The terms of trade, the external balance, and the size of the net foreign asset position

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Abstract

In this paper, we study the extent to which higher capital mobility impacts the manner in which the terms of trade affect a country´s external balance. We find that the impact of an income shock in the terms of trade on the external balance depends on whether the traditional rule or the new view for the current account dominates. If the new view for the current account holds, the Harberger-Laursen-Metzler (HLM) effect holds for creditor countries: a deterioration of the terms of trade deteriorates the external balance. However, if the traditional rule dominates, changes in the terms-of-trade may not affect the external balance, and the HLM effect fails to hold. The

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empirical evidence, based on a sample of 37 countries from 1970 to 2009, shows that when the ratio of the net foreign asset position is approximately between −15% and +15% as a share of domestic wealth, the new view dominates and the *HLM* effect holds for creditor countries; however, in large creditor or debtor countries, the traditional rule dominates, and the *HLM* effect ceases to hold.

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Changes in the terms of trade are widely recognized for creating important changes in income, savings and the external balance.[1] The conventional wisdom regarding the impact of terms of trade shocks on the external balance is summarized in the classical Harberger-Laursen-Metzler effect (HLM, henceforth).[2] Harberger (1950) and Laursen and Metzler (1950) postulated that savings from any given income fell with a terms-of-trade deterioration, thereby deteriorating the current account balance, given the level of investment. However, this argument relies on a static theory of savings, which led some authors to reconsider the question of how terms-of-trade changes affect the current account balance in an explicitly intertemporal framework. The HLM result has been found to depend on, at least, six factors: first, the country's rate of time preferences (Obstfeld, 1980, 1982; Svensson and Razin, 1983; Mansoorian, 1993; Ikeda, 2001); second, the production in terms of labor supply (Bean, 1986) and capital (Sen and Turnovsky, 1989); third, capital market imperfections (Obstfeld, 1982; Huang and Meng, 2007); fourth, the duration of the shock (Sachs, 1981; Obstfeld, 1982; Persson and Svensson, 1985); fifth, the country's credit status, i.e., whether it is a debtor or creditor (Turnovsky, 1993) and the role of debt and risk with adjustment dynamics (Eicher et al., 2008); and sixth, the government-spending channel (Tornell and Lane, 1998).

However, the impact of the tremendous increase in cross-border holdings of capital in recent years on the manner in which terms-of-trade changes affect the external balance of an open economy has rarely been analyzed in the literature.[3] An important exception is a key theoretical contribution by Turnovsky (1993)[4], who found that the impact of a change in the terms of trade depends on the net foreign asset position of the country.[5] Thus, a deterioration of the terms of trade worsens both the current account balance and the trade balance if and only if the country is a net creditor, and the HLM

[1] This effect is usually stronger for developing countries [Patnaik et al. (2013)]. Changes in the terms of trade are also usually related to aggregate economic instability.

[2] See Duncan (2003) for a recent survey.

[3] See Kraay et al. (2005) and Lane and Milesi-Ferretti (2001, 2007), for instance.

[4] See also Kraay and Ventura (2000b), which has not been published and it is quite difficult to find it. Recent research has analyzed, in a different setting, the extent to which financial integration impacts the manner in which terms of trade affect business cycles in emerging economies (Patnaik, Bhattacharya and Pundit, 2013).

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effect holds. This result is based on the new view for the current account, i.e., when a transitory income shock occurs, the marginal unit of wealth is invested as the average unit of wealth (Kraay and Ventura, 2000a; KV henceforth). Thus, the impact of a transitory income shock on the current account would be equal to the amount of savings multiplied by the ratio of the net foreign asset position to domestic wealth, which was termed "the new rule" in contrast to the standard benchmark model for the current account, i.e., the traditional rule. According to the traditional rule, the impact of a transitory income shock on the current account is equal to the savings generated by the shock because the marginal unit of wealth is invested in foreign assets.

Erauskin (2014) shows that the reaction of current accounts to income shocks is better represented by a combination of both the new view and the traditional rule. Furthermore, the support for the new view or the traditional rule depends crucially on the size of the net foreign asset position of the country. Thus, when the ratio of the net foreign asset position to domestic wealth is approximately within the ± 15 percent interval, the new view for the current account seems to better explain the behavior of current accounts as Figure 1, borrowed from Erauskin (2014), shows. We plot the ratio of the net foreign asset position to domestic wealth multiplied by savings against the net foreign asset position over domestic wealth. Two vertical lines for the ± 15 percent interval are also depicted for reference. Figure 1 shows that if we are restricted to values of the size of the net foreign asset position as a share of domestic wealth between approximately -15% and +15%, a clear linear relation emerges between the size of the net foreign asset position as a share of wealth and the ratio of the net foreign asset position to domestic wealth multiplied by savings.[6]However, for values outside this interval any linear relation between both variables nearly disappears. Therefore, Figure 1 seems to suggest that the size of the net foreign asset position is a key variable for explaining current account dynamics for "moderate" values of the net foreign asset position. Thus, Erauskin (2014) shows that when the size of the net foreign asset position as a share of domestic wealth is approximately between -15% and +15%, the new rule would be a satisfactory framework to account for the dynamics of current accounts. In contrast, when the ratio of the net foreign asset position to domestic wealth is higher than +15% the new rule

[6]The new rule implicitly assumes that savings do not depend on the net foreign asset position. Therefore, the new rule would imply a linear relation between the size of the net foreign asset position as a share of wealth and the ratio of the net foreign asset position to domestic wealth multiplied by savings.

fails and the traditional rule plays a dominant role; this could be explained by a lower degree of relative risk aversion as wealth increases. Finally, when the ratio of the net foreign asset position to domestic wealth is lower than −15 percent, the traditional rule seems to dominate, but the reaction of the current account is weaker than for creditor countries, probably reflecting financing constraints. However, the fact that the impact of the terms of trade on the external balance of a country may also depend on the size of the net foreign asset position of the country has received no attention in the literature, as far as we know.

In this paper, we offer three main contributions. First, we build a formal model that studies the extent to which capital mobility impacts the manner in which terms of trade affect the external balance of a country, thus extending the work of Turnovsky (1993). We find that the impact of an income shock in the terms of trade on the external balance depends on whether the traditional rule or the new view dominates. If the new view for the current account holds, the impact of changes in the terms of trade is equal to that found in Turnovsky (1993), and the HLM effect holds for creditor countries. However, if the traditional rule dominates, changes in the terms-of-trade may not affect the current account balance or trade balance, and the HLM effect fails to hold. Second, using a sample of 37 countries (20 industrial and 17 developing) from 1970 to 2009, we test the main predictions of the model and find that they are broadly supported by the empirical evidence. Thus, when the ratio of the net foreign asset position to domestic wealth is between −15% and +15% the new view dominates, and a deterioration of the terms of trade deteriorates the external balance, and the HLM effect holds if and only if the country is a net creditor. In contrast, when the ratio of the net foreign asset position to domestic wealth is higher than +15% or lower than −15% the traditional rule dominates and the HLM effect ceases to hold.[7] Third, the theoretical and empirical analysis for the external balance has been applied not only to the current account balance but also to the trade balance, and we find that the results are broadly similar.

This paper proceeds as follows. The model is described in Section 1. In Section 2, we discuss how the traditional rule and the new view interact for the current account. Section 3 contains the main results of this paper´s

[7]Please note that ratios of the net foreign asset position to domestic wealth ranging between −15% and +15% correspond approximately to ratios of the net foreign asset position between −30% and +30% in terms of GDP.

model. Section 4 reviews the data sources employed for the model and provides the empirical evidence. Finally, Section 5 concludes.

1 The model

In a small open economy, there is a representative agent that has an infinite time horizon and consumes a domestically produced good and another good imported from abroad.[8] The relative price E of the imported good, in terms of the domestically produced good (as the *numeraire*), is assumed to be exogenous and is generated by a geometric Brownian motion process:

$$\frac{dE}{E} = \varepsilon dt + de, \tag{1}$$

where ε is the instantaneous expected rate of change in the relative price E and de represents a shock term: de is the increment of a stochastic process e. Those increments are temporally independent and are normally distributed, and they satisfy $E(de) = 0$ and $E(de^2) = \sigma_e^2 dt$. We omit, for convenience, formal references to time, although those variables do depend on time. The terms of trade, i.e., the relative price of exports in terms of imports, are given by $1/E$. A lower value of $1/E$, or equivalently, an increase in E, represent a deterioration in the terms of trade[9].

The model is real, i.e., there are no nominal assets, such as money and different financial assets. The representative agent holds two assets: domestic capital, K, which is not available to foreigners, and foreign bonds, B^*, which are traded and represent the net foreign asset position for simplicity[10]. Domestic production is obtained using only domestic capital, K, through an AK function:

$$dY = \alpha K \cdot dt, \tag{2}$$

where $\alpha > 0$ is the marginal physical product of domestic capital[11]. The term dY indicates the flow of production, instead of Y, as in ordinary stochastic

[8]Most of this section draws heavily from Turnovsky (1993), KV (2000a), Achury et al. (2012), and Erauskin (2009, 2014).

[9]It can be shown that $\frac{d\left(\frac{1}{E}\right)}{\frac{1}{E}} = -\frac{dE}{E}$.

[10]More on this will be detailed below.

[11]The depreciation rate is contained in the marginal product of capital, α, as is usual in the literature. In addition, productivity does not need to be a constant. In fact, the tradi-

calculus. From equation (2), the real return on domestic capital is given by

$$dR_K = \frac{dY}{K} = \alpha \cdot dt, \tag{3}$$

Foreign bonds are short-term bonds and pay an interest rate i^*. The domestic economy can lend to the foreign economy, that is, $B^* > 0$ (creditor country), or borrow from the foreign economy, $B^* < 0$ (debtor country). Foreign bonds are assumed to be denominated in terms of foreign output. Therefore the price of foreign bonds in terms of the numeraire also follows equation (1). The real return on foreign bonds, expressed in terms of the domestic good, is then:

$$dR_F = r_F dt + du_F;\ r_F \equiv i^* + \varepsilon;\ du_F \equiv de, \tag{4}$$

where the foreign interest rate i^* is assumed to be exogenous.

