Common Drivers in Emerging Market Spreads and Commodity Prices

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4. Preliminary evidence: relationship between EE sovereign spreads and commodity prices
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1. Introduction

• **Capital flows** and **commodity prices** are **two key elements in the EE** with high incidence of commodities on exports and open capital and financial account.

• The **literature** so far **has separately studied** that **the dynamics of commodity prices and capital flows** could be **explained by exogenous variables** linked to the international monetary and financial context.

• **Interdependence between small economy and the rest of the world** goes through two channels: **trade and finance**.

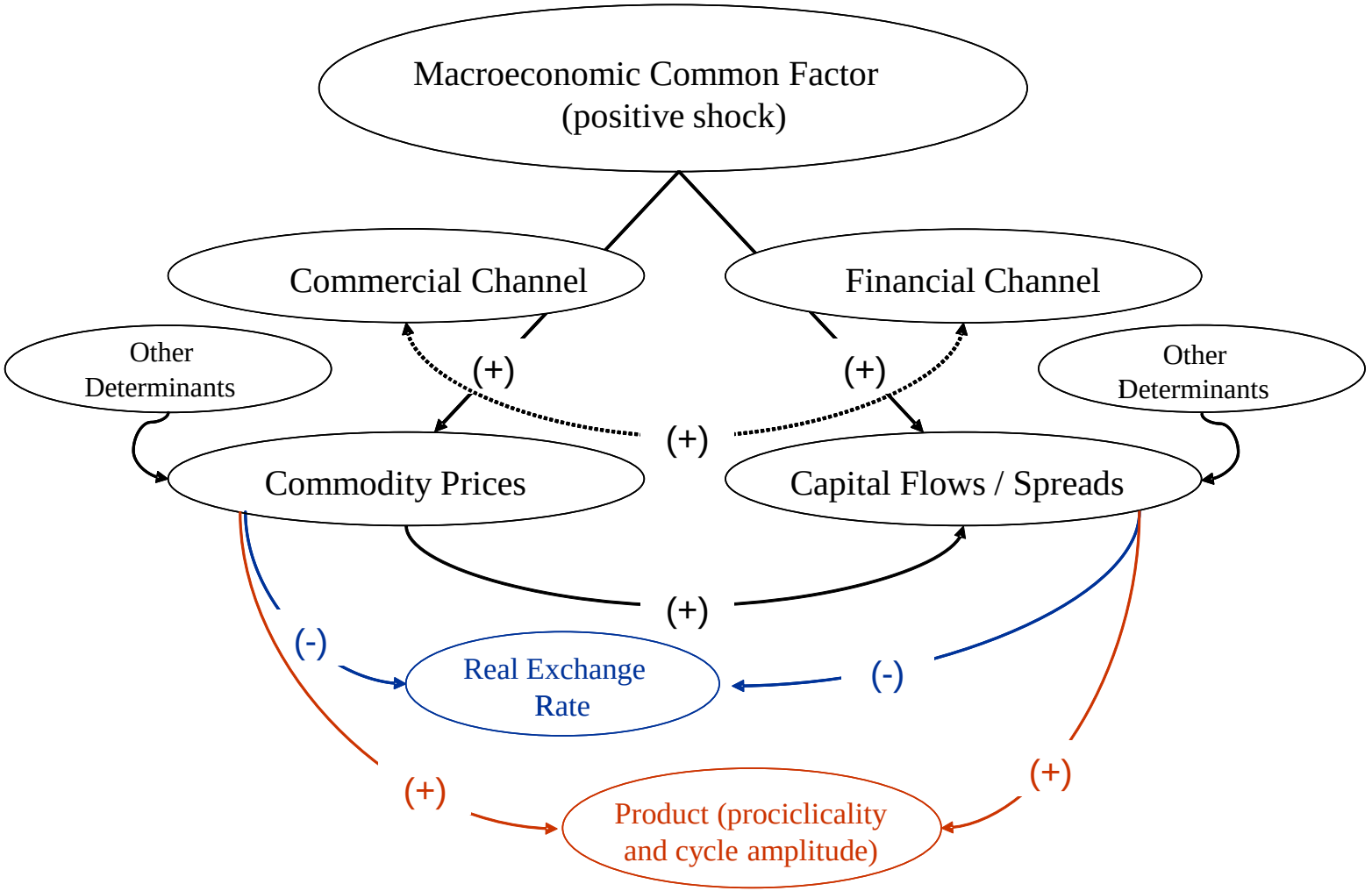
• **Traditionally,** it is assumed that shocks in these **channels are orthogonals**.

• **Hypothesis: shocks are interconnected** by global variables.

• **Global variables induce strong positive and significant correlation** between commodity prices and capital flows into the EE.

