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# Real exchange rate misalignment and redistribution

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**Abstract**

Developing countries frequently maintain an overvalued nominal exchange rate, resulting in real exchange rate misalignment. To finance import demand at the overvalued exchange rate, countries have to raise the level of income taxation or they have to resort to monetary finance. This paper explains nominal and implicitly real exchange rate misalignment as the outcome of the political process. More specifically, the paper explains the misalignment of an import exchange rate relative to a market exchange rate used for exports. Voters differ in their ownership of a single factor of production. Real exchange rate overvaluation results if the median voter spends a relatively large share of his income on the importable good. The political economy of explicit and implicit import subsidies is first analyzed in a real model, which is then extended to include money holdings and exchange rate policy.

*JEL classification:* F31; H23

*Keywords:* Overvaluation; Multiple exchange rates; Redistribution

## 1. Introduction

Real exchange rates in developing countries appear to be quite volatile. To some extent, real exchange rate adjustments no doubt reflect changes in underlying exchange rate fundamentals. Real exchange rate movements, however, appear to be too sizeable and too often reversed to be mere reflections of underlying


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fundamentals. Instead, exchange rate policy per se appears to be an important destabilizing influence. This paper examines the political economy of exchange rate policy. Exchange rate adjustments, in particular, are assumed to be determined by popular vote. Voters differ in their ownership shares of the economy's single factor of production called land. In this setting, exchange rate policy cannot affect relative incomes. In this respect, the present paper differs from contributions on the political economy of tariff policy by, for instance, Brock and Magee (1978) and Mayer (1984).

Exchange rate policy still affects agents differently to the extent that they have different expenditure shares on tradeables and nontradebles. Exchange rate adjustments that imply a lower relative price of tradeables, in particular, benefit agents that spend a relatively large share of their income on tradeables. Survey data gathered by Hazell and Roell (1983) indicates that an agent's expenditure share on tradeables falls with his income. This suggests that an exchange rate policy that reduces the relative price of tradeables benefits the poor relative to the rich. The relative price of tradeables is reduced if the exchange rate is overvalued. This paper shows that a median voter that is relatively poor will be in favor of such an overvalued exchange rate. The rate of overvaluation preferred by a poor median voter is shown to decline with the general level of income for a given relative distribution of income. This result can explain why real exchange rate misalignment appears to be a relatively serious problem in developing economies.

Agents are assumed to consume importables and nontradeables. A lower relative price of importables facing consumers, if desired by the median voter, can be brought about in a variety of ways. One way is to institute a separate, relatively appreciated exchange rate for import purposes. Alternatively, the relative price of importables can be reduced by a straightforward import subsidy. In either case, the government needs to raise revenues to cover the budgetary expense of cheapening imports. In this paper, we assume that the government can institute a flat tax on all factor income or alternatively apply monetary finance. In practice, many countries use exchange rate policy to affect relative prices in combination with monetary finance to balance the budget. In this instance, an expansion of the money supply against a backdrop of a constant nominal import exchange rate leads to a further real appreciation of the exchange rate. An ongoing real exchange rate appreciation, in turn, increases the need for monetary finance. The process of exchange rate overvaluation and money printing continues until the nominal import exchange rate is adjusted by the political process. The adjustment takes the form of a devaluation of the nominal import exchange rate. If the government has limited taxing powers, however, then the devaluation preferred by the median voter may be insufficient to prevent a renewed overvaluation-cum-money printing cycle. The model thus can explain recurrent periods of real exchange rate misalignment.

It is well understood that exchange rate management under a system of multiple exchange rates, official or unofficial, can be viewed as a tax policy. Huizinga (1991), for instance, examines the black market for foreign exchange that arises

from the evasion of exchange regulations integral to a system of separate import and export exchange rates. At the same time, Frenkel and Razin (1989) examine the equivalence between a system of dual exchange rates, consisting of separate exchange rates for commercial and financial transactions, and tax policy.

Several authors have attributed reasons for policy makers to bring about deviations of real exchange rates from apparent equilibrium values. Rodrik (1986), for instance, argues that policy-induced real exchange rate devaluations that strengthen the demand for tradeables at present improve welfare, if the production of tradeables is characterized by learning-by-doing. Van der Ploeg (1989) instead examines political exchange rate cycles, where the government effects an appreciation of the real exchange rate prior to elections to facilitate reelection. [1]

The present paper is in essentially two parts. First, Section 2 examines the political economy of import subsidies financed by a general factor income tax in a static, entirely real model. Second, Section 3 introduces money holdings and a system of multiple export and import exchange rates. In the absence of monetary finance, this monetary model has an equilibrium that is equivalent to the static equilibrium of the real model. Generally the authorities, however, have to resort to monetary finance with dynamic, real implications if the nominal import exchange rate is held constant over the political cycle. In this instance, voters take into account these dynamic implications when setting nominal exchange rate policy. The monetary model is an extension of Huizinga (1995) to a three-good model of exchange rate policy. [2] Section 4 concludes.

## 2. A real model of import subsidies

Let there be a single factor of production, $L$, which we will call land. The economy is populated by a range of agents indexed by $i$, with $i \in [0, 1]$. The agents only differ in their individual land ownership shares. Let agent $i$'s land ownership share be denoted $\lambda(i)$ so that this agent's absolute land ownership is given by $\lambda(i)L$. Agents are ordered by their land ownership share so that $\lambda(i)$ increases with the index $i$. Clearly, we have $\int_0^1 \lambda(i)\mathrm{d}i = 1$.

There are three goods: a nontradeable, $N$, an importable, $Y$, and an exportable, $X$. The economy only produces the nontradeable and exportable goods. Technology is assumed to be linear. Units are chosen, in particular, such that a unit of

[1] The slow response of the trade balance to real exchange rate movements, embodied in the J-curve, implies that an exchange rate appreciation leads to an improved short-run inflation performance without an immediate worsening of the trade balance. The political effectiveness of exchange rate cycles of this type, however, rests of the assumption that voters are myopic.

