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**Crisis and Consumption Smoothing**

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Pushan DUTT  
V. Paddy PADMANABHAN  
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# **Crisis and Consumption Smoothing**

May 2009

by

Dutt Pushan\*

and

V. Padmanabhan\*\*

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\*\* Assistant Professor of Economics, 1 Ayer Rajah Avenue, INSEAD, Singapore 138676 Email:  
[Pushan.Dutt@insead.edu](mailto:Pushan.Dutt@insead.edu) Ph: + 65 6799 5498

\*\*\* John H. Loudon Chaired Professor of Marketing, 1 Ayer Rajah Avenue, INSEAD, Singapore 138676  
Email: [paddy.padmanabhan@insead.edu](mailto:paddy.padmanabhan@insead.edu) Ph: + 65 6799 5335

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# Crisis and Consumption Smoothing

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## Abstract

The dramatic impact of the current crisis on performance of businesses across sectors and economies have been headlining the business press for the past many months. Interestingly, the impact of the crisis across categories of goods/services and across economies reveals several interesting patterns. Extant reconciliations of these patterns in the popular press rely on ad-hoc reasoning. Using historical data on currency crisis episodes across the world, this paper shows that the observed patterns in the impact of a crisis across classes of goods and economies are a consequence of active smoothing of consumption expenditures by consumers.

The results reveal that consumer behavior in a crisis is characterized by consumption smoothing at various levels – inter-temporal, inter-category and intra-category. In sum, these behavioral adjustments result in significant reallocation of consumption expenditures. More importantly, the smoothing decisions due to a crisis are distinct and independent of the impact of changes in income and prices that accompany a crisis. Interestingly, there is marked variation in the patterns of consumption smoothing across different types of economies. Taken together, these results have important and interesting implications for managers, policy makers and academics.

*JEL Classification:* F31; M31; M38; F34

*Key Words:* Currency Crisis, Consumption Smoothing, Consumer Expenditure, Category Shares.

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## 1 Introduction

What started as a problem in the mortgage industry in the United States has morphed into a crisis that has engulfed the globe. An examination of recent newspaper headlines shows that the impact of the crisis on businesses exhibits several interesting patterns. For instance, the roll call of firms reporting severe contractions in their business is as long as it is illustrious (American Express, Cargill, De Beers, General Electric, Maersk, Nokia, Procter & Gamble, Singapore Airlines, Toyota, etc.). Yet, there are several others reporting mild or no impact of the crisis on their business (Bharati, China Mobile, McDonalds, Syngenta, Walmart, etc.). Similarly, the impact of the crisis on a category seems to vary markedly across the world. For instance, the telecommunication handheld devices market reported sales contractions that ranged from -19% in N. America, -42% in Latin America, -27% in EMEA (Europe, Middle East and Africa) to +6% in Asia-Pacific ex-China (J. P. Morgan Equity Research, 17 April, 2009). In contrast, the pharmaceutical sector reported 1.4% growth in N. America, 15.3% growth in Asia-Pacific & Africa and 5% growth in Europe (Shinhan Securities, May 21, 2009).

There are several rationales advanced in the popular press for the observed patterns on the impact of the crisis on a firm. The variation in impact of a crisis across different categories is commonly attributed to the role of the category – necessity versus discretionary. Items such as food are considered necessities and hence less severely impacted relative to discretionary items such as durables (automobiles) or luxuries. Yet, there is no formal classification of what is a necessity versus discretionary and how this applies in the context of a crisis. The reconciliation of variation in impact across geography is also ad-hoc and sometimes contradictory. Here it is argued that the patterns could be a consequence of growth and development, (i.e., lower impact of a crisis on emerging markets such as China, India - the decoupling hypothesis), dependence of the economy on exports relative to domestic demand (i.e., greater impact on China, Singapore,

etc., due to their high dependence on exports relative to domestic consumption), extent of debt (i.e., more indebted implying greater impact in Eastern European countries) and so on. In short, there is an abundance of ad-hoc explanations for the observed patterns of impact of the crisis but a serious lack of careful and systematic analysis.

This research analyzes crisis episodes over the past decades and establishes a series of stylized facts about the impact of a crisis. In particular, it shows that the impact of a crisis and its variance across different categories and classes of economies is a consequence of active smoothing of consumption expenditures by consumers in response to a crisis. In other words, it is the consumer's decisions on how much to spend and the allocation of this expenditures across their consumption basket following a crisis that underpins the observed patterns of impact of a crisis on business. The key message of the paper is that decision makers seeking to obtain a proper assessment of the impact of the crisis on their business need to start by understanding the impact of a crisis on their consumer's behaviors. This is also consistent with the recent editorial observations of Bradlow (2009) that the crisis represents a real opportunity for marketing academia to contribute to a better understanding of the impact of a crisis.

As a first step, it is useful to define what is meant by a crisis. Economic crisis may be broadly classified as banking crisis and/or currency crisis. In the former, the country's financial sector experiences a large number of defaults, bank runs increase in frequency, and we observe massive liquidity support for banks and bailout packages. A currency crisis, on the other hand, entails a sharp correction in the exchange rate of a country. Currency crises are easier to measure and identify since data on exchange rates are widely available. Banking crises, on the other hand, require much more detailed data on bank runs, bank closures, and bailouts. Assembling data for a comprehensive set of countries over time is non-trivial, a task which is further complicated by the fact that identifying a banking crisis involves subjective assessments. In this paper, therefore

we focus on currency crisis.<sup>1</sup>

Consumer's response to a crisis could manifest itself in several different ways.

- At an aggregate level, consumers could respond to a crisis by changing how much they spend (i.e., altering the size of their wallet). We use aggregate indicators of consumption such as per capita consumption expenditure and per capita retail sales to show precisely how consumers smooth their aggregate consumption expenditures over time in the event of a crisis.
- Consumers can also respond to a crisis by altering the composition of their consumption expenditures (i.e., altering the share of wallet allocated to different classes of goods and services). We show using a four fold classification of consumer expenditures (spending on durable goods, non-durable goods, semi-durable goods and services) that consumer behavior in a crisis is characterized by rich patterns of consumption smoothing across the four different categories of consumption. More importantly, it is the patterns of consumption smoothing that reveals what categories are considered as necessities versus discretionary by consumers in times of crisis.
- Finally, consumers could also engage in intra-category consumption smoothing by reallocating expenditures across the different sub-categories within each of the four different categories. We show using disaggregate sub-category expenditures that consumers engage in significant consumption smoothing within each of the four classes of goods and services. In summary, by examining consumption smoothing at various levels of analysis - inter-temporal, inter-category and intra-category - we highlight the rich patterns of consumption smoothing that characterize consumer behavior in a crisis.

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<sup>1</sup> Reinhart and Rogoff (2009) find that 26% of all banking crisis are also currency crisis - termed twin crisis.

- Interestingly, there is marked variation in the patterns of consumption smoothing across developed and developing economies.

Taken together, these results establish a series of stylized facts about the impact of a crisis which have important and interesting implications for managers, policy makers and academics. The rest of the paper is organized as follows. Section 2 provides a brief review of the related economics and marketing literature. Section 3 provides a formal definition of a crisis. Section 4 details the impact of a crisis on aggregate consumption indicators. Section 5 uses a four fold classification of consumption to illuminate the patterns of consumption smoothing across categories. Section 6 analyzes intra-category consumption smoothing. Section 7 highlights the implications of these findings and concludes with some suggestions for future research.

## 2 Related Literature

The empirical work on currency crisis can be broadly classified into three categories. First, are papers that simply establish a set of stylized facts by examining how various macroeconomic variables behaved prior to and immediately following a crisis (Hutchison and Noy, 2005; Bordo et al 2001; Eichengreen et al, 1996). Second, some papers estimate the probability of a currency crisis (in terms of a large devaluation) as a function of various macroeconomic indicators (Frankel and Rose, 1996; Sachs, Tornell and Velasco, 1996). A third set of papers use a non-parametric approach to evaluate the usefulness of several variables in signaling an impending crisis (Kaminsky et al, 1998). The focus of this empirical literature has been on broad macroeconomic aggregates such as GDP, current account, and GDP growth. Surprisingly, it is silent on the impact of a crisis on consumption expenditure and more disaggregate variables such as retail and category sales. The lack of research on the impact of a crisis on consumption expenditure is puzzling since consumption expenditure is by far the biggest component of GDP and the fall in

consumption expenditure has direct welfare implications. Theoretically, it may be argued that a crisis is a temporary event, and has no impact on consumption expenditures. This follows from the permanent income hypothesis theory of consumption (Friedman, 1957) according to which forward looking consumers base their consumption decisions on the expected discounted value of lifetime resources or their permanent income, and not on current income. Only changes to permanent income triggers changes in consumption. However, this is inconsistent with our data which shows marked shifts in consumer expenditures following a crisis.

Within economics, researchers have also documented the impact of a particular crisis on consumption patterns within a country. Frankenberg et al. (1999) for instance find substantial reallocation of expenditure towards food staples such as rice during the Indonesian crisis. McKenzie (2006) uses Mexican household income and expenditure surveys to investigate changes in consumption for the Mexico peso crisis of 1994. Kang and Sawada (2008) show that Korean households coped with negative shocks of the 1997 Asian crisis by reducing consumption of luxury items. However, all these are country case studies focusing on one country and a single crisis episode. Our paper complements this literature by highlighting consistent patterns in the impact of a crisis on consumption behavior of consumers for a large sample of countries over multiple crisis episodes. Further, it analyzes aggregate consumption expenditure as well as category-level consumption expenditures.

