Capital Flow Waves: Surges, Stops, Flight and Retrenchment

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Motivation

- Substantial volatility in cross-border capital flows
  - Long history of "waves", of booms and busts

- Can have substantial economic costs
  - Surges correlated with real estate booms, banking crises, debt defaults, inflation and currency crises
    - Aizenman and Jinjarek (2009), Caballero (2010), Reinhart and Reinhart (2009)
  - Sudden stops correlated with currency depreciations, slower growth and higher interest rates
    - Edwards (2005), Freund and Warnock (2007)

- But can also stabilize economies
  - Evidence from recent Global Financial Crisis

- Our question: What causes these extreme movements or "waves" in capital flows?

This Paper: 3 Contributions

1. New methodology to identify capital flow episodes
   - Other work uses <u>net</u> capital flow proxies
   - Our methodology analyzes <u>gross</u> capital flows disaggregated by foreign & domestic investors

2. Evaluate relevance of theoretical models on capital flow volatility, crises and surges
   - Global versus contagion versus domestic factors
   - Relevance of recent theoretical emphasis on global factors driving GFC

3. Understand these events to guide policy responses

Outline

1. **Measuring Capital Flow Episodes**
   - **Our approach**
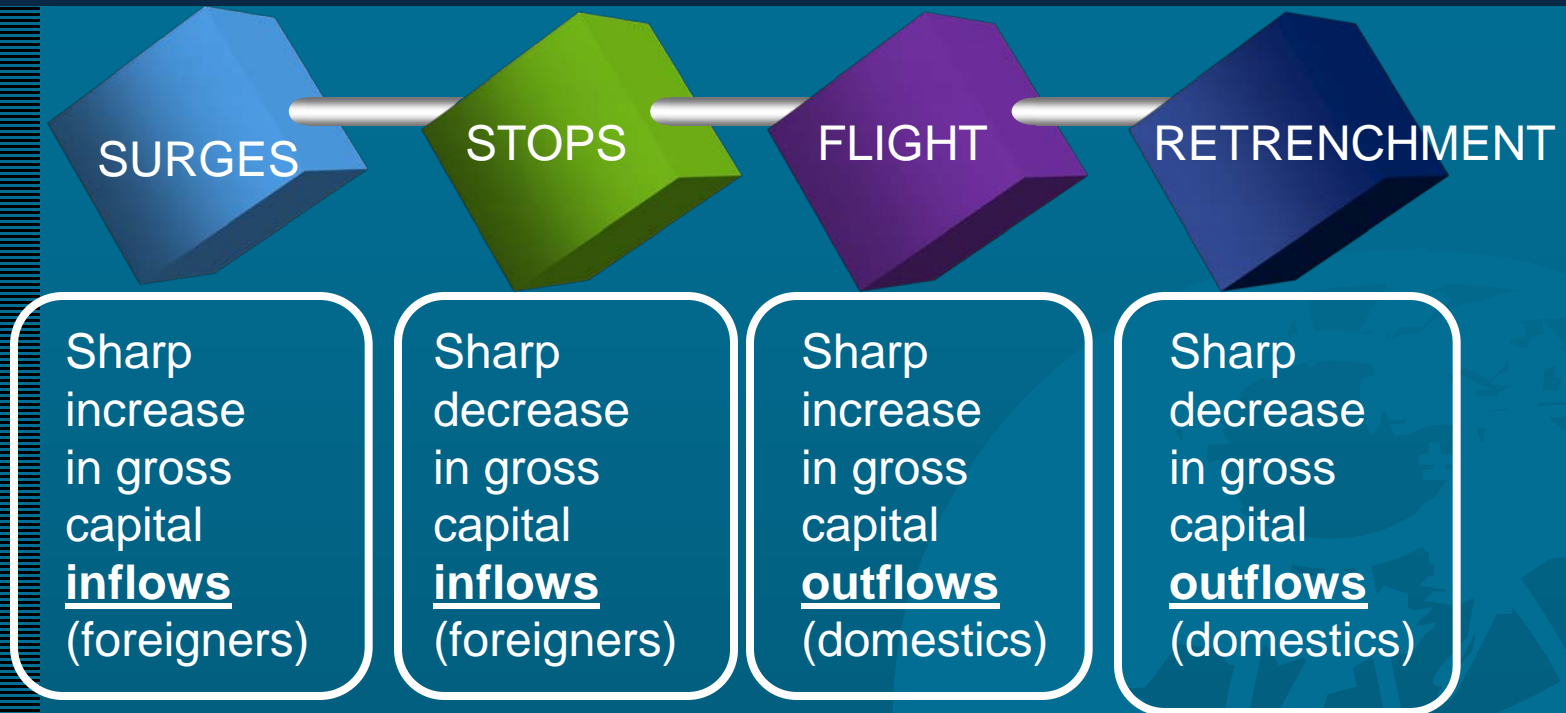   - **Comparison to previous work**

