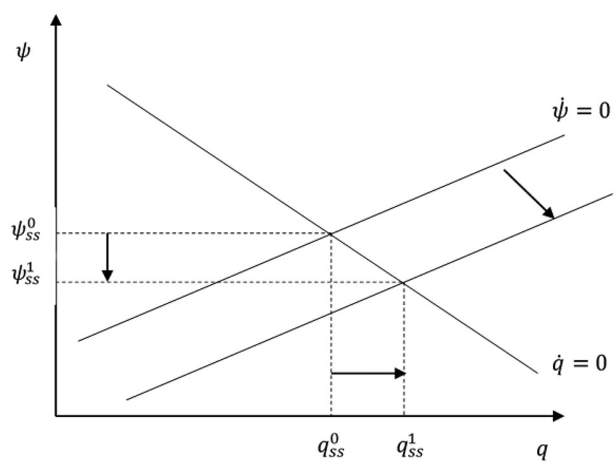

Figure 4. Short-run dynamics between wage-shares, real exchange rate, and capital flows for financially controlled countries.

stable and corresponding stability conditions are investigated in the Appendix A.

An increase in foreign capital that is directed by central authority to productive sectors $(\bar{f})$, results in productivity increases in the general economy through spillover effects and pushes the wage share curve $(\dot{\psi} = 0)$ down, since productivity changes negatively affect wage shares, as it is shown in Equation (21).

An exogenous decrease in wage shares pushes the price level down and in turn results in real exchange rate depreciation through Equation (29). The new equilibrium in the short run for financially controlled countries is associated with lower wage shares and a depreciated real exchange rate.

Figures 3 and 4 capture the varying outcomes of an increase in capital flows during the short-term. In the financially liberalized case, an increase in foreign capital stock for financing needs results in an appreciated real exchange rate, lower wage shares and higher foreign capital stock for financing needs. However, capital flows that are directed to the productive sector, lower the wage share due to a higher level of productivity and depreciates the real exchange rate. These different outcomes with respect to different types of foreign capital have different applications in the process of medium-run adjustment.

Medium-Run adjustment of goods market to Short-Run dynamics

Medium-run adjustment to short-run equilibrium conditions occurs through capacity utilization. Firstly, the wage share is determined by capacity utilization in the medium-run and an increase in capacity utilization positively affects wage shares. In this section, the adjustment process is investigated for financially liberalized and financially controlled countries based on both profit-led and wage-led demand regimes.

Financially liberalized case

Equations (14) and (20) form the medium-run goods market equilibrium. The steady state values of real exchange rate and foreign capital is determined in the short-run and are treated as a shift variable in the medium-run analysis.

In the financially liberalized case, an exogenous increase in foreign capital for deficit financing as the result of a decrease in interest rates, capacity utilization abroad, or a positive change in the risk perception of foreign investors about domestic country's ability to pay returns leads to real exchange rate appreciation and increases the foreign indebtedness of the domestic country. These two have a negative effect on capacity utilization.

Firstly, real exchange rate appreciation deteriorates the country's export competitiveness, increases the cost of production and decreases the value of return payments of foreign capital. This fact leads to a decrease in the current account deficit. The effect of real exchange rate appreciation on effective demand $\left(\frac{\partial \dot{u}}{\partial \mathrm{q}} = \frac{\partial \Delta}{\partial q}\right)$ can be detected through the implicit function theorem as follows:

$$d\Delta = \frac{\partial \Delta}{\partial u} du + \frac{\partial \Delta}{\partial q} dq = 0$$
$$\frac{du}{dq} = -\frac{\frac{\partial \Delta}{\partial q}}{\frac{\partial \Delta}{\partial u}} = -\frac{\eta \frac{\epsilon}{q} - au - if(g_3 + u)}{\frac{\partial \Delta}{\partial u}} \tag{34}$$

Equation (34) shows the effect of real exchange rate appreciation on the IS curve. The denominator $(\frac{\partial \Delta}{\partial u})$ must be smaller than zero again due to Keynesian stability. The first term in the denominator $(\eta \frac{\epsilon}{q})$ is the export price elasticity times the level of exports in foreign prices.[2] On the basis of Marshall-Lerner condition, the effect of real exchange rate appreciation on trade balances is negative $((\eta \frac{\epsilon}{q} - au) < 0)$.

