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In Search of Lost Time: Examining the Duration of Sudden Stops in Capital Flows

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In Search of Lost Time: Examining the Duration of Sudden Stops in Capital Flows[1]

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Abstract

This paper investigates what factors affect the duration of sudden stops in capital flows using quarterly data for a large panel of countries. We find that countries with floating exchange rate regimes tend to experience shorter sudden stop episodes and that fixed exchange rate regimes are associated with longer periods of low output growth following sudden stops. These effects are quantitatively large: having a flexible exchange rate regime increases the probability of exiting the sudden stop state by between 50 to 80 percent. Flexible exchange rate regimes significantly shorten the duration of output decelerations following sudden stops by over 30 percent. Positive variations in terms of trade also abbreviate the duration of sudden stops. In terms of policies, identification is trickier, but the evidence suggests that monetary policy tightening shortens the duration of sudden stops. Changes in capital account restrictions do not seem to matter.

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1 Introduction

Sudden stops in capital inflows often entail abrupt adjustments in the current account accompanied by sub-par economic performance. Credit constraints become binding and uncertainty increases, causing investment and GDP to plummet. Here we take a different view from the standard literature and analyze the duration of Sudden Stop episodes. Though duration and total output costs of sudden stops are tightly correlated, it is likely that duration in itself matters. That is, for a *given* output loss incurred, episodes lasting longer should be more detrimental to the economy than shorter ones, which renders duration analysis an important way of approaching the issue.

After identifying sudden-stops episodes, we investigate what factors affect how long they last using quarterly data for a large panel of countries. We find that countries featuring floating exchange rate regimes tend to experience shorter sudden stop episodes and that fixed exchange rate regimes are associated with longer decelerations in output growth following a sudden stop episode. Our analysis adds to the view that floating exchange rates are the appropriate tool to deal with adverse real shocks (Poole, 1970). Moreover, the analysis indicates that positive variations in terms of trade also abbreviate the duration of sudden stops. Identifying the effects of policy responses to a sudden stop is much trickier, but the data suggests that monetary policy tightening is linked to shorter sudden stops and growth-reducing sudden stop episodes.

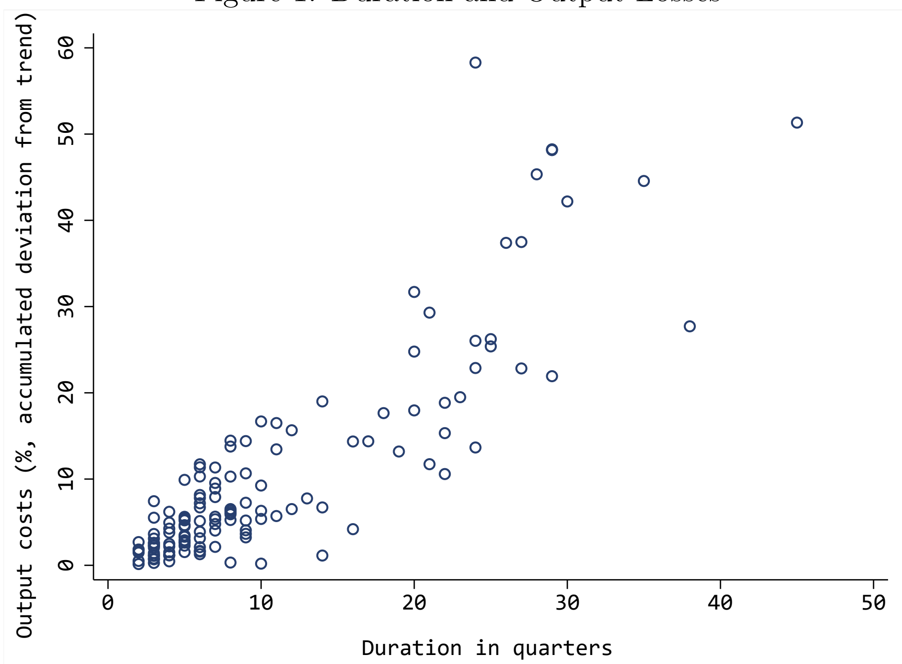
The literature suggests that the costs of sudden stops vary according to the nature of the episode: reversals of gross inflows are less costly when changes in net inflows are milder, that is, when domestic agents partially offset the reversal by bringing capital back into the country (Cavallo et al., 2015 and Cavallo, Izquierdo, and Leon-Diaz, 2017). In this paper we focus on a related question: is the heterogeneity in the duration of sudden stops related to economic policies?

Studies on the determinants of sudden stops (Calvo, Izquierdo, and Mejia, 2008; Calderon and Kubota, 2013) find that higher financial and trade openness, higher global risk aversion, higher global interest rates, lower growth and higher liability dollarization are associated with a larger probability of sudden stops. Nevertheless, evidence on the importance of macroeconomic policy frameworks in curbing the adverse effects of sudden stops once they come to pass has not received much scrutiny.[1] But the issue is of crucial importance to policymakers in a context of increased vulnerability to capital flows reversals. This study is an attempt to fill in this gap.

[1]the chapters in Cavallo and Izquierdo, 2009 as well as Eichengreen and Gupta, 2017 are notable exceptions.

In what sense is the duration of a sudden stop episode in itself relevant? First, as Figure 1 illustrates, a measure of accumulated output losses during these episodes is strongly correlated with their duration.[2] Second, duration per se matters because of its detrimental consequences for the political economy constraints that policymakers face. Third, prolonged episodes of low growth can have persistent effects on potential output due to harmful effects of long-term unemployment on the human capital. Arguably, a sharp but swift fall in GDP will not generate the same pressure for quick fixes or a deterioration in human capital as severe as a long-lasting growth deceleration would.

Figure 1: Duration and Output Losses



The rest of this paper is structured as follows. Section 2 provides a quick overview of duration analysis and how it is applied to the issues at hand. Section 3 presents the criteria used to identify sudden stop episodes as well as output decelerations linked to sudden stops and discusses the variables included in the baseline specifications. Section 4 presents the baseline results for non-parametric, semi-parametric, and parametric approaches. Section 5 considers a number of robustness checks, including introducing unobserved heterogeneity, alternative definitions of sudden stops, and controlling for banking crises, as well as initial levels of public debt and reserves. Finally, section 6 concludes.

[2]We compare the level of the realized GDP at the end of the episode with a counterfactual that extrapolates GDP levels through time using an episode-specific and constant pre-crisis growth rate trend.

2 Duration Analysis: A Brief Overview

To investigate what lies behind the duration of a sudden stop one cannot resort to traditional linear methods for a straightforward reason: the distribution of the variable "time to an event" is almost certainly non-symmetric, and hence the normality of the residuals assumption is not adequate. For instance, the probability distribution of finding a job after four years in unemployment is certainly quite different from the one that applies to an individual who has been unemployed for less than two *months*. Therefore, ordinary least squares estimation of the parameters would not be appropriate.

In duration models, survival time is assumed to follow a distribution with a certain underlying density function, $f(t)$. The so-called survival function, $S(t)$ is given by: $S(t) = P(T > t) = \int_t^\infty f(z)dz$. From this, one can derive the hazard function, $h(t) = -\frac{\frac{dS(t)}{dt}}{S(t)}$, which is simply the instantaneous probability of failure at t given non-failure up to that point in time.

In general, the hazard will be a function of a vector x of (possibly country-specific) controls, thus allowing for the traditional comparative statics exercise: how does an increase from x_i to $x_i + 1$ affect the probability of failure? Note that *failure* in this paper does not have the dim connotation typical of studies in medicine. Quite the contrary, failure means exiting the sudden stop state.

There are three types of survival analysis models: non-parametric, semi parametric and fully parametric models. The first class - non-parametric models – assumes a universal survival distribution for all units of observation in the sample and does not depend on any controls; the second assumes the existence of a non-parametric common baseline distribution that shifts multiplicatively according to the controls included in the regressions. Finally, in fully parametric models, different functional forms for the shape of the baseline distribution are tested and estimated.[3]

2.1 Proportional Hazard Models

Proportional hazard (PH) models estimate the hazard function:

$$h(t_j \mid x_j) = h_0(t)exp(x_j\beta) \tag{1}$$

In which $h(t_j \mid x_j)$ is the hazard function and $h_0(t)$ is the baseline hazard function (the hazard function when all explanatory variables are assumed to have zero value) and x_j is a vector of covariates.

