Macroprudential Foreign Exchange Interventions

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RESEARCH QUESTIONS

- I analyse the **macroprudential role of foreign exchange interventions** by empirically studying whether resilience to external shocks is enhanced by foreign exchange interventions (FXI), both in prior years and during the shock:

    - *Do FX interventions during the period of capital inflow surges reduce the* **probability** *of a sudden stop?*

    - *Do FXI in the period of surges dampen the* **magnitude** *of the macroeconomic contraction in economic activity during a sudden stop?*

    - *If so, what* **channels** *are at work?*

MOTIVATION

- Emerging market economies are exposed to the ebbs and flows of cross-border capital flows, which can be amplified by domestic and international frictions.

- Number of policy measures to mitigate the impact of external shocks: monetary policy, macroprudential policy, capital flow management (CFMs), fiscal policy and **foreign exchange interventions**.

- Even though majority of central banks in emerging and developing economies follow inflation targeting, they still use FX interventions extensively in both, tranquil and turbulent times.
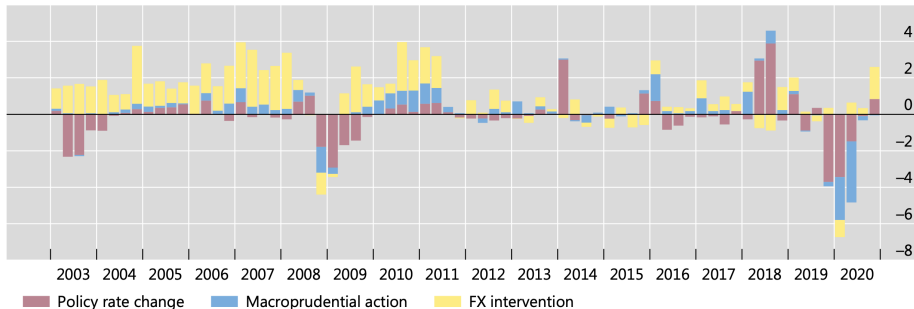
FXI IS USED INTENSIVELY

FIGURE 1: Policy Response Intensity in Emerging Markets

Source: Borio, Shim, and Shin (2022)

- Empirical literature studying the effectiveness of FXI has primarily focused on whether they can influence the level or volatility of the exchange rate.

- However, "**traffic lights are not intended to only stop the cars, they are designed to reduce the number and probability of car crashes.**"

- **Contribution**: The paper empirically tests the theoretical studies exploring the role of FX interventions in presence of international financial frictions. (Arce, Bengui, Bianchi (2022), Fanelli and Straub (2021), Cavallino (2019), Basu et al. (2020), Davis, et al. (2022) and Itskhoki and Mukhin (2022))

- In recent years, financial stability has become one of the main objectives of FXI (Cavallino and Patel (2019)).

FINDINGS

- *Do FX interventions during the period of surges reduce the probability of a sudden stop?* **Yes**

- *Do FXI in the period of surges dampen the macroeconomic contraction in economic activity during a sudden stop?* **Yes**

- *If so, what are the channels at work?* **Ex-Post Channel**

- Consistent with the theoretical studies.

PROBABILITY - ECONOMETRIC APPROACH

- Do FX interventions during the boom phase of capital inflow cycle reduce the **probability** of a sudden stop?

$$Prob(s_{i,t} = 1) = F\Big(\Phi^{S*FXI} \, Surge_{i,t-n} \, * \, FXI_{i,t-n} \, + \, \Phi^{S} Surge_{i,t-n} +$$
$$\Phi^{FXI} FXI_{i,t-n} \, + \, \Phi^{G} \, C_{t-1}^{G} \, + \, \Phi^{C} \, C_{i,t-1}^{C} + \Phi^{D} \, C_{i,t-1}^{D}\Big) \tag{1}$$

- with

$$F(x) = 1 - \exp[-\exp(x)] \tag{2}$$

- i.e. complementary logarithmic (cloglog) framework, which assumes that $F(\cdot)$ is asymmetric.

RESEARCH QUESTION
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PROBABILITY
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SEVERITY
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CHANNELS - EX-POST
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CHANNELS - CREDIT
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CONCLUSION
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APPENDIX
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DATA

- I cover 34 emerging countries for the period of 2000Q1-2020Q3. ▸ Sample

- FX intervention data is from Adler et al. (2021).

