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Demand and Distribution in Integrated Economies[*]

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Abstract

Aggregate demand is influenced by the functional income distribution of an economy and that of its trading partners. This relationship between income distribution and output is analyzed in a short-run two-country Neo-Kaleckian model. The effects of devaluation and redistribution are discussed in detail. Trade and redistribution within one country interact and output increases or decreases with changes in either depending on the specific distributional and exchange rate movements. The Marshall-Lerner condition is shown to be equivalent to the assumption of expansionary devaluation. If devaluation increases output, national redistribution policy toward wage earners is also more likely to be expansionary.

Keywords: Open Economy, Adding-Up Constraints, International Macroeconomics, Devaluation, Growth, Distribution

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1 Introduction

The functional distribution of income in an economy affects its levels of demand and output. This relationship between income distribution and demand is usually studied in a closed-economy or a small-open-economy framework. A multi-country model with sufficient detail on the demand side allows the analytic investigation of the interrelation between demand and distribution not only within but also across economies.

The idea that redistribution between income groups can increase the level of income is usually presented as a trade-off between wage- and profit-earners in a closed-economy framework (Dutt, 1984; Taylor, 1985; Bhaduri and Marglin, 1990). Some studies consider the possibility of trade but limit their analyses of the relationship between demand and distribution to the small open economy case. Movements in prices and quantities in the economy are assumed to have no effect on the rest of the world, which is taken to be exogenous (Krugman and Taylor, 1978; Blecker, 1989, 1999, 2002; Taylor, 2004; La Marca, 2010). The concerns of this body of literature are more the interactions between openness to trade and the degree of competition and between growth and changes in the exchange rate (such as contractionary devaluation) than that between growth and distribution across countries. These cross-country effects cannot be discussed in a small open economy framework. Blecker (2011) provides a recent, comprehensive summary on the topic.

If one abandons the small open economy assumption, important and interesting feed-back mechanisms come into play: increases in domestic demand also imply higher imports from trading partners which in turn stimulate demand in their economies and with it demand for exports from the domestic economy. Such interactions have been analyzed in terms of the foreign trade multiplier (Harrod, 1933) and multi-region/country models (Goodwin, 1949; Metzler, 1950) long ago and subsequently were combined with elaborate input-output system specifying patterns of production (Leontief, 1953, Miyazawa, 1960, Goodwin, 1980). This kind of trade multiplier analysis only compares the distribution of income across countries. Functional income distribution within each country, however, is determined residually (see also the discussion in Taylor, 1995).

In this paper I combine the insight that income distribution has an important effect on aggregate demand with the insight that the international trade network responds to changes in the

domestic level of demand. I use two small open economy Kalecki-Keynes models in which demand is deficient---and therefore the limiting constraint---to form a closed system of bilateral trade. This set-up allows the analytic study of how shifts in distribution affect demand directly through their effects on consumption, investment and imports, and indirectly through their effects on foreign output and foreign import demand (i.e. domestic export demand). Such 'general equilibrium' analysis has been conducted numerically before (Godley, 1999; Godley and Lavoie, 2007; von Arnim, 2009, 2010), but assumptions about parameter values can (and do) lead to a loss of generality. Accounting for trade repercussions in a closed multi-country system reverses some of the findings of partial equilibrium analysis on the relationship between demand and distribution.

The key to understanding most results presented below is the fact that linking two economies through trade extends distributional conflict. The effect of internal redistribution between factors of income on domestic demand in a multi-country context hinges on multiple partial effects which need careful consideration: its effect on domestic investment and saving, its effect on the real exchange rate, and the effects of a change in the real exchange rate on domestic and foreign demand. These partial effects are discussed in the following sections: the model is presented in section 2, domestic and foreign levels of income and the real exchange rate are considered in sections 3 and 4, and the effects of devaluation and redistribution on domestic and foreign output are studied in sections 5 and 6. Section 7 concludes.

While focusing on the short-run dynamics and ignoring the balance of payment constraint, the results on the international effects of domestic redistribution contribute to the existing explanations of regional growth divergences. The model used here is very similar to the one of McCombie (1993) in that tradition, but relaxes the assumption of constant terms of trade. Dutt (2002) also uses a two-country setting and endogenizes the real exchange rate, but assumes the Marshall-Lerner condition to hold. Von Arnim et al. (2014) use a model very similar to the one presented here but their assumptions do not allow analytic treatment except under special cases. The results of this paper also extend to the large literature on uneven development (Kaldor, 1970; Taylor, 1981; Dutt, 1990). Considering positive feed-back effects of increased domestic import demand ameliorates some of the bleak results about international trade and the effectiveness of domestic stimulus policies. Integrating an economy in a

regional or world trade network can lead to the increase of income in all countries, but not necessarily so. This highlights the need of international coordination of economic policy (see also von Arnim et al., 2014; Kiefer and Rada, 2014).

2 Model

The general equilibrium analysis is based on two economies each of which is characterized by the standard short-run Kalecki-Keynes model. The variant below is similar to the ones of Taylor (2004b, ch.7) and Godley and Lavoie (2007, ch.12), since all imports enter the economy through the business sector. Business combines import and labor inputs to produce the final good.