[3]For a more detailed discussion of duration analysis see, for example, Wooldridge (2002).

In the Cox PH model, the underlying distribution of the baseline hazard does not need to be known (it is not estimated, hence the term *semi*-parametric). Relative hazards are time independent, being a function only of the control variables [4]:

$$\frac{h(t \mid x_i)}{h(t \mid x_j)} = \frac{exp(x_i\beta)}{exp(x_j\beta)} \tag{2}$$

Alternative formulations of PH models make varied assumptions about the distribution of the baseline hazard (parametric approach). For example, if the data exhibits duration dependence, i.e. if the hazard rate is expected to increase or decrease with time, the Weibull distribution is a more appropriate option. It assumes that the baseline hazard function is given by $h_0(t) = \theta t^{\theta-1}$, where the parameter θ captures duration dependence.

2.2 Accelerated Failure-Time Models

Accelerated failure-time models (AFT) are a useful alternative to PH models since they analyze survival times directly, rather than focusing on the hazard rate. In this case, the typical regression model assumes the following format:

$$Log(t_j) = x_j\beta + \varepsilon_j \tag{3}$$

Where t is the survival time, ε_j is an error term that can follow different distributions depending on the specific regression model considered (commonly assumed distributions include the gompertz, gamma, log normal, and log logistic distributions).

In this class of models, the coefficients for the different explanatory variables should be interpreted as time ratios showing how much the baseline duration expands or contracts following a one-unit change in the explanatory variable.

3 Data and Definitions

The analysis focuses on sudden stops in gross private capital inflows (excluding reserves and other official flows). Data at a quarterly frequency comes from the Financial Flows Analytics (FFA) database constructed by the IMF's Research Department (see Bluedorn et al., 2013 for a description and application of the database). The database contains information for 165 countries going back to 1970. It also contains information on capital flows as a share of GDP, although data availability for this series is more limited.

One advantage of using the FFA database is the extensive coverage of capital flows data across countries and time. It compiles data on capital flows from the IMF's Balance of

[4]Arguably, a strong assumption.

Payments Statistics database and extends it with data from other sources including Haver Analytics, the CEIC and EMED databases. Moreover, it presents information on private capital flows within the "other investment" category of capital flows (that excludes all flows to the general government and monetary authorities as well as IMF lending and reserve asset accumulation). Therefore, it allows us to concentrate the analysis on flows responding to market forces, which is not feasible using standard balance of payments statistics.

We resort to several control variables capturing structural characteristics as well as individual policy responses to sudden stops. One variable of particular interest for the analysis is the exchange rate regime adopted by a country. Our binary exchange rate regime classification is constructed in the following fashion: we collapse the classification in Ilzetzki, Reinhart, and Rogoff (2017) into a 0 or 1 dummy. A pair year-country labeled as 1 and 2 in theirs classification is relabeled as 0 or *fixed*, whereas their 3 and 4 classification become 1 or *flexible*.

The choice of the exchange rate regime is a slow-moving variable, which is not to say that countries randomly choose their regimes. For example, flexible regimes are more prevalent in higher middle-income and advanced economies, and since institutional development may affect countries' abilities to manage adverse shocks, controlling for income per capita is important. Research on the choice of regime types, though, is inconclusive, and we are unaware of any study linking this choice to variables that could affect the duration of sudden stops. Finally, while it is true that some peggers are forced to abandon their rigid regime when a sudden stop hits – and this is, of course, a highly endogenous policy response – what we show is that *pre*-shock floaters leave the growth-reducing sudden stop state more quickly than *pre*-shock peggers.

We discuss some of the other policy variables included in our regressions in a sub-section below. Other controls in the baseline regressions are the level of GDP per capita at the beginning of the episode (which could serve as a proxy for institutional quality) and the change in the log commodity terms of trade index over four quarters after the onset of the episode. See Appendix A for a detailed presentation of sources and definitions for these variables.

3.1 Defining Sudden Stops

We follow Forbes and Warnock (2012) and define sudden stops in private capital flows as an event in which the year-over-year change in four-quarter capital inflows $C_t = \sum_{i=0}^{3} flows_{t-i}$ is more than two standard deviations below the historical average during at least one quarter of the episode. The historical average is calculated over the past five years (rolling means of

$\Delta C_t = C_t - C_{t-4}$). The episode lasts for all consecutive quarters for which the change in annual capital flows is more than one standard deviation below the historical average.

Using this approach, we identify 1,089 quarters under sudden stops in gross private capital inflows expressed in real US dollar terms (out of a total of 10,779 quarters with available data for that variable in the dataset) and 714 quarters with private capital flows expressed as a share of GDP (out of a total of 7,023 quarters with available data). A complete list of sudden stop episodes by country is provided in Appendix B. Table 1 presents descriptive statistics for the duration of episodes (in quarters) for the entire sample of countries as well as episodes divided by country groupings. The duration of sudden stops does not seem to vary substantially across the two different definitions used nor does it vary much across country groups. The descriptive statistics also indicate that the overall variation of the duration of the identified episodes is somewhat limited with sudden stops lasting a minimum of one quarter and maximum of 8 to 9 quarters depending on the definition.

Table 1: Descriptive Statistics for the Duration of Sudden Stops

	Sudden Stops (Real US Dollars)	*Sudden Stops (Share of GDP)*
All countries		
Number of episodes	278	173
Mean Duration (quarters)	3.89	4.10
Standard Dev.(quarters)	1.60	1.70
Min.(quarters)	1	1
Max.(quarters)	9	9
Emerging Markets		
Number of episodes	157	69
Mean Duration (quarters)	3.69	3.86
Standard Dev.(quarters)	1.55	1.61
Min.(quarters)	1	1
Max.(quarters)	9	7
Advanced Economies		
Number of episodes	121	104
Mean Duration (quarters)	4.15	4.27
Standard Dev.(quarters)	1.64	1.74
Min.(quarters)	1	1
Max.(quarters)	8	9

3.2 Output Decelerations Following Sudden Stops

The difficulty with duration analysis when one follows standard definitions of sudden stops is that they usually do not last many quarters. In other words, the duration distribution is too tight, meaning there is not sufficient variability in the dependent variable. In addition, in our sample, not all sudden stops are accompanied by reductions in growth rates for the

Table 2: Descriptive Statistics for the Duration of Growth Decelerations

	Decelerations (Real US Dollars)	*Decelerations (Share of GDP)*
All countries		
Number of episodes	130	96
Mean Duration (quarters)	10.61	11.44
Standard Dev.(quarters)	8.88	9.21
Min.(quarters)	2	2
Max.(quarters)	45	40
Emerging Markets		
Number of episodes	53	35
Mean Duration (quarters)	10.34	10.57
Standard Dev.(quarters)	9.68	8.95
Min.(quarters)	2	2
Max.(quarters)	45	35
Advanced Economies		
Number of episodes	77	61
Mean Duration (quarters)	10.78	11.93
Standard Dev.(quarters)	8.35	9.39
Min.(quarters)	2	2
Max.(quarters)	38	40

overall economy. Arguably, the analysis of sudden stops episodes that have consequences for real economic activity is of greater policy interest. For both reasons, we favor a different duration metric, namely, the number of quarters of subpar growth performance ignited by a sudden stop episode (if such growth deceleration does occur). Empirically, the dispersion in this new duration variable is considerably higher.

We define the economic growth rates as the year-on-year change in the log of real GDP ($LGDP_t - LGDP_{t-4}$). For any given country and sudden stop episode, we compare the eight-quarter moving average of the growth rate in the quarter preceding the start of a sudden stop episode with the growth rate at the onset of the episode (and in subsequent quarters). Only sudden stops featuring a growth deceleration at the onset qualify for the duration analysis. This deceleration needs to last for at least two quarters. To determine the end of an episode, we posit that growth needs to exceed the moving average growth (defined above) prevailing before the onset of the episode for at least two consecutive quarters. Table 2 presents the descriptive statistics for these episodes for the entire sample of countries as well as country groupings.

3.3 Policy Responses

The existing literature has analyzed a variety of policy responses to sudden stops, or to crises more generally. Hutchison et al. (2010) study the effects of monetary and fiscal policies on output growth during sudden stops using annual data. They define the fiscal policy response as the change in the residuals of a regression of the budget balance as a share of GDP on contemporaneous and lagged GDP growth and a time trend. The monetary policy response is captured by a dummy for tightening if the change in the discount rate exceeds two standard deviations above the country-specific mean and a dummy for loosening if the change in the discount rate is smaller by at least two standard deviations below the mean. Finally, changes in international reserves are captured by a dummy covering periods in which the change in reserves is smaller than two standard deviations below the country-specific mean.