[2] The present paper in addition starts from more general preferences and government finance options.

either the nontradeable, $N$, or the exportable, $X$, can be produced with a single unit of land. The economy is assumed to be small in international markets. As a result, the country faces a constant world price of the importable, $Y$, in terms of the exportable, $X$, denoted $\hat{\theta}$.

Agents consume only the nontradeable good, $N$, and the importable good, $Y$. [3] The utility of agent $i$, denoted $U(i)$, can be expressed as follows:

$$U(i) = \alpha \log\big(N(i) - \hat{N}\big) + (1-\alpha)\big(Y(i) - \hat{Y}\big), \quad 0 < \alpha < 1, \tag{1}$$

where $N(i)$ and $Y(i)$ are individual $i$'s consumption of the nontradeable and the importable goods, respectively. In Eq. (1), $\hat{N}$ and $\hat{Y}$ are constants representing the minimum consumption levels of the two goods.

Imports are subsidized at a rate $s$. The price of imports in terms of other goods facing domestic agents, denoted $\theta$, is thus given by $(1-s)\hat{\theta}$. Import subsidies are financed by a flat rental income tax at a rate $\tau$. Agent $i$ now faces the following binding budget constraint:

$$N(i) + \theta Y(i) = (1-\tau)\lambda(i)L. \tag{2}$$

The logarithmic utility specification in Eq. (1) along with the budget constraint in Eq. (2) implies that the consumption levels $N(i)$ and $Y(i)$ of the two goods for individual $i$ are as follows:

$$N(i) = \alpha\big[(1-\tau)\lambda(i)L - C\big] + \hat{N}, \tag{3}$$

$$Y(i) = (1-\alpha)\left[\frac{(1-\lambda)\lambda(i)L - C}{\theta}\right] + \hat{Y}, \tag{4}$$

where $C = \hat{N} + \theta\hat{Y}$.

In deriving Eqs. (3) and (4), we assume that all individuals can afford to purchase the minimum consumption basket consisting of quantities $\hat{N}$ and $\hat{Y}$ of the nontradeable and importable goods, or equivalently that $(1-\tau)\lambda(i)L \geq C$ for all $i$. Aggregate consumption levels of the two goods are found by aggregating the individual consumption levels in Eqs. (3) and (4) for all individuals. The resulting expressions are as in Eqs. (3) and (4) without the agent index $i$. The variables $N$ and $Y$ then denote the aggregate consumption levels of the nontradeable and the importable goods.

The government budget constraint can now be written as follows:

$$s\hat{\theta}Y + G = \tau L \tag{5}$$

where $G$ is government spending other than on import subsidies.

[3] Little is gained if we assume that domestic agents also consume exportables.

The private and government budget constraints together imply an overall resource constraint given by $L = N + \hat{\theta} Y + G$. This resource constraint and the expressions for $N$ and $Y$ as in Eq. (3) and Eq. (4) imply that the internal importables price, $\theta$, and the labor income tax rate, $\tau$, are related implicitly as follows:

$$\theta = \frac{L' - (1-\alpha)\hat{\theta}\left[\dfrac{(1-\tau)L}{\theta} - \dfrac{\hat{N}}{\theta} - \hat{Y}\right]}{\alpha\left[\dfrac{(1-\tau)L}{\theta} - \dfrac{\hat{N}}{\theta} - \hat{Y}\right]} \tag{6}$$

where $L' = L - \hat{N} - \hat{\theta}\hat{Y} - G$.

It is useful to check from Eq. (6) that the domestic imports price, $\theta$, and the tax rate, $\tau$, are negatively related as follows:

$$\frac{d\tau}{d\theta} = -\frac{1}{L}\left[\hat{Y} + \frac{L'(1-\alpha)\hat{\theta}}{\left[\alpha\theta + (1-\alpha)\hat{\theta}\right]^2}\right] < 0. \tag{7}$$

Now let us consider how tax policy affects individual welfare. Let agent $i$'s maximal welfare given a value of $\theta$ be denoted $V(\theta, i)$. Using Eqs. (1), (3), (4) and (6), we can express $V(\theta, i)$ as follows:

$$V(\theta, i) = \log\left(\alpha^{\alpha}(1-\alpha)^{1-\alpha}\right) + \alpha \log(\theta) + \log\left(\frac{(1-\tau)L_i}{\theta} - \frac{\hat{N}}{\theta} - \hat{Y}\right). \tag{8}$$

An individual $i$'s welfare clearly increases with his own land holdings, $L_i = \lambda(i)L$. In Eq. (8), the imports price, $\theta$, affects individual welfare directly and through its effect on the tax rate, $\tau$. To see this, we can differentiate $V(\theta, i)$ with respect to $\theta$ to yield

$$\frac{dV(\theta, i)}{d\theta} = -\frac{1-\alpha}{\theta} + \frac{L_i\left[-\dfrac{d\tau}{d\theta}\right] - \hat{Y}}{(1-\tau)L_i - \hat{N} - \theta\hat{Y}}. \tag{9}$$

In developing countries, importables often include basic necessities such as staple foods, while nontradeables may include many services that relatively speaking are luxuries. Exportables instead tend to be concentrated in one or a few sectors that differ from country to country so that it is difficult to say in general whether exportables form an important component of the basic consumption

bundle. Hazell and Roell (1983) provide some evidence on the budget shares spent on nontradeables, importables and exportables for the example of Malaysian households in 1972. [4] Poorer households indeed are shown to spend relatively little on nontradeables: the marginal expenditure share on nontradeables of households in the first (tenth) income decile is estimated to be roughly 24 (55) percent. [5] Marginal expenditure shares on imports for the two income groups, in contrast, are both around 38 percent. Within the imports category, expenditure shifts at the margin from food to non-food items for wealthier households. Finally, marginal expenditure shares on exportables for household in the first and tenth decile are estimated at 38 and 7 percent, respectively. Overall, poorer households in Malaysia appear to spend relatively little on nontradeables, which suggests that $\alpha\hat{\theta}\hat{Y} > (1-\alpha)\hat{N}$.