2. **Explaining the Episodes**
   - **The theory**
   - **The evidence**

3. **Conclusions**

Measuring Capital Flow Episodes

Our Approach

SURGES — STOPS — FLIGHT — RETRENCHMENT

Sharp increase in gross capital **inflows** (foreigners)	Sharp decrease in gross capital **inflows** (foreigners)	Sharp increase in gross capital **outflows** (domestics)	Sharp decrease in gross capital **outflows** (domestics)

- Builds on literature on "sudden stops", similar approach in recent work on "bonanzas"
- Calvo (1998), Calvo et al. (2004), Reinhart and Reinhart (2009), Caballero (2010)

Our Approach

- More specifically, to calculate a surge or stop:
  - Let C_t be a 4-quarter moving sum of gross capital inflows from foreigners (GINFLOW):

$$C_t = \sum_{i=0}^{3} GINFLOW_{t-i}$$

$$\Delta C_t = C_t - C_{t-4}$$

  - A surge is when ΔC_t increases more than 1 standard deviation above its rolling historical mean, provided:
    - ΔC_t increases at least 2 sd at some point in episode
    - The entire episode lasts more than 1 quarter
    - Country has at least 4 years of data to calculate historic mean
  - Stop is defined symmetrically

Surges & Stops for Brazil
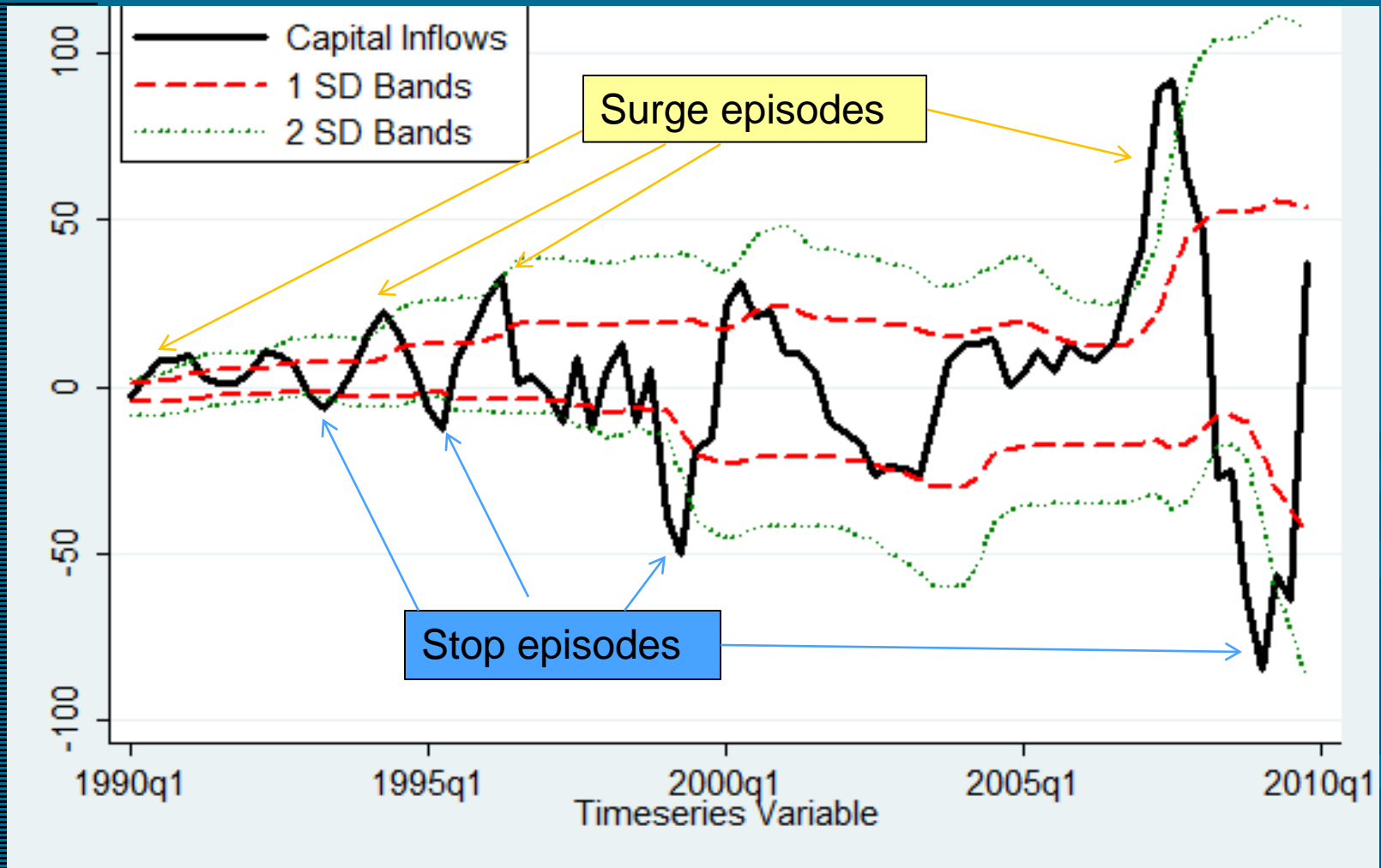
Some Data Specifics

- Main data: IMF's, IFS
  - Augment with data from country authorities

- Resulting dataset: 58 countries from 1980-2009
  - Coverage substantially better at end of sample