In a similar fashion, Forbes and Klein (2015) also use statistical criteria to define the policy response to crises. They focus on large policy changes defined as changes occurring in only 5 percent of the country-quarter observations in their sample (as a robustness check they also consider a threshold of 10 percent). For example, they consider as large depreciations a 22.6 percent depreciation over the previous year in the bilateral exchange rate versus the dollar and large changes in monetary policy as an increase of at least 200 basis points in the reference rate relative to the previous year. Capital controls are an exception to these statistical criteria, as they use the year in which new controls on capital outflows are added as a measure of the policy response.

In contrast, Eichengreen and Gupta (2017) rely on a narrative approach rather than statistical indicators. For each of the 46 sudden stops episodes identified in their sample, they construct indicators on whether the specific policy has been tightened, loosened, or remained unchanged. More specifically, these authors identify changes in monetary policy; announcements of tax increases and expenditure changes, as well as the imposition of capital controls and macroprudential measures from IMF Article IV documents as well as other reports and policy documents. The authors document that most countries loosen monetary policy and tighten fiscal policy in response to sudden stops.

In our analysis we consider the following policy responses to sudden stops: i) changes in real interest rates; ii) sales of international reserves; iii) changes in capital account restrictions; and iv) changes in fiscal primary balance.[5] Conceptually, structural reforms could also be seen as a policy response, but they are likely to have a more long-term impact with possibly muted effects in the short to near term. Debt restructuring could also be added to the list, but it does not seem to be prevalent enough to allow for meaningful econometric analysis.

As this paper uses duration models, control variables need to be included in a time-fixed manner. Therefore, policy variables are usually included as the change over four

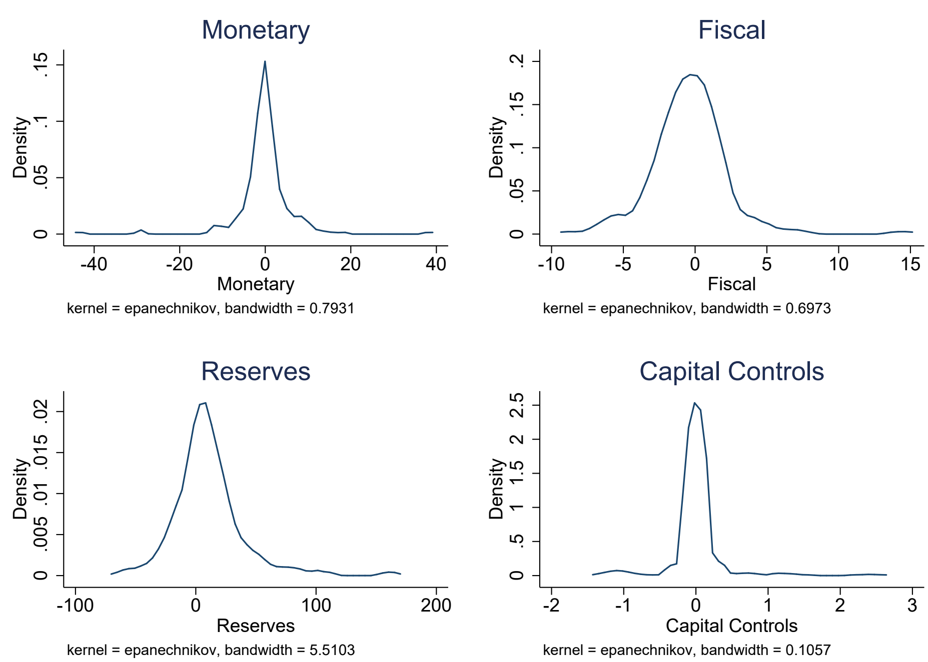
[5]see Appendix A for variable definitions and sources.

quarters following the onset of a sudden stop (either defined directly in terms of capital flows or in terms of growth deceleration). Differently from the literature, to capture monetary policy responses we use changes in the ex-post short term real interest rates, rather than dummies based on nominal interest rates variations.

The discretionary fiscal policy response is the change in the residuals from a regression of the primary balance as a share of GDP on real GDP growth and the growth in the commodity terms of trade index, in line with the approach followed by Hutchison et al. (2010). To capture changes in capital account regulations, we simply include changes in the index of *de jure* capital account openness constructed by Chinn and Ito (2006). Finally, sales in international reserves are measured by the percent change in international reserves over four quarters after the onset of the sudden stop episode. Figure 2 presents kernel density estimates for the different policy response variables across sudden stops.

The choice of considering the change over four quarters is to some extent arbitrary, but the main rationale is that policy changes taken long after the onset of the shock are not a "response to the shock". Given that the duration of sudden stops is relatively short, it makes little sense to look at longer horizons.

Figure 2: Kernel Density Estimates of Policy Responses to Sudden Stops



4 Baseline Results

In this section we present the baseline results of the duration analysis starting with simple depictions of survival functions (non-parametric approach). Subsequently, we turn to semi-parametric Cox regression models that estimate conditional hazard functions including several control variables as well as the policy response variables discussed in previous section. Finally, results obtained using different parametric approaches are presented.

Throughout the section we consider two distinct dependent variables capturing definitions of sudden stops events: i) sudden stops in gross private capital inflows expressed in real U.S. dollars; and ii) our preferred specification, output decelerations following sudden stop episodes in gross private capital inflows.

4.1 A First Look at the Duration of Sudden Stops: Non-Parametric Approach

We begin the analysis by presenting Kaplan-Meier (K-M) survival functions for two different binary independent variables: the exchange rate regime and an advanced country dummy. The survival functions show both how fast the probability of survival declines (i.e. the probability of a sudden stop or output deceleration not coming to an end) and how this rate of decline depends on a particular characteristic/variable.

Figure 3 depicts the K-M estimators for different exchange rate regimes – fixed or floating – prevailing at the onset of the episode. The duration of output decelerations episodes (left-hand-side panel) tends to be longer if the country features a fixed exchange rate regime (i.e. the dashed curve lies above the solid one). This relates to a well-established empirical finding linking flexible exchange rates to smaller output variability (see for instance Levy-Yeyati and Sturzenegger, 2003 and Gertler, Gilchrist, Natalucci, 2007). Figure 4 presents the K-M estimators for the survival function differentiating between advanced economies and emerging markets. In this case, the differences between the two groups do not look significant, neither for sudden stops nor output deceleration episodes. There is some indication that the probability of remaining in a growth deceleration episode is higher for advanced economies after 5 quarters, but the differences in survival vanish after 20 quarters.

4.2 Semi-parametric Models

We now turn to semi-parametric models to estimate the hazard rate of exiting a sudden stop or output deceleration episode. While being less restrictive than parametric approaches, one shortcoming of the Cox regression models is that they require hazard rates to be proportional across episodes (Grinols and Perrelli, 2006). This is a strong assumption that can be

