Abstract

This paper assesses whether the current account has an asymmetric response to permanent terms-of-trade shocks in countries with borrowing constraints. The Baxter-King filter is used to decompose the terms-of-trade series into its permanent and transitory components; we further divide permanent shocks into their positive and negative components. We focus on eighteen Latin American countries (1973-2008) and run a Feasible Generalized Least Squares panel data regression to test if the current account response to positive shocks is greater than zero and if the response to negative shocks is null. Results are fairly similar to those reported by Agénor and Aizenman (2004).

Keywords: Terms of Trade; Current Account; Harberger-Laursen-Metzler effect; Argentina; Latin America.

JEL Classification: F32, F34, F41

* Facultad de Ciencias Económicas, Universidad Nacional de Córdoba, Argentina. E-mail: sbarone@eco.uncor.edu; ricipes@eco.uncor.edu. Tomás Frías Sole and Luciana María Orozco provided active and valuable research assistance.
CREDIT CONSTRAINTS AND THE ASYMMETRIC CURRENT ACCOUNT RESPONSE TO TERMS-OF-TRADE SHOCKS: AN EMPIRICAL APPLICATION TO LATIN AMERICAN COUNTRIES

Sergio V. Barone, Ricardo Descalzi

I. INTRODUCTION

The paper analyzes the general problem related to the transmission of economic cycles to Small Open Economies (SOEs) (Obstfeld and Rogoff, 1995; Baxter, 1996; Obstfeld and Rogoff, 1996; Turnovsky, 1997) using long run dynamic models that describe an “impulse-response” mechanism that identifies shocks, which alter steady state, followed by an evaluation of the changes in the dynamic of main economic aggregates as result of that variation in the long run equilibrium.

The analysis focuses on terms-of-trade shocks, which are considered one of the major sources of income volatility in developing economies (Mendoza 1995, Kose 2005). Specifically, we tackle the problem related to the impact of terms-of-trade shocks in Less Developed SOEs. In the present study, ‘Less Developed SOEs’ are understood as those countries who have borrowing constraints.

Thus, our approach takes into account two aspects of this general problem. First, we analyze the effects of terms of trade on the current account (putting aside the dynamics of other variables such as the real exchange rate or the interest rate, which are assumed as fixed variables in our analysis). Second, we distinguish within the group of Small Open Economies the behavior of Developed Countries (Canada, Australia among others) from the performance of Developing Countries (where Latin American Countries are supposed to be included) and assess the structural relationship between current account and terms of trade in the latter.

This problem has been studied by Agénor and Aizenman (2004), who carry out a panel data estimation for Sub-Saharan Africa; Bouakez and Kano (2008); and Huang and Meng (2007). Our investigation is focused on the same issue and analyzes the effects of terms-of-trade shocks on Current Account for a set of 18 Latin American Countries during the period 1973-2008.

These countries (i.e. Less Developed Countries or LDCs) are thought to have a high level of indebtedness and a high default risk. When a positive stimulus occurs (i.e. a positive terms-of-trade shock) these countries can save and buy International Financial Assets; however, when the opposite occurs (i.e. a negative terms-of-trade shock) LDCs are no longer able to borrow money from the rest of the world because international markets are not willing to finance an external disequilibrium of a country with high default risk. In short, there is an asymmetric response of the current account between “good times” (when a surplus is present after a positive terms-of-trade shock since the entire increase in current income is saved) and “bad times” (when the current account response to negative terms-of-trade shock is zero because SOEs are no longer able to borrow due to their lack of creditworthiness) as Agénor and Aizenman (2004) suggest.

The main propose of this paper is to empirically test if the current account responds asymmetrically to permanent terms-of-trade shocks on a sample of eighteen Latin
American economies. First, we apply the Baxter-King filter to decompose the terms-of-trade shocks into their permanent and transitory components. Second, we split permanent terms-of-trade shocks into positive and negative ‘swings’, following Agénor and Aizenman (2004). Third, we run a Feasible Generalized Least Squares (FGLS) panel data regression to examine if permanent shocks provoke an asymmetric response on the current account in Latin American countries. Finally, we conclude by pointing out some distinctions between the results of this paper and those obtained in a previous work, in which we tested the Harberger-Laursen-Metzler (HLM) predictions on an economy without credit constraints.

The rest of this paper is organized as follows. In Section II we review the main theoretical findings related to our field of interest and develop the working hypothesis to be tested. In Section III we present an explanation of the empirical approach used to test the working hypothesis, a discussion about coefficient interpretation, and the results of our study. In Section IV concludes.

II. THEORETICAL FINDINGS AND WORKING HYPOTHESIS

In this section we make a brief synthesis of the developments in the study of the relationship between current account and terms of trade – also known as the Harberger-Laursen-Metzler (HLM) effect - and highlight the theoretical findings related to Less Developed Countries. Then we introduce the working hypothesis for this paper.

a. Literature Review

The problem dealt with in this paper gives us insight to the macroeconomic dynamics during the last 30 years in Latin American economies. We find political economy suggestions related to the behavior of the external sector and its connection with the problem of growth.

Here we mention two economic facts that stress the link between growth and external sector performance. First, the long run dynamics of terms of trade seems to be associated with the growth trend in Latin America (LA). In a previous work Barone, Descalzi and Díaz Cafferata (2009), on the basis of a sample of eleven LA Countries, found five cointegrating vectors between gross domestic product (GDP) and terms of trade series. These results would indicate strong influences of external prices on domestic economic activity: the changes in an exogenous variable (i.e. the external prices that are determined by the international market) exert a strong influence on the growth trend. This fact encourages the study of the process of transmission of economic cycles to small open economies as a source of economic growth.

