

# Crisis and Consumption Smoothing

Pushan Dutt, V. Padmanabhan

INSEAD, Singapore 138676 {pushan.dutt@insead.edu, paddy.padmanabhan@insead.edu}

The dramatic impact of the current crisis on performance of businesses across sectors and economies has been headlining the business press for the past several months. Extant reconciliations of these patterns in the popular press rely on ad hoc reasoning. Using historical data on currency crisis episodes across the world, we show that the impact of the crisis on a firm's business is best understood by focusing on the impact of the crisis on the behavior of consumers. Our analyses show that consumer behavior in a crisis is characterized by consumption smoothing at various levels—intertemporal, intercategory, and intracategory. These behavioral adjustments result in significant reallocation of consumption expenditures. More importantly, the smoothing decisions because of 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.

*Key words:* consumer behavior; consumption smoothing; crisis; econometrics; marketing strategy

*History:* Received: May 27, 2009; accepted: December 1, 2010; Eric Bradlow served as the editor-in-chief and K. Sudhir served as associate editor for this article. Published online in *Articles in Advance* March 15, 2011.

## 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, McDonald's, 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 North America,  $-42\%$  in Latin America, and  $-27\%$  in Europe, Middle East, and Africa (EMEA) to  $+6\%$  in Asia-Pacific ex-China (Hall et al. 2009). In contrast, the pharmaceutical sector reported  $1.4\%$  growth in North America,  $15.3\%$  growth in Asia-Pacific and Africa, and  $5\%$  growth in Europe (Bae 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 most commonly attributed to the role of the category—necessity versus discretionary. However, there is a marked absence of evidence in the literature on how categories of goods and services are classified by consumers as

necessity and discretionary in the context of a crisis. The ad hoc nature of rationalization is clearly seen in the recent paper by Quelch and Jocz (2009). They suggest that categories such as food, clothing, shelter, and perhaps transportation and health care would be deemed essentials by consumers in a crisis, but then they go on to state that “beyond that, assignment of particular goods and services to various categories is highly idiosyncratic” (Quelch and Jocz 2009, p. 55). There are two problems with this hypothesis. First, there is no evidence to support the claim on what categories are deemed essential by consumer. More importantly, we will show that careful analysis of consumption expenditures in a crisis context reveals systematic patterns in the assignment by consumers of different goods and services to necessity versus discretionary status. In other words, consumer behavior in a crisis is carefully calibrated and is not idiosyncratic.

The key message of the paper is that decision makers seeking to obtain a proper assessment of the impact of the crisis on a their business need to start by understanding the impact of a crisis on their consumers' behaviors. This is very similar to the message of Quelch and Jocz (2009)—the difference is that our results are based on systematic empirical analyses of actual consumer expenditures across goods and services, across crisis episodes over the past five decades, and across countries. In particular, we show that following a crisis, there is active smoothing of consumption expenditures by consumers. This smoothing drives their decisions on *how much to spend*

and how to allocate the spending across their consumption basket, and it is these decisions that underpin the observed variance in the impact of a crisis across different categories and countries. Bradlow (2009) suggests that the current financial crisis represents a real opportunity for marketing academia to contribute to a better understanding of the impact of a crisis. We believe that the results in this paper, by setting forth a series of stylized facts, are a step in that direction.

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 because 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 nontrivial, a task that is further complicated by the fact that identifying a banking crisis involves subjective assessments. In this paper, we therefore focus on currency crisis.<sup>1</sup>

Consumers' responses to a crisis could manifest themselves in the following 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 to show precisely how consumers smooth their aggregate consumption expenditures over time if there is a crisis. We find that in developing countries, a crisis has a big immediate downward impact on consumption expenditure, and the independent effect of a crisis persists for four years. More interestingly, for more than 70% of developing countries, consumption expenditure declines by more than income in a crisis. There is no evidence of intertemporal consumption smoothing, and our results suggest a greater weight given by consumers to the precautionary motive of saving in the face of a crisis. In contrast, for developed countries, a crisis does not directly affect consumption expenditure once we control for changes in income and interest rates.

- 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 fourfold classification of consumer expenditures (spending on durable goods, nondurable goods, and semidurable 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 which categories are considered as necessity versus discretionary by consumers in times of crisis. Our results show that consumers in developing countries reallocate expenditure from durables and semidurables toward the nondurables category. In developed countries, consumption smoothing benefits the services sector at the expense of durables.

- Finally, consumers could also engage in intracategory consumption smoothing by reallocating expenditures across the different subcategories within each of the four different categories. We show using disaggregate subcategory expenditures that consumers engage in consumption smoothing within each of the four classes of goods and services as well.

In summary, by examining consumption expenditures at various levels of analysis—intertemporal, intercategory, and intracategory—we highlight the rich patterns of consumption smoothing that characterize consumer behavior in a crisis. 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 this 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 fourfold classification of consumption to illuminate the patterns of consumption smoothing across categories. Section 6 analyzes intracategory consumption smoothing. Section 7 highlights the implications of these findings and concludes with limitations and 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 et al. 1996). A third set of papers use a nonparametric approach to evaluate the usefulness of several variables in signaling an impending crisis (Kaminsky et al. 1998). The focus of this

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

empirical literature has been on broad macroeconomic aggregates such as gross domestic product (GDP), current account, and GDP growth. Surprisingly, it is silent on the impact of a crisis on consumption expenditure. The lack of research on the impact of a crisis on consumption expenditure is puzzling because 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 (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 trigger changes in consumption. However, this is inconsistent with our data, which show 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 toward 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. Furthermore, 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 et al. (2007), Van Heerde et al. (2007), and Klein and Dawar (2004) have focused on the implications of product-harm crisis. Pennings et al. (2002) have focused on the implications of the mad cow disease crisis. However, we have not been able to uncover any work that focuses on the marketing implications of an economic crisis. The closest work in spirit is the literature in marketing on the impact of business cycles. Deleersnyder et al. (2004) show that consumer durables are more sensitive to business cycle fluctuations than general economic indicators. In addition, they find that sales fall more quickly during contractions, whereas they adjust upward 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. Our focus in this paper is on economic crisis and not business cycles. Economic crisis affects the periodicity of the business cycle, and in that sense, there is a relation to this stream of work. In addition, 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 U.S. 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. Although 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>

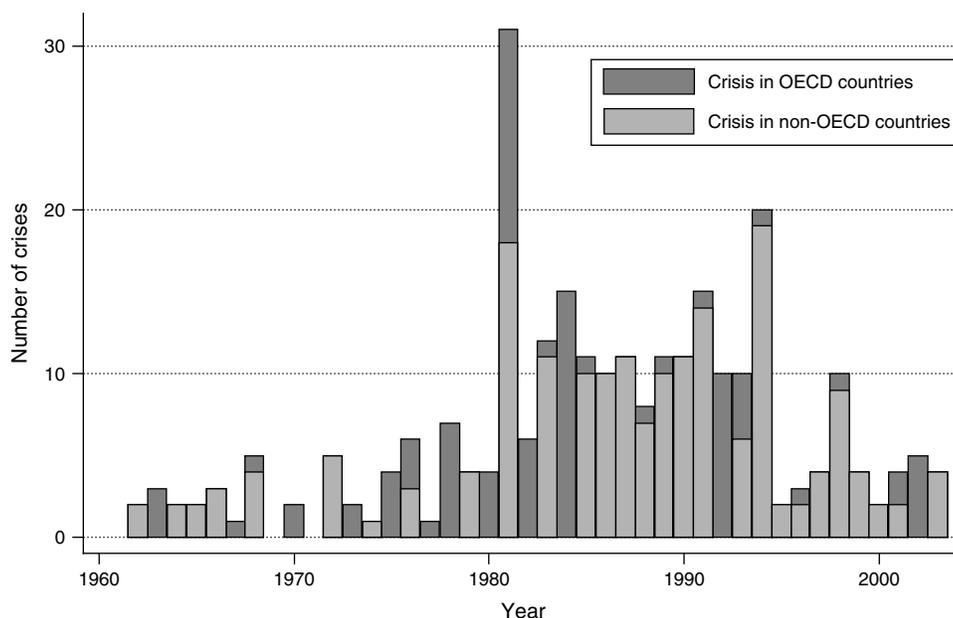
- at least a 20% nominal depreciation of its currency, and<sup>3</sup>
- also at least a 10% increase in the rate of depreciation of the exchange rate.<sup>4</sup>

<sup>2</sup> Eichengreen et al. (1996) define a currency crisis to include both the large depreciations that we consider here as well as speculative attacks that are successfully warded off by the authorities. Unfortunately, unsuccessful speculative attacks 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 make 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 exchange rate mechanism (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> Many countries, such as Argentina in the 1980s, experienced changes in the exchange rate of 20% or more—year after year. Therefore, we also require that the change in the exchange rate

Figure 1 Number of Currency Crises per Year



Note. OECD, Organization for Economic Co-operation and Development.