Figure 3: Kaplan-Maier Survival Functions: Exchange Rate Regimes

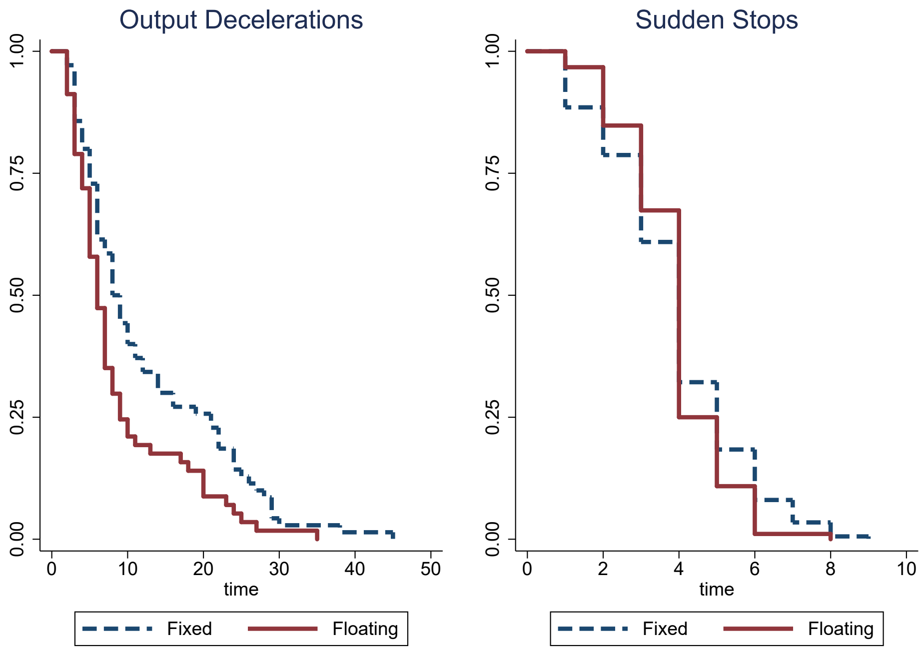
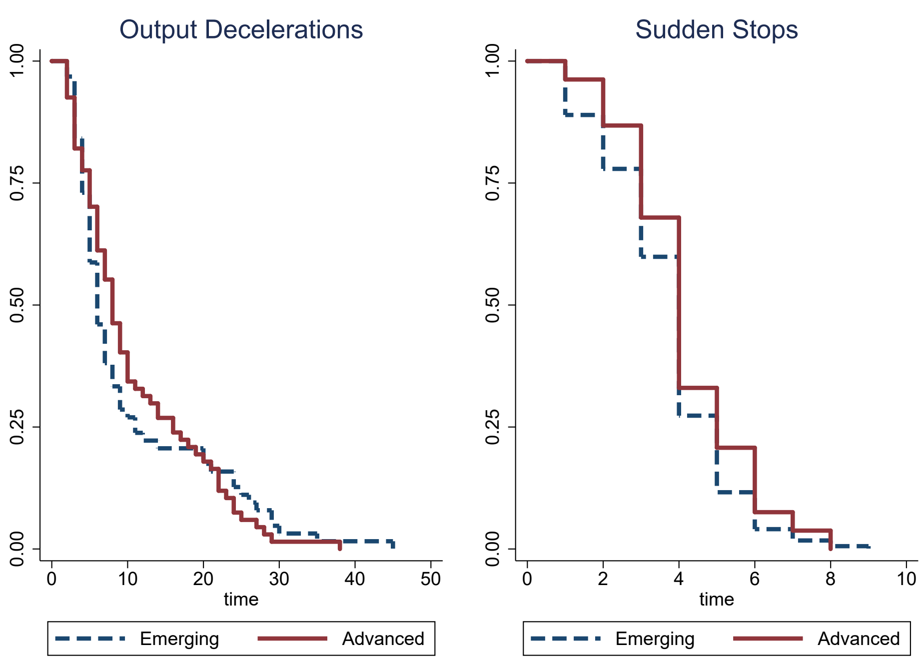


Figure 4: Kaplan-Maier Survival Functions: Advanced vs. EMDEs



tested. In the case of our samples, proportionality is generally rejected and therefore results presented in this sub-section should be interpreted with caution.

Table 3 presents the estimation results. The Breslow method is used to handle ties. The two left-most columns refer to standard sudden stops, while the two right-most refer to output decelerations associated with sudden stops. Having a flexible exchange rate regime helps shorten duration in both cases, as do improvements in terms of trade. Featuring a flexible regime increases the odds of exiting a growth deceleration by over 50 percent, whereas an improvement of 1 percent in the terms of trade increases the hazard rate by 10 percent. Both effects are large: a one standard deviation in the commodities terms of trade growth, which is around 2.5 percent, may reduce/increase the duration of a sudden stop by 25 percent.

Moreover, we find that monetary policy tightening is associated with an increase in the hazard of exiting a growth deceleration episode, while other variables do not present significant coefficients. A tightening of 3 percent in real terms is associated with a decrease in the duration of 15 percent in model (4). Nonetheless, since the proportional hazards assumption is rejected by the Schoenfeld residuals tests, results from these semi-parametric models should be interpreted with caution.

4.3 Parametric Models

In this sub-section, we focus on two types of survival distributions: (i) Weibull and (ii) Gompertz. These distributions are well-suited for modeling data with hazard rates that either increase or decrease monotonically with time. The Weibull baseline hazard is given by: $h_0(t) = \theta t^{\theta-1}$, where θ is a parameter to be jointly estimated with the standard $exp(x_j\beta)$ term. For the Gompertz distribution, the base hazard is given by $h_0(t) = exp(\gamma t)$, where γ is a parameter to be estimated.

In Table 4 we present the results for the standard sudden stop of capital inflows. The likelihood of "exit" increases with the flexibility of the exchange rate regime and the improvement in the terms of trade. The coefficients for the exchange rate regime variable are statistically significant and economically large in all specifications. In addition, an increase in the terms of trade of 1 standard deviation would increase the chance of leaving the sudden stop state by 30 percent.

Moreover, monetary policy tightening also increases the hazard rate: an increase of 1 percentage point in real interest rates increase the chances of leaving the sudden stop state by 6 percent. In all specifications, the estimates for θ and γ point to an increasing hazard over time, i.e. everything else equal, countries are more likely to exit sudden stops as the number of quarters increases.

Table 3: Cox Models

	Sudden Stops		*Growth Decelerations*	
	(1)	(2)	(3)	(4)
GDP per capita	0.86**	0.79**	0.91	0.73**
	(-2.57)	(-2.22)	(-0.68)	(-2.49)
ER Regime	1.15	1.40**	1.54**	1.83***
	(1.31)	(2.39)	(2.32)	(3.14)
Terms of Trade	1.10**	1.11***	1.08***	1.10**
	(2.44)	(3.10)	(3.10)	(2.49)
Monetary		1.02		1.05***
		(0.79)		(3.20)
Fiscal		1.01		1.00
		(0.54)		(-0.013)
Reserves		1.00*		1.01*
		(1.74)		(1.73)
Capital Controls		0.97		1.13
		(-0.14)		(0.42)
Observations	242	145	125	97
PH-test	15.61	23.00	11.83	4.88
p-value	0.00	0.00	0.01	0.67

Exponentiated coefficients, z statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Parametric PH Models for Sudden Stops

	(1) Weibull	(2) Weibull	(3) Gompertz	(4) Gompertz
GDP per capita	0.84**	0.76**	0.85**	0.76**
	(-2.47)	(-2.43)	(-2.04)	(-2.18)
ER Regime	1.28*	1.62***	1.38**	1.96***
	(1.95)	(2.86)	(2.37)	(3.76)
Terms of Trade	1.12**	1.13***	1.11**	1.12***
	(2.25)	(2.95)	(2.09)	(2.84)
Monetary		1.03		1.06*
		(1.16)		(1.93)
Fiscal		1.02		1.02
		(0.71)		(0.82)
Reserves		1.01**		1.01***
		(2.12)		(2.65)
Capital Controls		0.96		1.00
		(-0.17)		(-0.01)
θ	2.65***	2.90***		
	(18.05)	(12.69)		
γ			1.66***	1.83***
			(12.08)	(10.39)
Observations	242	145	242	145

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Parametric PH Models for Growth Decelerations

	(1) Weibull	(2) Weibull	(3) Gompertz	(4) Gompertz
GDP per capita	0.90	0.74**	0.92	0.75**
	(-0.69)	(-2.30)	(-0.61)	(-2.21)
ER Regime	1.58**	1.84***	1.52**	1.81***
	(2.13)	(2.80)	(2.15)	(2.86)
Terms of Trade	1.08***	1.10***	1.08***	1.09***
	(3.07)	(2.64)	(3.27)	(2.88)
Monetary		1.05***		1.05***
		(3.06)		(3.23)
Fiscal		0.99		0.99
		(-0.18)		(-0.31)
Reserves		1.01		1.01
		(1.50)		(1.59)
Capital Controls		0.97		1.03
		(-0.07)		(0.07)
θ	1.39***	1.57***		
	(7.23)	(8.07)		
γ			1.03***	1.06***
			(3.61)	(5.70)
Observations	125	97	125	97

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For models using growth decelerations as the dependent variable (Table 5), we find that changes in the terms of trade and the initial exchange rate regime are again statistically significant and have the "correct" sign. The coefficient estimates indicate the magnitude of the effects are similar to the ones obtained using the Cox models. Typically, more flexible exchange rate regimes increase the hazard by between 50 to 80 percent. In addition, monetary policy tightening increases the hazard rate under both distributions. An increase of 1 percentage point in real interest rates increases the chances of leaving the low growth state behind by 5 percent.