- Sudden Stops and Surges episodes: Forbes and Warnock (2021). ▸ Definition

- The country-quarter is defined as a floater following Ilzetzki, Reinhart and Rogoff (2019).

Table 1 - Probability of a Sudden Stop

	Floater Countries	Pegger Countries	All Countries
Surge * FXI (lagged)	-0.290***	-0.187***	-0.240***
	(0.089)	(0.066)	(0.059)
Surge (lagged)	0.853***	1.557***	1.160***
	(0.234)	(0.461)	(0.242)
FXI (lagged)	0.014	0.002	0.007
	(0.013)	(0.030)	(0.018)
.	.	.	.
.	.	.	.
.	.	.	.
Macroprudential Policy (lagged)	-0.019	0.088	0.024
	(0.079)	(0.091)	(0.060)
Surge * Macroprudential Policy (lagged)	0.312	-0.204	0.007
	(0.241)	(0.232)	(0.192)
Number of Observations	819	649	1,468

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

► Full Table

TAKEAWAY NO.1

- **FX interventions during the boom phase** of capital inflow cycle do **reduce** the probability of a sudden stop.

- Revealing the <u>ex-ante role of FXI</u> (ex-ante = boom phase).

- By contrast, macroprudential policy does not help.

- Unlike macroprudential tools, FX interventions have the ability to **"get in all the cracks"** of the economy.

SEVERITY OF SUDDEN STOP

- Do FX interventions during the boom phase of capital inflow cycle reduce the **severity** of a sudden stop?

- I first assess the impact of a sudden stop.

- I use the following regression estimated using Local Projections with fixed effects:

$$Y_{i,t+h} = \alpha_{i,h} \ + \ \lambda_{t,h} \ + \ \beta_h Stop_{i,t} \ + \ \theta_h X_{i,t} \ + \ \epsilon_{i,t+h} \tag{3}$$
$$\text{with} \qquad h = 0, 1, 2, ..., m \qquad \text{and} \qquad m = 4$$

- where $X_{i,t}$ is the vector of control variables in selecting of which I follow Obstfeld, Ostry, and Qureshi (2019). ▶ Controls

Response of GDP Growth to Sudden Stop
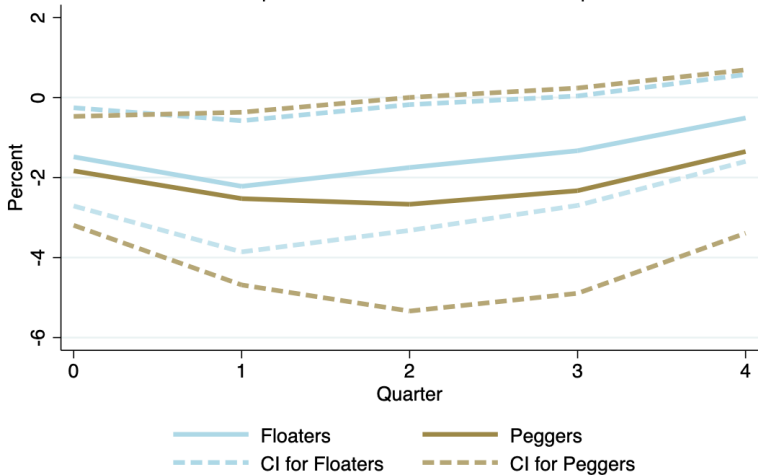
- Sudden Stop highly painfully hits economic activity, both - floaters and peggers

SEVERITY OF SUDDEN STOP WITH FXI

- I now assess the role of FXI by expanding the previous specification as:

$$Y_{i,t+h} = \alpha_{i,h} \; + \; \lambda_{t,h} \; + \; \gamma_h \Big(Stop_{i,t} \; * \; Surge_{i,t-n} \; * \; FXI_{i,t-n} \Big) + \quad (4)$$

$$\theta_h X_{i,t} \; + \; \epsilon_{i,t+h}$$

$$\text{with} \quad h = 0, 1, 2, ..., m \quad \text{and} \quad m = 4 \; \text{and} \; n = 12$$

