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Cheung, Yin-Wong and Sengupta, Rajeswari

University of California Santa Cruz

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Accumulation of Reserves and Keeping Up with the Joneses: The Case of LATAM Economies

Yin Wong Cheung and Rajeswari Sengupta*
University of California, Santa Cruz

ABSTRACT

In this paper we explore the 'Mrs.Machlup's Wardrobe' hypothesis to understand the growing trend of Latin American economies amassing large stocks of international reserves. Using annual data from 1980 to 2007, we examine the relevance of the argument that economies continue to add to their existing reserves stock in order to keep up with the Joneses. We find strong evidence of presence of the Joneses effect. The effect is robust to the inclusion of traditional determinants of reserve accumulation as well as region specific factors including commodity exports that set the Latin American economies apart from other emerging economies.

JEL Classifications: F3, F4

Keywords*: Demand for International Reserves,* 'Mrs. Machlup's Wardrobe' Hypothesis*, Speculative Attack, Competitive Hoarding, Financial Crisis.*

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* Rajeswari Sengupta, Department of Economics, University of California, 1156 High Street, Santa Cruz, 95064, CA, USA. Phone: (831) 239-8676. Fax: (831) 459-5077. Email: rsengupt@ucsc.edu.

1. Introduction

The recent global financial crisis of 2008-09 has highlighted the pivotal role of the US dollar in the global monetary architecture. It has been repeatedly demonstrated that, during financial crises, the US dollar asserts its multiple and related roles as a safe haven currency, as well as an international currency for trade and finance. Increasingly, both academics and policy makers have been realizing the potential drawbacks of having a single national currency plays such a dominating role in the international financial system. Nevertheless, there appears to be no quick fix. Arguably, previous attempts to develop an alternative reserve currency including the Japanese yen and the euro, have borne little fruit.[1]

While the international community is working on a new international monetary architecture, policy makers have to deal with real life economic issues. In the aftermath of the 1997 Asian financial crisis, international reserves were perceived to be a crucial factor in determining how well an emerging economy could survive a financial crisis.[2] In the current paper, we study the holdings of international reserves of a major group of emerging market economies (EMEs) that are generally clubbed together in popular thinking, international policy making as well as contemporary economic literature as the Latin American (LATAM) economies. Rapid growth of international reserves in the LATAM economies has been stirring a lively debate for quite some time now. For instance, international reserves of Argentina, Bolivia, Brazil, Colombia, Ecuador, Mexico and Peru increased respectively by 78%, 391%, 453%, 132%, 197%, 145% and 220% between 2000 and 2007. Needless to say this has become an important issue on international policy agenda.

It is frequently perceived that the recent levels of reserve holding of most EMEs in general and of LATAM economies in particular are difficult to justify on the basis of conventional reasoning. For instance, the popular Greenspan-Guidotti Rule (Greenspan, 1999) suggests that reserves should equal short-term external debt (one-year or less maturity), implying a reserves to short term debt ratio of 1. However at the end of 2007, the reserves to debt ratio of LATAM economies such as Bolivia, Brazil, Chile, Colombia, Mexico and Peru were 14.86, 2.17, 1.46, 2.86, 8.47 and 2.88 respectively. Excess hoarding of reserves imposes a positive cost on the

[1] The possibility of Chinese renminbi to be an international currency has also been recently explored. See, for example, Cheung, Ma, and McCauley (2010).

[2] Some recent studies on international reserves include Aizenman and Marion (2003, 2004), Cheung and Ito (2009), Cheung and Wong (2008), Jeanne and Ranciere (2006), Rodrik (2006).

economy and also contributes to global imbalances.[3] It is therefore crucial to understand the factors that cause economies to undertake reserve accumulation at such unprecedented levels.

Most early studies of international reserves behavior suggest that demand for international reserves was mainly attributed to the need for smoothing trade imbalances.[4] However, in the current environment of growing capital mobility, higher exchange rate flexibility, rapid growth in financial market innovations and increasing global financial integration, the buffer stock models of 1960s to 1980s have limited capacity to account for continued accumulation of reserves at such dramatic rates. The role and functionality of reserves have evolved with recent developments in global capital markets thereby making it more challenging to explain international reserve holding behavior.

One prominent explanation focuses on the precautionary motive of holding reserves to self-insure against future financial crises and speculative currency attacks.[5] However according to a modern incarnation of mercantilism proposed by Dooley, Folkerts-Landau and Garber (2003), reserve accumulation is a by-product of an export-oriented growth strategy.[6] Several other reserve determinants explored in recent studies include short-term external debt, depth of domestic financial markets and politico-institutional factors.[7]

The debate centering on the remarkable growth in reserve holding is far from settled. Observed levels of reserves continue to exceed the levels predicted by contemporary theories. In this paper, our objective is to delve deeper into this unresolved issue and to understand the dynamics of reserve accumulation using the 'Mrs. Machlup's Wardrobe' hypothesis of international reserves. Fritz Machlup (Machlup, 1966) likened the acquisitive characteristics of central banks in terms of adding to their reserves, to his wife's tendency to add to her stock of dresses. Thus, the 'peer-effects' based hypothesis purports that economies continue to add to their existing stock of reserves in order to keep up with the Joneses.

Indeed while most studies so far have focused on economic fundamentals, it is plausible to argue that psychological factors governed by some underlying economic rationale may also play

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[3] See for example, Rodrik (2006) for an exposition on the cost of reserve accumulation.
[4] See for example, Frenkel (1974,1980), Frenkel and Jovanovic (1981), Heller (1966), and Kelly (1970).
[5] See for example, Aizenman and Lee (2007), Aizenman and Marion (2003), Garcia and Soto (2004), Jeanne and Ranciere (2006).
[6] Aizenman and Lee (2007) however find that relative to the precautionary demand, the mercantilist motive accounts for a smaller amount of reserve holding.
[7] See for example, Aizenman and Marion (2003, 2004), Greenspan (1999), Obstfeld, Shambaugh and Taylor (2008).

a role in explaining the recent surge of international reserves in EMEs. Cheung and Qian (2009) find strong empirical evidence in support of keeping up with the Joneses effect in the reserve holding behavior of a group of East Asian economies. According to them, an implicit rivalry among economies may give rise to a competitive mechanism that pushes reserve accumulation to a level difficult to be explained by traditional economic factors.

A natural question to ask in this context is whether the Joneses effect is unique to East Asia or alternatively, to what extent this hypothesis is applicable to other groups of EMEs as well. In the current exercise, we examine the relevance of the Joneses effect to the LATAM economies that are arguably the most important group of developing economies outside East Asia. Apart from a generic psychological desire to feel good and not to be perceived as inferior, a few other reasons may lead to the intent of economies to keep up with their peers. These motives can very well be applied to the case of LATAM economies that are similar in several economic aspects.

LATAM economies are highly integrated with world financial markets thereby exposing them to the possibility of capital flight, sudden stops and hence, output contractions.[8] Indeed, over last three decades, LATAM economies have been highly crisis prone. Moreover, political instability intrinsic in many LATAM economies may further exacerbate the contractionary effects of a crisis. A higher level of reserves compared to neighboring economies may diffuse the speculative pressure on a particular economy thereby reducing the probability of bearing the full cost of an attack. The series of debt and currency crises experienced by LATAM economies since 1980s and the contagion associated with these turmoil episodes thus provide a good incentive to hoard reserves to keep up with the Joneses. The objective behind such a competitive reserve hoarding behavior would be to insure against the cost of potential speculative attacks.