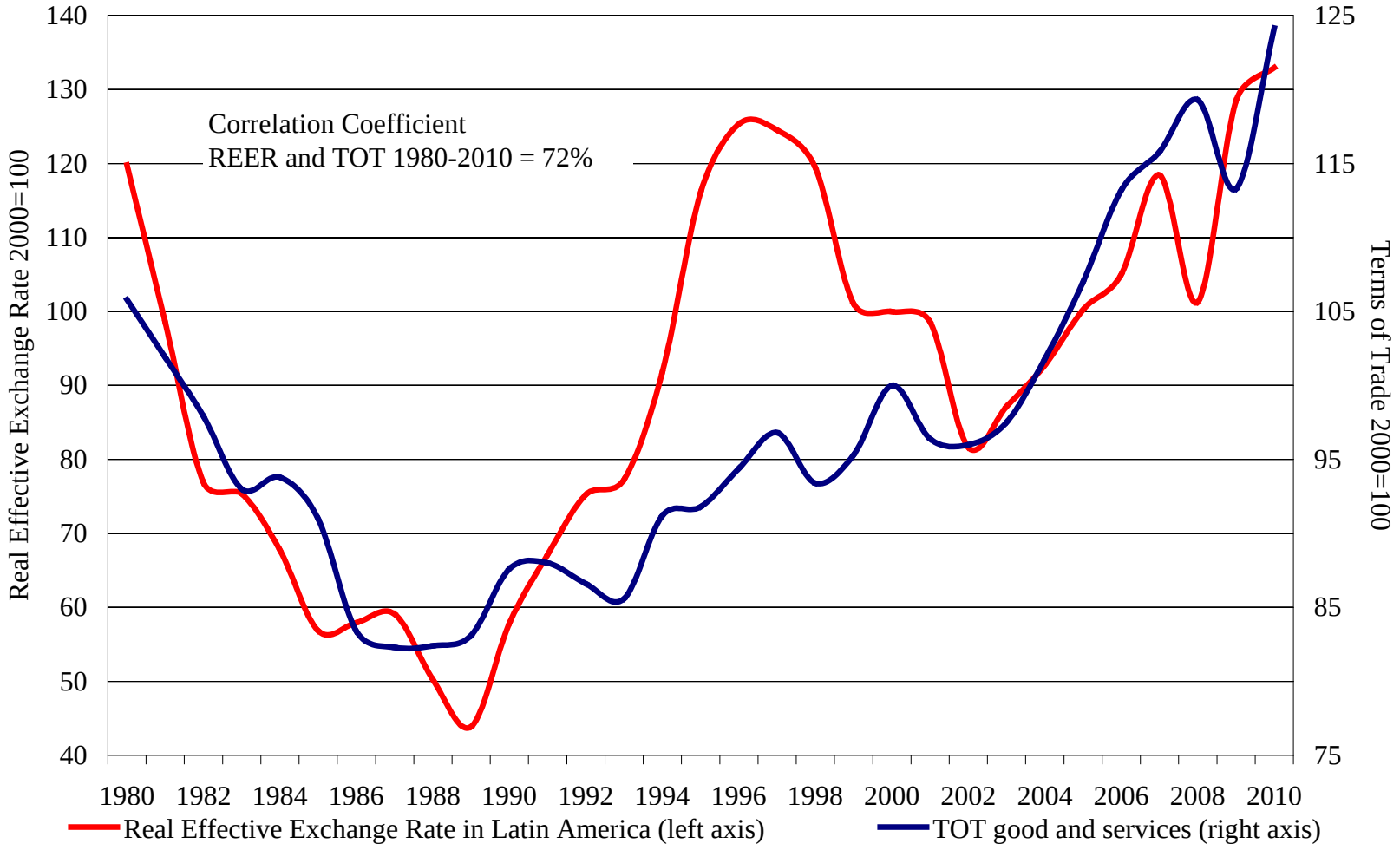
1. Introduction

Stylized representation of the link between capital flows, commodity prices and common global factors in commodity exporters



1. Introduction

RER and Terms of Trade in Latin America

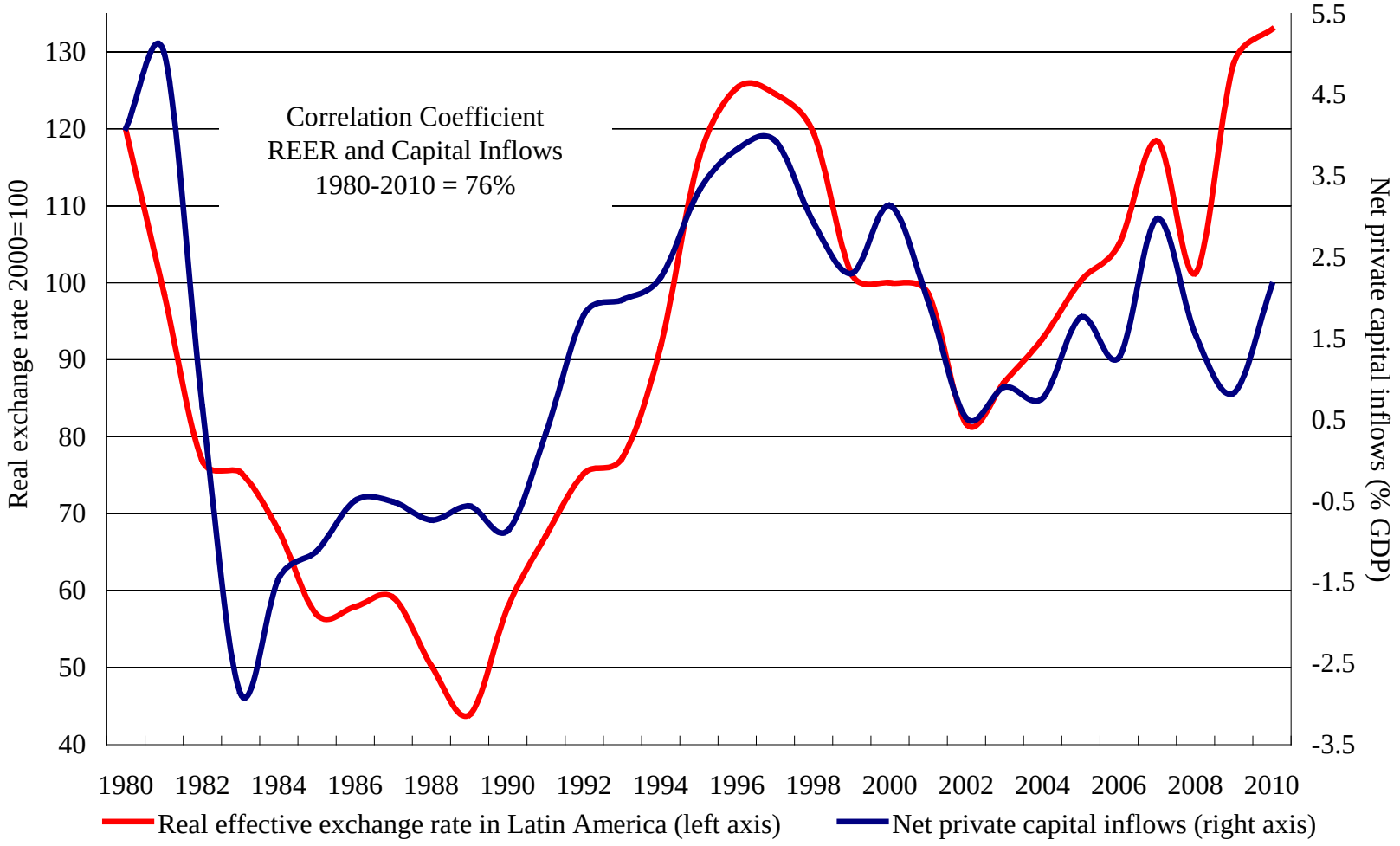


Source: Authors´ calculation based on IMF, Bloomberg and ECLAC data.

Note: An increase in the RER series represents a real appreciation for the region

1. Introduction

RER and Capital Inflows in Latin America



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2. Capitals flows into EE and risk premiums determinants

• ***Push*** **(**external variables**) and *pull*** **(**internal variables**) factors** literature (Calvo et al., 1993; Fernández-Arias, 1996).

• **Relative weight of push-pull factors** is a central issue for capital account management.

• If a significant portion of capital flows to EE is due to exogenous variables, then country fundamentals have low relevance. Improvements in domestic indicators do not necessarily mean greater stability and predictability of flows.

• Main **push factors**: 1) **Global liquidity** and 2) **"Markets sentiments"**

- Global liquidity

• Strong debate about how to approximate the international liquidity level.

• **International interest rate:** Positive correlation with spreads. Hypothesis: spreads compression since 2000 due to excess global liquidity (Hartelius et al., 2008).

• **Quantitative measures:** Monetary aggregates of countries with reserve currency (growth rate, levels) international reserves, etc. (Ruffer y Stracca, 2006; Matsumoto, 2011).

2. Capitals flows into EE and risk premiums determinants

- "Market sentiments"

• **Global risk averse/seeking:** Attitude of investors toward risk is key in determining the demand for risky assets. Changes in risk appetite lead to sudden portfolio rebalancing (ie. "*flight to quality*").

• **Risk measures**: **VIX Index** (implied volatility of S&P 500 index options). **TED spread** (difference between 3-month US government debt and LIBOR rate of interbank loans) approximates credit risk (Gonzáles-Hermosillo, 2008; Fratzscher, 2011).

