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Sovereign spreads in emerging economies: do natural resources matter?*

Magali Dauvin†

Abstract

Natural resource prices have been plunging since mid-2014, constituing a threat to emerging markets whose revenues mainly stem from commodity exports. Within this context, the purpose of this paper is to investigate to what extent commodities are reflected in financial markets' assessment of emerging country risk, and if a special premium is added for commodity exporters. We focus on 22 emerging markets sovereign spreads and assess how prices and their commodity trade structure are gauged by investors. Our results indicate that commodity prices are relevant for exporters, as they help relaxing the credit constraint in periods of increasing prices. As for resource-poor countries, they are of no importance when assessing sovereign risk. Also, global financial markets do not pay attention to dependence on natural resources although they are now suffering from collapsing prices. Finally, high variations in commodity prices are not particularly reflected in the way markets assess sovereign risk.

KEYWORDS: Sovereign spreads, emerging markets, commodity exporters, commodity prices

JEL CODES: C23, F34, F41, 013

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1 Introduction

"(...) With a collapse of global commodity prices catalyzed Mexico's default in August [1982], and shortly thereafter the defaults of well over a dozen other emerging economies, including Argentina, Brazil, Nigeria, the Philippines, and Turkey. "

Carmen M. Reinhart & Kenneth S. Rogoff - *This Time is different*, 2009

In just one year, from 2014 to 2015, Venezuela's average cost of traded debt increased by 149% while oil prices almost halved. The situation has now radically changed. Together with the huge decline in the price of oil —fallen under $30 per barrel at the beginning of 2016— Venezuela's bond holders' confidence also diminishes, as illustrated by boosted required premia on sovereign debt swap instruments (now up to over 5937 basis points).[1] Around 95 % of the country's revenues stem from oil exports, accounting for roughly two-third of the government budget. What role, if any, does commodity dependence play on the perceived risk?

The cornerstone of our investigation is the multiple crises that occured in emerging markets in the eighties (see Reinhart and Rogoff, 2009), as well as the recent slide experienced by commodity prices in the last years.[2] Emerging economies share the common feature of having an export-oriented growth model, of either primary resources or manufacturing goods, thus depending on the global business cycle and export prices. Moreover, they have often been prone to significant default risk. When a country is commodity dependent, its economic performance is strongly influenced by global economic sentiment and its effects on commodity prices (Aizenman et al., 2013). However, may the country be dependent or not, natural resources prices have always had an impact on the economy (Collier and Goderis, 2012; among others). Plunging commodity prices may strongly impact government revenues and economic growth of exporters, but can be a blessing for those struggling with inflation and overheating economy.

Here, we focus on sovereign risk as reflecting financial markets views on the ability of a country to service its external debt obligations. The Emerging Market Bond Index Global (EMBIG),[3] which can be seen as a country 's average cost of traded debt, is widely used to assess emerging market economies external financing conditions.[4] The empirical work on spreads' determinants has been evolving throughout the years. While academics investigated the determinants of emerging economies' spreads mostly through the scope of internal factors in the 1980-90s,[5] the run-up of spreads following the 2007-08 financial

[1] CDS-5Y for Venezuela on January, 4^{th} 2016. Source: www.boursorama.com.

[2] The IMF All-Commodities Price Index lost -40.97% between September 2014 and September 2015.

[3] The Emerging Bond Market Index Global was introduced in January 1998 by J.P. Morgan. It is an emerging market debt benchmark for dollar-denominated bonds issued by sovereign and quasi-sovereign entities. Issuers are classified as quasi-sovereign if the sovereign has explicitely guaranteed the issuer or if it is its majority shareholder.

[4] We focus on the spread, which measures the credit risk premium over US Treasury bonds.

[5] Fiscal space variables, international reserves, the exchange rate, the current account deficit are exam-

crisis initiated the idea that external but mostly global factors were important drivers. Dailami et al. (2008), Akinci (2013) and Kennedy and Palerm (2014), among others, evidenced that global risk and monetary conditions were indeed increasingly regarded by investors when evaluating a country's creditworthiness.

To the best of our knowledge, the literature has not coped with the export structure and sovereign risk, in the precise case of commodity exporters. Our aim is to fill this gap by examining whether commodity exporters struggle more than other countries when it comes to sovereign risk. Specifically, our purpose is to investigate to what extent commodities are reflected in financial markets' assessment of emerging country risk. In other words, we assess whether markets charge a special premium for commodity exporters.

The issue relative to the role of commodities on sovereign risk premium has been tackled in two different manners in the literature. The first strand of studies relies on the terms-of-trade channel, and shows that there exists a negative correlation between the latter and sovereign spreads of emerging economies (Hischler and Nosbusch, 2010; Bastourre et al., 2012; and Aizenman et al., 2013). The rationale behind this link is that competitiveness in Emerging Market Economies (EME) is assessed by the terms-of-trade, more than the exchange rate, and their improvement increases the country's ability of paying its dollar-denominated debt obligations. However, although these studies aknowledge the importance of commodity prices, arguing that the sample under investigation is mainly (or entirely in the case of Bastourre et al. (2012)) composed of commodity exporters, they do not give us insights on whether having a commodity-oriented export structure is game-changing. Nevertheless, they allow us to have a starting result for our research: commodity prices do matter. The second strand of studies, more recent and proposed by Arezki and Brückner (2012) and Hooper (2015), takes the debt overhang issue as point of departure, i.e. the use of natural resources as collaterals to borrow in international capital markets. Based on a sample of oil- and gas- rich economies, Hooper (2015) investigates how resource abundance is perceived by financial markets. Her results indicate that countries endowed with oil reserves suffer from higher sovereign risk premia than the ones blessed with natural gas reserves. Then again, prices are not neutral, the higher risk perceived for oil-countries would be in part due to the versatile feature of oil prices.

Here, we stand at the crossroads of these two strands of the literature. In contrast with the first one, we distinguish between resource-rich and resource-poor emerging economies, in order to assess whether risks stemming from commodity trade intensity affect solely exporting countries or whether it can be considered as a global factor, and thus would affect importing countries as well. We differ from the second one since we lay outside the resource abundance scope, by focusing on dependence, not only on fuel resources, but also on metals and agricultural commodities. We consider a sample of twenty-two emerging markets, twelve commodity exporters and ten non-exporting coun-

ples of variables that were found to be key determinants. See Edwards (1984).

tries over the 2003- 2013 period. The inclusion of both types of countries allows for a meaningful comparison across EME.

The remainder of the paper is as follows. In Section 2 we provide some brief stylized facts about sovereign spreads over the 2003-2013 period, and insights on how they would be related to natural resources. In Section 3, we present the econometric framework as well as the data used throughout the empirical analysis. Section 4 examines natural resources' impact in a time-series framework in order to check whether all countries behave the same way as it is advanced in the literature. In Section 5, after splitting exporters from importers, we investigate whether (i) commodity trade intensity and (ii) large price variations are somewhat depicted in the sovereign risk benchmark. Section 6 conludes.

2 Stylized facts and the importance of natural resources

The main risks attached to commodity exporters in the short run lie in the price dynamics of their exports. Declining prices, either because of tumbling world demand, or favorable production conditions—good harvests in the case of agricultural commodities, or exogenous increase in supply—lead to decreasing expected revenues and thereby can reduce the country's ability to pay its external debtors.

Declining prices become a key issue in the case of "debt-overhangs" (Manzano and Rigobon, 2008; Arezki and Brückner, 2010, 2012; Hoover, 2015). While benefiting from favorable external conditions, natural resource-rich countries can be tempted to increase their indebtness with commodities used as "collateral". Yet once the cycle returns, it becomes harder to repay debtors or even to preserve steady rollover rates. Manzano and Rigobon (2008) find that credit constraint led by falling prices was the reason why exporting countries experienced slow growth in the eighties, after a decade of high commodity prices. Arezki and Brückner (2010, 2012) evidence that debt-overhangs were most likely to occur in autocracies, while democratic regimes tended to favour a reduction of external indebtness in times of revenue windfalls. Financial markets thus should normally take this factor into account and it should be reflected in sovereign spreads.[6]

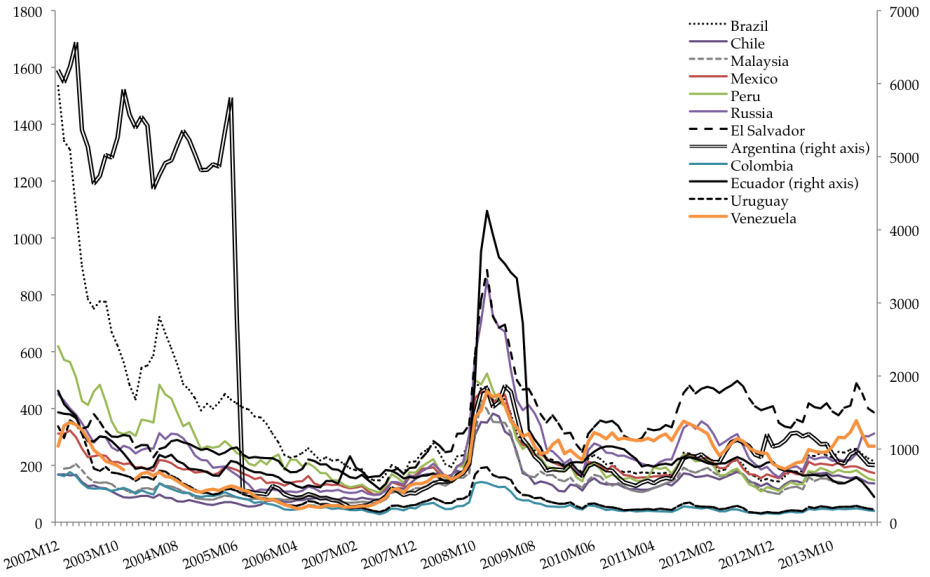
After providing some brief stylized facts on emerging sovereign spreads, we give some visual insights on the extent to which natural resources are reflected in sovereign spreads dynamics, in terms of prices and commodity trade intensity.

[6]Another risk that could be inherent to commodity exporters could lie on the fear that private companies might not be able to renew their contract or be nationalized. It would reduce incentives to invest in the sector thus lowering FDI inflows. Commodity wealth may make exporting countries vulnerable from an investor viewpoint (Bohn and Deacon, 2000), a fact that can be particularly relevant in the case of point-source commodities which require large research, capacity and storage investments. This would most likely happen in the case of a commodity boom, and would require the same institutionally-based reasoning as Arezki and Brückner (2010, 2012).

2.1 Sovereign spreads over the 2002-2014 period

Leaving aside the recent global crisis episode, the early 2000s had seen a steady narrowing of sovereign spreads in emerging market economies on the back of a highly favorable external environment: global growth was robust, commodity prices were high, and liquidity conditions were favorable and resulted in large capital inflows to these countries.