Before spelling out the model details, I review the effects of trade in a simple two-country model of the real, demand side. With s the saving rate, i the marginal propensity to invest, m the marginal propensity to import, and e the exchange rate, the identity $(I - S) + (E - M) = 0$ can be re-arranged to the well-known equations:

$$Y = \frac{1}{(s - i) + m\, e}(I + m^*\, Y^*) \qquad Y^* = \frac{1}{(s^* - i^*) + m^*/e}(I^* + m\, Y)$$

where foreign variables are starred. Home output, Y, is determined by domestic autonomous investment plus export demand times the multiplier, $\lambda = (s - i) + m\, e$ (and $\lambda^* = (s^* - i^*) + m^*/e$). Considering the adding-up constraints that exports from one country have to be another countries imports, one can solve output levels as functions of exogenous investment demands times the domestic and trade multipliers:

$$Y = \frac{1}{1 - \frac{m\, m^*}{\lambda\, \lambda^*}} \frac{1}{\lambda}\left(I + \frac{m^*\, I^*}{\lambda^*}\right) \qquad Y^* = \frac{1}{1 - \frac{m\, m^*}{\lambda\, \lambda^*}} \frac{1}{\lambda^*}\left(I^* + \frac{m\, I}{\lambda}\right)$$

The small open economy multiplier is supplemented by the trade multiplier $\left(1 - \frac{m\, m^*}{\lambda\, \lambda^*}\right)^{-1}$ to capture the circular structure of the trade network. Autonomous injections in the closed system can only stem from autonomous investment demand (in this model). In the case of home output, this is domestic autonomous investment demand I plus foreign investment demand in the form of domestic exports $(m^*\, I^*/\lambda^*)$. An increase in either autonomous investment demand increases output in both economies; an increase in either saving rate decreases output. An increase in a country's propensity to import

lowers its output but increases the other country's output. The overall effect on world output is ambiguous, depending on the saving-investment differentials in each country. Devaluation of home currency (meaning an increase in e) has ambiguous effects on domestic output: home imports become more expensive and the multiplier decreases (λ increases), but the foreign multiplier increases (λ^* falls). In general, devaluation will be expansionary if home is sufficiently small relative to foreign ($Y \ll Y^*$).[3]

The simple model discussed in the previous paragraphs assumes that the distribution of income is irrelevant to macroeconomic equilibrium. Macroeconomic variables, however, are influenced by the (functional) distribution of income in the economy. Differences in saving rates for capital and wage incomes are persistent and large (Carvalho and Rezai, 2013); profitability considerations enter any sensible investment decision. This implies that the aggregate investment and saving are functions of income distribution. To see how distribution affects aggregate demand and output within and across countries, Neo- Kaleckian features need to be introduced.

Table 1 spells out the model equations. Foreign variables are still starred. Equations (1) through (6) characterize the home economy with each starred equation characterizing the foreign counterpart. Both economies are identical in their functional (linear) forms. Equation (1) states that the price of the final good is set by a mark-up on variable cost components (labor and import) as it is customary in most economies for foreign goods to enter the domestic market through the business sector (i.e. retailers). Import demand is a linear function in the exchange rate, e, and the price of the foreign good in foreign currency, P*. This linear function implies that home import elasticity equals 1. Von Arnim et al. (2014) allow for variable import demand in a similar model. Equation (1) implicitly assumes that the cost of imports is included in total cost of output so that the value of output PX is greater than value added (i.e. GDP).4 Most results are presented for both variables and the difference is shown to be irrelevant.

[3] The formal conditions are: $\frac{d(Y+Y^*)}{d\,m} \lessgtr 0 \Leftrightarrow s - i - e(s^* - i^*) \lessgtr 0$, $\frac{d\,Y}{d\,e} = -\frac{1}{1-\frac{m\,m^*}{\lambda\,\lambda^*}}\frac{1}{\lambda}\left(Y\frac{\partial\lambda}{\partial e} + \frac{m^*}{\lambda^*}Y^*\frac{\partial\lambda^*}{\partial e}\right) \gtrless 0$ and $\frac{d(Y+Y^*)}{d\,e} = -\frac{1}{1-\frac{m\,m^*}{\lambda\,\lambda^*}}\left[\frac{1}{\lambda}\left(Y\frac{\partial\lambda}{\partial e} + \frac{m^*}{\lambda^*}Y^*\frac{\partial\lambda^*}{\partial e}\right) + \frac{1}{\lambda^*}\left(Y^*\frac{\partial\lambda^*}{\partial e} + \frac{m}{\lambda}Y\frac{\partial\lambda}{\partial e}\right)\right] \lessgtr 0$ with $\frac{\partial\lambda}{\partial e} = m > 0$ and $\frac{\partial\lambda^*}{\partial e} = -\frac{m^*}{e^2} < 0$.

[4] Reformulating (1) gives: $PX = wbX + \pi PX + eP^*aX$.

