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Relative price levels and current accounts: an exploration

Joshua Aizenman

UCSC and the NBER[*]

Abstract

This paper studies the links between current accounts and relative price levels, finding that current account changes are associated with sizable future relative price levels effects. This is done in panel regressions of the *Penn effect*, adding a lagged current account/GDP and other explanatory variables. Higher GDP/capita and a greater export share of manufacturing tend to mitigate the real exchange rate impact of lagged current accounts. Active management of current accounts may provide a powerful adjustment channel, mitigating the real exchange rate effects of volatile terms of trade, and may explain the growing proliferation of Sovereign Wealth Funds.

Keywords: Current account, Relative Price levels, Real Exchange rate, Sovereign Wealth Funds
JEL Classification: F15, F21, F32

Joshua Aizenman
UCSC and the NBER
Economics department, E2
UCSC, Santa Cruz
CA 95064, USA
jaizen@ucsc.edu

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1. **Introduction**

The higher volatility of commodity prices in recent years is adding to the challenge facing policy makers. While favorable terms of trade shocks tend to induce real appreciation and capital inflows, adverse shocks frequently lead to capital outflows, real depreciation, and expose a country to recessionary pressures. Capital market imperfections imply that the volatility associated with these shocks may reduce both the expected GDP, and growth rate. A recent contribution illustrating these considerations is Aghion, Bacchetta, Ranciere and Rogoff (2006), who found that real exchange rate volatility reduces growth for countries with relatively low levels of financial development. Earlier literature found that in developing countries, volatility is associated with lower private investment and growth [Aizenman and Marion (1993, 1999)]. Ramey and Ramey (1995) found that volatility is associated with lower growth for both the OECD and developing countries.

These studies suggest that factors mitigating real exchange rate volatility may be associated with superior economic performance. Consequently, policies that would stabilize the real exchange rate [REER henceforth] of developing countries may provide further benefits by increasing their growth. An example of such policies is the buffering effect of international reserves, which tend to mitigate the impact of terms of trade shocks on the REERs of developing countries.[1] Yet, hoarding international reserves may be costly, both due to the direct opportunity costs, and the possibility of increasing costs of sterilization [see Aizenman and Glick (2008)]. The greater volatility of commodity prices in recent years begs the question of the degree to which other adjustment mechanisms may provide further buffering, thus reducing the adverse effects of terms of trade and commodity shocks on the real exchange rate, therefore stabilization the GDP and the growth rate of economies. This paper points out that active management of

[1] Aizenman and Riera-Crichton (2008) found that the elasticity of the real exchange rate with respect to the effective terms of trade shocks depends negatively on the average level of international reserves. Specifically, for developing countries, $d\ln(REER)/[TO^{*}\ d\ln(TOT)]$ is about $1.8[1-2^{*}\ IR/GDP]$; where TOT, TO and IR are the terms of trade, trade openness and international reserves, respectively. Hence, in developing countries, on average, higher stock of international reserves tends to smooth the reactions of their REERs to TOT changes.

current accounts may provide such a channel, which suggests that prudent management of fiscal policy is needed in countries challenged by exogenous volatility.

The purpose of this paper is to test empirically the association between lagged current account of a developing country and its relative price level via other countries. Verifying the presence and the stability of a linkage between lagged current account deficit and relative prices between countries is a necessary condition for establishing the viability of the policy option discussed above. Section 2 reviews the background literature, focusing on the intertemproal approach to the current account as a useful organizing framework. Our empirical departure point is the positive association between relative national price levels and relative income per capita, dubbed *the Penn effect* by Samuelson (1994), and referred frequently as the Harrod–Balassa–Samuelson effect. While the Penn effect is not as strong among advanced economies, it is among the more robust findings in countries at varying stages of development during the last forty years (see Rogoff (1996), Fitzgerald (2003), Lee and Chinn (2006) and Bergina, Glick and Taylor (2006) for further discussion and references). This observation fits the aim of our study, as we focus mostly on developing countries, where limited financial depth and the greater volatility of the terms of trade suggest that the gains from buffer policies is greater than for the OECD.

Section 3 outlines the benchmark panel regression of the Penn effect, adding the lagged current account/GDP ratio to the explanatory variables. In addition, we evaluate the impact of the current account interacted with several structural characteristics of the economy -- the relative GDP/Capita of a country, population density, trade openness, and the share of manufacturing exports. In order to deal with possible endogeneity issues, we lagged all the explanatory variables by a year. Our findings show that current account improvements (lower current account/GDP deficits or higher surpluses) are associated with significant and economically sizable real depreciation. Higher GDP/capita, and greater export share of manufacturing tend to mitigate the real exchange rate impact of the current account. In addition, we conduct various robustness tests, and conclude that the impact of the current account on country's relative price level is robust, though it tends to be weaker in smaller countries, in countries running large current account imbalances, and richer countries. Section 4 discusses the finding.

2. Overview and background literature

The notion that current account position impacts relative prices and competitiveness is at the core of the intertemporal approach to the balance of payment. This approach is outlined in Obstfeld and Rogoff (1996), the state of the art text book of the late 1990s early 2000s, and is summarized in Obstfeld and Rogoff (1997). The intertemporal approach views the current-account balance as the outcome of forward-looking dynamic saving and investment decisions. It supplements and expands earlier versions of the Mundell-Fleming IS-LM model, embodying the analysis in the context of an intertemporal utility optimization framework. The crux of the intertemporal approach is that relative prices in the open economy reflect the expected path of fundamentals. An vivid application of this approach was Obstfeld and Rogoff (2000), who argued that the United States current account deficit—then running at 4.4% of GDP—was on an unsustainable trajectory over the medium term, and that its inevitable reversal would precipitate a change in the real exchange rate of about 14% if the rebalancing were gradual, but with significant potential overshooting if the change were precipitous. Their logic follows the feedback from the current account to the real exchange rate. Their argument builds on the notion that the equilibrium relative price of non traded goods reflects both the demand and supply conditions. As current account deficits are associated with higher demand for the non traded goods, under reasonable assumptions about various elasticities, they conclude that larger current account deficits are associated with higher relative price of non traded goods, acting to appreciate the real exchange of a country.