Secondly, the effect of an exogenous increase in the foreign debt in the medium-run can be investigated through the implicit function theorem as follows:

$$d\Delta = \frac{\partial \Delta}{\partial u} du + \frac{\partial \Delta}{\partial f} df = 0$$
$$\frac{du}{df} = -\frac{\frac{\partial \Delta}{\partial f}}{\frac{\partial \Delta}{\partial u}} = -\frac{-\Omega qi(g_3 + u)}{\frac{\partial \Delta}{\partial u}} \tag{35}$$

In Equation (35) the denominator $(\frac{\partial \Delta}{\partial u})$ must be smaller than zero again due to Keynesian stability and the effect of an increase in foreign debt also shifts the effective demand curve in the same direction as in the case of real exchange rate appreciation.

Figure 5 shows the medium-run adjustment of effective demand among financially liberalized countries after an exogenous increase in capital flows. A positive shift of the foreign exchange rate curve in the northeast diagram of Figure 5 leads to real exchange rate appreciation from q_{ss}^0 to q_{ss}^1 because capital flows lead to nominal exchange rate appreciation. An appreciated real exchange rate results in lower prices for imported goods. The cheaper price level disincentives workers to bargain on nominal wages. Consequently, the wage share decreases and the new medium-run equilibrium after the capital flow shock is $(\psi_{ss}^1, q_{ss}^1, f_{ss}^1)$. In the northwest graph,

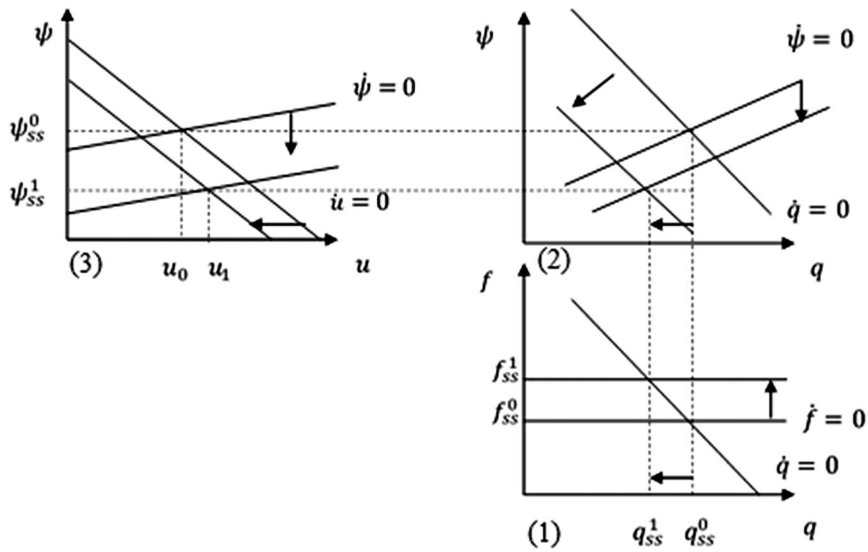

Figure 5. Medium-run adjustment in financially liberalized countries after an exogenous increase in capital flows. (Profit-led demand).

the wage share curve $(\dot{\psi} = 0)$ shifts left as the result of an exogenous increase in capital flows in the short-run. Real exchange rate appreciation deteriorates export price competitiveness and leads to an increase in the current account deficit due to the Marshall-Lerner condition. This leads a shift of effective demand to the left. The negative effects of a real exchange rate appreciation through current account deficits do not totally offset the positive effect of decreasing wage shares through higher investment levels. Higher current account deficits associated with increasing capacity utilization is the known fact about financially liberalized countries.

Figure 6 illustrates the same adjustment under wage-led demand conditions. Under wage-led demand regimes, short run-effects are lower capacity utilization, wage shares, and higher trade deficits.