Table 1: Two-country model of demand and distribution

Home macroeconomic relationships		*Foreign macroeconomic relationships*	
$P = \frac{1}{1-\pi}(wb + eP^*a)$	(1)	$P^* = \frac{1}{1-\pi^*}(w^*b^* + \frac{1}{e}Pa^*)$	(1^*)
$\mathbb{S} = [s_\pi \pi + s_w(1-\pi-a\rho)]PX$	(2)	$\mathbb{S}^* = \left[s_\pi^* \pi^* + s_w^*\left(1-\pi^*-\frac{a^*}{\rho}\right)\right]P^*X^*$	(2^*)
$\mathbb{I} = P\, I[\pi, u]\, K$	(3)	$\mathbb{I}^* = P^*\, I^*[\pi^*, u^*]\, K^*$	(3^*)
$\mathbb{M} = eP^*a\, X$	(4)	$\mathbb{M}^* = \frac{P}{e}a^*X^*$	(4^*)
$\mathbb{E} \equiv e\mathbb{M}^* = Pa^*X^*$	(5)	$\mathbb{E}^* \equiv \frac{1}{e}\mathbb{M} = P^*a\, X$	(5^*)

Equilibrium Conditions:

$$\dot{u} = \frac{1}{PK}\ \gamma\ [(\mathbb{E}-\mathbb{M}) + (\mathbb{I}-\mathbb{S})] = 0 \quad (6)$$

$$\dot{u^*} = \frac{1}{P^*K^*}\gamma^*[(\mathbb{E}^*-\mathbb{M}^*) + (\mathbb{I}^*-\mathbb{S}^*)] = 0 \quad (6^*)$$

Definitions:

$$u = PX/(PK); \qquad u^* = P^*X^*/(P^*K^*) \quad (7)$$

$$\rho = \frac{eP^*}{P} \quad (8)$$

$$1 = \psi + \pi + a\rho = \psi^* + \pi^* + \frac{a^*}{\rho} \quad (9)$$

The analysis is carried out in real terms, scaled to capital stock. Output scaled to capital stock, u, in eqn. (7) is determined by domestic and foreign sources of demand. Macroeconomic equilibrium in eqn. (6) requires that aggregate injections equal aggregate leakage. In the closed economy, this occurs if saving equals investment. Aggregate saving, $\mathbb{S}$, in eqn. (2) is determined by the behavior of capitalists and workers, where the latter's share in income is $1-\pi-a\rho$ (using eqn. (1) to derive eqn. (9)).[1] Aggregate investment, $\mathbb{I}$, in eqn. (3) is defined as an implicit function of output and profitability per unit of capital. In the open economy, the difference between exports $\mathbb{E}$, eqn. (4), and imports $\mathbb{M}$, eqn. (5), provides an additional source of demand injections. Equations (7) through (9) are definitions of the real exchange rate, capacity utilization, and the wage share.

[1] With value added $VA = (1-a\rho)u$, the wage share definition $\psi = 1-\pi-a\rho$ ensures that shares of wages and profit exhaust value added $(\pi+\psi)u = (1-a\rho)u = VA$.

The novel aspect of this model is the algebraic consideration of the effects of distribution if the open economy accounts are closed by adding structure to the rest of this Neo-Kaleckian world. The adding-up constraint dictates that the volume of home imports has to equal foreign exports and vice versa. Each country's export demand is determined by the other's import demand. Algebraically, adding up implies that $\mathbb{E} \equiv e\mathbb{M}^*$ and $\mathbb{E}^* \equiv \frac{1}{e}\mathbb{M}$.

Clearly, there are many important aspects of international economics that are left out of consideration in this model. It focuses on the short run and the real side of the world economy; increases in output imply higher utilization of capital and labor. For simplicity, capital and labor are assumed to be immobile across countries and investment to be influenced only by domestic variables, such as profitability and economic activity. International competition and competitiveness enter the model through their indirect effects on the real exchange rate. Domestic and international financial aspects like interest rates and asset stocks and flows are neglected. Such extensions would most importantly determine the nominal exchange rate, e, which is assumed given in this set-up.

3 International Competition and the Mark-Up

In the open economy, the real exchange rate, ρ, adjusts to scale the home economy to the rest of the world. As pointed out by Taylor (2004, p.254), allowing for foreign trade introduces foreign as a new claimant in the distributional conflict over income in eqn. (9). International competition and home and foreign mark-up primarily determine the real exchange rate—the terms of trade. Before determining equilibrium output levels, the domestic and foreign price levels are discussed in this section. Through equations (1) and (1*), the domestic price level equals:

$$P = \frac{1}{1-\pi}(wb + ea^*P^*) = \frac{1}{\left(1-\frac{aa^*}{(1-\pi)(1-\pi^*)}\right)}\frac{1}{(1-\pi)}(wb + ea\frac{w^*b^*}{1-\pi^*}). \quad (10)$$

(for derivations see appendix B). Prices depend on variable cost, which--when considering the whole world as a closed system--reduce to labor inputs. For home business, variable cost breaks down into direct domestic labor input and indirect imported foreign, marked-up labor input. The general equilibrium feed-back also introduces the trade-based multiplier $(1 - \frac{aa^*}{(1-\pi)(1-\pi^*)})^{-1}$. As in the closed economy, prices are still anchored by historically determined nominal wages.