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. We use data on exchange rates from International Financial Statistics to construct a dummy variable, which takes the value 1 in the year of the crisis. Our data span 99 countries over the period 1960–2003. Using the above definition of currency crisis, we obtain 273 episodes of currency crisis, which is approximately 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. As a robustness check, we also predict the probability of a currency crisis and use this predicted probability instead of the categorical classification. Such a construct allows us to capture the severity of the crisis as well.<sup>5</sup>

#### 4. Intertemporal Consumption Smoothing

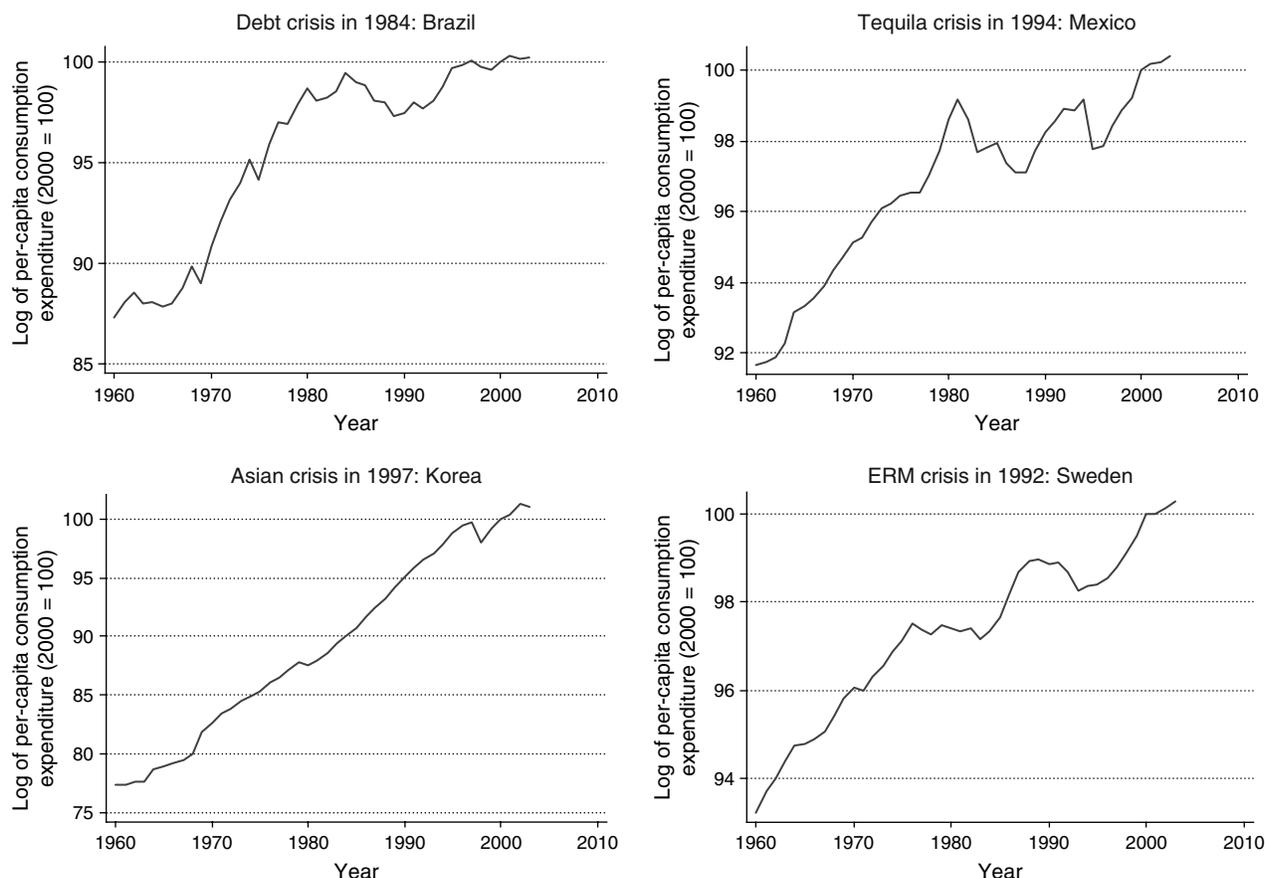
As mentioned earlier, one of the ways consumers could respond to a crisis is by changing how much they spend (i.e., changing the size of the wallet). We

not only exceed 20% but exceed the previous year's change in the exchange rate by a margin of at least 10%. This is a conservative specification and avoids counting the same crisis event multiple times.

<sup>5</sup> The table in the appendix lists the variables, summary statistics, and data sources used.

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 the patterns of intertemporal consumption smoothing. The graphs in Figure 2 show the reaction of consumer expenditure to four major crisis events: (a) the debt crisis in Brazil in 1984, (b) the ERM crisis in Sweden in 1992, (c) the Tequila crisis in Mexico in 1994, and (d) the Asian crisis in South Korea in 1997. In all cases, we see a significant drop in per-capita consumption expenditure. Across these four cases, we also see interesting variations. First, for both South Korea and Sweden, the impact of the currency crisis is moderate and short-lived. Moreover, the growth rate of per-capita consumption (as shown by the slope of the lines) does not seem to have been affected by the crisis—for Korea, the trend in the growth rate resumes shortly after the crisis, whereas in Sweden, it accelerates about two years after the crisis. For Brazil and Mexico, the impact is more pronounced, and recovery takes nearly a decade. The upward trend turns into a downward trend postcrisis. Consequently, we (1) estimate not just the contemporaneous impact of a crisis but also the time horizon over which the impact persists, (2) present estimates separately for developing and developed countries, and (3) carefully control for either common time trends or country-specific trends, paying attention to concerns of non-stationarity. We use two methodologies to do this: (1) the Arellano–Bond (1991) generalized method of moments (GMM) estimator and (2) the Pesaran–Smith mean group (MG) and pooled mean group (PMG) estimator.

Figure 2 Consumer Expenditure Index and Currency Crisis



#### 4.1. Arellano–Bond (1991) GMM Estimation

We follow Davidson et al. (1978) and Haque and Montiel (1989) in our specification of aggregate consumption function and 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). Although the literature rejects this contention (see Campbell and Mankiw 1990), it is plausible that per-capita consumption expenditure depends on its past values.<sup>6</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:

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

where  $C_{it}$  is per-capita consumption in country  $i$  at time  $t$ ,  $C_{it-1}$  is lagged per-capita consumption in

country  $i$ ,  $\text{crisis}_{it-k}$  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,  $\pi$  denotes inflation, and  $v_{it}$  is the error term.<sup>7</sup> The country dummies should control for unobserved and time-invariant country-specific effects, whereas the time trend should capture global trends in per-capita consumption. All crisis lags that were significant and resulted in an 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

<sup>6</sup>Theories of habit persistence in consumption, for example, can also generate such lagged dependence. See Fuhrer (2000).

<sup>7</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 characteristics and varies little over time, they will be subsumed within the country-specific effect  $\eta_i$ .

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 intertemporal 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>8</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 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. With  $T \geq 30$  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 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:

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

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>9</sup> Finally, to control for heteroskedasticity, we report results using the two-step

<sup>8</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.

<sup>9</sup> When  $T$  is large, there may be 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.

GMM estimator and employ a finite-sample correction to the two-step covariance matrix. We present results that account for a common time trend and country-specific time trends.

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. Here, consumption expenditure is expenditure by private households and not by firms or governments.<sup>10</sup> Data on per capita income are obtained from Penn World Tables. For all countries, per-capita consumption and income are converted to constant 2000 U.S. dollars on a purchasing power parity (PPP) basis and are presented in log terms.<sup>11</sup> Finally, 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 whether there is variance in the magnitude and duration of impact of the crisis across developed and developing countries.<sup>12</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

<sup>10</sup> Household final per-capita consumption expenditure is the market value of all goods and services, including durable products, purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits and licenses. However, household consumption expenditures include the expenditures of nonprofit institutions serving households. Only a handful of countries report expenditures of nonprofit institutions serving households. Moreover, for 99% of these observations, expenditure by nonprofits is less than 5% of overall per-capita consumption expenditure. Even for this reduced sample, our overall results are supported.

<sup>11</sup> PPP conversion factor is the number of units of a country's currency required to buy the 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>12</sup> Originally, the OECD members consisted of only rich countries. However, over time, it added middle-income and developing countries such as Mexico, Poland, and Korea. Because we are interested in distinguishing the crisis impact along the developed and developing country dimension, we restrict the OECD sample to the 24 countries that 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.