Figure 1: EMBIG spreads of **Resource-rich Economies** - (Dec. 2002- May 2014)



Notes. The Emerging Market Bond Index Global is an emerging market debt benchmark constructed by J.P. Morgan. Countries must fulfill at least one of the following requirements: (i) be classified as having low or middle per capita income by the World Bank, (ii) have restructured external of local debt in the past 10 years, (iii) be currently restructuring their external debt or their local debt outstanding. This index considers for inclusion emerging markets issues denominated in U.S.D., with a minimum current face outstanding of 500 millions U.S.D. and at least 2.5 years to maturity, at the time each instrument is added to the index. **Sources.** World Bank, Global Economic Monitor (GEM) database.

As an illustration, Table 1 displays net inflows of FDI in percentage of GDP for a sample of 18 EME. Apart from Ecuador and Mexico, net inflows of FDI in percentage of GDP more than doubled between 2003 and 2008. The registered median growth rate in emerging economies was of roughly 6 percent during 2003-2007 (IMF, 2009), resulting in some cases in drops in external-debt-to-GDP ratios (see Table 1). In Brazil, Chile, Colombia, Mexico, Paraguay, Peru, and Uruguay, external indebtness declined by 25 percentage points of GDP, on average over the 2003-2008 period. For Argentina, the 2005 debt restructuring program was a major factor driving debt ratios down (external as well as public, see Table 1), which corresponded to a tightening of the EMBIG: spreads narrowed from 5802,98 basis points in April 2005 to 426,81 in July 2005.

The financial turmoil manifested itself in emerging markets after Lehman's bankrupcy: confidence was lost and counterpart risk rose. Collapsing global growth and commodity

Table 1: Foreign Direct Investment and External Debt

	Foreign Direct Investment (net inflows)				External Debt			
	Level in	Percentage change		Level in	Level in	Percentage change		Level in
Countries	2003	2003-2008	2009-2014	2014	2003	2003-2008	2009-2012	2013
Argentina	1.27	87.91	-48.90	1.22	12.17	-43.6	-19.8	9.75
Brazil	1.81	64.93	37.93	4.12	6.23	-8.9	46.5	8.31
Chile	5.53	52.41	1.08	8.52				
Colombia	1.812	138.29	-1.85	4.24	7.11	0.09	44.3	10.27
Ecuador	2.68	-36.27	-55.17*	0.76*	2.61	-26.2	-8.1	8.55
El Salvador	0.93	349.03	-55.32	1.88				
Malaysia	2.24	46.19	12.73*	3.69*	10.81***	14.7	25.2	15.54
Mexico	2.60	-0.25	-31.50	1.77	7.51	9.51	54.5	12.71
Peru	2.26	151.82	-19.32*	4.59*	13.05	-19.6	25.6	13.17
Russia	1.84	143.49	-72.71	1.22				
Uruguay	3.45	104.04	-32.06	4.79				
Venezuela					38.9	-62.21	36.73	20.1
Average	2.40			3.47				
China	2.99	36.70	-10.55*	3.66*	2.9	7.9	39.2	4.36
Egypt					6.59**	-2.2	4.3	6.72
Hungary	2.56	1764.55	-81.55	8.83	17.93	251.2	-5.1	59.76
Philippines	0.58	31.46	183.23	2.17	18.10	-28.7	-13.2	11.2
Poland	2.11	34.37	-99.92*	0.002*				
Turkey	0.56	383.89	-42.30	1.56	10.72	64.5	-4.5	16.84
South Africa	0.44	671.40	-52.39	1.64	5.45	47.2	86.3	14.96
Ukraine	2.84	109.28	-89.19	0.64	9.28	214.5	38.5	40.46
Average	1.73			2.64				

Notes. Variables expressed as percentage of GDP. *: 2014 data replaced by 2013 figures. ** (resp. ***): 2003 data replaced by 2006 (resp. 2005). **Source.** *World Bank, WDI database; IMF WEO.*
For Venezuela: http://mecometer.com.

prices added even more pressure to the already existing flight in capital flows to emerging economies.[7] Sovereign spreads peaked from September 2008, as depicted in Figure 1. However, countries such as Brazil and Russia had already been accumulating high levels of foreign reserves, making them a bit less vulnerable to sudden stops. Exporting countries have suffered from higher spreads over the 2003-2013 period compared to importers, though enjoyed a lower level of external debt (Table 14).

In Europe, sovereign debt crisis that intensified in 2010 has been (to various extent) felt by "neighour" countries, Hungary, Poland and Ukraine with no surprise, as well as Turkey and Russia (IMF, 2012). In this respect, the literature has recently emphasized the growing importance of global factors in explaining sovereign spreads after the Great Recession (Aizenman et al., 2013; Csonto and Ivaschenko, 2013). Spreads narrowed steadily during the second half of 2012, though followed by a small increase starting in January 2013, most likely due to rising uncertainty about Cyprus.

[7]The Institute of International Finance (IIF) reports a near halving in private capital flows for 30 key emerging markets from $1.2 trillion USD in 2007 to $649 billion USD in 2008.

2.2 Sovereign spreads and commodity prices

It is a well established fact that commodity terms-of-trade matter in the assessment of sovereign risk (Arezki and Brückner, 2012; Bastourre et al., 2012) and are inversely related to the evolution of spreads. Let us now investigate whether this link is country-specific or not. We compute the pairwise correlations (Pearsons') among spreads and commodity prices. One would expect to find a negative link between sovereign spreads and prices of commodities that are the most exported by countries, and a positive nexus for countries that heavily rely on their imports.

We check these relationships by crossing information from Tables 9a, 9b, 10a, and 10b with Figure 2.[8]

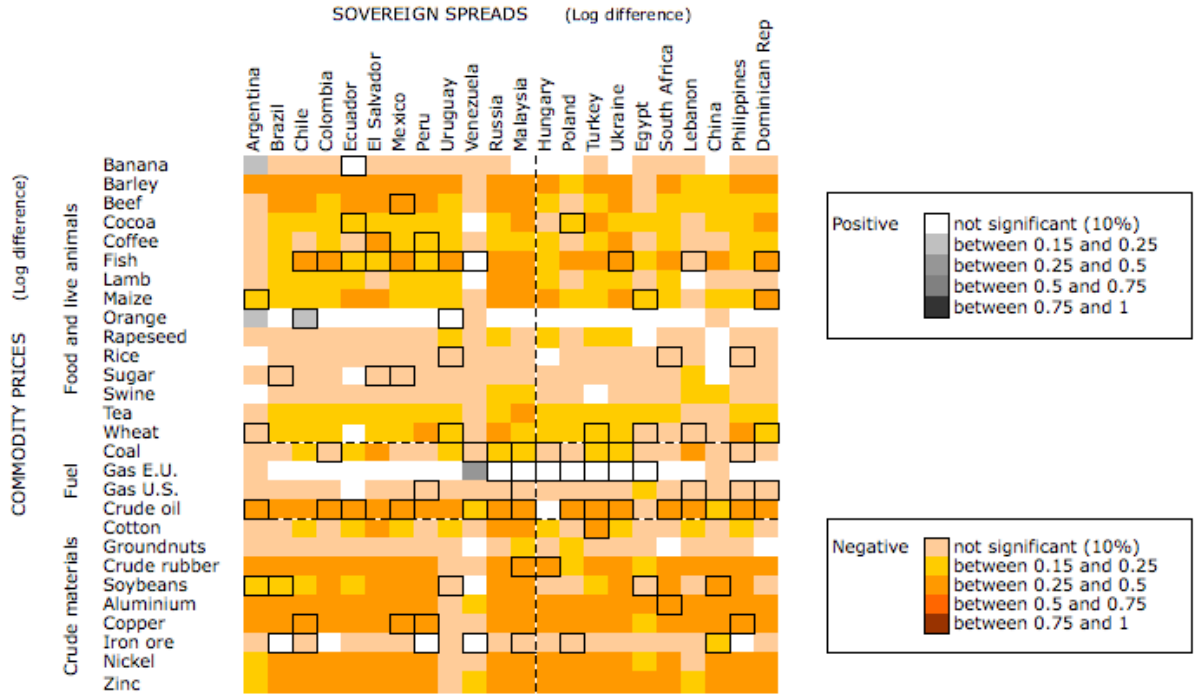
As shown, individual commodity prices are negatively (or not significantly) correlated with sovereign spreads. Financial markets will tend to associate higher prices with a favorable economic environment for emerging markets.

Higher fuel commodity prices are associated with lower sovereign risk of countries whose main exports are composed of crude oil, as expected. More surprisingly, we do not find a positive association between energy prices and sovereign spreads for countries known as highly dependent on fuel imports. We could assume that increasing fuel import prices reduce available income in general, enhancing greater risk, though it does not appear clearly. In the same vein, iron ore price increases seem to go hand-in-hand with lower Chinese spreads, although China is the biggest known importer.[9]

[8] Figure 2 can be also found in Bastourre et al. (2012) with a few differences: our sample is larger, with respect to the countries, the commodities considered, and the period under investigation (1991-2010 vs. 2003-2013).

[9] China's metal consumption grew at an annual rate of roughly 16%, accounting for more than 80% of world demand (IMF, 2010).

Figure 2: Correlation matrix of spreads and commodity prices (2003-2013)

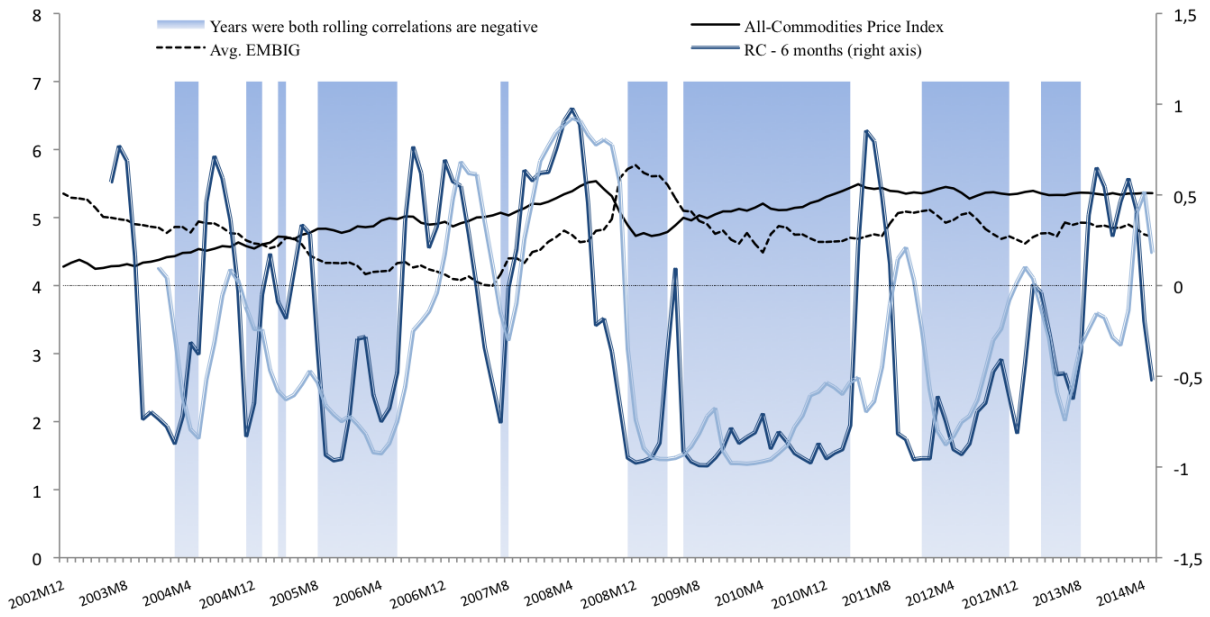


Notes. Framed squared highlight the commodities that are the main exported (resp. imported) in 2002 and 2013 for commodity exporters (resp. importers). See Tables 9a, 9b, 10a, and 10b. **Source.** IMF, World Bank, Bank of Canada for prices; Macrobond for country spreads.