To conclude this section, let us turn to the determination of $\theta$ by voting. Let us define $\theta_m^*$ to be the value of $\theta$ that maximizes the median voter's welfare, $V(\theta, 0.5)$. The median voter is assumed to be relatively poor, i.e. we assume that $L_m < L$. We can now show the following:

*Proposition 1.* *If* $\alpha\hat{\theta}\hat{Y} > (1-\alpha)\hat{N}$, *then*

(*i*) *the median voter is decisive.*

(*ii*) $$\sqrt{\frac{(1-\alpha)\hat{N}\hat{\theta}}{(\alpha\hat{Y})}} < \theta_m^* < \hat{\theta}.$$

(*iii*) $$\frac{\mathrm{d}\theta_m^*}{\mathrm{d}L_m} > 0.$$

For a proof of this and other propositions, see Appendix A.

Part (i) of the proposition states that the median voter's preferences regarding $\theta$ are implemented in political equilibrium. Part (ii) indicates that the median voter wishes to effect a value of $\theta$ that is positive, but less than the world relative price of importables, $\hat{\theta}$. This implies that the median voter is in favor of an import subsidy, $s$, that is positive but less than one. Correspondingly, the rental income

[4] Qualitatively similar expenditure patterns are found by the authors for Nigerian data.

[5] See Hazell and Roell (1983, Tbl. 12). Note that strictly speaking the utility specification in Eq. (1) implies that marginal expenditure shares of households on nontradeables and on importables are invariant with household income.

tax rate, $\tau$, is positive. Finally, part (iii) indicates that other things equal a wealthier median voter wishes to implement a higher internal imports price, $\theta$.

## 3. A monetary model with exchange rate policy

In this section, we introduce money holdings and exchange rate policy into the real model outlined above. The real side of the model is as outlined before with the distinction that the government no longer can directly subsidize imports. Instead, the domestic imports price, $\theta$, is set implicitly by a system of multiple export and import exchange rates. The government may or may not have unrestricted access to a flat rental income tax.

The introduction of money generally renders the model dynamic. Correspondingly, we now assume that agent $i$ has lifetime utility from time $t$ onwards, denoted $U_t(i)$, as follows:

$$U_t(i) = \int_t^{\infty} \left[ \alpha \log\left(N_s(i) - \hat{N}\right) + (1-\alpha)\left(Y_s(i) - \hat{Y}\right)\right] e^{-\delta s} ds,$$

$$0 < \alpha < 1,\ \delta > 0, \tag{10}$$

where the subscripts refer to time. In Eq. (10), $\delta$ is the subjective discount rate.

Let $P_{nt}$, $P_{yt}$ and $P_{xt}$ be the three goods prices in terms of the economy's money at time $t$. Money, denoted $M$, is the only financial asset available to the economy's residents. Agent $i$'s money holdings, $M(i)$, increase with his net-of-tax rental income equal to $(1-\tau)\lambda(i)LR_t$, where $R_t$ is the land rental rate at time $t$. At the same time, money holdings decline with the agent's consumption expenditure $P_{nt}N_t(i) + P_{yt}Y_t(i)$ at time $t$. Formally, the change in agent $i$'s money holdings, $dM_t(i)$, at time $t$ is given by

$$dM_t(i) = (1-\tau)\lambda(i)LR_t - \left[P_{nt}N_t(i) + P_{yt}Y_t(i)\right]. \tag{11}$$

Money is necessary to conduct transactions. Reflecting the primary role of money in financing consumption expenditures, we will assume that agent $i$'s demand for money, $M_t(i)$, at time $t$ is subject to the following cash-in-advance constraint:

$$M_t \geq P_{nt}N_t(i) + P_{yt}Y_t(i). \tag{12}$$

In what follows, we will assume that the subjective discount rate, $\delta$, is so large that the cash-in-advance constraint in Eq. (12) is always binding. In the language of Feenstra (1985), this means that all agents are illiquid at all times. As a result, the agents' land rental incomes, money holdings and total consumption expenditures are all proportional to the land ownership share, $\lambda(i)$.

Again, we can derive agent $i$'s consumption levels $N(i)$ and $Y(i)$ of the two goods as follows:

$$N(i) = \alpha\left[\frac{M(i) - C}{P_n}\right] + \hat{N}, \tag{13}$$

$$Y(i) = (1 - \alpha)\left[\frac{M(i) - C}{P_y}\right] + \hat{Y}, \tag{14}$$

where now $C = P_n\hat{N} + P_y\hat{Y}$ and where time subscripts are deleted. All agents again are assumed to be able to purchase the minimum consumption basket consisting of quantities $\hat{N}$ and $\hat{Y}$ of the nontradeable and importable goods, which implies that $M(i) \geq C$ for all $i$. Aggregate consumption levels of the two goods, $N$ and $Y$, now are as in Eqs. (13) and (14) without the agent index $i$, while $M$ stands for aggregate money holdings.