Financially controlled case

In the case of financially controlled countries, an increase in capital flows that is directed to productive sectors increases the productivity of labor $(\frac{\dot{\varepsilon}}{\varepsilon} = \sigma f)$ shifting the wage share curve to the right and is illustrated in Figure 7. In the short term, an increase in foreign capital boosts productivity and pushes wage shares down. As wage shares decrease the real exchange rate depreciates due to lower domestic price levels (Equation 29). As a result, medium-run equilibrium will be (q^1_{ss}, ψ^1_{ss}) where the wage share is lower but the real exchange rate is higher. In a profit-led financially controlled economy, the wage share curve will shift to the right due to the new

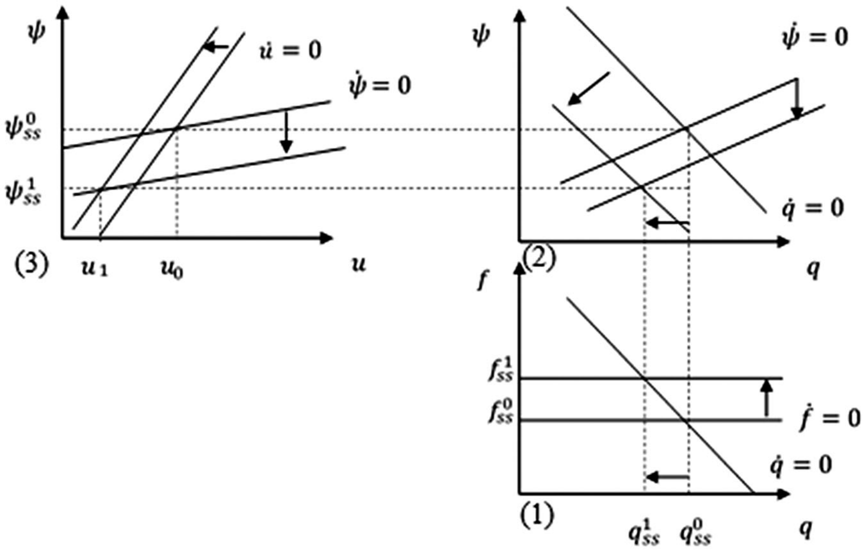

Figure 6. Medium-run adjustment in financially liberalized countries after an exogenous increase in capital flows. (Wage-led demand).

level of productivity. Effective demand also shifts to the right because of increased export competitiveness resulting from the now depreciated domestic currency. In the new medium-run equilibrium (ψ^1_{ss}, u^1_{ss}), higher capacity utilization is associated with improved trade balances or higher surpluses.

In the wage-led financially controlled country, improvement in productivity again shifts the wage share curve down. The positively sloped effective demand curve shifts to the right due to the now depreciated real exchange rate. This shift leads to higher levels of capacity utilization. Higher export competitiveness is the main reason for this shift. Lower export goods prices increase foreign demand for export goods due in large part to the higher real exchange rate elasticity of exports among financially controlled countries. In this new equilibrium $(u_1\ \psi^1_{ss})$, lower wage shares are associated with higher capacity utilizations.

Conclusion

Presented here is a post Keynesian open economy model based on typology that distinguishes between financially liberalized and financially controlled policy regimes. Foreign capital inflows for financing current account deficits lead to nominal exchange rate appreciation in liberalized capital markets as in financially liberalized economic regimes. This nominal exchange rate appreciation leads to real exchange rate appreciation and decreases the production costs through imported intermediary goods. Finally, higher capacity utilization occurs in profit-led open economies. However, real

