7TH JACQUES POLAK ANNUAL RESEARCH CONFERENCE
NOVEMBER 9-10, 2006

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Does Moving to a Flexible Exchange Rate Regime Reduce Currency Mismatches in Firms' Balance Sheets?

Herman Kamil

International Monetary Fund

November 10th, 2006

Importance of Balance Sheet Mismatches

- Currency mismatches in firms' balance sheets have been a source of financial vulnerability in emerging markets.
- Firms highly leveraged in foreign currency debt but with little foreign currency earnings are exposed to sudden swings in the exchange rate.
- Currency risk exposure in the corporate sector can lead to financial stress in the banking system.

Do Exchange Rate Regimes Affect Incentives to Hedge Currency Risk?

- Conventional wisdom: pegged regimes provide an implicit guarantee that leads to excessive currency risk-taking (Mishkin 1996; Burnside, Eichenbaum and Rebelo, 2002; Goldstein and Turner, 2004).
- Different view: the problem of unhedged foreign currency liabilities has deeper roots than the choice of exchange rate regimes (Calvo and Reinhart, 2000a and 2000b; Eichengreen, Hausmann and Panizza, 2003).

Scant Microeconomic Evidence on the Effect of Exchange Rate Regimes

- Arteta (2005) finds that floating regimes *exacerbate* balance sheet currency mismatches at the *bank level.*
- At the *firm-level*, Martinez and Werner (2002) and Cowan, Hansen and Herrera (2005) look at the individual experiences of Mexico and Chile, respectively.
- There is no cross-country, microeconomic evidence on the financial vulnerability induced by different exchange rate regimes.

Goal of the Study

Is to answer the following question:

- Do Flexible Exchange Rate Regimes Encourage More Hedging of Currency Risk at the Firm Level?
- Analysis based on microeconomic dataset with information on the currency composition of balance sheet variables for seven Latin American countries, between 1992 and 2005.

Outline of the Presentation

Organization of the rest of the presentation:

- Description of Data Set and Key Stylized Facts.
- Empirical Results.
- Conclusions and Policy Implications.

Main Results of the Study

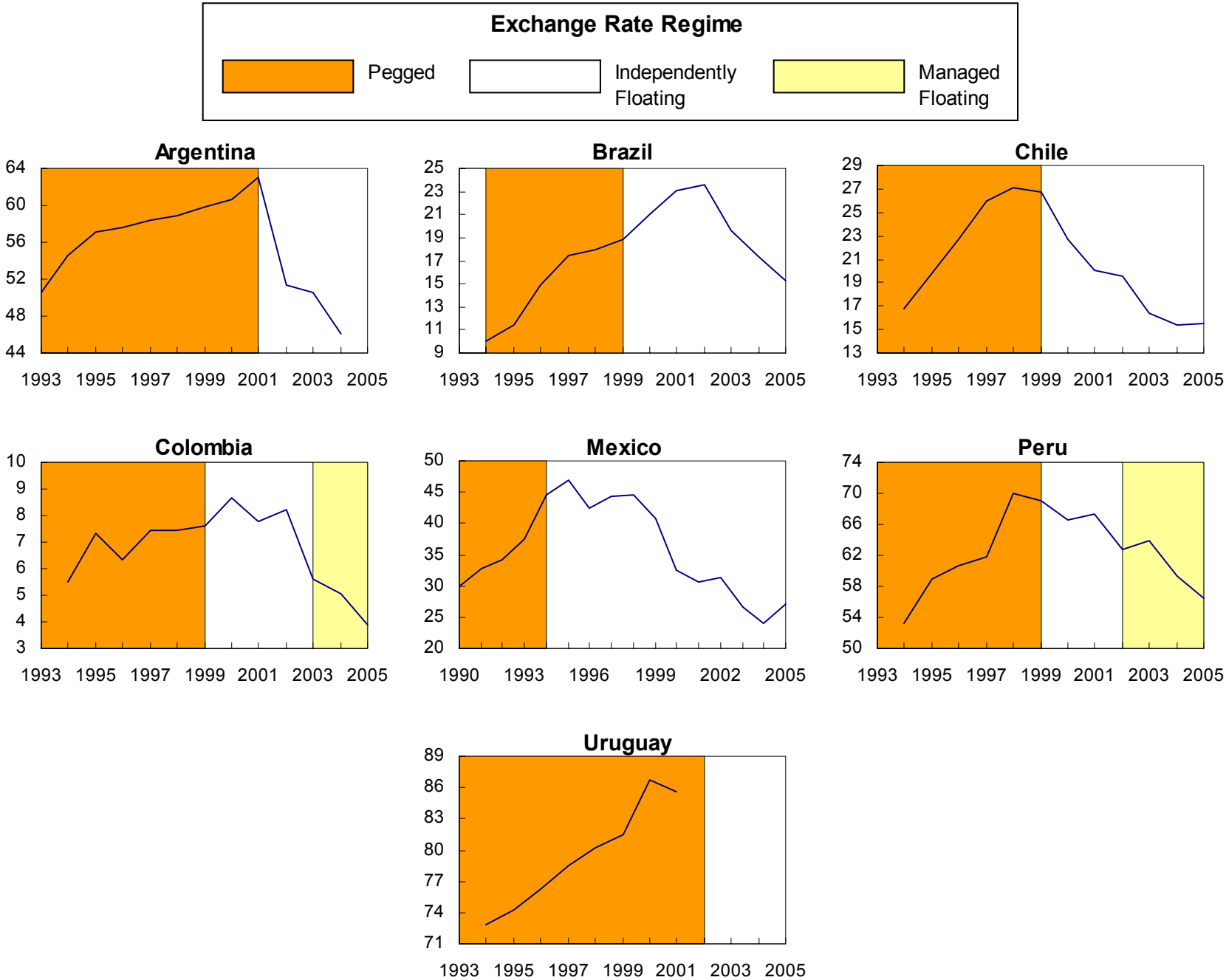
- Unhedged foreign currency borrowing is *lower* under floating exchange regimes.
- Following adoption of a floating regime, foreign currency revenues and dollar assets become a more significant predictor of foreign currency-denominated liabilities.
- This increase in currency matching is more pronounced in firms which are more leveraged in dollar debt.