**Table 1** Impact of Currency Crisis on Aggregate Consumption: Arellano–Bond (1991) GMM Estimator

Variable	(1) Per-capita consumption expenditure (OECD)	(2) Per-capita consumption expenditure (OECD)	(3) Per-capita consumption expenditure (OECD)	(4) Per-capita consumption expenditure (non-OECD)	(5) Per-capita consumption expenditure (non-OECD)	(6) Per-capita consumption expenditure (non-OECD)
Per-capita consumption ( $t - 1$ )	0.888*** (0.034)	0.399*** (0.051)	0.464*** (0.056)	0.712*** (0.009)	0.618*** (0.024)	0.820*** (0.019)
Crisis event ( $t$ )	-0.037*** (0.007)	-0.008 (0.005)	-0.002 (0.014)	-0.035*** (0.002)	-0.030*** (0.002)	-0.039*** (0.001)
Crisis event ( $t - 1$ )	-0.029*** (0.007)	-0.012 (0.009)	-0.002 (0.014)	-0.018*** (0.001)	-0.014*** (0.001)	-0.019*** (0.001)
Crisis event ( $t - 2$ )	-0.003 (0.005)	-0.001 (0.011)	0.010 (0.013)	-0.010*** (0.001)	-0.007*** (0.001)	-0.010*** (0.001)
Crisis event ( $t - 3$ )	-0.012*** (0.003)	-0.008 (0.012)	0.001 (0.012)	-0.001 (0.001)	0.001 (0.001)	-0.004** (0.001)
Per-capita GDP		0.570*** (0.038)	0.503*** (0.032)		0.304*** (0.017)	0.029*** (0.003)
Inflation		-0.014 (0.051)	-0.025 (0.039)		0.0003*** (0.000)	0.0004*** (0.000)
Observations	950	944	944	2,960	2,719	2,719
Number of countries	24	24	24	74	74	74
Number of crisis episodes	38	38	38	235	235	235
Overall model test	1207.84***	11,424.38***	2,339.12***	13,850.66***	821,88.16***	19,154.95***
Specification test $p$ -values						
OID test	1.00	1.00	1.00	0.99	1.00	1.00
Serial correlation: AR(1) test	0.65	0.02	0.03	0	0	0
Serial correlation: AR(2) test	0.45	0.24	0.29	0.58	0.63	0.52

*Notes.* All variables except inflation and crisis dummies are logged. All columns except 3 and 6 include a trend term (not shown). Columns 3 and 6 use detrended per-capita consumption expenditure data where a country-specific trend term is used. 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 that joined after 1973 such as Mexico, Korea, Poland, Hungary, Slovakia, and Czech Republic are classified as non-OECD. Per-capita consumption expenditure and incomes are logged. Robust standard errors are in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

the effects, the results in column 1 of Table 2 imply that a crisis event reduces per-capita consumption expenditure by approximately 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 is 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 4 shows that the crisis reduces consumption the year of the crisis and two years after the crisis. Now, even when we add income and inflation in column 5, 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 the part of consumers.<sup>13</sup> Of the 235 crisis episodes in column 4, in only 44 was the decline in income greater than 4.31%, whereas in 191 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 because 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>14</sup>

<sup>13</sup> The critical value of 4.31% is calculated as  $\delta_0/(1 - \beta)$ .

<sup>14</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

**Table 2** Impact of Currency Crisis on Aggregate Consumption: Mean Group and Pooled Mean Group Estimator

Variable	(1) Mean group (OECD)	(2) Pooled mean group (OECD)	(3) Mean group (non-OECD)	(4) Pooled mean group (non-OECD)
<b>Long run</b>				
Per-capita GDP	0.911*** (0.030)	0.955*** (0.006)	0.675*** (0.143)	0.845*** (0.009)
Inflation	0.131 (0.109)	0.217*** (0.033)	0.046 (0.095)	0.003 (0.002)
<b>Short run</b>				
Crisis event ( $t$ )	0.001 (0.002)	−0.000 (0.002)	−0.014* (0.008)	−0.020** (0.010)
Crisis event ( $t - 1$ )	−0.000 (0.003)	−0.002 (0.004)	−0.015** (0.007)	−0.019** (0.007)
Crisis event ( $t - 2$ )	0.001 (0.003)	−0.000 (0.004)	−0.012** (0.005)	−0.013*** (0.005)
Crisis event ( $t - 3$ )	−0.003 (0.002)	−0.003 (0.002)	−0.006 (0.005)	−0.004 (0.004)
Per-capita GDP	0.366*** (0.027)	0.518*** (0.044)	0.466*** (0.046)	0.557*** (0.041)
Inflation	−0.084*** (0.031)	−0.081*** (0.026)	0.025 (0.016)	0.043*** (0.015)
Error correction coefficient	−0.325*** (0.032)	−0.171*** (0.032)	−0.309*** (0.026)	−0.186*** (0.014)
Observations	944	944	2,704	2,704
Number of countries	24	24	74	74
Number of crisis episodes	38	38	235	235

*Notes.* 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 that joined after 1973 such as Mexico, Korea, Poland, Hungary, Slovakia, and Czech Republic are classified as non-OECD. Per-capita consumption expenditure and incomes are logged. Standard errors are in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

The results discussed so far include a common global trend variable. Even though the trend component differs for OECD and non-OECD countries, the assumption of a common trend variable for each of these country groupings may be too strong an assumption. Therefore, Columns 3 and 6 use detrended per-capita consumption expenditure for OECD and non-OECD countries, respectively. The detrending is done on a country-by-country basis, and a country-specific time trend is removed from per capita consumption expenditure. However, this does not change our results substantively. The estimates in column 3 are very close to ones in column 4 and the estimates in columns 5 and 6 are close to one another as well. In other words, we have very similar results on consumption smoothing regardless of the trend adjustment.

The GMM estimator is consistent provided the error term  $v_{it}$  is not serially correlated and provided the

significant in non-OECD countries, whereas none of the dummies is significant in OECD countries. Note that this is equivalent to estimating (1) and restricting  $\beta = 1$ .

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 indicates 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 overidentifying 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 of serial correlation in  $v_{it}$ .

## 4.2. Pesaran–Smith (1995) Mean Group and Pooled Mean Group Estimator

The Arellano–Bond (1991) GMM methodology pools countries together and allows only the intercepts ( $\eta_i$ ) to differ across the groups. Phillips 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 because the crisis variables are coded as dummies, which are stationary.

Pesaran and Smith (1995) and Pesaran et al. (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 (including the time trend parameter), 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>15</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 autoregressive distributed lag model for consumption as

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

Setting  $C_{it} = C_{it-1}$ ,  $y_{it} = y_{it-1}$ ,  $\pi_{it} = \pi_{it-1}$ , and  $\text{crisis}_{it-k} = 0$  for all  $k$ , we obtain a long-run consumption function as

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

<sup>15</sup> Of course, the long-run consumption expenditure will not be a function of the crisis because a crisis is by definition a temporary event. In the long run steady state, the crisis dummy will take a value of zero.

If all variables are integrated of order 1, then  $u_{it}$  is an  $I(0)$  process for all  $i$ .<sup>16</sup> The error-correction reparameterization of (2) is

$$\begin{aligned} \Delta C_{it} = & \phi_i (C_{it-1} - \theta_{0i} - \theta_{1i} y_{it} - \theta_{2i} \pi_{it} - \tau_i^* t) \\ & - \beta_{1i} \Delta y_{it} - \gamma_{1i} \Delta \pi_{it} + \delta_0 \Delta \text{crisis}_{it} + \dots \\ & + \delta_k \Delta \text{crisis}_{it-k} + v_{it} \end{aligned} \quad (4)$$

where  $\phi_i = -(1 - \alpha_i)$  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  $\theta_{1i} = (\beta_{0i} + \beta_{1i}) / (1 - \alpha_i)$  and  $\theta_{2i} = (\gamma_{0i} + \gamma_{1i}) / (1 - \alpha_i)$ , and the  $\delta$  coefficients are again of primary interest, capturing the 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  $\theta_{2i}$ , and 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 is significant. Column 2 shows the PMG 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 0–2. Similar to the findings in Table 1, in non-OECD countries a currency crisis results in a decline in consumption over and

<sup>16</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, the 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 stationarity test rejects the null that the three variables are integrated of order 1.

above that induced by income in 192 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 whereas 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 results 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>17</sup>

<sup>17</sup> We went beyond the OECD- and non-OECD classification and checked for other interesting categorizations. First, we classified

### 4.3. Alternate Measure of Crisis

To estimate the impact of a crisis, we have used a dummy variable that takes the value 1 in the event of a crisis. This is the standard approach taken in the literature on the impact of a currency crisis (see Eichengreen et al. 1996, Hong and Tornell 2005, Reinhart and Rogoff 2009b). The major advantage of this approach is that it is easy to identify and interpret the coefficients. However, such a specification does not distinguish between a severe and mild crisis—all exchange rate changes that cross the thresholds of 20% for the exchange rate and 10% for the depreciation rate are treated in a symmetric fashion. Second, unsuccessful speculative attacks on the currency, which may trigger a near crisis but may fail to cross the 20% nominal depreciation threshold in the definition of a crisis, would be treated equivalently to a tranquil episode where there was no pressure on the exchange rate, which is clearly not the case. Therefore, as a first robustness check, we experimented with alternate thresholds for exchange rate movements, none of which significantly altered our results.