Blecker (1989, 2002) criticizes the rigidity of the usual mark-up rule for its inability to capture the effects of international competition on home's pricing decision and adopts an international closure instead with foreign determinants driving profit share and mark-up. The formulation chosen here overcomes this criticism. Home business responds to changes in foreign parameters. An increase in the foreign profit share or wage rate increases prices abroad and to a lesser extent at home. The real exchange rate depreciates (rises) and home competitiveness increases.

Using equation (10) and its foreign counterpart we have algebraically,

$$\rho = \frac{e\,P^*}{P} = e\,\frac{1-\pi}{1-\pi^*}\,\frac{(w^*b^*+\frac{1}{e}a^*\frac{w\,b}{1-\pi})}{(wb+ea\frac{w^*b^*}{1-\pi^*})} = \frac{(1-\pi)\,e+a^*(wb/w^*b^*)}{(1-\pi^*)\,(wb/w^*b^*)+e\,a}. \tag{11}$$

And, as can be seen easily, $d\rho/d\pi^* > 0$. Conversely, an increase in the domestic profit share decreases ρ, $d\rho/d\pi < 0$.

4 Output Determination

Output is determined through independent investment and saving behavior. In a simple closed economy, output adjusts such that domestic investment equals domestic saving. Distribution affects both of these variables through profitability considerations entering the investment function and differential saving rates. Depending those two effects, redistribution toward wages can increase or decrease output. If aggregate demand increases in the wage share (profit share), it is called wage-led (profit-led). In the multi-country model considered here, equation (6) shows that net exports constitute an additional source of demand. The aim of the paper is to study the relationship between demand and distribution in such a multi-country model.

Equations (6) and (6^*) form a system of differential equations which can be analyzed using standard dynamical methods. Before applying these, it makes sense to investigate the mechanism establishing equilibrium. Let NB_d stand for domestic net borrowing (e.g. excess investment) and NB_f for foreign net borrowing (the trade surplus) capturing foreign demand (see Godley and Cripps, 1983). In equilibrium, macroeconomic balance in (6) requires

$$NB_d + NB_f = 0 \tag{12}$$

Domestic net borrowing has to be financed by negative net borrowing (positive net lending) from abroad. Since the only source of external finance is foreign, we have $NB_d = -NB_f = NB_f^* = -NB_d^*$ or $NB_d + NB_d^* = 0$. It is not possible for both economies to simultaneously rely on financing from abroad; net borrowing of the whole system has to equal zero. This is, of course, a mere restatement of the adding up constraint that both economies cannot be having current account surpluses (or deficits) at the same time.

Using (6) and the assumption that the investment function is multiplicative in u, $I[\pi, u] = \iota[\pi] + I_u\, u$, the small open economies' output can be determined in multiplier form as in the simple model at the beginning of section 2:[2]

$$u = \frac{1}{\mu}(\iota[\pi] + a^* u^*) \quad \text{and} \quad u^* = \frac{1}{\mu^*}(\iota^*[\pi^*] + a\, u) \tag{13}$$

with multipliers $\mu = [s_\pi \pi + s_w(1 - \pi - a\rho)] + a\rho - I_u$ and $\mu^* = [s_\pi^* \pi^* + s_w^*(1 - \pi^* - a^*/\rho)] + a^*/\rho - I_u^*$ and autonomous investment demands, $\iota[\pi]$ and $\iota^*[\pi^*]$, now functions of functional income distribution.[3] The circular structure of the trade network, again, introduces the trade multiplier:

$$u = \frac{1}{1 - \frac{a\, a^*}{\mu\, \mu^*}} \frac{1}{\mu} \left(\iota[\pi] + \frac{a^*}{\mu^*} \iota^*[\pi^*]\right) \quad \text{and} \quad u^* = \frac{1}{1 - \frac{a\, a^*}{\mu\, \mu^*}} \frac{1}{\mu^*} \left(\iota^*[\pi^*] + \frac{a}{\mu} \iota[\pi]\right).^4 \tag{14}$$

The only sources of demand available to home are now autonomous home investment and autonomous foreign investment in the form of export demand.[5] An increase in either autonomous demand component increases aggregate demand:

$$\frac{du}{d\iota[\pi]} = \frac{1}{1 - \frac{a\, a^*}{\mu\, \mu^*}} \frac{1}{\mu} > 0 \quad \text{and} \quad \frac{du^*}{d\iota[\pi]} = \frac{1}{1 - \frac{a\, a^*}{\mu\, \mu^*}} \frac{1}{\mu^*} \frac{a}{\mu} \iota[\pi] > 0. \tag{15}$$

Home (and foreign) domestic demand is now a function of income distribution through its effect on investment. Profit shares, however, also enter the multipliers through their effect on aggregate domestic and foreign saving. As seen in the previous section, profit shares also shift the real exchange rate.

