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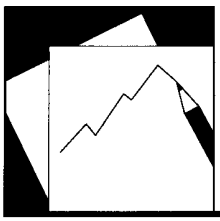

# IMF Working Paper

# Fiscal Policy and the Exchange Rate-Current Account Nexus

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# Fiscal Policy and the Exchange Rate-Current Account Nexus

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## Abstract



By using a simple intertemporal model of the current account, I show that the exchange rate elasticity of the trade balance would ceteris paribus be smaller for countries with higher government spending ratios (relative to GDP) and with more limited scope for private consumption smoothing. This finding may have important implications for the design of adjustment programs and for resolving current global imbalances. It could also help explain and reconcile mixed empirical findings on trade elasticities.

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## I. INTRODUCTION

Both theory and empirical evidence suggests that fiscal policy is likely to matter for external adjustment. The role of fiscal policy in external adjustments is evident from the national income identity by which the current account is characterized as the investment-saving gap. Since the fiscal balance is part of the gap, fiscal tightening directly improves the external balance although the final effect could be more or less than proportional depending on the endogenous interaction between public and private sector adjustments.

In the trade elasticities approach, the role of fiscal policy in external adjustment is not explicitly seen but implicitly assumed. Given the partial equilibrium nature of the approach, trade elasticities yield the impact on the trade balance of a *given* movement of the exchange rate abstracting from how that exchange rate movement comes about. In this context, the role of fiscal policy is implicit via the effect on the exchange rate and/or on economic activity. Similarly, the conventional macroeconomic models also characterize the current account as a function of national income and the real exchange rate with no specific role of fiscal policy.[2]

What is less evident in the literature is the potential interaction between fiscal policy and the exchange rate elasticity of the trade balance. The trade elasticities approach typically assumes that the exchange rate elasticity of trade is invariant to fiscal policy (and other macroeconomic policies). At least in theory, however, fiscal policy might interact with the slope of the trade balance by, for instance, changing the composition of aggregate absorption. If government spending and private consumption differs in the exchange rate sensitivity, the slope of the trade balance would not be invariant to changes in the composition of aggregate absorption.

Better understanding of the interaction between fiscal policy and the exchange rate in external adjustment would help improve the design of adjustment programs in which expenditure-reducing policies such as fiscal tightening are often combined with the exchange rate correction for expenditure switching. It could also help explain and reconcile mixed empirical findings on the price elasticity of trade.[3] Fiscal policy variables are often included in the estimation of trade elasticity, but they are typically considered as a control for covariates affecting the level, rather than the slope, of the trade balance. If fiscal policy interacts with the exchange rate elasticity of trade, more precise estimates of the exchange rate elasticity of the trade balance could be obtained by allowing for cross-country variation in the slope of the trade balance related to fiscal policy stance.

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[2] The role of fiscal policy would of course be borne out in a fully worked-out model, but it is often too model-specific and complex to provide useful guidance on the design of adjustment programs.

[3] See IMF (2006) for a survey of the empirical literature on trade elasticity and the references therein.

This paper investigates the link between fiscal policy and the exchange rate elasticity of the trade balance by using a simple intertemporal model of the current account. The model used in the paper is a simple extension of the model developed by Dornbusch (1983) and further elaborated by Obstfeld and Rogoff (1996). In the model, there are two goods—traded and nontraded—that are produced by using (fixed) capital and labor, the latter being mobile across sectors. Both consumers and the government have access to external capital markets. The government levies the income tax and issues external debt to finance government spending on both goods.

The model suggests that the exchange rate elasticity of the trade balance would ceteris paribus be smaller the larger the government spending relative to GDP. The key intuition for this result is closely related to the stylized fact that government spending is more strongly (and positively) correlated with GDP than private consumption as the latter is smoothed intertemporally while the former is not. Therefore, the comovement between output and absorption would be stronger the larger the government spending relative to GDP. Assuming that the real exchange rate affects both tradable output and absorption, stronger comovement between output and absorption would imply a weaker response of the trade balance—which is the difference between output and absorption—to the real exchange rate.