Next, we predict the probability of a currency crisis and use this predicted probability instead of the 0–1 categorical classification. The predicted probability is a continuous measure—it admits greater variation and is potentially helpful in capturing the severity of a crisis.<sup>18</sup> As a first step, we estimate a probit model with the crisis event as a discrete dependent variable that is a function of a vector  $\mathbf{W}$  of explanatory variables that are potential predictors of a currency crisis.<sup>19</sup> We predict the probability of a crisis

---

countries into oil exporters versus oil importers. However, because only 11 countries in our sample are oil exporters, we do not have sufficient observations in the oil exporter sample to identify the coefficients with high levels of precision. For the oil importer sample, we further reclassified countries into OECD versus non-OECD and our results continue to hold. Next, we classified countries into net exporters (exports > imports) and net importers (exports < imports). For both sets of countries, we find that the crisis has an impact on consumption over and above that on income and that this effect persists for four years. Furthermore, reclassifying either net exporters or net importers into OECD versus non-OECD supports out main results, that the impact of a crisis over and above that on income manifests itself mainly in non-OECD countries. We find that the negative impact of a crisis on consumption expenditures is magnified by countries that had a higher real interest rate. Finally, portfolio flows and capital controls are a key mechanism through which a crisis unfolds. However, data on portfolio flows and capital controls are sparse and of very recent vintage, which means that we cannot investigate this issue in detail.

<sup>18</sup> It also allows us to incorporate events in countries, where by conventional wisdom, the country did experience a crisis but where the currency depreciation failed to cross the 20% threshold. An example would be the United Kingdom and France during the ERM crisis.

<sup>19</sup> It may be argued that rather than using big discrete jumps in exchange rates to define crisis events, we could simply use the

conditional on  $\mathbf{W}$  as  $\hat{p}_{it} = P(\text{crisis}_{it} = 1 \mid \mathbf{W}_{it}) = \Phi(\mathbf{W}_{it}\gamma)$  and use  $\hat{p}_{it}$  in lieu of the crisis dummy in Equations (1) and (4). In choosing the variables in  $\mathbf{W}$ , we draw on the extant literature on currency crises (see Jeanne 2000 for a survey). Our choice is also guided by two additional criteria: first, these variables should affect the probability of a crisis, and second, they should not directly influence per-capita consumer expenditure. In other words, while emphasizing the alternate (continuous) measure of a currency crisis, we also pick variables in  $\mathbf{W}$  such that, at least in theory, there are plausible exclusion restrictions (may be excluded from Equations (1) and (4)).<sup>20</sup> All variables in  $\mathbf{W}$  are lagged by one year.

Early models of currency crisis emphasize loose fiscal and monetary policies as key triggers of a currency crisis. However, both measures may affect consumer expenditures directly—monetary policy by reducing interest rates and fiscal policy through tax cuts and/or government subsidies. One common underlying characteristic of all countries that experienced a crisis was the vulnerability of the country to a speculative currency attacks. Later models of currency crisis emphasize that such vulnerability shifts perceptions of economic agents regarding the exchange rates and may trigger a crisis. To capture the vulnerability of countries to such self-fulfilling speculative attacks, we include in  $\mathbf{W}$  the ratio of reserves to imports, the current account surplus as a percentage of GDP, and the degree of overvaluation of the exchange rate. All of these variables should affect only the composition of consumer expenditure, between spending on imports and domestic goods, and not the level of expenditures, per se. Data on these variables are obtained from the International Financial Statistics and the World Development Indicators. We also include two variables as measure of institutions in our model. Our choice of these variables is guided by prior research (Dutt and Mobarak 2007, Acemoglu et al. 2003, La Porta et al. 1998) that shows that these institutions influence the likelihood of adoption of sound macroeconomic policies, and hence the likelihood of a crisis. The first is the political constraints measure of Henisz (2000), which captures the checks and balances on executive decision making and on policy formulation. The second is the legal tradition in a country—we use

exchange rate itself and capture all changes in exchange rates, big or small. However, much research has underscored the inadequacy of models linking macroeconomic variables to the exchange rate (Meese and Rogoff 1983 is the classic reference).

<sup>20</sup> In Table 1, we also added controls for per-capita GDP and interest rates. However, it may be plausibly argued that we continue to have an omitted variable problem—an omitted variable is driving both the likelihood of a crisis and the magnitude of fall in consumption expenditures. This procedure should help in alleviating the omitted variable critique as well.

a dummy variable that equals one for countries based on a common law tradition.<sup>21</sup>

The first-stage regression yields

$$\begin{aligned} \hat{p}_{it} = & -1.10 - 0.293 (\text{political constraints}) \\ & - 0.184 * (\text{common law}) \\ & - 0.034 * (\text{reserves}) - 0.009 * (\text{current account}) \\ & + 0.001(\text{overvaluation}). \end{aligned}$$

All coefficients are significant at the 5% level of significance. Next, we use the predicted probabilities of the crisis, at various lags from the above regression to estimate Equations (1) and (4).

Columns 1 and 2 of Table 3 present the Arellano–Bond results with the predicted probability of crisis, for OECD and non-OECD countries, where both columns include a time trend and country fixed effects. As before, we find that for OECD countries, there is no independent impact of the crisis probability itself. For non-OECD countries, the predicted probability of crisis affects consumer expenditure contemporaneously as well as at lags 1 and 2. The coefficient estimates in column 2 imply that a one standard deviation increase in the probability of crisis reduces consumption expenditure by 0.82% in the year of the crisis. In columns 3 and 4, we present the Pesaran–Smith Mean Group estimator. The estimates are very similar to the ones obtained with the crisis dummy. For OECD countries, there is no evidence of consumption smoothing once we control for per-capita incomes, whereas non-OECD countries reduce per-capita consumption expenditures at lags 0–3 even controlling for per-capita incomes.

#### 4.4. The Role of Consumer Confidence

So far, we have shown that per-capita consumption expenditures decline more than income highlighting the influence of the precautionary motive. In this subsection, we provide some suggestive evidence by incorporating data on consumer confidence indices. The logic is that a crisis is likely to engender a decline in consumer confidence, and this decline may help account for the decline in consumer expenditure over and above the decline in income. However, historical data on consumer confidence are sparse and available for only 31 countries, of which only 10 are non-OECD countries. Therefore, we do not disaggregate results into OECD and non-OECD because we do

<sup>21</sup> The common law tradition originates in the laws of England, and through conquest and colonization, spread to England’s colonies, including the United States, Australia, Canada, and many countries in Africa and Asia. The civil law tradition has its roots in the Roman law and was adopted by several continental states, including France. See Glaeser and Shleifer (2002) for a historical perspective.

**Table 3** Impact of Probability of Currency Crisis on Aggregate Consumption: Arellano–Bond (1991) and Mean Group Estimator

Variable	(1)	(2)	(3)	(4)
	Arellano–Bond (OECD)	Arellano–Bond (non-OECD)	Mean group (OECD)	Mean group (non-OECD)
Crisis probability ( $t$ )	−0.034 (0.087)	−0.230*** (0.042)	0.136 (0.132)	0.149 (0.102)
Crisis probability ( $t - 1$ )	−0.150 (0.098)	−0.395*** (0.026)	0.019 (0.159)	−0.202** (0.105)
Crisis probability ( $t - 2$ )	0.037 (0.136)	−0.321*** (0.050)	−0.173 (0.158)	−0.350*** (0.111)
Crisis probability ( $t - 3$ )	0.020 (0.091)	0.017 (0.083)	−0.075 (0.116)	−0.257** (0.108)
Per capita GDP	0.547*** (0.037)	0.725*** (0.019)	0.375*** (0.042)	0.503*** (0.029)
Inflation	−0.031** (0.016)	−0.001*** (0.000)	−0.061 (0.042)	−0.0002 (0.0004)
Per-capita consumption ( $t - 1$ )	0.432*** (0.058)	0.297*** (0.017)		
Long-run coefficients				
Per-capita GDP			1.090*** (0.082)	0.818*** (0.033)
Inflation			0.227 (0.216)	0.002 (0.002)
Error correction coefficient			−0.350*** (0.037)	−0.278*** (0.020)
Observations	572	1,399	572	1,399
Number of countries	22	72	22	72

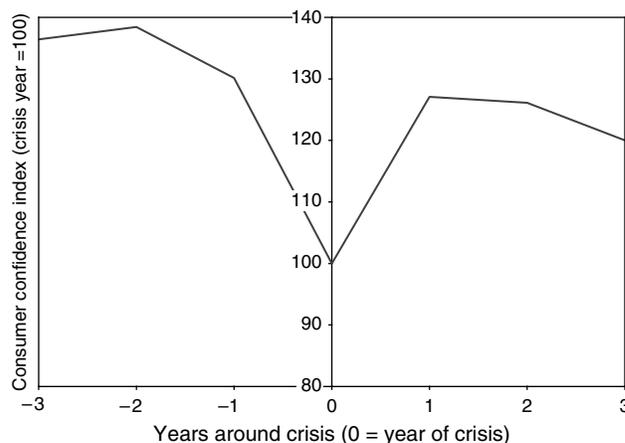
*Notes.* All columns use the predicted probability of a crisis instead of the crisis event dummy. The probability of a crisis is predicted using a probit model that regresses the crisis dummy on macroeconomic and institutional variables. All variables except inflation and crisis probability are logged. All columns include a constant and a time trend (not shown). Columns 1 and 3 restrict the sample to OECD countries. Columns 2 and 4 restrict the sample to non-OECD countries. Only countries that joined the OECD prior to 1973 were classified as OECD countries. Countries that joined after 1973 such as Mexico, Korea, Poland, Hungary, Slovakia and Czech Republic are classified as non-OECD. Per-capita consumption expenditure and incomes are logged. Standard errors are in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

not have sufficient observations for each subset of countries, and we pool the data. The data on consumer confidence indices are from two sources. The first is the OECD Statistics database, which provides these data not just for developed OECD countries but also for select non-OECD countries, including Brazil, China, India, and Mexico. We supplemented this with data from MasterCard International that provided us with consumer confidence metrics for six Southeast Asian countries (Hong Kong, Indonesia, Malaysia, the Philippines, Thailand, and Taiwan) from 1993 onward. This allows us to include the 1997 Asian crisis episodes.<sup>22</sup> The consumer confidence index for each country takes the value 100 in the year 2000.