While the above example focuses on the association between the current account and relative prices, the intertemproal approach to the current account recognizes the two way intertemporal feedback. Accordingly, the current account today may impact future relative prices, and present relative prices may impact future current accounts. As the current account is, by definition, the gap between net saving and net investment, the feedback from relative prices to the current account is determined by the strength of the impact of relative prices on saving and investment. Our paper focuses on relative price adjustment to current account changes; hence we don't investigate in this paper the viability of the reverse feedback, from relative prices to the current account. While full discussion of reverse feedback issues is beyond the scope of the present paper, we note that the literature on the impact of relative prices on current account

patterns is rather inconclusive. The Absorption Approach argues that real exchange rate and terms of trade shocks impact the current account only via its effects on saving and investment. The discussion about the strength of the Harberger-Laursen-Meltzer effect, dealing with the impact of terms of trade changes on the current account suggests that these effects are weak, and ambiguous. These observations are in line with Chinn and Prasad (2003), studying key factors affecting the current account. They investigated the medium-term determinants of current accounts for a large sample of industrial and developing countries, utilizing an approach that highlights macroeconomic determinants of longer-term saving and investment balances in Cross-section and panel regressions. They failed to find a robust effect of lagged changes of the real effective exchange rate on the current account of developing countries. In line with the absorption approach, they found that current account balances are positively correlated with government budget balances. Among developing countries, financial deepening is positively associated with current account balances while international trade openness is negatively correlated with current account balances.[2]

3. **On the association between the relative price levels and current account surpluses**

Our base specification is a Penn-Effect regression, adding the lagged value of current account/GDP ratios to the conditioning variables. The advantage of focusing on the lagged current account is that it mitigates endogenity concerns induced by the two way feedback between contemporaneous current account and the relative price levels, and deals with the possibility that prices are adjusting with a lag to current account imbalances. Figure 2 plots the association between the relative price levels [RPL henceforth], relative GDP pre capita, and the current account/GDP. While the Penn-effect is vividly evident in Figure 2, it's useful to apply

[2] World Economic Outlook (November 2008, Chapter 6) discusses the limited inference one gets from the linkages between relative prices and the current account. Recent attempts to explain current account patterns applying the variables suggested by the literature found that national relative price levels have an insignificant effect on the current account [Aizenamn and Jinjarak (2008b)]. Similarly, a panel test for the impact of relative price of country's real estates [housing wealth] on the current account led to similar inclusive results [see Aizenamn and Jinjarak (2008a)].

multivariate regression analysis to identify the marginal impact of current account deficits on relative prices. We estimate the following equation:[3]

(1)

$$\text{R.Price level}_{\text{i\_us,t}} = a_0 + c_t + a_1 \text{R.GDP}_{\text{i\_us,t-1}} + a_2 CA/GDP_{i\_us,t-1} + \sum_{j=3}^{k} a_j CA/GDP_{i\_us,t-1} \cdot X_{j,t-1} + \varepsilon_{i,t}$$

It accounts the price of country i relative to the US at time t [$\text{R.Price level}_{\text{i\_us,t}}$] by the lagged percentage GDP/Capita of country i relative to the US [$\text{R.GDP}_{\text{i\_us,t-1}}$], the difference between the lagged percentage Current account/GDP of country i and that of the US [$CA/GDP_{i\_us,t-1}$], and the interaction of this variable with several lagged structural variables of country i, $X^{i}_{j,t-1}$.[4] The choice of these variables is guided by the literature explaining the factors impacting relative price levels [see WEO (October 2008) for a recent overview]. Specifically, if higher GDP/capita are associated, on average, with more diversified economy, it would mitigate the impact of shocks on relative prices. Similarly, trade openness may mitigate the real appreciation induced by shocks, as part of the needed adjustment would be met by imports. If the manufacturing sector is characterized by higher supply and demand elasticities, higher share of manufacturing exports may dampen the adjustment of relative prices to shocks. Landlocked countries tend to be associated with higher transportation costs, probability increasing the market clout of domestic producers, potentially mitigating the responsiveness of prices to shocks (thought this effect may depend on the industrial structure of the various sectors). Population density impacts the thickness of markets, and the responsiveness of relative prices to demand changes. Financial depth may increase the flexibility of adjustment to shocks, mitigating thereby the responsiveness of relative prices. We allow for these effects by interacting the lagged current account/GDP

[3] This study doesn't attempt to explain the current account/GDP, treating it as a variable possibly impacted by policies. See Edwards (2004) and the references therein for studies evaluating current account's determinations.

[4] As the RPL of country i is defined relative to the US, we measure the conditioning variables relative to the US.

with relative income pre capital ($R.GDP_{i\_us,t-1}$), trade openness, a dummy for landlocked countries, population density, financial depth (= domestic credit/GDP), and the percentage of manufacturing exports in total merchandise exports [see the Data Notes for further details]. We also included year-specific constants, c_t, to address the fact that national price levels are constructed for comparison across space rather than across time.