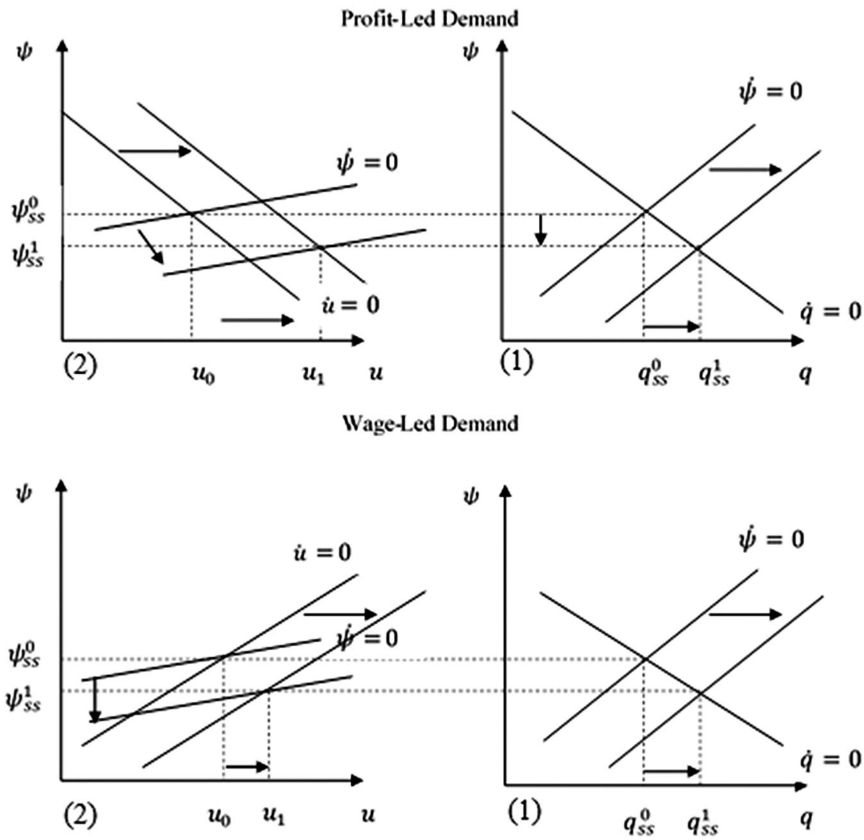

Figure 7. Medium-run adjustment in financially controlled countries after an exogenous increase in capital flows under both profit and wage-led demand regimes.

exchange rate appreciation leads to deterioration of current account balances due to loss of price competitiveness of exports. In conclusion, it is assumed that the loss of price competitiveness does not overrun the positive effect on investments and leads to higher capacity utilization, lower wage shares, lower level of trade balances (or current account deficits) and higher foreign debt in the new equilibrium.

In financially controlled regimes, in contrast, capital controls direct capital inflows into productive sectors in turn increasing the productivity of labor through spillover effects and pushing wage shares down. Lower wage shares decrease costs and the price level in the country again depreciating the real exchange rate of the domestic currency. Real exchange rate depreciation increases the demand for exporting goods due to high price elasticity of export goods which ends with both higher capacity utilization and trade balances under a profit-led demand regime. Under wage-led regime, results are not different on the condition of high export demand for goods that compensate for the effect of lower wage shares.

In this study, we define *capital controls* as the deliberate policy channeling foreign capital inflows with the objective of flows increasing productivity (efficiency and affecting economic activity positively). The model presented focuses on the positive effects of capital controls that channel foreign capital in ways that increase the productivity of labor. In other contexts a different type of capital control could have very different impacts from that suggested by the analytical model of this work. More generally, capital controls would have to be tailored to the specific type and form of capital flows as Blanchard et al. (2017) argues.

Notes

1. Exchange rate is illustrated through price quotation system. An increase in exchange rate refers to depreciation and a decrease, appreciation.
2. $\eta = \frac{d\epsilon}{dq}\frac{q}{\epsilon} \Rightarrow \frac{d\epsilon}{dq} = \frac{\eta q}{\epsilon}$

ORCID

Anil Bolukoglu http://orcid.org/0000-0002-0322-112X

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Appendix A

Social accounting matrix

All entries in the social accounting matrix (SAM) are in the form of real domestic currency. The SAM is quite standard in structuralist theory except net return payments to foreign capital that is not reinvested in the domestic economy out of profits. These payments are accounted as a deduction from profits.

Table A1. Social accounting matrix of the model relations.