Firm-Level Data and Key Stylized Facts

- New microeconomic data-set with accounting information for 2,200 firms in Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay.
- Detailed information on the currency and maturity composition of assets and liabilities, and breakdown of revenues in domestic and foreign sales.
- To classify Regimes, we follow the IMF *de facto* classification as described in Bubula and Otker-Robe (2002), and updated by IMF staff till 2005.

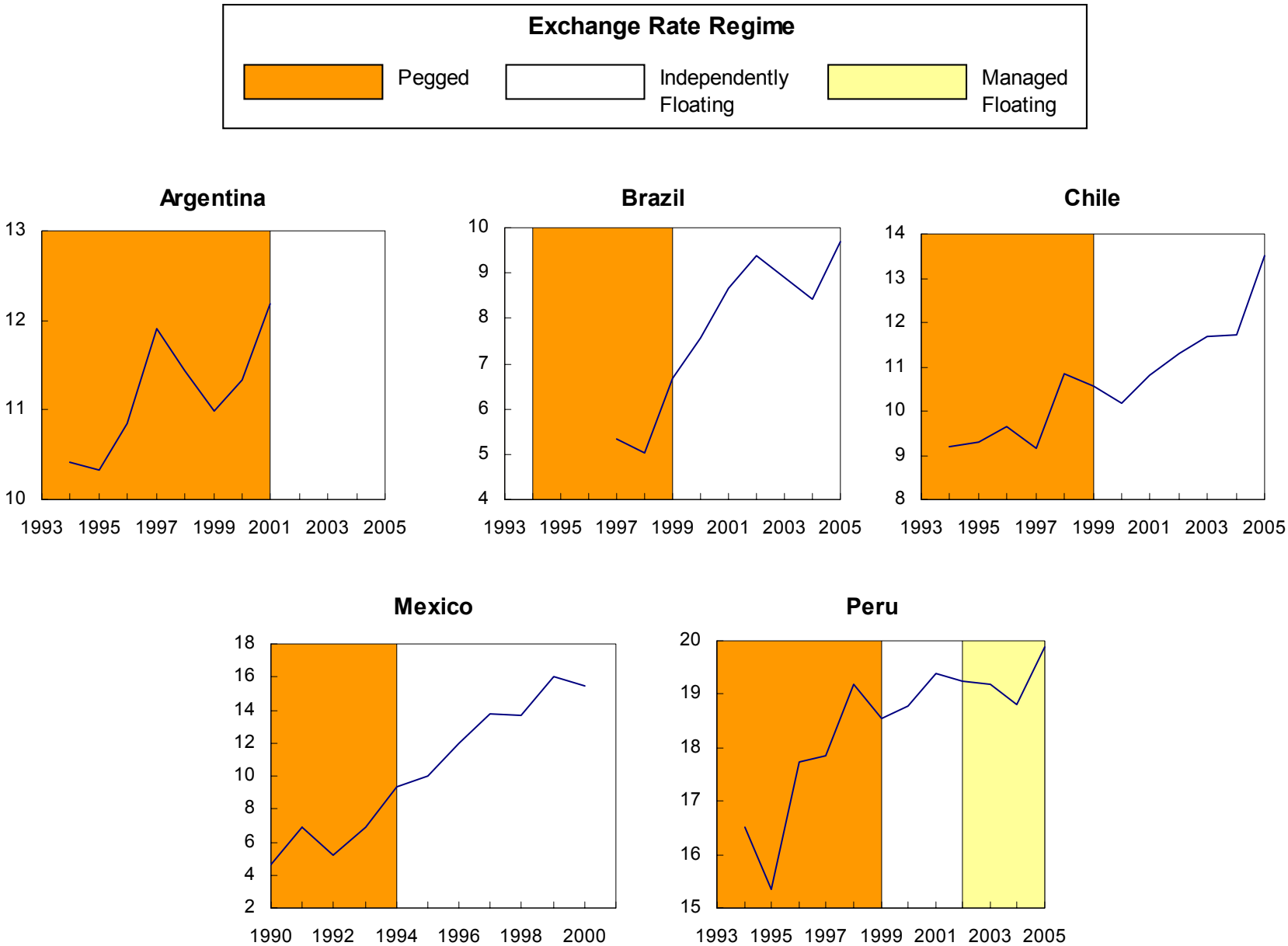
Dollarization of Liabilities of the Corporate Sector in Latin America