A concern regarding regression (1) is the possibility of unit root problems. A common challenge facing individual tests of the unit root of each macro time series is the relatively short sample period, and the low power in these tests. One may work around this problem by using the panel unit root test developed by Levin, Lin and Chu (2002).[5] We apply their methodology, and reject the unit root hypothesis for a balanced panel version of our data [see Table 7]. As the effect of smallness and large current account/GDP imbalances may be non linear, we focus in the base regression on countries whose population exceeding 2.5 million, and current account imbalances below 15% (i.e., |current account/GDP| < 15%). Table 1 summarizes the result for 113 countries, covering years 1971-2004 (2004 is the last year covered by the Penn data). Column 3 provides the OLS results of (1), whereas column 4 provides the GLS estimation, accounting for possible heteroskedasticity in error terms. The implied change of the RPL with respect to lagged current account/GDP surplus is highly significant, and large (close to - 0.9 in the OLG, and - 0.7 GLS in the regressions, respectively). Hence, a 10% current account/GDP surplus is associated with a lower Relative price level of at least 9% [at least 7% in the GLS regression].[6] Higher GDP/capita tend to mitigate the real exchange rate impact of lagged current accounts -- applying the OLS regression results, (3), we infer that

[5] The test assumes that each individual unit in the panel shares the same AR(1) coefficient, but allows for individual effects, time effects and possibly a time trend. By introducing a series of lags, the test may be viewed as a pooled Augmented Dickey-Fuller (ADF), with the null hypothesis of nonstationarity (I(1)) behavior [see Maddala and Wu (1999) for further discussion].

[6] Note that the percentage change of the RPL of poorer countries induced by a given change in the current account/GDP is larger than that of the richer countries -- the semi elasticity of the

$$(2) \qquad \frac{\partial \text{R.Price level}_{i\_us,t}}{\partial CA/GDP_{i\_us,t-1}} \simeq -0.9[1-0.007*\text{R.GDP}_{i\_us,t-1}].$$

Hence, for a country half as rich as the US, a current account/GDP improvement of 1% is associated at the margin with a lower relative price level of at least 0.6%, but of 0.27% for a country as rich as the US.[7] Economic structure and geography impacts the RPL adjustment to the lagged current account: it is mitigated in landlock countries, and in countries exporting manufacturing goods; but is magnified in densely populated countries.[8]

Tables 2-4 explore the robustness of these findings to the level of aggregation. Table 2 adds to the sample used in Table 1 countries with current account imbalances exceeding 15% [while excluding very small countries] , whereas Table 3 added to the sample used in Table 1 very small countries, with population below 2.5 million [while excluding countries with current account imbalances exceeding 15%]. The main results of Table 1 continue to hold.
Table 4 is the entire sample, including all the outliers [both very small countries, and countries with large current account imbalances]. The main change is that the heterogeneity of the full

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RPL with respect to the current account is

$$\frac{\partial \text{R.Price level}_{i\_us,t} / \text{R.Price level}_{i\_us,t}}{\partial CA/GDP_{i\_us,t-1}} \simeq \frac{a_2}{\text{R.Price level}_{i\_us,t}}, \text{ where } a_2 < 0.$$

For most developing countries, $\text{R.Price level}_{i\_us,t} < 1$, implying that

$$\frac{\partial \text{R.Price level}_{i\_us,t} / \text{R.Price level}_{i\_us,t}}{\partial CA/GDP_{i\_us,t-1}} \simeq \frac{a_2}{\text{R.Price level}_{i\_us,t}} < a_2 < 0.$$

Hence, the poorer is the country, the lower tends to be its RPL, and the higher is the absolute value of the semi elasticity of the RPL with respect to CA/GDP.

[7] Note that relative GDP per capita is defined such that US=100.

[8] The impact of landlockness is very large -- reducing the magnitude of the semi elasticity of the RPL with respect to the current account by more than half -- the high transportation costs associated with landlockness reduces the responsiveness of the RPL of these countries to current account changes.

sample reduces the responsiveness of the RPL to current accounts.[9] This suggests that aggregation matters, and that the association between the RPL and current accounts in very small countries and in countries with large current account imbalances differs from that in all the other countries.

We close this section with robustness analysis. Tables 5a-b report the results where we split the "No outlier" sample into the earlier period, prior to the onset of financial integration of developing countries (1971-92), and the period dominated by growing financial integration of developing countries, 1993-2004. The main results of the paper hold for both sub-periods. Tables 6a,b,c report the results where the "No outlier" sample is segregated according the WB classification of the GDP/Capita -- low, middle and high income countries. Comparing the three tables, we infer that the main results hold strongly for the low income countries, but are much weaker for the high income countries, where the impact of the current account on relative prices becomes mostly insignificant, in line with the discussion in Fitzgerald (2003) and Lee and Chinn (2006).

[9] The semi elasticity of the RPL with respect to the current account changes from about -0.9 in the first three regressions, to about - 0.5 in the OLS regression (and the change is larger in the GLS regressions).

4. **Discussion**

Our analysis shows that current account surpluses are associated with sizable future real depreciation. Active management of current accounts may provide another powerful adjustment channel that may mitigate the real exchange rate effects of volatile terms of trade, as well as other sources of volatility. Current account management may supplement the role of other shock absorbers, including hoarding international reserves. While beyond the scope of the present paper, active management of the current account may also reduce swings of real estate valuations.[10]