Researchers in marketing have studied the marketing implications of a crisis. For instance, Rubel, Naik and Srinivasan (2007), Van Heerde, Helsen and Dekimpe (2007) and Klein and Dawar (2004) have focused on the implications of product-harm crisis. Pennings, Wansink and Meulenberg (2002) have focused on the implications of the mad-cow crisis. However, we have not been able to uncover any work that focuses on the marketing implications of a economic crisis. The closest work in spirit is the literature in marketing on the impact of business cycles. Deleer-

synder et al (2004) show that consumer durables are more sensitive to business cycle fluctuations than general economic indicators. Additionally, they find that sales fall more quickly during contractions whereas they adjust upwards more slowly during expansions. Lamey, et al (2007) examine the impact of business cycles on private labels (a fast moving consumer good versus the consumer durable context of their earlier work) and report largely similar results. Deleersnyder et al (2009) show that advertising expenditures are more sensitive to business cycle fluctuations than the economy as a whole and highlight the variations in sensitivity across different media. Further, they show that cultural and economic considerations play an important role in moderating advertising's sensitivity to the business cycle. Our focus in this paper is on economic crisis and not business cycles. Economic crisis impacts the periodicity of the business cycle and in that sense there is a relation to this stream of work. Additionally, our work is very different in terms of its focus on both developed and developing countries (amongst whom, the latter have experienced the majority of crisis episodes).

### **3 Currency Crisis: Definition and Measurement**

A canonical currency crisis is one where investors flee a currency (sell the local currency in exchange for safer currencies such as US dollars or Euros) because they expect it to be devalued, and much of the pressure on the currency comes precisely because of this lack of confidence. This sort of circular logic is the defining feature of a currency crisis. While this is the broad and general feature of a currency crisis, it can manifest itself in various ways - a sharp depreciation of the exchange rate, a depletion of foreign exchange reserves, an increase in interest rates to shore up the currency, etc.

For purposes of this paper, we draw on the commonly accepted definition of currency crisis (Frankel and Rose, 1996; Hong and Tornell, 2005) - a country is said to experience a currency

crisis if there is:<sup>2</sup>

- at least a 20% nominal depreciation of its currency, and,<sup>3</sup>
- there is also at least a 10% increase in the rate of depreciation of the exchange rate.

Currency depreciation refers to change in the natural logarithm of the nominal bilateral dollar exchange rate (multiplied by 100) and all changes are expressed in annual rates of change. Since many countries, such as Argentina in the 1980s experienced changes in the exchange rate of 20 per cent or more – year after year, we also require that the change in the exchange rate, not only exceed 20 per cent, but exceed the previous year’s change in the exchange rate by a margin of at least 10 per cent. This is a conservative specification and avoids counting the same crisis event multiple times.

We use data on exchange rates from International Financial Statistics to construct a dummy variable which takes the value one in the year of the crisis. Our data spans 99 countries over the period 1960-2003. Using the above definition of currency crisis, we obtain 273 episodes of currency crisis which is about 6.4% of the entire sample (see Figure 1). More importantly, 87 of these 99 countries have experienced at least one crisis testifying to the ubiquitous nature of currency crisis.<sup>4</sup>

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<sup>2</sup> Eichengreen et. al. (1996) define a currency crisis to include both the large depreciations that we consider here, and also speculative attacks that are successfully warded off by the authorities. Unfortunately, unsuccessful speculative attack are difficult to identify even ex-post and they use sharp falls in foreign exchange reserves and/or increases in interest rates to do this. Moreover, the majority of currency crises have historically been in developing countries where sparse data on interest rates and foreign exchange reserves makes it difficult to identify successful defense against speculative attacks using these variables. Finally, reserve movements are notoriously noisy measures of exchange market intervention for almost all countries.

<sup>3</sup> Frankel and Rose (1996) use a 25% nominal depreciation of currency to identify a crisis. However, some of the ERM crisis countries such as Italy, Finland and Spain exhibit nominal depreciation of greater than 20% but less than 25%. Our cutoff of 20% allows us to include these countries in our sample of countries experiencing a crisis. We also experimented with cutoffs of 15, 25 and 30%. The results remain qualitatively unaffected.

<sup>4</sup> Table-A in the Appendix lists the variables, summary statistics and the data sources used.

## 4 Inter-temporal consumption smoothing

As mentioned in the introduction, one of the ways consumers could respond to a crisis is by changing how much they spend (i.e., changing the size of the wallet). We focus in this section on analyzing the impact of a crisis (both the magnitude and the duration of impact) on aggregate consumer expenditure and document patterns of inter-temporal consumption smoothing. We use two methodologies to do this: (1) the Arellano-Bond GMM estimator and (2) the Pesaran-Smith Mean-Group and Pooled-Mean-Group Estimator.

### 4.1 Arellano-Bond GMM estimation

We follow Davidson et al. (1978) and Haque and Montiel (1989) in our specification of aggregate consumption function, where we estimate per capita consumption expenditure as a function of lagged per capita consumption, per capita income, and the inflation rate. The permanent income hypothesis implies that consumption should evolve over time as a martingale (Hall, 1978). While the literature rejects this contention (see Campbell and Mankiw 1990), it is plausible that per capita consumption expenditure depends on its past values.<sup>5</sup> Therefore, we estimate a consumption function where we include lagged values of per capita consumption as regressors. GMM estimates suggest that only one lag of the dependent variable should be included. Therefore, we estimate the following dynamic specification:

$$C_{it} = \alpha C_{it-1} + \beta y_{it} + \gamma \pi_{it} + \delta_0 crisis_{it} + \dots + \delta_k crisis_{it-k} + (\eta_i + \tau t + v_{it}); \quad i = 1, \dots, N; \quad t = 2, \dots, T \quad (1)$$

where  $C_{it}$  is per capita consumption in country  $i$  at time  $t$ ;  $C_{it-1}$  is lagged per capita consumption in country  $i$ ;  $crisis_{it-k}$  is the crisis dummy at lag  $k$ ;  $\eta_i$  is a time invariant country-specific effect;  $t$  is a common trend component,  $y$  is per capita income and  $\pi$  denotes inflation, and  $v_{it}$  is the error

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<sup>5</sup> Theories of habit-persistence in consumption for example, can also generate such lagged dependence. See Fuhrer (2000).

term.<sup>6</sup> The country dummies should control for unobserved and time-invariant country-specific effects while the time trend should capture global trends in per capita consumption. All crisis lags that were significant and resulted in improvement of model fit are included - in general no lags higher than three years ( $k = 3$ ) turn out to be significant.

It is widely recognized that per capita GDP contracts following a crisis (Bordo et al, 2001). However, it is unclear whether the impact of a crisis on per capita consumption expenditure exceeds the impact on per capita GDP or whether it falls short. If we think of a crisis as a transitory shock and believe in the permanent income hypothesis then consumption smoothing would dictate a *rising* share of consumption in GDP in the year of the crisis. On the other hand, if a crisis leads to a rise in uncertainty, consumers may react by reducing consumption by more than income and increasing savings as a fraction of income. This behavior is best explained by a precautionary motive for saving. A necessary (but not sufficient) condition for consumption to fall by more than income in the year of the crisis is that we obtain a negative and significant coefficient on the contemporaneous crisis dummy. Hence,  $\delta_0 > 0$  would indicate inter-temporal consumption smoothing with consumers drawing down on savings in the crisis period. Similarly,  $\delta_1, \delta_2, \delta_3 > 0$  would capture persistence of consumption-smoothing one, two and three years after the crisis. However, if these  $\delta'$ s are negative this would indicate that a crisis potentially leads to a decline in consumption over and above that dictated by income.<sup>7</sup> Finally, the inflation variable is a proxy for various wealth effects, and we would expect its coefficient to be negative (Hendry, 1974).

In the presence of lagged dependent variables as regressors, the fixed-effects estimator is

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<sup>6</sup> Measurement error in per capita consumption is a serious concern with the presence of the lagged dependent variables on the right hand side. However, if this error is driven by country-specific specific characteristics and vary little over time, they will be subsumed within the country specific effect  $\eta_i$ .

<sup>7</sup> We could obtain the same result by using consumption as a share of income as the dependent variable. Note that this is equivalent to estimating (1) while constraining the coefficient on income,  $\beta = 1$ . However, (1) is a more general specification, and in fact we can test whether  $\beta$  is indeed equal to one.

consistent only in panels where  $T$  is large - the transformed lagged dependent variables are correlated with the transformed error term but this correlation goes to zero as  $T$  gets large. While  $T \geq 30$  for all countries when we use per capita consumption, this correlation should vanish and the fixed-effects estimator is likely to be consistent. However, we choose to be conservative and employ the generalized method of moments (GMM) procedure developed by Arellano and Bond (1991) to generate consistent estimates of the parameters of interest and their asymptotic variance-covariance. Estimation proceeds by first differencing the data - this eliminates the country-specific effects  $\eta_i$  from the model - and instrumenting the lagged dependent variable by appropriately lagged levels of  $C_{it}$ . The instruments are based on the following moment conditions:

$$E [C_{it-s} \Delta v_{it}] = 0 \text{ for } s \geq 2; t = 3, 4, \dots T$$

Another advantage of the Arellano-Bond technique is that it allows us to treat income and inflation as endogenous variables. We adopt a more conservative specification and assume that the inflation rate and income are endogenous in the sense that  $y_{it}$  and  $\pi_{it}$  are correlated with  $v_{it}$  and earlier shocks but uncorrelated with  $v_{it+1}$  and subsequent shocks. Thus lagged values of  $y_{it}$  and  $\pi_{it}$ , lagged two periods or more, are available as instruments.<sup>8</sup> Finally, to control for heteroskedasticity we report results using the two-step GMM estimator and employ a finite-sample correction to the two-step covariance matrix.