	Current expenditures					
	Output costs	Wages	Profits	Foreign	Capital formation	Total
Output		$(1-s_w)\psi X$	$(1-s_\pi)(1-\psi-\phi)X$	EX	I	X
Incomes						
Wages	ωbX					Y_w
Profits	πX					Y_π
Foreign	qaX		$i\Omega qfX$			Y_f
Flow of funds		$s_w\psi X$	$s_\pi(1-\psi-\phi)X$	$-CA$	$-I$	0
Total	X	Y_w	Y_π	Y_f	0	

Appendix B

Stability conditions of medium-run and short-run models

Financially liberalized countries: Short-run dynamic model

Short-run equilibrium of financially liberalized regimes is 3×3 dynamic model of real exchange rate $(\dot{q}=0)$, wage share $(\dot{\psi}=0)$, and foreign capital $(\dot{f}=0)$. The stability of the model can be investigated through linearization of the model around steady state values as follows:

$$\dot{\psi}=\psi(\theta_1\psi_w+\delta z+(\theta_2-\delta\gamma)q+\theta_3 u-\varepsilon-(\delta+\theta_1)\psi) \quad (18a)$$

$$\dot{f}=f(\alpha_1(u-u_f)+\alpha_2(i-i_f)+\alpha_3(f_c-f)) \quad (24a)$$

$$\dot{q}=q(-\mu f-\ \delta(\psi-z+\gamma q)) \quad (26a)$$

$$\dot{\psi}=\dot{\psi}(\psi_{ss},q_{ss},f_{ss})+\frac{\partial\dot{\psi}}{\partial\psi}(\psi_{ss},q_{ss},f_{ss})(\psi-\psi_{ss})+\frac{\partial\dot{\psi}}{\partial q}(\psi_{ss},q_{ss},f_{ss})(q-q_{ss})$$
$$+\frac{\partial\dot{\psi}}{\partial f}(\psi_{ss},q_{ss},f_{ss})(f-f_{ss})$$

$$\dot{q} = \dot{q}(\psi_{ss}, q_{ss}, f_{ss}) + \frac{\partial \dot{q}}{\partial \psi}(\psi_{ss}, q_{ss}, f_{ss})(\psi - \psi_{ss}) + \frac{\partial \dot{q}}{\partial q}(\psi_{ss}, q_{ss}, f_{ss})(q - q_{ss})$$
$$+ \frac{\partial \dot{q}}{\partial f}(\psi_{ss}, q_{ss}, f_{ss})(f - f_{ss})$$
$$\dot{f} = \dot{f}(\psi_{ss}, q_{ss}, f_{ss}) + \frac{\partial \dot{f}}{\partial \psi}(\psi_{ss}, q_{ss}, f_{ss})(\psi - \psi_{ss}) + \frac{\partial \dot{f}}{\partial q}(\psi_{ss}, q_{ss}, f_{ss})(q - q_{ss})$$
$$+ \frac{\partial \dot{f}}{\partial f}(\psi_{ss}, q_{ss}, f_{ss})(f - f_{ss})$$

The system can be written in matrix format and features of Jacobian matrix of the system informs about the stability conditions of the model.

$$\begin{bmatrix} \dot{\psi} \\ \dot{q} \\ \dot{f} \end{bmatrix} = \begin{bmatrix} \frac{\partial \dot{\psi}}{\partial \psi} & \frac{\partial \dot{\psi}}{\partial q} & \frac{\partial \dot{\psi}}{\partial f} \\ \frac{\partial \dot{q}}{\partial \psi} & \frac{\partial \dot{q}}{\partial q} & \frac{\partial \dot{q}}{\partial f} \\ \frac{\partial \dot{f}}{\partial \psi} & \frac{\partial \dot{f}}{\partial q} & \frac{\partial \dot{f}}{\partial f} \end{bmatrix} \begin{bmatrix} (\psi - \psi_{ss}) \\ (q - q_{ss}) \\ (f - f_{ss}) \end{bmatrix}$$