- Baseline definitions:
  - Gross inflows: sum of inflows of direct investment, portfolio inflows & other inflows
  - Gross (private) outflows: sum of outflows of direct investment, portfolio, and other outflows with reserve accumulation omitted
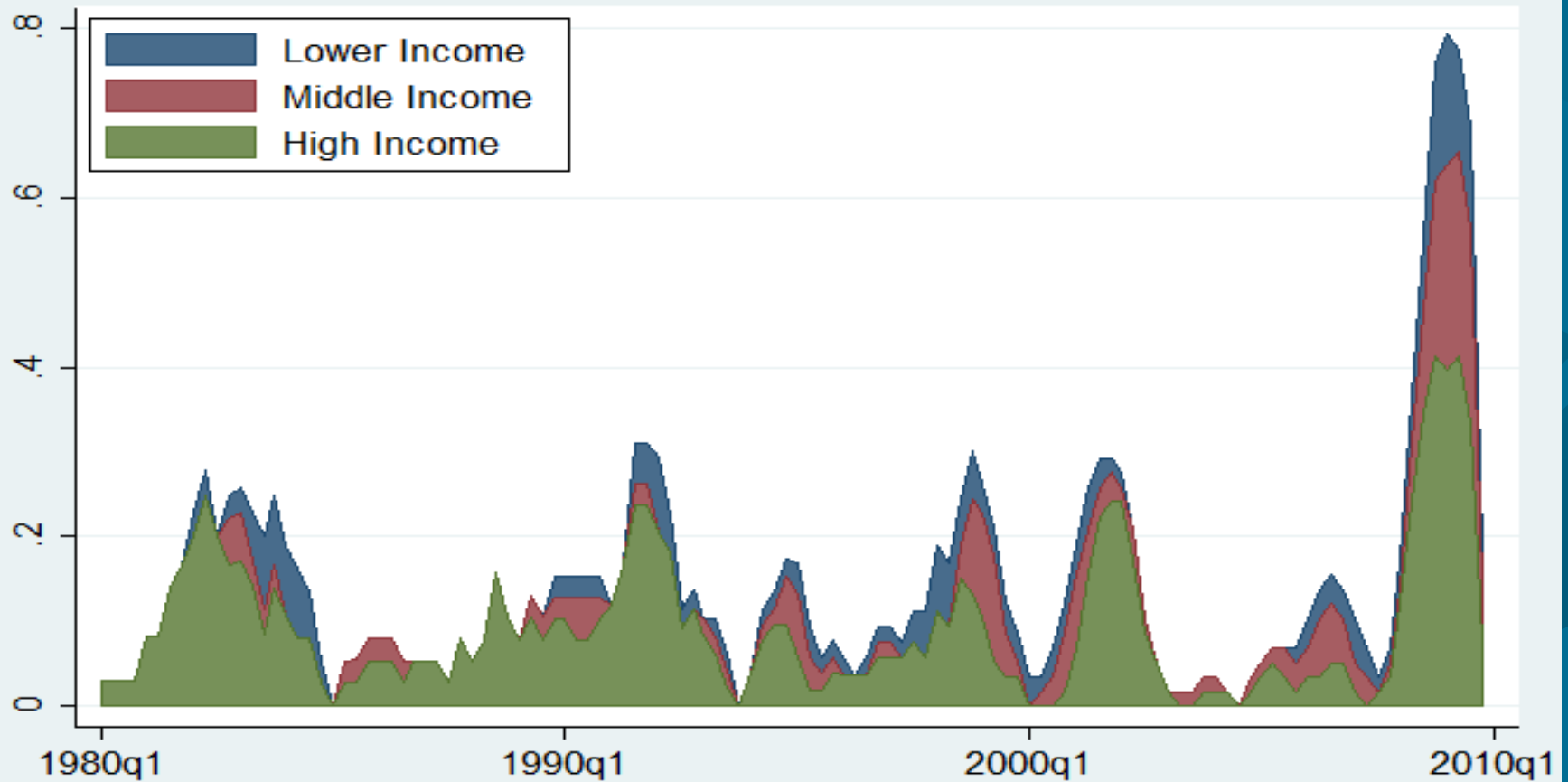
Share of Countries with a Surge