Generally, investors prefer an economic environment wherein natural resources prices follow an upward trend, regardless of whether the country is a net exporter of a net importer. This is confirmed by Figure 3, where the 6 months- and the 1 year-rolling correlations between EMBIG and commodity prices are depicted.[10] The significant negative link may be qualified since it not constant over time, however it has intensified over the years, which may be an indication that commodity prices have become an increasing relevant indicator of sovereign risk over the time.

[10]We chose to depict both rolling correlations in order to ensure ourselves regarding the robustness of this measure.

Figure 3: EMBIG and Commodity Prices: rolling correlations (Dec. 2002-May 2014)



Notes. Rolling correlations (RC) are calculated as the correlation coefficient between Commodity Price Index and EMBIG series from t-6 (t-12 in the case of 1-year RC) to t. Original series are taken in natural logarithm. Periods for which 1-year and 6-months RC are simultaneously negative are the following: 2004M02-05; 2004M12-2005M01; 2005M03-04; 2005M08-2006M06; 2007M07-08; 2008M11-2009M04; 2009M06-2011M03; 2011M12-2012M11; and 2013M04-08. **Sources.** IMF commodity prices and Macrobond for the EMBIG.

2.3 Sovereign spreads and commodity trade intensity

Commodity prices dynamics are helpful to understand the evolution of emerging sovereign spreads, as shown in the literature and in the previous subsection. Let us now examine whether there is any role for the trade structure. Countries that heavily depend on natural resources can be risky for many reasons that were evoked earlier, but one of them could be particularly relevant as the period under study is mostly characterized by increasing commodity prices: the "debt-overhang".

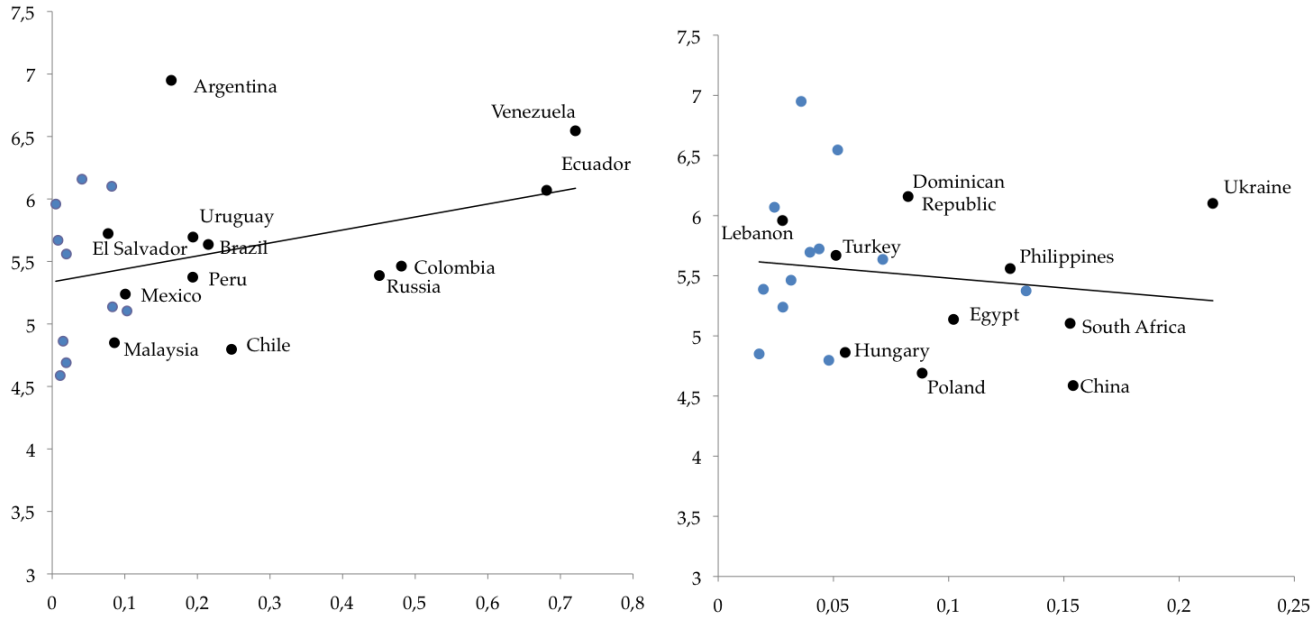
Resource-rich countries have the unfortunate habit of following pro-cyclical fiscal policies, financed by external debt, which can be anticipated by markets as it usually gets harder when the cycle returns. In the same logic, one feature which was recently emphasized by recent reports by the IMF (2015) is the indebtness in foreign currency of companies in fuel and mining sectors (both public and private) facilitated by buoying prices.[11] Therefore, if the "debt-overang" was at play, financial markets should have taken

[11] For example, most of Russia's non banking external debt is held by the state-owned company Rosneft (and Gazprom) which bought its competitor TNK-BP for $55 billion in March 2013. Sanctions against Russia and the oil's crash has now made it one of the most indebted oil producer relative to its earnings,

it into account by charging a special premium to commodity exporters.

Figure 4 displays EMBIG spreads (y-axis) and the sum of the 4 commodities the most net exported (resp. imported) expressed as a share of total exports (resp. imports) denoted as W_{Exp} and W_{Imp} are represented on the x-axis on Figure 4a and Figure 4b, respectively. All figures are averaged over the 2003-2013 period.

Figure 4: Sovereign spreads and commodity share in the ...



(a) ... export structure

(b) ... import structure

Notes. Figure 4 depicts the average EMBIG (in natural logarithm) for each country and is calculated over the 2003-2013 period. To each dot representing a level of sovereign spread is associated a proxy for the commodity share in the export structure (4a) and the import structure (4b). They are referred to W_{Exp} and W_{Imp} respectively thereafter and are defined as the sum of the 4 main net exported (resp. imported) commodities in the export (resp. import) structure. In Figure (4a), dark dots represent resource-rich economies while they represent commodity importers in Figure (4b). Each line represents the trend followed by the sample, and is only illustrative. **Sources.** J.P. Morgan *via* Macrobond and UN Comtrade.

The insights we get from Figure 4 is that financial markets could have actually discriminated spreads on the basis of whether the country is a net exporter or a net-importer of natural resources: higher commodity exports tend to be associated with higher spreads and the contrary is found in terms of imports.[12] However, the "debt-overhang" problem advocated by Manzano and Rigobon (2001) does not seem to be the reason why on aver-

in addition to the fact that most of the debt contracted is due at short-term thus leading to reduced debt rollover possibilities.

[12]It should be noticed that a small W_{Exp} did not prevent countries from experiencing higher spreads than average (Table 14) as can be shown in figure (4a). Also, Russia, Colombia and Ecuador do not particularly stand out apart from their high commodity export share.

age over the 2003-2013 period, a high intensity in commodity exports is associated with a higher spread since most exporting countries de-leveraged during the commodity boom (Table 1).

3 Data and spreads determinants

Before turning to the estimation strategy itself, let us briefly recall some theoretical considerations on the determination of emerging markets spreads. The EMBIG is an indicator that reflects the risk associated to the capacity of a country to meet its debt obligations, and thus, its probability of default. A simple model used in the literature is the one derived by Edwards (1984) that provides us a functional form of spread determinants for our empirical exercise.

Denote $spread$ as the spread calculated over U.S. Treasury bonds of the same maturity, p the perceived default probability existing until the debt contract is over and γ the exogenous risk-free world interest. We can write that:

$$spread = \left[\frac{p}{1-p}\right]\gamma, \tag{1}$$

The logistic function is used to characterize the subjective probability of default, which can be written as:

$$p = \frac{\exp \sum \beta_i y_i}{1 + \exp \sum \beta_i y_i}, \tag{2}$$

where the y_i refer to the determinants of the perceived probability of default and β_i to the corresponding coefficients. Combining Equations (1) and (2) yields the following spread function, once expressed in logarithm terms:

$$\ln spread = \ln \gamma + \sum \beta_i y_i \tag{3}$$

As the EMBIG is already measured as a premium over a supposedly risk-free U.S. Treasury bond, $\ln \gamma$ may be dropped.

3.1 Variables and data description

Our sample is composed of monthly data spanning from January 2003 to December 2013 for twenty-two emerging economies (listed in Table 2). [13]

[13] Countries were selected on the basis of available data. Given the lack of data availability for some variables at a monthly frequency, we use standard interpolation.

Table 2: Countries

AFRICA	AMERICA	ASIA	EUROPE
Egypt, South Africa	Argentina, Brazil, Chile, Colombia, Dominican Republic, Ecuador, El Salvador, Mexico, Peru, Uruguay, Venezuela	China, Lebanon, Malaysia, Philippines,	Hungary, Poland, Turkey, Ukraine Russian Federation

The spread variable ($spread$) is measured by the secondary market spread, as provided by J.P. Morgan's EMBIG. It covers 27 countries and serves as a benchmark for emerging markets debt, including U.S.-dollar denominated Brady bonds, Eurobonds, traded loans and local market debt instruments issued by sovereign or quasi-sovereign entities (it includes up to 127 instruments).[14] The spread yield is calculated as the premium paid by an emerging market over a U.S. government bond with comparable maturity features. This measure, used as one benchmark on financial markets (in addition to the Credit Default Swaps (CDS)) should take into account all the risks beared by countries, thus including the risk associated with natural resources.

The right-hand side of Equation (3) includes the main determinants, summarized in y_i,[15] and that we describe now. We consider a variable that is able of translating the degree of sustainability of external solvency. In limited fiscal space, a high *external indebtness* increases the cost of debt issuance as argued by Sachs and Cohen (1982), Ferrucci (2003) and many others. Edwards (1986), Eichengreen and Mody (1998), and Min (1998) provided empirical support to the positive link between debt and spreads in Low Developing Countries and emerging markets in the seventies until the late-nineties, as well as Aizenman et al. (2013), Hilscher and Nosbusch (2010) and Kenedy and Palerm (2014) more recently.