The same intuition also suggests that the exchange rate elasticity of the trade balance would be, all else equal, smaller for emerging market countries than for advanced countries. The scope for intertemporal consumption smoothing is in general more limited for emerging market economies because of limited market access. As a result, the correlation between tradable absorption and output is likely to be stronger and thus the trade balance is likely to be less sensitive to the real exchange rate for emerging market countries. These findings may have important implications for resolving current global imbalances.

The remainder of the paper is organized as follows. Section II presents the model. Section III discusses the role of fiscal policy in the determination of the exchange rate-current account nexus. Section IV concludes the paper.

## II. THE MODEL

Consider a small open economy that produces and consumes two composite goods, tradables and nontradables. There is a continuum of consumers whose total mass is normalized to 1. Consumers are also producers of the two goods. Outputs are produced by using labor and a fixed amount of capital. Total labor force of the economy is fixed and normalized to 1. Labor is freely mobile between sectors. Domestic prices are fully flexible.

The government levies income tax and issues external debt to finance government spending which is exogenously given and does not enter into the utility of consumers. For simplicity, domestic government debt is ignored as it is netted out with private domestic assets when the budget constraint is consolidated for the country as a whole. Both the government and consumers can lend or borrow externally at the fixed world real interest rate $r$.

The production function for tradable and nontradable outputs, denoted by $Y^T$ and $Y^N$ respectively, is specified as

$$(1) \qquad Y^T = A^T L^{1-\alpha} \quad \text{and} \quad Y^N = A^N (1-L)^{1-\alpha}, \qquad 0 < \alpha < 1$$

where *L* represents the share of labor employed in the production of tradables, and $A^T$ and $A^N$ refer to productivity which is exogenous.

Labor mobility implies that real wage or the value of marginal product of labor be equalized across sectors in equilibrium. Given this equilibrium condition, tradable and nontradable outputs are characterized by

$$(2) \qquad \begin{aligned} Y^T &= f^T(p) = A^T[1+(Ap)^{1/\alpha}]^{-(1-\alpha)} \\ Y^N &= f^N(p) = A^N(Ap)^{1/\alpha}[1+(Ap)^{1/\alpha}]^{-(1-\alpha)} \\ Y &= Y^T + pY^N = f(p) = A^T[1+(Ap)^{(1+\alpha)/\alpha}][1+(Ap)^{1/\alpha}]^{-(1-\alpha)} \end{aligned}$$

where $A = A^N / A^T$ is the relative productivity, and $p$ is the price of nontraded good in units of traded good or, equivalently, the real exchange rate. Note that $f^{T\prime}(p) < 0$ and $f^{N\prime}(p) > 0$ while the sign of $f'(p)$ is indeterminate.

The utility function of the representative consumer is given by

$$(3) \qquad V_t = \sum_{s=t}^{\infty} \beta^{s-t} E_t \left[ \{C_s^{1-\theta} - 1\} / (1-\theta) \right], \qquad 0 < \beta < 1, \quad C_s = H (C_s^T)^{1-\gamma} (C_s^N)^{\gamma}$$

where $C^T$ and $C^N$ refer, respectively, to consumption of traded and nontraded goods, and $\theta = 1/\sigma$ is the inverse of the intertemporal elasticity of substitution. The index of consumption $C$ takes a Cobb-Douglas functional form with $0 < \gamma < 1$ and proportionality constant $H = \gamma^{-\gamma}(1-\gamma)^{-(1-\gamma)}$. The parameter $\gamma$ is a measure of home bias in consumption expenditure.

The representative consumer maximizes (3) subject to the budget constraint

$$(4) \qquad \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (C_s^T + pC_s^N) = (1+r) B_t^P + \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (1-\tau_s) Y_s$$

where $\tau$ is the income tax rate which is common for both tradable and nontradable outputs. $B^P$ refers to net foreign asset of the private sector.

Given that the utility function is homothetic, the utility maximization results in the income expansion path which is linear with a constant expenditure share of traded and nontraded goods. Specifically, the following relationships hold:

(5) $$Z \equiv C^T + pC^N = p^\gamma C, \quad C^T = (1-\gamma)Z, \quad \text{and} \quad pC^N = \gamma Z$$

where $Z$ is consumption expenditure in units of traded good. By using the first result, the consumer price index in units of traded good is defined by $q = Z/C = p^\gamma$, which in conceptual terms corresponds to the CPI-based real exchange rate.