To estimate (1), we use aggregate country-level data on per capita consumption expenditures from the World Development Indicators (World Bank) over the period 1960-2003. Data on per capita income are from Penn World Tables. For all countries, per capital consumption and income are converted to constant 2000 US dollars on a purchasing power parity (PPP) basis.<sup>9</sup> Finally,

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<sup>8</sup> Arellano (2003) shows that when  $T$  is large it leads to an overfitting bias caused by instrument proliferation in dynamic panels. To mitigate this concern, we use only three lags as instruments in the moment conditions.

<sup>9</sup> Purchasing power parity conversion factor is the number of units of a country's currency required to buy the

inflation is measured using the consumer price index, with the data derived from the World Development Indicators.

#### 4.1.1 Results

We divide our sample into OECD and non-OECD countries to examine if there is variance in the magnitude and length of impact of the crisis across developed and developing countries.<sup>10</sup> Column 1 in Table 1 presents the Arellano-Bond GMM estimates for the OECD sample, where we regress per capita consumption expenditure on lagged consumption, the contemporaneous crisis dummy, as well as three lags of the crisis dummy. We see that the crisis dummies at lags 0, 1 and 3 significantly reduce per capita consumption expenditure. Our results suggest that on average, the impact of a currency crisis lasts at least four years - there is an immediate and significant contemporaneous decline in consumption expenditure, and the impact lasts three years into the future. In terms of magnitude of the effects, the results in Column 1 of Table 2 imply that a crisis event reduces per capita consumption expenditure by about 3.7% in the year of the crisis, by 2.9% one year later, by 0.3% two years later, and by 1.2% three years later. Column 2 adds income and inflation as additional regressors instrumenting these with lagged income and inflation. Now, none of the crisis dummies are statistically significant. Therefore, for OECD countries, the decline in per capita consumption expenditure can simply be linked to a decline in per capita GDP in response to the crisis. There is no independent impact of the crisis itself beyond its impact on income.

For non-OECD countries, Column 1 shows that the crisis reduces consumption the year of the crisis and two years following the crisis. Now, even when we add income and inflation in same amount of goods and services in the domestic market as a U.S. dollar would buy in the United States. It assumes a constant real exchange rate, which facilitates comparisons across countries and over time.

<sup>10</sup> Originally the OECD members consisted of only rich countries. However, over time, it added middle income and developing countries such as Mexico, Poland, Korea. Since we are interested in distinguishing the crisis impact along the developed/developing country dimension, we restrict the OECD sample to the 24 countries who joined the OECD prior to 1973. Mexico, Korea, Poland, Hungary, Slovakia and Czech Republic, all of whom joined the OECD in the 1990s are classified as non-OECD.

Column 2, the crisis dummies at lags 0, 1 and 2 remain negative and significant so that there is an independent impact of the crisis over and above the induced impact through income. Moreover, the effect persists for a period of three years. Our estimates imply that if income declines by more than 4.31% in the year of the crisis we would observe a rising share of consumption in income, indicating consumption smoothing. However, if income declines by less than 4.31% then consumption declines by more than income and is evidence for precautionary savings behavior on part of consumers.<sup>11</sup> Out of the 235 crisis episodes in Column 4, in only 44 was the decline in income greater than 4.31% whereas in 191 countries the decline in income in the year of the crisis was less than 4.31%. Therefore for the vast majority of non-OECD countries (81%) we observe a decline in consumption greater than the decline in income. For them, our estimates suggest that a precautionary motive for saving manifests itself during crisis periods and consumers cut back on consumption out of current income. This is not surprising since financial and credit markets that facilitate consumption smoothing are less developed in these countries, and consumers react to a crisis by saving more out of current income. By contrast, there is no evidence for such a precautionary motive in OECD countries.<sup>12</sup>

The GMM estimator is consistent provided the error term  $v_{it}$  is not serially correlated and provided the lagged values of the explanatory variables are valid instruments. To evaluate this, we perform two specification tests suggested by Arellano and Bond (1991). The first examines serial correlation in the error term. It tests whether the differenced error term (the residuals from the regression in differences) is second-order serially correlated. First-order serial correlation of the differenced error term is expected even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk. Second-order serial correlation of the differenced residual indi-

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<sup>11</sup> The critical value of 4.31% is calculated as  $\frac{\delta_0}{(1-\beta)}$

<sup>12</sup> We get similar results if we regress consumption as a share of GDP on the crisis dummies. The crisis dummy at lags 0, 1 and 2 are significant in non-OECD countries while none of the dummies are significant in OECD countries. Note that this is equivalent to estimating (1) and restricting  $\beta = 1$ .

cates that the original error term is serially correlated, which means that the moment conditions are invalid. The second specification test is a Hansen test of over-identifying restrictions, which tests the null hypothesis of overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process ( $p$ -values for these tests are reported in the last three rows of table with the Arellano-Bond specification). The last three rows in Table 1 show that our results are supported by the specification tests - our instruments are valid and there is no evidence for serial correlation in  $v_{it}$ .

## 4.2 Pesaran-Smith Mean-Group and Pooled-Mean-Group Estimator

The Arellano-Bond GMM methodology pools countries together and allows only the intercepts ( $\eta_i$ ) to differ across the groups. Philips and Moon (2000) argue that in panel data the assumption of homogeneity of slope parameters is often inappropriate. Moreover, in dynamic panels with large  $T$ , nonstationarity is also a concern. In the presence of nonstationarity the estimated coefficients on the nonstationary variables are consistent, but the standard errors are incorrect rendering inferences invalid. Despite this our inferences with respect to  $\delta$  are *not* affected since the crisis variables are coded as dummies which are stationary.

Pesaran and Smith (1995) and Pesaran, Shin, and Smith (1999) present two new techniques to estimate nonstationarity dynamic panels in which the coefficients are heterogeneous across groups: the mean-group (MG) and pooled mean-group (PMG) estimators. The MG estimator runs separate regressions for each country, averages the coefficients and produces consistent estimates of the averages of the coefficients. The PMG estimator based on maximum-likelihood relies on a combination of pooling and averaging of coefficients. It allows us to estimate both a short-run consumption function which captures the dynamics of adjustment to a crisis and a long-run consumption function with consumption as a function of income and the inflation rate.<sup>13</sup>

The PMG estimator allows the intercepts, the short-run coefficients and the error variances to vary freely across groups (thus capturing cross-sectional heterogeneity) while constraining the long-run coefficients to be the same across groups. This pooling of long-run coefficients across countries yields efficient and consistent estimates when the restrictions are true. If the true model is heterogeneous, the PMG estimates are inconsistent; the MG estimates are consistent in either case. A Hausman test allows us to compare the coefficient estimates of the MG and PMG estimators.

We use an auto-regressive distributed lag model for consumption as

$$C_{it} = \alpha_i C_{it-1} + \beta_{0i} y_{it} + \beta_{1i} y_{it-1} + \gamma_{0i} \pi_{it} + \gamma_{1i} \pi_{it-1} + \delta_0 crisis_{it} + \dots + \delta_k crisis_{it-k} + \eta_i + \tau t + v_{it} \quad (2)$$

Setting  $C_{it} = C_{it-1}$ ;  $y_{it} = y_{it-1}$ ;  $\pi_{it} = \pi_{it-1}$ ;  $crisis_{it-k} = 0$  for all  $k$  we obtain a long-run consumption function as

$$C_{it} = \theta_{0i} + \theta_{1i} y_{it} + \theta_{2i} \pi_{it} + \tau^* t + u_{it} \quad (3)$$

If all variables are integrated of order 1, then  $u_{it}$  is an  $I(0)$  process for all  $i$ .<sup>14</sup> The error correction reparameterization of (2) is

$$\Delta C_{it} = \phi_i (C_{it-1} - \theta_{0i} - \theta_{1i} y_{it} - \theta_{2i} \pi_{it} - \tau^* t) - \beta_{1i} \Delta y_{it} - \gamma_{1i} \Delta \pi_{it} + \delta_0 \Delta crisis_{it} + \dots + \delta_k \Delta crisis_{it-k} + v_{it} \quad (4)$$

$\phi_i = -(1 - \alpha_i)$  is the error-correction speed of adjustment parameter and we expect it to be negative if the variables exhibit a return to long-run equilibrium. The long-run coefficients are  $\theta_{1i} = \frac{\beta_{0i} + \beta_{1i}}{(1 - \alpha_i)}$  and  $\theta_{2i} = \frac{\gamma_{0i} + \gamma_{1i}}{(1 - \alpha_i)}$  and the  $\delta$  coefficients are again of primary interest, capturing the

<sup>13</sup> Of course, the long-run consumption expenditure will not be a function of the crisis since a crisis is by definition a temporary event. In the long-run steady-state the crisis dummy will take a value of 0.