Majority of LATAM economies including Mexico, Brazil, Chile, Venezuela and Ecuador, are rich in natural resources such as oil and minerals and specialize in agricultural products. Their reliance on commodity trade implies that they are subject to some common terms of trade shocks. From these common shocks arises the possibility of competing with each other to

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[8] According to the Chinn-Ito index (Chinn and Ito, 2008*)*, the degrees of capital account openness of LATAM economies have been going up rapidly since the beginning of the 1990s. The capital openness indices of major LATAM economies including Bolivia, Brazil, Chile, Ecuador, Mexico and Peru are 1.5, 1.3, 2.5, 2.3, 1.2 and 2.5 respectively. These numbers are relatively higher than those of Asian EMEs such as Indonesia, Korea, Malaysia, Thailand, Philippines and Vietnam. The capital openness indices of the latter countries are mostly negative or very small say, in the order of 0.14.

accumulate reserves in excess of the prescribed rules of thumb.[9] Moreover, competition for international investment in these natural resources could lead to implicit rivalry among these economies. Finally, if the level of international reserves is an indicator of financial health and stability of an economy, then an economy has an added incentive to keep up with the Joneses, in order to place itself in a favorable position to compete for world capital.

Given the common features of the LATAM economies, we explore to what extent the 'Mrs. Machlup's Wardrobe' hypothesis is relevant for this group of EMEs. Do the factors governing reserve holding behavior extend beyond standard economic determinants and include other economies' levels of international reserves? Our exercise will shed light on the question of whether the competitive reserve hoarding behavior underlying the 'Mrs. Machlup's Wardrobe' hypothesis is applicable outside the group of East Asian economies.

Our standard panel estimation results for ten major LATAM economies over the period 1980-2007 are suggestive of the presence of Joneses effect. The Joneses effects persist even when controlled for import propensity, financial openness, exchange rate volatility, reserve volatility, ratio of commodity exports to GDP, political instability, domestic financial liabilities, and a common growth trend. The Joneses effect results also survive a series of robustness checks.

2. Data and Methodology

We use annual data from ten LATAM economies namely Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela, to assess the keeping up with the Joneses effect in the LATAM region. Our analysis covers the time period from 1980 to 2007, chosen primarily on the basis of data availability.[10] The demand for international reserves is investigated using the following regression models:

$$Y_{it} = c + X'_{it}\alpha + \varepsilon_{it}, \quad (1)$$

$$Y_{it} = c + X'_{it}\alpha + \beta J_{it-1} + \varepsilon_{it}, \quad (2)$$

$$Y_{it} = c + X'_{it}\alpha + \beta J_{it-1} + \gamma J_{it-1} * D1 + \delta J_{it-1} * D2 + \varepsilon_{it}, \; i = 1.....N; t = 1.....T \quad (3)$$

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[9] As pointed out by Aizenman and Riera-Cricton (2008), economies exposed to terms of trade volatility may reduce the resultant real exchange rate volatility by hoarding international reserves.

[10] The data frequency is dictated by the fact that data on some explanatory variables are only available annually. Also, in most common contemporary usage, Latin America refers only to those territories in the Americas where Spanish or Portuguese languages are the main spoken languages. Some remarks pertaining to the 2008 and 2009 data that became available after the first draft of the paper, are discussed in Section 4.4.

where i denotes economies (N=10) and t denotes time (T=28). Y_{it} is the reserves to GDP ratio of economy i at time t, X'_{it} is the vector of economic variables used to explain reserve demand, J_{it-1} is the variable capturing the `keeping up with the Joneses effect', and D1 and D2 represent crisis dummy variables. The variable J_{it-1} is henceforth referred to as the Joneses variable for brevity. The interaction Joneses terms (J_{it-1}*D1 and J_{it-1}*D2) are included to account for the impact of the series of financial crises experienced by the economies in our sample and the spillover effects thereof. The Joneses variable and related interaction terms are defined later.

The dependent variable is international reserves normalized by GDP to facilitate comparison across economies of varying sizes. The explanatory variables incorporated can be grouped into four categories: (i) traditional or canonical macroeconomic variables, (ii) factors capturing the Joneses effect, (iii) dummy variables for the crises, and finally (iv) region specific and/or determinants that have been advocated in relatively recent literature analyzing reserve demand. The categorization helps understand dynamics of the interactions among different types of determinants of demand for international reserves.

The group of traditional or canonical macroeconomic variables consists of average propensity to import (measured by the ratio of imports to GDP), financial openness (ratio of the sum of absolute values of capital inflows and outflows to GDP), volatility of exchange rate (measured by the annual standard deviation of monthly exchange rate series) and volatility of international reserves (measured by the annual standard deviation of monthly reserves series). These variables have been commonly considered as primary determinants of reserve demand since the 1960s.

The second category includes variables capturing the Joneses effect - the focal point of our analysis. Since there is no foolproof method of defining the Joneses, we follow the convention of Cheung and Qian (2009). For any one economy, the Joneses constitute all the other economies in our sample, which together act as a proxy for all other economies in the LATAM region.

The principal idea behind this definition is that precautionary or mercantilist hoarding of reserves by one economy may induce competitive hoarding by other economies in the same region, in order to preempt any competitive advantage gained by the first economy. If an economy is holding a level of international reserves that is relatively lower than other economies in the same region, then it is likely to be more vulnerable to potential speculative attacks and financial crisis brewing in the region. After the 1997 financial crisis in East Asia, Feldstein

(1999) and Fischer (1999) observed that economies with higher level of international reserves survived the crisis better than those with a lower level. Moreover, international reserve holding can act as a barometer of financial health. This can further add to the motive of competitive hoarding to keep up with the Joneses, in order to attract international capital investment and FDI.

In view of the arguments presented above, we define the Joneses variable for economy i, as follows:

$$J_{it} = \Sigma_{i \neq k} Y_{kt} \qquad (4)$$

where Y_{kt} is the reserves to GDP ratio of economy k at time t. The lagged Joneses variable is used in equations (2) and (3) to reflect the lack of contemporaneous data on other economies' international reserves. In spirit of the 'Mrs. Machlup's Wardrobe' hypothesis, if reserve accumulation of other economies in the region went up in the previous year, then reserves held by the economy in question will go up in the current year. Later on we consider an alternative definition of the Joneses variable.

The next category of determinants includes two dummy variables intended to capture the effects of financial crises experienced by the ten LATAM economies over the sample period. The crisis-Joneses interaction terms J_{it-1}*D1 (*JonesesI*D1*) and J_{it-1}*D2 (*JonesesI*D2*) are introduced in the regressions to investigate if there has been a change in the Joneses effect in the year prior to the crisis (that is the year in which the Joneses effect is calculated) as well as in the year of the crisis. The dummy variable D1 denotes year of the crisis whereas D2 represents the year immediately preceding the crisis.

The final group of explanatory variables consists of the ratio of ores, metal and fuel exports to GDP, an index of political risk, ratio of M2 to GDP and the principal component of growth rates of all ten economies in the sample. The first two variables capture the fact that economies in our sample rely heavily on commodity exports and that political instability is rampant in the LATAM region. These variables are discussed in more details in the next section.[11]

We incorporate the above-mentioned categories of determinants sequentially in our estimations - the canonical variables, followed by the Joneses variable, the crisis-Joneses interaction terms, and finally the relatively recent determinants and region specific factors. The

[11] Given the prevalence of foreign currency denominated debt in the balance sheets of banks and firms in most LATAM countries, it is plausible to argue that such 'liability dollarization' can impact the demand for reserves. However, data on such factors is not available for the full sample period of our study.

sequence highlights the importance and evolution of each group of determinants. Data sources and definitions are listed in the Appendix.