Below, we consider policy interventions through changes in $P_y$ that leave all relative prices not involving the importable good unchanged. In this instance, the simple production technology immediately implies that we have $P_n = P_x = R$ throughout. Let us define the internal (external) real exchange rate as the price of the importable good in terms of the nontradeable (exportable) good, i.e. as $P_y/P_n$ ($P_y/P_x$). As we have $P_n = P_x$, the two real exchange rates will always be equal. Let us use $\theta$ to denote either real exchange rate. The real exchange rate variable, $\theta$, clearly equals the world price of the importable in terms of the exportable, $\hat{\theta}$, in the absence of any policy intervention.

The real exchange rate, $\theta$, is implemented by way of a system of multiple exchange rates with separate exchange rates for imports and exports. If the foreign currency price of the importable good, $Y$, is unity, then the domestic currency price of the importable, $P_y$, equals the nominal import exchange rate by the law of one price. We can thus refer to $P_y$ as the nominal import exchange rate. If $P_y$ is set below $P_x\hat{\theta}$, then the real exchange rate, $\theta$, is reduced below $\hat{\theta}$, and vice versa. Many countries, indeed, maintain separate exchange rates for import and export transactions. [6]

With $\theta$ less than $\hat{\theta}$, the exchange authorities are incurring a budgetary loss on their foreign exchange operations equal to $(\hat{\theta} - \theta)Y$ in terms of the nontradeable good, $N$. Government spending other than on foreign exchange operations in terms of the nontradeble good is equal to $G$, while the government generally taxes rental income at a rate $\tau$. In addition, the government may print money in order to balance the budget. The government budget constraint is now given as follows:

$$\frac{dM}{P_n} + \tau L = (\hat{\theta} - \theta)Y + G. \tag{15}$$

[6] In 1995, 29 countries in particular maintained separate import and export exchange rates. See the IMF (1995).

Noting the static resource constraint $L = N + \hat{\theta} Y + G$ and expressions (13) and (14) for $N$ and $Y$, we can obtain the following implicit expression for the real exchange rate $\theta$: [7]

$$\theta = \frac{L' - (1-\alpha)\hat{\theta}\left[\dfrac{M}{P_y} - \dfrac{\hat{N}}{\theta} - \hat{Y}\right]}{\alpha\left[\dfrac{M}{P_y} - \dfrac{\hat{N}}{\theta} - \hat{Y}\right]} \tag{16}$$

where $L' = L - \hat{N} - \hat{\theta}\hat{Y} - G$ as before.

Expression (16) implies that a devaluation of the nominal import exchange rate, $P_y$, also leads to a real exchange rate devaluation for a given money supply $M$, as totally differentiating Eq. (16) yields $\mathrm{d}\theta/\mathrm{d}P_y < 0$. At the same time, money creation leads to a real exchange rate appreciation for a given nominal exchange rate $P_y$, as $\mathrm{d}\theta/\mathrm{d}M < 0$. Eqs. (15) and (16) and the expression for, $Y$, as in Eq. (14) together imply the following rate of real money creation in terms of the nontradeable:

$$\frac{dM}{P_n} = G - \tau L + \frac{(1-\alpha)(\hat{\theta} - \theta)}{\alpha\theta + (1-\alpha)\hat{\theta}} L' + (\hat{\theta} - \theta)\hat{Y}. \tag{17}$$

Expression (17) confirms that an appreciation of the real exchange rate leads to a larger rate of real money creation, for given values of $G$ and $\tau$. Note that a higher government spending, $G$, or a lower tax rate, $\tau$, also lead to a larger real money creation. At the same time, real money creation decreases with $\hat{N}$, and it increases with $\hat{Y}$ for a given value of $\theta$ less than $\hat{\theta}$. [8] If in fact $dM > 0$, then Eq. (16) implies that the real exchange rate, $\theta$, falls over time, while Eq. (17) in turn implies that the rate of real money creation, $dM/P_n$, rises over time. As $\theta$ falls, the rate of money creation in terms of the importable good, $dM/P_y$, equally increases. Note that ongoing money creation against a background of a fixed nominal import exchange rate stimulates the consumption of the importable good, $Y$. To finance these additional imports, exports have to rise. This is accomplished by a shift in production from the nontradeable to the exportable sectors.

Again, we can consider how agent i's instantaneous utility, denoted $V(\theta, i)$, depends on the domestic importables price, $\theta$, and on the individual's ranking in

[7] Note that we abstract from the possibility of international capital flows.

[8] Specifically, we can find from Eq. (3) that

$$\frac{\mathrm{d}(\mathrm{d}M/P_n)}{\mathrm{d}\hat{N}} = -\frac{(1-\alpha)(\hat{\theta} - \theta)}{\alpha\theta + (1-\alpha)\hat{\theta}} < 0 \text{ and } \frac{\mathrm{d}(\mathrm{d}M/P_n)}{d\hat{Y}} = \frac{\alpha\theta(\hat{\theta} - \theta)}{\alpha\theta + (1-\alpha)\hat{\theta}} > 0.$$

the overall income distribution. Using Eqs. (1), (13), (14) and (16), we can express $V(\theta, i)$ as follows:

$$V(\theta, i) = \log\left(\alpha^{\alpha}(1-\alpha)^{1-\alpha}\right) + \alpha \log(\theta) + \log\left(\frac{M(i) - C}{P_y}\right). \tag{18}$$

Expression (18) now indicates that an appreciation of the real exchange rate, i.e. a lowering of $\theta$, other things equal reduces instantaneous utility, as it entails a higher nontradeable price, $P_n$, while the individual's welfare clearly increases with his own money holdings, $M(i)$. To see how exchange rate policy affects individual welfare, we can differentiate $V(\theta, i)$ with respect to $P_y$ to yield,

$$\frac{dV(\theta, i)}{dP_y} = \alpha L' \frac{\left[\frac{M}{(P_y)^2} + \frac{d(1/\theta)}{dP_y}\hat{N}\right]}{\left[\frac{M-C}{P_y}\right]\left[L' - (1-\alpha)\hat{\theta}\left[\frac{M-C}{P_y}\right]\right]} - \frac{\left[\frac{M(i)}{(P_y)^2} + \frac{d(1/\theta)}{dP_y}\hat{N}\right]}{\left[\frac{M(i)-C}{P_y}\right]} \tag{19}$$

where $P_x$ and thus $\theta = P_y/P_x$ respond to changes in $P_y$ to satisfy the overall resource constraint.