The preferences of the domestic representative agent are represented by a Stone-Geary intertemporal utility function in which she obtains utility from consumption in the domestic good, C_D, and the imported good, C_M:

$$E_0 \int_0^\infty \frac{\left[(C_D - \tau_D)^{\theta} (C_M - \tau_M)^{1-\theta}\right]^{1-\frac{1}{\gamma}} - 1}{1 - \frac{1}{\gamma}} e^{-\beta t} dt \tag{5}$$

$$\tau_D, \tau_M, \gamma > 0; C_D > \tau_D; C_M > \tau_M.$$

The welfare of the domestic representative agent in period 0 is the expected value of the discounted sum of instantaneous utilities, which is conditioned on the set of disposable information in period 0. The parameter β is a positive subjective discount rate (or rate of time preference). The Arrow-Pratt coefficients of relative risk aversion are given by $\frac{C_D}{\gamma(C_D - \tau_D)}$ for the domestic good and $\frac{C_M}{\gamma(C_M - \tau_M)}$ for the imported good. Thus, if $\tau_D, \tau_M > 0$, which is the more realistic case, consumers exhibit a decreasing degree of relative risk aversion[12].

tional rule requires diminishing returns to capital to happen, as we show below clearly. A deterministic production process for the domestic economy may be a somewhat rather restrictive assumption for the model. This has been adopted for reasons of tractability. This is quite usual in the literature, for example, Obstfeld (1994, p. 1318), where "international portfolio diversification encourages a global shift from (relatively) low-return, low-risk investments into high-return, riskier investments". This assumption would be appropriate to the extent that the domestic economy is less risky than the foreign economy.

[12]When $\tau_D = \tau_M = 0$, relative risk aversion is constant.

The domestic representative agent consumes at a deterministic rate $C_D(t)dt$ and $C_M(t)dt$, in the instant dt. Domestic wealth W is given by

$$W = K + E \times B^*. \tag{6}$$

The dynamic budget restriction can be expressed by the following:

$$dW = W\left[n_K dR_K + n_F dR_F\right] - \left(C_D + E \times C_M\right) dt. \tag{7}$$

If we define the following variables for the domestic representative agent,

$$\begin{aligned} n_K &\equiv \frac{K}{W} = \text{ share of the domestic portfolio in the form of} \\ &\quad \text{domestic capital, and} \\ n_F &\equiv \frac{EB^*}{W} = \text{ share of the domestic portfolio in the form of} \\ &\quad \text{foreign bonds.} \end{aligned}$$

Equation (6) for the domestic wealth can be expressed more conveniently, if we divide by W:

$$1 = n_K + n_F. \tag{8}$$

Substituting equations (3), (4) and (8) into the dynamic budget constraint (7), we obtain the following dynamic restriction for the resources of the economy:

$$\frac{dW}{W} = \psi dt + dw, \tag{9}$$

where the deterministic and stochastic parts of the rate of growth of assets, dW/W, can be expressed as following way:

$$\psi \equiv n_K \alpha + n_F\left(i^* + \varepsilon\right) - \frac{\left(C_D + EC_M\right)}{W} \equiv \rho - \frac{\left(C_D + EC_M\right)}{W} \tag{10}$$

$$dw = n_F de, \tag{11}$$

where $\rho \equiv n_K \alpha + n_F\left(i^* + \varepsilon\right) \equiv n_K\left[\alpha - \left(i^* + \varepsilon\right)\right] + \left(i^* + \varepsilon\right)$ denotes the gross rate of return of the asset portfolio.

The objective of the domestic representative agent is to choose the path of consumption and portfolio shares that maximizes the expected value of the intertemporal utility function (5), subject to $W(0) = W_0$, $E(0) = E_0$, (9), (10), and (11). This optimization is a stochastic optimal control problem.[13] The macroeconomic equilibrium is derived in Appendix A.

If we define aggregate consumption, in terms of domestic output, as

$$C - \tau \equiv (C_D - \tau_D) + E\,(C_M - \tau_M)\,, \tag{12}$$

the first-order conditions can be represented as

$$\begin{aligned}
C_D - \tau_D &= \theta\,(C - \tau)\,, &(13)\\
E\,(C_M - \tau_M) &= (1-\theta)\,(C-\tau)\,, &(14)\\
\frac{C}{W} &= \Bigg[\beta\gamma - (\gamma - 1)\,\rho + (1-\theta)\,(\gamma-1)\,\varepsilon + \frac{0.5\,(\gamma-1)}{\gamma}\sigma_w^2 \\
&\quad -0.5\,(1-\theta)\,(\gamma-1)\left[(1-\theta)\left(1-\frac{1}{\gamma}\right)+1\right]\sigma_e^2 \\
&\quad + \frac{(1-\theta)\,(\gamma-1)^2}{\gamma}\sigma_{we}\Bigg]\,, &(15)
\end{aligned}$$

$$\frac{K}{W} = \frac{\left\{\alpha - (i^* + \varepsilon) + (1-\theta)\left(1-\frac{1}{\gamma}\right)\sigma_e^2\right\}\gamma\left(1-\frac{\tau/\alpha}{W}\right)}{\sigma_e^2} + 1, \tag{16}$$

$$n_F = 1 - n_K. \tag{17}$$

where

$$\sigma_w^2 = n_F^2\sigma_e^2; \sigma_{we} = n_F\sigma_e^2. \tag{18}$$

Equations (13), (14), (15), and (16) correspond, respectively, to equations (52), (53), (62), and (63) in Appendix A, and equation (17) corresponds to equation (8). Equations (13) and (14) capture the consumptions of the domestic and the imported good as fixed fractions of the aggregate consumption spending, in terms of the domestic good. Equation (15) shows

[13]To solve problems of stochastic optimal control see, for instance, Kamien and Schwartz (1991, section 22), Malliaris and Brock (1982, ch. 2), Obstfeld (1992), or Turnovsky (1997, ch. 9; 2000, ch. 15). The reader is also referred to Turnovsky (1993), KV (2000a), Achury et al. (2012), or Erauskin (2009, 2014) for the details on the equilibrium solution.

that consumption is partially linear in wealth, and it captures substitution and income effects. When $\tau > 0$ and $\gamma = 1$, the classical logarithmic case applies, and portfolio shares solely depend on assets characteristics, not on the level of wealth, and the consumption function is linear in wealth. Equation (16) illustrates that the share of domestic wealth devoted to domestic capital decreases with wealth if and only if $\tau > 0$ because consumers exhibit decreasing relative risk aversion. This is a key result of our model.

2 The rules

The current account of the domestic economy, CA', is defined as the variation in its net foreign asset position:

$$CA' = d\left(EB^*\right), \tag{19}$$

which, in combination with equation (6), can be converted into:

$$CA' = dW - dK = dW - dW\frac{\partial K}{\partial W}. \tag{20}$$

Equation (20) is a national accounting identity, which establishes that the current account balance is equal to the variation in domestic wealth minus the variation in domestic capital. The variation in domestic wealth, dW, is equal to the national savings for the period, S, i.e., national income minus consumption. The variation in domestic capital, dK, is equal to the domestic investment for the period.

If domestic capital K is subject to diminishing returns, i.e., $\frac{\partial\alpha}{\partial K} < 0$, by completely differentiating equation (15), we obtain

$$\frac{\partial K}{\partial W} = \frac{\frac{K}{W} + \frac{\rho\gamma\left(\frac{\tau/\alpha}{W}\right)}{\sigma_e^2}}{1 - \gamma\left(\frac{\partial\alpha/\partial K}{\sigma_e^2}\right)W\left[1 - \frac{\tau}{\alpha}\left\{1 - \frac{\rho}{\alpha}\right\}\right]}, \tag{21}$$

where:

$$\rho \;\equiv\; \alpha - (i^* + \varepsilon) + (1-\theta)\left(1 - \frac{1}{\gamma}\right)\sigma_e^2.$$

This is a familiar result previously reported by Kraay and Ventura (2000a).

[14] When diminishing returns are strong relative to investment risk, i.e., $\left(\partial\alpha/\partial K\right)/\sigma_e^2 \to -\infty$, the marginal unit of wealth is not invested in domestic capital:

$$\frac{\partial K}{\partial W} \to 0. \tag{22}$$

Instead, the marginal unit of wealth is invested in foreign bonds[15]. Thus, combining equations (20) and (22), we obtain the traditional rule:

$$CA' = dW, \tag{23}$$

i.e., when a transitory income shock occurs, the response of the current account will be equal to the amount of savings generated by the shock because savings are invested abroad.

However, when investment risk is high relative to the diminishing returns effect, i.e.,

$$\frac{(\partial\alpha/\partial K)}{\sigma_e^2} \to 0,$$

the marginal unit of wealth is invested as the average unit of wealth plus an additional term:

$$\frac{\partial K}{\partial W} = \frac{K}{W} + \frac{\rho\gamma\left(\frac{\tau/\alpha}{W}\right)}{\sigma_e^2}. \tag{24}$$

Equation (24) implies that increasing wealth induces consumers to invest a smaller share of their portfolio in domestic wealth. If $\tau = 0$, the marginal unit of wealth is invested as the average unit of wealth:

$$\frac{\partial K}{\partial W} = \frac{K}{W}. \tag{25}$$

Equation (25), combined with equation (20), leads to the new rule:

$$CA' = dW\left(\frac{EB^*}{W}\right) = dW \times n_F, \tag{26}$$

i.e., when a transitory income shock occurs, the current account balance is equal to the saving generated by the shock multiplied by the ratio of the net

[14]Please note that when $\tau = 0$ then we get the basic result, i.e., $\frac{\partial K}{\partial W} = \frac{\frac{K}{W}}{1-\gamma\left(\frac{\partial\alpha/\partial K}{\sigma_e^2}\right)W}$.

[15]Note that in a small open economy foreign holdings of domestic capital are assumed to be constant.

foreign asset position with respect to domestic wealth. Thus, savings would be associated with current account surpluses in creditor countries; conversely, savings would be associated with current account deficits in debtor countries.