Second, LA countries are restricted in their access to credit markets. In other words, the capital supply is not perfectly elastic. This fact represents a clear difference in relation with more developed countries such as Canada, Australia, New Zealand, etc. In fact, developing countries have shown many problems to manage their debt. This has given rise to the development of new literature on debt, reputation and default (Gertler y Rogoff, 1990, Catao, 2009, Reinhart, Rogoff and Savastano, 2003, among others). The problem of developing a strategy to grow under credit restrictions became a critical subject of political economy.

We then study the possibility of experiencing a growth processes when the external restriction (measured as a large current account deficit) holds. Under traditional theories (consider, for example, the Stop-Go mechanism), the economic growth would cause an increase in commercial deficit (also knows as “bottleneck”) in the economy, which would not be financed for a long time due to lack of creditworthiness. However, as we pointed
out, the experience of LA countries has shown that in many cases the growth goal has correlated to the external balance enhancement (i.e. balance of payment improvement provoking a sustained growth rate of accumulation of external financial assets -EFA).

Thus we expect to gather evidence to refute the “Stop-Go” hypothesis: if the terms-of-trade shocks drive the growth trend, then the improvement in current account is in line with the economic growth. We attempt to answer the following question: is it possible to experience a growth process without the help of foreign savings?

Given that our focus is on the analysis of terms of trade (and their influence upon growth) and on external balances (as indicators of the “external gap”), our theoretical interest turns to the analysis of the so-called Harberger-Laursen-Metzler (HLM) effect, and how it works when credit restrictions are binding.

In the economic literature the analysis of the Harberger-Lausen-Metzler (HLM) effect refers to the study of the dynamic relationship between the current account and the terms of trade. Haberger (1950) and Laursen and Metzler (1959) predicted –within the Keynesian framework- that an increase in the terms of trade would rise the national income and consumption; but the rise in the latter would be lower because the marginal propensity to consume is less than one. Thus, the current account response to a terms-of-trade shock is positive in this type of income-expenditure scheme.

Many years later, with the development of dynamic-optimizing models, the HLM effect, and the prediction that there is a positive relationship between terms of trade and current account was supported by micro funded macroeconomic theory. Obstfeld (1982); Svenson and Razin (1983); and Persson and Svensson (1985), among others, developed optimizing intertemporal models to explain this relationship.

One relevant issue is that the HLM effect depends on the persistence of real shocks. In a simplified way the HLM effect could be depicted as follows. If a transitory terms-of-trade shock affects small endowment economy, the consumption will not change because it depends only on permanent income. If the current income is higher than its permanent level then the current account will improve at the moment the shocks hit the small open economy. In subsequent periods the current account balance returns to zero as the current income converges to its (unchanged) long run value. On the other hand, if the shock is permanent, the terms-of-trade shock has no effect on current account because, in an endowment economy, the rise in consumption (which in the intertemporal approach behaves according to the permanent income hypothesis, contrary to Keynesian assumptions) is equal to the increase in small country’s real national income.

However, this prediction was challenged by Mendoza (1995), who, utilizing a business cycle model calibrated to Canada, shows that the HLM effect holds and that it is independent of the persistence of the shock. Otto (2003) uses a structural vector autoregression model to estimate the current account response to an exogenous terms-of-trade shock, and also employs the traditional Blanchard & Quah scheme that identifies (transitory) demand and (permanent) supply shocks. The results support Mendoza’s findings.

Kent and Cashin (2003) find favorable evidence for the role of transitory shocks in the operation of the HLM effect. They point out that persistence of shocks is a matter of relevance. In an empirical work they argue that the HLM effect prediction only holds when the terms-of-trade shock is transitory: the current account reacts only to transitory shocks. They compare the consequences of a permanent and transitory terms-of-trade shock on the current account both in an endowment model and in a framework that allows for capital accumulation.

In a model with endowment the current account response to a permanent shock is zero because the consumption and the current income rise in the same amount. When the role of investment is considered, the response of current account –at the moment of a
permanent shock hits the economy- is negative because the current income level is less than the long run value; then the small open economy has to borrow to finance the increase in consumption and investment. On the other hand, when the shock is transitory the current account response is positive in a model with endowment and also with capital accumulation (in fact, if the shock is purely transitory, the investment response is zero, consumption smoothing effect prevails, and HLM effect follows).

They run a panel-data regression in order to estimate current account response to terms-of-trade shocks for two different groups of countries. They consider a first group of countries that experience permanent terms-of-trade shocks and differentiate it from the countries with transitory shocks. They find that the current account response is negative in the first group while “for countries with temporary terms of trade, the sum of the coefficients was not significantly different from zero”.

However, this prediction is nowadays being challenged, in part, because of mixed evidence found in different countries. Other models have been developed to take into account complexities that might alter HLM prediction. Backus (1993) indicates that the HLM effect depends additionally on others assumptions included in the models. He stresses that the grade of market completeness is the key factor to determine the joint relationship between terms of trade and trade balance: if the markets are complete the co-movements between terms of trade and the trade balance are independent from the degree of stationary of time series but not from the preferences, technical parameters and other economic fundamentals.

Agénor and Aizenman (2004) present a three period endowment economy, with possibility of habit formation, in which the individual faces borrowing constraints at the time the economy is hit by a negative shock. They suppose that the economy receives a permanent positive shock in the first period, while in the second there exists a possibility of a negative transitory shock. In case of a negative shock, since the representative agent is unable to borrow to smooth consumption, equilibrium conditions determine that the optimum saving in the first period increases in spite of the permanent shock faced by the economy.

This gives rise to the possibility of an “asymmetric response” of current account to shocks that is not in line with the traditional HLM proposition. In fact, in good times, when the economy faces a long lasting positive shock, the saving rate increases (in opposition with HLM, which remarks that the saving rate does not change) because individuals expect, to some extent, that there will be a transitory correction in next period that will force them to dissave in a context of binding borrowing constraints. Agénor and Aizenman (2004) do not analyze the case when a permanent negative terms-of-trade shock affects the economy (in the first period). So the standard conclusion associated to current account response in an endowment model remains unchanged in “bad times”: the current account response is zero under the impact of negative and permanent terms-of-trade shock.