[2] Foreign variables have to additionally be rescaled by $\kappa = K^*/K$ and the real exchange rate, $\rho = eP^*/P$. Since κ serves no particular purpose, units are chosen such that $\kappa \equiv 1$.
[3] The stability of the system is warranted by the Keynesian stability conditions $\mu, \mu^* > 0$.
[4] The introduction of the trade multiplier makes the stability condition more restrictive: $\mu\, \mu^* > a\, a^* > 0$.
[5] Thirwall (2011) reviews the broad literature on balance-of-payment constraints. It is important to note that in the absence of such complications, aggregate demand can only be determined by its autonomous components and the multiplier rather than export and import components.

5 Effects of Devaluation

To understand the aggregate effects of redistribution (through shifts in the profit shares) on output, I first establish its partial effects through devaluation. The effects of devaluation on capacity utilization have long been discussed by international and development economists. In the simple model in section 2, the effects of devaluation (an increase in e) are ambiguous and depend on changes in the multipliers.[6] Devaluation, independent of its source, increases or decreases output:

$$\frac{du}{de} = -\frac{1}{1-\frac{a\,a^*}{\mu\,\mu^*}}\frac{1}{\mu}\left(u\frac{\partial\mu}{\partial\rho}+\frac{a^*}{\mu^*}u^*\frac{\partial\mu^*}{\partial\rho}\right)\frac{\partial\rho}{\partial e} \gtrless 0 \tag{16}$$

with $\partial\mu/\partial\rho = a(1-s_w) > 0, \partial\mu^*/\partial\rho = -a^*(1-s_w^*)/\rho^2 < 0,$ and $\partial\rho/\partial e > 0$.[7] Again, domestic output falls if the effect of the devaluation on the domestic multiplier is large, the effect on the foreign multiplier small, and if the difference between the domestic and foreign output is large.

The effect of devaluation on both multipliers now depends on functional income distribution through differential saving rates. In the simple model of section 2 the effect on the domestic multiplier expression, μ, is the equivalent of a, since devaluation increases the import bill and with it external leakage (see also footnote 3). The partial effect of the devaluation, $\partial\mu/\partial\rho$, is $a(1-s_w)$ in this model. This is because the devaluation tilts distribution in favor of foreign, thereby affecting internal demand. With the profit share fixed by the mark-up rule, the wage share has to adjust and the associated leakage through workers' saving falls. The reduction of $-a\,s_w$ compensates some of the effects of the higher import bill. The same applies for the effect on devaluation on the foreign multiplier. Restating (16), the aggregate effect is

$$\frac{du}{de} \gtrless 0 \Leftrightarrow -a(1-s_w)u + \frac{a^{*2}}{\mu^*\,\rho^2}(1-s_w^*)u^* \gtrless 0. \tag{16'}$$

In demand-driven models, aggregate demand generally increases if income is redistributed away from high-saving toward low-saving groups. In this model, there are four income groups but only domestic and foreign workers are affected by devaluation. Domestic and foreign profit earners are unaffected through the mark-up rule. Equation (16') shows that devaluation can only increase

[6] Typically, one considers the effect of a nominal devaluation (de). Here nominal devaluation always leads to real devaluation since the exchange rate only enters through the real exchange rate and $de\,/\,d\rho > 0$. In the following sections devaluation means real devaluation with the understanding that real devaluation is brought about through nominal devaluation (de) or shifts in profits shares ($d\pi$).

[7] $\partial\rho/\partial e = \rho\frac{bb^*\,w\,w^*}{P(a^*bw+b^*ew^*(1-\pi))} > 0$. Restating (18) for GDP: $\frac{dGDP}{de} = \frac{d(1-a\rho)u}{de} = -a\,u + (1-a\rho)\frac{du}{de} \gtrless 0.$

domestic output if domestic workers save significantly more than their foreign counterparts or if the import coefficient and the size of the domestic economy is sufficiently small relative to foreign. In this case, devaluation shifts disposable income toward low-saving groups and output can increase. Conversely, appreciation can be expansionary if domestic workers have sufficiently lower saving propensities than their foreign counterparts.

While there might be a conflict between workers over a given amount of income, redistribution across countries, through movements in the exchange rate, can increase income of both. This case is rarely considered in models of growth and distribution, given that it is only apparent when considering a multi-country model as a closed system (in the small open economy case in (13) an appreciation always lowers output). Numerical 'general equilibrium' models of growth and distribution usually do not consider this possibility.[8] Analytically the condition for devaluation to increase world output is

$$\frac{d(u+u^*)}{de} = -\frac{1}{1-\frac{a\,a^*}{\mu\,\mu^*}}\left[(1+\frac{a}{\mu^*})\frac{u}{\mu}\frac{\partial\mu}{\partial\rho} + (1+\frac{a^*}{\mu})\frac{u^*}{\mu^*}\frac{\partial\mu^*}{\partial\rho}\right]\frac{\partial\rho}{\partial e} \gtrless 0. \qquad (17)$$

Expression (17) is identical to the condition for expansionary devaluation given for the simple model in footnote 3. The effects of distribution are captured in effects of devaluation on the multiplier as discussed above. Again, devaluation can increase world output, benefiting potentially all income earners, if domestic workers save significantly larger portions of their income than their foreign counterparts and if the import coefficient and the size of the domestic economy is sufficiently smaller than foreign.