Note that the results (23) and (25) are derived from an accounting identity (20) and a behavioral equation (21). Therefore, as shown above, different results can be obtained depending on how countries behave. The new rule has been criticized recently (Guo and Jin, 2009; Tille and Van Wincoop, 2010). However, this criticism is flawed, as shown by Erauskin (2013) and Kraay and Ventura (2009). First, the new rule can be easily adapted to distinguish between gross and net foreign asset positions, as we do in Section 4 for the terms of trade effect. Second, the favorable results were demonstrated not to be driven by an accounting-based "approximate" regression, as suggested by Guo and Jin (2009), because the latter, i.e., the accounting-based approximate regression, is a poor approximation to the former, i.e., the "true" regression.[16] Third, because a steady state may not exist, the favorable results were established to not be driven by a steady state. Furthermore, if the steady state were to exist this would imply that both the domestic economy and the foreign economy should grow at the same rate, which is not true. Finally, as the empirical evidence in Section 4 suggests, both the traditional rule and the new view are necessary to explain the behavior of current accounts. This finding further reinforces the validity of the second argument.

The new rule is based on well-functioning capital markets[17]. However, this characterization may not be as appropriate for some "large" debtor countries. To view why, let us suppose, for instance, that the net foreign asset position of a country with respect to domestic wealth is -20%. This implies, through equation (26), that $CA = (-.2)dW$, that is, net investment exceeds savings by a "large" amount. This, of course, needs to be financed. However, what would happen if this were not fully possible because foreign borrowing is much more costly, for example? Then, domestic investment could be constrained to domestic savings and the new rule would fail. Furthermore, to the extent that foreign debt must be serviced, domestic investment could be well below domestic savings. Thus, for some "large" debtor countries, it may be possible that the new rule is not a suitable approximation to capture current account

[16]This was also the main issue addressed in the response by KV (2009) to Guo and Jin (2009).

[17]See KV (2000a, pp. 1152-1156).

behavior, i.e., savings may also be associated to current account surpluses in some debtor countries.

To go further, and to simplify notation, we can conveniently assume, departing from equation (24) and without a loss of generalization, that the marginal unit of wealth invested in domestic capital is a fraction λ of the average unit of wealth invested in domestic capital, i.e.,

$$\frac{dK}{dW} = \lambda \frac{K}{W} = \lambda n_K. \tag{27}$$

If $\lambda = 0$ then the traditional rule applies: the marginal unit of wealth invested in domestic capital is 0. Instead, the marginal unit of wealth is completely invested abroad. Conversely, if $\lambda = 1$, the marginal unit of wealth is invested as the average, i.e., the new view applies. Moreover, the fraction λ would depend on the size of the net foreign asset position and may be heterogeneous because the reaction may vary from some countries to others. This will be discussed in Section 4 below.

Plugging equation (27) into equation (20) we obtain, through equations (6) and (8), that the impact of a transitory income shock on the current account is given, after certain algebraic calculations[18], by

$$CA' = \left[(1-\lambda) + \lambda n_F\right] dW, \tag{28}$$

where different values for the parameter λ lead to different results. Equation (28) is key, and it combines the traditional rule and the new view. For instance, when $\lambda = 0$, the traditional rule applies, and when $\lambda = 1$, the new view applies. Note that equation (28) captures changes both in the deterministic and stochastic terms of domestic and foreign wealth, as given by equations (9), (10), and (11). However, equation (28) cannot be directly tested because it does not capture the current account balance as balance of payments statistics do. To this issue we now turn.

3 Trade balance and current account balance

The amount of savings is given by equation (7):

$$dW = \left[\alpha K + (i^* + \varepsilon) EB^* - C\right] dt + EB^* de. \tag{29}$$

[18] See Erauskin (2014).

Rearranging equation (29), three terms can be observed on the right:

$$dW = [(\alpha K - C)\, dt] + i^* EB^* dt + [(\varepsilon dt + de)\, EB^*]\,. \tag{30}$$

The first term on the right in equation (30) is the amount of domestic savings, S_D, and the second term could be broadly interpreted as the net income from abroad plus net current transfers, $NIANCT$.[19] Thus, the sum of the first two terms is equal to national savings, S_N:

$$S_N \equiv S_D + NIANCT \equiv S_D + i^* EB^* dt, \tag{31}$$

where

$$S_D \equiv (\alpha K - C)\, dt. \tag{32}$$

The third term on the right in equation (30) captures the terms of trade effect, $TOTE$, i.e.,

$$TOTE \equiv (\varepsilon dt + de)\, EB^*, \tag{33}$$

or, equivalently, through equation (1):

$$TOTE \equiv dE \times B^*.$$

Thus, the terms of trade effect is defined in this paper as the additional income that is lost or gained on the value of assets and liabilities due to changes in the price of exports relative to the price of imports. This is a type of "financial" terms of trade, thus capturing the revaluation of assets and liabilities in terms of export and import prices. Instead, terms of trade typically refer to the share of income that is lost or gained due to changes in the price of exports relative to the price of imports, i.e., the growth rate in the export price index times the current price share of exports in GDP less the import price index times the current price share of imports in GDP. (Kraay and Ventura, 2000b)[20] Although the terms of trade effect is not captured by balance of payments statistics, the terms of trade effect has an impact on the external balance, as we show below.

Equation (30) can be rearranged, through equations (31), (32), and (1), as

$$dW = S_N + TOTE. \tag{34}$$

[19] Note that the net current transfers are ignored in the model for simplicity. However, they are included in the empirical estimation below.

[20] This term is also included in the estimation below.

The conventional definition of the current account, CA, as registered by balance of payments statistics, is obtained subtracting by the terms of trade effect from the current account balance in equation (20), i.e.,

$$CA = CA' - TOTE. \tag{35}$$

Plugging equations (28) and (34) into equation (35), we obtain

$$CA = S_N \left[(1 - \lambda) + \lambda n_F \right] - TOTE \times \lambda \times (1 - n_F). \tag{36}$$

Equation (36) is a key equation, which is tested in Section 4. The first term on the right of the equation (36), which is a combination of the traditional rule and the new rule, is standard and has been recently analyzed elsewhere (Erauskin, 2014). The main focus of this paper is on the second term in equation (36). When the country is a net creditor (i.e., $n_F > 0$[21]), a positive terms-of-trade shock (i.e., a deterioration of the terms of trade), improves the export value of the net foreign asset position, i.e., $TOTE > 0$; this generates a positive income effect for the country but is not registered in the balance of payments statistics. Then, the country reacts by investing the marginal unit of wealth as a fraction λ of the average unit of wealth, as suggested by equation (24). Only the effect on investment, i.e., the latter effect, is captured by the conventional definition of the current account balance. This generally creates a current account deficit. In fact, when $\lambda = 1$, i.e., when the new view holds, the result is identical to that obtained by Turnovsky (1993, p. 288):

$$CA = S_N \times n_F - TOTE \times (1 - n_F). \tag{37}$$

However, when the adjustment parameter λ equals 0 in equation (36), i.e., the traditional rule applies, the impact of the terms-of-trade effect on the current account disappears because additional savings are invested abroad; thus, investment is not affected. Then, the impact on the current account is given by

$$CA = S_N.$$

Conversely, when the country is a net debtor (i.e., $n_F < 0$), a positive terms-of-trade shock, i.e., a deterioration of the terms of trade, generates a current account superavit because it worsens the export value of the net foreign asset position, i.e., $TOTE < 0$. This generates a negative income effect

[21] Please note that $n_F < 1$ as long as the stock of domestic capital is positive, i.e., $K > 0$.

for the country that is not captured in the balance of payments statistics and generates a negative effect on investment.

Analogous results and intuition apply to the balance of trade, which refers to exports and imports of goods and services. To obtain the trade balance, the net income from abroad plus net current transfers, $NIANCT$, must be subtracted from the current account in equation (36)[22]:

$$TB = CA - NIANCT = CA - i^{*}EB^{*}dt. \tag{38}$$

Then, plugging equations (36), and (31) into equation (38) we obtain the following expression for the trade balance:

$$TB = S_D\left[(1-\lambda) + \lambda n_F\right] - TOTE \times \lambda \times (1-n_F) - NIANCT \times \lambda \times (1-n_F)\,. \tag{39}$$

Therefore, equation (39) captures the new view, the traditional rule, and a combination of both the new view and the traditional rule for the trade balance, which is also tested also in Section 4, in conjunction with equation (36) for the current account. As above, when the country is a net creditor, i.e., $n_F > 0$, a positive terms-of-trade shock, i.e., a deterioration of the terms of trade, causes a deficit in the balance of trade. The intuition behind the result is that this improves the export value of the net foreign asset position, i.e., ; this generates a positive income effect for the country but is not registered in the balance of payments statistics. Then, the country reacts by investing the marginal unit of wealth as a fraction λ of the average unit of wealth, as suggested by equation (24). Only the effect on investment, i.e., the latter effect, is captured by the balance of trade, thus generally leading to a deficit in the balance of trade. Only when the adjustment parameter λ equals 0, i.e., the traditional rule, the impact of terms of trade on the balance of trade disappears because investment is not affected.

4 Data sources and empirical evidence

The dataset employed in this paper to test the main results of the model, as shown in Section 3, encompasses37 industrial and developing countries from 1970 to 2009, as exhibited in Table A.[23] The data on GDP for those countries

[22]Please note again that the net current transfers are ignored in the model, but they are included for the empirical estimation.