• **Stocks Index**: Measure of alternative assets performance or general market risk (Ciarlone et al., 2009). Ej. **S&P 500**, **Dow Jones**, etc.

- Empirical evidence

• **Push** factors **explain much of spreads variability** in EE.

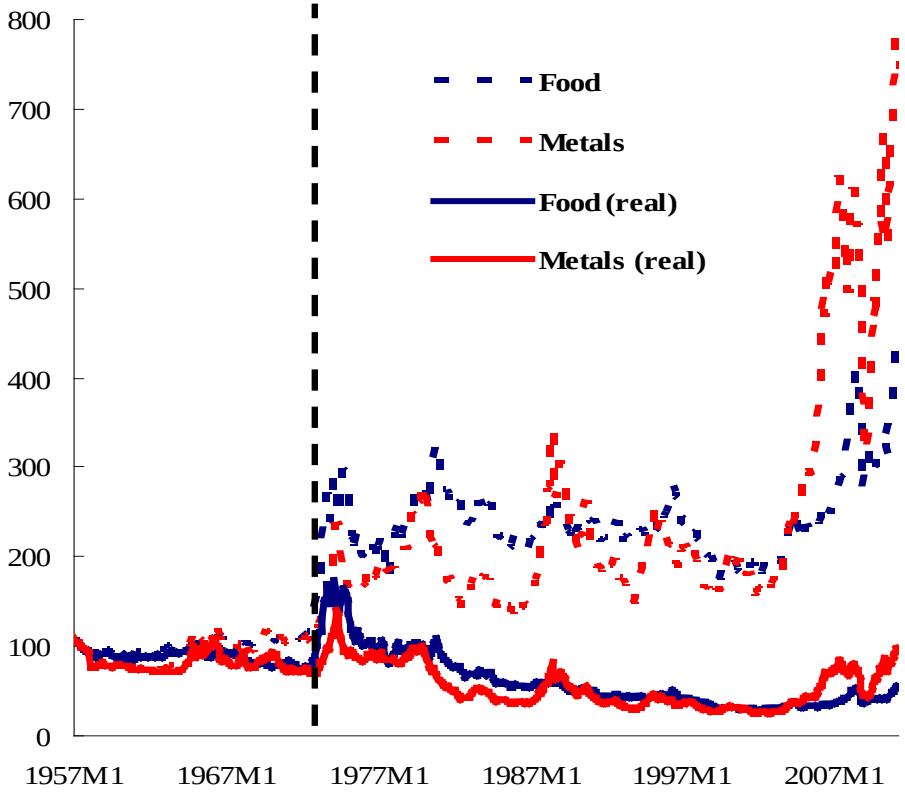
• Hartelius et al. (2008): VIX and FED rate explain 56% of spreads variability in EE.

• González Rozada & Levy Yeyati (2006): push factors explain 41% of spreads variability in EE in 1993-2005 and more than 50% in 2000-2005.

3. Commodity prices determinants

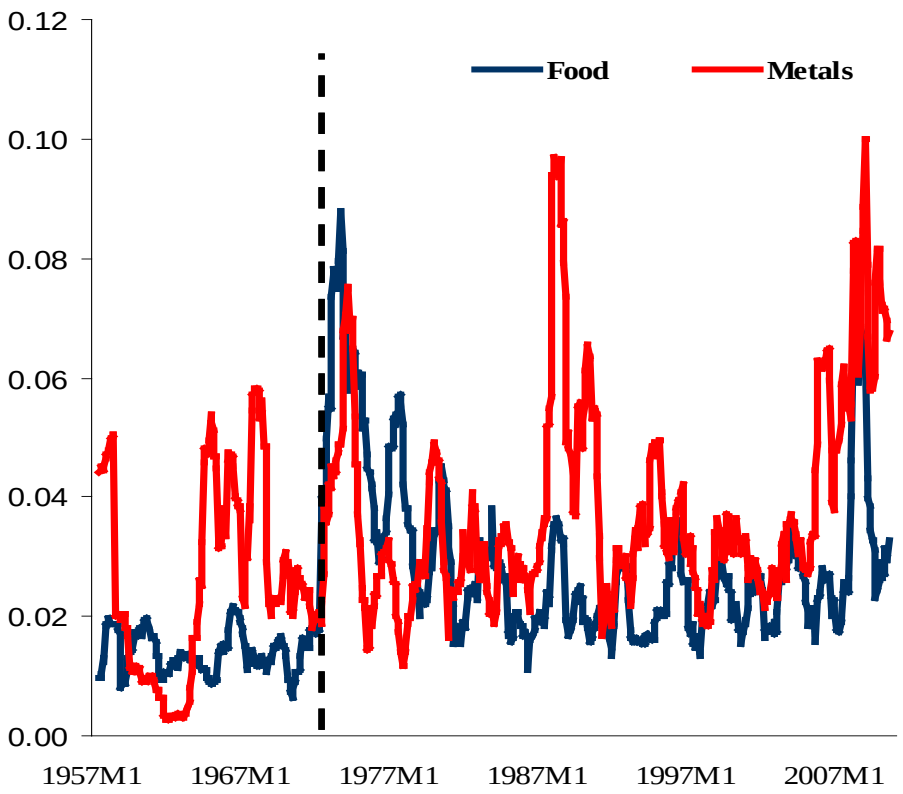
Commodity prices, nominal and real

(1957-2011)



Commodities nominal volatility

(1957-2011)



Source: Author's calculations based on IMF data.
Real prices deflated by US CPI.
Volatility is calculated as the standard deviation of nominal prices variation rates within a 12-month rolling window.

3. Commodity prices determinants

• Rising volatility in commodities prices since 1973 (Bretton Woods). Development literature explaining medium-term fluctuations and volatility beyond secular trends (Prebisch).

• **Since the oil shocks: emphasis on international macroeconomic variables** as determinants of commodity prices (Borensztein and Reinhart, 1994).

- US REER

• Ridler and Yandle (1972): **U.S. dollar depreciation generates** commodity price **rises**. Dornbusch (1985) obtained analytical expression for RER price elasticity.

- Interest rate

• **Interest rate hikes reduce commodity prices by 3 channels** (Frankel, 2006):

i) Increasing incentive to extraction (or production) today instead of tomorrow ii) decreasing firms desire to hold inventories, and iii) encouraging speculators to change position from commodity contracts to “Treasury bonds".

3. Commodity prices determinants

-Financialization of commoditiy markets

• Increasing importance of financial derivatives related to commodities for investors. **Higher role for global financial variables determining commodities prices**.

• **Commodity prices are now more sensitive to porfolio rebalancing by financial investors** (Inamura et al., 2011).

• For this reason, **we consider** the **impact of financial variables** such as:

Stocks index (as alternative asset performance / overall risk / market liquidity).

VIX (measure of global risk aversion).

4. Preliminary evidence: Sample selection

Countries selection criteria:

• **Emerging economies** whose **commodity exports** are not less than 20% of total exports for the period 1990-2009 (average).

• **EMEs included in the EMBI at least since 1997M12** (moment at which several commodity exporters EE are part of the index).

• Spreads are considered in real terms (deflated by the U.S. CPI) and expressed in logs.