<sup>14</sup> We use the Im-Pesaran-Shin (IPS) panel unit root test, assuming individual effects and trends, to determine whether these three variables are cointegrated. Specifically, IPS panel unit root tests like those above are conducted on the residuals from regression (3). We reject the unit root in the residuals at the 1% level, supporting a hypothesis of cointegration. However, a Levin-Lin-Chu panel-stationary test rejects the null that the three variables are integrated of order 1.

short-run response of consumption to a crisis.

#### 4.2.1 Results

Table 2 presents estimates of (4). The top-panel (labeled long-run) gives estimates of the long-run coefficients  $\theta_{1i}$  and  $\theta_{2i}$  while the bottom panel (labeled short-run) presents estimates of the short-run coefficients on the crisis-dummies as well as on income and inflation.

Columns 1 and 2 show the MG and PMG estimates for the OECD countries. In Column 1, the Mean-Group estimator for OECD countries shows that none of the crisis dummies are significant. Column 2 shows the Pooled Mean Group estimator which imposes homogeneity on the long-run coefficients. This estimator also fails to find a significant coefficient on any of the crisis dummies. Comparing the two estimators for OECD countries, we see that the PMG estimator reduces the standard-errors of the long-run coefficients but does not affect the estimates much. This is confirmed by an insignificant Hausman test statistic of 2.62 which is  $\chi^2(2)$  under the null hypothesis of no difference between the MG and PMG estimators. Therefore, as was the case for the Arellano-Bond estimates, in OECD countries the decline in per capita consumption expenditure can simply be linked to a decline in per capita income in response to the crisis and there is no effect of a crisis on consumption over and above its effect on income.

Columns 3 and 4 present the estimates for non-OECD countries. Here the currency crisis dummy is again significant at lags 0, 1, and 2. Similar to the findings in Table 1, in non-OECD countries, a currency crisis results in a decline in consumption over and above that induced by income in 192 out of the 235 crisis episodes. Moreover, the effect persists for three years - the year of the crisis and two more years thereafter. A Hausman test statistic of 1.44 again indicates no significant difference between the MG and PMG estimators. When compared to the estimates in Column 4 of Table 1, the estimates for the contemporaneous effect of the crisis declines somewhat while that for the lagged crisis dummies remain unaffected in terms of magnitude. Even then,

the PMG and MG estimates of the coefficient on the contemporaneous crisis dummy are not significantly different from the Arellano-Bond specification in Table 1.

Table 2 also reports the estimate of the error-correction adjustment parameters  $\phi_i$  which are averaged across the countries. The parameter equals -0.3 for the MG estimator for both samples and equals -0.2 for the PMG estimator. In every case  $\phi_i$  is significantly different from zero. If the panel was not cointegrated, then we would expect this coefficient to be zero, so these estimates further support the cointegration of the panel. The interpretation of the coefficient in the MG estimator is that 30% of the disequilibrium divergence is eliminated each year for both OECD and non-OECD countries. Imposing homogeneity as the PMG estimator does, leads to an upward bias in the coefficient of the lagged dependent variable ( $\alpha_i$ ) so the PMG estimate of  $\phi_i$  implies a slower adjustment to the long-run equilibrium.

In summary, we obtain results that are robust to an array of specifications - to endogeneity in income and inflation, to lagged dependence on the dependent variable, to heterogeneity in coefficient estimates, to cross-sectional correlations, and to nonstationarity concerns in panels. We find that a currency crisis result in significant reductions in per capita consumption expenditures that persist for many years after the event. The magnitude of the impact of a crisis, as well as its duration, varies markedly across developed (OECD) and developing (non-OECD) economies. We find that a crisis has a bigger immediate downward impact on consumption indicators and the effect persists longer in developing economies in comparison to developed economies. Second, we find that following a crisis, for more than 70% of developing countries, consumption expenditure declines by more than incomes. This suggests a decline in the share of consumption in income and a greater weight given by consumers to the precautionary motive of saving, in the face of a crisis. By contrast, in developed countries, when we control for per capita GDP, there is

no independent impact of the crisis on per capita consumption.<sup>15</sup>

## 5 Inter-Category Consumption Smoothing

Our earlier results reveal a sharp contraction in aggregate indicators of consumption in response to a crisis. Our focus in this section is in moving from understanding the impact of a crisis on aggregate spending indicators to highlighting its impact on disaggregate spending indicators. We examine whether there is evidence of category-level consumption smoothing - whether and how consumers adjust the expenditure shares devoted to various categories of goods and services. In short, this section is about understanding how consumers change their share of wallet allocation decisions to different classes of goods and services during crisis periods.

Previous research has shown that during times of cyclical downturns, consumers can resort to various means to smooth consumption - drawing down on their savings (Paxson, 1992), taking loans from the formal financial sector to carry them through difficult times (Udry, 1994), selling assets (McKenzie, 2006) etc. However, such choices may be infeasible in the case of a currency crisis, especially for crises concentrated in developing countries. Savings and assets may be inadequate to compensate for loss of income, and financial markets may be thin and/or missing during times of crisis. In such a scenario, consumers are likely to respond by altering the *composition* of consumption in response to the crisis. For example, they are likely to reduce and/or postpone expenditure on certain categories of goods (discretionary goods) and substitute these by increasing expenditure shares of others (necessities). Our methodology will allow us to empirically identify which goods are classified by consumers as necessities versus discretionary in the context of a

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<sup>15</sup> As a robustness check, we decomposed per capita consumption into a trend and a cyclical component using a rational square-wave filter. This is preferred over the Hodrick-Prescott filter when there are structural breaks in the data (Pollock, 2000). In OECD countries we find that the crisis does not induce a trend break; instead, there is only a deeper cyclical downturn. In non-OECD countries, on the other hand, the crisis induces both a trend break and a deeper downturn in terms of the cyclical component, and the impact persists for a period of three years. These results are available from the authors on request.

crisis. This is important since much of the current writing on the marketing implication of a crisis (e.g., Quelch and Jocz, 2009) relies on informal metrics for categorization of goods as necessities versus discretionary. Additionally, it is unclear if the academic characterization of necessities versus discretionary goods based on income elasticities is sufficient to explain the observed patterns of consumption smoothing in a crisis (e.g., Moeller 1981).

## 5.1 AIDS Methodology

We use the Almost Ideal Demand System (AIDS) methodology of Deaton and Muellbauer (1980) to understand how consumers change their expenditure allocations due to a crisis. The methodology estimates a system of demand equations defined in terms of expenditure shares. It starts from a specific class of preferences to define a system of demand equations that satisfies the axioms of consumer choice. The AIDS model represents a flexible demand system of the Translog and PIGLOG family and can be considered as a first-order approximation to any demand system. An important advantage of this methodology is that it is compatible with aggregation over consumers. It can thus be interpreted in terms of economic models of consumer behavior when estimated with aggregated (macroeconomic) or disaggregated (in terms of households and/or sub-categories) data (Deaton and Muellbauer, 1980; Glewwe, 2001). In the AIDS model, the budget share of each good is expressed a linear function of the logarithm of total expenditure and of the logarithm of prices (both own prices and prices of all other goods). The system of equations is specified as

$$w_{jt}^i = \alpha_j^i + \sum_{k=1}^n \gamma_{jk} \ln p_{kt}^i + \beta_j \ln \left( \frac{E}{P} \right)_t^i + \delta_0 crisis_{it} + \delta_1 crisis_{it-1} + \tau_t \quad (5)$$

where,  $w_{jt}^i$  is the budget (expenditure) share of the  $j^{th}$  good in country  $i$  at time  $t$ ;  $p_{kt}^i$  is the nominal price of the  $k^{th}$  good in country  $i$  at time  $t$ ;  $E_t^i = \sum_{k=1}^n p_{kt}^i x_{kt}^i$  is the total expenditure in country  $i$  at time  $t$ ;  $n$  is the number of categories;  $\alpha_j^i$  is the constant coefficient in the  $j^{th}$  share

equation for country  $i$ ;  $crisis_{it}$  is the crisis dummy at time  $t$  and  $crisis_{it-1}$  is the crisis dummy lagged by one year.<sup>16</sup> Finally,  $P_t^i$  is a translog price index defined by

$$\ln P_t^i = a_0 + \sum_{j=1}^n \ln p_{jt}^i + \frac{1}{2} \sum_{j=1}^n \sum_{k=1}^n \ln p_{jt}^i \ln p_{kt}^i \quad (6)$$

Deaton and Meulbauer (1980) recommend replacing this price index with Stone's price index, defined as

$$\ln P_t^i = a_0 + \sum_{j=1}^n w_{jt}^i \ln p_{jt}^i \quad (7)$$

Since the shares are used as the dependent variable and are present in the Stone's price index as well, this gives rise to a simultaneity problem. Following Eales & Unnevehr (1988) we use the lagged share  $w_{jt-1}^i$  in equation (7). We also impose the following constraints on the coefficients<sup>17</sup>

Adding Up:  $\sum \alpha_j^i = 0, \sum_{j=1}^n \beta_j = 0, \sum_{k=1}^n \gamma_{jk} = 0$

Symmetry:  $\gamma_{jk} = \gamma_{kj}$

Homogeneity :  $\sum_{k=1}^n \gamma_{jk} = 0$  for all  $j$

An important caveat is that the coefficients ( $\gamma_{jk}$ ) on the price terms do **not** indicate the direction of price effects. The system of equations is estimated using iterated seemingly unrelated regression as the estimation method. Since budget shares always sum to 1 in the system, one of the share equations is deleted to deal with the singularity problem. Whichever one is eliminated should not have any effect on the results. The parameters associated with the share equation that is deleted can be recovered through the parameter restrictions implied by the homogeneity, symmetry, and adding-up properties. Our variables of interest are  $\delta_0$  and  $\delta_1$ . The signs and significance of the

<sup>16</sup> We experimented with higher lags of the crisis dummy but these were not significant.