3. Estimation Results

The results of fixed effects panel regressions based on equations (1) to (3) are presented in Table 1. These are our baseline Joneses effect results, and their robustness is examined in subsequent analyses. The effects of the canonical macroeconomic determinants, the Joneses variable, and the crisis-Joneses interaction terms are reported under the Columns labeled (1) to (3). Columns (4) to (7) show the contributions of the recently advocated determinants and region specific factors added sequentially to the X'_{it} vector in regression equation (3).

The Joneses variable as defined here exclusively encompasses the LATAM economies in our sample as opposed to the traditional variables that are mostly common to studies examining reserve demand irrespective of the economies in the sample. Likewise the crisis dummies, and the region specific factors are related to specific financial crises, institutional settings, and economic conditions affecting the economies in our sample.

In absence of the Joneses variable, all four canonical macroeconomic variables, import propensity (*mp*), financial openness (*fopen*), volatility of exchange rate (*exvol*) and volatility of reserves (*rvol*), are statistically significant. The signs of the estimated coefficients are in accordance with theoretical predications. For instance, import propensity has a positive effect on demand for international reserves. According to Frenkel (1974), average propensity to import, that is the imports to GDP ratio, measures trade openness and should have a positive effect on international reserve holding due to the precautionary motive to accommodate trade related shocks. Hence in our case, the significant, and positive coefficient of the import propensity variable implies that a high degree of vulnerability to external trade related shocks will induce a high level of international reserve holding.

The effect of financial openness on the holding of international reserves is similar to the one of trade openness. A high level of financial openness increases the vulnerability of an economy to external shocks (Flood and Marion, 2002). Thus similar to trade openness, we expect financial openness to have a positive effect on reserve holding. Indeed, the financial openness variable in Table 1 has a significantly positive coefficient estimate. The result emphasizes that the precautionary motive not only pertains to trade related shocks but also to shocks related to the

capital account. A higher level of international reserve holding allows an economy to better manage potential capital flow reversals and sudden stop risks that could have substantial adverse real economic impacts. The finding appears consistent with the recent trend of financial liberalization and the related need to self-insure against unfavorable capital flows.

Theoretically, under a pure floating exchange rate regime, there is no need to defend the currency using international reserves. Thus, international reserve holding behavior should not respond to exchange rate variability given that none of the economies in our sample (with the exception of Argentina which had a currency board arrangement from 1992 to 2001) had a pegged exchange rate regime during the period under consideration. In Table 1 however, exchange rate volatility is significant with a positive sign. This implies that a high degree of volatility of the exchange rate leads to a high level of international reserve holding. The empirical result indicates that Central Banks of these LATAM economies could be using international reserves to actively intervene in foreign exchange markets and manage the values of their respective currencies. This seems to be consistent with the official exchange rate regime classifications of these economies, as put together by Reinhart and Rogoff (2004). The currencies of most of these EMEs appear to be within a crawling band around the US dollar.

Finally, volatility of international reserve holdings that acts as a proxy for uncertainty yields a significantly positive coefficient. This result is consistent with the role of reserves as illustrated by the buffer stock model of international reserves in a stochastic inventory control setting (Frenkel and Jovanovic, 1981). Overall, these four canonical explanatory variables perform quite well and explain 24% of the variation in international reserve holdings of the ten economies in our sample.

The Joneses effect reported under Column (2) attests to the notion of catching up with the Joneses and has a positive impact on demand for international reserves. The coefficient estimate is highly significantly with a p-value less than 0.001. The Joneses variable in equation (4) is given by the sum of international reserves held by other economies in the sample in the previous period. After controlling for the effects of the canonical economic determinants, a unit increase in an economy's international reserves induces an estimated increase of 0.061 unit in reserve stock of each of the remaining economies, and a total increase of 0.549 unit in the reserve stock of the other nine 'peer economies'. Hence in addition to statistical significance, the Joneses effect is of practical relevance as well.

The inclusion of the Joneses variable improves the adjusted R-squares estimate from 24% to 30%. Compared with the results of Column (1), coefficients estimates of the canonical explanatory variables are still statistically significant but are smaller in magnitude in presence of the Joneses variable.

The LATAM economies under consideration experienced a series of currency crises during the sample period.[12] The series of crises make it difficult to study the post-crisis effect on reserve accumulation in the region. Even a small time window after one crisis in an economy overlaps with a crisis in some other economy. Given the occurrence of multiple crises, we consider two types of dummy variables and interact them with the Joneses variable. The objective is to separately treat the change in reserves in the year when an economy was going through a crisis and also in the year preceding the crisis.

We anticipate that prior to the occurrence of a crisis as well as during a crisis year, an economy's level of international reserves will be lower than in relatively stable or calm periods. This implies that the Joneses variable when interacted with both the crisis dummies could have a negative coefficient. For example, Brazil experienced a financial crisis in 1999. Hence, in 1991, Brazil may have a smaller than usual response to Joneses' holdings of international reserves in 1998. Likewise international reserves of Brazil in 1998 may decline as it was entering a crisis period, even as the Joneses' international reserves of 1997 may have gone up.

In Column (3), the Joneses variable itself is still positive and highly significant when the crisis-Joneses interaction dummies are added. The two crisis-Joneses interaction terms are negative and significant. As anticipated, during the crisis year and the year before, the international reserve holding of the economy in question is likely to get depleted and move in a direction different from that of its peer group. The inclusion of the crisis-Joneses interaction terms, however, does not have a discernible impact on the original Joneses variable. The estimates indicate that preceding and during a financial crisis, an economy barely responds to its peer group's accumulation of international reserves. The finding appears in line with the anecdotal evidence of dramatic depletion of international reserve holding of the crisis-affected

[12] The crisis episodes include (a) debt crisis of 1982-1983 triggered by debt default in Mexico and affecting Argentina, Bolivia, Brazil, Chile, Ecuador and Uruguay (b) separate debt crises in Colombia (1985) and Venezuela (1984 and 1987), (c) Mexican 'tequila' crisis of 1994-1995 that affected Argentina, (d) Brazilian Real crisis of 1999, and (e) the Argentine crisis of 2001-2002.

economies in the LATAM region during the crises. Later on, we consider the effect of interacting the crisis dummy variable (D1) with other explanatory variables in the regression.

In Columns (4) to (7), we report the effects of sequentially adding the ratio of ores, metal and fuel exports to GDP (*oresfuel_gdp*), a political risk index (*polrisk*), M2 to GDP ratio (*M2_GDP*), and the principal component of growth rates of the ten LATAM economies (*grrates_pc*), to the baseline regression specification.

Although the LATAM economies are rich in natural resources and minerals and rely heavily on commodity exports, the ratio of ores, fuel and metal exports to GDP does not come out to be significant in most of our specifications. We also considered other variables for capturing trade related to natural resources and commodities, including a proxy for terms of trade using data from the IFS and commodity price index data from Reuters. However, these variables did not yield statistically significant coefficients in our regressions. The results are not reported here for brevity but are available upon request.

The proxy for political risk however is found to be highly significant and has a positive sign. The result is in accordance with Aizenman and Marion (2003, 2004) who show that holdings of international reserves are positively influenced by political uncertainty. The inclusion of the political risk index has a discernible impact on the estimated effects of trade openness, financial openness, and the Joneses variable. Even though these three variables are still statistically significant and have the same sign in Column (5), their coefficient estimates display a noticeable drop in magnitude compared to those in say Column (3). The inclusion of the political risk index also leads to a large increase in the adjusted R-squares estimate.