Eq. (19) implies that the qualitative impact of changes in $P_y$ on individual welfare depends on the size of individual money holdings, $M(i)$, relative to aggregate money holdings, $M$. To see this, let us first consider how exchange rate policy affects the mean voter, i.e. the voter $i$ for whom $M(i) = M$. First note that if $\theta = \hat{\theta}$, then expression (16) implies that $P_n = M/(L - G)$ and $P_y = M\hat{\theta}/(L - G)$. The expression for $P_y$ and Eq. (19) together now imply that $dV(\theta, i)/dP_y = 0$ if $\hat{\theta} = \theta$ with $M(i) = M$. The mean voter thus cannot benefit from an exchange rate policy that causes $\theta$ to diverge from $\hat{\theta}$. The mean voter, in other words, cannot benefit from exchange rate misalignment. Next, let us consider a voter $i$, who is poorer than the mean voter, i.e. for whom $M(i) < M$. Comparing static outcomes without monetary finance, we can show that

*Proposition 2. A voter poorer than the mean voter benefits from a reduction in the nominal import exchange rate, $P_y$, if spending on the importable in the minimum consumption bundle is relatively large so that $\alpha\hat{\theta}\hat{Y} > (1-\alpha)\hat{N}$. If so, a reduction in $P_y$ results in a reduction in the price of the minimum consumption bundle of the importable and nontradeable goods, i.e. $\hat{Y}dP_y + \hat{N}dP_n < 0$ if $dP_y < 0$.*

The proposition implies that more than half of the electorate can benefit from a real exchange rate appreciation starting from $\theta = \hat{\theta}$ if the median voter is poorer than average.

Now let us turn to voting on exchange rate policy. Voting is assumed to occur at regular intervals. The political equilibrium depends importantly on what is voted on. In this regard, we can distinguish whether (i) there in fact exists an unrestricted rental income tax and whether (ii) people vote periodically on a fixed nominal import exchange rate or on a prospective path of the nominal import exchange rate in the form of a preannounced exchange rate tablita. As a benchmark, we can consider that there is an unrestricted rental income tax and that voters decide periodically on a fixed nominal import exchange rate. In this instance, the monetary model is potentially fully equivalent to the real model of Section 2. Analogously to Proposition 1(i), the relatively poor median voter is decisive. This voter in particular selects a nominal import exchange rate, $P_y$, so as to effect his optimal real exchange rate, $\theta_m^*$, as in Proposition 1(ii).

Next, let us assume that the rental income tax rate, $\tau$, is restricted to, say, zero. The median voter, however, can select a rate of nominal exchange rate depreciation that in equilibrium equals the rate of money creation. In this instance, the median voter can set $P_y$ such that $\theta = \theta_m^*$, while the rate of depreciation and money creation is set so as to maintain the equality $\theta = \theta_m^*$. In this scenario, again the monetary model in practice is fully equivalent to the real model of Section 2, and Proposition 1 applies. All real variables, in particular, are constant, while all nominal variables increase at the constant rate of money creation. Note that in this and in the previous scenario the length of the political cycle is immaterial.

Finally, let us assume that again the rental income tax rate, $\tau$ is restricted to zero, while the electorate can only select a value of the nominal exchange rate to be maintained until the next vote. If $\tau = 0$ and also $G = 0$, then monetary finance will be called for if voters select $P_y$ so that initially $\theta < \hat{\theta}$. In this instance, the printing of money leads to a gradual appreciation of the real exchange rate until the next adjustment of the nominal exchange rate, $P_y$. In essence, voters now have to decide between a constant real exchange rate equal to $\hat{\theta}$, or a path of a continuously appreciating real exchange rate over the political cycle.

Let the median voter again be poorer than average. It is then straightforward to show that there will indeed be a political exchange rate cycle. To see this, let $\theta_b$ be the real exchange rate at the beginning of the cycle. The dynamics of monetary finance and of price formation and the length of the political cycle then together determine the real exchange at the end of the political cycle, denoted $\theta$. It is possible to select $\theta_b$ just less than $\hat{\theta}_e$ such that $\theta_m^* < \theta_e < \theta_b < \hat{\theta}$. Such an exchange rate cycle will clearly be preferred to a constant real exchange rate of $\hat{\theta}$ by median income agents and by all poorer agents. It follows that a political exchange rate cycle will indeed be implemented. If we assume that $\hat{N} = 0$, then from Eq. (A.1) in the appendix we can easily see that $dV(\theta, i)/d\theta > 0$ for $\lambda(i) > 1$ and $\theta \leq \hat{\theta}$, while the preferences of the majority of agents with $\lambda(i) < 1$

remain single-peaked. In this instance, the political exchange rate cycle will be such that the real exchange rate, $\theta_m^*$, preferred by the median voter lies between the beginning and ending real exchange rates, $\theta_b$ and $\theta_e$, as follows:

$$\theta_e < \theta_m^* < \theta_b < \hat{\theta}. \tag{20}$$

The voting outcome satisfies Eq. (20), as any alternative characterized by either $\theta_b \leq \theta_m^*$ or by $\theta_e \geq \theta_m^*$ will be valued less than a range of paths characterized by Eq. (20) by at least half of the electorate. With $\theta_e > \theta_m^*$, for instance, the median voter as well as all poorer agents will have lower welfare than would be possible from various paths characterized by Eq. (20), even if the median voter and all poorer voters prefer such paths to a constant real exchange rate equal to $\hat{\theta}$. Note that the exchange rate cycle will be recurrent, as the incentive to effect a renewed cycle remains at each vote. [9] These result are summarized as follows:

*Proposition 3. In the absence of sufficiently high income taxes, periodic voting on the level of the nominal import exchange rate can give rise to recurrent real exchange rate cycles, where the real exchange rate appreciates over the political cycle.*

Note from Eqs. (16) and (17) that the rate of real money creation increases over the electoral cycle, as the real exchange rate appreciates. At the same time, the consumption of importables rises over the period, while the consumption of nontradeables declines. To maintain external balance, the volume of exports has to increase. The instantaneous welfare of the median voter first rises over the electoral cycle until the real exchange rate reaches $\theta_m^*$, and then falls. The welfare of voters richer (poorer) than the median voter peaks earlier (later) than the welfare of the median voter. Note that the median voter prefers a constant real exchange rate equal to $\theta_m^*$ to any real exchange rate cycle. Cycles, therefore, will cease to exist if the monetary finance can be replaced by a higher level of rental income taxation.

Evidence of the existence of real exchange rate cycles can be found in Edwards (1988), who presents time series of the real exchange rates for 12 developing countries over the period 1964–1985. For many of these countries, the graphs are characterized by periodic large real devaluations, effected by nominal devaluations, followed by gradual real exchange rate appreciations. The real exchange rates of Brazil, Israel, India, and the Philippines, for instance, display such patterns. Brazilian real exchange rate cycles appear to be relatively short at about three years. The length of the Isreali cycle is closer to four years, while the Indian and Philippine cycles appear to last about a decade. In the second half of the

[9] Alesina and Drazen (1991), instead, consider the political aspects of a once-and-for-all stabilization of an unsustainable economic policy.

1980s, the pace of Brazilian real exchange rate-cum-inflation cycles appears to have quickened. Brazil, in particular, experienced four consecutive real exchange rate-cum-inflation stabilization plans between January 1986 and April 1990. Over this almost five year period, Brazilian inflation displayed a regular, saw-like pattern. [10]

Edwards (1993, p. 35) further provides evidence on the political timing of exchange rate adjustments. The evidence confirms that major devaluations by democratic regimes in developing countries tend to take place relatively quickly after a transfer of power. For parliamentary democracies, 70 percent of the devaluations considered, in particular, occurred within two years after the transfer of government, while only 20 percent of devaluations occurred one year or less time before the next government transfer. Devaluations may quickly follow the transfer of power, as democratic regimes are perceived to be strongest in the early years of their administrations. Early devaluations also have the advantage that their causes can more easily be blamed on the regime's predecessor.

Next, let us consider how nominal and real goods prices in the economy are affected by growth in real factor income, as indicated by a larger value of $L'$. All agents' factor incomes are in fact assumed to increase proportionately. In the absence of monetary finance, growth in factor incomes affects nominal and real goods prices as follows:

*Proposition 4.* *With* $\hat{Y} > 0$ *and* $\hat{N} = 0$, *an increase in* $L'$ *has the following implications:*

$$\frac{dP_y}{dL'} < 0, \quad \frac{dP_x}{dL'} < 0, \quad \frac{d\theta}{dL'} > 0.$$

According to the proposition, larger overall resources lead to a reduction in the goods prices $P_x = P_n$ and $P_y$. Interestingly, the economic expansion leads to a devaluation of the real exchange rate, $\theta$, which reflects that income growth leads the median voter to prefer a smaller degree of real exchange rate overvaluation – all for a given relative interpersonal income distribution. The rationale is that average expenditure shares on nontradeables and importables become more alike, as society grows wealthier. As a result, the median voter has less to gain from relative price distortions implicit in exchange rate overvaluation. The role of exchange rate policy as a redistributive device indeed appears to be more important in developing countries than in the developed countries.

Throughout this section, we have assumed that there is a system of multiple legal trade exchange rates. The model, however, also applies to countries that have

[10] See Mondino and Sturzenegger (1992, Fig. 7). Inflation specifically fell after the Cruzado plan of January 1986, the Bresser plan of May 1987, the Summer plan of December 1988, and the Collor plan of April 1990.

a single fixed nominal official exchange rate, but limit the range of transactions that can be conducted at this exchange rate. The remainder of international transactions then are valued at the (black) market exchange rate. The government may, for instance, maintain lists of sanctioned and of proscribed imports. In some countries, the importation of various luxury items, for instance, is forbidden. In this setting, prospective importers are able to obtain foreign exchange at the official exchange rate only for approved imports. The model of this paper applies immediately to this situation, if nontradeable consumption is replaced by the consumption of non-approved imports. As before, we can maintain that there is no domestic production of importable goods. The variable $\theta$ now is the ratio of the official import exchange rate to the (black) market exchange rate for non-approved imports. This market exchange rate also applies to exports, unless there are strictly enforced export surrender requirements that force exporters to surrender their export earnings at the more appreciated official exchange rate. [11] In this guise, the model predicts the path of the (black) market exchange rate premium over the political cycle. The model, specifically, indicates that the black market premium is smallest after a devaluation of the official exchange rate, while the premium gradually increases until the next official exchange rate devaluation. It would be interesting to see to what extent empirical evidence can confirm that the black market exchange rate premium rises over the political cycle.