The Euler equation that characterizes the optimal consumption profile is characterized by

$$C_{t+1}/C_t = \beta^\sigma[(1+r)(q_t/q_{t+1})]^\sigma = \beta^\sigma(1+r_t^H)^\sigma$$

where $1+r_t^H = (1+r)(q_t/q_{t+1})$ is the consumption-based (gross) home interest rate which reflects developments in the real exchange rate. The home interest rate exceeds (falls below) the world interest rate if the real exchange rate is expected to depreciate (appreciate), a result consistent with the uncovered real interest rate parity.

In what follows, we assume that $\beta = 1/(1+r)$ to simplify the analysis by abstracting from the issue of consumption tilting or the issue of permanent current account imbalances. Given this assumption and using (6), the Euler equation for traded and nontraded goods consumption is analogously given by

(6) $$C_{t+1}^T/C_t^T = p_{t+1}C_{t+1}^N/p_tC_t^N = Z_{t+1}/Z_t = (p_{t+1}/p_t)^{\gamma(1-\sigma)}$$

Present consumption on traded goods falls relative to future consumption when the real exchange rate is expected to appreciate if $\sigma < 1$ but the opposite relationship arises if $\sigma > 1$. If $\sigma = 1$, consumption on traded goods remains flat over time and unaffected by changes in the real exchange rate.

The government's intertemporal budget constraint is given by

(7) $$\sum_{s=t}^{\infty}(1+r)^{-(s-t)}\left[g_s^TY_s^T + g_s^NpY_s^N\right] = (1+r)B_t^G + \sum_{s=t}^{\infty}(1+r)^{-(s-t)}\tau_sY_s$$

where $g^T$ and $g^N$ are government spending on traded and nontraded goods relative to their respective outputs, and $B^G$ represents net foreign asset of the government. In contrast to a common income tax rate, different spending ratios are allowed in order to examine the effect of home bias in government spending on the exchange rate-current account nexus.

Equilibrium in the nontraded goods market requires for each period,

(8a) $$(1-g^N)Y^N = C^N$$

By using (5), this equilibrium condition can be transformed into an equilibrium relationship between nontradable output and tradable consumption:

$$C^T = \gamma^{-1}(1-\gamma)(1-g^N)pY^N \tag{8b}$$

Finally, the intertemporal budget constraint of the economy as a whole can be obtained by combining (5), (7), and (8a):

$$\sum_{s=t}^{\infty}(1+r)^{-(s-t)}C_s^T = (1-\gamma)\left[(1+r)B_t + \sum_{s=t}^{\infty}(1+r)^{-(s-t)}(1-g_s^T)Y_s^T\right] \tag{9}$$

where $B_t = B_t^P + B_t^G$ is the net foreign asset of the economy as a whole. The consolidated budget constraint exhibits the Ricardian equivalence: for a given path of government spending, changes in the time profile of income tax does not alter aggregate consumption on traded goods.[4] It also suggests that the presence of nontraded goods affects traded goods consumption and thus the current account only by influencing the path of the relative price.

## III. Fiscal Policy in the Exchange Rate-Current Account Nexus

It should be noted at the outset that the exchange rate-current account nexus or trade elasticity is a partial-equilibrium concept as it measures the change in the current account or trade balance for a *given* change in the real exchange rate.

The current account or external borrowing is the difference between total income and absorption, and in equilibrium, it is the difference between tradable income and tradable absorption. In accounting terms, it is the sum of factor income and trade balance. Thus, the current account is represented by

$$\begin{aligned} CA_t = B_{t+1} - B_t &= rB_t + (1-g_t^T)Y_t^T - C_t^T \\ &= rB_t + \left[(1-g_t^T)Y_t^T - \gamma^{-1}(1-\gamma)(1-g_t^N)p_tY_t^N\right] \\ &= rB_t + TB_t \end{aligned} \tag{10}$$

where the second equality follows from (8) and *TB* refers to the trade balance.