(In percent, annual average across firms)



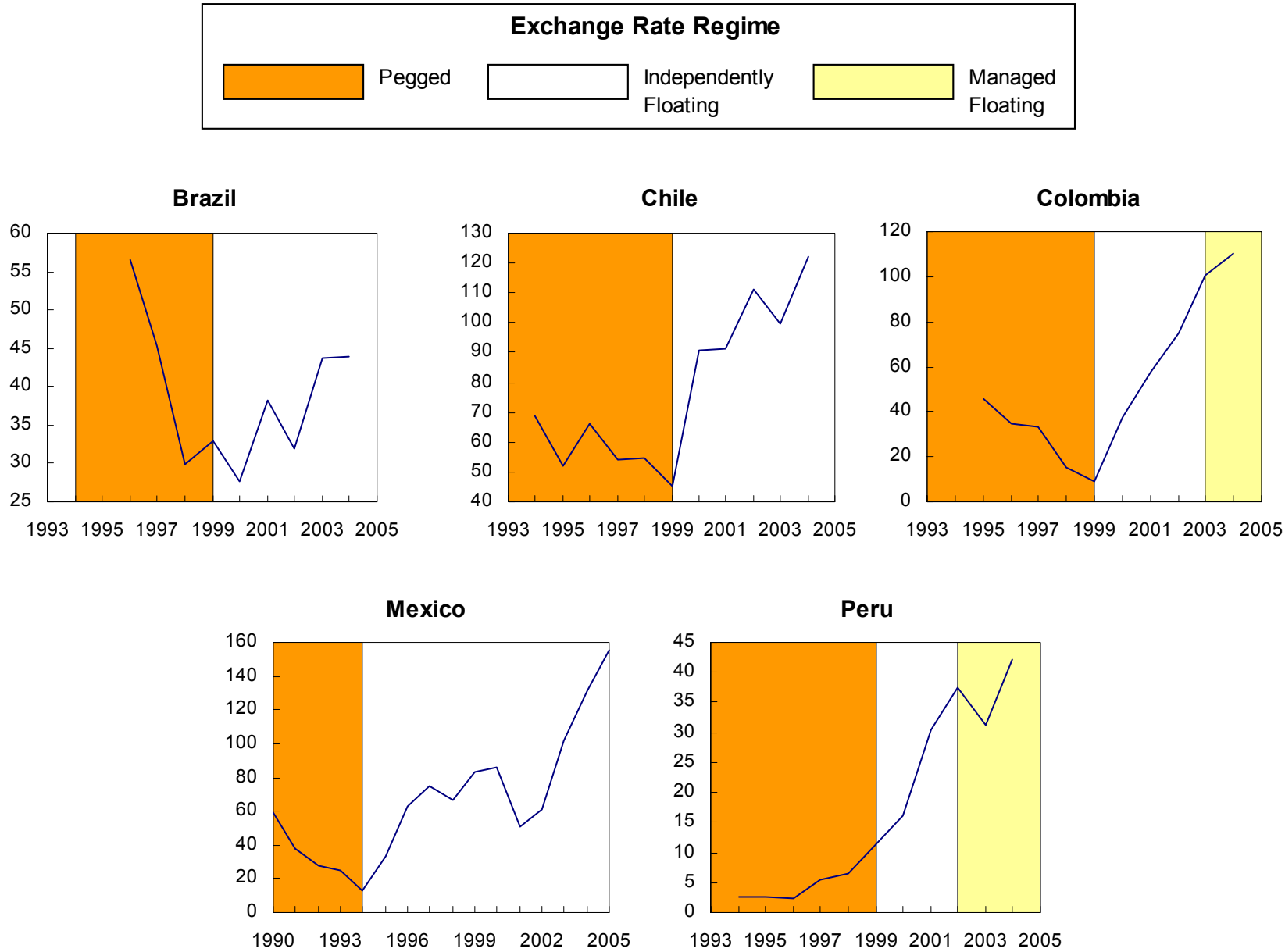
Dollarization of Assets of the Corporate Sector in Latin America