The M2 to GDP ratio is positive and significant. Wijnolds and Kapteyn (2001) argue that money stock (M2) in an economy is a proxy for potential capital flight undertaken by domestic residents and hence can be used to measure 'internal drain'. More recently, Obstfeld, Shambaugh and Taylor (2008) demonstrated that the M2 to GDP ratio (the size of domestic financial liabilities that could potentially be converted into foreign currency divided by GDP) acts as a proxy for depth of financial markets and is a significant predictor of reserve stocks. The inclusion of the M2 to GDP ratio however increases the adjusted R-squares estimate by a relatively small amount.

One possible empirical concern about the Joneses variable is that it is measured by the sum of international reserves held by other economies in the sample. This way of defining the Joneses

variable may capture some common latent dynamics driving the economies and their reserve holding behavior (Cheung and Qian, 2009). In order to guard against this possibility we include a common output growth variable and re-examine the Joneses effect. We implicitly assume that output growth is a reasonable proxy for general economic conditions.

The result of including the principal component of GDP growth rates of the ten LATAM economies in our sample (*grrates_pc)* is shown in Column (7). The *grrates_pc* variable is significant only at the 10% level. It is encouraging to note that the Joneses variable continues to be highly significant and positive and its magnitude is quite comparable to the one reported in say Column (6). The adjusted R-squares estimates indicate that inclusion of the common output growth variable only marginally improves the goodness of fit of the models. Thus, the estimated Joneses effect is not likely to be attributable to common forces driving the growth dynamics of these EMEs.

In their paper, Cheung and Qian (2009) include a dummy variable to investigate whether there was a change in the Joneses effect in the post-1997 crisis period among the Asian economies in their sample. They find that the Joneses effect is significantly stronger after the East Asian financial crisis. Given the series of financial crises experienced by the LATAM economies during the sample period and the spillover effects of the crises, it is relatively more difficult to conduct this kind of an exercise in our current study. We perceive that years following the 2001 financial crisis in Argentina were relatively more stable and hence in some sense constitute a post-crisis period. With this is mind, we interacted the Joneses variable with a millennium dummy (2002-2007) and included it in our regression analysis.

The results showed that the millennium dummy is always positive but is significant only in one case. Its presence does not have any notable impact on the significance of other explanatory variables in Table 1, including the Joneses variables. For brevity, results pertaining to the millennium dummy variable are not reported but are available upon request. Thus, compared with results for the East Asian economies in Cheung and Qian (2009), our finding offers only limited support for a stronger post-crisis Joneses effect among LATAM economies.

4. Robustness Checks

In this section, we report the results of a few robustness checks performed to validate the empirical Joneses effect across different scenarios.

4.1 An Alternative Measure of the Joneses Variable

As mentioned before, we do not have a foolproof method of defining the Joneses variable because we do not really know who the Joneses are from the perspective of these ten LATAM economies. To check the robustness of our estimation results, we experiment with an alternative definition of the Joneses variable. We consider the possibility that an economy may regard only a few major economies in the region as the Joneses, instead of all other economies in the region as postulated so far in equation (4).

The alternative suggested may be justified by the hypothesis that the larger representative economies have timely information as well as a good assessment of the regional economic conditions. Moreover, global investors could use the economic and financial stability of these representative economies as an indicator to gauge the overall financial condition of the region. Accordingly we define the alternative Joneses variable as the sum of the reserves to GDP ratios of Argentina, Brazil and Mexico – the three largest economies in our sample in terms of GDP. Thus, the alternative Joneses variable (*JonesesII*) is defined as follows:

$$J_{it} = \Sigma_{k=Argentina,\ Brazil,\ Mexico}\ Y_{kt} \qquad (5)$$

For any one of these three major economies, the Joneses variable is defined to be the sum of the reserves to GDP ratios of the other two economies. For convenience, we label the variable defined by (4) the *JonesesI* variable and the one by (5), the *JonesesII* variable. The results of estimating equations (1) to (3) with *JonesesII* are presented in Table 2.

In general, for the same specification in Tables 1 and 2, use of the *JonesesII* instead of the *JonesesI* yields a larger adjusted R-squares estimate and does not qualitatively change the coefficient estimates of explanatory variables. There are a few similarities and a few differences, and the differences are of quantitative rather than of qualitative nature.

In terms of the Joneses effect, the *JonesesII* variable and the two associated crisis-Joneses interaction terms (*JonesesII*D1* and *JonesesII*D2*) have coefficient estimates that are larger in magnitude than the corresponding ones in Table 1. Thus, choice of the largest economies as the Joneses strengthens the empirical effect of keeping up with the Joneses. These coefficient estimates also indicate that prior to a crisis, an economy tends to deplete international reserves when its neighbors are accumulating reserves. The sum of coefficient estimates of the *JonesesII*

and the two crisis-Joneses variables is negative in all cases. The results point indirectly to the close link between the drawing down of international reserves and a financial crisis.

Aside from the Joneses related variables, coefficient estimates of other explanatory variables show only minor changes. It is of interest to note that inclusion of the political risk index in Table 2 induces a noticeable decrease in the effect of the *JonesesII*, trade openness, and financial openness variables, similar to the results seen in Table 1. The common output growth variable (*grrates_pc*) is statistically insignificant implying that the Joneses effect, when measured using the alternative definition, is not spuriously affected by any common underlying dynamics.

Given the diversity among LATAM economies, it is of interest to estimate economy-specific reserve demand equations. An economy-specific regression analysis, however, could suffer from a lack of degrees of freedom problem because the number of annual observations is quite small compared with the model complexity. Nonetheless, the results in Tables 1 and 2 are indicative of the diverse behavior among these economies. For instance, the estimated coefficient of the *JonesesII* variable is larger than that of *JonesesI*; that is, on average the relatively smaller economies respond more to the larger ones when it comes to competitive reserve hoarding.

4.2 Interaction of Crisis Dummies and Macro Variables

The crisis-Joneses interaction variables illustrate how the effect of an explanatory variable can be affected by the occurrence of a crisis. The ability to construct crisis interaction variables is limited by the paucity of annual observations in our sample. In this subsection, we make another attempt to investigate the implication of financial crises for the Joneses effect. We interact the crisis dummy variable D1 with the canonical macroeconomic determinants of reserve demand. To maintain a reasonable degree of freedom for the regression exercise, we consider only the canonical macro variables and the *JonesesI* variable.[13] The regression model may be specified as follows, building up on equation (3):

$$Y_{it} = c + X'_{it}\alpha + \beta J_{it-1} + \gamma J_{it-1} * D1 + \delta J_{it-1} * D2 + \eta X'_{it} * D1 + \varepsilon_{it}, \qquad (6)$$

[13] We interacted the relatively recently advocated determinants of reserve demand with the crisis dummy D1 as well as the two main groups of control variables (canonical and recent ones) separately with the pre-crisis dummy D2. The Joneses effect is found to be robust to all of these interactions. The results are not reported here for brevity but are available upon request.

where all notations denote same variables as before (as in equation (3)). The X'_{it} vector now contains only the canonical variables as mentioned before. The additional term, X'_{it}*D1 denotes interaction of the canonical macro variables with the crisis dummy (D1).

Table 3 presents the estimation results. Only two of the four macroeconomic variables are significant when interacted with the crisis dummy. Financial openness is the only explanatory variable that is found to be consistently significant and negative when interacted with the crisis dummy (*fopen*D1*). The more financially open the economy, the higher is the likelihood for reserves to get depleted when a financial crisis occurs. It is to be noted that the effect of *fopen*D1* is larger in magnitude than the financial openness variable itself. During 'normal' times, an economy prepares against a possible future crisis by accumulating reserves according to its degree of financial openness, among other factors. When the crisis hits, the preparation pays off in the sense that amidst the ensuing financial instability, the economy can fall back upon its stock of international reserves to mitigate the adverse economic conditions.