In practice, Sovereign wealth funds [SWFs] may provide active management of the current account– frequently, SWFs de-facto tax the revenue from exports, saving it in foreign assets, which ultimately boosts future government's resources. Sovereign wealth funds are saving funds controlled by sovereign governments that hold and manage foreign assets. Private analysts estimated that SWFs assets were in the range of $1.5 to 2.5 trillion in 2007. This amount is projected to grow sevenfold to $15 trillion in the next ten years, an amount more than double that of the current global stock of foreign reserves of about $7 trillion [see Jen (2007) and Aizenman and Glick (2007)]. The growth of SWFs may be viewed as the consequence of countries running persistent current account surpluses and accumulating net foreign assets. SWFs arise as a by-product of these current account surpluses in circumstances where sovereign governments retain control of the foreign assets. The recent commodity price boom has swelled the sovereign asset holdings of commodity-exporting countries where the public sector controls commodity exports or heavily taxes the revenues earned by private commodity exporters. Earlier commodity price booms vividly illustrate the adverse effect on competitiveness and on domestic inflation, induced by using these windfall gains for domestic expenditures, particularly when the gains are transitory. In some cases these savings are used as a financial stabilizer if commodity prices decline and depress tax revenue. In other cases, SWFs serve as mechanisms to transform

[10] Aiznman and Jinjarak (2008) found a robust and strong positive association between current account deficits and the appreciation of the real estate prices/(GDP deflator) in a sample of 43 countries [of which 25 are OECD], during 1990-2005. Intriguingly, the economic importance of current account variations in accounting for the real estate valuation exceeds that of the other variables, including the real interest rate and inflation.

the concentrated exposure of public assets to volatile commodity prices into a more balanced and diversified global exposure, thereby protecting the income of future generations. As such, SWFs may stabilize the current account of countries exposed to terms of trade and other shocks.

Figure 1 plots the leading SWFs in 2007, and the corresponding level of international reserves [IR henceforth]. Intriguingly, about half of the top SWF reported in Figure 1 were established during 2005-8 [China, Quatar, Lybia, Russia, South Korea].[11] This reflects the growing recognition that international reserves has reached a level that warrants deeper diversification into funds that will invest in equities, with the goal of increasing the overall return in the long run.[12]

The downside of active management of the current account is the need to rely on fiscal adjustment, which may be associated with administrative costs that potentially differ from the one associated with the cost of managing international reserves. Yet, the heightened volatility due to commodity shocks with significant persistence suggests that international reserve policy should not be the only policy tool used to deal with volatility. Chile provides a vivid case study of these considerations, leading the *Financial Times* to note that:

Copper boom prompts Chile into saving mode

> Few countries are benefiting quite as much from the bonanza in raw material prices as Chile, Latin America's fourth largest economy. Copper, the flagship industrial commodity whose price has more than doubled in the last 12 months, accounts for about half of Chile's exports and revenues from taxes help shore up the operations of Latin America's most efficient public sector. Equally, though, high prices and soaring export revenues from metals have led to a strong appreciation of the peso, undermining the competitiveness of a range of other

[11] Note that for most of the countries that established SWFs before 2005, their SWF accumulation is vastly larger than the level of international reserves, hence their SWF/IRs are well above 1. In contrast, SWF/IRs are well below 1 for the new members of the SWFs club [China, South Korea and Russia]. This suggests duration dependence of SWF/IR, and that SWF/IR will increase overtime for the newer members of the SWFs club.

[12] The list of countries that joined the SWFs club after 2005 includes Chile and Brazil, while India, Japan and Thailand are considering establishing SWFs.

> export products, ranging from wine and grapes to salmon and wood. …And it is perhaps not surprising that the first big new policy initiative by Andres Velasco, the Harvard economics professor who has the job of administering the boom, is designed to ease the pressure…Last week he announced details of two new funds designed to take dollar earnings overseas. The idea is that by saving the dollars to meet future liabilities rather than exchanging them for pesos, the government will ease pressure on the peso. The funds will be significant. Mr Velasco told the FT that he expects to place an amount equal to half a percentage point of gross domestic product per year for the next decade – making for a total of about $5bn-$6bn at current prices – into a pension guarantee fund… Mr Velasco explains the new measures as being part of the same counter-cyclical approach that he says has been conducted successfully since the 1990s. Laws introduced by the previous government mean that governments are obliged to record an average fiscal surplus equal to 1 per cent of gross domestic product. "We have dealt with the flows but now we are setting up mechanisms to invest the stocks that arise as a result. You have to have a policy towards stocks that is as transparent and as institutionalised as the policy on flows."
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> By Richard Lapper, FT Latin America editor, May 5 2006 [13]

As most international reserves are invested in low yield and low risk asset class, observers noted the possibility of excessive hoarding of international reserves [see Rodrik (2006)]. The proliferation of Sovereign Wealth Funds in recent years allows the public sector to attain pubic saving objectives by investing in diversified assets, potentially offering higher returns. It should also facilitate cheaper ways to mitigate the volatility of the real exchange rate in the presence of external shocks. Indeed, one expects that more countries will opt to channel part of their international reserves into new Sovereign Wealth Funds, which will have a mandate akin the to Chilean policy of counter cyclical management of export revenue, stabilizing thereby the real exchange rate in turbulent times.

[13] This policy resulted with the formation of two Chilean SWFs, known as "Economic and social stabilization fund" [ESSF] and "the Pension Reserve Fund" [RES]. The ESSF fund was constituted with an initial deposit of $6 billion; de-facto channeling international reserves to the new Chilean SWF (see IMF Survey: Assessing Chile's Reserve Management, 2007). As of March 2008, the value of Chilean's SWFs was about 17 Billion $, hoarding a significant portion of the windfall gains associated with the earlier Chilean terms of trade improvements.