Values of the elements of Jacobian Matrix can be found as follows:

$$\frac{\partial \dot{\psi}}{\partial \psi} = -\psi_{ss}(\theta_1 + \delta) = J_{11} < 0 \quad \frac{\partial \dot{\psi}}{\partial q} = \psi_{ss}(\theta_2 - \delta\gamma) = J_{12} > 0 \quad \frac{\partial \dot{\psi}}{\partial f} = 0 = J_{13}$$
$$\frac{\partial \dot{q}}{\partial \psi} = q_{ss}(-\delta) = J_{21} < 0 \quad \frac{\partial \dot{q}}{\partial q} = q_{ss}(-\delta\gamma) = J_{22} < 0 \quad \frac{\partial \dot{q}}{\partial f} = q_{ss}(-\mu) = J_{22} < 0$$
$$\frac{\partial \dot{f}}{\partial \psi} = 0 = J_{31} \quad \frac{\partial \dot{f}}{\partial q} = 0 = J_{32} \quad \frac{\partial \dot{f}}{\partial f} = -f_{ss}\alpha_3 = J_{33} < 0$$

The Routh-Hurwitz necessary and sufficient conditions for stability are such that:

1. Trace of the Jacobian matrix must be smaller than zero $(TrJ < 0)$.

$$TrJ = J_{11} + J_{22} + J_{33} < 0$$

2. Determinant of the Jacobian matrix must be smaller than zero $(DetJ < 0)$.

$$DetJ = J_{33}(J_{22}J_{11} - J_{12}J_{21}) < 0$$

3. The sum of the second order principal minors of J must be greater than zero $(PmJ > 0)$.

$$J_{11}J_{22} - J_{21}J_{12} + J_{11}J_{33} + J_{22}J_{33} > 0$$

4. Finally, it is needed to check that $-PmJ + \frac{DetJ}{TrJ} > 0$. Since $TrJ < 0$, the condition can be written again as $DetJ - TrJ(PmJ) > 0$.

$$J_{33}(J_{22}J_{11} - J_{12}J_{21}) - (J_{11} + J_{22} + J_{33})(J_{11}J_{22} - J_{21}J_{12} + J_{11}J_{33} + J_{22}J_{33})$$
$$-J_{33}(J_{11}J_{33} + J_{22}J_{33}) - (J_{11} + J_{22})(J_{11}J_{22} - J_{21}J_{12} + J_{11}J_{33} + J_{22}J_{33}) > 0$$

Under these conditions, the medium-run system for financially liberalized countries is found stable.

Financially liberalized countries: Medium-run dynamic model

In the medium run effective demand and distribution curve forms a 2×2 by matrix. The stability conditions can change under profit-led and wage-led demand regimes. The Jacobian matrix of the linearized system of Equations (12) and (18a) is as follows:

$$\begin{bmatrix} \dot{\psi} \\ \dot{u} \end{bmatrix} = \begin{bmatrix} \frac{\partial \dot{\psi}}{\partial \psi} & \frac{\partial \dot{\psi}}{\partial u} \\ \frac{\partial \dot{u}}{\partial \psi} & \frac{\partial \dot{u}}{\partial u} \end{bmatrix} \begin{bmatrix} (\psi - \psi_{ss}) \\ (u - u_{ss}) \end{bmatrix}$$

$$\frac{\partial \dot{\psi}}{\partial \psi} = -\psi_{ss}(\theta_1 + \delta) = J_{11} < 0 \quad \frac{\partial \dot{\psi}}{\partial u} = \psi_{ss}\theta_3 = J_{12} > 0$$

$$\frac{\partial \dot{u}}{\partial \psi} = u_{ss}\Gamma((s_\pi - s_w) - g_2) = J_{21} \gtreqless 0 \quad \frac{\partial \dot{u}}{\partial u} = u_{ss}\Gamma\left(g_1 - (qa + i\Omega qf) - \{s_w\psi + s_\pi(1 - \psi - \phi)\}\right) = J_{22} < 0$$

The sign of the J_{21} depends on the demand regime. In the condition of wage-led demand regime J_{21} is positive and it is negative if the demand regime is profit-led. The stability conditions of a 2×2 system are such that:

1. The trace of the Jacobian matrix must be smaller than zero $(TrJ < 0)$.

$$Tr(J) = J_{11} + J_{22} < 0$$

Because trace is lower than zero the system is stable under both demand regimes.