Turning to AFT models, we consider different distributions in the columns of Table 6 and Table 7. In AFT form, exponentiated coefficients are interpreted as time ratios, they indicate how much the expected duration would be shortened or lengthened relative to the baseline for a one unit change in the control variable. Note that the exponential distribution is suitable for modeling data where the baseline hazard is constant and the lognormal and

Table 6: AFT Models for Sudden Stops

	(1) Lognormal	(2) Loglogistic	(3) Exponential	(4) Weibull
GDP per capita	1.14*	1.13*	1.12**	1.10**
	(1.93)	(1.68)	(2.01)	(2.42)
ER Regime	0.99	0.96	0.92	0.85***
	(-0.06)	(-0.52)	(-1.12)	(-3.10)
Terms of Trade	0.94***	0.95***	0.95***	0.96***
	(-3.21)	(-3.24)	(-3.04)	(-3.00)
Monetary	1.01	1.01	1.00	0.99
	(1.37)	(1.17)	(0.28)	(-1.21)
Fiscal	1.00	1.00	1.00	0.99
	(0.28)	(-0.10)	(-0.24)	(-0.71)
Reserves	1.00	1.00	1.00	1.00**
	(0.20)	(-0.14)	(-0.74)	(-2.16)
Capital Controls	1.01	1.01	1.02	1.01
	(0.16)	(0.10)	(0.25)	(0.17)
Observations	145	145	145	145

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

the loglogistic distributions are indicated for data exhibiting nonmonotonic hazard rates (for example initially increasing and then decreasing rates).

The specifications indicate that flexible exchange rate regimes tend to significantly shorten the duration of output decelerations following sudden stops typically by over 30 percent (Table 7). As before, changes in the terms of trade are also key. Results are more mixed for sudden stops per se (Table 6). While the model using the Weibull distribution points to more flexible exchange rate regimes being associated with a reduction in the duration of sudden stops by 15 percent, other models do not suggest significant results, perhaps because the assumptions regarding the baseline hazard are not adequate for the data at hand (constant or non-monotonic rates).

5 Robustness Checks

In this section we consider a number of checks to assess the robustness of the results previously obtained. We begin by examining whether controlling for banking crisis during sudden stop episodes affect the results. We also consider specifications in which we control

Table 7: AFT Models for Growth Decelerations

	(1) Lognormal	(2) Loglogistic	(3) Exponential	(4) Gamma
GDP per capita	1.24**	1.26**	1.23**	1.24**
	(2.30)	(2.12)	(2.34)	(2.32)
ER Regime	0.70**	0.67***	0.67***	0.70**
	(-2.54)	(-2.65)	(-2.96)	(-2.29)
Terms of Trade	0.93***	0.94***	0.94***	0.93***
	(-4.41)	(-4.11)	(-3.26)	(-4.04)
Monetary	0.98	0.98	0.97***	0.98
	(-1.36)	(-0.95)	(-2.80)	(-1.00)
Fiscal	1.00	1.00	1.00	1.00
	(0.16)	(0.14)	(0.17)	(0.16)
Reserves	1.00	1.00	1.00	1.00
	(-1.17)	(-1.27)	(-1.46)	(-1.00)
Capital Controls	0.91	0.87	0.95	0.91
	(-0.56)	(-0.77)	(-0.22)	(-0.56)
Observations	97	97	97	97

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

for the initial levels of public debt and reserve cover. We then estimate models considering alternative definitions of sudden stops to identify the relevant episodes. Subsequently, we introduce unobserved heterogeneity by estimating shared frailty models.

5.1 Controlling for Banking Crises

In order to assess whether the estimates change when we control for the presence of a banking crisis during a sudden stop or growth deceleration episode, we use the crisis start and end dates compiled by Laeven and Valencia (2018) to construct a dummy variable for banking crisis quarters. The results are presented in Table 8. The findings of previous sections regarding the role of the exchange rate regime are confirmed. Interestingly, we also find that banking crises significantly reduce the hazard of exiting sudden stop states, but the effects on growth deceleration episodes are not statistically significant.

5.2 Controlling for Initial Levels of Public Debt and Reserves

We also experiment with specifications that include as an additional explanatory variable either the initial level of public debt in percent of GDP (Table 9) or the initial ratio of reserves to imports (Table 10).[6] The main purpose of these exercises is to assess whether these initial conditions affect the impact of the policy responses. The results reported in both tables are similar to the ones presented previously for the main variables of interest with the exchange rate regime and monetary policy affecting the duration of sudden stops and growth decelerations.

5.3 Alternative Definitions of Sudden Stops

As an alternative to the benchmark regressions, we use gross private inflows as share of GDP to identify episodes, rather than capital flows in real US dollars. One drawback of using this measure is that data availability is substantially reduced. The results for sudden stops are presented in Table 11 and for growth decelerations in Table 12.

The findings reported in previous sections are confirmed when using these alternative measures. Changes in the terms of trade and the exchange rate regime are highly significant across the board. In particular, when looking at sudden stops, the role of the initial exchange rate regime becomes clearer (relative to baseline specifications) with large and statistically significant effects in all models. Among policy variables, monetary policy seems to matter in

[6]Data on public debt levels as a share of GDP comes from the IMF's historical public debt database and the series for imports in millions of USD comes from the IMF's IFS database. Initial levels refer to levels prevailing at before the onset of the episode.

Table 8: PH Models with Banking Crises

	Sudden Stops		*Growth Decelerations*	
	(1)	(2)	(3)	(4)
	Weibull	Gompertz	Weibull	Gompertz
GDP per capita	0.87	0.87	0.74**	0.75**
	(-1.09)	(-0.91)	(-2.21)	(-2.11)
ER Regime	1.52**	1.84***	1.84***	1.82***
	(2.37)	(3.25)	(2.79)	(2.85)
Terms of Trade	1.13***	1.12***	1.10***	1.09***
	(3.30)	(3.16)	(2.64)	(2.86)
Monetary	1.03	1.06*	1.05***	1.05***
	(0.96)	(1.77)	(3.02)	(3.19)
Fiscal	1.02	1.03	0.99	0.99
	(1.01)	(1.13)	(-0.17)	(-0.32)
Reserves	1.01***	1.01***	1.01	1.01
	(2.95)	(3.59)	(1.49)	(1.59)
Capital Controls	0.92	0.96	0.97	1.03
	(-0.36)	(-0.18)	(-0.07)	(0.08)
Banking Crisis	0.52***	0.51***	0.98	1.02
	(-4.11)	(-3.46)	(-0.07)	(0.07)
θ	2.97***		1.57***	
	(12.88)		(7.94)	
γ		1.87***		1.06***
		(10.79)		(5.57)
Observations	145	145	97	97

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

all specifications such that tighter policy reduces the duration of sudden stops by between 3 to 5 percent for every percentage point increase in real rates.

5.4 Introducing Unobserved Heterogeneity

As a final robustness exercise, we introduce unobserved heterogeneity across countries through the estimation of shared frailty models. Accounting for unobserved heterogeneity is one way to tackle the problem of omitted explanatory variables in the specification of the hazard rate. It basically consists of introducing a multiplicative random effect v to the standard specification.

$$h(t_j, x_j, v) = h_0(t) exp(x_j \beta) v \tag{4}$$

Table 9: PH Models with Initial Public Debt

	Sudden Stops		*Growth Decelerations*	
	(1)	(2)	(3)	(4)
	Weibull	Gompertz	Weibull	Gompertz
GDP per capita	0.79**	0.79**	0.73**	0.74**
	(-2.23)	(-1.97)	(-2.27)	(-2.18)
ER Regime	1.59***	1.93***	1.88***	1.85***
	(2.74)	(3.63)	(2.95)	(3.00)
Terms of Trade	1.13***	1.12***	1.09**	1.08**
	(3.25)	(3.16)	(2.36)	(2.55)
Monetary	1.03	1.05	1.05***	1.05***
	(0.82)	(1.59)	(3.25)	(3.41)
Fiscal	1.02	1.03	0.99	0.98
	(0.84)	(0.94)	(-0.42)	(-0.56)
Reserves	1.00*	1.01**	1.01	1.01
	(1.85)	(2.47)	(1.45)	(1.55)
Capital Controls	0.94	0.97	0.92	0.97
	(-0.27)	(-0.12)	(-0.22)	(-0.08)
Initial Public Debt (Share of GDP)	1.00	1.00	1.00	1.00
	(-1.49)	(-1.51)	(1.31)	(1.44)
θ	2.90***		1.58***	
	(12.74)		(8.23)	
γ		1.84***		1.06***
		(10.19)		(5.67)
Observations	144	144	97	97