In the macroeconomic analysis of devaluation, one usually invokes the "Marshall-Lerner" (ML) condition. It ensures that devaluation leads to an improvement in the current account. In the present model, the ML condition implies that any devaluation is expansionary for the domestic economy. To see this, it is useful to return to the net borrowing analysis of section 4. Restated in net borrowing, the ML condition assumes that foreign net borrowing increases as the economy depreciates, $dNB_f/d\rho > 0$, and by (13) this means that domestic net borrowing has to fall, $dNB_d/$

[8] e.g. Lavoie and Godley only found a contractionary effect in their numerical simulations (Godley and Lavoie, 2007, p.182); von Arnim et al (2014) find the possibility of expansionary devaluation without discussing the implications.

$d\rho < 0$. The economy needs to generate more net lending to finance foreign purchase of home exports, in light of an increase in home net exports.

Algebraically, using (2) and (3) we have, $NB_d = \frac{1}{PK}(\mathbb{I} - \mathbb{S}) = \iota[\pi] - (\mu - a\rho)\, u$ and

$$\frac{dNB_d}{d\rho} = a\, s_w\, u - (\mu - a\rho)\frac{\partial u}{\partial \rho} \tag{18}$$

which can only be negative if the devaluation is expansionary ($\partial u/\partial \rho > 0$).[9] The assumption of the ML condition to hold for home automatically implies that devaluation is expansionary for home and that the ML condition simultaneously holds for foreign as the depreciation (i.e. foreign appreciation) increases the foreign trade deficit.

6 Effects of Redistribution

The idea that redistribution between income groups can increase the income of all is an old idea dating back to Kalecki and Steindl. It is usually presented as a trade-off between wage- and profit-earners in a closed-economy framework. The seminal papers on this subject are Dutt (1984), Taylor (1985), and Bhaduri and Marglin (1990). Empirical investigations based on these contributions (Bowles and Boyer, 1995; Gordon, 1995; Naastepad, 2006; Naastepad and Storm, 2007; Ederer and Stockhammer, 2007; Stockhammer, Onaran and Ederer, 2009; Hein and Vogel, 2008; Galanis and Onaran, 2012) often had to accommodate the fact that real economies are always linked to the world economy in some form. Most studies find that small open economies (like the Netherlands or Austria) are more likely to be profit-led than large, relatively closed ones (like the US or the Euro area as a whole). As Gordon (1995) put it early on: "[...] the estimated coefficients from the net-export equation are instrumental in determining the final sign of the utilization function" (p. 361). Based on these findings, the view emerged that increasing openness of an economy pushes demand necessarily toward a profit-led regime. However, given the ambiguous output response to devaluation, trade openness could very well push demand regimes in either direction.

In a closed economy, redistribution to profits increases output if the investment response to this increase in profitability is strong and the difference in the saving rates of wage- and profit-earners

[9] Note that $(\mu - a\rho) = [s_\pi \pi + s_w(1 - \pi - a\rho)] - I_u > 0$ by the Keynesian stability condition.

is small, i.e. $\iota[\pi]' - (s_\pi - s_w)u > 0$. In an open economy an increase in the mark-up additionally leads to a loss in competitiveness as $\frac{\partial \rho}{\partial \pi} < 0$.

Taking the full derivative of (14) with respect to π yields

$$\frac{du}{d\pi} = \frac{1}{1-\frac{aa^*}{\mu\,\mu^*}} \frac{1}{\mu} \left(\iota[\pi]' - (s_\pi - s_w)u\right) + \frac{\partial u}{\partial \rho}\frac{\partial \rho}{\partial \pi}. \quad (19)$$

The first term captures the closed economy output effects of redistribution away from wages toward profits. The second term captures the redistributive effects of real appreciation, $\partial\rho/\,\partial\pi < 0$. Trade openness pushes an economy toward profit-led demand, increasing (19), if the appreciation has a positive effect on output, i.e. if $du/d\rho < 0$. If depreciation increases output (which is necessarily the case if the ML condition holds), the (closed) economy's demand regime becomes more wage-led. [10]

The effect of redistribution between wages and profits within one country hinges not only on national distributional conflict, but also the conflict between the home and foreign. The international dimension of conflict is captured through the shift in the exchange rate. Using (16') in (19), makes this three-fold conflict apparent:

$$\frac{du}{d\pi} = \frac{1}{1-\frac{aa^*}{\mu\,\mu^*}} \frac{1}{\mu} \left[\iota[\pi]' - (s_\pi - s_w)u - \left(a(1-s_w)u - \frac{a^{*2}}{\mu^*\,\rho^2}(1-s_w^*)u^*\right)\frac{\partial \rho}{\partial \pi}\right]. \quad (19')$$

A change in the domestic profits share leads to a change in profitability and a redistribution of income (and saving) between wages and profits internally. However, it also leads to a change in the real exchange rate, implying a redistribution of income across home and foreign workers, externally (as discussed in section 5).