Discussions on the exchange rate-current account nexus are typically centered around the estimation of trade elasticity. Moreover, external adjustments are typically geared toward improved trade balance. In this light, the analysis focuses hereafter on the slope of the trade balance with respect to the real exchange rate. For better mapping with empirical estimates of

[4] The Ricardian equivalence holds despite the distortionary income tax because the total labor supply is inelastic and the consumers' utility depends only on consumption.

trade elasticity, it would be useful to express the trade balance as a share of GDP. Dividing the expression for *TB* in (11) by total output ( $Y = Y^T + pY^N$ ) and substituting from (2) yields

$$(11) \qquad tb_t = \frac{(1-g_t^T) - \gamma^{-1}(1-\gamma)(1-g_t^N)(A_t p_t)^{(1+\alpha)/\alpha}}{1+(A_t p_t)^{(1+\alpha)/\alpha}}$$

where $tb \equiv TB / Y$ is the trade balance in percent of GDP.

For given real exchange rate, a reduction in government spending on tradables improves the trade balance simply because it directly reduces tradable absorption. In contrast, a reduction in government spending on nontradables deteriorates the trade balance because it increases consumption on nontraded goods which, in turn, induces a proportional increase in consumption on traded goods along the linear income path. This result suggests that fiscal tightening would have different impact on the trade balance depending on how it is achieved.

Bearing in mind the partial equilibrium nature of the analysis, the semi-elasticity of the trade balance with respect to the real exchange rate—which measures the change in the trade balance in percent of GDP for a 1 percent *depreciation* of the real exchange rate—is obtained by differentiating (11) with respect to the relative price *p*. Dropping time subscripts, the semi-elasticity is given by

$$(12) \qquad \varepsilon_p^{tb} = -\frac{\partial tb}{(\partial p / p)} = \{(1+\alpha)/\alpha\} \cdot [(1-g^T) + \gamma^{-1}(1-\gamma)(1-g^N)] \cdot H(A, p) > 0$$

where $H(A, p) = (Ap)^{(1+\alpha)/\alpha} / [1+(Ap)^{(1+\alpha)/\alpha}]^2$ . The positive semi-elasticity suggests that the trade balance tends to improve when the real exchange rate depreciates, a result which underlies the specification of the current account in conventional macroeconomic models.

The expression for the semi-elasticity clearly indicates that fiscal policy matters for the exchange rate-current account nexus. Abstracting from the effect of fiscal policy on the real exchange rate, fiscal tightening reinforces external adjustments induced by the exchange rate correction. The impact effect of fiscal tightening differs in magnitude, however, depending on which government spending is tightened due to asymmetric influence of home bias which matters only for government spending on nontradables. The stronger the home bias, the smaller is the exchange rate elasticity of the trade balance for given levels of government spending.

Fiscal policy would also affect the slope of the trade balance indirectly via its effect on the level of the real exchange rate. The equilibrium relationship between fiscal policy and the real exchange rate is highly complex because of forward-looking behavior of consumers. For tractability, the subsequent analysis focuses on a stationary equilibrium in which the real exchange rate, outputs, and the current account balance are all constant over time. A stationary equilibrium is obtained if government spending ratios, the income tax rate, and the productivity parameters are all constant over time.

Substituting (6) into (9) yields the following relationship for optimal tradable consumption:

$$C_t^T = D_t^{-1}\left[(1+r)B_t + \sum_{s=t}^{\infty}(1+r)^{-(s-t)}(1-g_s^T)Y_s^T\right], \quad D_t = \sum_{s=t}^{\infty}(1+r)^{-(s-t)}(p_s/p_t)^{\gamma(1-\sigma)}$$

By using the fact that $D_t = (1+r)/r$ in a stationary equilibrium and dropping time subscripts, the optimal level of tradable consumption in a stationary equilibrium is given by

$$C^T = rB + (1-g^T)\bar{Y}^T \tag{13}$$

where $\bar{Y}_t^T = (r/1+r)\sum_{s=t}^{\infty}(1+r)^{-(s-t)}Y_s^T$ represents the permanent tradable income, which simply equals the constant level of tradable output in a stationary equilibrium.