[23]This distinction is acknowledged to be somewhat arbitrary. See, for instance, Lane and Milesi-Ferretti (2001, 2007), and Kraay, Loayza, Servén, and Ventura (2005).

are provided directly by the World Bank's World Development Indicators (WBWDI). The data on current accounts, exports of goods and services, the net income from abroad and the net current transfers ($NIANCT$), domestic savings, international investment positions, export prices and import prices[24] have been obtained from the International Monetary Fund's International Financial Statistics (IMFIFS). National savings are obtained adding the net income from abroad and the net current transfers, $NIANCT$, to domestic savings. In addition, because the data on international investment positions are incomplete or missing for many countries (particularly before 1986), Lane and Milesi-Ferretti (2001, 2007)[25] provided an excellent source of data for those years[26]. Total external assets and liabilities include the stock of direct investment plus portfolio equity, portfolio debt investment, other investment assets (e.g., general government, banks), reserve assets (minus gold) and financial derivatives. The gross domestic capital stock, K, which is measured in current US dollars for the countries in the sample, is constructed using the procedure suggested by Kraay and Ventura (2000a) in their Appendix 2[27], by cumulating gross domestic investment in current US dollars (from WBWDI), by assuming a depreciation rate of 4% per year and by adjusting the value of previous year's stock using the US gross domestic investment deflator. The initial capital stock in 1970 is estimated using the average capital-output ratio over the period 1965-1970[28] [based on Nehru and Dareshwar (1993)] multiplied by GDP in current US dollars (WBWDI).

The impact of terms of trade on the current account, as shown by equation (36), can be tested with the following regression equation:

$$\begin{aligned}\frac{CA_{ct}}{Y_{ct}} &= a_0 + a_1 \times \left(\frac{S_{N,ct}}{Y_{ct}}\right) + a_2 \times \left(n_{F,ct} \times \frac{S_{N,ct}}{Y_{ct}}\right) \\ &+a_3 \times \left(\frac{TOTE_{ct}}{Y_{ct}}\right) \times (1 - n_{F,ct}) + a_4 \times \left(\frac{TTOTE_{ct}}{Y_{ct}}\right) + u_{ct}, \qquad (40)\end{aligned}$$

[24]When export and import prices were not available, we used export unit values and import unit values.

[25]From this point forward, we refer only to Lane and Milesi-Ferretti (2007) as the relevant data source for this paper.

[26]Note that most of the data from IMFIFS and from Lane and Milesi-Ferretti (2007) coincide for recent years.

[27]See also Erauskin (2009) for more details.

[28]The initial value for the capital-output ratio for the world is the weighted mean of the capital-output ratios in the sample from 1965 to 1970.

where CA_{ct} denotes the current account balance, $S_{N,ct}$ is the national savings, $n_{F,ct}$ is the ratio of the net foreign asset position to domestic wealth, $TOTE_{ct}$ is the terms-of-trade effect, $TTOTE_{ct}$ is the "trade" terms-of-trade effect and u_{ct} is the error term, for country c in period t in all cases. The coefficients from a_0 to a_3 capture the impact of different variables on the current account balance. A standard terms of trade expression, which is reflected in the estimate a_4, has also been included to the empirical estimation, as mentioned above. All the variables are conveniently adjusted by the level of gross domestic product, Y_{ct}, of the country. Usual control variables, such as the population and the output per capita (both in levels), and time dummies have also been added to the regression. Now, the period analyzed is restricted to 1975-2009 for the same set of countries due to data availability. We test the regression equation (40) for all values of the net foreign asset position. The results are exhibited in Table 2 for the pooled estimation by ordinary least squares (OLS) and for the fixed effects estimation, without controls and with control variables and time dummies. Fixed effect estimation allows for free correlation among the additive, unobserved heterogeneity and the explanatory variables. Furthermore, despite the fixed effect estimation is somewhat restrictive because heterogeneity is assumed to be additive and to have constant coefficients; this allows robust estimates with the presence of country-specific slopes on the country-specific covariates.[29] The combination of both the traditional rule and the new rule, i.e., $a_1 + a_2 = 1$, does not seem to fit adequately with the results of our model. Furthermore, the terms of trade effect (a_3) is negative but not significant, and the "trade" terms of trade is weakly negative when controls are included, but not significant either. The basic results for regression equation (40) are disappointing. However, recent research has provided interesting additional insights to analyze the impact on current accounts [Erauskin (2014)].

First, we distinguish the reaction from the assets´ side, $TOTE_d$, from the reaction from the liabilities´ side, $TOTE_f$, because they are likely to differ for many reasons, such as different degrees of risk aversion, or preferences. Then, we define, from equation (33), gross foreign asset positions as:

$$TOTE_d \equiv (\varepsilon dt + de) \times EB_d^* \tag{41}$$

$$TOTE_f \equiv (\varepsilon dt + de) \times EB_f^*, \tag{42}$$

[29] See Wooldridge (2005).

where B_d^* and B_f^* refer to the domestic holdings of foreign assets and foreign holdings of domestic assets, respectively. Of course, the sum of both terms is equal to the terms of trade effect, i.e.,

$$TOTE_d + TOTE_f \equiv TOTE.$$

Now, equation (40) can be tested when assets and liabilities are considered [equations (41) and (42)] using the following regression equation:

$$\begin{aligned}\frac{CA_{ct}}{Y_{ct}} = \sum_{i=0}^{2} D_i \times \Bigg\{ & a_{i,0} + a_{i,1} \times \left(\frac{S_{N,ct}}{Y_{ct}}\right) + a_{i,2} \times \left(n_{F,ct} \times \frac{S_{N,ct}}{Y_{ct}}\right) \\ & + a_{i,3} \times \left(\frac{TOTE_{d,ct}}{Y_{ct}}\right) \times (1 - n_{F,ct}) + a_{i,4} \times \left(\frac{TOTE_{f,ct}}{Y_{ct}}\right) \times (1 - n_{F,ct}) \\ & + a_{i,5} \times \left(\frac{TTOTE_{ct}}{Y_{ct}}\right) \Bigg\} + u_{ct}, \end{aligned} \tag{43}$$

where

$$\begin{aligned} & D_0 = 1, \\ & D_1 = 1 \; if \; n_{F,ct} > 0.15, \; 0 \; otherwise, \\ & D_2 = 1 \; if \; n_{F,ct} < 0.15, \; 0 \; otherwise. \end{aligned}$$

Second, given that recent research has shown that the support for the traditional rule and the new view seems to depend on the size of the net foreign asset position (Erauskin, 2014), we have added two dummy variables, D_1 and D_2, for all the terms in equation (40) to consider"large" creditor positions, i.e., when the net foreign asset position is higher than 15% as a share of domestic wealth and thus $D_1 = 1$, and large debtor positions, i.e., when the net foreign asset position is lower than −15% as a share of domestic wealth and thus $D_2 = 1$.[30] Please note that $TOTE_{d,ct}$ denotes the assets´ reaction to the terms-of-trade effect, and $TOTE_{f,ct}$ is the liabilities´ reaction to the terms-of-trade effect for country c in period t in all cases. All the variables are conveniently adjusted by the level of gross domestic product, Y, of the country, as above. The coefficients from $a_{i,0}$ to $a_{i,5}$ capture the impact of

[30] When the net foreign asset position is moderate, i.e., between −15% and +15%, both dummy variables take the value of 0.

different variables on the current account balance. The main focus of this paper is on the value of the parameters $a_{i,3}$ and $a_{i,4}$ because they capture the impact of the terms of trade effect[31]. We also include a standard terms of trade expression, which is reflected in the estimate $a_{i,5}$, as mentioned above. [32] Usual control variables, such as population and output per capita (both in levels), and time dummies have also been added to the regression. Then, the period analyzed is restricted to 1975-2009 for the same set of countries owing to data availability.

Our model suggests that, when the new rule holds, $a_{0,1} = 0$ and $a_{0,2} = 1$, whereas $a_{0,1} = 1$ and $a_{0,2} = 0$ if the traditional rule holds. In any case, in our model the sum of both estimates should be equal to 1, i.e., $a_{0,1} + a_{0,2} = 1$. [33] The estimates related to the terms of trade effect should be negative, i.e., $a_{0,3} + a_{0,4} < 0$, when the new rule holds. Conversely, if the traditional rule holds, the estimates related to the terms of trade effect should be equal to 0, i.e., $a_{0,3} + a_{0,4} = 0$. In addition, the estimate corresponding to the standard terms of trade should be negative, i.e., $a_{0,5} < 0$.

First, we test the regression equation (43) for all values of the net foreign asset position, i.e., not considering the size of the net foreign asset position. The results are exhibited in Table 3 for the pooled estimation by ordinary least squares (OLS) and for the fixed effects estimation, without and with control variables and time dummies[34]. The results globally are in the direction of supporting the combination of the traditional and the new rule, but the estimates generally fall below the expected impact. The terms of trade effect seems to have an impact on the current account balance; however, we observe that the impact on the assets´ side of the domestic economy is stronger than that on the liabilities´ side. The trade terms-of-trade is mildly negative, as the traditional HLM result would suggest, when control

[31]Note that then the estimation of the standard regression without the terms of trade may suffer from bias derived from the omission of relevant variables.

[32]Please note that, for consistency, this term is just the inverse of the measure suggested by Kraay and Ventura (2000b), because in our model traded bonds are assumed to be denominated in terms of foreign output, which is imported at the relative price E, in terms of the domestically produced good.

[33]Note that in this paper gross foreign assets and liabilities are not considered when analyzing the validity of the traditional and the new rules because many more estimates and their corresponding dummies should be added to account for the size of the net foreign asset position. Instead, we are inclined to analyze gross foreign asset positions only when focusing on the terms of trade effect.

[34]Note that the estimates are also robust.

variables are included, but the results are not statistically significant.