Dampening Effect of the Surge Phase FXI on the Severity of Sudden Stop
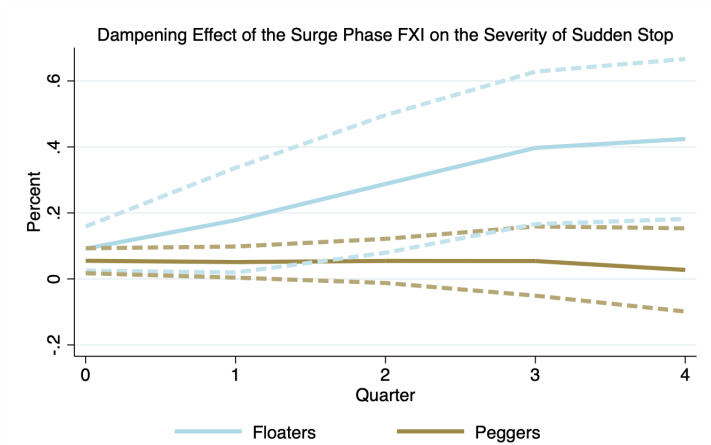
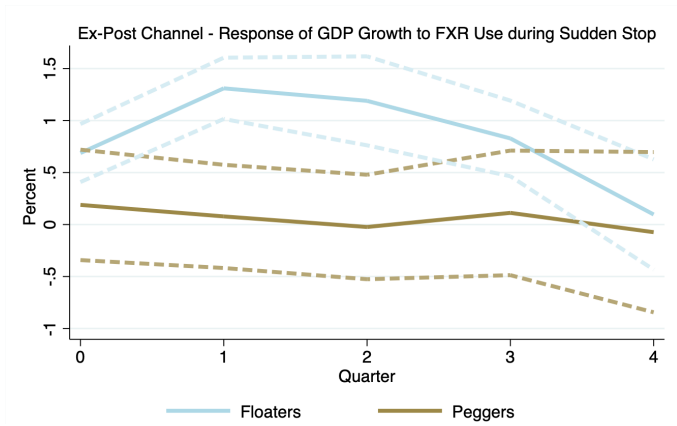- **Takeaway no.2** - **FX interventions during the boom phase** of capital inflow cycle do **reduce** the severity of a sudden stop.

- Given the median FXI during surges in floaters (2.14 p.p.) and peggers (1.84 p.p.), the dampening effect of FXI is 0.6% and 0.1%, respectively.

- Thus, strengthening the above-mentioned ex-ante role of FXI.

CHANNEL I - EX-POST CHANNEL OF FXI

"EXTINGUISHING A HOUSE ON A FIRE"

- **Ex-Post Channel of FXI** - a country can sell more reserves in the period of a sudden stop.

- Does **selling more FX reserves** during the bust support economic activity?

- For this, using the Local Projection approach, I estimate:

$$Y_{i,t+h} = \alpha_{i,h} + \lambda_{t,h} + \beta_h^{Stop} Stop_{i,t-1} + \beta_h^{FXI} FXR\ Use_{i,t-1} +$$
$$\gamma_h(Stop_{i,t-1} * FXR\ Use_{i,t-1}) + \theta_h X_{i,t} + \epsilon_{i,t+h}$$
$$\text{with} \quad h = 0, 1, 2, ..., m \quad \text{and} \quad m = 4 \quad (5)$$

Ex-Post Channel - Response of GDP Growth to FXR Use during Sudden Stop

- **Takeaway no.3** - FX interventions during the bust phase of the capital inflow cycle do **support the recovery** of the economic activity, but only for floaters.
- With the median value of FXR Use in floaters (0.18 p.p.), the decline in GDP growth is mitigated by 0.18%.
- Implying that there is an ex-post role for FXI.

CHANNEL II - EFFECT OF FXI ON CREDIT

"BUILDING A RESILIENT HOUSE"

- **Effect of FXI on Credit** - FX intervention prevents capital inflows from excessive credit.