(In percent, annual average across firms)



Coverage of Short Term Exchange Rate Exposure

(Exports as a percentage of end-of period short term dollar liabilities, annual medians)



Econometric Specification

Empirical Model

$$\frac{D^*}{D}_{ijct} = \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 \frac{EXP}{S}_{ijct} + \alpha_3 \frac{A^*}{A}_{ijct-1}$$

$$+\alpha_4 \left[\frac{EXP}{S}_{ijct} * FLEX_{ct}\right] + \alpha_5 \left[\frac{A^*}{A}_{ijct-1} * FLEX_{ct}\right]$$

$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- Where indices denote:

i	firm
j	economic sector
c	country
t	year

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Empirical Model

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$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- **Dependent Variable**:

$\frac{D^*}{D}$ Share of total liabilities that are denominated in (or indexed to) a foreign currency, contracted domestically or abroad.

Econometric Specification

Empirical Model

$$\frac{D^*}{D}_{ijct} = \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 \frac{EXP}{S}_{ijct} + \alpha_3 \frac{A^*}{A}_{ijct-1}$$

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$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- **Main Explanatory Variables:**

FLEX Dummy variable equals 1 for years when a country has an independently floating regime, 0 otherwise.

Econometric Specification

Empirical Model

$$\frac{D^*}{D}_{ijct} = \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 \frac{EXP}{S}_{ijct} + \alpha_3 \frac{A^*}{A}_{ijct-1}$$

$$+\alpha_4 \left[\frac{EXP}{S}_{ijct} * FLEX_{ct}\right] + \alpha_5 \left[\frac{A^*}{A}_{ijct-1} * FLEX_{ct}\right]$$

$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- **Main Explanatory Variables:**

$\frac{EXP}{S}$ Share of exports in total sales

$\frac{A^*}{A}$ Share of assets denominated in dollars.

Econometric Specification

Empirical Model

$$\frac{D^*}{D}_{ijct} = \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 \frac{EXP}{S}_{ijct} + \alpha_3 \frac{A^*}{A}_{ijct-1}$$

$$+\alpha_4 \left[\frac{EXP}{S}_{ijct} * FLEX_{ct}\right] + \alpha_5 \left[\frac{A^*}{A}_{ijct-1} * FLEX_{ct}\right]$$

$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- **Key Estimated Parameter on Average Dollarization Effect:**

α_1 measures the average *change* in dollarization of liabilities following the adoption of a floating regime (for firms with no natural hedges)

Econometric Specification

Empirical Model

$$\frac{D^*}{D}_{ijct} = \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 \frac{EXP}{S}_{ijct} + \alpha_3 \frac{A^*}{A}_{ijct-1}$$

$$+\alpha_4 \left[\frac{EXP}{S}_{ijct} * FLEX_{ct}\right] + \alpha_5 \left[\frac{A^*}{A}_{ijct-1} * FLEX_{ct}\right]$$

$$+\mathbf{X}_{ijct-1}\,\boldsymbol{\beta} + \gamma_c + \phi_j + \lambda_t + e_{ijct}$$

- **Key Estimated Parameters on Currency Matching Effect:**

  α_4 , α_5 measure the average *change* in the degree of currency matching under floating regimes.

Econometric Specification

- **Control Variables**:

Size Based on value of total assets each year (dummies for large and medium-sized firms; small firms is excluded category).

International Access
Dummy variable equal 1 starting the year a firm access international capital markets (equity or financial debt).

Fixed Effects:

γ_c country-specific
ϕ_j sector-specific
λ_t year-specific

Determinants of the Currency Composition of Firms' Liabilities, 1992-2005

Dependent Variable: **Share of TOTAL Liabilities Denominated in Foreign Currency**

Independent Variables	(1)
Main Effects	
Exports to Sales ratio	0.26
	(0.03)***
Total Foreign Currency Assets over Total Assets	0.46
	(0.06)***
Flexible Regime Dummy	-0.09
	(0.02)***
Exchange Rate Regime Effects	
Export to Sales x Flex Regime Dummy	0.13
	(0.06)***
Dollarization Assets x Flex Regime Dummy	0.14
	(0.01)***
Controls	
Size_Medium	0.08
	(0.02)***
Size_Big	0.13
	(0.02)***
International_Access	0.15
	(0.01)***
Crisis Year Dummy	0.09
	(0.02)***
Fixed Effects	
Country	Yes
Year	Yes
Economic Sector	Yes
Number of Observations	4484
Non-Corner Observations (in %)	73.0
McFadden's R2	0.52