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Data Notes:

Table 1	Countries included are those whose maximum population in the sample exceeded 2.5 million and whose average current account as a percentage of GDP did not exceed [-15, 15].
Table 2	All observations with non missing values for any of the conditioning variables.
Table 3	Only countries which had more than 2.5 million population over the sample period are used.
Table 4	Only countries whose average |current account| < 15 percent of GDP

Each Table has the following 4 columns
1. Only relative incomes (GDP per capita relative to US) as RHS variable
2. Only relative incomes and current account variable as RHS variables
3. Relative income, cagdp and the following controls interacted with the CAGDP measure:
   i. Income per capita relative to US
   ii. Population density
   iii. Landlockedness Dummy = 1 for each of the 30 remaining landlocked countries in the sample.
   iv. Domestic Credit to the private sector as a percentage of GDP, as a measure of financial development
   v. Trade as a percentage of GDP
   vi. Percentage of manufacturing exports in total merchandise exports as a measure of composition of exports.
4. A GLS estimation of model in (3), to account for heteroskedasticity in error terms

Variable Descriptions and Data Sources

Variable name	Description	source
Relative Prices	Price Level of GDP (P) is the PPP over GDP divided by the exchange rate (both expressed as national currency units per US dollar) times 100. The value of P for the United States is made equal to 100.	Penn World Tables
Relative GDP	Current Per capita GDP, US=100	Penn World Tables
CAGDP	Current Account Balance (% of GDP)	WDI
CAGDP_D	CAGDP_i - CAGDP_US	
openc	Trade/GDP, in percent	Penn World Tables
domcrpvtzgdp	Domestic credit to private sector (% of GDP)	WDI
landlocked	Dummy variable, equals 1 if the country is landlocked.	
popdensity	People per square kilometer	WDI
manufxzx	Percentage of manufacturing exports in total merchandise exports.	WDI

Table 1: Penn-Effect Regressions with lags of CA differences, 1971-2004
No outliers: Population > 2.5 million, and |current account/GDP| < 15%. Dependent Variable: Relative Prices

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.7636	0.7988	0.7859	0.9478
	(0.0429)***	(0.0447)***	(0.0464)***	(0.0107)***
L. CAGDPi-CAGDPus		**-0.2132**	**-0.9156**	**-0.7143**
		(0.0750)* **	**(0.1796)*** **	**(0.1377)*** **
lag(opencxCA_D)			-0.0004	-0.0012
			-0.0019	-0.0015
lag(landlockedxCA_D)			0.7147	0.4273
			(0.2280)***	(0.1073)***
lag(Relative GDPxCA_D)			0.0059	0.0093
			(0.0021)***	(0.0022)***
lag(popdensityxCA_D)			-0.0002	-0.0003
			(0.0001)**	(0.0001)***
lag(manufxzxxCA_D)			0.0099	0.0114
			(0.0028)***	(0.0020)***
lag(domcrpvtzgdpxCA_D)			0.0042	0.0026
			(0.0022)*	-0.0019
Constant	14.5005	12.5832	13.4531	11.3722
	(5.1656)***	(5.2022)**	(5.1540)***	(3.8472)***
Observations	2146	2146	2146	2146
Number of countries	113	113	113	113

Notes:
Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.
“L.” stands for lagged, “D” stands for difference

Table 2: Penn-Effect Regressions with lags of CA differences, large countries only. Dependent Variable: Relative Prices

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.7662	0.8011	0.7914	0.946
	(0.0419)***	(0.0437)***	(0.0452)***	(0.0108)***
L. CAGDPi-CAGDPus		**-0.1928**	**-0.8951**	**-0.417**
		(0.0696)* **	**(0.1587)*** **	**(0.1233)*** **
lag(opencxCA_D)			0.0019	-0.0017
			-0.0015	-0.0013
lag(landlockedxCA_D)			0.6667	0.3197
			(0.2058)***	(0.0998)***
lag(Relative GDPxCA_D)			0.0041	0.008
			(0.0020)**	(0.0022)***
lag(popdensityxCA_D)			-0.0003	-0.0003
			(0.0001)***	(0.0001)***
lag(manufxzxxCA_D)			0.0089	0.0101
			(0.0026)***	(0.0019)***
lag(domcrpvtzgdpxCA_D)			0.0032	0.0019
			(0.0019)*	-0.0018
Constant	14.2935	12.3683	13.0168	11.9723
	(5.1230)***	(5.1617)**	(5.1220)**	(3.8992)***
Observations	2193	2193	2193	2193
Number of countries	118	118	118	118

Notes:
Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.
"L." stands for lagged, "D" stands for difference

Table 3: Penn-Effect Regressions with lags of CA differences, Countries with average CA/GDP percentages in the range [-15%, 15%] only. Dependent Variable: Relative Prices

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.6519	0.674	0.6424	0.9058
	(0.0370)***	(0.0380)***	(0.0390)***	(0.0100)***
L. CAGDPi-CAGDPus		**-0.1507**	**-0.9278**	**-0.5103**
		(0.0574)* **	**(0.1505)*** **	**(0.1177)*** **
lag(opencxCA_D)			0.0012	-0.0026
			-0.0014	(0.0011)**
lag(landlockedxCA_D)			0.5338	0.3246
			(0.2093)**	(0.0938)***
lag(Relative GDPxCA_D)			0.008	0.0103
			(0.0018)***	(0.0019)***
lag(popdensityxCA_D)			-0.0002	-0.0002
			(0.0001)**	(0.0001)***
lag(manufxzxxCA_D)			0.0092	0.0108
			(0.0021)***	(0.0012)***
lag(domcrpvtzgdpxCA_D)			0.0017	0.0009
			-0.0018	-0.0014
Constant	15.9726	14.3873	15.5266	13.5977
	(4.7571)***	(4.7906)***	(4.7507)***	(3.8337)***
Observations	2584	2584	2584	2584
Number of countries	146	146	146	146

Notes:
Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported. “L.” stands for lagged, “D” stands for difference

Table 4: Penn-Effect Regressions with lags of CA differences, 1971-2004

All countries with nonmissing values for any of the conditioning variables.