To test the hypothesis the authors use the GMM estimation technique of Arellano and Bond (1991) and estimate a dynamic (unbalanced) panel data model. Previously they employ a modified version of the ideal band pass filter of Baxter and King (1999) to obtain the permanent component of the terms of trade. The model performs quite well for Sub-Saharan Africa data.

Recently, Huang and Meng (2007) based on a classical Obstfeld (1982) model, tackle from a theoretical point of view the effects on the SOE dynamics of a permanent terms-of-trade shock under capital market imperfections, where the economy faces an upward debt curve. They find that a permanent and negative terms-of-trade shock enhances the aggregate expenditure and displays a current account deterioration as the HLM effect would suggest.

In summary, the traditional view related to the HLM effect (mainly associated to perfect-foresight models developed in the 1980’s) stated that the current account only responds
to transitory shocks in order to smooth consumption. The papers of Mendoza (1992, 1995) and Backus (1993) challenged this view indicating that the response of current account does not depend on the duration of the shock. Otto’s work supported this hypothesis. In recent years, models were developed to consider other complexities –such as binding borrowing constraints- that explain asymmetric response to permanent shocks. Agénor and Aizenman (2003) emphasize the relevant task of differentiating “current account asymmetric response” in good times with respect to bad times rather than testing the influence of the shocks’ persistence.

This paper examines the relationship between current account and terms-of-trade shocks in Latin American countries (LACs) to shed light on the business cycle transmission mechanism in small developing countries economies. Given that the fluctuation of the terms of trade shocks amounts to a significant part of economic activity in these countries, we test the main hypothesis stated by international macroeconomics literature.

Panel-regression techniques are employed to test two types of hypothesis. First, we decompose terms-of-trade series into permanent and transitory components by using the Baxter-King Filter to evaluate its impact on current account response according to HLM predictions. Second, we examine the symmetry of current account response to permanent shocks to test the hypothesis of credit constraints. Conclusions are drawn from the comparison of the results with international evidence of related literature.

b. Working Hypothesis

In the models with perfect capital mobility it is assumed that when a (positive or negative) permanent terms-of-trade shock affects the Small Open Economy, the current account does not respond at the moment of impact since consumption and current income increase in an equal amount in an endowment model. This is the standard “consumption smoothing” assumption.

However, in this paper our interest is in testing the hypothesis of asymmetric response of current account to terms-of-trade shocks (the impact of the shock on current account differs depending whether it is positive or negative), which originates from considering binding restrictions in international capital markets. We can summarize it as follows:

(i) If the permanent shock in terms of trade is negative the current account response is zero (in a model with endowment);

(ii) If the permanent shock in terms of trade is positive, the current account response is positive since that the economy reduces its consumption below its long-run level in an attempt to save. In other words, in “good times” LDC displays a “precautionary saving” to avoid a sudden decrease in consumption in the future in case that the economic situation worsens, given that they know they cannot borrow from international markets at “bad times”.

III. EMPIRICAL APPROACH

In this section we describe the procedure and discuss the results of the econometric panel model regression used to estimate the existence of asymmetric effects of the terms-of-trade shocks ($S_{TOT}$) on the current account ($CA$). We use a balanced panel annual data set covering the period 1973-2008 for 18 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela.
We apply Feasible Generalized Least Squares (FGLS) to test the working hypothesis. We use a covariance structure that assumes a contemporaneous correlation between equation errors of different countries. Additionally, Fixed Effects analysis is carried out in order to control unobserved heterogeneity between countries included in the panel.

**a. Model specification and variables description**

We estimate the following specification:

\[
\Delta CA_i = \gamma_1 dpa_{i,t}^{TOT} S_{tot}^{P} + \gamma_2 dna_{i,t}^{TOT} S_{tot}^{P} + \gamma_3 S_{tot}^{T} + \gamma_4 dpa_{i,t}^{GDP} S_{gdp}^{P} + \gamma_5 dna_{i,t}^{GDP} S_{gdp}^{P} + \\
\gamma_6 S_{gdp}^{T} + \gamma_7 QM \mid M_Z + \gamma_8 DEPRATIO_i + \gamma_9 INF_{i,t} + \gamma_{10}_INV_{i,t-1} + rCA_{i,t-1} + \mu_{i,t}
\]

\(\Delta CC_i\) is the dependent variable measured as the annual change in \(CA_i\). The specification of the regression model involves a list of explanatory variables: \(S_{tot}^{P}\) and \(S_{tot}^{T}\) are the exogenous permanent and transitory shocks to the terms of trade, respectively; \(S_{gdp}^{P}\) and \(S_{gdp}^{T}\) are the permanent and transitory shocks to \(GDP\), respectively, used as a proxy of the change in the Total Productivity Factor (TPF).

With the purpose of identifying the asymmetric impact of permanent shocks on the \(CA_i\), the permanent shocks to the terms of trade \((S_{tot}^{P})\) are entered as follows. The sample is split between “positive” and “negative” values, defined in two different ways: 1) a positive (negative) value is defined when the permanent component of terms of trade at time \(t\) is greater (lower) than its value at \(t-1\); the dummy variable \(dpa_{i,t}^{TOT}\) \((dna_{i,t}^{TOT})\) is equal to one if this condition is satisfied and zero otherwise; 2) following Agénor and Aizenman (2004) we define a positive (negative) value when the permanent component of terms of trade at time \(t\) is greater (lower) than its value at \(t-1\) as well as greater (lower) than its within sample mean; the dummy variable \(dpa_{i,t}^{TOT}\) \((dna_{i,t}^{TOT})\) is equal to one if this condition is satisfied and zero otherwise. A similar procedure was used for identifying the positive and negative \(GDP\) shocks.