Determinants of the Currency Composition of Firms' Liabilities, 1992-2005

Dependent Variable: **Share of TOTAL Liabilities Denominated in Foreign Currency**

Independent Variables	(1)	(2)
Main Effects		
Exports to Sales ratio	0.26	0.28
	(0.03) ***	(0.03) ***
Total Foreign Currency Assets over Total Assets	0.46	0.48
	(0.06) ***	(0.06) ***
De Facto Flexibility	-0.09	-0.08
	(0.02) ***	(0.02) ***
Exchange Rate Regime Effects		
Export to Sales x De Facto Flexibility	0.13	0.15
	(0.06) ***	(0.06) ***
Dollarization Assets x De Facto Flexibility	0.14	0.16
	(0.01) ***	(0.05) ***
Controls		
Size_Medium	0.08	0.08
	(0.02) ***	(0.02) ***
Size_Big	0.13	0.13
	(0.02) ***	(0.02) ***
International_Access	0.15	0.14
	(0.01) ***	(0.01) ***
Crisis Year Dummy	0.09	0.07
	(0.02) ***	(0.02) ***
Fixed Effects		
Country	Yes	Yes
Year	Yes	Yes
Economic Sector	Yes	Yes
Number of Observations	4484	4484
Non-Corner Observations (in %)	73.0	73.0
McFadden's R2	0.52	0.52

Determinants of the Currency Composition of Firms' Liabilities, 1992-2005

Dependent Variable: **Share of SHORT TERM Liabilities Denominated in Foreign Currency**

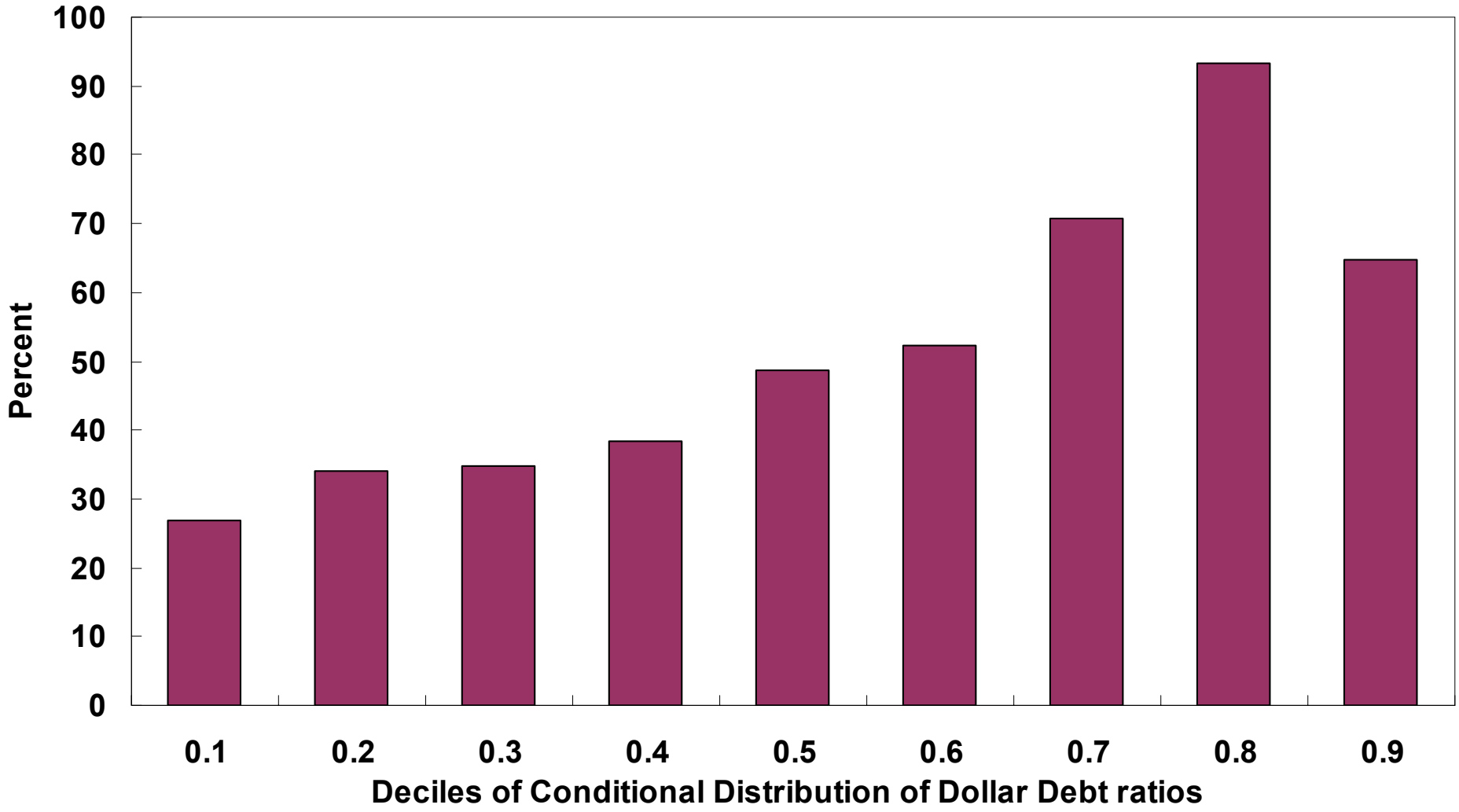
Independent Variables	(3)
Main Effects	
Exports to Sales ratio	0.34
	(0.04)***
Total Foreign Currency Assets over Total Assets	0.46
	(0.07)***
Flexible Regime Dummy	-0.05
	(0.02)***
Exchange Rate Regime Effects	
Export to Sales x Flex Regime Dummy	0.15
	(0.05)***
Dollarization Assets x Flex Regime Dummy	0.05
	(0.07)
Controls	
Size_Medium	0.07
	(0.02)***
Size_Big	0.11
	(0.02)***
International_Access	0.08
	(0.01)***
Crisis Year Dummy	0.08
	(0.02)***
Fixed Effects	
Country	Yes
Year	Yes
Economic Sector	Yes
Number of Observations	3720
Non-Corner Observations (in %)	71.0
McFadden's R2	0.61