Commodities

• **14 series** of commodity prices accounting for **71% of IMF global commodity pirce index**. Sample similar to Lombardi et al. (2010).

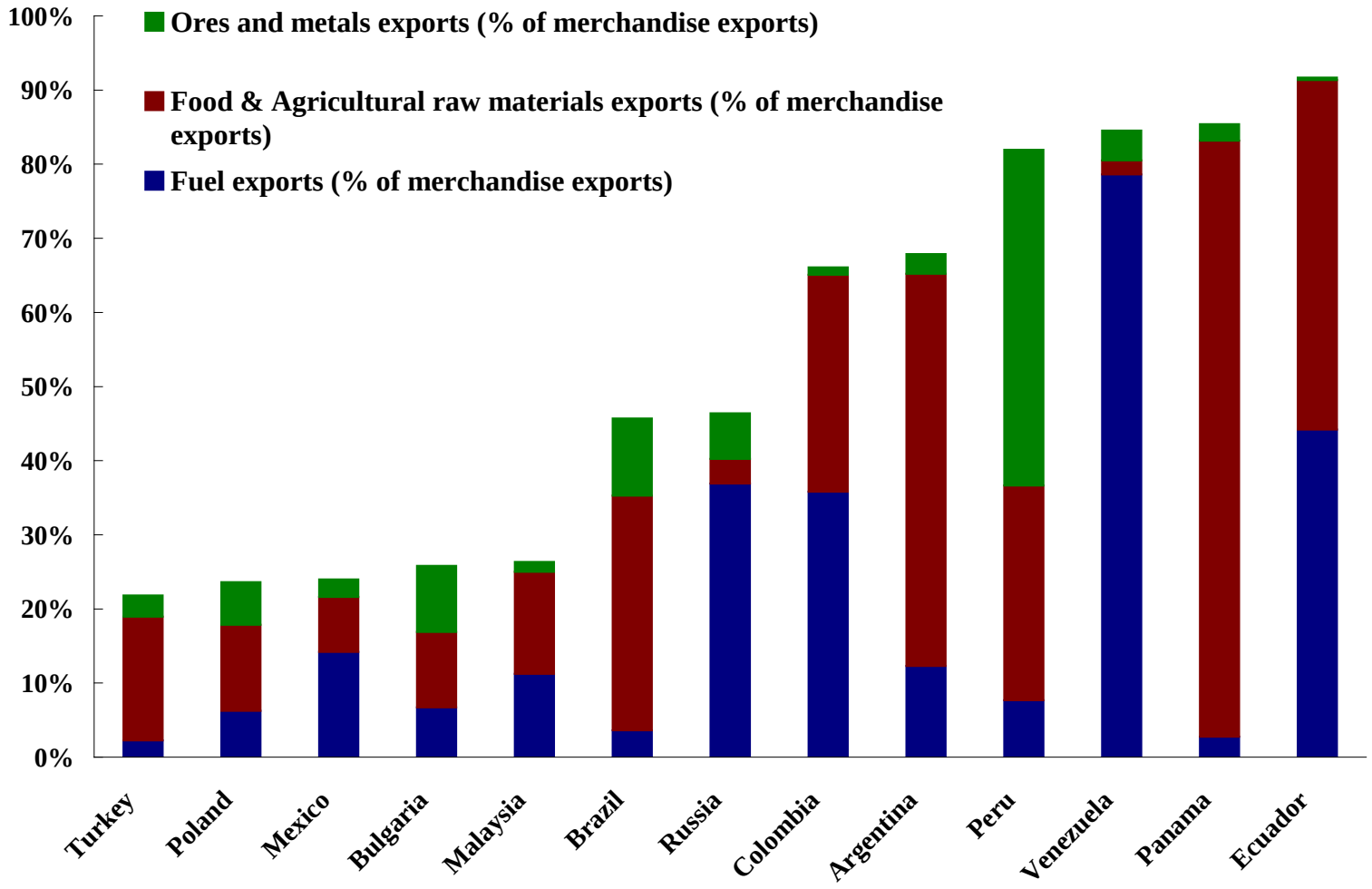
• **7 commodities linked to food:** rice, sugar, coffee, cocoa, corn, soybeans and wheat .

• **7 metals and minerals**: aluminum, copper, iron ore, nickel, lead, zinc and Oil.

• Series in logs and in real terms (deflated by the U.S. CPI).

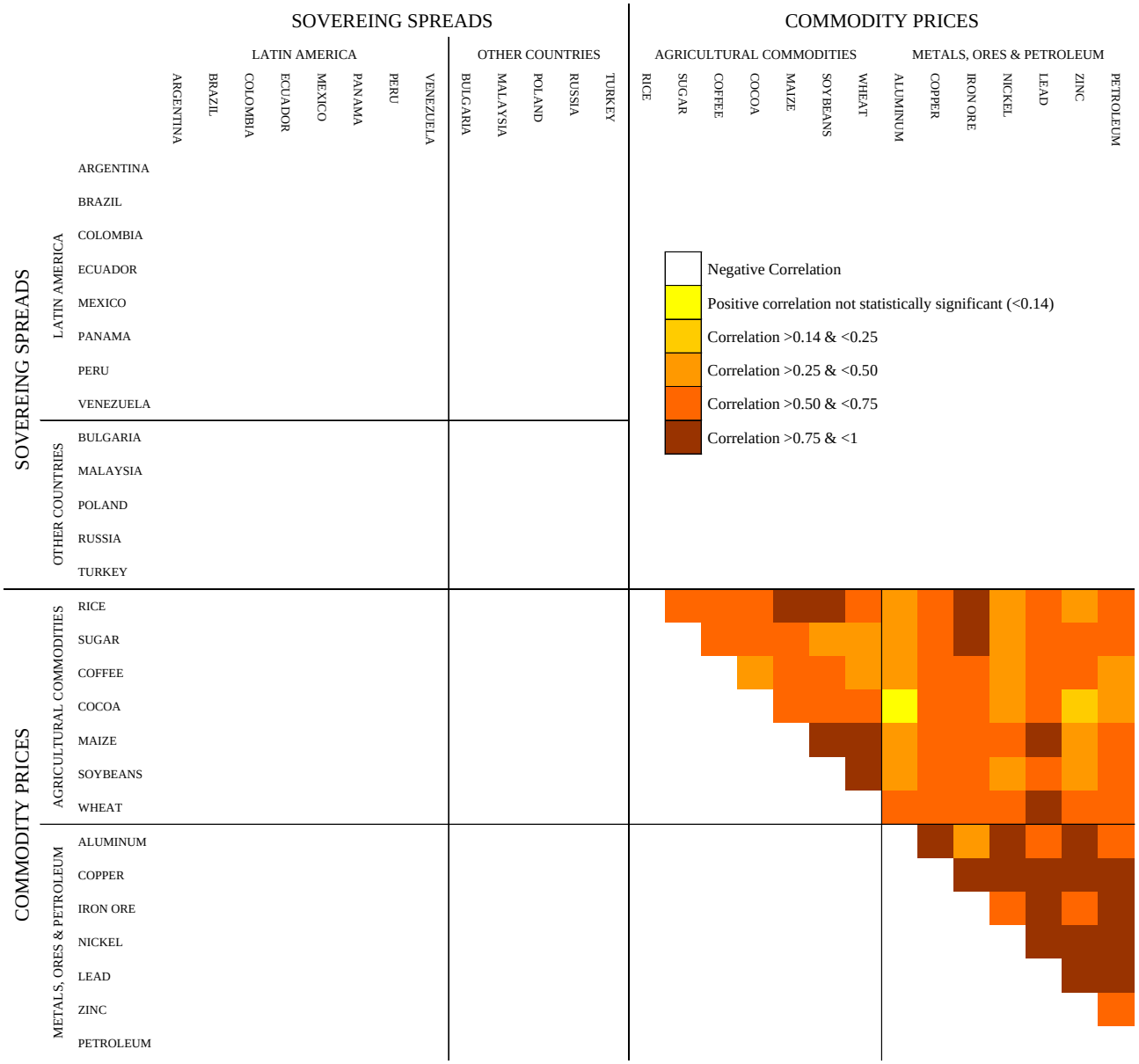
4. Preliminary evidence: Sample selection