The *exvol*D1* variable that captures the interaction effect of exchange rate volatility and D1 is the other significant crisis-macro variable. It is significant only in presence of other interaction terms. Its negative coefficient estimate suggests that exchange volatility and financial openness play a similar role in determining the level of international reserves during calm and crisis periods. International reserves are accumulated based on exchange rate volatility during calm periods and are drawn down according to exchange rate volatility during crises.

Inclusion of the crisis-macro variables does not have a significant impact on the Joneses variable itself. The Joneses effect continues to be significantly positive across all specifications. These results are similar to those under Columns (2) and (3) in Table 1. Also the magnitudes of the estimated Joneses effect in Columns (8) and (11) are very similar when compared to those reported in say in Columns (2) and (3) of Table 1.

The crisis-macro interaction terms however, weaken the statistical significance of the crisis-Joneses variable, *JonesesI*D1*. The reserve depletion effect associated with the *JonesesI*D1* interaction term reported in the previous section, could be driven by the economy's own macroeconomic conditions including financial openness and exchange rate volatility. In this case, the *JonesesI*D1* variable by itself only captures the negative association between an economy's level of international reserves and that of its peer group during a crisis period whereas the underlying economic factors are captured by financial openness and exchange rate

volatility. However, the same cannot be said for the Joneses effect, which remain robust to all economic variables included in the regressions.

Thus financial crisis in some sense magnifies the role played by financial openness and exchange rate volatility in explaining the precautionary demand for international reserves. However, the similarity between the adjusted R-squares estimates across Columns (3) to (11) suggests that the contribution of the crisis-macro variable interaction terms in the overall goodness of fit of the models is only marginal.

4.3 Alternative Measure of International Reserves

So far we have normalized international reserves by an economy's GDP to facilitate comparison across economies of different sizes. While this normalization scheme is quite standard in the empirical literature on international reserves, it may understate the role of other economic variable in assessing the adequacy of international reserve holding. For instance, the Greenspan-Guidotti Rule (Greenspan, 1999) recommends that an EME should hold international reserves sufficient to cover one-year amortized value of its short-term external debt. The rationale is that economies should have enough reserves to resist a massive withdrawal of short-term foreign capital.

Thus, normalizing international reserves by short-term external debt would facilitate comparison across our sample of LATAM economies that display varying levels of indebtedness.[14] To assess the robustness of the Joneses effect to an alternative method of normalizing international reserves, we re-estimate the equations of international reserves using the ratio of reserves to short-term external debt as the dependent variable. The estimation results are presented in Table 4 and Table 5.

Table 4 shows results from using the Joneses variable derived from equation (4) based on reserves-debt ratios. Again, we call it the *JonesesI* variable. The Columns (1) to (3) correspond to the regression equations (1) to (3) as before. From Column (4) onwards, we sequentially add the recently advocated group of explanatory variables. The Joneses effect is consistently robust to the alternative specification of the dependent variable. It is positive and statistically significant across all specifications. However its estimated coefficient is now smaller than before (0.055 as

[14] The average short-term external debt over the sample period (1980-2007) of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela are: 10.51%, 5.81%, 4.71%, 8.49%, 5.25%, 10.92%, 5.50%, 11.39%, 10.94% and 8.96% of the respective economies' GDP.

opposed to 0.061 in Table 1). Also, the estimated impact of most of the explanatory variables is now relatively smaller. With the exception of import propensity, exchange rate volatility and political risk, no other variable is found to be significant. The variables overall explain about 20% of the variation in reserves-debt ratios. Thus, compared with results in previous Tables, it is more difficult to explain the variability of international reserves normalized by external short-term debt than by GDP.

In Table (5), the Joneses variable (*JonesesII*) is defined by equation (5) with international reserves now scaled by short-term external debt. As before, the *JonesesII* variable is based on data of Argentina, Brazil and Mexico. In our sample, these three countries are the three largest ones and they also have the highest levels of short-term external debt. Once again, the Joneses effect is found to be positive and significant. When compared to Table 4, impact of the Joneses variable is now higher. This result is consistent with what we had found in Tables 1 and 2 when international reserves were scaled by GDP. Thus, considering the three major economies as the 'Joneses' seems to have a larger impact on reserve holding of the economies in our sample.

Import propensity, political risk and financial openness are once again the only three explanatory variables that come out to be significant. The estimated coefficients of all three variables have the expected signs. It is to be noted that the *polrisk* variable is highly significant and its presence leads to a noticeable increase in the adjusted R-squares measure in all our estimations so far. These findings point to the crucial role played by political instability in explaining reserve accumulation of the LATAM economies.

The common output growth variable (*grrates_pc*) is statistically insignificant in both Table 4 and Table 5. Addition of this variable does not result in a major change in the magnitude of the Joneses effect. The adjusted R-squares estimates also do not exhibit a noticeable change when this variable is added. This finding reinforces the previously established result that the Joneses effect is not attributed to the presence of any common latent dynamics driving the growth of the economies in our sample.

4.4 Recent Developments

Our sample ended right before the current Global Financial Crisis of 2008-09. A natural question to ask is whether the recent developments are in line with our reported results. To this end, we collected data on 2008 and 2009 levels of international reserves for the ten LATAM

countries in our sample. It should be noted that data on some explanatory variables are available only up to 2008 at the time of writing. The on-going nature of the crisis makes it quite tricky to incorporate these extra data points to our empirical analysis. Nonetheless, we could draw some preliminary inferences and leave a more rigorous analysis as future exercise.

Table 6 presents the changes in the reserves to GDP ratios during 2007-2008 and 2008-2009 ($Y_{i,2007\text{-}2008}$ and $Y_{i,2008\text{-}2009}$), and the corresponding changes in the Joneses variables ($J_{i,2006\text{-}2007}$ and $J_{i,2007\text{-}2008}$) of all ten countries. The depletion of international reserves among these countries is not wide spread – only five of ten countries in our sample experienced a decline in their reserves to GDP ratios in 2008 from 2007. Our finding is consistent with the phenomenon of moving from the 'Fear of Floating' to the 'Fear of Losing International Reserves' noted by Aizenman and Sun (2009). The increase in the reserves to GDP ratios of the remaining five countries outweighs the decrease, such that most of the change in the Joneses variables $J_{i,2007\text{-}2008}$ are positive. By 2009 as the impact of the crisis subsided, most of these countries experienced an increase in their reserves to GDP ratios.

The correlations of $Y_{i,2007\text{-}2008}$ and $J_{i,2006\text{-}2007}$ and of $Y_{i,2008\text{-}2009}$ and $J_{i,2007\text{-}2008}$ are, respectively, -0.2668 and -0.1274. The negative correlation is consistent with the negative crisis-dummy effect documented in the previous tables. The reserve accumulation behavior displayed by countries during unstable, crisis situations could potentially be different from stable or normal times. Since these two correlation estimates are based on a relatively small number of observations, we do not focus on their statistical significance. Instead, we note that as these countries were emerging from the current global crisis, the correlation decreases in magnitude from 2008 to 2009. This may suggest that the Joneses effect could have reverted back to being positive when the global economy was recovering from the crisis.