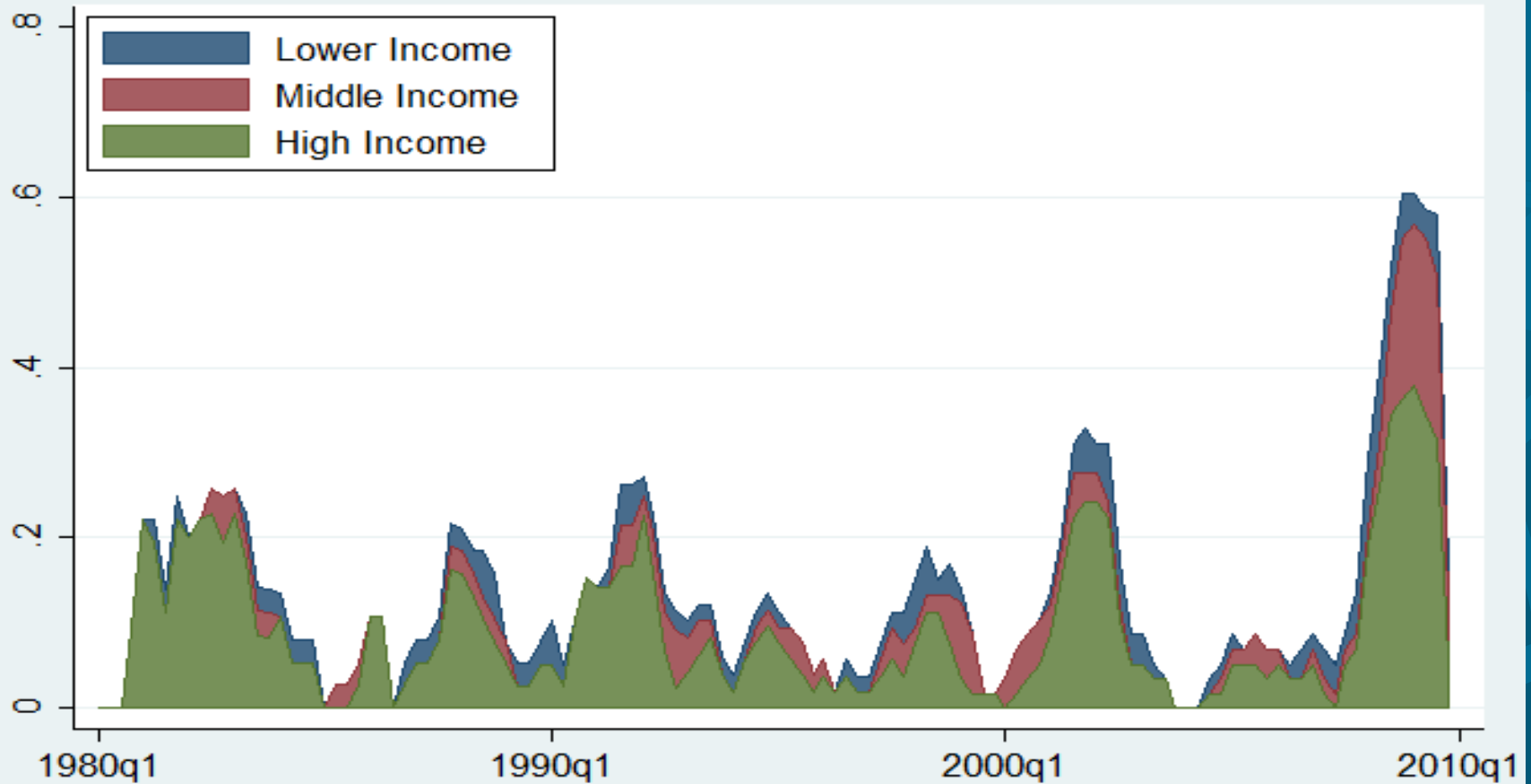Share of countries experiencing a sudden surge episode (for TO capital flows)
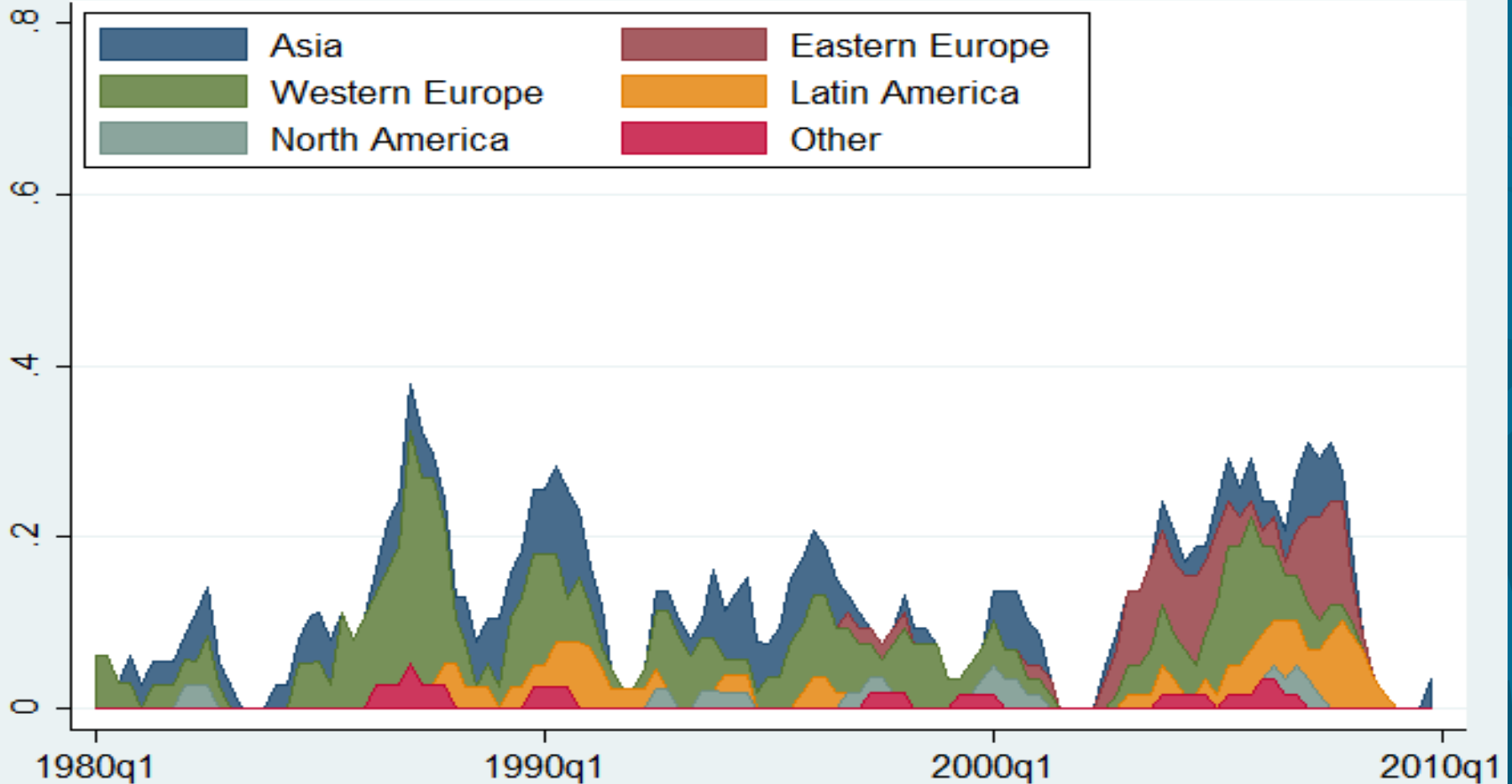
Share of Countries with a Stop