- Can FX interventions during the surge phase of capital inflows **dampen excessive credit?**

$$Credit\ Gap_{i,t+h} = \alpha_{i,h}\ +\ \lambda_{t,h}\ +\ \beta_h^{Surge} Surge_{i,t-n}\ +\ \beta_h^{FXI} FXI_{i,t-n}\ +$$
$$\gamma_h(Surge_{i,t-n}\ *\ FXI_{i,t-n})\ +\ \theta_h X_{i,t}\ +\ \epsilon_{i,t+h}$$
$$\text{with}\quad h = 0,1,2,...,m,\quad m = 4\quad \text{and}\quad n = 12 \qquad (6)$$

Table 2 - Response of Credit-to-GDP Gap - All Countries

	Gap_{t+0}	Gap_{t+1}	Gap_{t+2}	Gap_{t+3}	Gap_{t+4}
Surge (lagged)	1.496*	1.859**	1.892**	1.761**	1.898**
	(0.836)	(0.845)	(0.783)	(0.714)	(0.804)
Surge * FXI (lagged)	0.377	0.144	-0.045	-0.075	-0.349
	(0.296)	(0.319)	(0.372)	(0.326)	(0.373)
FXI (lagged)	0.076**	0.073*	0.058	0.044	0.030
	(0.033)	(0.039)	(0.042)	(0.042)	(0.041)
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Surge * Macroprudential Policy (lagged)	-0.159*	-0.098	-0.007	0.005	0.117
	(0.090)	(0.093)	(0.119)	(0.107)	(0.123)
Macroprudential Policy (lagged)	-0.293	-0.353	-0.403*	-0.215	-0.133
	(0.239)	(0.246)	(0.210)	(0.141)	(0.159)
F Statistics	7.7	4.3	4.4	7.7	12.0
Number of Observations	985	977	966	954	938

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

- **Takeaway no.4** - FX interventions during the boom phase of capital inflows are **not able** to dampen excessive credit growth.

CONCLUSION

- I looked at 34 emerging and developing economies using complementary logarithmic approach and Local Projections and asked:

- *Do FX interventions during the period of surges reduce the probability of a sudden stop?* **Yes**

- *Do FXI in the period of surges dampen the macroeconomic contraction in economic activity during a sudden stop?* **Yes**

- *If so, what channels are at work?* **Ex-Post Channel**

Conclusion and Policy Implications

- FX interventions have the **ex-ante** as well as **ex-post role**.
  - **Ex-Ante Role** - *FX reserves' accumulation during the period of surges helps reduce the probability and severity of a sudden stop*.
  - **Ex-Post Role** - *FX reserves' decumulation during sudden stops supports economic activity*.

- Central Banks in emerging economies can act preemptively and countercyclically in the FX market.
  - accumulate buffers **during the boom times** of capital inflow cycle.
  - decumulate them in **periods of stress**.

- Central banks of emerging market economies can rely on FX interventions and **complement macroprudential tools**, when the effectiveness of the latter is reduced.

Thank you

SAMPLE

- Sample includes 34 countries, covering: Turkey, South Africa, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Guatemala, Mexico, Panama, Peru, Venezuela, Bangladesh, Sri Lanka, Taiwan, India, Indonesia, Republic of Korea, Malaysia, Philippines, Thailand, Russian Federation, China, Czech Republic, Slovak Republic, Estonia, Latvia, Lithuania, Hungary, Croatia, Slovenia, Poland and Romania.

SUDDEN STOPS AND SURGES

- A sudden stop episode is defined as a period when:
  - gross capital inflows by foreigners *fall* one standard deviation *below* its mean
  - provided it reaches two standard deviations *below* at some point
  - an episode ends when gross capital inflows are no longer at least one standard deviation *below* its mean

- A surge episode is defined as a mirror image of a sudden stop, that is, when:
  - gross capital inflows by foreigners *increase* one standard deviation *above* its mean
  - provided it reaches two standard deviations *above* at some point
  - an episode ends when gross capital inflows are no longer at least one standard deviation *above* its mean