If both $DetJ$ are $\Delta = TrJ^2 - 4DetJ$ greater than zero, system is asymptotically stable.

Profit-led demand:

$$DetJ = J_{11}J_{22} - J_{12}J_{21} > 0 \ \ \Delta = (J_{11} - J_{22})^2 - 4J_{12}J_{21} > 0$$

Profit-led demand system is asymptotically stable.
Wage-led demand:

$$DetJ = J_{11}J_{22} - J_{12}J_{21} > 0 \ \ \Delta = (J_{11} - J_{22})^2 - 4J_{12}J_{21} \gtreqless 0$$

Signs of both terms are indeterminate because it is quite complicated to solve. In this case, to have a positive determinant, it is assumed that utilization curve is steeper than the distributive curve which implies weak wage-led demand.

$$\frac{J_{11}}{J_{12}} > \frac{J_{21}}{J_{22}} \Rightarrow -\underbrace{\frac{du}{d\psi}_{|\dot{\psi}=0}}_{\substack{\text{Distributive}\\ \text{Curve}}} > -\underbrace{\frac{du}{d\psi}_{|\dot{u}=0}}_{\substack{\text{Utilization}\\ \text{Curve}}}$$

This assumption implies stability but sign of Δ is still indeterminate. The sign of Δ shows that whether system shows damped oscillations to a fixed point or not. Positive determinant and negative trace of a Jacobian matrix are necessary and sufficient conditions for an asymptotically stable dynamic system.

Financially controlled countries: Short-run dynamic model

Medium-run equilibrium of financially controlled economies is 2×2 dynamic model of real exchange rate ($\dot{q} = 0$), wage share ($\dot{\psi} = 0$). The Jacobian matrix of the linearized system of Equations (37) and (21) is as follows:

$$\begin{bmatrix} \dot{\psi} \\ \dot{q} \end{bmatrix} = \begin{bmatrix} \frac{\partial \dot{\psi}}{\partial \psi} & \frac{\partial \dot{\psi}}{\partial q} \\ \frac{\partial \dot{q}}{\partial \psi} & \frac{\partial \dot{q}}{\partial q} \end{bmatrix} \begin{bmatrix} (\psi - \psi_{ss}) \\ (q - q_{ss}) \end{bmatrix}$$

$$\frac{\partial \dot{\psi}}{\partial \psi} = -\psi_{ss}(\theta_1 + \delta) = J_{11} < 0 \quad \frac{\partial \dot{\psi}}{\partial q} = \psi_{ss}(\theta_2 - \delta_1 \gamma) = J_{12} > 0$$

$$\frac{\partial \dot{q}}{\partial \psi} = -q_{ss}\delta = J_{21} < 0 \quad \frac{\partial \dot{q}}{\partial q} = -q_{ss}(\beta + \delta\gamma) = J_{22} < 0$$

The stability conditions of a 2×2 system are such that

1. The trace of the Jacobian matrix must be smaller than zero ($TrJ < 0$).

$$Tr(J) = J_{11} + J_{22} < 0$$

Because trace is lower than zero, the system is stable under both demand regimes.

2. If both $DetJ$ are $\Delta = TrJ^2 - 4DetJ$ greater than zero, system is asymptotically stable.

$$DetJ = J_{11}J_{22} - J_{12}J_{21} > 0 \quad \Delta = (J_{11} - J_{22})^2 - 4J_{12}J_{21} > 0$$

Medium-run system of equations for financially controlled countries is found asymptotically stable.

Financially liberalized countries: Medium-run dynamic model

Stability conditions for short-run dynamic equilibrium is the same of financially liberalized countries. The model with profit-led demand regime is found stable, the model with wage-led demand regime is found stable. However, steeper utilization curve is assumed in order to provide necessary and sufficient conditions for stability.