Consumer confidence declines significantly (approximately 13%) in the year of the crisis. Figure 3 presents an event study of the evolution of the consumer confidence index around the year of the crisis. We have data for 15 crisis episodes, and we set the consumer confidence index to 100 in the year

of the crisis for each crisis episode. We average the consumer confidence index across crisis episodes and show this average index three years before and three years after the crisis. On average, consumer confidence index declines sharply in the year of the

**Figure 3** Consumer Confidence Index Around a Currency Crisis (Event Study)

<sup>22</sup> Taiwan drops out because of missing data on other variables.

crisis and fails to recover to precrisis levels even three years after the crisis. This closely tracks our results from the previous subsection, which shows that consumer expenditures decline not just in the year of the crisis but also in each of the three years following the crisis. It supports the precautionary motive—the decline in consumer confidence is likely reflected in the decline in consumption expenditures over and above that predicted by the decline in incomes alone.

Finally, we reestimate Equation (1), where we include the consumer confidence index as an additional explanatory variable, treating this variable as predetermined because this is a forward-looking variable. This yields the following estimated coefficients (with standard errors in parentheses;  $Obsv = 536, N = 30$ ):

$$C_{it} = \underset{(0.05)}{0.53} C_{it-1} + \underset{(0.05)}{0.44} y_{it} - \underset{(0.003)}{0.05} \pi_{it} - \underset{(0.004)}{0.011} crisis_{it} \\ - \underset{(0.005)}{0.007} crisis_{it-1} - \underset{(0.005)}{0.0001} crisis_{it-2} \\ - \underset{(0.003)}{0.0001} crisis_{it-3} + \underset{(0.0001)}{0.001} cci_{it}.$$

We see that the coefficient on the consumer confidence index ( $cci$ ) is positive and strongly significant, suggesting that a decline in consumer confidence results in a decline in consumption. More interestingly, now the crisis dummies lagged 1–3 years are no longer significant.<sup>23</sup> In other words, once we control for the consumer confidence index, higher lags of the crisis episodes do not significantly reduce consumption. Instead, the effect is absorbed by the index of consumer confidence. However, the coefficient on the crisis dummy in the year of the crisis continues to be negative and significant, although it declines in terms of magnitude. Overall, our results show that a crisis leads to a significant decline in consumer confidence, that the decline is the strongest in the year of the crisis, and this effect persists for multiple years after a crisis. When we include the consumer confidence index as an explanatory variable, the higher lags of crisis dummies are no longer significant, suggesting that the decline in consumption is mediated through a decline in consumer confidence. Consumers become more precautionary as they lose confidence following a crisis, which is reflected in a decline in consumption over and above that of declines in income. However, the sharp contraction in consumption in the crisis year is over and above the decline in incomes as well as the consumer confidence index. Therefore, even the consumer confidence index may underestimate the actual decline in consumption in the year of the crisis.

<sup>23</sup> If we estimate Equation (1) without the consumer confidence index and restrict the sample to the 536 observations for which we have data on consumer confidence, we obtain negative and significant coefficients on the crisis dummies at all lags.

## 5. Intercategory 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 use the 1993 System of National Accounts (SNA) classification of individual consumption expenditure by purpose, also known as COICOP, for assessing the impact of a crisis on consumption expenditures at the disaggregate level.<sup>24</sup> At the individual consumption level, COICOP is divided into four classes: services, nondurables, semidurables, and durables. Although the COICOP is not strictly linked to any particular model of consumer behavior, the purposes broadly reflect differences in income elasticities. For instance, lower-income households spend relatively high proportions of their income on nondurables and semidurables, whereas wealthier households spend more on durables and services. The SNA-based functional classifications are now the commonly used formats by countries with adaptation as required for their national requirements.<sup>25</sup>

We use data from Euromonitor on consumer expenditures for various categories, at various levels of disaggregation, as well as price indices for these categories.<sup>26</sup> The data cover 54 countries over the period 1990–2006. Euromonitor first classifies goods into four broad categories: durables, nondurables,

<sup>24</sup> This was ratified by the OECD in 1998 and subsequently approved by the United Nations Statistical Commission in 1999 and further updated in 2004 (Updates and Amendments to the System of National Accounts 1993, Studies in Methods Series, F/2, revision 4, addendum 1; United Nations, Department of Economic and Social Affairs, Statistics Division, New York, 2004).

<sup>25</sup> For instance, the U.S. Bureau of Economic Analysis adopted a three-class system using durables, nondurables, and services. The classification of semidurables was not used because it would require changes going back to the beginning of the National Income and Product Accounts in the presentation of GDP by type of product, as well as classification of exports and imports (McCully and Teensma 2008).

<sup>26</sup> The price indices are Laspeyres' price indices, which are weighted averages of prices of all goods in a particular category with base period quantities used as weights. Although these are subject to country-specific measurement error, using country fixed effects will attenuate this somewhat. The drawback of the Laspeyres index is substitution bias—by using base quantities as weights, it does not allow for substitution between goods as relative prices change. Chained price indices allow for such substitution. However, Feenstra and Shapiro (2003) argue that one must consider substitution over time as well, because consumers can accumulate inventory in response to price promotions. They use scanner data on purchases by individuals to show that in the presence of intertemporal substitution effects, chained indices have a pronounced upward bias, whereas a fixed-base Laspeyres index does not.

semidurables, and services. This fourfold classification or an alternate threefold classification (durables, nondurables, and services) is the one most commonly used in the literature on consumption smoothing (Browning and Crossley 2009, Browning and Collado 2001).

Consumer expenditure (total or by category) comprises personal expenditure on goods and services produced in the domestic market. It is calculated as follows: Consumer expenditure by resident households – Direct purchases abroad by resident households + Direct purchases in the domestic market by nonresident households. Direct purchases abroad by resident households and in the domestic market by nonresident households cover expenditures by diplomats, military personnel, tourists, and seasonal workers who remain in foreign countries for less than a year. Consumer expenditure from Euromonitor does not include either business expenditures or expenditures by nonprofit organizations. Moreover, all expenditures by individuals and households are deemed as consumption expenditure except for housing purchases. For housing, Euromonitor imputes rents for owner-occupied housing and includes this as consumer expenditure in the services category. For tenant-occupied housing, they use actual rentals. Therefore, all changes in consumption expenditures and category shares can be attributed to decisions by private individuals and households, not to governments or businesses.

We start by looking at the impact of a crisis on per-capita expenditure (logged) in each of the four categories, separately for OECD and non-OECD countries. Table 4 is a first look at the impact of a crisis

and should be useful for marketing managers in generating baseline estimates of impact. First, we see that expenditure on durables falls significantly for four years into a crisis in both OECD and non-OECD countries. Semidurables also decline for four consecutive years in both sets of countries, even though the magnitude of the impact of the crisis is less than that of durables. However, for the other two categories, the patterns vary significantly across the two sets of countries. Neither services nor nondurables are significantly affected by a crisis in OECD countries. Per-capita expenditure devoted to the services category, however, significantly declines in non-OECD countries. Nondurables see the smallest impact in non-OECD countries, with minor declines one and two years after the crisis.

Next, we move from the simple impact of a crisis to examine whether there is evidence of category-level consumption smoothing—that is, whether and how consumers adjust the expenditure shares devoted to various categories of goods and services. 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 (Udry 1994), selling assets (McKenzie 2006), etc. However, such choices may be infeasible in the case of a currency crisis, especially for crises 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

**Table 4** Impact of Currency Crisis on Category Expenditure on Four Categories

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Durables (OECD)	Nondurables (OECD)	Services (OECD)	Semidurables (OECD)	Durables (non-OECD)	Nondurables (non-OECD)	Services (non-OECD)	Semidurables (non-OECD)
Crisis event ( $t$ )	–0.233*** (0.044)	–0.020 (0.020)	–0.037 (0.028)	–0.123*** (0.042)	–0.182*** (0.055)	–0.043 (0.047)	–0.128*** (0.048)	–0.075* (0.044)
Crisis event ( $t - 1$ )	–0.165*** (0.044)	–0.001 (0.020)	–0.033 (0.028)	–0.084** (0.042)	–0.207*** (0.051)	–0.103** (0.044)	–0.182*** (0.045)	–0.112*** (0.042)
Crisis event ( $t - 2$ )	–0.097** (0.044)	0.003 (0.020)	–0.024 (0.028)	–0.079* (0.042)	–0.161*** (0.051)	–0.083* (0.044)	–0.129*** (0.045)	–0.078* (0.042)
Crisis event ( $t - 3$ )	–0.081* (0.044)	–0.005 (0.020)	–0.019 (0.028)	–0.072* (0.042)	–0.147*** (0.052)	–0.070 (0.044)	–0.102** (0.046)	–0.080* (0.042)
Constant	7.282*** (0.021)	8.184*** (0.009)	8.845*** (0.013)	7.037*** (0.019)	4.714*** (0.043)	6.318*** (0.037)	6.312*** (0.038)	4.510*** (0.036)
Observations	308	308	308	308	490	490	490	490
Number of countries	22	22	22	22	35	35	35	35
Overall model test	18.07***	30.51***	64.13***	5.82***	5.56***	3.04***	10.73***	3.09***