Dependent Variable: Relative Prices

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.4911	0.5249	0.621	0.9013
	(0.0324)***	(0.0339)***	(0.0377)***	(0.0101)***
L. CAGDPi-CAGDPus		**-0.1731**	**-0.5279**	**-0.0997**
		(0.0532)* **	**(0.1085)*** **	**-0.0844**
lag(opencxCA_D)			0.001	-0.0025
			-0.0008	(0.0007)***
lag(landlockedxCA_D)			0.4735	0.1508
			(0.1896)**	(0.0879)*
lag(Relative GDPxCA_D)			-0.0033	-0.0078
			(0.0011)***	(0.0010)***
lag(popdensityxCA_D)			-0.0001	-0.0001
			(0.0000)**	(0.0000)***
lag(manufxzxxCA_D)			0.007	0.0092
			(0.0018)***	(0.0011)***
lag(domcrpvtzgdpxCA_D)			0.0034	0.0043
			(0.0016)**	(0.0013)***
Constant	20.399	18.2282	15.2175	12.3949
	(4.7265)***	(4.7651)***	(4.7395)***	(3.8670)***
Observations	2674	2674	2674	2674
Number of countries	157	157	157	157

Notes:

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

"L." stands for lagged, "D" stands for difference

Table 5.a: Penn-Effect Regressions with lags of CA differences
No outliers, 1971-92

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	GLS
L. Relative GDP	0.69	0.77	0.75	0.83
	(0.07)***	(0.07)***	(0.07)***	(0.01)***
L. CAGDPi-CAGDPus		**-0.39**	**-1.85**	**-0.49**
		(0.10)* **	**(0.26)*** **	**(0.19)** **
lag(opencxCA_D)			0.01	-0.00
			(0.00)***	(0.00)**
lag(landlockedxCA_D)			0.93	0.33
			(0.38)**	(0.12)***
lag(Relative GDPxCA_D)			0.00	-0.00
			(0.00)*	(0.00)
lag(popdensityxCA_D)			-0.00	0.00
			(0.00)***	(0.00)
lag(manufxzxxCA_D)			0.01	0.01
			(0.00)**	(0.00)***
lag(domcrpvtzgdpxCA_D)			0.01	0.02
			(0.00)*	(0.00)***
Constant	23.46	19.69	19.45	17.34
	(5.71)***	(5.76)***	(5.65)***	(4.10)***
Observations	1139	1139	1139	1139
Number of countries	85	85	85	85

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

Table 5.b: Penn-Effect Regressions with lags of CA differences
No outliers, 1993-2004

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	GLS
L. Relative GDP	1.10	1.10	1.14	1.10
	(0.05)***	(0.05)***	(0.05)***	(0.01)***
L. CAGDPi-CAGDPus		**-0.05**	**0.57**	**-0.50**
		(0.07)	**(0.17)*** **	**(0.16)*** **
lag(opencxCA_D)			-0.00	0.00
			(0.00)**	(0.00)
lag(landlockedxCA_D)			0.03	0.58
			(0.18)	(0.14)***
lag(Relative GDPxCA_D)			-0.01	0.02
			(0.00)***	(0.00)***
lag(popdensityxCA_D)			-0.00	-0.00
			(0.00)	(0.00)***
lag(manufxzxxCA_D)			-0.01	0.01
			(0.00)**	(0.00)**
lag(domcrpvtzgdpxCA_D)			0.00	-0.01
			(0.00)	(0.00)***
Constant	21.47	21.25	20.69	20.31
	(2.12)***	(2.15)***	(2.07)***	(1.11)***
Observations	1007	1007	1007	1007
Number of countries	110	110	110	110

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

Table 6.a: Penn-Effect Regressions with lags of CA differences
Low Income Countries, No outliers

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.32	-0.50	-0.68	-0.73
	(0.75)	(0.54)	(0.59)	(0.20)***
L. CAGDPi-CAGDPus		**0.24**	**-2.47**	**-0.54**
		(0.25)	**(0.90)*** **	**(0.39)**
lag(opencxCA_D)			0.04	0.01
			(0.01)***	(0.01)
lag(landlockedxCA_D)			0.85	0.76
			(0.50)*	(0.17)***
lag(Relative GDPxCA_D)			-0.11	-0.01
			(0.08)	(0.03)
lag(popdensityxCA_D)			0.00	0.00
			(0.00)	(0.00)*
lag(manufxzxxCA_D)			0.01	0.00
			(0.01)	(0.01)
lag(domcrpvtzgdpxCA_D)			0.01	-0.02
			(0.03)	(0.01)*
Constant	34.60	24.99	25.74	24.94
	(21.52)	(25.91)	(27.24)	(17.00)
Observations	435	435	435	435
Number of country isocode	35	35	35	35

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

Table 6.b: Penn-Effect Regressions with lags of CA differences
Middle Income Countries, No outliers

	(1) OLS	(2) OLS	(3) OLS	(4) GLS
L. Relative GDP	0.22	0.27	0.25	0.48
	(0.09)**	(0.09)***	(0.09)***	(0.03)***
L. CAGDPi-CAGDPus		**-0.25**	**-0.54**	**0.55**
		(0.09)* **	**(0.27)** **	**(0.19)*** **
lag(opencxCA_D)			0.00	-0.00
			(0.00)**	(0.00)*
lag(landlockedxCA_D)			0.23	0.05
			(0.35)	(0.21)
lag(Relative GDPxCA_D)			0.00	-0.01
			(0.01)	(0.00)***
lag(popdensityxCA_D)			0.00	0.00
			(0.00)	(0.00)**
lag(manufxzxxCA_D)			-0.01	-0.01
			(0.00)	(0.00)***
lag(domcrpvtzgdpxCA_D)			-0.00	0.00
			(0.00)	(0.00)
Constant	46.80	44.01	43.85	38.74
	(8.78)***	(8.78)***	(8.79)***	(8.33)***
Observations	1000	1000	1000	1000
Number of countries	52	52	52	52