When dummy variables are included to capture the fact that results depend on the size of the net foreign asset position, the results for the regression equation (43) change enormously, as shown in Table 4. Now, when the size of the net foreign asset position is between -15% and 15% as a share of domestic wealth, the new rule receives much stronger support than the traditional rule, i.e., $a_{0,1} < a_{0,2}$. The null hypothesis that the sum of the estimates for the traditional rule and the new rule is equal to 1, i.e., $a_{0,1} + a_{0,2} = 1$, cannot be rejected but the point estimate is well above unity In addition, the assets´ side of the terms of trade effect, $a_{0,3}$, exhibits a higher impact, whereas the liabilities´ side, $a_{0,4}$, remains largely unaltered. The estimate of the impact of trade terms-of-trade, $a_{0,5}$, is slightly negative again, but not significant when control variables are added. For large creditor countries, i.e., when $D_1 = 1$, results change drastically; the new rule term, $a_{0,2} + a_{1,2}$, disappears practically, except for the fixed effects regression, but the traditional rule estimates, $a_{0,1} + a_{1,1}$, gain more support. In addition, although the assets´ side reaction in the terms of trade effect, $a_{0,3} + a_{1,3}$, is much stronger, the liabilities´ side, $a_{0,4} + a_{1,4}$, also follow suit, thus compensating each other; the overall impact of changes in the terms of trade effect, $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4}$, nearly disappears, and the null hypothesis that $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4} = 0$ cannot be rejected. The impact of trade terms-of-trade, $a_{0,5} + a_{1,5}$, becomes positive, and significant. For large debtor countries, i.e., $D_2 = 1$, results resemble those for large creditor countries, but the impacts are generally weaker. The new rule loses much support, but it does not disappear, whereas the traditional rule does not receive much more support. The impact of the terms of trade effect, $a_{0,3} + a_{2,3}$, and $a_{0,4} + a_{2,4}$, becomes negligible on both the assets´ and liabilities´ side; the null hypothesis that $a_{0,3} + a_{2,3} + a_{0,4} + a_{2,4} = 0$ cannot be rejected.

In sum, the terms of trade effect seems to have a significant impact when the net foreign asset position is intermediate, but it ceases to have an impact for large creditor of debtor positions, as expected[35].

Analogously equation (39) can be tested with the following regression

[35] These results also hold when three regressions are run separately for intermediate net foreign asset positions, for big creditors or for big debtors. Broadly similar conclusions are reached when the results are exhibited in terms of net foreign asset positions as a share of *GDP*.

equation:

$$\frac{TB_{ct}}{Y_{ct}} = \sum_{i=0}^{2} D_i \times \left\{ a_{i,0} + a_{i,1} \times \left(\frac{S_{D,ct}}{Y_{ct}} \right) + a_{i,2} \times \left(n_{F,ct} \times \frac{S_{D,ct}}{Y_{ct}} \right) \right.$$
$$+ a_{i,3} \times \left(\frac{TOTE_{d,ct}}{Y_{ct}} \right) \times (1 - n_{F,ct}) + a_{i,4} \times \left(\frac{TOTE_{f,ct}}{Y_{ct}} \right) \times (1 - n_{F,ct})$$
$$\left. + a_{i,5} \times \left(\frac{TTOTE_{ct}}{Y_{ct}} \right) + a_{i,6} \times \left(\frac{NIANCT_{d,ct}}{Y_{ct}} \right) \times (1 - n_{F,ct}) \right\} + u_{ct}, \quad (44)$$

where

$$D_0 = 1,$$
$$D_1 = 1 \; if \; n_{F,ct} > 0.15, \; 0 \; otherwise,$$
$$D_2 = 1 \; if \; n_{F,ct} < 0.15, \; 0 \; otherwise.$$

The term $S_{D,ct}$ refers to domestic savings, the term $NIANCT_{d,ct}$ to the net income from abroad and the net current transfers, and the remaining explanatory variables are identical to those in equation (43). First, we test the regression (44) for all values of the net foreign asset position, i.e., not considering the size of the net foreign asset position. The results are exhibited in Table 5[36]. The results for the trade balance are very similar to those found for the current account balance in Table 3. When the size of the net foreign asset position is considered with dummy variables, as Table 6 shows, the results for regression equation (44) are again similar to those estimated for the current account balance in Table 4. The new rule is much more relevant than the traditional rule, $a_{0,1} < a_{0,2}$, when the size of the net foreign asset position is between -15% and 15% as a share of domestic wealth, and the estimates for the terms of trade effect, $a_{0,3} + a_{0,4}$, and the standard terms of trade, $a_{0,5}$, are negative[37], as expected. For large creditor countries, i.e., $D_1 = 1$, the new rule term, $a_{0,2} + a_{1,2}$, nearly disappears, except for the fixed-effects estimation. The terms of trade effect, $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4}$, seems to dissipate, when both assets and liabilities are considered. For large

[36]Please note that the results change very slightly if only exports and imports of goods are considered.

[37]The standard terms of trade are negative when control variables are included but are positive otherwise.

debtor countries, i.e., $D_2 = 1$, the results resemble those obtained for large creditor countries, but the impacts are weaker. The terms of trade effect, $a_{0,3} + a_{2,3}$, and $a_{0,4} + a_{2,4}$, disappears both on the assets´ and liabilities´ side. In sum, the terms of trade effect seems to have a significant impact when net foreign asset position is intermediate, but not that for large creditor or debtor positions, in accordance with the results for the current account.

Finally, to allow for possible endogeneity in the explanatory variables, we use the dynamic Generalized Method of Moments (GMM) developed by Arellano and Bond (1991). We also include two lagged values of the dependent variable to capture dynamics. The first difference of the explanatory variables are used as instruments. Note also that although the empirical growth literature has usually averaged the data over horizons spanning five or ten years, we continue using annual data in this paper to maximize the sample size and to estimate the parameters more precisely [38]. We test the relation between the terms of trade effect and the external balance with and without control variables. The GMM estimation is accompanied by the usual diagnostic testing. The first diagnostic test investigates first- and second-order serial correlations in the disturbances. The absence of a first-order serial correlation should be rejected, but the absence of a second-order serial correlation should not. Second, a Sargan test is performed for the null hypothesis that the overidentifying assumptions are rejected. All the results are shown in Table 7. When the size of the net foreign asset position is between -15% and 15% as a share of domestic wealth, the support for the new rule declines, and the traditional rule dominates, $a_{0,1} > a_{0,2}$, and $a_{0,1} + a_{0,2} = 1$ cannot be rejected particularly when control variables are included. The terms of trade effect, $a_{0,3} + a_{0,4}$, continues to be negative[39], as does the trade terms of trade, $a_{0,5}$, when control variables are incorporated. For large creditor countries, the traditional rule, $a_{0,1} + a_{2,1}$, becomes more dominant, whereas the new rule, $a_{0,1} + a_{2,1}$, nearly disappears. The terms of trade effect, $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4}$, loses support, $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4} = 0$ can be rejected; however, the impact of the standard terms of trade, $a_{0,5} + a_{1,5}$, is now positive, but not significant. For large debtor countries, as for creditors, the traditional rule is more dominant and now the terms of trade effect, $a_{0,3} + a_{2,3} + a_{0,4} + a_{2,4}$, loses support; however, $a_{0,3} + a_{1,3} + a_{0,4} + a_{1,4} = 0$ cannot be rejected. The trade terms of trade effect, $a_{0,5}$, nearly disappears. Summarizing, the empirical results

[38]See Baltagi, Demetriades and Law (2009), for instance.

[39]In addition, it can be rejected that $a_{0,3} + a_{0,4} = 0$.

obtained appear to be broadly robust when endogeneity is considered.

5 Conclusions

In this paper, we have studied the extent to which capital mobility impacts the manner in which the terms of trade affect the external balance of a country, as either the current account or the trade balance. We have found that the impact of an income shock in the terms of trade on the external balance depends on whether the traditional rule or the new view dominates. If the new view for the current account holds, the impact of changes in the terms of trade are equal to those found in Turnovsky (1993), and the HLM effect holds for creditor countries. However, if the traditional rule dominates, changes in the terms-of-trade may not affect the external balance, and the HLM effect fails to hold. The empirical evidence, based on a sample of 37 countries from 1970 to 2009, has found that when the ratio of the net foreign asset position to domestic wealth is between -15% and $+15\%$, the new rule dominates, and a deterioration of the terms of trade deteriorates the external balance; the HLM effect holds if and only if the country is a net creditor. In contrast, for large creditor or debtor countries the traditional rule dominates and the HLM effect ceases to hold. Extending this analysis to the current economic and financial developments will probably provide further valuable insights.

A Optimization

The first step to solve the optimization problem is to introduce a value function, $V(W,E)$, which is defined by the following equation:

$$V(W,E) = \underset{\{C_D, C_M, n_K\}}{Max} \; E_0 \int_0^{\infty} \frac{\left[(C_D - \tau_D)^{\theta} (C_M - \tau_M)^{1-\theta}\right]^{1-\frac{1}{\gamma}} - 1}{1 - \frac{1}{\gamma}} e^{-\beta t} dt, \tag{45}$$

subject to restrictions (9), (10), (11), and given the initial wealth and exchange rate. The value function in period 0 is the expected value of the discounted sum of instantaneous utilities, evaluated along the optimal path, starting in period 0 in states $W(0) = W_0$ and $E(0) = E_0$.

Second, starting from equation (45) the value function must satisfy the following equation, which is known as the Hamilton-Jacobi-Bellman equation of stochastic control theory or, in short, the Bellman equation:

$$\beta V(W,E) = \underset{\{C_D, C_M, n_K\}}{Max} \left[\begin{array}{c} \frac{\left[(C_D - \tau_D)^{\theta} (C_M - \tau_M)^{1-\theta}\right]^{1-\frac{1}{\gamma}} - 1}{1 - \frac{1}{\gamma}} + V_W W \psi + V_E E \varepsilon \\ +0.5 V_{WW} W^2 \sigma_w^2 + 0.5 V_{EE} E^2 \sigma_e^2 + V_{WE} W E \sigma_{we} \end{array} \right]. \tag{46}$$

Third, the right side of equation (46) is partially differentiated with respect to C_D, C_M and n_K to obtain the first-order optimality conditions of the optimization problem:

$$\theta \left[(C_D - \tau_D)^{\theta\left(1-\frac{1}{\gamma}\right)-1} (C_M - \tau_M)^{(1-\theta)\left(1-\frac{1}{\gamma}\right)} \right] - V_W = 0, \tag{47}$$

$$(1-\theta) \left[(C_D - \tau_D)^{\theta\left(1-\frac{1}{\gamma}\right)} (C_M - \tau_M)^{(1-\theta)\left(1-\frac{1}{\gamma}\right)-1} \right] - V_W E = 0, \tag{48}$$

$$V_W W \left[\alpha - (i^* + \varepsilon)\right] dt - V_{WW} W^2 cov\,(dw, de) - V_{WE} W E \sigma_e^2 = 0. \tag{49}$$

These are typical equations in stochastic models over continuous time. Equations (47) and (48) indicate that, at the optimum, the marginal utility derived from consumption must be equal to the marginal change in the value function or the marginal utility of wealth. Equation (49) shows that the optimal choice of portfolio shares by the representative agent must be such that the risk-adjusted rates of returns for both assets, that is, domestic capital and foreign bonds, are equalized.