*Notes.* Columns (1)–(4) present the estimates for OECD countries; columns (5)–(8) show it for non-OECD countries. Each column includes country fixed effects and a time trend (not shown). Per-capita consumption expenditure for each category are logged. Standard errors are in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

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 necessity versus discretionary in the context of a crisis. This is important because much of the current writing on the marketing implications of a crisis (e.g., Quelch and Jocz 2009) relies on informal metrics for categorization of goods as necessity versus discretionary. In addition, it is unclear whether the academic characterization of necessity 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 because of a crisis. The methodology derives 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. Deaton and Muellbauer (1980) provide the microfoundations, derive demand functions from a utility-maximization exercise, and express demand functions in expenditure/budget share form. 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 subcategories) data (Deaton and Muellbauer 1980). 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) as follows:

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

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  $i$ ,  $\text{crisis}_{it}$  is the crisis dummy at time  $t$ , and  $\text{crisis}_{it-1}$  is the crisis dummy

lagged by one year.<sup>27</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 Muellbauer (1980) recommend replacing this price index with Stone's price index, defined as

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

Because 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 and Unnevehr (1988), we use the lagged share  $w_{jt-1}^i$  in Equation (7). We also impose the following constraints on the coefficients:<sup>28</sup>

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

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

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

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. Because budget shares  $w_{jt}^i$  always sum to 1, 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. We eliminate the share equation for semidurables from the system. 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  $\delta$ s allow us to examine whether 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 adjustments are through relative price and income changes, then the crisis dummies in Equation (5) should turn out to be *insignificant*.

<sup>27</sup> We experimented with higher lags of the crisis dummy, but these were not significant.

<sup>28</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.

**Table 5** Impact of Currency Crisis on Category Shares: Almost Ideal Demand System (AIDS) Model for Four Categories

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Durables (OECD)	Nondurables (OECD)	Services (OECD)	Semidurables (OECD)	Durables (non-OECD)	Nondurables (non-OECD)	Services (non-OECD)	Semidurables (non-OECD)
Crisis event ( $t$ )	-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)
Crisis event ( $t - 1$ )	-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)
Price (durables)	-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)
Price (nondurables)	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)
Price (services)	-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)
Price (semidurables)	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)
Expenditure	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)
Urbanization	-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)
Unemployment rate	-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)
Median population age	-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)
Workforce size	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)
Observations	352	352	352	352	481	481	481	481
Number of countries	22	22	22	22	32	32	32	32
Income elasticity of demand	1.51	0.92	0.95	1.05	1.82	0.99	1.72	2.11

Notes. 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. Standard errors are in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

The system of equations specified in Equation (5) includes country fixed effects and a time trend. However, because consumption patterns may widely vary across countries, following Deaton and Muellbauer (1980), we incorporate a host of demographic variables at the country level. These include workforce size (share of population between the ages of 15 and 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 semidurables, and a 7% decline in nondurables. Such a ranking is reasonable because it is likely that the income elasticity of demand is the highest for durables and lowest for nondurables. 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 necessities.

As before, we do a similar sample decomposition by estimating Equation (5) separately for 22 OECD countries<sup>29</sup> and 32 non-OECD countries.<sup>30</sup> The estimates are shown in Table 5, 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, whereas the shares of nondurables and semidurables

<sup>29</sup> Data on Iceland and Luxembourg are missing, so we have only 22 OECD countries compared to 24 in Tables 1 and 2.

<sup>30</sup> For the two subsamples, the fall in total expenditure on durables and nondurables 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 semidurables falls by 7% in OECD countries and by 10% in non-OECD countries.

are not affected. In OECD countries that 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 semidurables and a significant rise in the share of nondurables. Consumption smoothing in non-OECD countries channels money from durables and semidurables to nondurables. Consequently, in these economies, the drop in consumption of nondurables is less than predicted through direct income and price effects, whereas the drop in durables and semidurables 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 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 nondurables are considered as necessities by consumers in developing economies. Although the classification of nondurables as necessities would be considered a routine finding, the identification of services as necessities in developed economies is not obvious from the literature.<sup>31</sup> For semidurables, there is a significant drop in semidurables share in non-OECD countries but no change in OECD countries. This difference could arise because of the differences in liquidity constraints between the two sets of countries. In the presence of liquidity constraints, Browning and Crossley (2009) suggest that consumers may postpone their purchases of clothing and other small durable goods to finance current nondurable consumption. Consumers in developing economies, to borrow their terminology, use their internal capital market of semidurables to borrow from themselves.<sup>32</sup>

Overall, this consumption smoothing reveals that firms operating in durable goods will be worst

affected by a crisis across countries, both developed and developing. Firms in semidurables will be affected severely only in developing countries. Firms in the services sector in OECD countries and firms in nondurables in non-OECD countries will be least severely affected. The shift in shares highlights the fact that demand for products and services in a crisis event are significantly affected by the unfolding of consumption in other seemingly unrelated categories.<sup>33</sup>

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 the crisis dummy is significant for the shares only in the year of the crisis in OECD countries, but affects shares 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  $(\beta_j/\bar{w}_j^i) + 1$ , 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>34</sup> The last row of Table 5 shows the income elasticity of demand *averaged* across all countries in each sample. 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>35</sup>

## 6. Intracategory Consumption Smoothing

Next, we further disaggregate each of these four categories and analyze the patterns of consumption smoothing *within* each category. We again apply the Almost Ideal Demand System methodology of Deaton

<sup>33</sup> We reestimated Equation (5) using a threefold classification of consumption expenditures into durables, nondurables, and services by clubbing together the durable and semidurable categories. We get nearly identical results with this classification scheme. The results are available from the authors upon request.

<sup>34</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>35</sup> The AIDS model implies that the price elasticities calculated as  $(\gamma_{jk} - \beta_j(w_k - \beta_k \ln(E/P))/w_j) - \varphi_{jk}$ , 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.

<sup>31</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>32</sup> Empirically, Browning and Crossley (2009) 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.

**Table 6** AIDS Model Applied to Subcategories of Durables, Nondurables, Services, and Semidurables

Variable	(1)	(2)
Durable goods	OECD countries	Non-OECD countries
Significant increase	Telecommunication equipment; bicycles	Bicycles; medical equipment
Significant decrease	Cars and motorcycles	Audiovisual, photographic and information processing equipment; jewellery, silverware, watches and clocks, travel goods
Semidurable goods	OECD countries	Non-OECD countries
Significant increase	None	None
Significant decrease	Glassware	None
Nondurable goods	OECD countries	Non-OECD countries
Significant increase	Food	Nonalcoholic beverages; food
Significant decrease	Nonalcoholic beverages; household electricity, gas and other fuels; tobacco	Tobacco
Services	OECD countries	Non-OECD countries
Significant increase	Education	Accommodation; catering
Significant decrease		Financial services; hospital services; social protection services; household and domestic services; insurance services

*Notes.* Goods whose share in each category significantly increases or decreases is shown. Column 1 applies the AIDS specification to only OECD countries; column 2 applies the AIDS specification to only non-OECD countries:

Durable goods: audiovisual, 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.

Semidurable goods: clothing; footwear; glassware, tableware and household utensils; hardware and do-it-yourself goods; household textiles; books and stationery; recreational items and equipment for gardens and pets; personal care items.

Nondurable goods: alcoholic drinks; food; nonalcoholic 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.

and Muellbauer (1980), where for each of the four categories—durables, nondurables, semidurables, and services—we estimate the expenditure shares of all subcategories. We footnote in Table 6 the individual goods that Euromonitor uses to classify the aggregate categories of durables, nondurables, semidurables, and services. Once again, a significant estimate on the crisis dummy (higher lags were insignificant) implies that income and price adjustments following a crisis are insufficient, and consumers smooth consumption within each category as well.

### 6.1. Results

We provide in Table 6 a parsimonious and easy-to-read summary of our results. We list the individual goods in each of the four broad categories, where the coefficient on the crisis dummy is significantly different from zero, highlighting where this coefficient is positive and negative. As before, we present separate estimates for OECD and non-OECD countries to examine whether the patterns of adjustment vary across developed versus developing countries.

Table 6 shows that there are significant patterns of consumption smoothing within the durables and nondurable categories for both OECD and non-OECD countries. In contrast, there are almost no significant patterns of adjustment within the semidurable category for both OECD and non-OECD countries. In the case of services, whereas the sector as a whole benefits from consumption smoothing in OECD countries, there is very little smoothing at the subcategory level with only the share of education increasing significantly. In non-OECD countries, whereas the services sector as a whole was not impacted by consumption smoothing, there is considerable intracategory consumption smoothing. Comparing columns 1 and 2, we observe significant differences in consumption smoothing for OECD versus non-OECD countries within each category, with food and bicycles the only two subcategories that benefit from intracategory smoothing for both sets of countries.