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

Table 6.c: Penn-Effect Regressions with lags of CA differences
High Income Countries, No outliers

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	GLS
L. Relative GDP	0.67	0.73	0.84	1.05
	(0.05)***	(0.06)***	(0.06)***	(0.03)***
L. CAGDPi-CAGDPus		**-0.23**	**0.50**	**0.35**
		(0.09)**	**(0.49)**	**(0.65)**
lag(opencxCA_D)			-0.00	0.00
			(0.00)	(0.00)
lag(landlockedxCA_D)			0.80	-0.71
			(0.40)**	(0.38)*
lag(Relative GDPxCA_D)			-0.01	-0.01
			(0.00)	(0.01)**
lag(popdensityxCA_D)			-0.00	-0.00
			(0.00)	(0.00)***
lag(manufxzxxCA_D)			-0.01	-0.01
			(0.00)***	(0.00)**
lag(domcrpvtzgdpxCA_D)			0.01	0.03
			(0.00)***	(0.00)***
Constant	24.60	19.86	11.78	-8.30
	(5.47)***	(5.86)***	(5.72)**	(4.69)*
Observations	711	711	711	711
Number of countries	26	26	26	26

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions contained year dummies, not reported.

Table 7: Levin-Lin-Chu test of Panel Unit Root*

Variable	Coefficient	t-star	Lags	Obs
Relative Prices	-0.41	-2.40	0	660
Relative Prices	-0.64	-9.90	1	616
Relative GDP	-0.33	-4.04	0	660
Relative GDP	-0.52	-10.88	1	616
CAGDPi-CAGDPus	-0.63	-7.66	0	660
CAGDPi-CAGDPus	-0.80	-6.55	1	616
opencxCA_D	-0.67	-8.71	0	660
opencxCA_D	-0.79	-5.69	1	616
Relative GDPxCA_D	-0.58	-7.55	0	660
Relative GDPxCA_D	-0.76	-7.90	1	616
popdensityxCA_D	-0.93	-9.32	0	660
popdensityxCA_D	-1.20	-5.32	1	616
manufxzxxCA_D	-0.62	-8.28	0	660
manufxzxxCA_D	-0.79	-7.54	1	616
domcrpvtzgdpxCA_D	-0.59	-7.91	0	660
domcrpvtzgdpxCA_D	-0.77	-7.79	1	616

Table 8: Countries in the Balanced Panel

Argentina	El Salvador	Jamaica	Portugal
Australia	Finland	Japan	Singapore
Barbados	Germany	Korea, Republic of	Spain
Bolivia	Guatemala	Malaysia	Sweden
Canada	Honduras	Mauritius	Switzerland
Chile	Iceland	Mexico	Trinidad &Tobago
China	India	New Zealand	Tunisia
Costa Rica	Indonesia	Oman	Turkey
Cyprus	Ireland	Panama	United Kingdom
Ecuador	Israel	Philippines	Uruguay
Egypt	Italy	Poland	Venezuela

Note: The Levin-Lin-Chu Test was conducted using a balanced panel of the above countries, for the years 1988-2003.

* The unit root test applied a version of $\Delta y_{i,t} = \rho y_{i,t-1} + \alpha_0 + \delta t + \varepsilon_{i,t}; \quad H_0 : \rho = 0, \delta = 0$