Foreign reserves are also a key determinant of sovereign risk as it provides a buffer in case of a liquidity crisis (Min, 1998; Ferrucci, 2003) and is a rather good balance-of-payments' crisis predictor. Its importance might become even more relevant as argued by the IMF in its Global Financial Stability Report issued in October 2015. Emerging economies benefited from facilitated borrowing conditions these past few years, essentially permitted by accomodative monetary policies in major economies (FED US, Bank of Japan, and to a lesser extent, the ECB). Reserves can either provide a buffer when exports revenues drop or when the country is unable to roll-over its debts. Here, we use foreign reserves in months of imports, which are usually better suited for countries that have no or limited access to capital markets according to the IMF.[16] The literature provides

[14] The EMBI Global covers emerging market traded external debt including US-dollar denominated Brady bonds, loans, and Eurobonds, with an outstanding face value of at least of 500 millions of USD and at least two and a half years to maturity (at the time it is added to the index). For more information, see faculty.darden.virginia.edu/liw/emf/embi.pdf

[15] The source of the variables used throughout this analysis can be found in the Appendix, in Table 13.

[16] http://www.imf.org/external/np/pdr/debtres/.

mixed results with respect to this variable: while Min (1998) finds a significant negative association with the yield spread, Aizenman et al (2012) find no impact at all. We use the *M2-to-reserves ratio* in some cases to avoid multicolinearity issues.

Competitiveness is a major factor determining the ability to repay one's debt when the economy is export-oriented. As argued by Hilscher and Nosbusch (2010), bondholders care about adverse shocks, such as a sharp drop in the price of the main exported commodities, that can affect the country's revenues in the future. With respect to the terms-of-trade, the literature focused on both their level and, more recently, on their volatility (Hilscher and Nosbusch, 2010). The main challenge for indebted countries with a high reliance on exports is to generate enough foreign exchange reserves to service their debt obligations. Hence, favorable terms-of-trade decrease the credit risk faced by sovereigns. The literature often uses diverse price measures to account for commodity dependence, such as weighted export commodity price indices.[17] We rely on such indices and define a *commodity exports price index* ($CEPI$) and a *commodity imports price index* ($CIPI$). The construction of thses weighted-indices is based on 26 primary-commodities[18] which are the most exported (imported) by our considered countries. Let $w_i^{n,c,T}$ be the year-on-year time-varying (with $T = 2003, .., 2013$) weights, based on the main primary commodities traded (with i to be replaced either by exp or imp depending on the structure of trade of the n countries) and c the commodity.[19] Weights applied for each commodity can be defined as follows:

$$w_{exp}^{n,c,T} = \frac{\text{Exports}_{n,c,T} - \text{Imports}_{n,c,T}}{\text{Total Exports}_{n,T}} \tag{4}$$

Let $p_{c,t}$ ($t = $ 2003m1, ..., 2013m12) be the monthly price of commodity c, it follows that:

$$CEPI_{n,t} = \sum_{c=1} w_{exp}^{n,c,T} \times p_{c,t} \tag{5}$$

The $CIPI$ is constructed in the same way, with just one difference. As we define weights in net terms, if net exports of commodity c are negative, the denominator in (4) becomes the total imports of country n in year t and does not appear in (5).[20]

[17] Hischler and Nosbusch (2010) for instance.

[18] Listed in the Appendix, Table 8.

[19] The number of commodities taken into account can go up to twenty-six, depending on data availability.

[20] Exports and imports in value were retrieved from the UN Comtrade database using the 3^{rd} Revision of the Standard International Trade Classification (SITC), and commodity prices from the IMF's IFS database. Not all were taken from the IFS, as for fish or lamb prices which were taken from the Bank of Canada and the WorldBank, respectively. Also, trade values were taken without disentangling arabica from robusta coffee, however, the price applied was chosen in order to reflect which specie is cultivated the most in each country. For example, Asian countries typically produce robusta which requires warmer temperatures and more rainfall than arabica which is grown in Latin America. Finally, to avoid any potential breaks in the series due, e.g., to the inclusion of a commodity in year T whose price is much higher than the one considered in $T - 1$, prices are taken in indices (base 100 in January 2010).

In order to test whether commodity producers are charged with an additional premium, we use the cumulative sum of shares of natural resources in total exports (W_{Exp}) and in total imports (W_{Imp}) as a commodity-dependence indicator. (Table 12.)

While academics investigated the determinants of emerging economies' spreads mostly through the scope of internal factors in the 1980-90s, the run-up of spreads following the financial crisis initiated the idea that external but mostly global factors were important drivers. González-Rozada and Levy Yeyati (2008), Dailami et al. (2008), Akinci (2013) and Kennedy and Palerm (2014), among others, evidenced that global risk and monetary conditions are increasingly regarded by investors when evaluating a country's creditworthiness. The volatility index (*VIX*), measures the implied volatility of S&P 500. It is used as an indicator of financial stress as it expresses the expected movement in the U.S. stock market.

3.2 Baseline specification

The baseline specification stems from the one summarized briefly in Equation (3) (Edwards, 1984) and the log-linear relationship for spread determinants can be written as follows:

$$\ln(spread_{it}) = \alpha_i + \sum_{j=1}^{N} \beta_j y_{jit} + \varepsilon_{it} \tag{6}$$

y_{jit} is the set of N fundamentals that are generally considered when analyzing emerging markets spreads dynamics. α_i are the country fixed effects that capture time-invariant country-specific unobservables, and ε_{it} is an error term that is clustered at the country level.

4 Country-by-country analysis

We first retain a time series context, in order to check whether commodity prices imply the same dynamics with respect to our two samples: exporters ($k = X$) vs. importers ($k = M$). Although the literature generally gathers all emerging economies in the same box, there is no reason for spreads to be associated the same way for resource-poor and resource-rich countries. The regression takes the following form:

$$\ln(spread_{it}) = \alpha_i + \sum_{j=1}^{N} \alpha_j CV_{jit} + \gamma CTOT_{it}^{k} + u_t \tag{7}$$

where $CTOT$ stands for the commodity terms-of-trade with $CTOT^X = CEPI$ and $CTOT^M = CIPI$. CV is the set of control variables, which consists in a proxy for risk appetite (*VIX*), the level of external debt as a percentage of GDP (*external indebtness*), the level of foreign exchange reserves available ($foreign\ reserves$), and a country-specific

dummy that takes the value 1 when the country is in recession ($recession$).[21]

As one can note here, we have decided to include only the export side and the import side of the commodity terms-of-trade for exporters and importers respectively, since if some commodity effect were to be found, then it would most likely work this way. For exporters of natural resources, we expect that an improvement in the commodity terms-of-trade is associated with a decrease in spreads, therefore we test the following hypothesis:

$$H_0^{Exp} : \gamma < 0$$

Arezki and Brückner (2012) argued that commodity revenue windfalls had a significant impact on the level of external debt. Accordingly, we perform a correlation analysis for commodity exporters beforehand, and find that both series are highly correlated. This is why we prefer to add in (7) the external debt purged of the effect of exported commodity prices instead of the gross variable. As for commodity importers, we should expect that higher commodity prices included in the import basket go hand in hand with an increase in sovereign spreads. Accordingly, the null hypothesis is:

$$H_0^{Imp} : \gamma > 0$$

Table 3 presents the results of the estimation; the detailed results being displayed in the Appendix in Tables 15 and 16.

[21] We could use year dummies in order to account for the business cycle though there is no reason for the business cycle to be the same across countries. We constructed the variable following the definition of the NBER. The latter does not define a recession in terms of two consecutive quarters of decline in real GDP. Rather, it is defined as a decline in economic activity, supposedly visible in employment, industrial production, and wholesale-retail sales (among others). We characterized recession dates when there were simultaneously more than two consecutive quarters of decline in real GDP, at least 8 months of industrial production and wholesale-retail sales declines over a year, and finally an increase in unemployment lasting at least 8 months over a year. The restrictive two quarters drop in real GDP was used as an indicator for countries with no monthly data available.

Table 3: Commodity terms-of-trade and sovereign spreads: a country-by-country analysis

(a) EXPORTERS

Countries	Coefficient	Stand. Error	Observations	R^2
Argentina	-1.90[a]	0.269	109	0.676
Brazil	-0.27[a]	0.054	109	0.744
Chile*	0.63[a]	0.074	126	0.811
Colombia	-0.64[a]	0.068	109	0.621
Ecuador	-0.31[a]	0.077	109	0.749
El Salvador*	0.18[a]	0.051	129	0.473
Malaysia[f]	0.18[a]	0.056	94	0.816
Mexico	-0.09[a]	0.011	109	0.847
Peru	-0.47[a]	0.037	109	0.777
Russia*[f]	-0.19[a]	0.035	132	0.811
Uruguay*	-0.67[a]	0.056	123	0.779
Venezuela**	-0.35[a]	0.126	120	0.556

(b) IMPORTERS

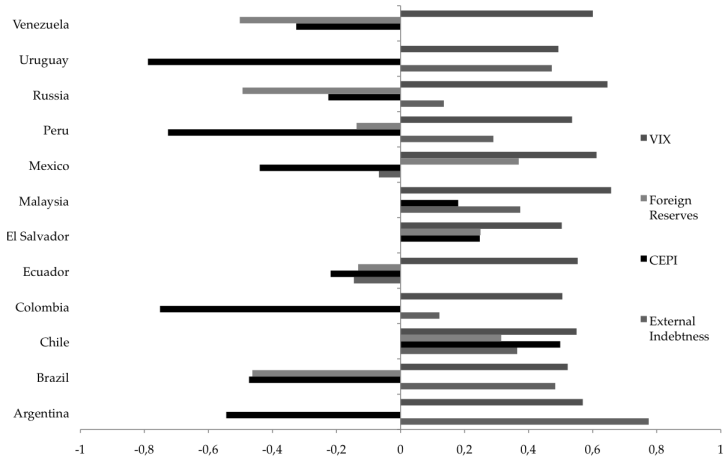
Countries	Coefficient	Stand. Error	Observations	R^2
China	0.067	0.111	109	0.661
Dom. Rep.**	0.04	0.062	132	0.427
Egypt	0.99[a]	0.220	76	0.668
Hungary	0.80[a]	0.063	109	0.945
Lebanon**	0.05	0.068	132	0.338
Philippines	-0.12	0.081	109	0.741
Poland*	0.42[a]	0.053	132	0.830
South Africa	0.15[c]	0.077	109	0.822
Turkey	0.03	0.061	109	0.508
Ukraine**	0.90[a]	0.181	123	0.591

Notes. * Countries for which external debt data was not available, replaced by short-term external debt data. ** Countries for which external debt data was not available nor short-term external debt data. Results do not differ for Argentina when the 2005 restructuration is accounted for by neither a year dummy nor a quarterly dummy. ^{f} indicates that foreign reserves were replaced by the M2/Reserves ratio to avoid multi colinearity. $CEPI$ and foreign reserves are highly correlated in the case of Venezuela (Corr. = 0.88). We regressed foreign reserves on export terms-of-trade and used the residuals. ^{a} p< 0.01, ^{b} p< 0.05.