<sup>17</sup> Our results do not change if we perform an unconstrained estimation. For the unconstrained estimation, we are unable to reject the symmetry and homogeneity constraints.

$\delta'$ 's allow us to examine if there is a direct impact of the crisis, over and above that dictated by movements in incomes and prices. If the  $\delta'$ 's prove to be significant, then an immediate implication is that income and price adjustments following a crisis are insufficient, and consumers smooth their consumption patterns directly in response to a crisis. On the other hand, if all adjustment is through relative price and income changes then the crisis dummies in equation (5) should turn out to be *insignificant*.

For category-level consumption smoothing, we use data from Euro Monitor to calculate category shares. Euro Monitor provides data on consumer expenditures for various categories, at various levels of disaggregation as well as price indices for these categories over the period 1990-2006 for 54 countries. Euro Monitor first classifies goods into 4 broad categories: Durables, Non-durables, Semi-durables and Services. The share equation for Semi-durables is deleted from the system but we recover the parameter estimates and report them in Table 3. The system of equations specified in equation (5) include country and time fixed effects. However, since consumption patterns may widely vary across countries, following Deaton and Muellbauer (1980), we incorporate a host of demographic variable at the country-level. These include work force size (share of population between the ages 15-64), the urbanization rate (percentage of population living in urban areas), the median age in the population and the unemployment rate. Finally, total consumer expenditure is converted to constant 1990 dollars using the PPP exchange rate and the consumer price index in each country for 1990.

### 5.1.1 Results

If we examine the fall in expenditures in the year of the crisis across countries, we find on average, a 20% decline for Durables, a 14.6% decline in Services; a 9.5% decline in Semi-durables and a 7% decline in Non-durables. Such a ranking is reasonable since it is likely that the income elasticity of demand is the highest for Durables and lowest for Non-durables. These changes

hint at the traditional Engel effect where the direct effect of the fall in income caused by the crisis leads consumers to reduce their expenditure shares on discretionary goods and consume relatively more of necessities.

As before, we do a similar sample decomposition by estimating equation (5) separately for 22 OECD countries<sup>18</sup> and 32 non-OECD countries.<sup>19</sup> The estimates are shown in Table 3, where all equations include country fixed effects and a common time trend. The pattern of adjustment for OECD (Columns 1-4) versus non-OECD countries is remarkably different (Columns 5-8) . In OECD countries, we observe a fall in the share of Durables and an increase in the share of Services in the year of the crisis, while the shares of Non-durables and Semi-durables are not affected. In OECD countries who experience a crisis, consumers cut back on consumption of Durables more than predicted through direct income and price effects. Consumption smoothing in OECD countries manifests itself as an increase in the share of Services in the year of the crisis. In non-OECD countries, the pattern of adjustment is very different - we observe a significant fall in the share of Durables as well as Semi-durables and a significant rise in the share of Non-durables. Consumption smoothing in non-OECD countries channels money from Durables and Semi-Durables to Non-durables. Consequently, in these economies, the drop in consumption of Non-durables is less than predicted through direct income and price effects while the drop in Durables and Semi-Durables is more than that predicted through the usual price-income channels.

The fact that the share of Durables falls in both sets of countries in the crisis year shows that postponement of the consumption of Durables is the main mechanism through which consumers smooth consumption. The key finding is that the categories where these savings are channeled

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<sup>18</sup> Data on Iceland and Luxembourg are missing, so we have only 22 OECD countries as compared to 24 in Tables 1 and 2.

<sup>19</sup> For the two sub-samples, the fall in total expenditure on Durables and Non-durables in the year of crisis is very similar - equal to 11% and 2% respectively. The biggest difference is in Services, where the expenditure falls by 5% for non-OECD countries but remains unchanged for OECD countries. Expenditure on Semi-durables falls by 7% in OECD countries and by 10% in non-OECD countries.

into varies across developed and developing economies. In short, our analysis reveals that the goods classified as necessities are different across these classes of economies. Services are considered as necessities by consumers in developed economies and Non-durables are considered as necessities by consumers in developing economies. While the classification of Non-durables as necessities would be considered a routine finding, the identification of Services as necessities in developed economies is not obvious from the literature. In this sense, Non-durables and Services as necessities in developing and developed economies respectively, benefit from consumption smoothing relative to Durables in a crisis.<sup>20</sup> For Semi-durables, we see is that there is a significant drop in Semi-durables share in non-OECD countries, but no change in OECD countries. This difference could arise due to the differences in liquidity constraints between the two sets of countries. In the presence of liquidity constraints, Browning and Crossley (2008) suggest that consumers may postpone their purchases of clothing and other small durable goods in order to finance current non-durable consumption. Consumers in developing economies, to borrow their terminology use their internal capital market of Semi-durables to borrow from themselves.<sup>21</sup>

Overall, this consumption smoothing reveals that firms operating in Durable goods will be worst impacted by a crisis across countries, both developed and developing. Firms in Semi-durables will be impacted severely only in developing countries. Firms in the Services sector in OECD countries and firms in Non-durables in non-OECD countries will be least severely impacted. The shift in shares highlight the fact that demand for products/services in a crisis event are significantly impacted by the unfolding of consumption in other seemingly unrelated categories.

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<sup>20</sup> This is supported by our estimates of income elasticity of demand as well - demand for Services is income inelastic in OECD countries (equal to 0.95) and income elastic in non-OECD countries (equal to 1.72).

<sup>21</sup> Empirically, Browning and Crossley (2008) find evidence for this substitution between clothing and food during periods of unemployment in Canada. In Mexico, McKenzie (2006) finds that consumers shifted from clothing and other durables to basic foods in response to the 1994 Peso crisis.

Moving to the duration of the impact, the crisis has an impact on the relative shares only in the year of the crisis for OECD countries. The reaction in non-OECD countries is longer - it persists an extra year as the crisis dummy lagged by one year is significant in all share equations, apart from Services. The fact that crisis dummy is significant for the shares only in the year of the crisis in OECD countries, but affects share for both the year and the year following the crisis in non-OECD countries indicates that consumers in developing countries use their internal capital markets to smooth consumption for a longer span of time.

As an aside, we estimate the income elasticity of demand for the category  $j$  in country  $i$  as  $\frac{\beta_j}{\bar{w}_j^i} + 1$  where  $\bar{w}_j^i$  denotes the average expenditure share in country  $i$  on category  $j$ . We average the shares over time for each country leaving out the crisis year.<sup>22</sup> The last row of Table 3 shows the income elasticity of demand *averaged* across all countries in each sample. The income elasticity of demand is the highest for durable goods for OECD countries (equal to 1.51 across countries) where we see the biggest decline in the crisis year. For non-OECD countries the biggest decline is in Semi-Durables followed by Durables - the two categories whose income elasticity of demand equals 2.11 and 1.82 respectively. Income elasticity is lowest for Non-durables at 0.99 in non-OECD countries. It is reassuring that the crisis induces an increase in the expenditure share of the good with the income inelastic demand and the biggest decline in the expenditure share of the good with the most income elastic demand.<sup>23</sup>

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<sup>22</sup> For the AIDS model, income elasticity will mechanically rise for any good whose share declines. To counter the expenditure shifts in crisis years, we averaged the category expenditure shares over time but dropped the crisis year in the averaging procedure.

<sup>23</sup> The AIDS model implies that the price elasticities calculated as  $\frac{\gamma_{jk} - \beta_j(w_k - \beta_k \ln(\frac{P}{\bar{P}}))}{w_j} - \varphi_{jk}$  where  $\varphi_{jk} = 1$  if  $j = k$  and 0 otherwise. All price elasticities are negative (not reported) so that demand responds negatively to price increases.

## 6 Intra-Category Consumption Smoothing

Next, we further disaggregate each of these four categories and analyze the patterns of consumption smoothing *within* each category.

### 6.1 AIDS Methodology

Once again we rely on the Almost Ideal Demand System methodology of Deaton and Muellbauer (1980). We estimate the following system:

$$w_{jt}^{ih} = \alpha_j^h + \sum_{k=1}^{n^h} \gamma_{jk} \ln p_{kt}^{ih} + \beta_j \ln \left( \frac{E^h}{P^h} \right)_t^i + \delta crisis_{it} + \tau_t \quad (8)$$

separately for each category  $h \in (\text{Durables}, \text{Nondurables}, \text{Semidurable}, \text{Services})$ .  $w_{jt}^{ih}$  is the share of good  $j$  in category  $h$ ,  $n^h$  is the number of sub-categories in category  $h$ ,  $E^h$  is the expenditure on category  $h$  and

$$\ln P_t^{hi} = a_0^h + \sum_{j=1}^n w_{jt}^i \ln p_{jt}^{hi} \quad (9)$$

is the Stone's price index for category  $h$ . Higher lags of the crisis dummy were insignificant. A footnote in Table 4 lists the individual goods that Euro Monitor uses to classify the aggregate categories of Durables, Non-durables, Semi-durables and Services. Once again a significant estimate of  $\delta$  implies that income and price adjustments following a crisis are insufficient, and consumers smooth consumption within each category as well. Data on expenditure shares and price indices are from Euro Monitor as well.