The equivalence between exchange rate management with multiple exchange rates and certain fiscal policies implies that exchange rate policy can be used instead of or in combination with direct fiscal measures to effect the politically desired relative goods prices facing consumers. In practice, developing countries in particular appear to use a mix of exchange rate, trade and tax policies to affect the relative prices of the various nontradeable and tradeable goods. [12] Krueger et al. (1991) have compiled an exhaustive survey of the combined impact of exchange rate, trade and tax policies on the wedge between internal and external prices of various tradeable goods, particularly in the agricultural sector, for a large number of developing countries. These wedges, of course, have immediate implications for relative goods prices faced by consumers. The authors explain the various explicit and implicit price interventions on the basis of political economy rather than as consistent with some overall optimal tax structure. In each of the

[11] In the presence of export earnings surrender requirements, only part of the export earnings may in fact go to the non-official exchange market. Similarly, part of the foreign exchange for non-approved imports may be obtained at the official exchange rate through overinvoicing of approved imports. These issues are not considered here.

[12] The redistributive implications of exchange rate policy on account of income differences in the case of non-homothetic preferences have received little attention. The redistributive implications of tax policies that affect relative goods prices are, of course, central to the analysis of commodity taxation. See, for instance, Majumder (1988).

country studies, the implications of the overall scheme of price interventions for the distribution of income are drawn out.

Egypt has applied the full range of exchange rate, trade and tax policies to depress the relative price of especially imported foods in the 1970s, as documented by Scobie (1983). In addition to outright subsidies for imported foods such as grains, butter, sugar and tea, Egypt maintained a multiple exchange rate system with a relatively appreciated exchange rate for food imports. In 1981, the official exchange rate for food imports, for instance, was 1.43 US$/LE, while it was 1.19 US$/LE for non-food imports. As a result of the various policies, the Egyptian market prices of imported foods, such as wheat and rice, were about half of world prices in the 1979–1980 period. [13] Consistent with the model, Egypt financed its food imports to some extent with specific exports such as oil and cotton that by themselves do not represent a main part of the consumption bundle. These exports were taxed by the authorities. The authorities also used monetary finance to finance the food imports, resulting in an accelerating inflation in the late 1970s. In addition, the country incurred large foreign debts in maintaining its relatively appreciated exchange rate for food imports.

## 4. Conclusion

Developing countries frequently suffer from recurring episodes of real exchange rate overvaluation accompanied by monetary finance. Such episodes are puzzling, because it can hardly be the case that developing country policy makers do not know how to reverse overvaluations, or that they believe that real exchange overvaluation generally improves economic efficiency and welfare. This paper takes the view that apparent disequilibrium exchange rate policies are pursued, because those in the middle of the political spectrum benefit from such policies at the expense of others. Overvaluation in the present model implies that tradeables, and more specifically importables, are inexpensive relative to nontradeables. Such overvaluation benefits relatively poor agents, as the evidence suggests that poor agents spend relatively little on nontradeables. In the model, overvaluation benefits the median voter if he is poorer than the mean voter. In practice, the overvaluation can result from a combination of tax policy and exchange rate policy.

This paper has assumed that there is no rationing of foreign exchange intended for purchases of importables at the stated nominal import exchange rate. Many countries, of course, ration foreign exchange for import purposes in a myriad of ways. Clearly, differential access to official foreign exchange can explain differences in people's enthusiasm for various exchange rate policies. It would be

[13] See Alderman et al. (1982, Tbl. 30).

interesting to extend the present model to incorporate rationing of foreign exchange available at the overvalued official exchange rate. The relatively wealthy and powerful may stand a better chance of obtaining rationed foreign exchange than the poor and unpowerful. If so, rationed foreign exchange is more likely to be used for the importation of luxury items than for the importation of basic necessities. In some countries, a relatively appreciated import exchange rate, therefore, may coexist with luxury imports. Empirical work perhaps can shed light on the extent to which this is the case.

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## Appendix A. Proof of Propositions

*Proof of Proposition 1.* Part (i). We can multiply $dV(\theta, i)/d\theta$ in Eq. (9) by $(1-\tau)L_i - \hat{N} - \hat{\theta}\hat{Y} > 0$ to yield

$$-\frac{1-\alpha}{\theta}\left[(1-\tau)L_i - \hat{N} - \theta\hat{Y}\right] + L_i\left[-\frac{d\tau}{d\theta}\right] - \hat{Y} = 0.$$

After substituting for $(1-\tau)$ and $d\tau/d\theta$ from Eq. (6) and Eq. (7) and after rearranging, we obtain

$$[\lambda(i)-1]\left[\alpha\hat{Y} - (1-\alpha)\frac{\hat{N}}{\theta}\right] + \lambda(i)L' \cdot \frac{\alpha(1-\alpha)(\hat{\theta}-\theta)}{\left[\alpha\theta + (1-\alpha)\hat{\theta}\right]^2} = 0. \quad \text{(A.1)}$$

If $\lambda(i) = 1$, then it is clear from Eq. (A.1) that $dV(\theta, i)/d\theta \lesseqgtr 0$ as $\theta \gtreqless \hat{\theta}$, which implies that for agents with $\lambda(i) = 1$ preferences are single-peaked. If $\lambda(i) < 1$, then Eq. (A.1) implies that $dV(\theta, i)/d\theta < 0$ with $\theta = \hat{\theta}$. At the same time, $dV(\theta, i)/d\theta = 0$ has no solution for $\theta$ if $\theta > \hat{\theta}$, while there is at most one solution if $\theta < \hat{\theta}$. The implication is that agents with $\lambda(i) < 1$ also have single-peaked preferences. Finally, if $\lambda(i) > 1$, then Eq. (A.1) shows that $dV(\theta, i)/d\theta > 0$ if $\theta = \hat{\theta}$ or if $\theta = (1-\alpha)\hat{N}/\alpha\hat{Y}$, while $dV(\theta, i)/d\theta = 0$ has no solution for $(1-\alpha)\hat{N}/\alpha\hat{Y} < \theta < \hat{\theta}$. It follows that agents with $\lambda(i) > 1$ have single-peaked preferences over the restricted range where $(1-\alpha)\hat{N}/\alpha\hat{Y} \leq \theta \leq \hat{\theta}$. Note that for all agents $dV(\theta, i)/d\theta > 0$ if $\theta = (1-\alpha)\hat{N}/\alpha\hat{Y}$. As for the median income voter $\lambda(0.5) < 1$, this voter is decisive.