Determinants of the Currency Composition of Firms' Liabilities, 1992-2005

Dependent Variable: **Share of SHORT TERM Liabilities Denominated in Foreign Currency**

Independent Variables	(3)	(4)
Main Effects		
Exports to Sales ratio	0.34	0.36
	(0.04) ***	(0.04) ***
Total Foreign Currency Assets over Total Assets	0.46	0.47
	(0.07) ***	(0.07) ***
De Facto Flexibility	-0.05	-0.02
	(0.02) **	(0.02)
Exchange Rate Regime Effects		
Export to Sales x De Facto Flexibility	0.15	0.17
	(0.05) ***	(0.05) ***
Dollarization Assets x De Facto Flexibility	0.05	0.05
	(0.07)	(0.07)
Controls		
Size_Medium	0.07	0.08
	(0.02) ***	(0.02) ***
Size_Big	0.11	0.11
	(0.02) ***	(0.02) ***
International_Access	0.08	0.08
	(0.01) ***	(0.01) ***
Crisis Year Dummy	0.08	0.07
	(0.02) ***	(0.02) ***
Fixed Effects		
Country	Yes	Yes
Year	Yes	Yes
Economic Sector	Yes	Yes
Number of Observations	3720	3720
Non-Corner Observations (in %)	71.0	71.0
McFadden's R2	0.61	0.61

Increase in the Degree of Balance Sheet Currency Matching Across Firms with Different Dollar Debt Ratios 1/



1/ Compared with Pegged Regimes

Robustness Tests

- Are results affected by survivorship bias?
- Are findings contaminated by endogenous changes in firms' export status following a regime change?
- Are changes in the maturity structure of debt affecting the results?
- What happens if we control for the lagged value of the dependent variable?
- What happens if we exclude from the sample firms that hold no dollar debt during the whole period?

Transition Matrices for Export Status Before and After Regime Change

BRAZIL

PRE-FLOAT REGIME	POST-FLOAT REGIME: Non-Exporter	POST-FLOAT REGIME: Exporter
Non-Exporter	49%	0%
Exporter	12%	39%

CHILE

PRE-FLOAT REGIME	POST-FLOAT REGIME: Non-Exporter	POST-FLOAT REGIME: Exporter
Non-Exporter	47%	5%
Exporter	10%	38%