As expected, commodity terms-of-trade are significantly associated with sovereign spreads when considering commodity-exporting countries. All exporters experienced a decrease in their sovereign spread when prices of natural resources went up, and *vice-versa*. Our results are consistent with the findings of Chuffart and Hooper (2016) which show that the Venezuelian and the Russian CDS strongly reacts to oil prices. Chile, El Salvador and Malaysia 's spreads exhibit a positive and significant association with their export-prices index, which would not have been unobservable in the case of a panel analysis. Their trade structure is not responsible for that since their share of commodity exports is scattered (25%, 8% and 12% respectively). One potential explanation may be that these three countries "escapted the trap of procyclical fiscal policy" to become countercyclical as evidenced by Frankel et al. (2013). If we replace the export price index with the All Commodity price index, as given by the IMF, the only remaining country for which price increases are a source of higher risk perception is Chile.[22]

[22]The pairwise correlation between its sovereign spread and its commodity exports price index is positive though unsignificant during the period.

Figure 5: Economic Significance: Tables 3 (a)



Notes. This depicts economic significance of each variable that explains sovereign spreads in Equation (7). The value of each bar refers to the "standardized beta" coefficient associated to the variable of interest, and allows for meaningful comparison between explanatory variables. Say we focus on Argentina, the figure reports a beta coefficient ($\hat{\beta}^{\text{beta}}$) of 0.77 for *External Indebtness*. This value is retrieved with the following formula: $\hat{\beta}^{\text{beta}}_X = \hat{\beta}_X \times \frac{\sigma_X}{\sigma_Y} = 4.394 \times \frac{0.1645}{0.9859} = 0.77$, with X:*External Indebtness* and Y:*spread*. Hence, the Argentinian spread fluctuates more with the level of external debt than with the CEPI ($\hat{\beta}^{\text{beta}}_{CEPI} = -0.54$). For the sake of clarity, the beta coefficient associated to $Recession$ is not reported.

If we focus on the relative importance of determinants of the sovereign spreads by looking at "beta" coefficients,[23] we can note that commodity terms-of-trade do not prevail over the other determinants included. International investors are more concerned with the evolution of commodity terms-of-trade for Colombia, Peru and Uruguay than the level of external debt during the 2003-2013 period, while for Argentina it is the opposite. With respect to its default history (Argentina defaulted a fifth time on its external debt in 2001), this is not a striking result. Even after accounting for the 2005 debt restructuring, the level of external indebtness is one of the most important driver of the Argentinian spread. For both Argentina and Ecuador, external debt decreases a lot during the early 2000s although starting from much higher levels. It was primarily explained by large current-account surpluses due to favorable terms-of-trade as well as to currency appreciation (in response to increased foreign assets' holding by the private sector in the former and mostly in the public sector for the latter (IMF, 2013)). Nevertheless, the evolution of investors' risk appetite is the most significant driver for Ecuador, as for Brazil, El Salvador, Malaysia, Mexico, and finally Russia, most of them being fuel exporters. In the case of Russia, the drop of oil prices and natural gas prices— indexed to that of oil— has been found to be unanimously responsible for the $ 285 billions USD capital flight it endured between 2009 and 2013. In addition, the currency's value halved, benefiting the companies' competitiveness but in the same time put pressure on foreign denominated debt (Chalmin, 2015). As most of Russia's non-banking external debt is being held by Rosneft and Gazprom, international investors may have priced the country's debt with

[23] See Figure 5 and the notes therein.

respect to oil prices but *via* instability on financial markets.[24]

Turning now to commodity importers, results are much more heterogeneous. Four countries (Egypt, Hungary, Poland and Ukraine) exhibit a positive correlation between spreads and import commodity prices, while import prices do not have any explanatory power on the spread's evolution. Beta coefficients[25] show that when pricing external debt, international investors put a lower scrutiny to commodity terms-of-trade, a higher one to external debt, and a somewhat heterogenous attention regarding the U.S. stock market volatility, relative to that of exporters.

5 Panel analysis

We now investigate the extent to which natural resources are included in the emerging sovereign debt benchmark. We consider a panel framework, that allows us to study an average effect, for both exporters and importers. Thanks to this setup, we aim at assessing whether international investors pay a particular attention to natural resources, and especially if they consider the underlying risks inherent to the countries exporting them.

We proceed in three stages. First, we estimate regression (6) to examine the association between commodity terms-of-trade and spreads. Results can be found below in Table 4. Then, we investigate whether trade structure has been relevant for investors when they price debt (Table 5). Finally, we assess whether commodity terms-of-trade's relative importance changes with respect to commodity market trends (Tables 6 and 7).

[24]Note that foreign reserves have the second largest explanatory power, which is in line with Russia's recent depletion of foreign reserves.

[25]Not reported but available upon request to the author.

5.1 Testing the correlation between commodity terms-of-trade and sovereign spreads

Table 4: Commodity terms-of-trade and sovereign spreads: a panel perspective

Variables	EXPORTERS			IMPORTERS		
$CEPI$	-0.2153^b	-0.2029^b	-0.1917^c			
	(0.090)	(0.081)	(0.087)			
$CIPI$				0.2750	0.3373	0.1930
				(0.209)	(0.201)	(0.227)
VIX	0.5818^a	0.6156^a	0.6138^a	0.5960^a	0.6203^a	0.5175^b
	(0.068)	(0.060)	(0.064)	(0.099)	(0.104)	(0.148)
$Recession$	0.3651^a	0.3824^a	0.4105^a	0.5288^b	0.5204^b	0.3704^b
	(0.083)	(0.084)	(0.089)	(0.181)	(0.189)	(0.142)
$Foreign\ Reserves$		-0.0298^a	-0.0315^b		-0.0308	-0.0332
		(0.005)	(0.011)		(0.026)	(0.040)
$External\ Indebtness$			1.4981^c			0.9459^b
			(0.792)			(0.338)
$Constant$	3.2443^a	3.3536^a	3.2598^a	1.1638	1.0128	-4.6075
	(0.611)	(0.536)	(0.7918)	(1.189)	(1.169)	(2.437)
Observations	1,572	1,572	1258	1,320	1,320	730
R-squared	0.308	0.336	0.382	0.282	0.303	0.517
Number of Countries	12	12	11	10	10	7

Notes. Clustered standard errors are reported in parentheses. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1.

As shown in Table 4, not surprisingly, both external indebtness[26] and the VIX are significantly and positively associated with country risk, as well as the dummy variable $Recession$. It is in accordance with what is generally found in the literature explaining emerging markets' spreads.[27] Foreign reserves enter significantly the regression for exporters, with the expected sign. Indeed, accumulation of foreign reserves is highly relevant in countries for which most revenues from abroad are constituted of commodities, in addition to the fact that their prices have always been more volatile than that of manufactured goods (Jacks et al., 2011).

The main distinction between both types of countries that we are interested in lies in the impact of commodity prices. An increase in export prices has been associated with a decrease in the perceived exporting-country risk, while there is no positive apparent link between commodity terms-of-trade and the debt benchmark in the case of importers. Prices experienced a steep increase during the early 2000s, which corresponds to almost half of the observations. For importers, this means an expending import bill, especially with respect to energy prices. Therefore, if prices are acknowledged by financial markets, then one should expect a significant association between import prices and spreads. As seen in Table 3, only half of the sample exhibits a significant and positive correlation

[26] Purged by commodity export prices in the case of exporters.

[27] Arezki and Brückner (2010, 2012); Bellas et al. (2012); Aizenman et al. (2013); Akinci (2013); and Csonto and Ivaschenko (2013) among others.

between spreads and import commodity prices. This might be the reason why $CIPI$ is not significant. As a robustness check, we perform the same regressions with the All-Commodity price index, retrieved from the IMF (see Table 18). Results do not change, though using this index provides a better fit, in both cases.

5.2 Does commodity trade intensity matter?

So far, the only disctinction we have made about the trade structure was whether the country is a net exporter or a net importer. We evidenced previously that commodity prices helped understanding sovereign spreads in the case of exporters, but not in the case of importers. This result may vary with respect to the weight of commodities in the trade structure.

Weights are widely dispersed among exporters,[28] hence we might evidence a higher natural resource component in the spreads, the higher the commodity intensity. Also, Figure 4 shows that a higher share of commodity exports (resp. imports) is associated with higher (lower) spreads, on average over the period. This visual insight is obviously not sufficient to assess whether trade composition matters, since a scatter plot is a cross-section picture, averaged over the 2003-2013 period, depicting both exporters and importers. To go further, we add to Equation (6) the share of the four most exported (resp. imported) commodities for natural resources exporters (resp. importers), as defined by W_{Exp} (resp. W_{Imp}).

Table 5: Trade structure and sovereign spreads

Variables	EXPORTERS			IMPORTERS		
All Commodity	-0.4821^{c}	-0.4987^{c}	-0.4118^{c}	0.3338	0.3708	-0.1379
	(0.248)	(0.246)	(0.221)	(0.298)	(0.281)	(0.345)
W_Exp	-0.5390	-0.3280	-1.028^{c}			
	(0.707)	(0.705)	(0.537)			
W_Imp				0.8990	1.5538	-0.3283
				(1.389)	(1.357)	(1.586)
VIX	0.5977^{a}	0.6395^{a}	0.6427^{a}	0.6322^{a}	0.6561^{a}	0.5146^{b}
	(0.063)	(0.059)	(0.100)	(0.098)	(0.101)	(0.146)
Recession	0.2936^{a}	0.3060^{a}	0.3560^{a}	0.5742^{b}	0.5852^{b}	0.4100^{c}
	(0.077)	(0.084)	(0.063)	(0.179)	(0.185)	(0.193)
Foreign Reserves		-0.0324^{a}	-0.0282^{b}		-0.0261	-0.0344
		(0.010)	(0.012)		(0.025)	(0.041)
External Indebtness			1.4423^{c}			1.1738^{b}
			(0.7132)			(0.339)
Constant	4.7022^{a}	4.9065^{a}	1.5261^{a}	0.6690	0.5469	3.9699
	(1.259)	(1.214)	(1.073)	(1.746)	(1.686)	(2.073)
Observations	1,572	1,572	1258	1,320	1,320	730
R-squared	0.367	0.400	0.429	0.270	0.285	0.537
Number of countries	12	12	11	10	10	7

Notes. Clustered standard errors are reported in parentheses.
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1.

As shown in Table 5, the control variables' sign and significance do not differ from

[28] Imports account for roughly 10% on average for importers and go up to 29% (Ukraine), while exports account for 29% and go up to 92% (Venezuela) in the case of exporters.

the previous results in Table 4. Commodity prices are negatively associated with the sovereign risk measure in the case of commodity exporters, but there is still evidence of no impact of prices on the way financial markets assess sovereign risk.[29]

Our results indicate that the level of commodity intensity does not enter significantly in the determination of the ability of a country to repay its debtors, regardless of the country's trade specialization.