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. The magnitude of income elasticity of demand can help identify which categories are going to be more or less severely affected 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

The extant literature in economics shows that our ability to predict a crisis is minimal. However, careful examination of consumer responses to a crisis reveals several empirical regularities that imply that, notwithstanding the inability to predict a crisis, firms can still use the learnings about predictability of consumer behaviors in a crisis to inform and fine-tune their strategic and tactical responses at such times.

*Impact of a Crisis on the Size of the Wallet:* The critical first step in developing a firm's action plan during a crisis is understanding how consumers adjust their behaviors in response to such an event. Clearly, a crisis is accompanied by a change in per-capita income as is evident in the drop in GDP per capita because of a crisis. The relevant question for firms in this setting is how consumers adjust their consumption following the change in income. Our analysis reveals two significant implications for managers. First, our results show that after controlling for changes in per-capita GDP, there is a further drop in consumption in crisis episodes in developing countries. In other words, consumption declines more than income following a crisis, and the size of the wallet shrinks in developing economies. The fall in consumption share of income is the opposite of what intertemporal consumption smoothing would predict. This is not the case in developed economies. Second, the shrinkage in the wallet of consumers in developing economies persists beyond the immediate year of the crisis. Plausibly, this is because of 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. Taken together, these results imply that managers in developing economies need to realize that their businesses are going to see dramatic differences relative to their counterparts in the developed markets, both in terms of the magnitude of the impact and its duration.

*The Importance of Understanding Wallet Share in a Crisis:* A typical observation in articles in the

business press is that consumers reassess their priorities regarding consumption if there is a crisis by sorting products into necessity and discretionary. What has been lacking in these articles is careful empirical analysis that establishes clear, stylized facts about what is and what is not a necessity. Our research using the fourfold classification of consumption expenditures highlights the critical need for conducting wallet share analyses in times of a crisis. It is the differential shrinkage of wallet share by consumers in a crisis that helps identify how consumers classify a category as discretionary or necessity. In essence, wallet share analysis will help managers understand the intricacies of consumption smoothing undertaken by consumers, and more specifically, the role of their category in the consumers' internal capital market. Our results show that durable goods are classified as discretionary by consumers if there is a crisis irrespective of geography. Interestingly, the classification of a necessity varies across different classes of economies. Consumers in developed economies classify services as a necessity, whereas consumers in developing economies classify nondurables as a necessity. These results repudiate the claim by Quelch and Jocz (2009) that assignments of categories to discretionary versus necessity are idiosyncratic. The results in Table 6 reveal further illuminate the payoffs from understanding wallet share movements at the intracategory level. Clearly, the data that we have provide a very high-level view of consumption smoothing and will not be useful to managers dealing in products/categories at the very disaggregate levels such as dishwashers, salty snacks, painkillers, etc. However, conducting wallet share analyses at these disaggregate levels will still be a useful exercise. They can help managers understand which particular items in that category or in their product line are better at preserving their share of wallet and which are not. These findings have important implications for the firm in terms of assessing marketing allocations and investments in turbulent times. For large companies that operate across many different categories and geographies (e.g., Unilever, Kraft, etc.), such analyses can help prioritize their investments across categories and countries. Similarly, they can help identify the best new products to introduce in a category at the time of a crisis. The moves by Procter & Gamble on the introduction of new variants of detergents or those by Tesco and Walmart on new private labels can be easily rationalized using such techniques.

*Smart Pricing in a Crisis:* Managers face intense pressures to respond to a crisis with changes in their pricing strategies (e.g., increasing promotions or reducing prices to preserve market shares). In fact, simple calculation of price elasticities at this time further reinforces the rationale for such strategies as they

tend to increase sharply in a crisis. For instance, standard estimates of elasticity for a durable good are likely to increase sharply following a crisis because consumers reallocate expenditures from durables to other categories. However, it would be disastrous for a manager of a durable goods company to interpret this as a sharp rise in price sensitivity and attempt to preserve market share by ratcheting prices down aggressively. A careful understanding of wallet share movements will reveal the classification of durables as a discretionary good and that wallet allocation to this category has been shrunk drastically by consumers. Price reductions are not going to rechannel those expenditures back into that category. Price wars erupt in a crisis but for the wrong reasons, and managers need to be vigilant in guarding against those tendencies. Responding to price cuts by competitors through nonprice variables may be a better response at these times.

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. This 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 the effect of crises on consumption expenditures at the country level. In a sense, our results show how consumption smoothing, on average, evolves over a broad set of countries. We recognize that a country experiencing a crisis may not exhibit smoothing patterns that exactly mirror our findings, and there are likely to be significant variations in every crisis episode. At the same time, the impact of a crisis on a specific country may be mediated by multiple factors such as growth in trading partners, governmental fiscal and monetary policy responses, macroeconomic imbalances, the production structure of the economy, etc. All these factors may mitigate or magnify consumer responses to a crisis. However, we believe that our results are useful in the sense that they set baseline expectations and help discern some broad patterns in consumer behavior. We believe that these empirical results can enable the development of a productive research agenda for marketing scientists going forward. Our results are,

therefore, only a first step in a deeper understanding of how a crisis affects the bottom line of firms.

Furthermore, much of the focus of our paper is at the aggregate level. We lack data on variables such as advertising, new product introductions, etc., across countries and over time to model fine-grained managerial responses to the crisis. Analyzing firm-level data on how marketing managers react to a crisis is an important direction for future research. This should provide us with a better understanding of the effectiveness of various strategies in a crisis situation and how it varies across categories and countries. All our analyses are at the annual level because of 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 on currency crisis. However, there are other manifestations of crises—e.g., financial/banking crisis, debt crisis, twin crisis. Understanding the implications of these different forms of crises (e.g., currency crisis versus banking crisis) will help develop a holistic understanding of the implications of a crisis for managerial decision making. 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 comprehensive perspective on the impact of economic volatility.

Finally, our paper complements previous work using microlevel surveys to show how households and consumers react to a crisis. Although our aggregate evidence allows us to assess the impact on a sizable proportion of the population and to discern common patterns across many countries, more can be learned from micro studies that examine household and individual decisions in a crisis. In fact, future research can evaluate whether our aggregate cross-country results on consumption smoothing are consistent with microlevel individual consumption decisions in a crisis.

### Acknowledgments

The authors thank Anant Arun, Simon Benarroch, Henry Briggs, Christophe Le Caillec, Tat Chan, Marnik Dekimpe, Bob Herbold, Vish Iyer, Alex Lambeek, Sridhar Narayanan, Narayan Pant, Vithala Rao, Victor Saeijs, K. Sudhir, Naufel Vilcassim, Robert Weltevrede, Horatio Zhu, and seminar participants at the 2008 INSEAD Marketing Seminar Series, the 2008 Singapore Marketing Research Roundtable, and the 2008 Summer Institute of Competitive Strategy for their comments and suggestions. The authors gratefully acknowledge the considerable assistance of Ilian Mihov on econometrics issues. Finally, the guidance and encouragement of the editor, area editor, and two anonymous reviewers at *Marketing Science* are greatly appreciated.

## Appendix. Variable Description and Summary Statistics

Variable	N	Mean	Description
<i>Crisis event</i>	3,922	0.06	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%. <i>Source:</i> Date on exchange rates from International Financial Statistics.
<i>Predicted probability of crisis</i>	2,395	0.09	Predicted probability of a crisis from probit estimates with lagged institutional and macroeconomic variables as regressors. Own calculations.
<i>Per-capita consumption expenditure (log)</i>	3,922	7.91	Log of per-capita private consumption expenditure in constant 2000 dollars. <i>Source:</i> World Development Indicators.
<i>Per-capita GDP (log)</i>	3,922	8.28	Log of per-capita GDP in constant 2000 dollars. <i>Source:</i> World Development Indicators.
<i>Inflation</i>	3,922	0.32	Inflation measured as annual change in consumer price index. <i>Source:</i> World Development Indicators.
<i>Durable goods share</i>	833	0.10	Share of durable goods in total expenditure. <i>Source:</i> Euromonitor.
<i>Nondurable goods share</i>	833	0.37	Share of nondurable goods in total expenditure. <i>Source:</i> Euromonitor.
<i>Services share</i>	833	0.44	Share of services in total expenditure. <i>Source:</i> Euromonitor.
<i>Semidurable goods share</i>	833	0.09	Share of semidurable goods in total expenditure. <i>Source:</i> Euromonitor.
<i>Durable goods price</i>	833	4.73	Price index for durable goods (logged). <i>Source:</i> Euromonitor.
<i>Nondurable goods price</i>	833	4.82	Price index for nondurable goods (logged). <i>Source:</i> Euromonitor.
<i>Services price</i>	833	4.77	Price index for services. (logged). <i>Source:</i> Euromonitor.
<i>Semidurable goods price</i>	833	4.84	Price index for semidurable goods (logged). <i>Source:</i> Euromonitor.
<i>Expenditure</i>	833	20.34	Total expenditure (logged).
<i>Urbanization rate</i>	833	68.20	Percentage of population living in urban areas. <i>Source:</i> World Development Indicators.
<i>Unemployment rate</i>	833	7.68	Number of unemployed as percentage of working age population (ages 15–64). <i>Source:</i> World Development Indicators.
<i>Median age in population</i>	833	30.72	Median age of population. <i>Source:</i> World Development Indicators.
<i>Workforce size</i>	833	65.03	Population between the ages of 15 and 64 as percentage of total population. <i>Source:</i> World Development Indicators.