The effect of domestic redistribution on the trading partner's output also decomposes into direct effect of redistribution on domestic output and the indirect effects of domestic appreciation,

$$\frac{du^*}{d\pi} = \frac{1}{1-\frac{aa^*}{\mu\,\mu^*}} \frac{1}{\mu^*} \frac{a}{\mu} \left(\iota[\pi]' - (s_\pi - s_w)u\right) + \frac{\partial u^*}{\partial \rho}\frac{\partial \rho}{\partial \pi}. \quad (20)$$

Over the past decades labor shares have been falling in most OECD countries. Using (19) and (20) it is possible to investigate the effects of a concerted reflation of labor shares. First, consider the effect of a global reflation on domestic output,

[10] In terms of GDP, $\frac{dGDP}{d\pi} = \frac{d(1-a\rho)u}{d\pi} = -a\,u\frac{\partial \rho}{\partial \pi} + \frac{du}{d\pi} \gtrless 0$.

$$\frac{du}{d\pi}+\frac{du}{d\pi^*}=\frac{1}{1-\frac{aa^*}{\mu\,\mu^*}}\frac{1}{\mu}\Big[\iota[\pi]'-(s_\pi-s_w)u+\frac{a^*}{\mu^*}\left(\iota^*[\pi^*]'-(s_\pi^*-s_w^*)u^*\right)\Big]+$$

$$\frac{\partial u}{\partial\rho}\Big(\frac{\partial\rho}{\partial\pi}+\frac{\partial\rho}{\partial\pi^*}\Big). \tag{21}$$

Domestic output's response to reflation in both economies consists of the weighted sum of national closed-economy demand regimes and the response to the reflation-induced exchange rate movement. The direct change in aggregate demand is equivalent to that of a change in autonomous investment in (15) with the important difference that demand can change in either direction, depending on the national closed-economy demand regimes. Coordinated reflation has an ambiguous effect on the real exchange rate as structural parameters differ across countries. If the exchange rate responds more strongly to changes in the foreign than the home profit share, the overall effect is real depreciation (ρ increases). In such a situation, domestic output could decrease even if the national (closed-economy) demand regimes are both wage-led. This effect cancels out if both economies are identical in their pricing behavior, reducing home output's response to the weighted sum of closed-economy demand regimes.[11] There would only be internal redistribution between wages and profits and international effects would be limited to the extent that internal redistribution changes output and with it import demand.

The effect of coordinated redistributive policy on world output is given by extension of (21):

$$\frac{d(u+u^*)}{d\pi}+\frac{d(u+u^*)}{d\pi^*}=\frac{1}{1-\frac{aa^*}{\mu\,\mu^*}}\Big\{\frac{1}{\mu}\Big(1+\frac{a}{\mu^*}\Big)\left[\iota[\pi]'-(s_\pi-s_w)u\right]+\frac{1}{\mu^*}\Big(1+\frac{a^*}{\mu}\Big)\left[\iota^*[\pi^*]'-(s_\pi^*-s_w^*)u^*\right]\Big\}$$

$$+\frac{\partial\,u+u^*}{\partial\rho}\Big(\frac{\partial\rho}{\partial\pi}+\frac{\partial\rho}{\partial\pi^*}\Big). \tag{22}$$

The total effect captures all of partial effects previously discussed. Redistribution has a direct effect on the investment and saving through the national (closed-economy) demand regime. Changes in these demand regimes have themselves a direct effect (of 1) and indirect effects through changes in import demand (a/μ^*). These effects are based on national distributional conflict between earners of wages and profits. Redistribution also influences international conflict between home and foreign workers (see (16')). This type of distributional conflict is captured through movements in the real exchange rate. Coordinated reflation can increase or decrease the real exchange rate and this change in

[11] $\partial\rho/\partial\pi+\partial\rho/\partial\pi^*>0\Leftrightarrow(\pi-\pi^*)+(a/R-a^*R)<0$ with $R=wb/(w^*b^*\,e)$.

the exchange has itself an ambiguous effect on world output. Distributional conflict between profit earners across countries is muted through the particular mark-up assumption that variable cost includes both labor and imported inputs.

7 Discussion

Aggregate demand and output in an economy are functions of its functional distribution of income and that of its trading partners. Most models of demand and distribution focus on the closed economy and the interaction between demand and domestic income distribution. Issues of international economics are discussed in the small open economy context. In recent years (large-scale) models have been introduced to study the interaction of distribution in multiple economies numerically.

The main finding of the two-country model studied in this paper is that national policies of demand management and redistribution can have unintended macroeconomic effects. The outcomes of such policies depend on the structural parameters of both economies with relative size of the economies being one important determinant. The key to understanding this wide range of possible outcomes is the fact that introducing foreign trade in the model extends distributional conflict. Foreign income groups enter as claimants to income in the form of the trade deficit. The real exchange rate provides the link between home and foreign income earners.