#### 6.1.1 Results

Instead of presenting estimates for every coefficient in (8), we present a parsimonious and easy to read summary of our results. We simply list the individual goods in each of the four broad categories where  $\delta$  is significantly different from zero. We list the goods where  $\delta > 0$  as well as

the goods where  $\delta < 0$ . As before, we estimate (8) separately for OECD and non-OECD countries to examine if the patterns of adjustment vary across developed vs. developing countries.

Columns 1 and 2 in Table 4 show that within each of the four categories, there are significant differences in consumption smoothing for OECD vs. non-OECD countries. For Durables, we observe a fall in the share of “Cars and Motorcycles” in OECD countries. Consumers in these countries channel the savings from “Cars and Motorcycles” to “Bicycles” and “Telecommunications equipment”. In non-OECD countries, we observe a fall in “Audio-visual, photographic and information processing equipment” and “Jewelry, silverware, watches and clocks, travel goods”. There is a rise in expenditure shares of “Medical Equipment” in non-OECD countries where they are likely deemed essential goods. Interestingly, Bicycles are the only sub-category where the expenditure share increases in both samples.

If we calculate the elasticities of demand with respect to expenditure on Durables, then the goods with the highest elasticities of demand are “Audio-visual, photographic and information processing equipment” at 1.74 in non-OECD countries and “Cars and Motorcycles” at 1.29 in OECD countries. At the same time, demand is inelastic with respect to expenditure in the Durable goods category for “Bicycles” in OECD countries and for “Medical Equipment” in non-OECD - these are also the goods whose share in Durable goods expenditure rises in the crisis year. These results along with the results for the broad category aggregates in Table 3 suggest that Durables are a significant component of consumers’ adjustment pattern in a crisis - not only does the share of Durables fall in overall consumer expenditure, but there is significant reallocation of consumer expenditure within the category itself.

For the Semi-Durable category in OECD countries, only the share of “Glassware” falls, while for non-OECD countries there are no significant shifts in the shares of any of the sub-categories. So while Table 3 indicates a significant decline in the overall share of Semi-durables for non-

OECD countries, there are no significant patterns of adjustment within the category itself.

For Non-durables, we find that the share of “Food” rises, while the share of “Tobacco” falls in each of the two columns. The decline in the share of “Household electricity, gas and other fuels” in the overall sample is mainly confined to OECD countries. Finally, the share of “Non-alcoholic beverages” moves in opposite directions - it rises in non-OECD countries but falls in OECD countries. In the Non-Durable category the highest elasticity of demand with respect to Non-Durable expenditure are for “Tobacco” whose expenditure share falls in both samples, while the lowest is for “Food” whose share rises in both samples. Again, while Non-durable share rises in total consumption, within the category itself, the income inelastic category “Food” takes a larger share in the crisis year while the income elastic ones experience a fall in share.

For Services, there is an increase in “Accommodation” and “Catering” in non-OECD countries while there is an increase in expenditure share of “Education” in OECD countries. In addition, we observe a decline in the expenditure share in “Financial services”, “Hospital services” and “Social protection services” in non-OECD countries as a response to the crisis. In the latter, we also observe a significant decline in “Insurance services” and “Household and domestic services”. The highest elasticity of demand with respect to expenditure on Services is for “Social protection services” at 3.33 in non-OECD countries and the lowest for “Education” at 0.66 in OECD countries. Overall the pattern of adjustment in OECD countries is a rise in the share of Services in overall consumer expenditures and very little adjustment within the Services category, with only a rise in the share of Education.<sup>24</sup> In non-OECD countries, while we did not observe a major shift either towards or away from the Services sector, there are major adjustments made by consumers within the category itself.

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<sup>24</sup> This conforms to commonly held notions of a rise in college applications in times of crisis in rich countries. Note also that expenditure on “Social protection services” refers to private consumer expenditure and not expenditures by the state. It covers assistance and support services provided to persons who are: elderly, disabled, having occupational injuries and diseases, survivors, unemployed, destitute, homeless, low-income earners, indigenous people, immigrants, refugees, alcohol and substance abusers, etc.

Overall, our results show a rich pattern of consumers' adjusting to a crisis, by not only shifting shares of expenditure across broad categories, but also reallocating shares within each category. As before, there are significant differences in the patterns of consumption smoothing across developed and developing economies. It should be noted that the magnitude of income elasticity of demand can help identify which categories are going to be more or less severely impacted by a crisis. However, the significance of the crisis dummies, even when we control for income (and price) indicates that the income elasticity of demand fails to account for the full magnitude of the shifts in demand following a crisis. Rather, only the shift patterns are consistent with a rank ordering of income elasticities of various goods and services.

## 7 Managerial Implications and Conclusion

Our results identify a series of stylized descriptive facts about the impact of a crisis on consumption smoothing behavior at multiple levels of analyses - inter-temporal, inter-category, and intra-category. We also identify and document significant differences in consumers' patterns of adjustment across developed and developing countries. A series of implications follow from these results and we elaborate below.

First, in almost all crisis episodes in developing countries, consumption falls even when we control for per capita GDP. The fall in consumption share in income is the opposite of what intertemporal consumption smoothing would predict. Plausibly, this is due to thin or missing credit markets that facilitate smoothing across time and consumers react to the crisis by saving more and consuming less out of income. Managers in developing economies therefore need to realize that their business are going to see dramatically different patterns of impact relative to their counterparts in the developed markets. Our results also imply that they need to be prepared to weather a longer term duration of the impact of a crisis on their business as well. Increasing access of

consumers in developing markets to credit can help mitigate this impact and there are several instances of these initiatives in recent times. For instance, the tax rebates in China for small cars (Financial Times, February 11, 2009) or the alliance between housing and durable goods manufacturers with finance companies in India for targeted credit programs (Business Line, January 3, 2009). More generally, our results suggest that views expressed in the business literature on decoupling whereby growth in developing economies will help mitigate the global impact of crisis are misplaced (Financial Times, December 10, 2008). In fact our results suggest that the rebound in the global economy from the consumption perspective is going to be more likely driven in the immediate term by the rebound in consumption in developed economies since they exhibit a shorter duration of impact.<sup>25</sup>

Second, our results reveal the multi-faceted consumption smoothing across categories that consumers engage in response to a crisis. Forecasting business performance in a crisis situation will require managers to understand the intricacies of consumption smoothing undertaken by consumers and more specifically the role of their category in the consumer's internal capital market. In other words, managers need to understand whether their product/category is a necessity or discretionary. If it is a necessity (discretionary) then they should realize that they will gain (lose) from the consumer's internal capital expenditure reallocations. The results in Tables 3 and 4 can provide valuable initial guidance to managers in understanding the role of their category in different classes of economies. Managers interested in greater granularity should conduct a careful share-of-wallet analysis of their consumers to understand how they are reallocating consumption expenditures in a crisis. This will enable them to get a true assessment of the likely impact of a crisis on their demand.

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<sup>25</sup> However, the decline in the consumption share of income and the concomitant rise in the savings rate in the United States in the last two-quarters, suggests that such a rebound may take longer to materialize. Therefore, the impact of the current crisis, the likes of which has not been seen since the Great Depression, may be felt longer.

Third, estimates of price and income elasticities in a crisis situation will be biased because they fail to take account of the inter-category consumption smoothing undertaken by consumers. Consider the case of a necessity such as services in developed economies or non-durables in developing economies. Traditional estimates of price elasticity for these categories will be biased upwards because of the channeling of consumption expenditures into these categories from discretionary goods. Managers of these categories need to be vigilant and resist the temptation to indulge in intensified price competition in these circumstances. Similarly, estimates of price elasticities for discretionary goods will be biased downwards in a crisis setting. In short, managers need to make sure that their estimates of price (and income elasticities) incorporate the independent impact of a crisis and consumption smoothing. Failure to do so could lead to poor decisions.

Fourth, we illuminate the extent of smoothing that occurs within a category. The estimates reveal that managers need to understand that the extent of consumption smoothing varies from one category to another. In particular, businesses in Durables, Non-durables and Services need to play careful attention since intra-category consumption smoothing is substantial. Businesses in Semi-durables will suffer an aggregate contraction from consumption smoothing across categories but there will be minimal impact of intra-category smoothing. The reallocation of expenditure within a category require managers to identify whether their firm's business is among the potential gainers or losers. We would like to caution that the results in Table 4 should not be viewed as a list of winning and losing categories following a crisis. They need to be viewed instead as highlighting which categories are over-exposed or under-exposed to the impact of a crisis.

Finally, the results show that the impact of a crisis on aggregate as well as disaggregate indicators of consumption varies markedly across classes of economies. This highlights the need for decision makers and firms to develop a localized understanding of consumption smoothing

in developing the appropriate action plan. However, there are broad similarities within each of developed and developing countries.