The solution to this maximization problem is obtained through trial and error. We seek to find a value function $V(W,E)$ that satisfies, on the one hand, the first-order optimality conditions and, on the other hand, the Bellman equation. Thus, we postulate a guess value function of the following form[40]:

$$V(W,E) = a + b\frac{(W-d)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}E^{x}, \tag{50}$$

where the coefficients a, b,d, and x are determined below. That guess implies the following equations:

$$\begin{aligned}
V_W &= b\,(W-d)^{-\frac{1}{\gamma}}\,E^{x}, \\
V_{WW} &= -b\frac{(W-d)^{-\frac{1}{\gamma}-1}}{\gamma}E^{x}, \\
V_E &= xb\frac{(W-d)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}E^{x-1}, \\
V_{EE} &= x\,(x-1)\,b\frac{(W-d)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}E^{x-2}, \\
V_{WE} &= bx\,(W-d)^{-\frac{1}{\gamma}}\,E^{x-1}.
\end{aligned} \tag{51}$$

Now, dividing equation (47) into equation (48) and defining aggregate consumption C as

$$C-\tau \equiv C_D-\tau_D+E\,(C_M-\tau_M)\,,$$

where

$$\tau \equiv \tau_D + E\tau_M,$$

we can obtain

$$C_D-\tau_D = \theta\,(C-\tau)\,, \tag{52}$$

$$E\,(C_M-\tau_M) = (1-\theta)\,(C-\tau)\,. \tag{53}$$

Equations (52) and (53) are equations (13) and (14) in the main text.

[40]See Merton (1969, 1971).

Combining equations (47), (52), and (53), we obtain the following for the consumption function:

$$C = \tau + b^{-\gamma}\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}\left(W-d\right)E^{-\gamma\left[x+(1-\theta)\left(1-\frac{1}{\gamma}\right)\right]}. \tag{54}$$

Then, we substitute equations (51) into equation (49). This leads to the following portfolio share:

$$\frac{K}{W} = \frac{\gamma\left\{\alpha-(i^{*}+\varepsilon)-x\sigma_e^2\right\}\left(\frac{W-d}{W}\right)}{\sigma_e^2} + 1. \tag{55}$$

The parameters d and x need to be determined.

Substituting equations (51), (52), (53), (54), and (55) into the Bellman equation (46), we obtain the following:

$$\beta a + \beta b\frac{\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x}}{1-\frac{1}{\gamma}} =$$

$$\begin{aligned}
&= \frac{b^{1-\gamma}\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x-\gamma\left[x+(1-\theta)\left(1-\frac{1}{\gamma}\right)\right]}-1}{1-\frac{1}{\gamma}} \\
&+b\left(W-d\right)^{-\frac{1}{\gamma}}WE^{x}\left\{\left[\alpha-(i^{*}+\varepsilon)\right]\left\{\left[\alpha-(i^{*}+\varepsilon)\right]-x\sigma_e^2\right\}\frac{\gamma\left(W-d\right)}{\sigma_e^2W}+\alpha\right. \\
&\left.-b^{-\gamma}\left(\frac{W-d}{W}\right)\left\{\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}E^{-\gamma[x-(1-\theta)(1-\gamma)]}\right\}-\frac{\tau}{W}\right\} \\
&+\frac{x\varepsilon b\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x}}{1-\frac{1}{\gamma}}-\frac{0.5\gamma}{\sigma_e^2}\left\{\left[\alpha-(i^{*}+\varepsilon)\right]-x\sigma_e^2\right\}^2 b\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x} \\
&+\frac{0.5x\left(x-1\right)\sigma_e^2 b\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x}}{1-\frac{1}{\gamma}}-x\gamma\left\{\left[\alpha-(i^{*}+\varepsilon)\right]-x\sigma_e^2\right\}b\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x}
\end{aligned} \tag{56}$$

Because equation (56) includes terms involving W and E raised to constant powers, the viability of the value function (50) requires the following condition to be satisfied:

$$-\gamma\left[x+(1-\theta)\left(1-\frac{1}{\gamma}\right)\right]=0,$$

or, equivalently,

$$x=-(1-\theta)\left(1-\frac{1}{\gamma}\right). \tag{57}$$

Equation (56) implies that

$$a=-\frac{1}{\beta\left(1-\frac{1}{\gamma}\right)}.$$

Then, we divide both sides of (56) by $b\left(W-d\right)^{1-\frac{1}{\gamma}}E^{x}$; rearranging the terms, we obtain

$$(W-d)\left\{\frac{\beta-b^{-\gamma}\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}}{1-\frac{1}{\gamma}}-\frac{0.5\gamma\left[\alpha-(i^{*}+\varepsilon)\right]^{2}}{\sigma_{e}^{2}}\right.$$

$$-\gamma\left(1-\theta\right)\left(1-\frac{1}{\gamma}\right)\left[\alpha-(i^{*}+\varepsilon)\right]-\frac{x\varepsilon}{1-\frac{1}{\gamma}}$$

$$\left.-0.5\left(1-\gamma\right)\sigma_{e}^{2}\left\{1-(1-\theta)\left(1-\frac{1}{\gamma}\right)\right\}+(1-\theta)\left(1-\frac{1}{\gamma}\right)^{2}\right\}=$$

$$=\left\{-b^{-\gamma}\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}+\alpha\right\}W-$$

$$-\left\{-b^{-\gamma}\theta^{-\theta(1-\gamma)}\left(1-\theta\right)^{-(1-\theta)(1-\gamma)}+\tau\right\}d \tag{58}$$

For the value function to be feasible, b and d should be such that the coefficients of W and the constant part in equation (58) should be both equal to zero. Equalizing terms depending on W in equation (58) then, after some algebra, implies

$$b^{-\gamma}=\gamma\beta+(1-\gamma)\,\alpha+(1-\gamma)\left\{-\frac{0.5\gamma\left[\alpha-(i^{*}+\varepsilon)\right]^{2}}{\sigma_{e}^{2}}-\gamma\left(1-\theta\right)\left(1-\frac{1}{\gamma}\right)\left[\alpha-(i^{*}+\varepsilon)\right]\right.$$

$$\left.-0.5\left(1-\gamma\right)\sigma_{e}^{2}\left\{1-(1-\theta)\left(1-\frac{1}{\gamma}\right)\right\}+(1-\theta)\left(1-\frac{1}{\gamma}\right)^{2}-\frac{x\varepsilon}{1-\frac{1}{\gamma}}\right\}. \tag{59}$$

Equalizing the constant terms, together with equation (59), we obtain

$$d = \frac{\tau}{\alpha}. \tag{60}$$

Then, consumption function is given by:

$$C = \tau + \theta^{-\theta(1-\gamma)} (1-\theta)^{-(1-\theta)(1-\gamma)} W + \theta^{-\theta(1-\gamma)} (1-\theta)^{-(1-\theta)(1-\gamma)} \left(W - \frac{\tau}{\alpha}\right) b^{-\gamma}, \tag{61}$$

where $b^{-\gamma}$ has been defined by equation (59) above.

Equation (61) can also be more succinctly expressed. Substituting equations (9), (10), (11), (51), (52), and (53) in the Bellman equation (46), we can obtain an equivalent expression to equation (56), which, after calculations and rearranging terms, leads to

$$-0.5 (1-\theta) (\gamma - 1) \left[(1-\theta) \left(1 - \frac{1}{\gamma}\right) + 1 \right] \sigma_e^2 + \frac{(1-\theta)(\gamma-1)^2}{\gamma} \sigma_{we} \Bigg]. \tag{62}$$

Equation (62) is equation (15) in main the text.

Now, we substitute equations (57) and (55) in the equilibrium portfolio share equation (55), given by

$$\frac{K}{W} = \frac{\left\{\alpha - (i^* + \varepsilon) + (1-\theta)\left(1 - \frac{1}{\gamma}\right)\sigma_e^2\right\} \gamma \left(1 - \frac{\tau/\alpha}{W}\right)}{\sigma_e^2} + 1. \tag{63}$$

Equation (63) is equation (16) in the text.

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Table 1: List of countries

INDUSTRIAL COUNTRIES	DEVELOPING COUNTRIES
Austria	Argentina
Australia	Brazil
Belgium	Colombia
Canada	Hungary
Denmark	India
Finland	Israel
Germany	Korea
Greece	Mexico
Iceland	Pakistan
Ireland	the Philippines
Italy	Poland
Japan	Singapore
The Netherlands	South Africa
Norway	Thailand
New Zealand	Tunisia
Spain	Turkey
Portugal	Venezuela
Sweden	
the United Kingdom	
the Unites States	

[43]

Table 2: Current account balance for all values of the net foreign asset position

	Pooled regression		Fixed effects	
National savings [a_1]	0.377***	0.384***	0.443***	0.528***
	(0.0268)	(0.0270)	(0.0576)	(0.0633)
National savings × (Net foreign assets/Wealth) [a_2]	0.212***	0.189***	0.322*	0.316**
	(0.0315)	(0.0310)	(0.159)	(0.148)
$TOTE_d \times (1 - n_F)$ [a_3]	-0.0467	-0.105	-0.00825	-0.0593
	(0.0738)	(0.0641)	(0.0703)	(0.0422)
$TTOTE$ [a_4]	0.0231	-0.0373	0.0462	-0.0166
	(0.0365)	(0.0383)	(0.0276)	(0.0219)
Population		-2.65e-06		-0.000235***
		(5.84e-06)		(3.90e-05)
GDP per capita		0.000632***		0.000111
		(0.000124)		(0.00144)
Time dummies	No	Yes	No	Yes
Constant [a_0]	-0.0876***	-0.116***	-0.100***	-0.137***
	(0.00582)	(0.0116)	(0.0132)	(0.0206)
R^2	0.472	0.532	0.283	0.412
P-value for null hypothesis that a_1+a_2=1	0.0000	0.0000	0.1400	0.2744
No. of observations	1,181	1,176	1,181	1,176