The first procedure identifies a positive (negative) permanent shock to terms of trade as an annual change in the permanent component series obtained by filtering the terms of trade series. The second procedure is more restricted to obtain permanent shocks because it additionally requires annual change to be greater (lower) than sample mean of permanent component series to identify a positive (negative) shock. Thus, this alternative (suggested by Agénor and Aizenman, 2004) considers only the “large” and positive (negative) permanent shocks to terms of trade to be used as explanatory variables, and excludes the “small” positive (negative) permanent shocks.

Given that by definition the changes in permanent components of terms of trade represent changes in long-run terms-of-trade trend, it is believed that there are no theoretical reasons to justify the second procedure. Overall, we alternatively apply both definitions to specify the model in order to compare results.

A description of the variables used in our econometric estimations is completed as follows:

1) The dependent variable \(\Delta CA_i\) is the annual change in the current account scaled by within sample standard deviation in period \(t\) for country \(i\). This estimating equation is a reformulation of the Glick and Rogoff 1995 equation which includes the \(TOT\) to test for
the presence of asymmetric current account response to permanent terms-of-trade shocks. Since $\mu_{CA}$ and $CA_{t-1}$ are correlated in the structural model, the coefficient of $CA_{t-1}$ is replaced by its theoretical value given by the international interest rate. In other words, the dependent variable $\Delta CA$ is corrected by the interest payments generated by the change in Net Foreign Position in the previous year, then $\Delta CA_t = CA_t - CA_{t-1} - rCA_{t-1}$.

2) The permanent shocks to terms of trade $S^{p}_{tot} = tot^{p}_t - tot^{p}_{t-1}$, where $tot^p_t$ is the trend component of $TOT$ obtained by the Baxter-King filter\(^1\) in order to decompose the time series. And the transitory shocks of terms of trade $S^{T}_{tot} = tot^T_t - tot^T_{t-1}$, where $tot^T_t$ is the transitory (residual) component of $TOT$.

3) In a similar way, the permanent and transitory shocks of GDP were calculated, in this case $S^{p}_{gdp} = gdp^{p}_t - gdp^{p}_{t-1}$ and $S^{T}_{gdp} = gdp^{T}_t - gdp^{T}_{t-1}$, where $gdp^{p}_t$ and $gdp^{T}_t$ are the trend and the residual filter component of GDP.

4) $QM/M2$ is the ratio of quasi money to $M2$.

5) $INFL$ is the inflation rate measured as the annual rate of change of the GDP deflator, and represents a proxy for macroeconomic instability.

6) $DEPRATIO$ is the age dependency ratio, defined as the ratio of population younger than 15 years old and older than 64 years old to the population between 15 and 64 years old.

7) $INV_{t-1}$ is lagged investment scaled by within sample standard deviation in period $t$ for country $i$.

We test if the current account responds asymmetrically to permanent terms-of-trade shock by analyzing the values of $\gamma_1$ and $\gamma_2$. It is expected that the estimated value of $\gamma_1$ will be statistically greater than zero. If this hypothesis is not rejected then the current account response to a positive permanent shock would be positive as this hypothesis suggests. Additionally, we expect that the estimated value of $\gamma_2$ will not be statistically different from zero. That is, a negative permanent terms-of-trade shock is not expected to alter the current account (the consumption smoothing hypothesis would follow under negative shock).

The hypothesis that states that transitory terms-of-trade shocks produces a positive impact on current account is tested analyzing the sign of $\gamma_3$. The sign of $\gamma_3$ should be positive. Given that steady-state conditions are not changed after a transitory shocks, the SOE would buy (sell) Foreign Assets. Agénor and Aizenman (2003) assume that the credit constraints are hold in the future but not in the first period when borrowing can be used to smooth consumption.

As a consequence the hypothesis related to the current account response to transitory shocks in developing countries is the same for developed nations (perfect capital mobility). The main difference between both models arises when considering the current account response to permanents terms-of-trade shocks.

---

\(^1\) According to Baxter and King 1999, the ideal filter for business cycle analysis should meet some properties: (a) trend-reduction; (b) high frequency components ought to be smoothed out; (c) phase shifts should be induced, meaning that timing relationships between variables should not be altered; (d) one would like the filtering outcome to be independent of the length of the original series. In order to measure the permanent and transitory components on $TOT$ and GDP series the Baxter and King filter with conventional setting for annual data (upper=2; lower=8; nmd=3; arpad=1) was used.
It is expected that the estimated value of $\gamma_4$ will be positive as in the case of $\gamma_1$. Theoretical assumptions state that permanent positive or favorable terms-of-trade shocks provoke a positive current account response for the reasons we mention previously in relation to terms-of-trade shocks. $S'_{\text{gdp}}$ represents the aggregate supply shocks other than terms of trade. We expect that the value of $\gamma_5$ will not be statistically different from zero given that, in case of adverse shock conclusions related to consumption, smoothing models would be valid.

The estimated value of $\gamma_7$ takes into account the effects of the financial liberalization. The sign of this variable could be positive if financial liberalization increases the rate of return on domestic assets (saving increases) or negative if liquidity restrictions would be relaxed as a consequence of financial openness, rising the consumption and reducing saving. It is expected that the estimated coefficient $\gamma_8$ will be negative because an increase in the dependency rate would reduce the saving (or increase current account imbalances). It is expected that the sign of $\gamma_9$ will be negative: inflation would exert a negative impact on current account. The coefficient $\gamma_{10}$ should be negative given that the greater the lagged investment, the lesser the current account deficit needed to finance investment in the current period.

**b. Results**

The hypothesis of asymmetrical response of current account to terms-of-trade shocks is tested by analyzing the statistical significance and the sign of coefficient estimates of regression equation. They measure the current account response to the shocks selected as explanatory variables. Results are shown in Table 1.