In summary, developing an effective strategy for managing the business in times of economic volatility requires an understanding of its impact in the first place. The best way to estimate the magnitude of the impact on a firm's business is to understand the impact of the crisis on the consumption decisions of the firm's consumers. The paper develops a series of stylized facts about the impact of a crisis on the consumption expenditure allocations of a consumer across a broad range of products and services. At its very core, it demonstrates that consumers engage in remarkably sophisticated smoothing of consumption expenditures across and within diverse categories. Understanding these shifts is critical to assessing the likely impact of a crisis on a firm's business.

## 7.1 Limitations and Future Research Directions

This paper focuses attention on a currency crisis. However, much of the focus of our paper is at the aggregate level. We lack data on variables such as advertising, new product introductions etc. at the category level, across countries over time for us to model fine-grained managerial responses to the crisis. Analyzing firm level data on how marketing managers react to a crisis is a promising avenue for future research. This should provide us with a better understanding of the effectiveness of various strategies in a crisis situation. All our analyses is at the annual level due to data availability constraints. Moving from annual to quarterly or monthly data would enable a richer understanding of the dynamics of consumption smoothing across and within categories in response to a crisis. We also focus somewhat narrowly on currency crisis. However, there are other manifestations of crises - financial/banking crisis, debt crisis, twin crisis are some examples. Understanding the implications of these different forms of crises (e.g., currency crisis vs. banking crisis) will help develop a holistic understanding of the implications of a crisis for managerial

decision making. Finally, from a broader perspective, firms would be interested in understanding both the impact of a crisis as well as the recovery following a crisis. Research focusing on the dynamics of recovery and the underlying consumer behaviors would go a long way in furthering a holistic perspective on the impact of economic volatility.

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**Table 1: Impact of Currency Crisis on Aggregate Consumption: Arellano-Bond GMM Estimator<sup>+</sup>**

	(1)	(2)	(3)	(4)
	Per capita consumption expenditure (OECD)	Per capita consumption expenditure (OECD)	Per capita consumption expenditure (non-OECD)	Per capita consumption expenditure (non-OECD)
<i>Per capita consumption (t-1)</i>	0.888*** (0.034)	0.399*** (0.051)	0.712*** (0.009)	0.618*** (0.024)
<i>Crisis event (t)</i>	-0.037*** (0.007)	-0.008 (0.005)	-0.035*** (0.002)	-0.030*** (0.002)
<i>Crisis event (t - 1)</i>	-0.029*** (0.007)	-0.012 (0.009)	-0.018*** (0.001)	-0.014*** (0.001)
<i>Crisis event (t - 2)</i>	-0.003 (0.005)	-0.001 (0.011)	-0.010*** (0.001)	-0.007*** (0.001)
<i>Crisis event (t - 3)</i>	-0.012*** (0.003)	-0.008 (0.012)	-0.001 (0.001)	0.001 (0.001)
<i>Per capita GDP</i>		0.570*** (0.038)		0.304*** (0.017)
<i>Inflation</i>		-0.014 (0.051)		0.0003*** (0.000)
<i>Observations</i>	950	944	2960	2719
<i>Number of countries</i>	24	24	74	74
<i>Number of crisis episodes</i>	38	38	235	235
<i>Overall model test</i>	1207.84***	11424.38***	13850.66***	82188.16***
<b>Specification test p-values</b>				
<i>OID test</i>	1.0	1.0	0.99	1.0
<i>Serial correlation: AR(1) test</i>	0.65	0.02	0	0
<i>Serial correlation: AR(2) test</i>	0.45	0.24	0.58	0.63

+Robust standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

All variables except inflation and crisis dummies are logged. All columns include a trend term (not shown).

The first two columns restrict the sample to 24 OECD countries. The last two columns restrict the sample to non-OECD countries.

Only countries that joined the OECD prior to 1973, were classified as OECD countries. Countries who joined after 1973 such as Mexico, Korea, Poland, Hungary, Slovakia and Czech Republic are classified as non-OECD.

**Table 2: Impact of Currency Crisis on Aggregate Consumption: Mean-Group and Pooled-Mean-Group Estimator<sup>+</sup>**

	(1)	(2)	(3)	(4)
	Mean Group (OECD)	Pooled Mean Group (OECD)	Mean Group (non-OECD)	Pooled Mean Group (non-OECD)
<b>Long Run</b>				
<i>per capita GDP</i>	0.911*** (0.030)	0.955*** (0.006)	0.675*** (0.143)	0.845*** (0.009)
<i>inflation</i>	0.131 (0.109)	0.217*** (0.033)	0.046 (0.095)	0.003 (0.002)
<b>Short run</b>				
<i>Crisis event (t)</i>	0.001 (0.002)	-0.000 (0.002)	-0.014* (0.008)	-0.020** (0.010)
<i>Crisis event (t - 1)</i>	-0.000 (0.003)	-0.002 (0.004)	-0.015** (0.007)	-0.019** (0.007)
<i>Crisis event (t - 2)</i>	0.001 (0.003)	-0.000 (0.004)	-0.012** (0.005)	-0.013*** (0.005)
<i>Crisis event (t - 3)</i>	-0.003 (0.002)	-0.003 (0.002)	-0.006 (0.005)	-0.004 (0.004)
<i>per capita GDP</i>	0.366*** (0.027)	0.518*** (0.044)	0.466*** (0.046)	0.557*** (0.041)
<i>inflation</i>	-0.084*** (0.031)	-0.081*** (0.026)	0.025 (0.016)	0.043*** (0.015)
<i>Error correction coefficient</i>	-0.325*** (0.032)	-0.171*** (0.032)	-0.309*** (0.026)	-0.186*** (0.014)
<i>Observations</i>	944	944	2719	2719
<i>Number of countries</i>	24	24	74	74
<i>Number of crisis episodes</i>	38	38	235	235

+Standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

All variables except inflation and crisis dummy are logged. All columns include a constant and a time trend (not shown).

The first two columns restrict the sample to 24 OECD countries. The last two columns restrict the sample to non-OECD countries.

Only countries that joined the OECD prior to 1973, were classified as OECD countries. Countries who joined after 1973 such as Mexico, Korea, Poland, Hungary, Slovakia and Czech Republic are classified as non-OECD.

**Table 3: Impact of Currency Crisis on Category Shares: Almost Ideal Demand System (AIDS) Model for Four Categories**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Durables (OECD)	Non-durables (OECD)	Services (OECD)	Semi-durables (OECD)	Durables (non-OECD)	Non-durables (non-OECD)	Services (non-OECD)	Semi-durables (non-OECD)
<i>Crisis event (t)</i>	-0.006** (0.003)	0.002 (0.003)	0.008* (0.004)	-0.003 (0.002)	-0.004** (0.002)	0.013** (0.006)	-0.006 (0.005)	-0.004** (0.002)
<i>Crisis event (t - 1)</i>	-0.003 (0.003)	0.002 (0.003)	0.003 (0.005)	-0.002 (0.002)	-0.003* (0.002)	0.013** (0.006)	-0.006 (0.005)	-0.004** (0.002)
<i>Price (Durables)</i>	-0.018*** (0.007)	0.011* (0.006)	-0.023*** (0.007)	0.030*** (0.004)	-0.015*** (0.004)	0.025*** (0.007)	-0.002 (0.005)	-0.009*** (0.003)
<i>Price (Non-durables)</i>	0.011* (0.006)	0.134*** (0.010)	-0.114*** (0.009)	-0.031*** (0.005)	0.025*** (0.007)	-0.010 (0.021)	-0.022 (0.015)	0.007 (0.006)
<i>Price (Services)</i>	-0.023*** (0.007)	-0.114*** (0.009)	0.115*** (0.014)	0.023*** (0.006)	-0.002 (0.005)	-0.022 (0.015)	0.050*** (0.013)	-0.026*** (0.005)
<i>Price (Semi-durables)</i>	0.030*** (0.004)	-0.031*** (0.005)	0.023*** (0.006)	-0.022*** (0.005)	-0.009*** (0.003)	0.007 (0.006)	-0.026*** (0.005)	0.028*** (0.005)
<i>Expenditure</i>	0.043*** (0.006)	-0.028*** (0.007)	-0.019* (0.010)	0.004 (0.004)	0.001 (0.001)	-0.004*** (0.001)	0.003** (0.001)	0.001** (0.000)
<i>Urbanization</i>	-0.002*** (0.000)	0.002*** (0.000)	-0.000 (0.001)	0.001*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.003*** (0.001)	-0.002*** (0.000)
<i>Unemployment rate</i>	-0.001*** (0.000)	0.002*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.002** (0.001)	0.002*** (0.001)	0.000 (0.000)
<i>Median population age</i>	-0.008*** (0.001)	-0.001 (0.001)	0.013*** (0.001)	-0.004*** (0.001)	0.005*** (0.001)	-0.016*** (0.002)	0.015*** (0.002)	-0.004*** (0.001)
<i>Work force size</i>	0.001** (0.001)	-0.007*** (0.001)	0.006*** (0.001)	0.000 (0.000)	0.001 (0.000)	-0.002 (0.001)	-0.002 (0.001)	0.003*** (0.000)
<i>Observations</i>	352	352	352	352	481	481	481	481
<i>Number of countries</i>	22	22	22	22	32	32	32	32
<i>Income elasticity of demand</i>	1.51	0.92	0.95	1.05	1.82	0.99	1.72	2.11

Standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Columns (1)-(3) present the AIDS model. Columns 1-4 present the AIDS estimates for OECD countries; columns 5-8 show it for non-OECD countries. Estimation is done using iterated SURE technique. Each share equation includes country fixed-effects, a time trend and a constant (not shown). The table shows the average income elasticity of demand for each category evaluated at the average share for each country across time.