5.3 Do large commodity prices variations matter?

So far, we know that financial markets do not charge exporters a premium for being such, but the cost of debt is dependent on commodity prices' evolution. As evoked in the introduction, if any risk is beared by exporting countries (resp. importing) in terms of spreads, it mainly stems from high variations in commodity prices. The recent slide in commodity prices has shown increasing pressure weighting on exporting countries,[30] with debt payments dues, income shortfalls and consequently facing higher debt issue costs. We now investigate whether larger variations than average indeed impact the way commodity prices fluctuate with sovereign spreads over the 2003-2013 period. To this end, we use the All Commodity price index to define dummy variables constructed as follows:[31]

$$\begin{aligned} \text{Dummy}_t^- &= 0 \\ &= 1 \text{ if } \text{Indice}_t^{\text{All Commodity}} < \mu^{\text{All Commodity}} - \sigma^{\text{All Commodity}} \end{aligned} \tag{8}$$

and

$$\begin{aligned} \text{Dummy}_t^+ &= 0 \\ &= 1 \text{ if } \text{Indice}_t^{\text{All Commodity}} > \mu^{\text{All Commodity}} + \sigma^{\text{All Commodity}} \end{aligned} \tag{9}$$

μ and σ being the mean and the standard deviation of the price series, respectively.

Figure 6 illustrates the evolution of the All-Commodity price index over the 2003-2013 period.[32] The dates corresponding to the case where $\text{Dummy}_t^- = 1$ and $\text{Dummy}_t^+ = 1$ are reported in Table 17.

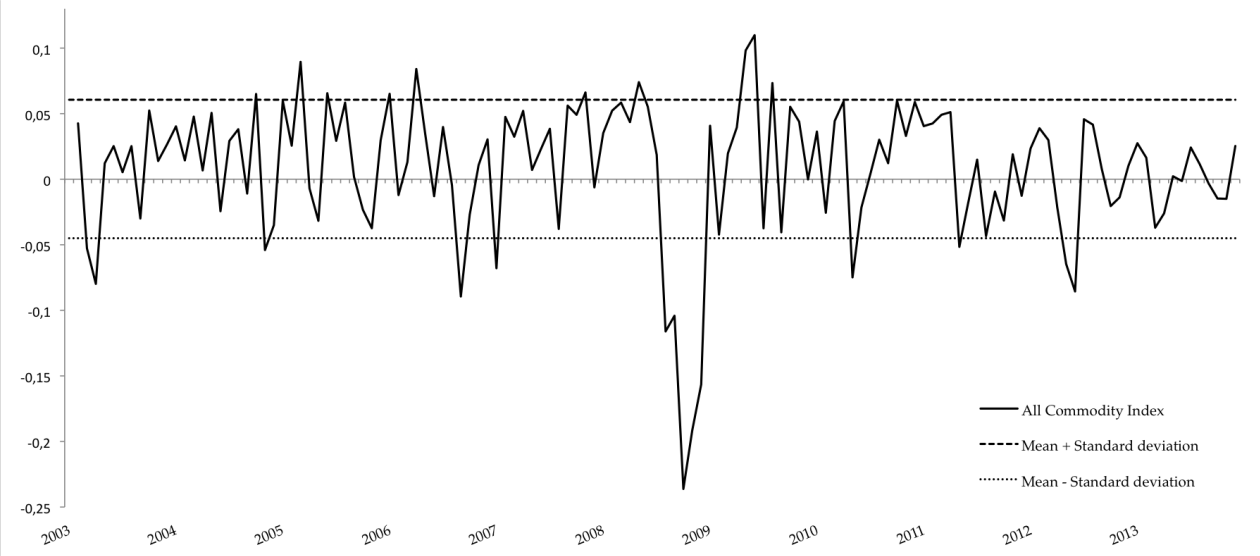
[29] It should be mentioned that commodity terms-of-trade have been replaced by the All-Commodity price index in Table 5 since the former were not significant (results are available upon request to the author).

[30] Especially Brazil, Russia and Venezuela.

[31] All series used are log differenced.

[32] Each time the index crosses the bottom line, it means that it was lower than the average growth rate minus the standard error.

Figure 6: Evolution of the All Commodity price index (2003-2013)



Tables 6 and 7 depict the estimation results of regression (6) when the commodity terms-of-trade interact with Dummy^{+} and Dummy^{-}, respectively. The results reveal that price slumps as well as price surges do not help explaining how sovereign spreads evolve.[33] This is not in line with the current situation, although the 2008 collapse and the steady decrease in prices experienced since 2014 do not have the same origin nor the same implications.[34]

Finally, it is worth mentioning that, not surprisingly, we find that terms-of-trade based on commodities are not relevant for explaining sovereign spreads in resource-poor countries. We confirm the results found previously.

[33]We have checked that Dummy$_t^- = 1$ was not correlated with $Recession$ since the former is over-represented by 2008, which was confirmed. Also, results do not change if we drop $Recession$.

[34]Note that, as a robustness check, we have replaced both commodity prices indices by the All-Commodity price index and, results remained unchanged. They are available upon request to the author.

Table 6: Commodity terms-of-trade and sovereign spreads in times of surging prices

Variables	EXPORTERS			IMPORTERS		
$CEPI$	-0.2137^b	-0.2020^b	-0.1905^b			
	(0.089)	(0.080)	(0.085)			
$\times$Dummy$^+$	-0.0093	0.0076	0.0328			
	(0.039)	(0.031)	(0.072)			
$CIPI$				0.2779	0.3389	0.1917
				(0.209)	(0.200)	(0.228)
$\times$Dummy$^+$				-0.0799	-0.0663	0.0353
				(0.057)	(0.050)	(0.074)
Dummy$^+$	0.0505	0.0159	-0.0045	0.1269	0.0917	-0.0468
	(0.095)	(0.073)	(0.098)	(0.093)	(0.096)	(0.154)
VIX	0.5816^a	0.6162^a	0.6190^a	0.5965^a	0.6209^a	0.5164^b
	(0.068)	(0.059)	(0.064)	(0.099)	(0.104)	(0.148)
$Recession$	0.3652^a	0.3808^a	0.4030^a	0.5266^b	0.5181^b	0.3736^b
	(0.081)	(0.083)	(0.087)	(0.182)	(0.190)	(0.146)
$Foreign\ Reserves$		-0.0300^a	-0.0323^b		-0.0309	-0.0331
		(0.005)	(0.011)		(0.026)	(0.040)
$External\ Indebtness$			1.5084^c			0.9490^b
			(0.796)			(0.337)
$Constant$	3.2336^a	3.3455^a	3.2377^a	1.1498	1.0058	-4.6223
	(0.607)	(0.532)	(0.482)	(1.185)	(1.164)	(2.428)
Observations	1,572	1,572	1,258	1,320	1,320	730
R-squared	0.308	0.336	0.385	0.283	0.304	0.517
Number of countries	12	12	11	10	10	7

Table 7: Commodity terms-of-trade and sovereign spreads in times of stumbling prices

Variables	EXPORTERS			IMPORTERS		
$CEPI$	-0.2146^b	-0.2028^b	-0.1937^c			
	(0.090)	(0.081)	(0.088)			
$\times$Dummy$^-$	-0.0004	0.00024	0.0209			
	(0.016)	(0.018)	(0.034)			
$CIPI$				0.2774	0.3403	0.1794
				(0.208)	(0.199)	(0.232)
$\times$Dummy$^-$				-0.0144	-0.0232	0.0819
				(0.030)	(0.029)	(0.060)
Dummy$^-$	0.0618	0.0328	-0.0210	0.0832	0.0888	-0.1329
	(0.051)	(0.057)	(0.111)	(0.083)	(0.084)	(0.136)
VIX	0.5719^a	0.6088^a	0.6077^a	0.5872^a	0.6135^a	0.5082^b
	(0.068)	(0.060)	(0.065)	(0.101)	(0.107)	(0.152)
$Recession$	0.3560^a	0.3763^a	0.4039^a	0.5225^b	0.5180^b	0.3422^b
	(0.084)	(0.085)	(0.092)	(0.187)	(0.194)	(0.139)
$Foreign\ Reserves$		-0.0295^a	-0.0310^b		-0.0308	-0.0323
		(0.005)	(0.011)		(0.026)	(0.040)
$External\ Indebtness$			1.5^c			0.9527^b
			(0.793)			(0.344)
$Constant$	3.2635^a	3.3666^a	3.2797^a	1.1719	1.0120	-4.5679
	(0.614)	(0.539)	(0.496)	(1.192)	(1.170)	(2.439)
Observations	1,572	1,572	1258	1,320	1,320	730
R-squared	0.309	0.336	0.383	0.283	0.303	0.519
Number of countries	12	12	11	10	10	7

6 Conclusion

Emerging economies enjoyed buoyant growth in the early 2000s, with an average growth rate of 6% per year, and became a popular investment theme — even more after the Great

Recession that entailed confidence in U.S and European investments. The collapse in commodity prices after the 1970s' boom and the subsequent multiple external defaults were about to be part of history. However, this spectrum has come back and is now hanging over emerging markets after all, especially those endowed with natural resources.

After a decade of commodity boom, the price of natural resources has been experiencing a sharp decline since July 2014. While this is good news for resource-poor countries as it shifts up disposable income in addition to reducing inflation, it acts as a drag on countries whose main revenues stem from their exports, and from oil especially. The price of Brent has gone from $106.50 USD/bb in January 2014 to $30.87 USD/bbl in January 2016. Countries such as Venezuela and Russia, have seen a sharp retrenchment of capital flows causing major depreciations of their currencies,[35] increasing the value of their dollar-denominated debt (private as well as public). Falling oil prices as well as China's slowdown have dragged metal prices along their fall, putting pressure on copper, iron ore and nickel producers, that have also seen their currency's value drop and their foreign reserves melting down, thereby increasing risks linked to external debt repayments. Financial markets have been worrying a lot about their ability to meet their debt payments, increasing their costs of issuance. Emerging markets economies that rely on exports other than commodities are not immune. Risks lie in weak external prospects in addition to the Federal Reserve's monetary policy which would imply higher commodity prices as well as capital flights to where it came from in the first place.

In this paper, we investigate the extent to which commodity terms-of-trade are reflected in the way financial markets assess risks attached to holding emerging markets bonds over the 2003-2013 period. We focus on a widely used measure of sovereign risk, namely the spread of the Emerging Market Bond Index (Global) calculated by J.P. Morgan. It serves as the benchmark for many money managers who invest in emerging-market debt. Our main purpose is to determine how the spread measure is capable of taking into account risks inherent to commodity dependence. To this end, we consider a sample of 22 countries, including twelve exporting and eleven importing economies.

Relying on a time series framework, we find evidence that export prices matter in exporting countries over the period. Specifically, an improvement in their terms-of-trade correspond to a decreasing perceived risk (apart for Chile, El Salvador, and Malaysia), whereas import prices are positively associated with sovereign spreads for only five importers. The poor link between natural resources and importers' sovereign spreads is confirmed through a panel analysis: the prices of imported commodities are not translated through higher bond yields despite the 2000s' commodity boom. Moreover, their high reliance on energy commodities does not appear in perceived risk.