5. Concluding Remarks

The US dollar plays an overarching role in the international financial architecture. Till the emergence of a serious contender, the US dollar will remain the reserve currency of a central bank's war chest to fight against or mitigate the adverse effects of a financial crisis. In this study, we investigate the factors determining the reserve accumulation in Latin American (LATAM) economies between 1980 and 2007. In doing so, we assess the relevance of 'Mrs. Machlup's Wardrobe' hypothesis of demand for international reserves, advocated by Fritz Machlup in the

1960s, and re-introduced by Cheung and Qian (2009). Against the background of the series of financial crises experienced by the LATAM economies in recent decades, we anticipate that, in addition to the standard economic determinants, the competitive hoarding motivation aptly observed by Fritz Machlup, would help explain these economies' demand for international reserves.

The empirical findings of our analysis are in general supportive of the presence of a significantly positive Joneses effect. The competitive hoarding behavior as implied by the empirical Joneses effect is robust to the presence of economic determinants that are commonly considered in the extant literature, control variables that account for region specific and crisis effects, alternative definitions of the Joneses variables, as well as different means to normalize cross-country international reserves.

Thus, the 'peer group' effect on international reserve accumulation is not unique to the East Asian economies explored in Cheung and Qian (2009). In some sense, the Joneses effect revealed in our analysis is stronger than the one in their study. For instance, compared with Cheung and Qian (2009), the Joneses effect found among the LATAM economies survives a more complex method of controlling for the effect of financial crises as well as an alternative normalization of international reserves. The empirical evidence of interdependence of economies' holdings of international reserves thus appears to be quite pervasive.

While our findings are indicative of competitive reserve hoarding behavior, there is little information on the underlying causes of such behavior. In principle, our empirical observation could follow from any mechanism that gives rise to competitive hoarding. In order to shed further light on the precise sources of the observed Joneses effect, additional guidelines are required say from an appropriate theoretical framework.

The empirical Joneses effect points to some interesting policy issues. For instance, it is believed, in general, that holding international reserves incurs a net economic cost. In that case, the competitive hoarding behavior implied by the observed Joneses effect is likely to inflate the cost of holding international reserves for the EMEs. This is because the competitive behavior pushes the demand for international reserves above levels justified by standard economic fundamentals. While the behavior may be a rational one from an individual economy's point of view, it may not necessarily be an optimal scenario for all economies as a group.

If the economies could instead co-ordinate their international reserve accumulation policies and alleviate or even eradicate the (motivations underlying the) competitive behavior, then they could maintain an optimal level of international reserves to smooth out trade and capital account variations instead of competing with their peers. Such a co-operation strategy could bring down individual economies' costs of holding international reserves. The resultant cost saving could have some implications for economic development in these EMEs. Future theoretical and empirical studies on competitive and co-operative hoarding of international reserves would shed light on these issues.

Finally, the global financial crisis of 2008-09 is in many ways a watershed event for not only industrialized but also major emerging economies, in terms of domestic as well as international policy making. It would thus be interesting to investigate the dynamics of the competitive reserve hoarding behavior displayed by the LATAM economies during the current crisis period as well as in the aftermath of the crisis. However, we are constrained by the availability of sufficient data required to perform a rigorous analysis. Hence this is left as a future extension of this topic.

References

Aizenman, J. (2006). International Reserves Management and the Current Account, *NBER Working Paper Series 12734*.

Aizenman, J. (2007). Large Hoarding of International Reserves and the Emerging Global Economic Architecture, *NBER Working Paper Series 13277*.

Aizenman, J., & Marion, N. (2003). The high demand for international reserves in the Far East: What's going on?, *Journal of the Japanese and International Economies 17*, 370-400.

Aizenman, J., & Marion, N. (2004). International reserves holdings with sovereign risk and costly tax collection, *Economic Journal 114*, 569-591.

Aizenman, J., & Lee, J. (2007). International reserves: Precautionary versus mercantilist views, hypothesis and evidence, *Open Economies Review 18,* 191-214.

Aizenman, J., & Riera- Crichton, D. (2008). Real exchange rate and international reserves in the era of growing financial and trade integration, *Review of Economics and Statistics 90:4*, 812-815.

Aizenman, J., & Sun, A. (2009). The Financial Crisis and Sizable International Reserves Depletion: From 'Fear of Floating' to the 'Fear of Losing International Reserves'? *Santa Cruz Institute for International Economics (SCIIE) Working Paper.*

de Beaufort Wijnholds, J. Onno, & Kapteyn, A. (2001). International Reserve Adequacy in Emerging Market Economies*, International Monetary Fund Working Paper 1:143*.

Cheung,Y.W., & Ito, H. (2009). A Cross-Country Empirical Analysis of International Reserves, *International Economic Journal 23*, 447-481.

Cheung,Y.W., Ma G., & McCauley, R.N. (2010). Renminbising China's Foreign Assets, *Cesifo Working Paper 3009*.

Cheung,Y.-W., & Qian, X. (2009). Hoarding of International Reserves: Mrs. Machlup's Wardrobe and the Joneses, *Review of International Economics. 17:4*, 777-801.

Cheung,Y.W., & Wong, Y. C., (2008). Are All Measures of International Reserves Created Equal? An Empirical Comparison of International Reserve Ratios, *Economics: The Open-Access, Open-Assessment E-Journal, 2008:15.*

Chinn, M., & Ito, H. (2008). A New Measure of Financial Openness, *Journal of Comparative Policy Analysis 10:3*, 309-322.

Dooley, M., Folkerts-Landau, D., & Garber, P. (2003). An essay on the revived Bretton Woods system, *NBER Working Paper Series 9971*.

Feldstein, M. (1999). Self-Protection for Emerging Market Economies, *NBER Working Paper Series 6097*.

Fischer, S. (1999). On the Need for an International Lender of Last Resort, *Journal of Economic Perspectives 13:4*, 85-104.

Flood, R., & Marion, P. (2002). Holding international reserves in an era of high capital mobility. In S. Collins & D. Rodrik (Eds.), *Brookings Trade Forum.* Washington, DC: Brookings Institution Press.

Frenkel, J. (1974). The Demand for International Reserves by Developed and Less-Developed Countries, *Economica 41,* 14-24.

Frenkel, J. (1980). International Reserves Under Pegged Exchange Rates and Managed Float: Corrections and Extensions, *Journal of Monetary Economics 6*, 295-302.

Frenkel, J. (1983). International liquidity and monetary control. In G. von Furstenberg (Eds.) *International Money and Credit: The Policy Roles*. Washington, DC: International Monetary Fund.

Frenkel, J., & B. Jovanovic. (1981). Optimal international reserves: A stochastic framework, *Economic Journal 9,* 507-14.

Garcia, P., & C. Soto. (2004). Large Holdings of International Reserves: Are They Worth It? *Central Bank of Chile Working paper 299*. Santiago, Chile.

Greenspan, A. (1999). Currency Reserves and debt, *Remarks made before the World Bank Conference on Recent Trends in International Reserves Management*, Washington, D.C., April 29.

Heller, H.R. (1966). Optimal International Reserves, *Economic Journal 76*, 296-311.

Heller, H.R. (1968). The Transactions Demand for International Means of Payment, *Journal of Political Economy 76,* 141-145.

Jeanne, O., & Ranciere, R. (2006). The Optimal Level of International Reserves for Emerging Market Countries: Formulas and Applications, *International Monetary Fund Working Paper 6:229*.

Kelly, M. G. (1970). The Demand for International Reserves, *American Economic Review 60:4*, 655 - 67.

Machlup, F. (1966). The need for monetary reserves, *Banca Nazionale del Lavoro Quarterly Review 5875*.

Obstfeld, M., Shambaugh, J. C., & Taylor, A. M. (2008). Financial Stability, the Trilemma, and International Reserves, *NBER Working Paper Series 14217*.