**Table 4: Almost Ideal Demand System (AIDS) Model Applied to Sub-Categories of Durables, Non-durables, Services, and Semi-durables**

	(1)	(2)
<i>Durable Goods</i>	<i>OECD countries</i>	<i>Non-OECD countries</i>
Significant increase	Telecommunication equipment; Bicycles	Bicycles; Medical equipment
Significant decrease	Cars and motorcycles	Audio-visual, photographic and information processing equipment; Jewellery, silverware, watches and clocks, travel goods
<i>Semi-Durable Goods</i>	<i>OECD countries</i>	<i>Non-OECD countries</i>
Significant increase	None	None
Significant decrease	Glassware	None
<i>Non-Durable Goods</i>	<i>OECD countries</i>	<i>Non-OECD countries</i>
Significant increase	Food	Non-alcoholic Beverages; Food
Significant decrease	Non-alcoholic Beverages; Household electricity, gas and other fuels; Tobacco	Tobacco
<i>Services</i>	<i>OECD countries</i>	<i>Non-OECD countries</i>
Significant increase	Education	Accommodation; Catering
Significant decrease		Financial services; Hospital services; Social protection services; Household and domestic services; Insurance services

Goods whose share in each category significantly increases or decreases is shown; Column 1 uses all countries; Column 2 applies the AIDS specification to only OECD countries; Column 3 applies the AIDS specification to only non-OECD countries.

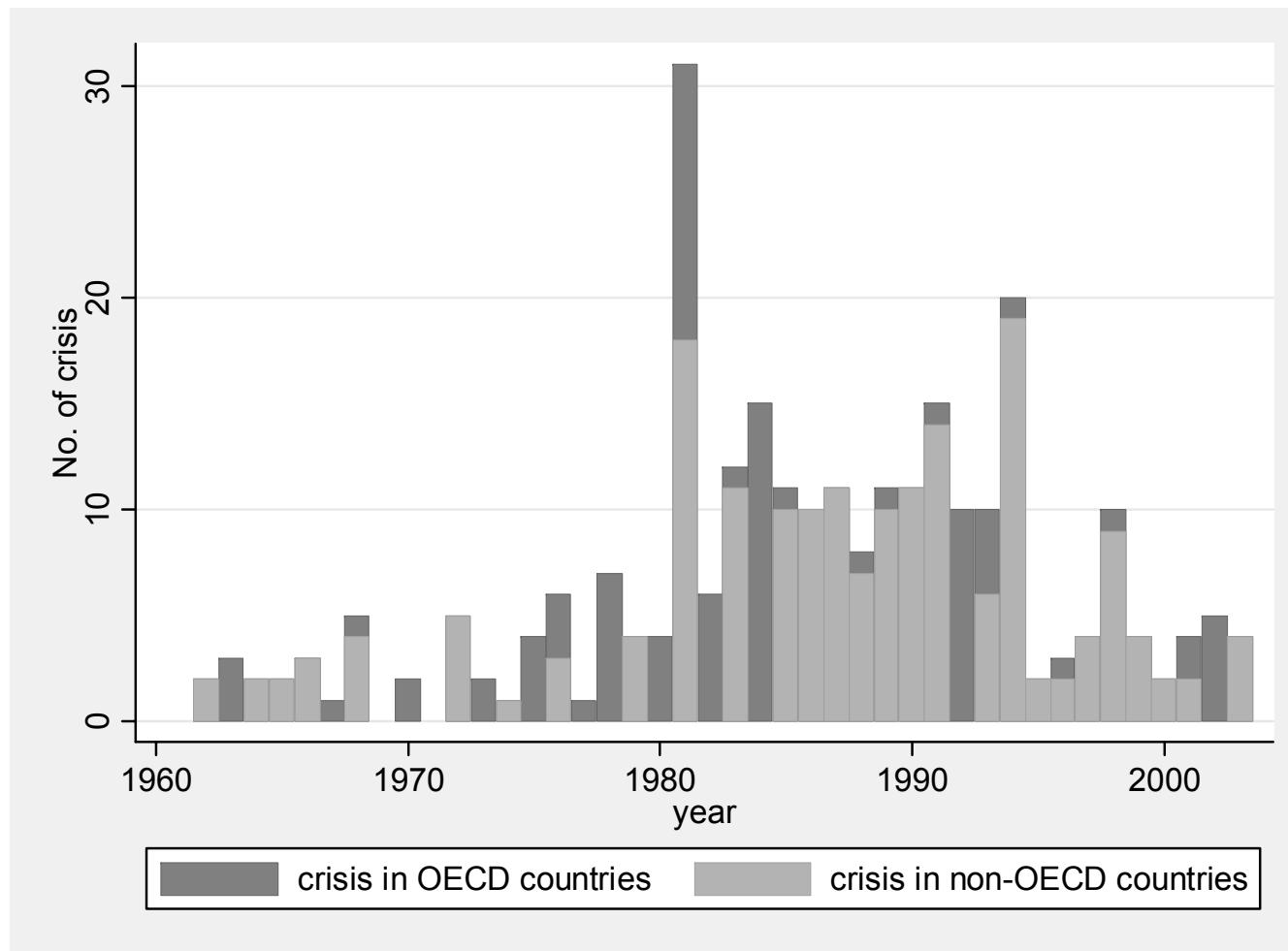
**Durable Goods:** Audio-visual, photographic and information processing equipment; Furniture and furnishings, carpets and other floor coverings; Household appliances; Jewellery, silverware, watches and clocks, travel goods; Medical appliances and equipment; Cars and motorcycles; Bicycles; Other major durables for recreation and culture; Telecommunications equipment.

**Semi-Durable Goods:** Clothing; Footwear; Glassware, tableware and household utensils; Hardware and DIY goods; Household textiles; Books and stationery; Recreational items and equipment for gardens and pets; Personal care items.

**Non-durables:** Alcoholic drinks; Food; Non-alcoholic beverages; Tobacco; Household electricity, gas and other fuels; Household maintenance and repair of dwellings; Fuel for personal transport equipment; Water.

**Services:** Accommodation; Catering services; Education; Financial services; Hospital services; Household and domestic services; Insurance services; Outpatient services; Social protection services; Telecommunications services; Transport services; Recreational and cultural services

Figure 1: Number of Currency Crisis per Year



## Appendix

**Table A: Variable Description and Summary Statistics**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Description</b>
<i>Crisis Event</i>	3922	0.07	Dummy variable equal to 1 if nominal depreciation of currency $\geq 20\%$ in a year and increase in the rate of depreciation from previous year $\geq 10\%$ . Source: Data on exchange rates from International Finance Statistics
<i>Per capita consumption expenditure (log)</i>	3922	7.98	Log of per capita private consumption expenditure in constant 2000 dollars. Source: World Development Indicators
<i>Per capita GDP (log)</i>	3922	8.35	Log of per capita GDP in constant 2000 dollars. Source: World Development Indicators
<i>Inflation</i>	3922	0.32	Inflation measured as annual change in consumer price index. Source: World Development Indicators
<i>Durable goods share</i>	833	0.10	Share of Durable goods in total expenditure. Source: Euro Monitor
<i>Non-durable goods share</i>	833	0.37	Share of Non-durable goods in total expenditure. Source: Euro Monitor
<i>Services share</i>	833	0.44	Share of Services in total expenditure. Source: Euro Monitor
<i>Semi-durable goods share</i>	833	0.09	Share of Semi-durable goods in total expenditure. Source: Euro Monitor
<i>Durable goods price</i>	833	4.73	Price index for Durable goods (logged). Source: Euro Monitor
<i>Non-durable goods price</i>	833	4.82	Price index for Non-durable goods (logged). Source: Euro Monitor
<i>Services price</i>	833	4.77	Price index for Services. (logged). Source: Euro Monitor
<i>Semi-durable goods price</i>	833	4.84	Price index for Semi-durable goods (logged). Source: Euro Monitor
<i>Expenditure</i>	833	20.34	Total expenditure (logged)
<i>Urbanization rate</i>	833	68.20	Percentage of population living in urban areas. Source: World Development Indicators
<i>Unemployment rate</i>	833	7.68	Number of unemployed as percentage of working age population (ages 15-64). Source: World Development Indicators
<i>Median age in population</i>	833	30.72	Median age of population. Source: World Development Indicators
<i>Work force size</i>	833	65.03	Population between the ages 15-64 as percentage of total population. Source: World Development Indicators

**Europe Campus**  
**Boulevard de Constance**  
**77305 Fontainebleau Cedex, France**  
**Tel: +33 (0)1 60 72 40 00**  
**Fax: +33 (0)1 60 74 55 00/01**

**Asia Campus**  
**1 Ayer Rajah Avenue, Singapore 138676**  
**Tel: +65 67 99 53 88**  
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