Turning to commodity exporters, which constitutes our main interest, the cost of debt

[35]The Venezuelan Central Bank estimates that in the first 9 months of 2015, $19,718 USD billion fleed the country.

issuance decreased until the 2008 turmoil thanks to higher commodity prices and all that it implied subsequently in terms of foreign reserves, external debt, etc. Nevertheless, the sovereign spread measure did not incorporate the risk inherent to the commodity prices cycle. A higher share of natural resources in the trade structure was not accounted for in the cost of debt issuance although the countries whose external default is looming are the ones that depend the most on commodity export revenues. It is all the more problematic as the debt benchmark does not only account for dollar-denominated bonds issued by governments but also by wholly state-owned companies. The latter indebtness and future payments dues have been subject to recent concern by the IMF (2015) and consitute a huge threat for the countries' solvency as investors may rely on the fact that state-owned issues are in most cases backed by a legal guarantee.[36]

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[36] J.P. Morgan Chase noticed their clients in 2014 that its debt indexes would not include any bonds issued by Russian companies subject to U.S. sanctions. They correspond to Rosneft, Novatek, Gazprombank, among others. However, the already existing bonds are kept in the indices.

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A Appendices

A.1 Commodity dependence

A.1.1 Commodities

Table 8: Commodities : SITC Rev. 3 Classification

Code	COMMODITY NAME
S3-011	Meat of bovine animals, fresh, chilled or frozen
S3-0121	Meat of sheep or goats
S3-0122	Meat of swine
S3-03	Fish (not marine mammals), crustaceans, molluscs and aquatic invertebrates, and preparations thereof
S3-041	Wheat (including spelt) and meslin, unmilled
S3-042	Rice
S3- 043	Barley, unmilled
S3-044	Maize, unmilled
S3-0571	Oranges, mandarins, clementines and similar citrus hybrids, fresh or dried
S3-0573	Bananas (including plantains), fresh or dried
S3-06	Sugar, sugar preparations, honey
S3-071	Coffee, coffee substitute
S3-072	Cocoa
S3-074	Tea and maté
S3-2222	Soya beans
S3-2226	Rape, colza and mustard seeds
S3-2221	Groundnuts (peanuts), not roasted or otherwise cooked, whether or not shelled or broken
S3-23	Crude rubber
S3-263	Cotton
S3-281	Iron ore and concentrates
S3-283	Copper ores and concentrates; copper mattes; cement copper
S3-284	Nickel ores and concentrates; nickel mattes, nickel oxide sinters and other intermediate product of nickel mettalurgy
S3-285	Aluminium ores and concentrates (including alumina)
S3-32	Coal, coke, briquettes
S3-333	Petroleum oils, crude
S3-34	Gas, natural, manufactured

Source: UN Comtrade.

A.1.2 Commodity trade

Table 9: Main Natural Resources Net - Exported ...

(a) ... in 2002

Country	Ranking		
	1	2	3
Argentina	Petroleum	Wheat	Soybeans
Brazil	Iron Ore	Soybeans	Sugar
Chile	Fish	Copper	Oranges
China	Coal	Fish	Maize
Colombia	Petroleum	Coal	Coffee
Dominican Rep.	Cocoa	Sugar	Bananas
Ecuador	Petroleum	Fish	Cocoa
Egypt	Cotton	Petroleum	Rice
El Salvador	Sugar	Coffee	Fish
Hungary	Maize	Wheat	Sugar
Lebanon	Oranges	Bananas	Nickel Ores
Malaysia	Natural Gas	Petroleum	Rubber
Mexico	Fish	Sugar	Bovine
Peru	Copper	Coffee	Fish
Philippines	Fish	Bananas	Nickel Ores
Poland	Coal	Bovine	Sugar
Russian Fed.	Petroleum	Natural Gas	Coal
South Africa	Coal	Iron Ore	Fish
Turkey	Sugar	Fish	Barley
Ukraine	Wheat	Iron Ore	Barley
Uruguay	Rice	Fish	Oranges
Venezuela	Petroleum	Coal	Fish

Source: UN Comtrade, author's calculation.

(b) ... in 2013

Country	Ranking		
	1	2	3
Argentina	Maize	Soybeans	Petroleum
Brazil	Iron Ore	Soybeans	Sugar
Chile	Copper	Fish	Iron Ore
China	Fish	Tea	Swine
Colombia	Petroleum	Coal	Coffee
Dominican Rep.	Bananas	Cocoa	Sugar
Ecuador	Petroleum	Fish	Bananas
Egypt	Petroleum	Oranges	Rice
El Salvador	Coffee	Fish	
Hungary	Maize	Wheat	Sugar
Lebanon	Bananas	Oranges	Soybeans
Malaysia	Natural Gas	Petroleum	Iron Ore
Mexico	Petroleum	Copper	Sugar
Peru	Copper	Natural Gas	Iron Ore
Philippines	Nickel Ores	Fish	Iron Ore
Poland	Coal	Wheat	Rape, Colza Seeds
Russian Fed.	Petroleum	Natural Gas	Coal
South Africa	Iron Ore	Coal	Maize
Turkey	Sugar	Copper	Fish
Ukraine	Maize	Iron Ore	Wheat
Uruguay	Soybeans	Rice	Wheat
Venezuela	Petroleum	Iron Ore	Coal

Source: UN Comtrade, author's calculation.

Table 10: Main Natural Resources Net - Imported ...

(a) ... in 2002

Country	Ranking		
	1	2	3
Argentina	Iron ore	Aluminium	Coal
Brazil	Petroleum	Wheat	Coal
Chile	Natural Gas	Coal	Maize
China	Petroleum	Iron Ore	Soybeans
Colombia	Maize	Wheat	Soybeans
Dominican Rep.	Maize	Fish	Wheat
Ecuador	Wheat	Maize	Cotton
Egypt	Wheat	Maize	Natural Gas
El Salvador	Maize	Natural Gas	Wheat
Hungary	Natural Gas	Coal	Crude Rubber
Lebanon	Wheat	Natural Gas	Fish
Malaysia	Maize	Wheat	Coal
Mexico	Natural Gas	Soybeans	Maize
Peru	Petroleum	Wheat	Maize
Philippines	Petroleum	Rice	Copper
Poland	Petroleum	Natural Gas	Cocoa
Russian Fed.	Sugar	Aluminium	Cocoa
South Africa	Petroleum	Aluminium	Rice
Turkey	Petroleum	Natural Gas	Coal
Ukraine	Natural Gas	Petroleum	Coal
Uruguay	Wheat	Barley	Tea
Venezuela	Wheat	Sugar	Maize

Source: UN Comtrade, author's calculation.

(b) ... in 2013

Country	Ranking		
	1	2	3
Argentina	Natural Gas	Iron Ore	Aluminium
Brazil	Natural Gas	Petroleum	Coal
Chile	Natural Gas	Coal	Wheat
China	Petroleum	Iron Ore	Soybeans
Colombia	Maize	Fish	Soybeans
Dominican Rep.	Natural Gas	Maize	Wheat
Ecuador	Natural Gas	Maize	Cotton
Egypt	Maize	Soybeans	Wheat
El Salvador	Natural Gas	Maize	Wheat
Hungary	Petroleum	Natural Gas	Crude Rubber
Lebanon	Wheat	Natural Gas	Fish
Malaysia	Coal	Maize	Crude Rubber
Mexico	Natural Gas	Soybeans	Maize
Peru	Petroleum	Wheat	Maize
Philippines	Petroleum	Natural Gas	Coal
Poland	Petroleum	Natural Gas	Iron Ore
Russian Fed.	Aluminium	Bananas	Coffee
South Africa	Petroleum	Rice	Aluminium
Turkey	Natural Gas	Cotton	Wheat
Ukraine	Natural Gas	Coal	Fish
Uruguay	Crude Rubber	Tea	Barley
Venezuela	Meat of bovine	Maize	Sugar

Source: UN Comtrade, author's calculation.

A.1.3 Classification: Exporters vs. Importers

We classify the countries according to their export- and import- commodity structure. Instead of dividing the sample between the commonly known resource-exporters, we decide to rely on the commodity-weight data we have at our disposal. Table 11 depicts descriptive statistics for weights measures at the individual level as well as on average.

The first constraint lies in the average individual share of primary resources in the export basket. If the period average is higher than the sample average for the same period, then the country goes in "exporter group". One obvious condition to meet is that W_{Exp} is higher than W_{Imp}. Brazil, Chile, Colombia, Ecuador, Peru, the Russian Federation, Uruguay and Venezuela satisfy these conditions and are *de facto* exporters. The next step is to look at the remaining countries, and pick the ones considered as "importers", that is countries for which $W_{Imp} \geqslant \bar{W_{Imp}}$ and $W_{Exp} < W_{Imp}$. This brings us to sort China, Dominican Republic, Egypt, Philippines, Poland, South Africa, and Ukraine as commodity "importers". It leaves us with Argentina, El Salvador, Malaysia, Mexico in hand, which are classified as exporters on the basis that the share of exports is higher than that of imports. Last but not the least, "importers" such as Egypt, Hungary, Lebanon, Turkey have been chosen on the same ground as previously done, except that $W_{Exp} < W_{Imp}$. We acknowledge the fact that the case of Egypt can be discutable as it is a well-known energy exporter, plus shares of commodities are really close on average across the period. Still, it is considered as an importer.

The present classification is not arbitrary in the sense that we rely on the UN Comtrade database to sort exporters from importers. The only exception lies in (i) Egypt which is known as being an oil-exporter, however, with respect to the commodities accounted for in this study, it is considered as an importer ($W_{Exp} = 0.09 < W_{Imp} = 0.10$ on average over the 2003-2013 period) as in Lederman and Maloney (2008); and (ii) South Africa, who while being recognized as a coal and a gold exporter, has a much larger share of imported commodities than exported commodities (0.17 vs. 0.10).