The estimated coefficient of positive permanent terms-of-trade shocks is positive and significantly different from zero using either first ($S_{\text{tot}}^{PP}$) or second ($S_{\text{tot}}^{PP}$) procedure to identify positive permanents shocks. As the theoretical approach suggests, favorable changes in the permanent terms of trade have a positive and statistically significant effect on current account.

The value of estimated coefficient of negative permanent terms-of-trade shocks varies depending on the procedure used to obtain the shocks. When negative shocks are identified by considering the first procedure (i.e. there is a negative shock at time $t$ when the permanent component of terms of trade at $t$ is lower than its value at $t-1$) $S_{\text{tot}}^{PN}$ is not statistically different to zero as expected. There is no evidence to reject the hypothesis that suggests an asymmetrical response of current account to permanent terms-of-trade shocks.

On the other hand, when the negative permanent shock at time $t$ such as the permanent component of terms of trade at $t$ is lower than its value at $t-1$, and lower than its within sample mean (second procedure, suggested by Agénor and Aizenman), the estimate coefficient $S_{\text{tot}}^{PN}$ is significantly different from zero at usual statistically level of significance in equations (5), (7) and (8) in Table 1. Even though the last results are not in line with Agénor and Aizenman (2004), who found that the current account response to negative permanent shocks is null, it should be noted that the estimated coefficient is negative and has an opposite sign to the estimated coefficient for positive shocks. As a consequence, under this definition of negative shocks (second procedure), the current account response to permanent shocks is asymmetrical too: given a borrowing constraint in the future either a positive or negative permanent shock increases current account.
As predicted by the "consumption smoothing" hypothesis, the transitory terms-of-trade shock is statistically significant and has the right sign. The coefficient of that variable is around 0.038 in all statistical specifications.

The estimated coefficient of positive permanent aggregate supply shocks is negative and statistically different from zero both when shocks are calculated with first procedure (i.e. when there is a positive shock at the time \( t \) when the permanent component of terms of trade at \( t \) is greater than its value at \( t-1 \), \( S_{gdp}^{PP} \) ) and when second definition is used (additionally it is required that the permanent component be greater than the mean, \( S_{gdp}^{PP} \)). These results reject the hypothesis which, applying the same reasoning used to analyze the response to a terms-of-trade shock, suggests that the value of this coefficient is positive (i.e. the current account would respond positively to a favorable productivity shock). It is concluded from this finding that shocks to GDP have different theoretical implications than terms-of-trade shocks.\(^2\)

Similarly, the estimated coefficient of negative permanent shocks to GDP is not statistically different from zero both when shocks are calculated with first procedure (\( S_{gdp}^{PN} \)) or when second definition is used (\( S_{gdp}^{PN} \)). These results support the previous statement about the impact of negative (permanent) shocks to GDP on the current account.

The estimated value of \( QM/M \) suggests that the financial liberalization increases savings; the estimated coefficient is statistically different from zero and has positive sign. According to our estimations the relationship between the dependency rate and the current account is negative; therefore, an increase in RATIODEP would reduce the current account imbalances. The estimated coefficient is statistically significant with negative sign; however, this variable is not statistically significant when fixed effects are included because RATIODEP capture the heterogeneity between countries. The estimate coefficient of IFL is statistically different from zero and has the expected sign.

The lagged investment \( INV_{t-1} \) is included to capture the effects of permanent terms-of-trade shocks to current account. When a permanent shock occurs the current income level is less than its long run value; consequently, the small open economy has to borrow to finance the increase in consumption and investment (Serven 1995). The coefficient is expected to be negative (i.e. the greater the investment in \( t-1 \) the lower the level of this variable in \( t \) to adequate the capital to its long-run level). However, the estimated coefficient is either zero or has positive sign. This result is not conclusive about the relationship between investment and current account.

\(^2\) Agénor and Aizenman (2004) find that the favorable and unfavorable shocks to the permanent component of real income per capita have not a asymmetric effect on private savings.
Table 1: Latin American Countries: determinants of Current Account 1973-2008 - Feasible Generalized Least Squares (FGLS)