## References

- Acemoglu, D., S. Johnson, J. A. Robinson, Y. Thaicharoen. 2003. Institutional causes, macroeconomic symptoms: Volatility, crises and growth. *J. Monetary Econom.* 50(1) 49–123.
- Arellano, M., S. Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Rev. Econom. Stud.* 58(2) 277–297.
- Bae, K. 2009. Biomedicine, overseas markets hold the key. Report, Korea Equity Research, Goodmorning Shinshan Securities, Seoul.
- Bordo, M., B. Eichengreen, D. Klingebiel, M. Martinez-Peria. 2001. Is the crisis problem growing more severe? *Econom. Policy* 16(32) 51–82.
- Bradlow, E. T. 2009. Marketing science and the financial crisis. *Marketing Sci.* 28(2) 201.
- Browning, M., M. D. Collado. 2001. The response of expenditures to anticipated income changes: Panel data estimates. *Amer. Econom. Rev.* 91(3) 681–692.
- Browning, M., T. F. Crossley. 2009. Shocks, stocks and socks: Smoothing consumption over a temporary income loss. *J. Eur. Econom. Assoc.* 7(6) 1169–1192.
- Campbell, J. Y., N. G. Mankiw. 1990. Permanent income, current income, and consumption. *J. Bus. Econom. Statist.* 8(3) 265–279.
- Davidson, J. E. H., D. F. Hendry, F. Srba, S. Yeo. 1978. Econometric modelling of the aggregate time-series relationship between consumers' expenditure and income in the United Kingdom. *Econom. J.* 88(352) 661–692.
- Deaton, A. S., J. Muellbauer. 1980. An almost ideal demand system. *Amer. Econom. Rev.* 70(3) 312–326.
- Deleersnyder, B., M. G. Dekimpe, M. Sarvary, P. M. Parker. 2004. Weathering tight economic times: The sales evolution of consumer durables over the business cycle. *Quant. Marketing Econom.* 2(4) 347–383.
- Dutt, P., A. Mobarak. 2007. Democracy and policy stability. Working Paper 2007/50/EPS, INSEAD, Singapore.
- Eales, J. S., L. J. Unnevehr. 1988. Demand for beef and chicken products: Separability and structural change. *Amer. J. Agricultural Econom.* 70(3) 521–532.
- Eichengreen, B., A. Rose, C. Wyplosz. 1996. Contagious currency crises: First tests. *Scand. J. Econom.* 98(4) 463–484.
- Feenstra, R. C., M. D. Shapiro. 2003. High-frequency substitution and the measurement of price indexes. R. C. Feenstra,

- M. D. Shapiro, eds. *Scanner Data and Price Indexes*. University of Chicago Press, Chicago, 123–150.
- Frankel, J. A., A. K. Rose. 1996. Currency crashes in emerging markets: An empirical treatment. *J. Internat. Econom.* **41**(3–4) 351–366.
- Frankenberg, E., D. Thomas, K. Beegle. 1999. The real costs of Indonesia's economic crisis: Preliminary findings from the Indonesia family life surveys. Working Paper Series 99-04, RAND Labor and Population Program, Santa Monica, CA.
- Friedman, M. 1957. *A Theory of the Consumption Function*. National Bureau of Economic Research, Princeton, NJ.
- Fuhrer, J. C. 2000. Habit formation in consumption and its implications for monetary-policy models. *Amer. Econom. Rev.* **90**(3) 367–390.
- Glaeser, E. L., A. Shleifer. 2002. Legal origins. *Quart. J. Econom.* **117**(November) 1193–1229.
- Hall, R. E. 1978. Stochastic implications of the life cycle-permanent income hypothesis. *J. Political Econom.* **86**(6) 971–987.
- Hall, R., M. Gupta, E. A. Gelblum, S. J. O'Brien. 2009. Nokia: Q109 wrap. Report, Europe Equity Research, J. P. Morgan, New York.
- Haque, N. U., P. Montiel. 1989. Consumption in developing countries: Tests for liquidity constraints and finite horizons. *Rev. Econom. Statist.* **71**(3) 408–415.
- Hendry, D. F. 1974. Stochastic specification in an aggregate demand model of the United Kingdom. *Econometrica* **42**(3) 559–578.
- Henisz, W. J. 2000. The institutional environment for economic growth. *Econom. Politics* **12**(1) 1–31.
- Hong, K., A. Tornell. 2005. Recovery from a currency crisis: Some stylized facts. *J. Dev. Econom.* **76**(1) 71–96.
- Hutchison, M. M., I. Noy. 2005. How bad are twins? Output costs of currency and banking crises. *J. Money, Credit Banking* **37**(4) 725–752.
- Jeanne, O. 2000. *Currency Crisis: A Perspective on Recent Theoretical Developments*. Special Papers in International Economics, Vol. 20. Princeton University, Princeton, NJ.
- Kaminsky, G. L., S. Lizondo, C. M. Reinhart. 1998. Leading indicators of currency crises. *Internat. Monetary Fund Staff Papers* **45**(1) 1–48.
- Kang, S. J., Y. Sawada. 2008. Credit crunch and household welfare: The case of the Korean financial crisis. *Japanese Econom. Rev.* **59**(4) 438–458.
- Klein, J., N. Dawar. 2004. Corporate social responsibility and consumers' attributions and brand evaluations in a product-harm crisis. *Internat. J. Res. Marketing* **21**(3) 203–217.
- Lamey, L., B. Deleersnyder, M. G. Dekimpe, J.-B. E. M. Steenkamp. 2007. How business cycles contribute to private label success: Evidence from the United States and Europe. *J. Marketing* **71**(1) 1–15.
- La Porta, R. F. Lopez-de-Silanes, A. Shleifer, R. W. Vishny. 1998. Law and finance. *J. Political Econom.* **106**(6) 1113–1155.
- McCully, C. P., T. D. Teensma. 2008. Preview of the 2009 comprehensive revision of the national income and product accounts: New classifications for personal consumption expenditures. *Survey Current Bus.* **88**(5) 6–17.
- McKenzie, D. J. 2006. The consumer response to the Mexican peso crisis. *Econom. Dev. Cultural Change* **55**(1) 139–172.
- Meese, R. A., K. Rogoff. 1983. Empirical exchange rate models of the Seventies: Do they fit out of sample? *J. Internat. Econom.* **14**(1–2) 3–24.
- Moeller, J. F. 1981. Consumer expenditure responses to income redistribution programs. *Rev. Econom. Statist.* **63**(3) 409–421.
- Paxson, C. H. 1992. Using weather variability to estimate the response of savings to transitory income in Thailand. *Amer. Econom. Rev.* **82**(1) 15–33.
- Pennings, J. M. E., B. Wansink, M. T. G. Meulenberg. 2002. A note on modeling consumer reactions to a crisis: The case of the mad cow disease. *Internat. J. Res. Marketing* **19**(1) 91–100.
- Pesaran, M. H., R. P. Smith. 1995. Estimating long-run relationships from dynamic heterogeneous panels. *J. Econometrics* **68**(1) 79–113.
- Pesaran, M. H., Y. Shin, R. P. Smith. 1999. Pooled mean group estimation of dynamic heterogeneous panels. *J. Amer. Statist. Assoc.* **94**(446) 621–634.
- Phillips, P. C. B., H. R. Moon. 2000. Nonstationary panel data analysis: An overview of some recent developments. *Econometric Rev.* **19**(3) 263–286.
- Quelch, J. A., K. E. Jocz. 2009. How to market in a downturn. *Harvard Bus. Rev.* **87**(4) 52–62.
- Reinhart, C. M., K. S. Rogoff. 2009a. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton University Press, Princeton, NJ.
- Reinhart, C. M., K. S. Rogoff. 2009b. The aftermath of financial crises. NBER Working Paper 14656, Cambridge, MA.
- Rubel, O., A. N. Prasad, S. Srinivasan. 2007. Optimal crisis management. Working paper, Krannert School of Management, Purdue University, West Lafayette, IN.
- Sachs, J. D., A. Tornell, A. Velasco. 1996. Financial crises in emerging markets: The lessons from 1995. *Brookings Papers Econom. Activity* **1996**(1) 147–216.
- Udry, C. 1994. Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria. *Rev. Econom. Stud.* **61**(3) 495–526.
- Van Heerde, H., K. Helsen, M. G. Dekimpe. 2007. The impact of a product-harm crisis on marketing effectiveness. *Marketing Sci.* **26**(2) 230–245.