Share of countries experiencing a sudden stop episode (for TO capital flows)

Share of Countries with Retrenchment

Share of countries experiencing a sudden retrench episode (for TO capital flows)
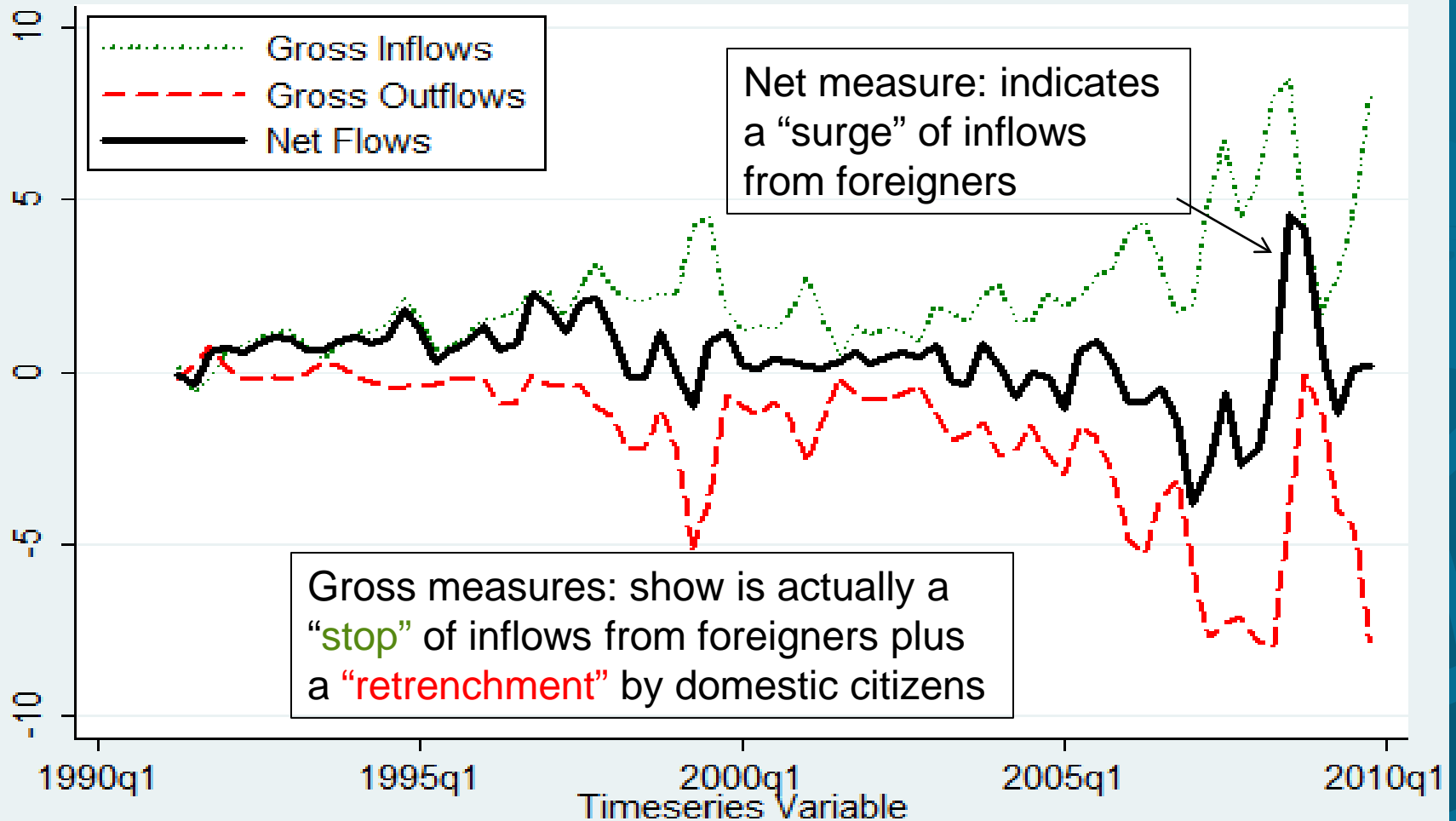
Comparison to Earlier Methodology

- Main similarities with past work:
    - Focus on periods of "extreme" capital flow movements, not daily flows
    - Define episodes versus rolling historic mean

- Main differences with past work:
    - Use capital flow data rather than current-account based proxies
    - Use data on gross flows instead of net flows
        - Also done in Broner et al (2010), Milesi-Ferretti & Tille (2010)
    - Examine more types of episodes—both sudden increases & decreases in flows driven by domestic versus foreign residents

Example: Chile

Net and Gross Flows for Chile

Legend:
- Gross Inflows
- Gross Outflows
- Net Flows

Net measure: indicates a "surge" of inflows from foreigners

Gross measures: show is actually a "stop" of inflows from foreigners plus a "retrenchment" by domestic citizens

Timeseries Variable

Explaining the Episodes

Theory

- Extensive literature on cross-country allocation of investment, contagion & capital flow cycles
  - "Push" or external factors
    - Includes global effects & contagion
  - "Pull" or domestic factors

- Global Factors—outside a country's control, affects world
  - Risk/risk appetite/probability of disaster:
    - Gourio, Siemer and Verdelhan (2010), Baccheta and Van Wincoop (2010), Dedola and Lombardo (2010),
    - Recent emphasis of theoretical work on Great Recession, motivated by Rose and Spiegel (2009)
  - Liquidity/leverage/bank run models
    - Devereux and Yetman (2010), Calvo (2009), Giannetti (2007), Brunnermeier (2009)
  - Interest rates
    - Calvo, Leiderman and Reinhart (1993, 1996)
  - Growth
    - Albuquerque, Loayza, and Serven (2005)

Theory

- <u>Contagion Effects</u> –outside of country's control, resulting from circumstances in another country or group of countries (but not world); Claessens and Forbes, 2001, Dungey et al, 2011
  - Regional effects
  - Trade channels
    - Glick and Rose (1999), Forbes (2002)
  - Financial channels
    - Peek and Rosengreen (1997), Kaminsky, Lyons and Schmukler (2001)