\[ \Delta CA = \gamma_0 + \gamma_1 \Delta PTOT + \gamma_2 \Delta TOT + \gamma_3 \Delta GDP + \gamma_4 \Delta QM/M2 + \gamma_5 \Delta DEPRATIO + \gamma_6 \Delta INFL + \gamma_7 \Delta INV_{t-1} + \mu_{t} \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Eq 01</th>
<th>Eq 02 (Fixed Effect)</th>
<th>Eq 03</th>
<th>Eq 04</th>
<th>Eq 05 (Fixed Effect)</th>
<th>Eq 06</th>
<th>Eq 07</th>
<th>Eq 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>( S_{PTOT} )</td>
<td>0.0340</td>
<td>-1.1205 (0.0193)</td>
<td>0.0539</td>
<td>0.0156</td>
<td>0.0221 (0.0004)</td>
<td>-1.1393</td>
<td>-1.1393</td>
<td></td>
</tr>
<tr>
<td>( S_{TOT} )</td>
<td>-0.0124</td>
<td>(0.2545)</td>
<td>-0.0376</td>
<td>-0.0067</td>
<td>-0.0111 (0.3267)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( S_{GDP} )</td>
<td>0.0379</td>
<td>(0.065)</td>
<td>0.0377</td>
<td>0.0371</td>
<td>0.0370 (0.0000)</td>
<td>0.0195 (0.0011)</td>
<td>0.0299 (0.0000)</td>
<td>0.0086 (0.1141)</td>
</tr>
<tr>
<td>( S_{GDP} )</td>
<td>-2.5138</td>
<td>(0.0000)</td>
<td>-2.600</td>
<td>(0.0000)</td>
<td>0.0268 (0.0161)</td>
<td>0.0286 (0.0140)</td>
<td>0.0326 (0.0260)</td>
<td>0.0297 (0.0402)</td>
</tr>
<tr>
<td>( S_{GDP} )</td>
<td>2.3527</td>
<td>(0.1063)</td>
<td>1.7457</td>
<td>(0.2950)</td>
<td></td>
<td>-0.7848 (0.0497)</td>
<td>-1.8521 (0.0005)</td>
<td></td>
</tr>
<tr>
<td>( S_{GDP} )</td>
<td>-0.2287</td>
<td>(0.0000)</td>
<td>-0.1985</td>
<td>(0.0000)</td>
<td>-0.2503 (0.0000)</td>
<td>-0.2166 (0.0000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QM / M2</td>
<td>0.7201</td>
<td>(0.0001)</td>
<td>1.7947</td>
<td>(0.0000)</td>
<td>0.3085 (0.0563)</td>
<td>0.6248 (0.0031)</td>
<td>0.6062 (0.0008)</td>
<td>1.6647 (0.0000)</td>
</tr>
<tr>
<td>RATIODEP</td>
<td>-0.0053</td>
<td>(0.0006)</td>
<td>-0.0036</td>
<td>(0.4739)</td>
<td>-0.0048 (0.3991)</td>
<td>-0.0015 (0.0007)</td>
<td>-0.0053 (0.0005)</td>
<td>-0.0035 (0.0004)</td>
</tr>
<tr>
<td>IFL</td>
<td>-0.0002</td>
<td>(0.0000)</td>
<td>-0.0002</td>
<td>(0.0000)</td>
<td>-0.0002 (0.0002)</td>
<td>-0.0002 (0.0002)</td>
<td>-0.0002 (0.0001)</td>
<td>-0.0002 (0.0000)</td>
</tr>
<tr>
<td>INV_{t-1}</td>
<td>0.0527</td>
<td>(1.203)</td>
<td>0.1239</td>
<td>(0.0146)</td>
<td>0.0599 (0.0397)</td>
<td>0.0714 (0.0150)</td>
<td>0.0223 (0.0496)</td>
<td>0.1515 (0.0025)</td>
</tr>
<tr>
<td>LPGDP</td>
<td>-0.0030</td>
<td>(0.7404)</td>
<td>-0.0036</td>
<td>(0.0000)</td>
<td>-0.0030 (0.7035)</td>
<td>-0.0030 (0.0061)</td>
<td>-0.0178 (0.0122)</td>
<td>-11.5204 (0.0000)</td>
</tr>
<tr>
<td>LRGDP</td>
<td>-10.8015</td>
<td>(0.0000)</td>
<td>-10.6144</td>
<td>(0.0000)</td>
<td>-11.4268 (0.0000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AdjR²</td>
<td>0.393</td>
<td>0.367</td>
<td>0.372</td>
<td>0.379</td>
<td>0.398</td>
<td>0.385</td>
<td>0.389</td>
<td>0.395</td>
</tr>
</tbody>
</table>

Note: p-value are in parenthesis. \( S_{PTOT} \) is the permanent positive terms-of-trade shock where the Dummy variable is equal to 1 using the first positive definition of shocks as explained in the text. \( S_{TOT} \) is the permanent negative terms-of-trade shock where the Dummy variable is equal to 1 using the first negative definition of shocks. \( S_{GDP} \) is the permanent positive terms-of-trade shock where the Dummy variable is equal to 1 using the Agénor and Aizenman (2004) criterion for positive shocks. \( S_{GDP} \) is the permanent negative terms-of-trade shock where the Dummy variable is equal to 1 using the Agénor and Aizenman (2004) criterion for negative shocks. In the same way we distinguish between permanent positive and negative shocks to \( GDP: S_{PTOT}, S_{TOT}, S_{GDP}. S_{GDP} \) is the trend component of \( LGDPPC \) obtained by using the Baxter-King filter. \( LGDPPC \) is the residual component of \( LGDP \) obtained by using the Baxter-King filter. Alternatively we use the trend component and residual of \( LGDP \) obtained by using Baxter and King. \( LPGDP, LRGDP \).
Following Agénor and Aizenman (2004), in Equations (3) and (4) the dummy variables that reflect the effect of permanent positive and negative shocks to product have been replaced by the permanent component ($\text{LPGDPPC}$) of the log of Gross Domestic Product per capita ($\text{LGDP}$). Additionally, residual component ($\text{LRGDPPC}$) is used as explanatory variable. Alternatively, in Equations (7) and (8) the trend component ($\text{LPGDP}$) and the residual ($\text{LRGDP}$) of the log of GDP ($\text{LGDP}$) obtained by using the Baxter-King filter were used.

These variables capture the impact of the level of income on consumption and saving decisions (Agénor and Aizenman, 2004). It is expected that the sign of their coefficient will be positive. The estimated coefficient of permanent component is not statistically different from zero. The coefficient of the residual component is statistically different from zero at usual significance level with negative sign.

In summary, our results are fairly similar to those reported by Agénor and Aizenman (2004). First, the coefficient of the permanent positive terms of trade shocks has a positive sign and is statistically significant under the two different procedures used to identify the positive and negative swings. However, in our estimations the coefficient (in its absolute value) is greater than the values reported by Agénor and Aizenman (2004). Second, the coefficient of the permanent negative terms-of-trade shocks is not statistically significant as the hypothesis of asymmetric current account response suggests (when the procedure explained first is used to split between positive and negative permanent terms-of-trade shocks). Third, according to the “consumption smoothing” hypothesis, the coefficient of transitory terms-of-trade shocks is positive and is statistically significant.

c. Does the distinction between positive and negative permanent shocks mean that assumptions related developed economies are rejected?

According to previous results evidence was not found that could reject the hypothesis of asymmetrical response of current account (borrowing constraints). In this section we apply counterfactual thinking and pose the following question: What would the conclusion have been if other assumptions about capital mobility had been tested with the same data set? In other words, is it possible to find evidence for the hypothesis associated to perfect capital mobility with the same data set? We focus on two theoretical issues under the assumption of perfect capital mobility.