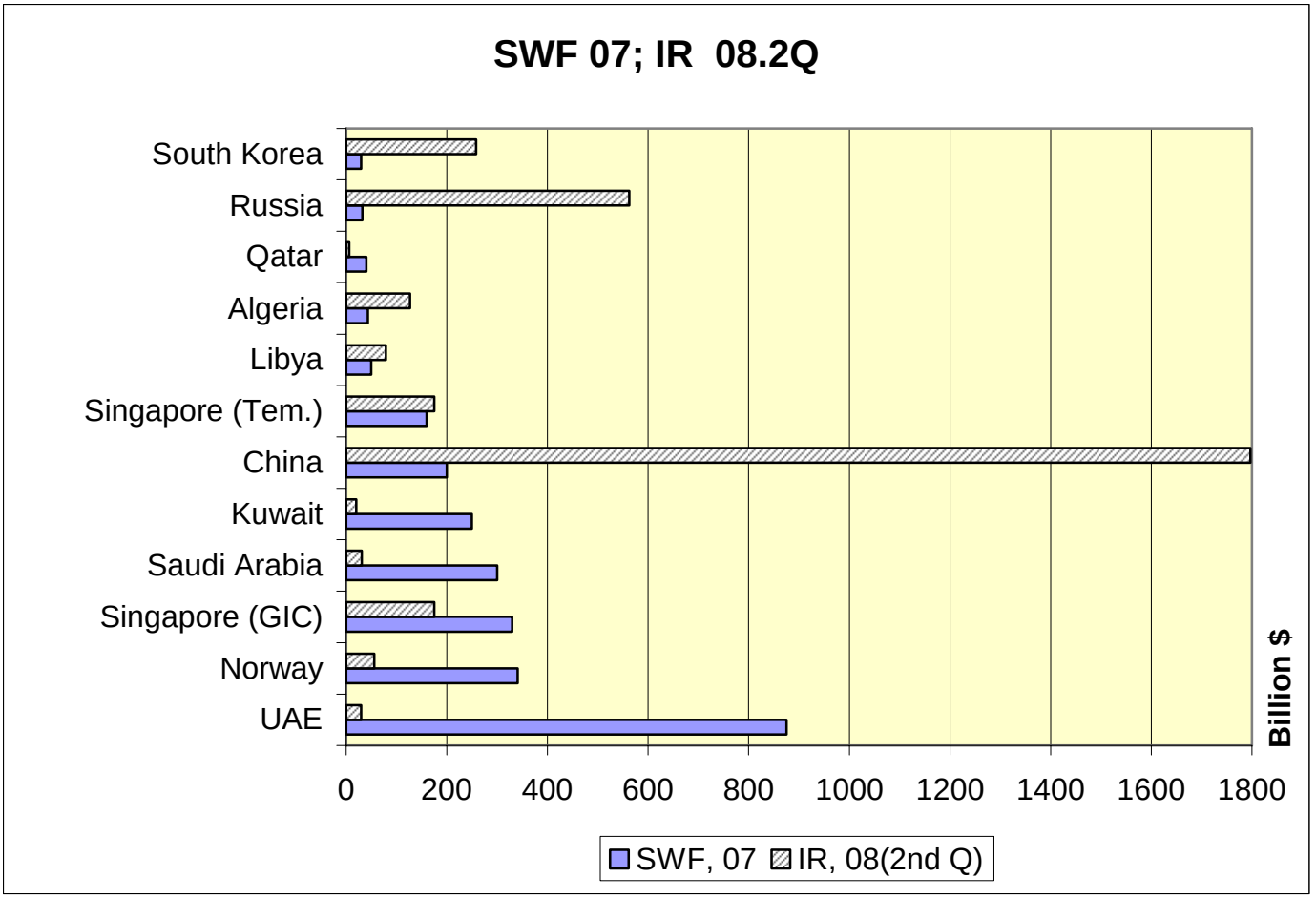

Figure 1: Largest sovereign-wealth funds (2007), and the corresponding countries foreign exchange reserves (2008, 2nd Q), billions of USD.

Sources: IMF, Morgan Stanley Research, The Economist

Comments:

1 Temasek Holdings does not consider itself a sovereign wealth fund and was excluded from an agreement between Singapore and the United States in 2008 requiring greater disclosure and transparency in transactions involving sovereign wealth funds. Only the Government of Singapore Investment Corporation (GIC) was involved in the agreement [see Straitstimes, March 22, 2008].

2 Five of the SWFs reported in Figure 1 were established during 2005-8 [China, Qatar, Libya, Russia, and South Korea]

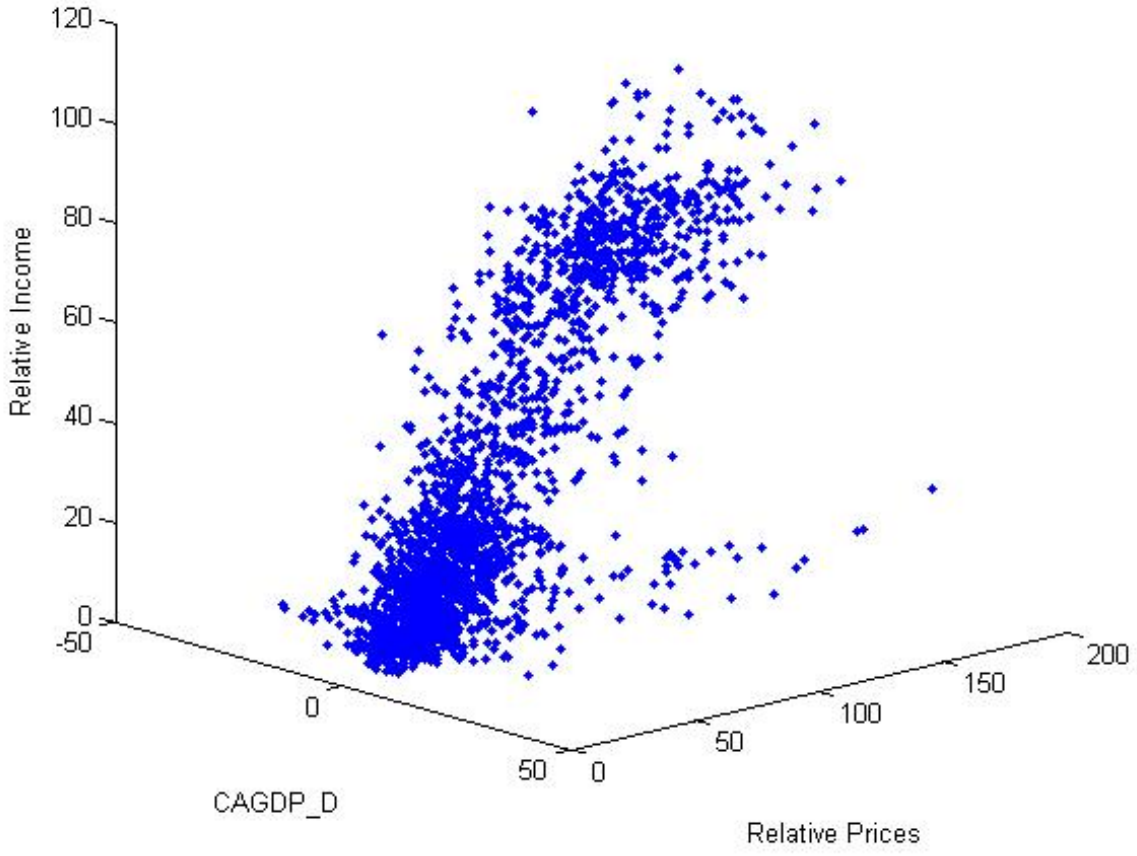

Figure 2
Patterns of relative income, Relative prices and the current account/GDP [all relative to the US]