Part (ii). Note from Eq. (9) that

$$\frac{d^2V(\theta,i)}{d\theta dL_i}=0 \quad \text{if} \quad \left[-\frac{d\tau}{d\theta}\right]/\hat{Y}=(1-\tau)/(\hat{N}+\hat{\theta}\hat{Y}).$$

Substituting for $(1-\tau)$ and $d\tau/d\theta$ from Eqs. (6) and (7), we see that this condition implies $\theta=\theta'$, with $\theta'=\sqrt{(1-\alpha)\hat{N}\hat{\theta}/(\alpha\hat{Y})}$. Note that $(1-\alpha)\hat{N}/\alpha\hat{Y}<\theta'<\hat{\theta}$. With $\theta=\theta'$, we have using Eq. (9),

$$\frac{dV(\theta,i)}{d\theta}=-\frac{(1-\alpha)}{\theta'}+\frac{\hat{Y}}{\hat{N}+\theta'\hat{Y}}=\frac{\alpha\theta'\hat{Y}-(1-\alpha)\hat{N}}{\theta'\left[\hat{N}+\theta'\hat{Y}\right]}>0.$$

This result and part (i) now imply that $\theta'<\theta_m^*<\hat{\theta}$.

Part (iii). From Eq. (9), we can see that

$$\frac{dV(\theta,i)}{d\theta dL_i}\gtrless 0, \quad \text{as} \quad \hat{Y}/[(-d\tau)/(d\theta)]\gtrless(\hat{N}+\theta\hat{Y})/(1-\tau).$$

If follows that

$$\frac{dV(\theta,i)}{d\theta dL_i}>0 \quad \text{if} \quad \theta>\theta'.$$

We further have $d^2V(\theta,0.5)/(d\theta)^2<0$ at $\theta=\theta_m^*$, as the median voter's preferences are single-peaked and as the median voter's preferred imports price, $\theta_m^*$, is finite according to part (ii). As $\theta_m^*>\theta'$, the result follows.

*Proof of Proposition 2.* As noted in the text, with $\theta=\hat{\theta}$ we have

$$P_n=\frac{M}{L-G}, \quad P_y=\frac{M\hat{\theta}}{L-G}.$$

After totally differentiating Eq. (16) and noting the above expressions for $P_n$ and $P_y$ and also Eqs. (13) and (14), we find that with $\theta=\hat{\theta}$,

$$\frac{dP_x}{dP_y}=-\frac{Y}{N}.$$

After substituting for $P_n$ and $P_y$ into Eq. (19), we find after rearranging that $dV(\theta,i)/dP_y<0$ is equivalent to

$$\frac{\dfrac{M}{(P_y)^2}+\dfrac{d(1/\theta)}{dP_y}\hat{N}}{\dfrac{M}{P_y}-\dfrac{N}{\hat{\theta}}-\hat{Y}}<\frac{\dfrac{M(i)}{(P_y)^2}+\dfrac{d(1/\theta)}{dP_y}\hat{N}}{\dfrac{M(i)}{P_y}-\dfrac{N}{\hat{\theta}}-\hat{Y}}.$$

After multiplying the above expression by the respective denominators, we get after simplifying,

$$M(i)\left[\frac{\mathrm{d}(1/\theta)}{\mathrm{d}P_y}\hat{N}+\frac{1}{P_y}\left(\frac{\hat{N}}{\hat{\theta}}+\hat{Y}\right)\right]<M\left[\frac{\mathrm{d}(1/\theta)}{\mathrm{d}P_y}\hat{N}+\frac{1}{P_y}\left(\frac{\hat{N}}{\hat{\theta}}+\hat{Y}\right)\right].$$

If we take $M(i)<M$, then the above is equivalent to

$$\frac{\mathrm{d}(1/\theta)}{\mathrm{d}P_y}\hat{N}+\frac{1}{P_y}\left(\frac{\hat{N}}{\hat{\theta}}+\hat{Y}\right)>0.$$

Noting that $\theta=P_y/P_x$, the above is equivalent to

$$\frac{\hat{Y}}{\hat{N}}>\frac{-\mathrm{d}P_x}{\mathrm{d}P_y}\left(=\frac{Y}{N}\right).$$

Finally noting Eqs. (13) and (14), we get

$$\frac{\hat{\theta}\hat{Y}}{\hat{N}}>\frac{1-\alpha}{\alpha}.$$

*Proof of Proposition 4.* First from Eq. (19) we can check that with $\mathrm{d}V/\mathrm{d}P_y=0$ we have

$$\frac{\mathrm{d}^2V}{\mathrm{d}P_y^2}<0,\quad \frac{\mathrm{d}^2V}{\mathrm{d}P_y\mathrm{d}L}<0.$$

If $M(i)<M$, we conclude that $\mathrm{d}P_y/\mathrm{d}L<0$. Next note that Eqs. (16) and (19) allow us to derive the following implicit expression for $\theta$:

$$\frac{\theta}{\alpha\theta+(1-\alpha)\hat{\theta}}=\frac{\left(\frac{M}{P_y}-\frac{M}{M(i)}\hat{Y}\right)}{\left(\frac{M}{P_y}-\hat{Y}\right)}.$$

Using this expression, we now obtain $\mathrm{d}\theta/\mathrm{d}L>0$. Noting that $\theta=P_y/P_x$, we finally obtain $\mathrm{d}P_x/\mathrm{d}L<0$.

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