First, if an endowment economy with perfect capital mobility is considered permanent the terms-of-trade shocks do not affect the Small Open Economy: the current account does not respond at the moment of impact (of the shock) given that consumption and current income rise in a equal amount in an endowment model, regardless of the shocks being positive or negative (Obstfeld 1982, Svensson and Razin, 1983). This is the standard “consumption smoothing” assumption.

Under this assumption, in an endowment economy with capital mobility, current account response to transitory terms-of-trade shocks is positive. In this situation consumption would not change because it depends only on permanent income. At the moment of the shock’s impact, the actual income should be higher than its permanent level; therefore, the current account improves. In subsequent periods the current account balance returns to zero as the current income converges to its (unchanged) long run value.

Second, when the investment is added to the model (Kent and Kashin 2003) the permanent terms-of-trade shock causes a decrease in the current account. This is so
because at the time that the shock impacts the SOE, the current income level is less than the long run value; therefore, the SOE has to borrow to finance the increase in consumption and investment (Serven 1995). Following same line of reasoning as in the previous paragraph, the current account response to transitory terms-of-trade shocks is positive.

Thus in order to assess the current account response under the assumption of capital mobility it should be noted that the current account response to permanent shocks should be either zero (endowment economy) or negative (with capital accumulation), while response to transitory shocks should be positive.

In what follows we take permanent terms-of-trade shocks as a whole to run a FGLS Panel Data regression. To test the “traditional” HLM model (understood as the current account response to shocks under the assumption of perfect capital mobility) we estimate the following specification:

$$\Delta CA_t = \gamma_1 S^P_{tot} + \gamma_2 S^T_{tot} + \gamma_3 S^P_{gdp} + \gamma_4 S^T_{gdp} + \gamma_5 \Delta INV_{t-1} + rCA_{t-1} + \mu_{CA}$$

Table 2 shows the coefficient estimates of the $\Delta CA$ equation under the HLM hypothesis where shocks to terms of trade entered without any distinction between positive or negative values for the permanent change to terms of trade and $GDP$.

### Table 2
Latin American Countries: determinants of Current Account (1973-2008) under the assumption of perfect capital mobility

Feasible Generalized Least Squares (FGLS)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Equation (1)</th>
<th>Equation (2) (Fixed Effect)</th>
<th>Equation (3)</th>
<th>Equation (4) (Fixed Effect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C$</td>
<td>-0.0286</td>
<td>-0.0286 (0.5674)</td>
<td>-0.4118</td>
<td>-0.4118 (0.0002)</td>
</tr>
<tr>
<td>$S^P_{tot}$</td>
<td>0.0073 (0.1180)</td>
<td>0.0047 (0.3854)</td>
<td>0.0113 (0.0197)</td>
<td>0.0081 (0.1486)</td>
</tr>
<tr>
<td>$S^T_{tot}$</td>
<td>0.0344 (0.0000)</td>
<td>0.0344 (0.0000)</td>
<td>0.0344 (0.0000)</td>
<td>0.0339 (0.0000)</td>
</tr>
<tr>
<td>$S^P_{gdp}$</td>
<td>-0.3425 (0.2018)</td>
<td>-0.6111 (0.0800)</td>
<td>-1.1590 (0.0028)</td>
<td>-1.4388 (0.0005)</td>
</tr>
<tr>
<td>$S^T_{gdp}$</td>
<td>-0.2488 (0.0000)</td>
<td>-0.2419 (0.0000)</td>
<td>-0.2357 (0.0000)</td>
<td>-0.2040 (0.0000)</td>
</tr>
<tr>
<td>$INV_{t-1}$</td>
<td>0.1842 (0.0000)</td>
<td>0.1842 (0.0000)</td>
<td>0.1842 (0.0000)</td>
<td>0.1842 (0.0000)</td>
</tr>
<tr>
<td>Adj$R^2$</td>
<td>0.345 0.324 0.341 0.296</td>
<td>0.345 (0.177)</td>
<td>0.341 (0.0000)</td>
<td>0.296 (0.0000)</td>
</tr>
</tbody>
</table>

Note: p-value are in parenthesis

In these regressions we estimate four alternative specification models. Equation (1) considers a small endowment economy, following the intertemporal model (Obstfeld 1982, Svensson and Razin, 1983). Equation (2) includes Fixed Effects analysis to control for unobserved heterogeneity in panel data countries. In these two equations estimated coefficients both for transitory terms-of-trade shocks and $GDP$ shocks are expected to be statistically different from zero and have a positive sign; coefficients for permanent shocks
are expected to be statistically insignificant. In Equations (3) and (4) lagged investment is included to capture the effects of permanent terms-of-trade shocks on current account.

The estimated coefficient for *permanent* shocks to $TOT$ ($S_{tot}^P$) is not significantly different from zero in Equations (1) and (2), in line with the theoretical prediction in the endowment small open economy (Obstfeld 1982, Svensson and Razin, 1983). However, the coefficient is either positive (Equation 3) or not statistically significant (Equation 4) under the assumptions of a model with capital accumulation.

In all the equations the estimated coefficient of *transitory* shocks to $TOT$ ($S_{tot}^T$) is significantly different from zero and has the expected positive sign. When a positive transitory term-of-trade shock occurs, the SOE saves the increase in output because the long run level of the variable does not change. This result is consistent with the “consumption smoothing” hypothesis of intertemporal models, both with and without specification of capital accumulation.

In summary, if the distinction between negative and positive permanent terms-of-trade shocks is not considered, the terms-of-trade shocks (measured as the change in the permanent component of the terms-of-trade series obtained by applying the Baxter-King Filter) can be used as an explanatory variable to test if the hypothesis engaged to a model with capital mobility are rejected.