Table 11: Commodity trade intensity for the period 2003-2013

		Mean	Standard Dev.	Min	Max	X vs. M
Argentina	W_{Exp}	0.15	0.05	0.12	0.21	X
	W_{Imp}	0.04	0.02	0.01	0.08	
Brazil	W_{Exp}	0.22	0.01	0.11	0.32	X
	W_{Imp}	0.07	0.02	0.05	0.11	
Chile	W_{Exp}	0.25	0.01	0.21	0.29	X
	W_{Imp}	0.05	0.01	0.04	0.06	
China	W_{Exp}	0.01	0.00	0.01	0.02	M
	W_{Imp}	0.15	0.05	0.07	0.21	
Colombia	W_{Exp}	0.44	0.08	0.37	0.63	X
	W_{Imp}	0.03	0.01	0.02	0.05	
Dominican Rep.	W_{Exp}	0.04	0.01	0.02	0.06	M
	W_{Imp}	0.08	0.05	0.03	0.16	
Ecuador	W_{Exp}	0.68	0.13	0.33	0.79	X
	W_{Imp}	0.03	0.02	0.01	0.05	
Egypt	W_{Exp}	0.09	0.05	0.05	0.12	M
	W_{Imp}	0.10	0.02	0.08	0.14	
El Salvador	W_{Exp}	0.08	0.02	0.06	0.11	X
	W_{Imp}	0.04	0.01	0.03	0.08	
Hungary	W_{Exp}	0.02	0.00	0.01	0.02	M
	W_{Imp}	0.06	0.02	0.03	0.09	
Lebanon	W_{Exp}	0.01	0.00	0.00	0.01	M
	W_{Imp}	0.03	0.00	0.02	0.03	
Malaysia	W_{Exp}	0.12	0.05	0.07	0.10	X
	W_{Imp}	0.02	0.01	0.01	0.03	
Mexico	W_{Exp}	0.10	0.06	0.01	0.15	X
	W_{Imp}	0.03	0.00	0.02	0.03	
Peru	W_{Exp}	0.19	0.05	0.10	0.26	X
	W_{Imp}	0.13	0.02	0.10	0.17	
Philippines	W_{Exp}	0.02	0.01	0.01	0.04	M
	W_{Imp}	0.13	0.03	0.08	0.18	
Poland	W_{Exp}	0.02	0.01	0.01	0.04	M
	W_{Imp}	0.09	0.01	0.07	0.11	
Russian Fed.	W_{Exp}	0.45	0.10	0.17	0.50	X
	W_{Imp}	0.02	0.01	0.01	0.03	
South Africa	W_{Exp}	0.10	0.04	0.07	0.16	M
	W_{Imp}	0.17	0.06	0.09	0.25	
Turkey	W_{Exp}	0.01	0.00	0.01	0.01	M
	W_{Imp}	0.05	0.03	0.02	0.11	
Ukraine	W_{Exp}	0.08	0.04	0.03	0.16	M
	W_{Imp}	0.25	0.08	0.18	0.30	
Uruguay	W_{Exp}	0.21	0.10	0.13	0.30	X
	W_{Imp}	0.04	0.04	0.02	0.16	
Venezuela	W_{Exp}	0.72	0.11	0.53	0.92	X
	W_{Imp}	0.05	0.02	0.02	0.07	
All	W_{Exp}	0.18	0.21	0.01	0.92	
	W_{Imp}	0.07	0.06	0.01	0.29	

Notes. X (resp. M) stands for Exporters (resp. Importers). **Source.** Author's calculation based on export and import classification data from UNCTAD

Table 12: Average share of commodities in ...

(a) ... W_{Exp}

	Fuel	Metal	Food
Exporters	0.27	0.18	0.58
Importers	0.10	0.20	0.77

(b) ... W_{Imp}

	Fuel	Metal	Food
Exporters	0.25	0.21	0.55
Importers	0.41	0.37	0.22

Notes. Shares do not necessarily sum up to one because of rounding-up. **Sources**. UN Comtrade and author's calculation.

A.2 Variables

A.2.1 Sources, Statistics and evolution

Table 13: Sources of variables

Variables	Unit /Measures	Source
Spreads	basis points	J.P. Morgan via Macrobond
External debt	% of GDP	World Bank, GEM
Commodity Export Price Index ($CEPI$)	Index base 100 in January 2010	UN Comtrade, IMF
Commodity Import Price Index ($CIPI$)		World Bank, Bank of Canada
Foreign reserves	In months of imports	World Bank, GEM
VIX	percentage points	St. Louis Federal Reserve
Short-term external gov. debt		World Bank, QDDS
M2/ Reserves		World Bank, GEM
$Recession$	Dummy=1 when recession	World Bank, GEM

Table 14: Summary Statistics, 2003-2013 period

	ALL COUNTRIES			EXPORTERS			IMPORTERS		
Variables	Mean	Standard Dev	N	Mean	Standard Dev	N	Mean	Standard Dev	N
Spreads	5.555	.855	2904	5.700	.847	1584	5.382	.834	1320
External debt	6.979	.641	1478	6.848	.317	748	7.112	.833	730
$CEPI$	1.978	1.541	2868	3.006	1.027	1572	.731	1.069	1296
$CIPI$	1.751	.831	2904	1.357	.687	1584	2.224	.737	1320
Foreign reserves	8.821	5.91	2904	9.362	5.668	1584	8.172	6.137	1320
M2/ Reserves	3.796	2.826	2640	2.898	1.768	1320	4.694	3.3526	1320
W_{Exp}	0.180	.180	2868	.297	.226	1572	.038	.040	1296
W_{Imp}	.072	.058	2904	.045	.0347	1584	.105	.065	1320
VIX	2.938	.366	2772						

Notes. Statistics are taken on the logarithms of the variables depicted. N is the number of observations. **Sources.** See Table 13.

A.2.2 Results

Table 15: Complete results of Table 3 (a)

VARIABLES	Argentina	Brazil	Chile^{R}	Colombia	Ecuador	El Salvador^{R}	Malaysia^{F}	Mexico	Peru	Russia^{FR}	Uruguay^{R}	Venezuela^{N}
$External\ Indebtness$	4.39***	1.75***	18,702.17***	0.53*	-0.52**	7.77	1.92***	-0.15	1.48***	8.84***	79.04***	
	(0.425)	(0.189)	(3,002.672)	(0.309)	(0.235)	(11.259)	(0.475)	(0.175)	(0.291)	(2.826)	(7.595)	
$CEPI$	-1.90***	-0.27***	0.63***	-0.63***	-0.31***	0.18***	0.18***	-0.09***	-0.47***	-0.19***	-0.67***	-0.35***
	(0.269)	(0.054)	(0.074)	(0.068)	(0.077)	(0.051)	(0.056)	(0.011)	(0.037)	(0.035)	(0.056)	(0.126)
$Foreign\ Reserves$	-0.04	-0.04***	0.08***	0.05	-0.09**	0.17***	-0.16	0.18***	-0.02**	0.67***	0.012	-0.58***
	(0.042)	(0.010)	(0.015)	(0.036)	(0.042)	(0.048)	(0.111)	(0.041)	(0.012)	(0.060)	(0.010)	(0.138)
$Recession$	0.84***	0.05	0.20***	-0.08	0.66***		0.33***	0.33***	0.33***	0.59***	0.48***	
	(0.242)	(0.132)	(0.065)	(0.203)	(0.095)		(0.096)	(0.050)	(0.100)	(0.081)	(0.107)	
VIX	1.37***	0.54***	0.62***	0.54***	0.65***	0.52***	0.70***	0.48***	0.51***	0.82***	0.62***	0.91***
	(0.168)	(0.082)	(0.059)	(0.077)	(0.086)	(0.075)	(0.062)	(0.044)	(0.073)	(0.064)	(0.066)	(0.099)
$Constant$	8.39***	3.54***	-1.49***	5.06***	3.95***	1.22***	1.50***	2.54***	5.32***	1.42***	4.86***	3.44***
	(1.504)	(0.290)	(0.492)	(0.494)	(0.411)	(0.344)	(0.335)	(0.162)	(0.208)	(0.271)	(0.245)	(0.846)
Observations	109	109	126	109	109	129	94	109	109	132	123	120
R-squared	0.676	0.744	0.811	0.621	0.749	0.473	0.816	0.847	0.777	0.811	0.779	0.556

Notes. ^{F} indicates that foreign reserves were replaced by the m2/reserves ratio in order to avoid multicolinearity. ^{R} indicates that external debt was replaced with short-term external debt due to unavailability. ^{N} indicates that no external debt data was available. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 16: Complete results of Table 3 (b)

VARIABLES	China	Dominican Rep.^{N}	Egypt	Hungary	Lebanon	Philippines	Poland	South Africa	Turkey	Ukraine
External Indebtness	2.48***		0.66	0.33**		3.33***	10.46	0.53***	-0.77***	-2.42
	(0.461)		(2.518)	(0.134)		(0.498)	(7.375)	(0.104)	(0.205)	(2.263)
CIPI	0.06	0.04	0.99***	0.80***	0.05	-0.12	0.42***	0.15*	0.02	0.90***
	(0.111)	(0.062)	(0.220)	(0.063)	(0.068)	(0.081)	(0.053)	(0.077)	(0.061)	(0.181)
Foreign Reserves	-0.007	-0.31***	-0.11***	0.34***	-0.003	0.03***	0.24***	-0.13***	-0.032	-0.04
	(0.011)	(0.076)	(0.025)	(0.026)	(0.004)	(0.011)	(0.035)	(0.026)	(0.037)	(0.041)
Recession		0.27		0.06			-0.10	0.40***	0.44***	-0.07
		(0.168)		(0.085)			(0.119)	(0.097)	(0.111)	(0.210)
VIX	0.71***	0.61***	0.57***	0.50***	0.42***	0.57***	0.96***	0.93***	0.48***	1.18***
	(0.121)	(0.109)	(0.160)	(0.099)	(0.058)	(0.060)	(0.067)	(0.082)	(0.094)	(0.173)
Constant	-11.99***	3.35***	-5.81	-4.52***	2.56***	-21.39***	-2.21***	-2.35***	7.87***	-3.49***
	(2.339)	(0.363)	(15.937)	(0.742)	(0.314)	(4.056)	(0.305)	(0.587)	(1.141)	(0.916)
Observations	109	132	76	109	132	109	132	109	109	123
R-squared	0.661	0.427	0.668	0.945	0.338	0.741	0.830	0.822	0.508	0.591

Notes. See Table 15.

Table 17: Commodity prices dummies

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dummy$_t^- = 1$	March April	November		September	January	August September October November December		May	May	May June	
Dummy$_t^+ = 1$		October	June	January April	November	May	May April July				

Notes. Author's calculation. **Source.** IMF.

Table 18: Commodity prices and sovereign spreads: robustness checks

Variables	EXPORTERS			IMPORTERS		
All Commodity	-0.5342^b	-0.5316^b	-0.4936^b	0.3487	0.3872	-0.0502
	(0.204)	(0.194)	(0.213)	(0.305)	(0.286)	(0.416)
VIX	0.6103^a	0.6486^a	0.6394^a	0.6427^a	0.6680^a	0.5349^b
	(0.072)	(0.064)	(0.065)	(0.093)	(0.093)	(0.150)
Recession	0.2807^a	0.2954^a	0.3342^a	0.5503^b	0.5452^b	0.3510^b
	(0.070)	(0.076)	(0.0728)	(0.178)	(0.181)	(0.141)
Foreign Reserves		-0.0309^a	-0.0302^c		-0.0209	-0.0204
		(0.009)	(0.016)		(0.027)	(0.043)
External Indebtness			1.338^c			1.0666^b
			(0.727)			(0.345)
Constant	4.7762^a	4.9379^a	4.7149^a	0.6550	0.5490	-4.2914
	(1.215)	(1.138)	(1.133)	(1.734)	(1.665)	(2.647)
Observations	1,584	1,584	1258	1,320	1,320	730
R-squared	0.359	0.389	0.418	0.268	0.278	0.504
Number of id1	12	12	11	10	10	7

Notes. Clustered standard errors are reported in parentheses.
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1.