Devaluation shifts distribution in favor of foreign. The price of domestic imports increases, decreasing the multiplier. With profits shares fixed by the mark-up rule, labor's share in domestic output falls. Foreign labor's share, however, increases by the same logic. The Paradox of Thrift implies that shifting income from high- to low-saving groups increases output. The overall effect of devaluation on the domestic and foreign economies, therefore, depends on the consumption behavior of domestic and foreign workers and the degree of economic integration.

Empirical studies on the national redistribution between wages and profits in open economies predominantly find that increasing openness pushes the economy in the profit-led direction. This finding is based on the fact that exports provide a demand source which is independent of workers' consumption. National redistribution is shown to have two effects: an internal between domestic wage

and profit earners, and an external between domestic and foreign workers due to the redistribution-based real exchange rate movement. Depending on this external output effect, trade can shift the internal demand regime in either direction. If devaluation is expansionary, the demand regime becomes more wage-led. It is shown that this is the case if the Marshall-Lerner condition holds.

The analysis of the paper is limited to the short run and the real side of the economy. Capital and financial stocks and their changes over time are not considered. An extension to the financial side of the economy would have to include the introduction of interest rates and the determination of the nominal exchange rate which is assumed to be fixed in this model. In the medium run, balance of payment considerations as presented in Minsky (1983) and Taylor (2010) would inevitably lead to important interactions between financial stocks and real flows. These interactions and the investigation of the sustainability of growth trajectories are left to future research.

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Appendix A Social Accounting Matrix of the World Economy

The model in Table 1 can be recast in a social accounting matrix illustrating the relationship between the inter-industry, national income and product, and flow-of-funds accounts. As SAMs need to be evaluated at consistent prices, all entries are in real home units. With the real wage denoted as ω and labor employed as L, it becomes clear that the world economy can be interpreted as a two-sector economy in which wage rates and profit shares differ across sectors because of barriers to mobility.

Output uses	$\boldsymbol{X}$	$\boldsymbol{X}^*$	$\boldsymbol{HH_w}$	$\boldsymbol{HH_w^*}$	$\boldsymbol{HH_\pi}$	$\boldsymbol{HH_\pi^*}$	$\boldsymbol{I}$	$\boldsymbol{I}^*$	$\boldsymbol{\Sigma}$
$\boldsymbol{X}$		$\rho^{-1}\, a^* X^*$	$(1-s_w)$ $\omega\, L$		$(1-s_\pi)$ $\pi\, X$		I		X
$\boldsymbol{X}^*$	$a\, \rho\, X$			$\rho^{-1}\,(1-s_w^*)$ $\omega^*\, L^*$		$\rho^{-1}(1-s_\pi^*)$ $\pi^*\, X^*$		$\rho^{-1} I$	$\rho^{-1} X^*$
$\boldsymbol{HH_w}$	$b\, \omega\, L$								Y_w
$\boldsymbol{HH_w^*}$		$\rho^{-1}\, b^*\, \omega^*\, L^*$							Y_w^*
$\boldsymbol{HH_\pi}$	$\pi\, X$								Y_π
$\boldsymbol{HH_\pi^*}$		$\rho^{-1}\, \pi^*\, X^*$							Y_π^*
Home FoF			$s_w\, \omega\, L$		$s_\pi\, \pi\, X$		$-I$		0
Foreign FoF				$\rho^{-1}\, s_w^*\, \omega^*\, L^*$		$\rho^{-1} s_\pi^*\, \pi^*\, X^*$		$-\rho^{-1} I$	0
	X	$\rho^{-1} X^*$	Y_w	Y_w^*	Y_π	Y_π^*	0	0	

Table B.1: World Economy SAM

Appendix B Home and Foreign Price Level

Restating equations (1) and (1*) in matrix notation yields

$$\begin{pmatrix} (1-\pi) & -a \\ -a^* & (1-\pi^*) \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & e \end{pmatrix} \begin{pmatrix} P \\ P^* \end{pmatrix} = \begin{pmatrix} w\, b \\ e\, w^*\, b^* \end{pmatrix}$$

which can be easily rearranged to solve for home and foreign macro prices

$$\begin{pmatrix} P \\ P^* \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & e \end{pmatrix}^{-1} \begin{pmatrix} (1-\pi) & -a \\ -a^* & (1-\pi^*) \end{pmatrix}^{-1} \begin{pmatrix} w\, b \\ e\, w^*\, b^* \end{pmatrix}$$

$$= \frac{1}{(1-\pi)(1-\pi^*) - a\, a^*} \begin{pmatrix} 1 & 0 \\ 0 & 1/e \end{pmatrix} \begin{pmatrix} (1-\pi^*) & a \\ a^* & (1-\pi) \end{pmatrix} \begin{pmatrix} w\, b \\ e\, w^*\, b^* \end{pmatrix}$$

$$= \frac{1}{(1-\pi)(1-\pi^*) - a\, a^*} \begin{pmatrix} (1-\pi^*)\, w\, b + e\, a\, w^*\, b^* \\ a^*/e\, w\, b + (1-\pi) w^*\, b^* \end{pmatrix}.$$