Reinhart, C. M., & Rogoff, K. (2004). The modern history of exchange rate arrangements: a reinterpretation, *Quarterly Journal of Economics 119:1,* 1-148.

Rodrik, D. (2006). The social cost of foreign exchange reserves, *International Economic Journal 20-3*, 253-266.

Appendix: Table A: Variable Definitions and Descriptions

Variables	*Definitions*	*Descriptions*
reserves_gdp	International Reserves to GDP ratio	Total Reserves minus Gold over GDP
reserves_debt	Reserves to External Debt Ratio	Total Reserves minus Gold over Debt
mp	Import Propensity	Sum of Imports and Exports over GDP
fopen	Financial Openness	Sum of Absolute Values of Capital Outflows and Inflows over GDP
exvol	Exchange Rate Volatility	Annual Standard Deviation of Monthly Exchange Rates
rvol	International Reserve Volatility	Annual Standard Deviation of Monthly Reserves
oresfuel_gdp	Ratio of ores-metals-fuel exports to GDP	Sum of Ores, Metal and Fuel Exports over GDP
polrisk	Political Risk	Index of Political Risk
M2_gdp	Ratio of M2 to GDP	Ratio of M2 and GDP
grrates_pc	Principal Components (PC) of Growth Rates	PCs of Annual GDP Growth Rates of Ten LATAM Economies

Appendix: Table B: Data Sources

Variable Definitions	*Data Sources*
Total Reserves minus Gold	International Financial Statistics from International Monetary Fund (IFS-IMF)
GDP (Gross Domestic Product)	World Development Indicators from World Bank (WDI)
Short-Term External Debt	World Development Indicators from World Bank (WDI)
Total Exports (c.i.f.)	International Financial Statistics from International Monetary Fund (IFS-IMF)
Total Imports (f.o.b.)	World Development Indicators from World Bank (WDI)
Capital Outflows and Inflows	International Financial Statistics from International Monetary Fund (IFS-IMF)
Monthly Exchange Rates	Global Financial Database
Monthly Reserves	Global Financial Database
Ores-Metals-Fuel Exports	World Development Indicators from World Bank (WDI)
Political Risk Index	International Country Risk Guide (ICRG)
M2 (Broad Money)	World Development Indicators from World Bank (WDI)

Table 1: International Reserves and Joneses Effect

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
mp	0.416***	0.235***	0.218**	0.236**	0.187**	0.155*	0.138*
	(0.078)	(0.089)	(0.088)	(0.095)	(0.085)	(0.081)	(0.079)
fopen	0.114***	0.086***	0.085***	0.080**	0.054*	0.050	0.055*
	(0.036)	(0.031)	(0.031)	(0.031)	(0.030)	(0.031)	(0.030)
exvol	0.003***	0.002**	0.002**	0.002**	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rvol	0.005***	0.003**	0.003***	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
JonesesI		0.061***	0.060***	0.061***	0.035***	0.037***	0.032***
		(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
JonesesI*D1			-.023***	-.024***	-.024***	-.027***	-.026***
			(0.008)	(0.007)	(0.009)	(0.008)	(0.009)
JonesesI*D2			-.033***	-.031***	-.031***	-.032***	-.034***
			(0.009)	(0.009)	(0.008)	(0.007)	(0.007)
oresfuel_gdp				0.004	0.005	0.005*	0.004
				(0.003)	(0.003)	(0.003)	(0.003)
polrisk					0.002***	0.002***	0.002***
					(0.000)	(0.000)	(0.000)
M2_gdp						0.001**	0.001**
						(0.000)	(0.000)
grrates_pc							0.003*
							(0.002)
Constant	-0.005	-0.014	-0.008	-0.018	0.110***	0.100***	0.092***
	(0.014)	(0.014)	(0.014)	(0.018)	(0.023)	(0.021)	(0.021)
Observations	280	280	280	278	278	274	274
Adj. R-sq	0.243	0.301	0.315	0.327	0.434	0.442	0.444

Note: Columns (1) and (2) correspond respectively to equations (1) and (2) while Columns (3) to (7) correspond to equation (3) in the text. The dependent variable is international reserves scaled by GDP of each country. mp is propensity to import, fopen is financial openness, exvol is exchange rate volatility, rvol is international reserve volatility, oresfuel_gdp is the ratio of ores-fuel exports to GDP, polrisk is an index of political risk, M2_gdp is the ratio of M2 to GDP and grrates_pc is the principal component of growth rates of the ten economies in our sample. JonesesI is the Joneses variable defined using equation (4) in the text. JonesesI*D1 and JonesesI*D2 denote interactions of the Joneses variable with two crisis dummies, D1 and D2 respectively. Robust standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 2: International Reserves and Alternative Measure of Joneses Variable

VARIABLES	(2)	(3)	(4)	(5)	(6)	(7)
mp	0.236***	0.217***	0.230***	0.168**	0.143**	0.129*
	(0.076)	(0.075)	(0.084)	(0.074)	(0.071)	(0.072)
fopen	0.076**	0.075**	0.072**	0.047	0.045	0.049
	(0.031)	(0.031)	(0.031)	(0.030)	(0.031)	(0.030)
exvol	0.002**	0.002**	0.002**	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rvol	0.003***	0.003***	0.004***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
JonesesII	0.226***	0.219***	0.222***	0.150***	0.152***	0.139***
	(0.046)	(0.047)	(0.046)	(0.042)	(0.044)	(0.044)
JonesesII*D1		-0.155**	-0.159**	-0.153**	-0.181***	-0.171**
		(0.067)	(0.064)	(0.069)	(0.069)	(0.070)
JonesesII*D2		-0.213***	-0.205***	-0.197***	-0.203***	-0.216***
		(0.059)	(0.059)	(0.047)	(0.043)	(0.044)
oresfuel_gdp			0.002	0.004	0.004	0.003
			(0.003)	(0.003)	(0.003)	(0.003)
polrisk				0.002***	0.002***	0.002***
				(0.000)	(0.000)	(0.000)
M2_gdp					0.001*	0.001**
					(0.000)	(0.000)
grrates_pc						0.002
						(0.002)
Constant	0.002	0.008	0.002	-0.094***	-0.086***	-0.081***
	(0.013)	(0.013)	(0.017)	(0.021)	(0.020)	(0.020)
Observations	280	280	278	278	274	274
Adj. R-sq	0.323	0.335	0.346	0.448	0.454	0.455

Note: Column (2) corresponds to equation (2) whereas Columns (3) to (7) correspond to equation (3) in the text. Columns in this table are comparable to the corresponding columns of Table 1. Dependent variable and explanatory variables are as in Table 1. JonesesII is the Joneses variable defined using equation (5) in the text. JonesesII*D1 and JonesesII*D2 denote interactions of the JonesesII variable with the two crisis dummies, D1 and D2, respectively. Robust standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 3: Joneses Effect in presence of Crisis-Macro Interaction Terms

VARIABLES	(3)	(8)	(9)	(10)	(11)
mp	0.218**	0.217**	0.216**	0.219**	0.219**
	(0.088)	(0.089)	(0.088)	(0.089)	(0.089)
fopen	0.085***	0.085***	0.087***	0.088***	0.088***
	(0.031)	(0.032)	(0.032)	(0.032)	(0.032)
exvol	0.002**	0.002**	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rvol	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
JonesesI	0.060***	0.060***	0.060***	0.061***	0.061***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
JonesesI*D1	-0.023***	-0.030*	0.029	-0.027	-0.029
	(0.008)	(0.017)	(0.023)	(0.027)	(0.050)
JonesesI*D2	-0.033***	-0.033***	-0.032***	-0.032***	-0.032***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
mp*D1		0.029	0.082	0.025	0.058
		(0.103)	(0.091)	(0.070)	(0.112)
fopen*D1			-0.678***	-0.631***	-0.591***
			(0.232)	(0.198)	(0.199)
exvol*D1				-0.277	-0.296*
				(0.170)	(0.170)
rvol*D1					0.005
					(0.008)
Constant	-0.008	-0.008	-0.008	-0.010	-0.010
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Observations	280	280	280	280	280
Adj. R-sq	0.315	0.313	0.317	0.317	0.314