Table A1 - Probability of a Sudden Stop

	Floater Countries	Pegger Countries	All Countries
Surge * FXI (lagged)	-0.290***	-0.187***	-0.240***
	(0.089)	(0.066)	(0.059)
Surge (lagged)	0.853***	1.557***	1.160***
	(0.234)	(0.461)	(0.242)
FXI (lagged)	0.014	0.002	0.007
	(0.013)	(0.030)	(0.018)
VIX growth (lagged)	0.012***	0.014***	0.014***
	(0.002)	(0.003)	(0.002)
Global Growth (lagged)	-0.056	-0.182**	-0.109**
	(0.071)	(0.083)	(0.049)
Global Liquidity Growth (lagged)	-0.070***	-0.052	-0.060***
	(0.025)	(0.032)	(0.018)
Global Rate (lagged)	0.292***	0.165*	0.229***
	(0.068)	(0.099)	(0.053)
Commodity Price Growth (lagged)	0.000	-0.003	-0.002
	(0.011)	(0.017)	(0.009)
Contagion (lagged)	0.301	0.875**	0.510
	(0.497)	(0.398)	(0.351)
National GDP Growth (lagged)	-0.100**	-0.027	-0.052**
	(0.046)	(0.027)	(0.021)
Macroprudential Policy (lagged)	-0.019	0.088	0.024
	(0.079)	(0.091)	(0.060)
Surge * Macroprudential Policy (lagged)	0.312	-0.204	0.007
	(0.241)	(0.232)	(0.192)
Number of Observations	819	649	1,468

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Table A2 - Response of Credit-to-GDP Gap - All Countries

	Gap_{t+0}	Gap_{t+1}	Gap_{t+2}	Gap_{t+3}	Gap_{t+4}
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Surge * FXI (lagged)	0.377	0.144	-0.045	-0.075	-0.349
	(0.296)	(0.319)	(0.372)	(0.326)	(0.373)
FXI (lagged)	0.076**	0.073*	0.058	0.044	0.030
	(0.033)	(0.039)	(0.042)	(0.042)	(0.041)
GDP Growth (lagged)	-0.226**	-0.133	0.051	0.175**	0.246***
	(0.092)	(0.092)	(0.086)	(0.066)	(0.063)
GDP Gap (lagged)	0.108*	0.106	0.126**	0.120**	0.080
	(0.057)	(0.061)	(0.053)	(0.048)	(0.054)
VIX Growth (lagged)	-3.515	-2.816	-2.094	-1.922	-1.443
	(3.716)	(4.108)	(4.293)	(4.199)	(4.283)
Monetary Policy Rate (lagged)	-0.046	-0.026	0.014	0.049	0.076**
	(0.052)	(0.049)	(0.044)	(0.038)	(0.034)
Surge * Macroprudential Policy (lagged)	-0.159*	-0.098	-0.007	0.005	0.117
	(0.090)	(0.093)	(0.119)	(0.107)	(0.123)
Macroprudential Policy (lagged)	-0.293	-0.353	-0.403*	-0.215	-0.133
	(0.239)	(0.246)	(0.210)	(0.141)	(0.159)
Credit-to-GDP Gap (lagged)	0.046*	-0.010	-0.064**	-0.113***	-0.142***
	(0.025)	(0.026)	(0.030)	(0.033)	(0.036)
F Statistics	7.7	4.3	4.4	7.7	12.0
Number of Observations	985	977	966	954	938

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table A3 - Severity of a Sudden Stop with FXI - Floater Countries