Commodity export share in countries included in the sample and Composition, average 1990-2009



Source: Authors´ calculation based on World Bank data.

4. Preliminary evidence: Correlation matrix of spreads and commodity prices at individual level



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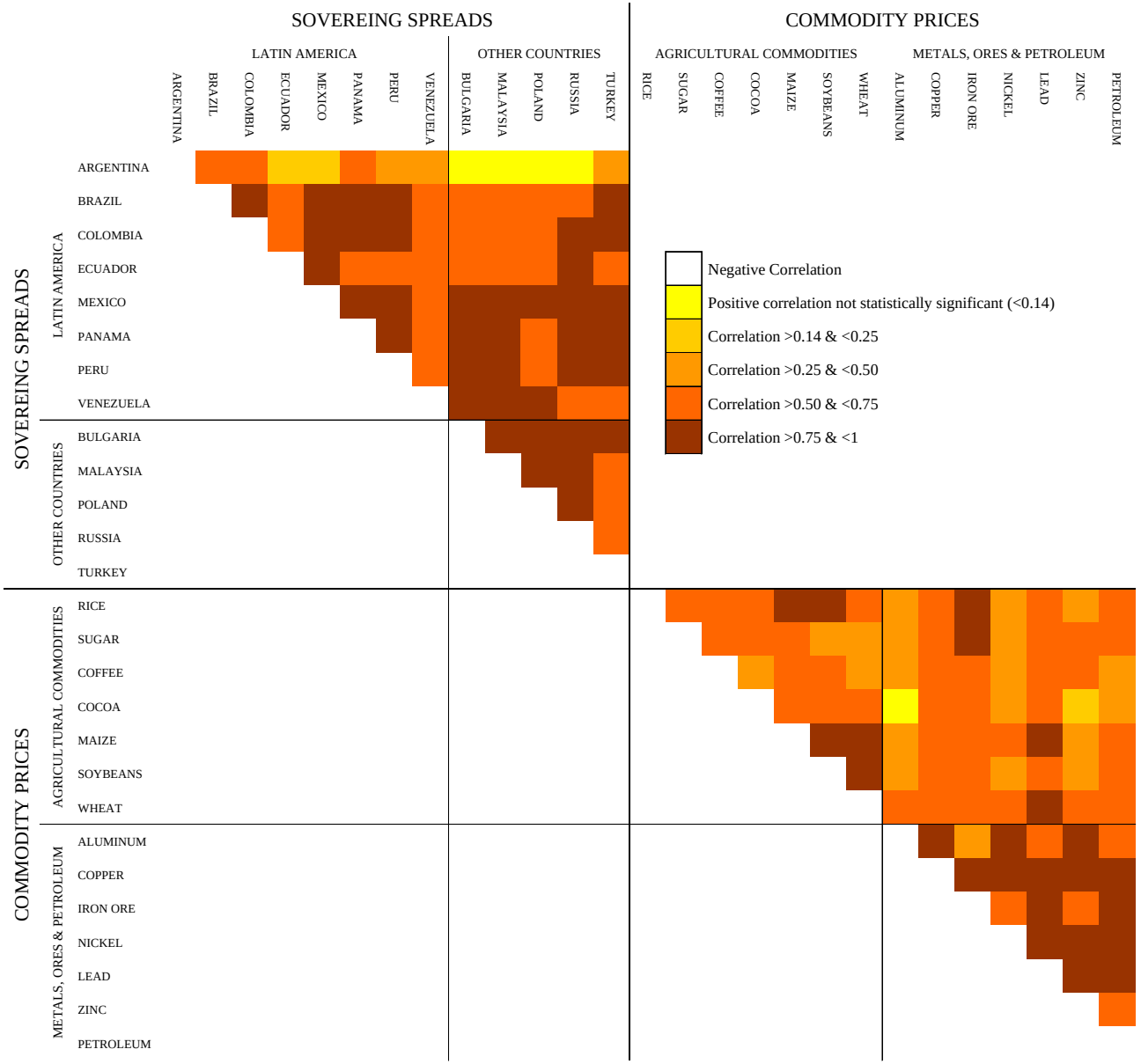

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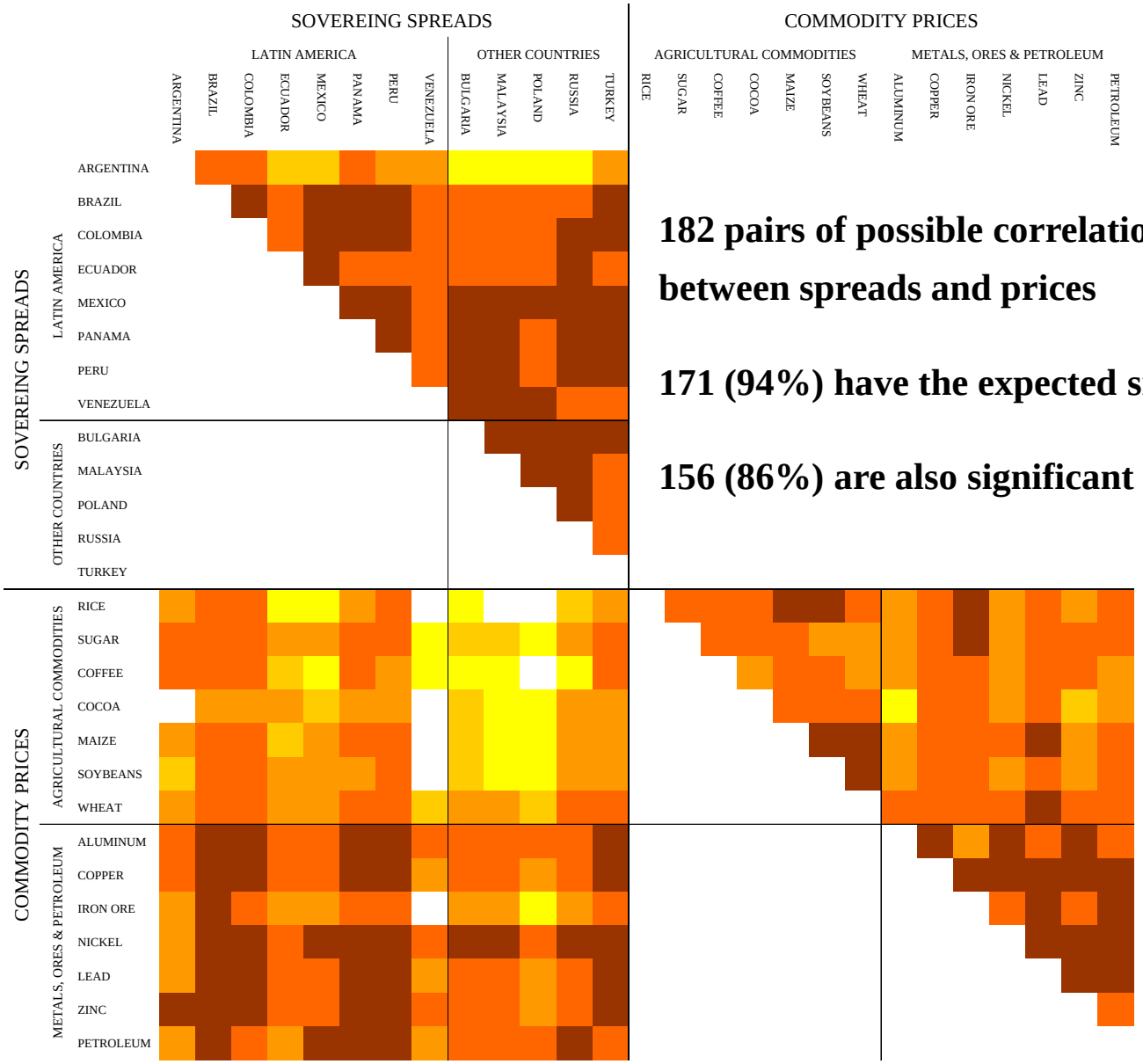