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: PH Models with Initial Levels of Reserves

	Sudden Stops		*Growth Decelerations*	
	(1)	(2)	(3)	(4)
	Weibull	Gompertz	Weibull	Gompertz
GDP per capita	0.74**	0.74**	0.82	0.83
	(-2.48)	(-2.31)	(-1.25)	(-1.26)
ER Regime	1.64***	1.97***	1.72**	1.69**
	(2.81)	(3.71)	(2.01)	(2.10)
Terms of Trade	1.12***	1.11***	1.10***	1.09***
	(2.79)	(2.69)	(2.82)	(3.11)
Monetary	1.03	1.06*	1.05***	1.05***
	(1.19)	(1.96)	(2.90)	(3.08)
Fiscal	1.02	1.03	0.98	0.98
	(0.79)	(0.91)	(-0.55)	(-0.75)
Reserves	1.01**	1.01***	1.01**	1.01**
	(2.03)	(2.58)	(2.12)	(2.24)
Capital Controls	0.98	1.01	0.91	0.97
	(-0.10)	(0.05)	(-0.23)	(-0.08)
Initial Reserves (Share of Imports)	1.00	1.00	1.00	1.00
	(-0.52)	(-0.41)	(0.65)	(0.69)
θ	2.87***		1.63***	
	(12.57)		(8.50)	
γ		1.82***		1.07***
		(10.37)		(5.99)
Observations	140	140	92	92

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Sudden Stops (with Inflows in Percent of GDP)

	(1) Weibull	(2) Weibull	(3) Gompertz	(4) Gompertz
GDP per capita	0.78***	0.70***	0.72***	0.65***
	(-2.66)	(-3.30)	(-3.30)	(-3.91)
ER Regime	1.51***	1.58**	1.67***	1.79***
	(2.63)	(2.45)	(3.01)	(2.96)
Terms of Trade	1.15***	1.13***	1.16***	1.14***
	(3.30)	(3.18)	(3.39)	(3.27)
Monetary		1.03*		1.05**
		(1.76)		(2.02)
Fiscal		1.01		1.01
		(0.25)		(0.37)
Reserves		1.01**		1.01**
		(2.25)		(2.42)
Capital Controls		1.20		1.13
		(0.62)		(0.40)
θ	3.05***	3.08***		
	(15.90)	(12.78)		
γ			1.84***	1.87***
			(11.08)	(9.37)
Observations	159	118	159	118

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results are presented in Table 13 for both dependent variables. We estimate regressions with the Gompertz distribution and use the Inverse-Gaussian distribution to model frailty in all specifications presented. The baseline results are broadly confirmed. More flexible exchange rate regimes are associated with increases in the hazard of leaving a sudden stop state and of exiting a growth deceleration episode. Changes in the terms of trade also matter, whereas the results for monetary policy are significant for growth decelerations, but not for sudden stops per se.

Table 12: Growth Decelerations (with Inflows in Percent of GDP)

	(1) Weibull	(2) Weibull	(3) Gompertz	(4) Gompertz
GDP per capita	0.97	0.67**	0.98	0.68**
	(-0.13)	(-2.19)	(-0.12)	(-2.23)
ER Regime	1.73**	1.96**	1.66**	1.95***
	(2.29)	(2.39)	(2.28)	(2.58)
Terms of Trade	1.09**	1.08**	1.08**	1.07*
	(2.49)	(1.97)	(2.48)	(1.94)
Monetary		1.05***		1.05***
		(3.38)		(3.63)
Fiscal		0.98		0.97
		(-0.72)		(-0.94)
Reserves		1.01**		1.01**
		(2.20)		(2.36)
Capital Controls		1.38		1.42
		(0.68)		(0.83)
θ	1.42***	1.64***		
	(6.89)	(8.63)		
γ			1.04***	1.06***
			(4.24)	(5.98)
Observations	91	76	91	76

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: PH Frailty Models

	Sudden Stops		*Growth Decelerations*	
	(1)	(2)	(3)	(4)
	Gompertz	Gompertz	Gompertz	Gompertz
GDP per capita	0.78**	0.71**	0.86	0.75**
	(-2.43)	(-2.04)	(-0.94)	(-2.21)
ER Regime	1.34*	1.86***	1.68**	1.81***
	(1.65)	(2.89)	(2.39)	(2.86)
Terms of Trade	1.15**	1.14***	1.09***	1.09***
	(2.33)	(2.60)	(4.02)	(2.88)
Monetary		1.04		1.05***
		(1.02)		(3.23)
Fiscal		1.02		0.99
		(0.66)		(-0.31)
Reserves		1.01*		1.01
		(2.10)		(0.59)
Capital Controls		0.96		1.03
		(-0.17)		(0.07)
γ	2.14***	2.03*** 1.06***	1.06***	
	(13.91)	(7.03)	(3.73)	(5.70)
v	0.88	0.27	0.32***	0.00
	(-0.87)	(-1.42)	(-2.71)	(-1.63)
Observations	242	145	125	97

Exponentiated coefficients, t statistics in parentheses. S.E. clustered by country.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Conclusion and Policy Implications

In this paper we use duration analysis to understand what policies are effective to abbreviate sudden stops. We find that countries with floating exchange rate regimes tend to experience shorter sudden stop episodes and shorter decelerations in growth following sudden stops. These effects are quantitatively large: having a flexible exchange regime increases the probability of exiting the sudden stop state by between 50 to 80 percent in several cases. As expected, positive variations in terms of trade also abbreviate the duration of sudden stops. In terms of policy reaction, a monetary policy tightening generating a rise in real interest rates of 3 percent is associated with a reduction of roughly 15 percent in the duration of a sudden stop.

The findings in this paper go to the heart of the "fix vs flex" empirical literature and provide additional support to the view that floating regimes help countries weather out external adverse shocks (Levy-Yeyati and Sturzenegger, 2003; Gertler, Gilchrist, Natalucci, 2007; Broda, 2004). Uncovering another angle through which floating regimes can benefit the economy seems relevant given this old debate has apparently not been settled (Rose, 2011). Our results also echo some of the findings of Cavallo, Izquierdo, and Leon-Diaz (2017), who focus on the analysis of "prevented" sudden stops (defined as episodes of sudden stops in gross capital inflows by foreigners that are not accompanied by a sudden stop in net capital flows). They conclude that the absence of exchange rate flexibility under an inflation targeting regime increases the hazard of transitioning from a sudden stop in gross capital inflows to a sudden stop in net capital flows.

In addition, the results indicate that monetary tightening can abbreviate the duration of sudden stops and of growth decelerations following a sudden stop, though identification here is trickier. This is in line with Braggion, Christiano, and Roldos (2007) paper showing that interest rates increases can be an optimal response to sudden stops in a general equilibrium framework with collateral binding constraints. This occurs because policy tightening contains the real exchange rate depreciation that tightens the collateral constraint.

The analysis presented here reinforces the role of exchange rate flexibility in mitigating the impact of external shocks. Moreover, it does not lend credence to the concept that tightening monetary policy is in general a bad idea and cautions against overstating the power of capital account restrictions in insulating countries against shocks.

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A Appendix: Data Sources and Definitions

Capital flows. Total Gross Non-Official Flows (ICAPFLP) in U. S. dollars and as a share of GDP from the IMF's Financial Flows Analytics (FFA) database. Capital flows in nominal dollar terms were deflated using the U.S. GDP deflator.

Real GDP in national currency units. This series was used as a basis for the calculations regarding growth decelerations after sudden stops as explained in the main text. For most countries we rely on quarterly data from IMF's International Financial Statistics Database (IFS). Nevertheless, we use data from Haver Analytics when information in the IFS was missing or with more limited availability. This is the case for the following countries: AZE; BHR; BLR; BLZ; BRA; CHN; CMR; COL; DEU; DNK; FIN; GHA; GTM; HND; IDN; IND; ITA; JOR; JPN; KAZ; KWT; LKA; LSO; MEX; MNE; MNG; MOZ; NAM; NGA; NIC; PAN; SLV; UGA; URY; VNM; ZAF; ZMB.

Real GDP per capita. Log of real GDP per capita. Data from the Maddison Project database (Bolt et al., 2018).

International reserves. Official reserve assets in millions of U.S. dollars from the IMF's IFS database.