Standard errors are in parenthesis.
*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.
Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Table 3: Current account balance for all values of the net foreign asset position (assets vs. liabilities)

	Pooled regression		Fixed effects	
National savings $[a_{0,1}]$	0.377***	0.382***	0.447***	0.528***
	(0.0194)	(0.0193)	(0.0591)	(0.0637)
National savings × (Net foreign assets/Wealth) $[a_{0,2}]$	0.211***	0.189***	0.327**	0.320**
	(0.0182)	(0.0180)	(0.159)	(0.148)
$TOTE_d \times (1 - n_F)$ $[a_{0,3}]$	-0.164***	-0.189***	-0.101	-0.116**
	(0.0438)	(0.0432)	(0.0813)	(0.0511)
$TOTE_f \times (1 - n_F)$ $[a_{0,4}]$	0.0527	0.104***	0.0163	0.0613
	(0.0381)	(0.0380)	(0.0672)	(0.0417)
$TTOTE$ $[a_{0,5}]$	0.0343**	-0.0223	0.0517**	-0.00938
	(0.0155)	(0.0176)	(0.0244)	(0.0216)
Population		-2.36e-06		-0.000234***
		(6.76e-06)		(3.88e-05)
GDP per capita		0.000645***		0.000104
		(0.000111)		(0.00144)
Time dummies	No	Yes	No	Yes
Constant $[a_{0,0}]$	-0.0875***	-0.115***	-0.101***	-0.137***
	(0.00448)	(0.0120)	(0.0136)	(0.0205)
R^2	0.484	0.539	0.294	0.416
P-value for null hypothesis that $a_{0,1}+a_{0,2}=1$	0.0000	0.0000	0.1508	0.2860
No. of observations	1,181	1,176	1,181	1,176

Standard errors are in parenthesis.

*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.

Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Table 4: Current account balance and the net foreign asset position (with dummy variables and assets vs. liabilities)

	Pooled regression		Fixed effects	
National savings $[a_{0,1}]$	0.318***	0.313***	0.414***	0.509***
	(0.0245)	(0.0242)	(0.0712)	(0.0629)
Creditor: $D_1\times$ National savings $[a_{1,1}]$	0.320***	0.368***	0.134	0.183
	(0.0827)	(0.0812)	(0.277)	(0.260)
Debtor: $D_2\times$ National savings $[a_{2,1}]$	0.0734*	0.122***	-0.0165	-0.0153
	(0.0430)	(0.0435)	(0.101)	(0.109)
National savings $\times$ (Net foreign assets/Wealth) $[a_{0,2}]$	0.896***	0.872***	0.783**	0.729***
	(0.0902)	(0.0923)	(0.296)	(0.217)
Creditor: $D_1\times$ National savings $\times$ (Net foreign assets/Wealth) $[a_{1,2}]$	-0.941***	-0.929***	-0.476	-0.520*
	(0.101)	(0.104)	(0.361)	(0.308)
Debtor: $D_2\times$ National savings $\times$ (Net foreign assets/Wealth) $[a_{2,2}]$	-0.611***	-0.520***	-0.623*	-0.501*
	(0.112)	(0.115)	(0.355)	(0.292)
$TOTE_d \times (1-n_F)$ $[a_{0,3}]$	-0.296***	-0.228***	-0.210	-0.110
	(0.0783)	(0.0774)	(0.130)	(0.0994)
Creditor: $D_1\times$ $TOTE_d \times (1-n_F)$ $[a_{1,3}]$	-0.211	-0.205	-0.643*	-0.598*
	(0.321)	(0.312)	(0.323)	(0.295)
Debtor: $D_2\times$ $TOTE_d \times (1-n_F)$ $[a_{2,3}]$	0.269***	0.172*	0.186	0.0487
	(0.0977)	(0.0958)	(0.141)	(0.115)
$TOTE_f \times (1-n_F)$ $[a_{0,4}]$	0.0835	0.0751	0.0357	-0.00279
	(0.0712)	(0.0696)	(0.105)	(0.0771)
Creditor: $D_1\times$ $TOTE_f \times (1-n_F)$ $[a_{1,4}]$	0.364	0.303	0.842**	0.730**
	(0.384)	(0.375)	(0.322)	(0.306)
Debtor: $D_2\times$ $TOTE_f \times (1-n_F)$ $[a_{2,4}]$	-0.0584	-0.00904	-0.0181	0.0703
	(0.0853)	(0.0833)	(0.122)	(0.0964)
$TTOTE$ $[a_{0,5}]$	0.0570**	-0.0385	0.0811***	-0.0344
	(0.0267)	(0.0311)	(0.0292)	(0.0321)
Creditor: $D_1\times$ $TTOTE$ $[a_{1,5}]$	0.0584	0.130***	-0.00145	0.0860**
	(0.0427)	(0.0436)	(0.0394)	(0.0417)
Debtor: $D_2\times$ $TTOTE$ $[a_{2,5}]$	-0.0397	0.0192	-0.0598	0.0104
	(0.0348)	(0.0371)	(0.0437)	(0.0388)
Population		-1.20e-05*		-0.000222***
		(6.63e-06)		(3.74e-05)
GDP per capita		0.000234**		0.000228
		(0.000119)		(0.00137)
Time dummies	No	Yes	No	Yes
Constant $[a_{0,0}]$	-0.0648***	-0.0884***	-0.0900***	-0.131***
	(0.00589)	(0.0120)	(0.0163)	(0.0199)
Creditor: $D_1\times$ Constant $[a_{1,0}]$	-0.0550***	-0.0774***	-0.0177	-0.0439
	(0.0199)	(0.0195)	(0.0665)	(0.0593)
Debtor: $D_2\times$ Constant $[a_{2,0}]$	-0.0288***	-0.0368***	-0.0118	-0.00802
	(0.00891)	(0.00890)	(0.0202)	(0.0199)
R^2	0.549	0.597	0.329	0.440
P-value for null hypothesis that $a_{0,1}+a_{0,2}=1$	0.0178	0.0458	0.5185	0.3309
P-value for null hypothesis that $a_{0,3}+a_{0,4}=0$	0.0000	0.0000	0.0003	0.0191
P-value for null hypothesis that $a_{0,3}+a_{1,3}+a_{0,4}+a_{1,4}=0$	0.5296	0.5527	0.4853	0.6635
P-value for null hypothesis that $a_{0,3}+a_{2,3}+a_{0,4}+a_{2,4}=0$	0.9500	0.7017	0.8456	0.8208
No. of observations	1,181	1,176	1,181	1,176

Standard errors are in parenthesis.
*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.
Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Table 5: Trade balance for all values of the net foreign asset position (assets vs. liabilities)

	Pooled regression		Fixed effects	
Domestic savings $[a_{0,1}]$	0.386***	0.392***	0.455***	0.521***
	(0.0197)	(0.0194)	(0.0571)	(0.0573)
Domestic savings× (Net foreign assets/Wealth) $[a_{0,2}]$	0.239***	0.209***	0.378**	0.314**
	(0.0181)	(0.0180)	(0.147)	(0.141)
$TOTE_d \times (1 - n_F)$ $[a_{0,3}]$	-0.517***	-0.449***	-0.495***	-0.290***
	(0.0328)	(0.0330)	(0.107)	(0.102)
$TOTE_f \times (1 - n_F)$ $[a_{0,4}]$	-0.155***	-0.183***	-0.0970	-0.121**
	(0.0445)	(0.0437)	(0.0849)	(0.0544)
$TTOTE$ $[a_{0,5}]$	0.0487	0.0998***	0.0138	0.0575
	(0.0387)	(0.0384)	(0.0660)	(0.0424)
$NIANCT \times (1 - n_F)$ $[a_{0,6}]$	0.0314**	-0.0263	0.0506**	-0.00649
	(0.0158)	(0.0178)	(0.0231)	(0.0207)
Population		-7.02e-06		-0.000243***
		(6.92e-06)		(3.85e-05)
GDP per capita		0.000690***		0.000383
		(0.000114)		(0.00133)
Time dummies	No	Yes	No	Yes
Constant $[a_{0,0}]$	-0.0887***	-0.119***	-0.102***	-0.138***
	(0.00457)	(0.0121)	(0.0131)	(0.0198)
R^2	0.633	0.675	0.407	0.518
P-value for null hypothesis that $a_{0,1}+a_{0,2}=1$	0.0000	0.0000	0.2395	0.2201
No. of observations	1,181	1,176	1,181	1,176

Standard errors are in parenthesis.

*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.

Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Table 6: Trade balance and the net foreign asset position (with dummy variables and assets vs. liabilities)

	Pooled regression		Fixed effects	
Domestic savings $[a_{0,1}]$	0.319***	0.311***	0.423***	0.517***
	(0.0246)	(0.0243)	(0.0729)	(0.0613)
Creditor: $D_1\times$ Domestic savings $[a_{1,1}]$	0.395***	0.440***	0.190	0.240
	(0.0886)	(0.0868)	(0.175)	(0.164)
Debtor: $D_2\times$ Domestic savings $[a_{2,1}]$	0.0910**	0.132***	0.0103	-0.0183
	(0.0414)	(0.0416)	(0.0978)	(0.102)
Domestic savings $\times$ (Net foreign assets/Wealth) $[a_{0,2}]$	0.960***	0.905***	0.822**	0.705***
	(0.0913)	(0.0934)	(0.330)	(0.225)
Creditor: $D_1\times$ Domestic savings $\times$ (Net foreign assets/Wealth) $[a_{1,2}]$	-1.023***	-0.979***	-0.456	-0.461
	(0.104)	(0.107)	(0.457)	(0.383)
Debtor: $D_2\times$ Domestic savings $\times$ (Net foreign assets/Wealth) $[a_{2,2}]$	-0.633***	-0.548***	-0.575	-0.465*
	(0.109)	(0.110)	(0.358)	(0.268)
$TOTE_d \times (1-n_F)$ $[a_{0,3}]$	-0.267***	-0.207***	-0.212	-0.122
	(0.0793)	(0.0783)	(0.131)	(0.0983)
Creditor: $D_1\times$ $TOTE_d \times (1-n_F)$ $[a_{1,3}]$	0.00472	0.00521	-0.797**	-0.768**
	(0.320)	(0.311)	(0.329)	(0.313)
Debtor: $D_2\times$ $TOTE_d \times (1-n_F)$ $[a_{2,3}]$	0.245**	0.150	0.204	0.0629
	(0.0988)	(0.0967)	(0.142)	(0.115)
$TOTE_f \times (1-n_F)$ $[a_{0,4}]$	0.0750	0.0703	0.0326	-0.00344
	(0.0717)	(0.0700)	(0.104)	(0.0757)
Creditor: $D_1\times$ $TOTE_f \times (1-n_F)$ $[a_{1,4}]$	0.137	0.0911	1.081***	1.006***
	(0.385)	(0.375)	(0.365)	(0.361)
Debtor: $D_2\times$ $TOTE_f \times (1-n_F)$ $[a_{2,4}]$	-0.0535	-0.00421	-0.0229	0.0647
	(0.0859)	(0.0837)	(0.123)	(0.0950)
$TTOTE$ $[a_{0,5}]$	0.0445	-0.0543*	0.0861***	-0.0282
	(0.0272)	(0.0315)	(0.0300)	(0.0305)
Creditor: $D_1\times$ $TTOTE$ $[a_{1,5}]$	0.0573	0.131***	-0.0179	0.0710
	(0.0433)	(0.0441)	(0.0450)	(0.0442)
Debtor: $D_2\times$ $TTOTE$ $[a_{2,5}]$	-0.0262	0.0334	-0.0602	0.00825
	(0.0352)	(0.0376)	(0.0442)	(0.0381)
$NIANCT \times (1-n_F)$ $[a_{0,6}]$	-0.853***	-0.829***	-0.568***	-0.351**
	(0.0546)	(0.0555)	(0.208)	(0.167)
Creditor: $D_1\times$ $NIANCT \times (1-n_F)$ $[a_{1,6}]$	0.805***	0.834***	0.483	0.495*
	(0.141)	(0.139)	(0.346)	(0.276)
Debtor: $D_2\times$ $NIANCT \times (1-n_F)$ $[a_{2,6}]$	0.368***	0.389***	0.0852	0.0180
	(0.0705)	(0.0705)	(0.208)	(0.217)
Population		-7.97e-06		-0.000230***
		(6.79e-06)		(3.52e-05)
GDP per capita		0.000302**		0.000433
		(0.000123)		(0.00125)
Time dummies	No	Yes	No	Yes
Constant $[a_{0,0}]$	-0.0656***	-0.0877***	-0.0918***	-0.136***
	(0.00593)	(0.0121)	(0.0165)	(0.0198)
Creditor: $D_1\times$ Constant $[a_{1,0}]$	-0.0685***	-0.0897***	-0.0261	-0.0529
	(0.0213)	(0.0208)	(0.0379)	(0.0324)
Debtor: $D_2\times$ Constant $[a_{2,0}]$	-0.0289***	-0.0362***	-0.0145	-0.00612
	(0.00894)	(0.00891)	(0.0199)	(0.0184)
R^2	0.685	0.720	0.441	0.540
P-value for null hypothesis that $a_{0,1}+a_{0,2}=1$	0.0023	0.0212	0.4837	0.3956
P-value for null hypothesis that $a_{0,3}+a_{0,4}=0$	0.0000	0.0000	0.0001	0.0086
P-value for null hypothesis that $a_{0,3}+a_{1,3}+a_{0,4}+a_{1,4}=0$	0.6000	0.6690	0.2059	0.2179
P-value for null hypothesis that $a_{0,3}+a_{2,3}+a_{0,4}+a_{2,4}=0$	0.9993	0.7438	0.9606	0.9259
No. of observations	1,181	1,176	1,181	1,176

Standard errors are in parenthesis.
*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.
Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Table 7: External balance and the net foreign asset position (with dummy variables and assets vs. liabilities). Dynamic GMM estimation (Arellano-Bond, 1991).

	Current account		Trade balance	
First lag dependent variable	0.409***	0.253***	0.398***	0.249***
	(0.0928)	(0.0745)	(0.0696)	(0.0601)
Second lag dependent variable	-0.205***	-0.177***	-0.157***	-0.136***
	(0.0413)	(0.0474)	(0.0447)	(0.0505)
Savings $[a_{0,1}]$	0.479***	0.679***	0.435***	0.658***
	(0.0738)	(0.0768)	(0.0824)	(0.0857)
Creditor: $D_1\times$ Savings $[a_{1,1}]$	0.0969	0.205*	0.118	0.278*
	(0.130)	(0.113)	(0.154)	(0.142)
Debtor: $D_2\times$ Savings $[a_{2,1}]$	-0.0932*	-0.122**	-0.0213	-0.0728
	(0.0519)	(0.0559)	(0.0577)	(0.0606)
Savings $\times$ (Net foreign assets/Wealth) $[a_{0,2}]$	0.165	0.404***	0.175	0.365***
	(0.105)	(0.110)	(0.117)	(0.120)
Creditor: $D_1\times$ Savings $\times$ (Net foreign assets/Wealth) $[a_{1,2}]$	-0.171	-0.483***	-0.0600	-0.377**
	(0.125)	(0.132)	(0.138)	(0.151)
Debtor: $D_2\times$ Savings $\times$ (Net foreign assets/Wealth) $[a_{2,2}]$	-0.141	-0.320***	-0.0809	-0.250*
	(0.113)	(0.123)	(0.121)	(0.130)
$TOTE_d \times (1-n_F)$ $[a_{0,3}]$	-0.279***	-0.137	-0.288***	-0.139
	(0.103)	(0.124)	(0.0921)	(0.119)
Creditor: $D_1\times$ $TOTE_d \times (1-n_F)$ $[a_{1,3}]$	0.300*	0.174	0.257	0.121
	(0.169)	(0.204)	(0.193)	(0.206)
Debtor: $D_2\times$ $TOTE_d \times (1-n_F)$ $[a_{2,3}]$	0.277***	0.121	0.289***	0.130
	(0.105)	(0.132)	(0.0937)	(0.121)
$TOTE_f \times (1-n_F)$ $[a_{0,4}]$	0.0303	-0.0171	0.0284	-0.0224
	(0.0736)	(0.0811)	(0.0656)	(0.0775)
Creditor: $D_1\times$ $TOTE_f \times (1-n_F)$ $[a_{1,4}]$	-0.186	-0.137	-0.142	-0.0688
	(0.158)	(0.169)	(0.177)	(0.175)
Debtor: $D_2\times$ $TOTE_f \times (1-n_F)$ $[a_{2,4}]$	-0.0566	0.0336	-0.0520	0.0345
	(0.0775)	(0.0885)	(0.0721)	(0.0822)
$TTOTE$ $[a_{0,5}]$	0.0320	-0.0239	0.0239	-0.0240
	(0.0350)	(0.0296)	(0.0344)	(0.0308)
Creditor: $D_1\times$ $TTOTE$ $[a_{1,5}]$	0.0497	0.0528	0.0535	0.0528
	(0.0411)	(0.0491)	(0.0386)	(0.0486)
Debtor: $D_2\times$ $TTOTE$ $[a_{2,5}]$	-0.0404	0.0135	-0.0328	0.0188
	(0.0378)	(0.0304)	(0.0369)	(0.0302)
$NIANCT \times (1-n_F)$ $[a_{0,6}]$			-0.357***	-0.223**
			(0.115)	(0.107)
Creditor: $D_1\times$ $NIANCT \times (1-n_F)$ $[a_{1,6}]$			-0.000971	0.173
			(0.180)	(0.189)
Debtor: $D_2\times$ $NIANCT \times (1-n_F)$ $[a_{2,6}]$			0.00102	-0.0600
			(0.112)	(0.128)
GDP per capita		-0.000538***		-0.000527***
		(0.000101)		(0.000108)
Population		-0.00988***		-0.00915**
		(0.00375)		(0.00362)
Time dummies	No	Yes	No	Yes
Constant $[a_{0,0}]$	-0.109***	-0.0608	-0.0994***	-0.0653
	(0.0179)	(0.0409)	(0.0194)	(0.0417)
Creditor: $D_1\times$ Constant $[a_{1,0}]$	-0.0246	-0.0449*	-0.0347	-0.0676*
	(0.0301)	(0.0254)	(0.0366)	(0.0347)
Debtor: $D_2\times$ Constant $[a_{2,0}]$	0.0164	0.0166	0.00106	0.00674
	(0.0113)	(0.0119)	(0.0109)	(0.0115)
P-value for null hypothesis that $a_{0,1}$+$a_{0,2}$=1	0.0078	0.5389	0.0128	0.8832
P-value for null hypothesis that $a_{0,3}$+$a_{0,4}$=0	0.0000	0.0028	0.0000	0.0019
P-value for null hypothesis that $a_{0,3}+a_{1,3}+a_{0,4}+a_{1,4}=0$	0.0013	0.0036	0.0020	0.0015
P-value for null hypothesis that $a_{0,3}+a_{2,3}+a_{0,4}+a_{2,4}=0$	0.0449	0.9550	0.1539	0.8033
No. of observations	1,089	1,086	1,089	1,086
Sargan test	215.90	201.43	205.69	197.56
	(0.00)	(0.00)	(0.00)	(0.00)
First-order autocorrelation	-4.46	-3.96	-4.21	-3.48
	(0.00)	(0.00)	(0.00)	(0.00)
Second-order autocorrelation	0.99	0.41	-0.33	-0.84
	(0.32)	(0.68)	(0.74)	(0.40)

Standard errors are in parenthesis.
*: Significant at 10% level; **: Significant at 5% level; ***: Significant at 1% level.
Sources: IMFIFS, WBWDI, Lane and Milesi-Ferretti (2007), Nehru and Dareshwar (1993), and own elaboration.

Figure 1: The relation between the net foreign asset position (as a share of domestic wealth) and the term capturing the new rule