Note: Column (3) corresponds to equation (3) in the text (with only the canonical variables included in the X'it vector). Columns (8) to (11) correspond to equation (6) in the text. Dependent variable and explanatory variables are as in Table 1. JonesesI is the Joneses variables defined using equation (4) in the text. JonesesI*D1 and JonesesI*D2 denote interactions of the JonesesI variable with the two crisis dummies, D1 and D2, respectively. mp*D1, fopen*D1, exvol*D1, and rvol*D1 denote interactions of each of the canonical variables with crisis dummy D1. Robust standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 4: Joneses Effect with Alternative Measure of International Reserves.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
mp	12.946***	8.920***	8.828***	8.089**	6.606**	6.424*	6.225*
	(3.282)	(3.034)	(3.033)	(3.364)	(3.257)	(3.279)	(3.229)
fopen	1.243	0.381	0.366	0.436	-0.120	-0.114	-0.080
	(0.794)	(0.761)	(0.767)	(0.774)	(0.789)	(0.804)	(0.792)
exvol	0.063***	0.035*	0.035*	0.029	0.032*	0.030*	0.033*
	(0.015)	(0.020)	(0.020)	(0.019)	(0.017)	(0.017)	(0.018)
rvol	0.127**	0.064	0.063	0.057	0.062	0.059	0.057
	(0.054)	(0.060)	(0.064)	(0.062)	(0.060)	(0.065)	(0.065)
JonesesI		0.055**	0.056**	0.061***	0.048**	0.050***	0.049**
		(0.022)	(0.022)	(0.021)	(0.020)	(0.019)	(0.019)
JonesesI*D1			-0.026	-0.026	-0.025	-0.025	-0.023
			(0.025)	(0.024)	(0.023)	(0.022)	(0.023)
JonesesI*D2			0.009	0.006	0.001	0.001	-0.001
			(0.038)	(0.039)	(0.037)	(0.036)	(0.036)
oresfuel_gdp				-0.085	-0.055	-0.059	-0.064
				(0.138)	(0.140)	(0.143)	(0.143)
polrisk					0.039***	0.039***	0.038***
					(0.007)	(0.010)	(0.010)
M2_gdp						0.001	0.002
						(0.014)	(0.014)
grrates_pc							0.029
							(0.072)
Constant	-1.302**	-0.991*	-0.967*	-0.763	-2.717***	-2.711***	-2.642***
	(0.587)	(0.545)	(0.541)	(0.732)	(0.736)	(0.724)	(0.700)
Observations	280	280	280	278	278	274	274
Adj. R-sq	0.151	0.175	0.171	0.171	0.205	0.203	0.200

Note: Columns (1) and (2) correspond respectively to equations (1) and (2) in the text whereas Columns (3) to (7) correspond to equation (3) in text. The dependent variable here is the ratio of international reserves to short term external debt of each country. Explanatory variables are as in Table 1. JonesesI is the Joneses variable defined using equation (4) in the text except in this case reserves of each country has been scaled by corresponding external debt amount. JonesesI*D1 and JonesesI*D2 denote interactions of the Joneses variable with two crisis dummies, D1 and D2, respectively. Robust standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 5: Joneses Effect with Alternative Measures of International Reserves and Joneses variable.

VARIABLES	(2)	(3)	(4)	(5)	(6)	(7)
mp	9.470***	9.662***	8.561***	6.566**	6.388**	6.611**
	(2.941)	(2.895)	(3.215)	(3.112)	(3.172)	(3.139)
fopen	0.434	0.423	0.494	-0.172	-0.168	-0.222
	(0.822)	(0.800)	(0.810)	(0.838)	(0.856)	(0.866)
exvol	0.066***	0.067***	0.063***	0.059***	0.058***	0.055***
	(0.017)	(0.018)	(0.018)	(0.016)	(0.016)	(0.017)
rvol	0.075	0.071	0.063	0.059	0.056	0.058
	(0.061)	(0.062)	(0.060)	(0.058)	(0.064)	(0.063)
JonesesII	0.105**	0.105*	0.123**	0.108**	0.109**	0.113**
	(0.053)	(0.054)	(0.052)	(0.051)	(0.048)	(0.050)
JonesesII*D1		-0.237	-0.222	-0.223	-0.227	-0.231
		(0.215)	(0.199)	(0.178)	(0.176)	(0.173)
JonesesII*D2		0.235	0.204	0.205	0.201	0.216
		(0.369)	(0.364)	(0.347)	(0.339)	(0.344)
oresfuel_gdp			-0.120	-0.089	-0.091	-0.087
			(0.129)	(0.130)	(0.133)	(0.134)
polrisk				0.041***	0.040***	0.041***
				(0.007)	(0.010)	(0.010)
M2_gdp					0.002	0.000
					(0.013)	(0.012)
grrates_pc						-0.039
						(0.075)
Constant	-0.837	-0.871*	-0.538	-2.562***	-2.541***	-2.622***
	(0.523)	(0.503)	(0.670)	(0.675)	(0.682)	(0.670)
Observations	280	280	278	278	274	274
Adj. R-sq	0.178	0.179	0.181	0.220	0.217	0.215

Note: Columns (1) and (2) correspond respectively to equations (1) and (2) in the text while Columns (3) to (7) correspond to equation (3) in text. The dependent variable here is the ratio of international reserves to short term external debt of each country. Explanatory variables are as in Table 1. JonesesII is the Joneses variable defined using equation (5) in the text except in this case reserves of each country has been scaled by the corresponding external debt amount. JonesesII*D1 and JonesesII*D2 denote interactions of the JonesesII variable with the two crisis dummies, D1 and D2, respectively. Robust standard errors are in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 6: International Reserves and Joneses Effect during the 2008-09 Global Financial Crisis

COUNTRIES	$Y_{i,\ 2007\text{-}2008}$	$J_{i,2006\text{-}2007}$	$Y_{i,\ 2008\text{-}2009}$	$J_{i,2007\text{-}2008}$
Argentina	-0.034	0.218	0.012	0.094
Bolivia	0.068	0.125	0.015	-0.008
Brazil	-0.014	0.187	0.028	0.075
Chile	0.033	0.274	0.020	0.027
Colombia	-0.004	0.238	0.012	0.064
Ecuador	0.005	0.217	-0.018	0.056
Peru	0.002	0.239	0.026	0.058
Mexico	-0.016	0.175	0.018	0.076
Uruguay	0.020	0.226	0.057	0.041
Venezuela	-0.001	0.298	-0.041	0.061
	Correlation	-0.2668	Correlation	-0.1274

Note: $Y_{i,\ 2007\text{-}2008}$ ($Y_{i,\ 2008\text{-}2009}$) is the change in the reserves to GDP ratio of country i between 2007 and 2008 (2008 and 2009). $J_{i,\ 2006\text{-}2007}$ ($J_{i,\ 2007\text{-}2008}$) is the change in the reserves to GDP ratio of the 'Joneses' of country i between 2006 and 2007 (2007 and 2008). The last row shows the correlation between the change in the reserves to GDP ratio of a country and that of its Joneses, during the years of the crisis.