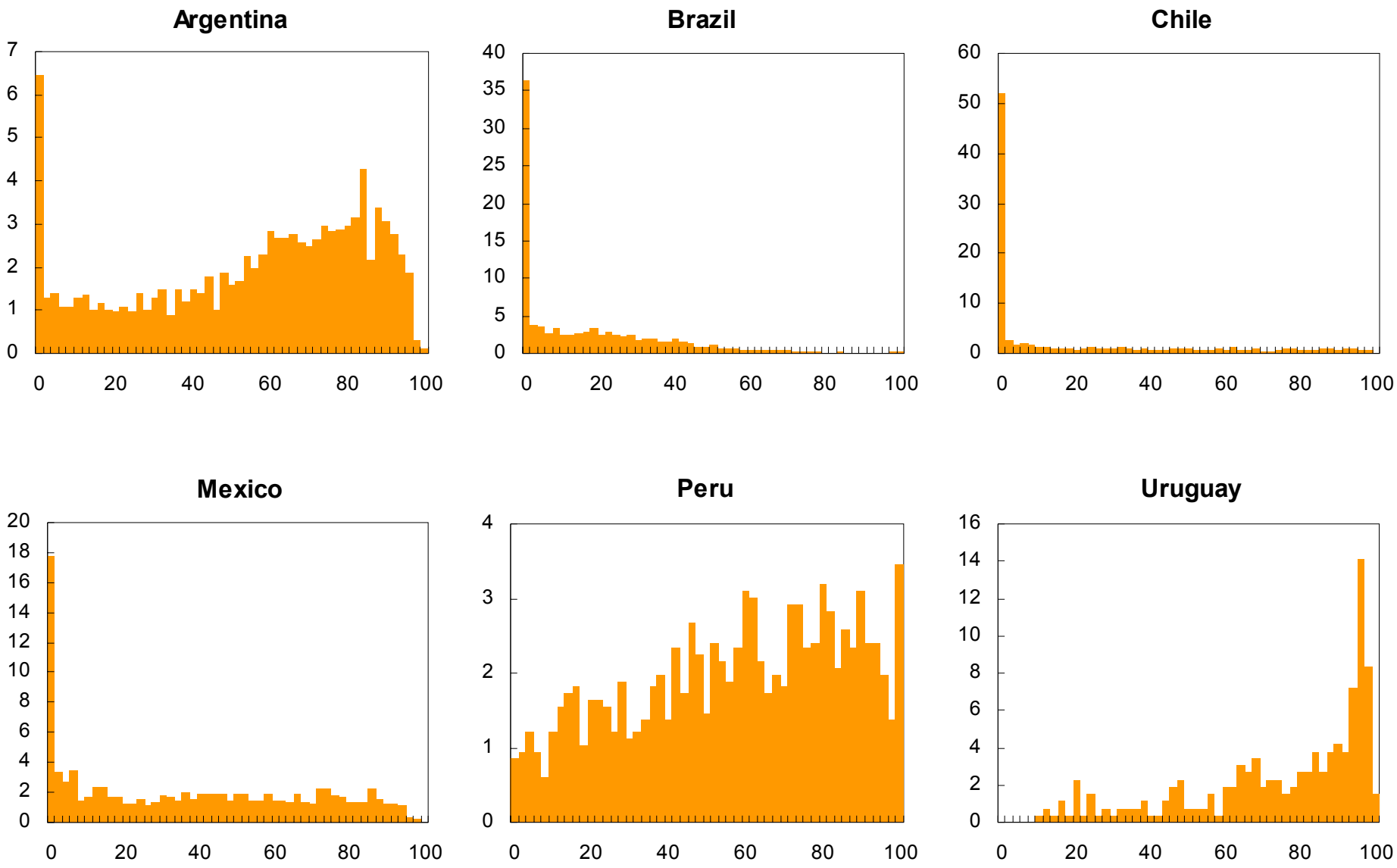
COLOMBIA

PRE-FLOAT REGIME	POST-FLOAT REGIME: Non-Exporter	POST-FLOAT REGIME: Exporter
Non-Exporter	59%	3%
Exporter	8%	30%

MEXICO

PRE-FLOAT REGIME	POST-FLOAT REGIME: Non-Exporter	POST-FLOAT REGIME: Exporter
Non-Exporter	27%	9%
Exporter	2%	63%

Distribution of Firm-Level Dollarization within Countries



Main Findings

- Currency regimes affect incentives of the private sector to hedge currency risk.
- In floating regimes, the ability to generate foreign currency revenues becomes a more significant determinant of dollar-denominated debt.
- At a macroeconomic level, results suggest that foreign currency liabilities get redistributed in the economy towards borrowers better able to bear exchange rate risk.

Policy Implications

- Moving to a floating regime should be considered part of a de-dollarization strategy.
- Shift to a flexible exchange rate regime seem to make the risks of foreign currency borrowing more apparent, leading to higher natural currency hedging.
- Moving to a flexible regime should be done gradually to avoid the risk of abrupt changes in exchange rates triggering bankruptcies.