182 pairs of possible correlations between spreads and prices

171 (94%) have the expected sign

156 (86%) are also significant

5. Factor Analysis

- We used **factor analysis to identify underlying joint dynamics**, isolating the effect of specific shocks that individual series might experience.
- **Three sources** of covariance (correlation) explanation of observed variables (Tucker and Mac Callum, 1997) :

  i) **Common factor** that affects simultaneously most observed variables.

  ii) **Specific or idiosyncratic factors**, the "uniqueness" that affects each series.

  iii) **Measurement errors** resulting from the previous calculation .

- **Common factors are used as a synthetic measure** of joint variability.

5. Factor Analysis: Sovereign spreads

• We applied the **maximum likelihood methodology and we** conditioned to explain at least 70% of the variability of the series. In this case **one common was relevant**.

• This **factor explains 74%** of the variability and the goodness of fit measure, a value in the range of merit according to the taxonomy of Kaiser.

• Since this factor explains a significant variability portion and facilitates economic interpretation **we work with a single factor, in line with other papers as McGuire and Schrijvers (2003) or Ciarlone et al. (2009).**

5. Factor Analysis: Sovereign spreads

Bond spreads common factor analysis:

1997M12-2011M3

	Loadings	Communality	Uniqueness
Argentina	0.478	0.228	0.772
Brazil	0.945	0.892	0.108
Bulgaria	0.813	0.662	0.338
Colombia	0.966	0.933	0.067
Ecuador	0.712	0.507	0.493
Malaysia	0.785	0.617	0.383
Mexico	0.888	0.789	0.211
Panama	0.980	0.961	0.039
Peru	0.989	0.977	0.023
Poland	0.684	0.468	0.532
Russia	0.840	0.705	0.295
Turkey	0.934	0.873	0.127
Venezuela	0.629	0.396	0.604
Average		0.693	0.307

• Brazil, Colombia, Panama and Peru have very high levels of communality. This means these individual series are those that best represent the joint dynamics.

• In Argentina, Ecuador, Poland and Venezuela have more relevance idiosyncratic components. However, they show still significant positive correlation with the common factor.

5. Factor Analysis: Commodities real price

• Using the method of **maximum likelihood** and conditioning it to explain at least 70% of the variability of the series, it is necessary to use **two common factors**.

• These two factors **account for 73% of the joint variability**.

• According to various evaluation criteria, a total of **two common factors** are **representative enough to capture the underlying dynamics** of all considered commodities.

• In the econometric analysis, we will use the first of these two as representative of commodity price dynamics. **First factor is accountable for a high percentage (77%) of the model variability**.

5. Factor Analysis: Commodities real price

Commodity prices common factor analysis: 1991M12-2011M3

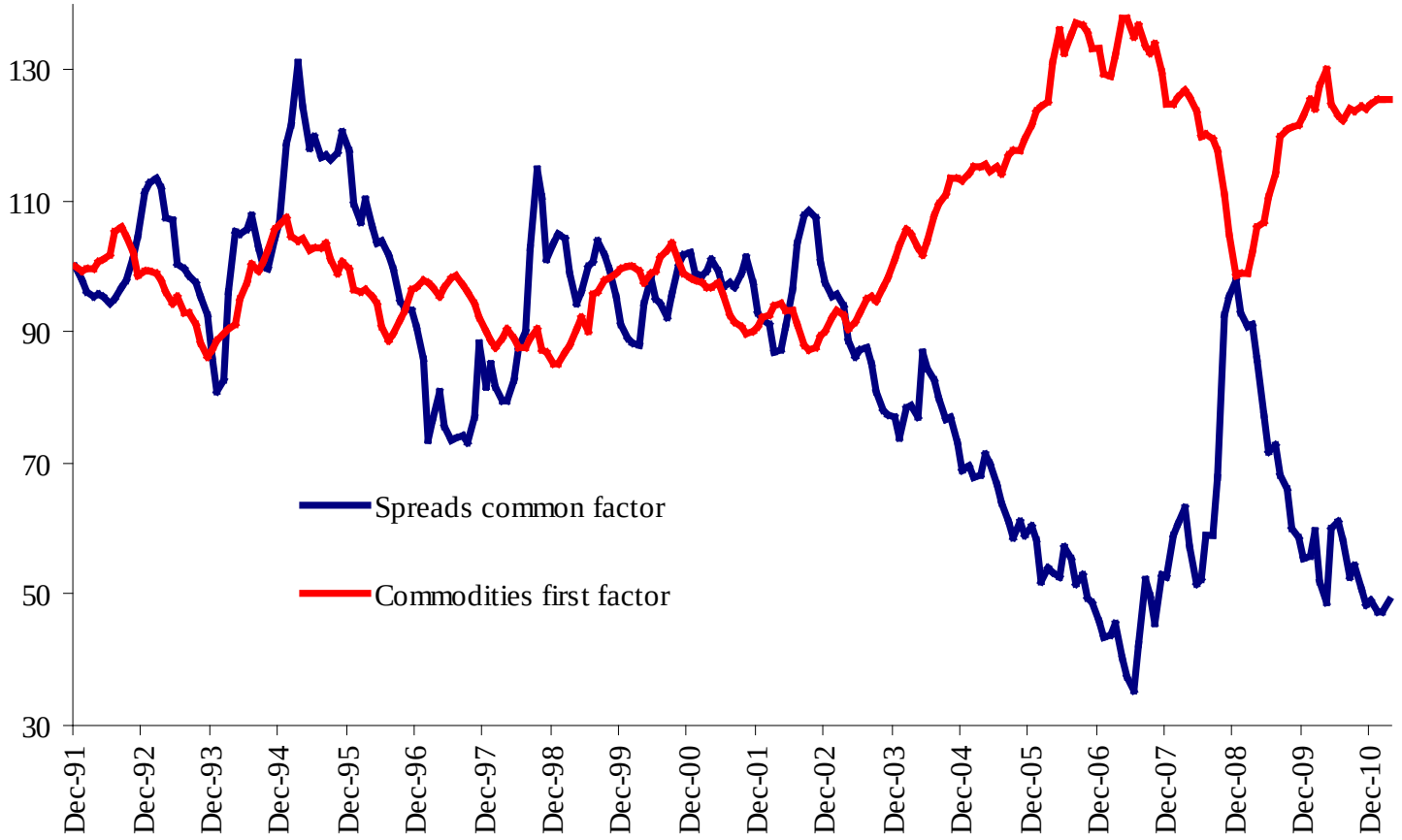
	Rotated Loadings		Communality	Uniquess
	First Factor	Second Factor		
Aluminum	0.712	0.214	0.553	0.447
Copper	0.898	0.403	0.969	0.031
Iron Ore	0.714	0.380	0.654	0.346
Nickel	0.921	0.110	0.860	0.140
Lead	0.838	0.436	0.892	0.108
Petroleum WTI	0.865	0.075	0.754	0.246
Zinc	0.800	0.199	0.680	0.320
Rice	0.288	0.805	0.731	0.269
Sugar	0.289	0.607	0.451	0.549
Coffee	0.173	0.581	0.368	0.632
Cocoa	0.288	0.628	0.477	0.523
Maize	0.217	0.906	0.869	0.131
Soybeans	0.184	0.888	0.823	0.177
Wheat	0.349	0.796	0.756	0.244
Average			0.703	0.297