- <u>Domestic Factors</u>—country-specific characteristics
  - Financial system size, depth and fragility
    - Caballero, Farhi and Gourinchas (2008), Mendoza, Quadrini, and Rios-Rull (2009), Bacchetta and Benhima (2010), Forbes (2010), Ju and Wei (2011), Dekle and Kletzer (2001), Mendoza and Terrones (2008)
    - Recent focus of work on global imbalances
  - Capital controls, integration with global financial markets
    - Ostry et al. (2010, 2011), Milesi-Ferretti and Tille (2010), Aghion, Bacchetta and Banerjee (2004)
  - Fiscal position/solvency
  - Technological shocks/TOT shocks/growth
    - Aguiar and Gopinath (2007)

Regression Analysis

- Estimate conditional probability of having a surge, stop, flight or retrenchment in a quarter

  $$Prob(e_{it}=1)=F(\phi_t, \gamma_{it}, \alpha_{it})$$

  - e_{it} is dummy=1 for each episode (surge, stop, flight, retrenchment)
  - ϕ_t : global factors
  - γ_{it} : contagion variables
  - α_{it} : domestic variables

- Estimation issue: cdf of F(.) is skewed (85% of episodes=0)
  - Therefore focus on complimentary logarithmic estimator (cloglog) which assumes the cdf of F(.) is the extreme value distribution,

  $$F(z) = 1 - exp\,[-exp(z)]$$

- Seemingly unrelated regression estimation to allow for cross-episode correlation in errors
- Robust standard errors, clustered by country

The Components

- Global factor
  - Global risk: VXO, VIX, quality spread, CSFB Risk Appetite index, Variance Risk Premium (VRP)
  - Global liquidity: growth in money supply in largest economies, private credit growth by financial institutions./GDP
  - Global interest rates: Avg LT rate in US, euro & Japan, just US
  - Global productivity: global GDP growth

- Contagion factor:
  - Geographic proximity; episode in country in same region
  - Trade linkages: based on bilateral trade flows
  - Financial linkages: based on bilateral bank exposure

- Domestic factor
  - Financial market depth: stock market cap/GDP, stock & bond mkt cap/GDP, ROE of banking system
  - Capital controls: general controls, intl assets & liabilities/GDP, specific controls, FX regulation, financial regulation
  - Fiscal position: public debt to GDP
  - Productivity shocks: country GDP growth relative to trend or WEO forecast
  - GDP per capita

Results

- Robust results:
  - Global risk: most consistently significant factor predicting all episodes—driven by foreigners and domestics
  - Global growth & domestic productivity shocks: significant predicting foreign capital flows (surges & stops)
  - Contagion: through financial and trade linkages significant in predicting stops and retrenchment

- Robust non-results:
  - No evidence that capital controls reduce incidence of episodes driven by foreigners
  - Less important role of global liquidity and global interest rates after controlling for risk

Closer Look at Risk Measures

- Measures that combined changes in economic risk (uncertainty etc) and changes in risk aversion
  - VXO, VIX, quality spread
  - Significant in predicting all episodes (except flight)

- Measures that isolate changes in risk aversion/risk appetite
  - Volatility Risk Premium (VRP)-Zhou (2010) and Credit Suisse First Boston Risk Appetite Index (RAI)
  - Significant in predicting stops by foreigners

- Suggest is changes in overall economic risk that are most important factors driving all types of capital flow episodes
  - Changes in risk appetite/risk aversion only important in driving sudden stops driven by foreigners

Conclusions

- New methodology to understand capital flow waves
  - Important to examine gross flows by type of investor
  - Very different results than traditional approach using net flows (especially for role of risk)

- Global & contagion factors most important determinants of surges, stops, flight & retrenchment episodes
  - Supports recent focus in theoretical literature on global risk
  - Little evidence supporting effectiveness of capital controls

- For policymakers seeking to reduce capital flow volatility, is an important role for global institutions and cross-country cooperation
  - Domestic policies may be better aimed at managing the volatility in capital flows (prudential regulations, etc) rather than directly reducing the volatility