Monetary policy rates. We rely on policy rates from Thomson Reuters Datastream. Nevertheless, we use information from the IMF's IFS Database for money market rates and for discount rates when data on policy rates is not available. The real (ex-post) interest rate is calculated using CPI inflation data from the IMF's IFS database.

Fiscal balance. General government primary net lending/borrowing as a share of GDP from the IMF's World Economic Outlook (WEO) database. In the regressions, the measure of fiscal policy is constructed using the residuals from a simple OLS regression of a constant and on real GDP growth and growth in the commodity terms of trade series in order to control for the effect of automatic stabilizers on the balance.

Capital account restrictions. Index of *de jure* capital account openness constructed by Chinn and Ito (2006) based on information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Higher levels of the index indicate a more open capital account.

Terms of trade. Log of the commodity net export price index constructed by Gruss (2014).

Exchange rate regimes. Coarse *de facto* exchange rate regime classification from Ilzetzki, Reinhart, and Rogoff (2017). Categories 1 and 2 were classified as fixed-exchange rate regimes and categories 3 and 4 as floating exchange rate regimes.

B Appendix: Sudden Stops and Growth Decelerations Episodes

Sudden Stops Episodes

Country	Start	End	Country	Start	End	Country	Start	End
United States	1980q2	1981q1	Canada	1977q2	1978q1	Australia	1983q2	1984q1
United States	1983q1	1983q3	Canada	1982q2	1983q2	Australia	1989q4	1991q3
United States	1988q3	1988q4	Canada	1991q2	1991q3	Australia	1998q1	1998q1
United States	1990q1	1990q4	Canada	2008q4	2009q3	Australia	2005q1	2005q4
United States	1998q1	1999q1	Japan	1990q4	1991q3	Australia	2016q1	2017q1
United States	2001q3	2002q2	Japan	1992q2	1993q1	New Zealand	1987q4	1988q3
United States	2008q1	2009q2	Japan	1998q2	1998q4	New Zealand	1996q4	1997q2
United Kingdom	1991q3	1992q1	Japan	2005q1	2005q4	New Zealand	1998q3	1999q2
United Kingdom	2001q3	2002q3	Japan	2008q3	2009q3	New Zealand	2005q3	2006q2
United Kingdom	2008q1	2009q2	Japan	2016q1	2016q4	New Zealand	2008q2	2009q2
Austria	1981q3	1982q3	Finland	1985q4	1986q2	South Africa	1979q1	1979q4
Belgium	2008q4	2009q3	Finland	1991q1	1992q3	South Africa	1985q1	1986q2
Denmark	1986q4	1987q2	Finland	2001q1	2002q1	South Africa	1993q2	1993q4
Denmark	1989q2	1989q4	Finland	2009q2	2009q3	South Africa	1998q3	1999q2
Denmark	2001q2	2002q1	Finland	2010q3	2010q4	South Africa	2008q3	2009q3
Denmark	2008q4	2009q2	Finland	2012q3	2013q4	Argentina	1990q4	1991q1
France	2008q4	1982q1	Greece	1992q1	1992q4	Argentina	1998q4	1999q3
France	1991q1	1992q1	Greece	1995q4	1996q2	Argentina	2001q2	2002q1
France	2001q4	2002q3	Greece	2006q2	2006q4	Argentina	2008q2	2009q3
France	2007q3	2009q2	Greece	2008q4	2009q3	Bolivia	1995q1	1995q3
Germany	1982q1	1982q4	Greece	2010q2	2011q1	Bolivia	1999q2	2001q2
Germany	1987q4	1988q3	Iceland	1989q3	1990q1	Bolivia	2006q3	2007q2
Germany	1994q1	1994q4	Iceland	2001q2	2002q1	Bolivia	2014q3	2015q2
Germany	2001q1	2002q2	Iceland	2008q2	2009q3	Brazil	1982q4	1983q3
Germany	2008q2	2009q3	Iceland	2015q2	2015q3	Brazil	1995q2	1995q2
Italy	1982q2	1983q1	Iceland	2016q1	2016q3	Brazil	1999q1	1999q2
Italy	1991q4	1993q2	Ireland	1989q2	1989q2	Brazil	2008q2	2009q3
Italy	2000q4	2002q3	Ireland	1991q3	1992q3	Chile	2000q2	2000q4
Italy	2007q3	2008q4	Ireland	1994q3	1994q4	Chile	2007q1	2007q1
Italy	2011q4	2012q2	Ireland	2001q1	2001q3	Chile	2009q1	2009q3
Luxembourg	2011q4	2009q2	Ireland	2008q2	2009q3	Colombia	2015q2	2016q2
Luxembourg	2016q1	2016q4	Ireland	2016q4	2017q1	Costa Rica	2007q3	2007q3
Netherlands	1981q1	1982q3	Malta	2008q2	2009q4	Costa Rica	2008q4	2009q4
Netherlands	1990q3	1991q4	Portugal	1992q3	1993q2	Costa Rica	2014q2	2015q2
Netherlands	1993q3	1993q3	Portugal	2002q4	2003q1	El Salvador	2009q1	2009q4
Netherlands	2008q2	2009q3	Portugal	2004q4	2005q2	Guatemala	1994q4	1995q3
Norway	1988q3	1989q2	Portugal	2010q4	2011q3	Guatemala	1999q4	2001q3
Norway	1997q4	1998q1	Spain	1985q2	1986q1	Guatemala	2008q4	2009q3
Norway	1999q2	1999q3	Spain	1994q2	1995q1	Honduras	2014q4	2015q3
Norway	2001q3	2002q1	Spain	2001q3	2002q2	Mexico	1994q4	1995q3
Norway	2008q3	2009q4	Spain	2007q4	2009q3	Mexico	2006q4	2007q2
Sweden	1991q2	1992q2	Spain	2012q1	2012q3	Mexico	2008q4	2009q3
Sweden	1997q1	1997q3	Turkey	1994q2	1995q1	Mexico	2014q4	2015q4
Sweden	2008q2	2009q3	Turkey	2001q2	2001q4	Nicaragua	2004q2	2004q4
Switzerland	2008q1	2009q1	Turkey	2008q4	2009q4	Panama	2008q4	2009q4

Sudden Stops Episodes (Cont.)