• The first factor is correlated with metals, minerals and oil (also positive and significant correlation with agricultural commodities). The second factor is associated with agricultural commodities .

• Higher communality in copper, nickel, lead, corn and soybeans. Lower values for tropical agricultural commodities: sugar, coffee and cocoa.

5. Factor Analysis: Relationship between common factor of spreads and commodity prices

Association between spreads common factor and the common factor of commodity prices (1991M12=100)



5. Factor Analysis: Correlation of common factors and global variables selected

Correlations between the spreads common factor and the common factor of commodity prices with global determinants , 1991M12-2011M2

Series	Emerging real spread		C*ommodity* real prices	
	Correlation	p-value	Correlation	p-value
Global real liquidity	-0.78	0.00	0.75	0.00
International real interest rate (1 year)	0.37	0.00	-0.32	0.00
International real interest rate (3 years)	0.47	0.00	-0.43	0.00
International real interest rate (5 years)	0.52	0.00	-0.48	0.00
S&P 500 real index	-0.43	0.00	0.23	0.00
***Dow Jones* real index**	-0.53	0.00	0.31	0.00
VIX volatility index	0.09	0.18	-0.24	0.00
U.S. Real Exchange Rate	0.16	0.02	-0.39	0.00

6. Econometric analysis: FAVEC model

- Idea: Analyze relationship of both commodity price factor and sovereign spread factor of commodity-exporting EMEs with a set of global variables.
- Empirical approach which combines factor analysis and econometric models is relatively recent (Stock y Watson, 2002; Bernanke et al., 2005).
- **Pros:**
  i) Allow introducing a higher amount of relevant information into estimations (compared to standard methods).
  ii) Lessen the problem of arbitrary selection of observable series.
- We adopt Bernanke et al. (2005) approach which combines standard VAR structure and factor analysis (FAVAR model). However, since we are interested in long-run relation between variables, we employ Banerjee and Marcellino (2008) and Banerjee et al. (2010) extension (FAVEC models).

6. Econometric analysis: FAVEC model

- Monthly data: 1991M12-2011M2.

- **Variables**

- **Real global liquidity:** World international reserves plus US monetary base deflated by US CPI (in logarithms). Source: IMF and Federal Reserve.

- **Real international interest rate:** One-year US Treasury constant maturity yield from the Board of Governors of the Federal Reserve System deflated by US CPI (in logarithms).

- **Real S&P 500 index:** Index deflated by US CPI (in logarithms). Source: Bloomberg.

- **VIX volatility index:** proxy for risk-aversion based on options volatility (in logarithms). Source: Bloomberg..

- **US ERER:** Index made up by the 26 leading trading partners of the United States (in logarithms). Source: Federal Reserve.

6. Econometric analysis: FAVEC model

• Error correction model specification:

$$\begin{pmatrix} \Delta F_t \\ \Delta X_t \end{pmatrix} = \begin{pmatrix} \gamma_F \\ \gamma_X \end{pmatrix} \delta' \begin{pmatrix} F_{t-1} \\ X_{t-1} \end{pmatrix} + A_1 \begin{pmatrix} \Delta F_{t-1} \\ \Delta X_{t-1} \end{pmatrix} + \ldots + A_q \begin{pmatrix} \Delta F_{t-q} \\ \Delta X_{t-q} \end{pmatrix} + \begin{pmatrix} \varepsilon_{Ft} \\ \varepsilon_{Xt} \end{pmatrix}$$

F_t are commodity price and sovereign spread factors, X_t is the matrix containing global variables.

• Estimated by two-stage method developed by Stock and Watson (1998, 2002).

• **Step 1:** Factors are computed applying common factors techniques. **Step 2:** System is estimated using standard time series methods, and treating the previously extracted factors as another series.

• **Johansen (1995) cointegration test:** starting from a 14-lag VAR in levels (residuals well-behaved) we found 4 long run relations. **Juselius (2006):** determination of the cointegration rank should not be exclusively based on those tests, due to power problems.

• As our objective is to model sovereign spreads and commodity prices equations simultaneously, we have opted for estimating the system considering 2 cointegration vectors.