Results indicate that the estimated coefficients for *permanent* terms-of-trade shocks are not significantly different from zero, except for Equation (3), while coefficients associated to *transitory* terms-of-trade shocks are all positive and significantly different from zero. This would support the idea that the sample countries behave according to the predictions about capital mobility.

Thus if, on the one hand, the hypothesis of borrowing constraints had been discarded and, on the other hand, the assumption of perfect capital mobility had been tested, the obtained results would not have added evidence to reject the latter. It is necessary to consider the hypothesis of borrowing constraints and test it in order to validate it as a plausible assumption and to confirm that the asymmetric current account response is a consequence of this hypothesis.

**IV. CONCLUDING REMARKS**

In this paper we assess the Harberger-Laursen-Metzler effect for a group of eighteen Latin American Countries for the period 1973-2008. We focus our interest on studying the current account response to terms-of-trade shocks in economies that suffer severe borrowing constraints.

The paper tests the hypothesis developed by Agénor and Aizenman (2004) to analyze the joint dynamics between current account and terms-of-trade in Sub-Saharan African Countries. In their model they expect that current account increases in response to a positive permanent terms-of-trade shock because the SOE decides to increase its savings in order to protect itself from a possible negative shock that could affect the economy in the next time period. On the other hand, the impact on current account of negative permanent terms-of-trade shocks is believed to be zero because the binding restrictions do not hold. Then the model assumes an asymmetrical response of current account to
permanent terms-of-trade shocks. This framework assumes that the current account response to transitory terms-of-trade shock is positive and symmetrical.

The empirical approach adopted entailed three steps: First, the Baxter-King Filter was used to obtain permanent and transitory components term-of-trade series. Second, we used the permanent terms-of-trade series to obtain positive and negative terms-of-trade “swings.” Third, we run a FGLS Panel Data to test our working hypothesis.

Our findings indicate that current account responds asymmetrically to permanent terms-of-trade shocks. All the estimated coefficients for positive swings are positive and significantly different from zero, as the model states. Our results suggest that, when the permanent shock in terms of trade is positive, the current account response is positive given that the economy reduces its consumption below its long-run level in an attempt to save. In other words, LDC displays a “precautionary saving” to avoid a sudden decrease in consumption in the future in the event of the worsening of the economic situation, given that they know they cannot borrow at international markets when the simple procedure to identify terms-of-trade shocks is used.

The coefficients that reflect the impact of negative swings are either insignificant (as in Agénor and Aizenman; 2004) or negative and significantly different from zero. The negative coefficient (i.e. a negative terms-of-trade shock followed by current account improvement) could be interpreted in a model with capital accumulation when the credit restrictions do not hold: when the SOE faces a negative and permanent terms-of-trade shock investment and consumption fall (because permanent income decreases) while current income (at the moment of the shock) is still greater that permanent income; then the current account increases.

Additionally, according to the “consumption smoothing” hypothesis, the coefficient of transitory terms-of-trade shocks is positive and is statistically significant. Finally, we suggest that, the Agénor and Aizenman (2004) procedure used for identification in positive and negative shocks is not entirely satisfactory to test the asymmetric hypothesis because it gives more importance to the magnitude of shocks than to the sign of shocks.

V. REFERENCES


STATISTICAL APPENDIX

Annual data for the years 1973-2007 for economic aggregates were obtained from World Development Indicators (WDI) and International Financial Statistics (IFS).
(a) Nominal aggregates expressed in local currency:

**Current Account**: because the current accounts were expressed in dollars- serie code BN.CAB:XOKA.CD (WDI)- they were converted to local currencies using the average market Exchange rates at end of the year - serie code AZ.ZF (IFS);

**Investment**: Obtained from WDI (code NE.GDI.TOTL.CN);

**Nominal Gross Domestic Product**: Obtained from WDI (code NY.GDP.MKTP.CN);

**Nominal Per-Capita Gross Domestic Product** is obtained by the ratio between the GDP and the Population. Population is obtained by the ratio between GDP (in real terms) - serie code NY.GDP.MKTP:KD (WDI)- and GDPpc (in real terms) - serie code NY.GDP.PCAP.KD (WDI);

**Cuasi-Money**: Following to Agénor and Aizenman (2004) it was constructed by the difference between \( M_2 \) -serie code FM.LBL.MQMY.CN (WDI) and \( M_1 \) - serie code FM.LBL.MONY.CN (WDI).

(b) Series at constant prices of year 2000: All nominal aggregates were converted into real terms by GDP deflator (NY.GDP.DEFL.ZS, WDI).

(d) Variable normalization: Current Account and Investments variables were scaled by dividing the values over their standard deviation.

(e) Ratios and growth rates:

\[
\text{DEPRATIO} \text{ is the dependency ratio -code SP.POP.DPND (WDI).}
\]

\[
\text{INFL} \text{ is the inflation rate measured as the annual percentage change in GDP deflator - code NY.GDP.DEFL.ZS (WDI).}
\]

\[
r^*CC_{t-1} \text{ is calculating by multiplying lagged current account times by the International interest rate } (r) \text{ - code 11160..ZF.. (IFS);}
\]

(g) Terms of trade:

Terms of trade indicators are obtained by constructing a Paasche index:

\[
\text{TOT} = \frac{X_{\text{cons}}}{M_{\text{cons}}} \times \frac{X_{\text{cte}}}{M_{\text{cte}}}
\]

\(X_{\text{cons}}\) Represents the exports in dollars at price of year 2000 -serie code NE.EXP.GNFS.KD (WDI). \(X_{\text{cte}}\) Are the exports expressed in current dollars -serie code NE.EXP.GNFS.CD (WDI). \(M_{\text{cons}}\) Are the imports expressed at dollars of year 2000 - code NE.IMP.GNFS.KD and \(M_{\text{cte}}\) are imports expressed in current dollars - code NE.IMP.GNFS.CD (WDI).