Exchange Rate Regimes and Measures of Exchange Rate Flexibility Within Regimes

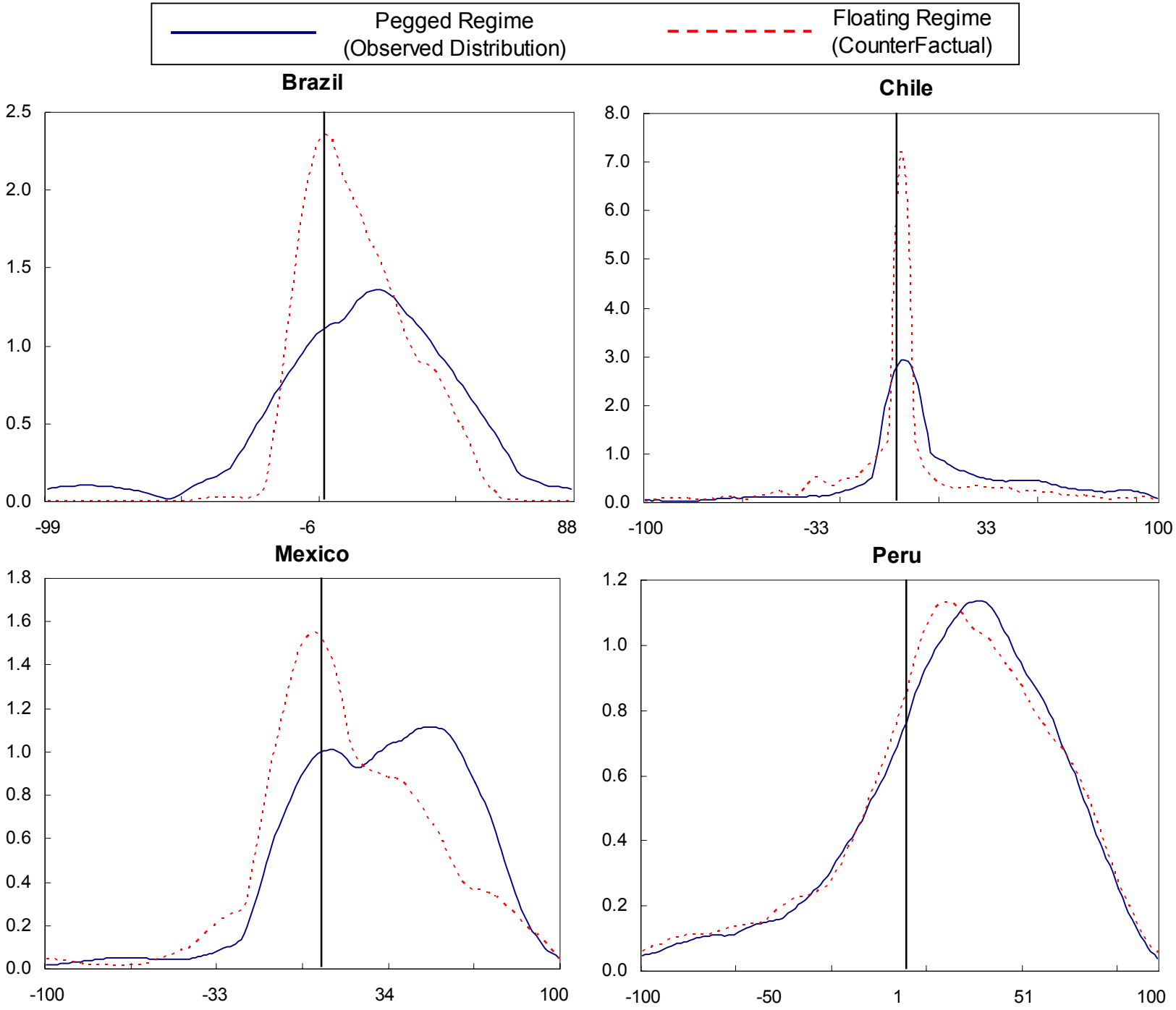
Country	Period	De Facto Regime (Coarse Classification, IMF)	Fear of Floating Indicator 3/	*De Facto Flexibility* Index 4/
Argentina	1994-2001	Currency Board Arrangement	0.00	0.00
	2002-2005	Managed Floating	0.28	0.96
Brazil 1/	1994-1998	Crawling Peg	0.01	0.09
	1999-2005	Independently Floating	0.97	0.52
Chile	1994-1998	Crawling Band	0.12	0.08
	1999-2005	Independently Floating	0.45	0.25
Colombia	1994-1998	Crawling Band	0.18	0.48
	1999-2003	Independently Floating	0.14	0.61
	2004-2005	Managed Floating	0.24	0.30
Mexico 2/	1990-1994	Crawling Band / Crawling Peg	0.00	0.06
	1995-2005	Independently Floating	0.08	0.32
Peru	1994-1998	Managed Floating	0.02	0.06
	1999-2001	Independently Floating	0.05	0.09
	2002-2005	Managed Floating	0.07	0.06
Uruguay	1994-2001	Crawling Band	0.01	0.17
	2002-2004	Independently Floating	0.05	0.09
	2005	Managed Floating	0.17	0.12

Sources: Author's calculations based on classification described in Bubula and Otker-Robe (2002); and updated by IMF staff through mid-2006.

1/ Crawling peg for Brazil starting from July 1994.

2/ Crawling band/crawling peg for Mexico ends in November 1994. Independent floating beginning in December 1994.

3/ Calculated using Calvo and Reinhart 's (2002) measure of fear of floating. A higher value denotes more flexibility.

4/ Calculated using measure of *de facto* exchange rate flexibility described in Poirson (2001). A higher value denotes more flexibility.

Distribution of Firms' Balance Sheet Currency Mismatches Across Regimes