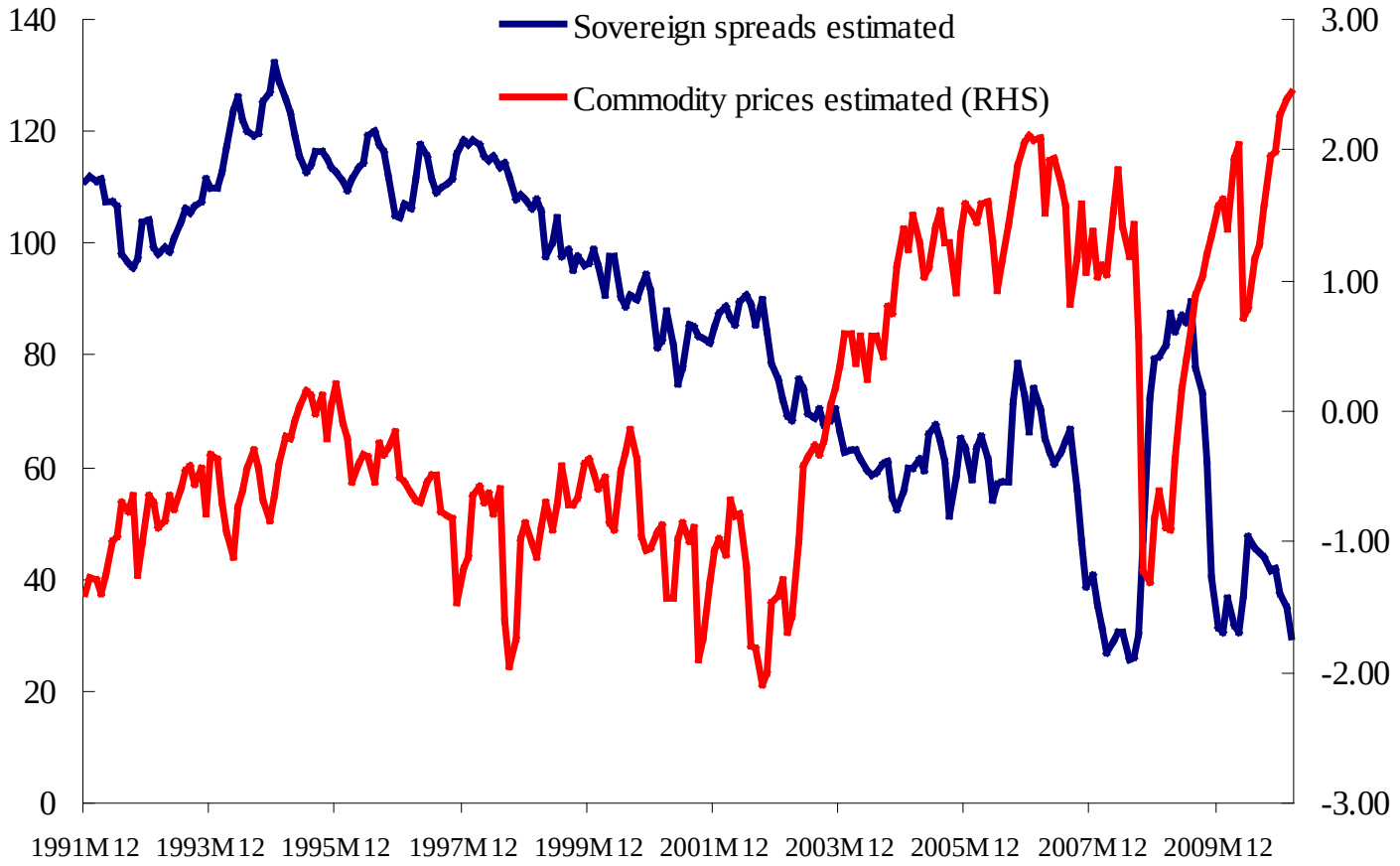
6. Econometric analysis: FAVEC model

Estimation of long-run relations

Variables	Real sovereign spreads		Real commodity prices	
	Coefficient	p-Value	Coefficient	p-Value
Real sovereign spreads	1	(Norm)	0	(Norm)
Real commodity prices	-8.816352	0.07089	1	(Norm)
Real global liquidity	-10.0401	0.4035	1.5900	0.0000
Real international interest rate	968.2036	0.0000	-0.9197	0.8900
Real S&P 500	-24.9038	0.0000	1.1312	0.0011
VIX volatility index	0.9803	0.9282	-1.8928	0.0000
US real exchange rate	0	(Norm)	-3.6761	0.0039
Constant	325.4977	-	1.3717	-
Adjustments coefficient				
Sovereign spreads relationship	-0.2583	0.0000	-0.0001	0.9730
Commodity prices relationship	-2.8441	0.0865	-0.1420	0.0086

6. Econometric analysis: FAVEC model

Sovereign spreads and commodity prices: estimated series



6. Econometric analysis: FAVEC model

Partial correlations and statistical significance

	Observed commodity price	Observed spreads	Estimated commodity price	Estimated spreads	Spread (misalignment)
Observed commodity price	1.0000				
Observed spreads	**-0.8145** 0.0000	1.0000			
Estimated commodity price	**0.8857** 0.0000	-0.8221 0.0000	1.0000		
Estimated spreads	-0.7224 0.0000	**0.7588** 0.0000	**-0.6993** 0.0000	1.0000	
Commodity price (misalignment)	-	-	-	-	**0.0658** 0.3197

- Strong negative correlation (-0.81) between observed commodity prices and observed sovereign spreads of the commodity-exporting EMEs.
- Estimated series present a very high negative correlation (-0.70 approximately) while the linear association of the respective misalignments is practically null (0.066) and statistically non-significant.
- This suggests that the model's global variables explain virtually the entire correlation between commodities prices and sovereign spreads.

7. Conclusions

• **Capital flows and commodity prices** are **2 key factors** in the performance **of EE with high incidence of commodities on exports and capital and financial account**.

• **We identified a common set of global variables** especially linked to international financial context **affecting commodity prices and spreads dynamics**.

• **We hypothesized** that **global variables not only explain commodity prices and capital flows** to EE exporters of raw materials, but also **accentuate the procyclicality of** capital and current account **shocks**.

• **The hypothesis applies to general trends** and not necessarily to idiosyncratic movements in spreads and commodity prices, **so we use factor analysis to indentify underlying joint dynamics.**

7. Policy Lessons

• Main implication for economic **policy design**: The ***transmission of the* cycle from central to EE countries is not homogeneous**, depending on whether the latter are **producers, exporters or importers of raw materials**.

• **International financial context changes tend to increase cycle amplitude in commodity exporting countries**.

• In **EE <u>importing</u> commodities: Current account and capital account shocks tend to be offset** by reducing GDP cycle magnitude.

• The rising price of imported commodities implies a deterioration of their TOT and negatively affect GDP. However, **the improvement in the international financial situation makes it easy to "finance" the negative current account shock**.

7. Policy Lessons

• This **asymmetry raises a question regarding if it is correct to suggest to all EE the same recommendations on capital flows regulation**, as it is often done routinely.

• **If this asymmetry is verified then a more active management of the capital account** has a **particularly important role** in the case of **EE commodity exporters**.

• As global shocks affect these countries simultaneously by the business and financial channel, the IFA failures related to the **absence of a lender of last resort has even more negative consequences in these cases**. A **strategy that includes self-insurance reserve accumulation and a countercyclical fiscal policy should be part of the policy mix** .

7. Extensions

- **Possible extensions** to generalize the results.

• Using gross flows and / or net capital to U.S. instead of sovereign spreads.

• **Distinguishing according to the type of flow** since the literature shows that the weight of the push and pull factors varies depending on this.

• **Employing panel data in order to incorporate *pull* factors** in the modeling of interest rate differentials.

• Controlling with a **group of EMEs which are** net **importers of commodities with a significant industrial base**. If the hypothesis is correct, in this group we should observe a **less clear relationship between their *spreads* and commodity prices**, because **the "direct" channel would operate in a reverse sense:** An increase in import prices represents a deterioration of fundamentals, increasing yield spreads .

Thank You!