Substituting (13) into (10) yields the current account in a stationary equilibrium,

$$CA = (1-g^T)(Y^T - \bar{Y}^T) = (Y-G) - (\bar{Y}-\bar{G})$$

where the second equality follows from the equilibrium condition for the nontraded goods market. This representation of the current account is well known and identical to the one that would emerge in a typical intertemporal model of the current account without nontraded goods. The current account is balanced at all times in a stationary equilibrium since $Y^T = \bar{Y}^T$ with the trade balance ($-rB$) being in permanent deficit or surplus depending on the initial international investment position.

The equilibrium level of the real exchange rate can be found from the equilibrium condition for the nontraded goods market. Substituting (13) into (9b) yields,

$$rB + (1-g^T)f^T(p) = \gamma^{-1}(1-\gamma)(1-g^N)pf^N(p) \tag{14}$$

The solution of (14), denoted by $\bar{p}$, constitutes the equilibrium level of the real exchange rate in a stationary equilibrium. By totally differentiating (14), the following comparative statics results are obtained:

$$d\bar{p}/dg^N > 0, \quad d\bar{p}/dg^T < 0, \quad d\bar{p}/dB < 0, \quad \text{and} \quad d\bar{p}/dA > 0 \tag{15}$$

The real exchange rate is at a more appreciated level for larger government spending on nontradables, smaller government spending on tradables, larger net foreign asset, and higher productivity in the production of tradables relative to the production of nontradables. The last result is consistent with the Balassa-Samuelson effect. It should be noted that these comparative statics results are derived for a stationary equilibrium and thus are valid only for a *permanent* change in the corresponding variables that affects the level of the real exchange rate for all periods in the same proportion so that the constancy of the real exchange rate is maintained.

In a stationary equilibrium, the full effect of a permanent change in government spending on the slope of the trade balance can be identified from (12) as follows:

$$\frac{\partial \overline{\varepsilon}_p^{tb}}{\partial g^T} = -\left(\frac{1+\alpha}{\alpha}\right)\cdot\left[H(A,\,\overline{p}) - (1-g^T)\frac{\partial H}{\partial \overline{p}}\cdot\frac{\partial \overline{p}}{\partial g^T}\right]$$
$$\frac{\partial \overline{\varepsilon}_p^{tb}}{\partial g^N} = -\left(\frac{1+\alpha}{\alpha}\right)\cdot\left(\frac{1-\gamma}{\gamma}\right)\cdot\left[H(A,\,\overline{p}) - (1-g^N)\frac{\partial H}{\partial \overline{p}}\cdot\frac{\partial \overline{p}}{\partial g^N}\right]$$

The sign of the partial derivatives is not fully determined because $\partial H/\partial \overline{p} > 0$ if $\overline{p} < A^{-1}$ but $\partial H/\partial \overline{p} < 0$ otherwise. By using the results in (15), it can be shown that

$$\text{sign}\,(\partial \overline{\varepsilon}_p^{tb}/\partial g^T) = \begin{cases} - & \text{if } \overline{p} < A^{-1} \\ +/- & \text{otherwise} \end{cases} \quad \text{and} \quad \text{sign}\,(\partial \overline{\varepsilon}_p^{tb}/\partial g^N) = \begin{cases} +/- & \text{if } \overline{p} < A^{-1} \\ - & \text{otherwise} \end{cases}$$

In a special case with a balanced trade account ($B = 0$), the sign can be fully pinned down. If $B = 0$, a closed-form solution for the stationary real exchange rate can be obtained from (14) as $\overline{p} = A^{-1}[\gamma(1-g^T)/(1-\gamma)(1-g^N)]^{\alpha/(1+\alpha)}$. By using this, the expression for the exchange rate elasticity can be simplified to yield

$$\overline{\varepsilon}_p^{tb=0} = \left(\frac{1+\alpha}{\alpha}\right)\cdot\frac{(1-\gamma)(1-g^N)(1-g^T)}{(1-\gamma)(1-g^N)+\gamma(1-g^T)}$$

where $\overline{\varepsilon}_p^{tb=0}$ refers to the exchange rate elasticity of the trade balance under a stationary equilibrium with a balanced trade account. If there is no home bias in government spending so that $g^T = g^N = g$, the expression for the exchange rate elasticity can be further simplified to $\overline{\varepsilon}_p^{tb=0} = [(1+\alpha)/\alpha](1-\gamma)(1-g)$, which is negatively related to the government spending ratio.