	Y_{t+0}	Y_{t+1}	Y_{t+2}	Y_{t+3}	Y_{t+4}
Sudden Stop	-1.229	-1.736*	-1.295	-1.339	-0.876
	(0.705)	(0.909)	(0.969)	(1.107)	(1.078)
Stop * Surge * FXI	0.092**	0.178*	0.288**	0.397***	0.424***
	(0.038)	(0.090)	(0.119)	(0.132)	(0.138)
Surge (lagged)	0.270	0.259	-0.149	-0.028	-0.497
	(0.259)	(0.382)	(0.423)	(0.386)	(0.575)
Surge * FXI (lagged)	-0.057	0.099	0.314	0.094	0.507
	(0.135)	(0.222)	(0.308)	(0.356)	(0.450)
Stop * FXI	0.205	0.148	0.230	0.488	0.049
	(0.278)	(0.269)	(0.346)	(0.342)	(0.393)
Stop * Surge	-0.400	-0.836	-0.886	-0.041	0.535
	(0.524)	(0.688)	(0.878)	(1.073)	(1.341)
FXI (lagged)	-0.003	-0.010	-0.037	-0.046	-0.071
	(0.029)	(0.046)	(0.054)	(0.053)	(0.061)
GDP Growth (lagged)	0.666***	0.459***	0.336***	0.133*	0.088
	(0.092)	(0.088)	(0.098)	(0.074)	(0.071)
GDP Gap (lagged)	-0.085*	-0.188*	-0.214***	-0.247***	-0.214***
	(0.042)	(0.089)	(0.070)	(0.059)	(0.058)
log of GDP Per Capita (lagged)	2.713	3.343	4.096	4.388	5.110
	(3.073)	(3.431)	(3.658)	(3.786)	(4.026)
Institutional Quality	0.587	1.362	1.837	2.193	1.472
	(1.053)	(1.581)	(2.088)	(2.124)	(2.105)
Linear Trend	-0.045	-0.068	-0.088*	-0.098**	-0.111**
	(0.036)	(0.042)	(0.045)	(0.045)	(0.048)
Commodity Terms of Trade	-0.002	0.015*	0.028**	0.036**	0.034*
	(0.009)	(0.008)	(0.012)	(0.015)	(0.016)
F Statistics	29.1	10.9	9.8	6.3	8.3
Number of Observations	820	820	809	797	785

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table A4 - Severity of a Sudden Stop with FXI - Pegger Countries

	Y_{t+0}	Y_{t+1}	Y_{t+2}	Y_{t+3}	Y_{t+4}
Sudden Stop	-0.941	-1.282	-1.059	-0.571	0.119
	(0.651)	(0.964)	(1.237)	(1.253)	(1.079)
Stop * Surge * FXI	0.055**	0.051*	0.055	0.054	0.027
	(0.022)	(0.027)	(0.038)	(0.060)	(0.072)
Surge (lagged)	0.139	0.283	0.371	-0.265	-0.765
	(0.218)	(0.331)	(0.504)	(0.565)	(0.736)
Surge * FXI (lagged)	0.204	0.123	0.186*	0.205	0.010
	(0.140)	(0.091)	(0.103)	(0.182)	(0.144)
Stop * FXI	0.091**	0.170**	0.195**	0.246**	0.225
	(0.033)	(0.063)	(0.073)	(0.102)	(0.163)
Stop * Surge	-1.293**	-1.963**	-2.241*	-2.466*	-2.034
	(0.595)	(0.821)	(1.216)	(1.405)	(1.442)
FXI (lagged)	-0.004	-0.006	-0.021	-0.030	-0.045
	(0.013)	(0.019)	(0.025)	(0.034)	(0.043)
GDP Growth (lagged)	0.738***	0.547***	0.377***	0.173**	0.075
	(0.071)	(0.084)	(0.091)	(0.079)	(0.075)
GDP Gap (lagged)	-0.007	-0.074	-0.060	-0.041	0.008
	(0.029)	(0.052)	(0.054)	(0.073)	(0.080)
log of GDP Per Capita (lagged)	-2.005	-3.571	-7.438	-10.614	-14.341
	(2.692)	(4.448)	(6.213)	(8.323)	(9.618)
Institutional Quality	2.027	2.837	4.515	5.474	6.237
	(1.594)	(2.290)	(3.103)	(3.622)	(4.005)
Linear Trend	-0.025	-0.040	-0.042	-0.032	-0.016
	(0.034)	(0.054)	(0.063)	(0.073)	(0.079)
Commodity Terms of Trade	-0.037	-0.033	-0.030	-0.021	-0.008
	(0.026)	(0.022)	(0.022)	(0.023)	(0.025)
F Statistics	27.1	11.8	8.7	6.9	8.8
Number of Observations	609	609	601	592	583

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

FXI ENTAILS SMALLER LAGS

Table A5 - Characteristics of Policy Tools

	FX Intervention	Macroprudential Policy	CFMs
Transmission Lag	Negligible	Long	Medium
Implementation Lag	Negligible	Large	Medium
Reputation Cost	Low	High	High
Frequency of Adjustment	Very Frequent	Infrequent	Infrequent

Source: Borio and Disyatat (2021)