Country	Start	End	Country	Start	End	Country	Start	End
Paraguay	2007q3	2007q4	Indonesia	1997q4	1998q3	Papua NG	1991q1	1991q3
Paraguay	2009q1	2009q2	Indonesia	2006q4	2007q1	Papua NG	1992q4	1993q4
Paraguay	2009q4	2009q4	Indonesia	2012q2	2012q2	Samoa	1992q4	2010q1
Peru	1998q4	1999q3	Indonesia	2015q3	2016q2	Armenia	2001q1	2001q4
Peru	2008q4	2009q3	Korea	1986q3	1987q4	Armenia	2010q2	2011q1
Uruguay	2013q3	2014q1	Korea	1997q2	1998q4	Azerbaijan	2009q1	2009q4
Uruguay	2015q3	2016q4	Korea	2008q1	2009q2	Azerbaijan	2015q2	2016q2
Venezuela	2006q2	2006q4	Lao P.D.R.	2008q2	2009q2	Belarus	2005q4	2005q4
Bahamas, The	1989q2	1990q1	Lao P.D.R.	2013q2	2013q3	Belarus	2012q1	2012q4
Bahamas, The	1995q3	1996q2	Lao P.D.R.	2016q4	2017q1	Albania	2009q4	2010q3
Bahamas, The	2003q2	2004q1	Malaysia	2005q4	2006q3	Georgia	2005q3	2005q3
Belize	2015q3	2016q2	Malaysia	2008q3	2009q2	Georgia	2009q1	2009q4
Suriname	1999q4	2000q4	Nepal	1986q3	1987q1	Kazakhstan	2007q4	2008q4
Cyprus	2008q2	2008q2	Nepal	1990q2	1991q1	Kazakhstan	2015q2	2016q1
Cyprus	2009q4	2011q2	Nepal	2001q2	2002q1	Bulgaria	2008q4	2010q1
Israel	1998q2	1998q4	Pakistan	1995q3	1995q4	Bulgaria	2015q3	2016q1
Israel	2001q1	2002q1	Pakistan	2008q2	2009q2	Moldova	2009q2	2010q1
Israel	2007q4	2008q3	Philippines	2008q2	1984q2	Moldova	2014q4	2015q3
Israel	2011q4	2012q3	Philippines	1992q1	1992q2	Russia	2008q4	2009q3
Jordan	1979q4	1980q3	Philippines	1997q3	1998q3	Russia	2014q1	2015q2
Jordan	1992q3	1993q4	Philippines	2008q1	2008q4	Tajikistan	2014q1	2009q3
Jordan	2007q3	2008q2	Singapore	2008q3	2009q3	Tajikistan	2015q1	2015q1
Jordan	2015q2	2015q2	Thailand	1992q1	1992q4	China	2008q3	2009q3
Lebanon	2010q3	2011q1	Thailand	1996q4	1998q1	Ukraine	2008q4	2009q4
Lebanon	2015q4	2016q2	Thailand	2008q2	2009q1	Czech Republic	2003q2	2004q1
Qatar	2015q4	2018q1	Thailand	2011q4	2012q2	Czech Republic	2006q2	2006q3
Egypt	2011q1	2011q4	Cabo Verde	2013q1	2013q3	Czech Republic	2008q4	2009q3
Bangladesh	1991q3	1992q1	Ethiopia	1989q1	1989q4	Slovak Republic	2006q1	2006q1
Bangladesh	2009q2	2009q4	Ethiopia	1994q3	1995q2	Slovak Republic	2009q1	2009q4
Bhutan	2017q2	2018q1	Ethiopia	2005q3	2005q4	Estonia	2009q1	1999q2
Myanmar	1999q2	2000q2	Ethiopia	2012q3	2012q4	Estonia	2006q1	2006q1
Myanmar	2012q3	2013q3	Lesotho	1993q3	1993q3	Estonia	2008q2	2009q3
Cambodia	2007q1	2007q1	Lesotho	1998q3	1999q2	Latvia	2008q2	2009q3
Cambodia	2009q1	2009q3	Lesotho	2005q2	2006q2	Latvia	2015q4	2015q4
Sri Lanka	2009q1	1984q4	Lesotho	2010q4	2010q4	Montenegro	2016q1	2016q3
Sri Lanka	1994q1	1994q3	Mauritius	2008q3	2009q2	Hungary	1996q4	1997q2
Sri Lanka	1995q4	1996q1	Mauritius	2012q2	2013q4	Hungary	2009q1	2010q1
Sri Lanka	1998q3	1999q1	Morocco	2015q2	2015q4	Lithuania	2009q1	2000q1
Sri Lanka	2008q4	2009q3	Mozambique	2006q3	2007q2	Lithuania	2008q4	2009q4
Sri Lanka	2015q1	2015q4	Mozambique	2014q3	2016q1	Mongolia	2008q4	2004q3
Taiwan Province o	2001q1	2001q2	Seychelles	2013q3	2014q1	Mongolia	2009q2	2009q4
Taiwan Province o	2008q4	2009q2	Namibia	2008q1	2008q1	Mongolia	2013q2	2014q2
Hong Kong SAR	2008q3	2009q3	Uganda	2008q1	2007q2	Slovenia	2008q4	2009q3
India	1989q3	1990q4	Fiji	2012q1	2012q2	FYR Macedonia	2007q1	2007q2
India	1993q2	1993q2	Vanuatu	2003q3	2003q4	FYR Macedonia	2009q2	2009q3
India	2008q3	2009q3	Vanuatu	2007q2	2007q4	Bosnia	2008q3	2010q2
India	2015q3	2016q3	Vanuatu	2009q2	2009q4	Poland	2008q4	2009q3
						Poland	2011q4	2012q3
						Romania	2008q3	2009q4

Growth Decelerations Episodes

Country	Start	End	Country	Start	End	Country	Start	End
United States	1980q2	1982q3	Greece	2010q2	2013q3	Cyprus	2008q2	2009q2
United States	1990q1	1994q1	Iceland	2002q1	2003q4	Cyprus	2009q4	2010q2
United States	1998q2	1998q3	Iceland	2008q2	2014q4	Israel	2001q1	2005q4
United States	2001q3	2001q4	Ireland	2001q1	2007q4	Israel	2008q2	2010q2
United States	2008q1	2010q1	Ireland	2008q2	2013q3	Jordan	2007q3	2014q4
United Kingdom	1991q3	1992q2	Malta	2008q4	2009q4	Cambodia	2007q1	2007q3
United Kingdom	2002q3	2003q1	Portugal	2002q4	2004q1	Hong Kong SAR	2008q3	2009q4
United Kingdom	2008q1	2013q4	Portugal	2011q2	2013q3	India	2008q3	2009q4
Belgium	2008q4	2010q1	Spain	2001q3	2007q2	Indonesia	1997q4	2006q2
Denmark	2001q2	2005q4	Spain	2007q4	2011q3	Indonesia	2012q2	2015q1
Denmark	2008q4	2010q1	Spain	2012q1	2013q4	Korea	1997q2	1999q1
France	1991q1	1998q1	Turkey	1994q2	1995q1	Korea	2008q2	2009q4
France	2001q4	2007q1	Turkey	2001q2	2002q1	Malaysia	2005q4	2007q2
France	2008q1	2010q2	Turkey	2008q4	2009q4	Malaysia	2008q3	2009q4
Germany	1982q1	1983q1	Australia	1983q2	1983q3	Philippines	1984q1	1986q1
Germany	2001q1	2006q1	Australia	1989q4	1994q1	Philippines	1992q2	1993q1
Germany	2008q2	2010q1	Australia	2005q1	2006q4	Philippines	1997q3	2003q2
Italy	1992q1	1994q1	Australia	2016q3	2017q3	Philippines	2008q1	2009q4
Italy	2001q3	2006q4	New Zealand	1996q4	1998q1	Singapore	2008q3	2009q4
Italy	2007q3	2010q1	New Zealand	1998q3	1998q4	Thailand	1996q4	2007q4
Italy	2011q4	2015q3	New Zealand	2005q3	2007q1	Thailand	2008q2	2009q3
Luxembourg	2008q4	2010q1	New Zealand	2008q2	2009q4	Thailand	2011q4	2012q2
Netherlands	2008q2	2017q3	South Africa	1985q1	1987q1	Mauritius	2008q3	2011q4
Norway	1988q3	1989q2	South Africa	1998q3	1999q2	Mauritius	2012q2	2012q4
Norway	1999q2	1999q3	Argentina	1998q4	2000q4	Mozambique	2014q3	2015q1
Norway	2001q3	2003q4	Argentina	2001q3	2002q4	Azerbaijan	2009q1	2014q4
Norway	2008q3	2011q3	Argentina	2008q2	2010q1	Georgia	2009q1	2011q2
Sweden	1991q2	1993q2	Bolivia	1999q2	2005q4	Kazakhstan	2007q4	2014q4
Sweden	2008q2	2010q1	Bolivia	2007q1	2007q2	Bulgaria	2008q4	2015q1
Canada	1977q2	1977q4	Brazil	1999q1	1999q3	Moldova	2014q4	2016q2
Canada	1982q2	1983q2	Brazil	2008q4	2009q3	Russia	2008q4	2013q3
Canada	1991q2	1991q4	Chile	2007q1	2008q3	Czech Republic	2008q4	2014q4
Canada	2008q4	2009q4	Chile	2009q1	2010q1	Estonia	1998q4	1999q4
Japan	1991q2	1991q4	Costa Rica	2008q4	2013q4	Estonia	2008q2	2010q4
Japan	1992q2	1997q4	Costa Rica	2014q2	2014q4	Latvia	2008q2	2015q2
Japan	1998q2	1999q4	El Salvador	2009q1	2010q3	Hungary	2009q1	2010q2
Japan	2005q1	2005q3	Mexico	1995q1	1996q1	Lithuania	1999q4	2000q3
Japan	2008q3	2009q4	Mexico	2006q4	2008q2	FYR Macedonia	2007q1	2007q2
Japan	2016q1	2016q3	Mexico	2008q4	2009q4	Poland	2008q4	2011q2
Finland	1985q4	1986q2	Paraguay	2009q1	2009q3	Poland	2012q1	2016q4
Finland	1991q1	1993q4	Peru	1998q4	1999q3			
Finland	2001q1	2007q1	Peru	2008q4	2010q1			
Finland	2009q2	2010q1	Uruguay	2014q1	2015q1			
Finland	2012q3	2015q4	Uruguay	2015q3	2016q3			
Greece	2008q4	2009q4	Belize	2016q1	2017q4			