Finally, differentiating $\overline{\varepsilon}_p^{tb=0}$ with respect to government spending ratios yields the following results for the full effect of fiscal policy on the slope of the trade balance:

(16)
$$\frac{\partial \overline{\varepsilon}_p^{tb=0}}{\partial g^T} = -\left(\frac{1+\alpha}{\alpha}\right)\cdot\left[\frac{(1-\gamma)(1-g^N)}{(1-\gamma)(1-g^N)+\gamma(1-g^T)}\right]^2 < 0$$
$$\frac{\partial \overline{\varepsilon}_p^{tb=0}}{\partial g^N} = -\left(\frac{1+\alpha}{\alpha}\right)\cdot\left(\frac{1-\gamma}{\gamma}\right)\cdot\left[\frac{\gamma(1-g^T)}{(1-\gamma)(1-g^N)+\gamma(1-g^T)}\right]^2 < 0$$

As noted earlier, the partial derivatives in (16) are valid only for a permanent change in government spending. For this reason, the intertemporal elasticity of substitution $\sigma$ does not appear in (16), which would not be the case for a transitory change in government spending.

Bearing this in mind, the comparative statics results in (16) suggest that the trade balance is less elastic to the real exchange rate in an economy with higher government spending ratios. Intuition behind this result is closely related to the fact that government spending varies in line with output with no intertemporal smoothing while private consumption is smoothed over time. Higher government spending implies stronger comovement between tradable absorption and tradable output, which is true for both types of government spending because of a constant expenditure share between tradable and nontradable consumption.[5] In turn, this implies that the trade balance—which is the difference between tradable output and tradable absorption—would be ceteris paribus less sensitive to the variation in tradable output and consumption induced by changes in the real exchange rate. Therefore, a given adjustment in the trade balance would require a larger correction in the real exchange rate, the greater the share of government spending.

If production responds to the real exchange rate only with a lag, the exchange rate elasticity would ceteris paribus be smaller in the short run than in the medium run. This point can be seen more clearly by assuming an endowment economy in which outputs are exogenously given. Since government spending is perfectly correlated with output in an endowment economy, the comovement between tradable output and tradable absorption would be even stronger than in a production economy. Moreover, the exchange rate elasticity of the trade balance is proportional the exchange rate elasticity of private consumption with the proportionality being determined by the share of private consumption in tradable absorption. Thus, the higher the government spending ratios the less elastic is the trade balance to the real exchange rate.

The same intuition can also be applied to predict the relationship between the country's access to external capital markets and the exchange rate elasticity of the trade balance. Suppose that a faction $\lambda$ of consumers are rule-of-thumb consumers with no access to capital markets while the remaining $1-\lambda$ are Ricardian consumers with market access. If the same utility function as given by (3) is assumed for both types of consumers, consumption by rule-of-thumb consumers would be proportional to disposable income in each period with a constant expenditure share between traded and nontraded goods. As a result, the effect of an increase in $\lambda$ on the exchange rate elasticity of the trade balance would be similar to that of an increase in government spending. In light of the fact that emerging market countries have in general limited market access, the exchange rate elasticity of the trade balance would ceteris paribus be smaller for emerging market countries than for advanced countries.

[5] Note that a permanent increase in government spending on nontradables results in a permanent decrease in nontradable consumption which, in turn, leads to a corresponding permanent reduction in tradable consumption given the constant expenditure share on traded and nontraded goods.

## IV. Concluding Remarks

The role of exchange rate in external adjustments depends on fiscal policy in a convoluted way. The analysis shows that the higher the level of government spending relative to GDP, the less elastic would be the trade balance to the real exchange rate. The same intuition for this result also implies that the exchange rate elasticity of the trade balance would ceteris paribus be smaller for emerging market countries with limited access to external capital markets than for advanced countries. These theoretical findings may shed light on the debate on current global imbalances.

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