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Financial Development Resource Curse in Resource-Rich Countries: The Role of Commodity Price Shocks

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Financial Development Resource Curse in Resource-Rich Countries: The Role of Commodity Price Shocks

Prepared by Montfort Mlachila and Rasmané Ouedraogo[1]

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Abstract

Why do commodity-dependent developing countries have typically lower levels of financial development than their peers? The literature has proposed many possible explanations, but it typically does not dwell on the deep mechanisms that drive such an outcome. In this paper, we argue that one of the main causes is the shocks to commodity prices. We test the hypothesis on 68 commodity-rich developing countries over the period 1980–2014, and we find strong evidence of the financial development resource curse through the channel of commodity price shocks, after controlling for other explanations found in the literature. The findings are robust to the different types of commodities, the nature of the shocks, various indicators of financial development, and alternative econometric methods. We also show how the impact of these shocks can be mitigated through good quality of governance.

JEL Classification Numbers: E30, E44, G38.

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I. Introduction

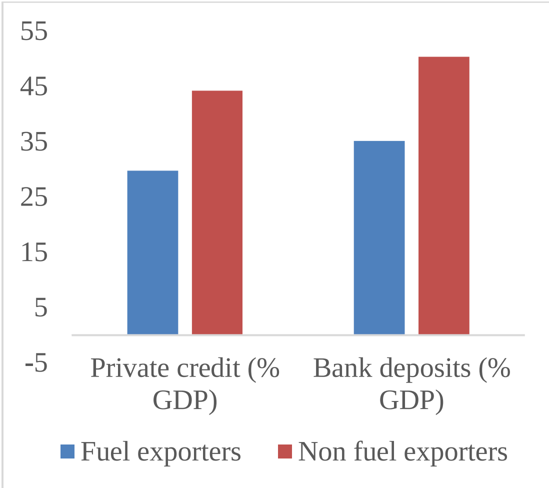
It has been well-established in the literature that resource-abundant economies typically suffer from lower financial development (e.g., Bhattacharrya and Holder, 2013; Beck, 2010). This is particularly the case in fuel exporters (Figure 1). Several hypotheses have been advanced for this outcome, for instance, lack of integration of commodity sector to the rest of the economy, poor governance (Yuxiang and Chen, 2011), especially the higher levels of mismanagement of financial and human resources in commodity-rich countries (Sarmidi *et al.*, 2012), including prevalence of rent-seeking behavior (Bhattarharyya and Hodler, 2013).[2]

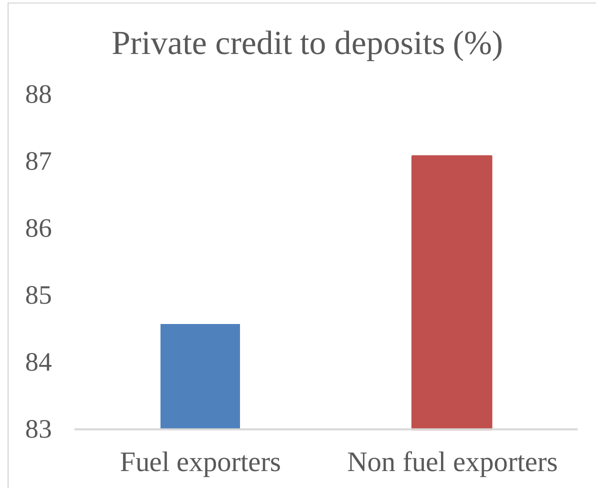
However, to the best of our knowledge, no work has explicitly considered commodity price shocks as a potential cause of the financial development resource curse in resource-dependent countries. This paper contributes to the literature by analyzing another channel that has not been sufficiently explored. This is the channel through which resource-abundance can impede financial development, namely the impact of commodity price shocks. We draw on Kinda *et al.* (2016) who established that commodity price shocks often lead to financial sector fragility, and sometimes even financial crises. They find strong evidence that commodity price shocks weaken the financial sector notably by increasing non-performing loans (NPLs), reducing provisions to bank non-performing loans, lowering bank liquidity, and reducing bank profits. They show that these effects operate through the reduction in growth rates, government revenue, and savings, and the increase in unemployment, debt in foreign currency, and fiscal deficits.

In this paper, we hypothesize that commodity price shocks lead to weak financial development. To do this, we conduct an empirical study based on a sample of 68 commodity-rich developing countries over the period 1980–2014. In line with the previous literature, this paper's approach to financial sector development is limited to the banking sector. Specifically, we use four indicators to measure the development of the financial sector: domestic credit to the private sector over GDP, bank deposits over GDP, liquid liabilities over GDP, and domestic credit to the private sector to bank deposits (a proxy for the effectiveness of financial intermediation). In addition, we explore whether the quality of institution matters. We use the GMM estimator to deal with the endogeneity issues of all right-hand variables in our baseline model.

[2] More recent approaches, such as in Sahay *et al. (*2015), take a more comprehensive view of financial sector development and develop a broad-based index. Unfortunately, the coverage of the index in terms of countries and duration does not allow us to have a sufficiently large sample of commodity-rich countries.

Figure 1: Financial Development in Non-fuel and Fuel Exporting Countries





Source: FinStat and Authors' calculations.

The main findings of this paper are the following. First, we find additional robust evidence of the financial development resource curse through the channel of commodity price shocks. The effect of commodity price shocks—whatever their nature—on the various indicators of the financial sector development is always negative. This implies that commodity price shocks tend to undermine the development of the financial sector. Second, we show that the impact of these shocks can be mitigated. Countries with good institutions tend to avoid the financial development resource curse as they are able to ensure better law enforcement and limit the misuse of the commodity windfalls.

The remainder of the paper is organized as follows. The next section presents a summary review of related literature. Section III describes the dataset and the empirical methodology. Section IV presents and discusses the results of the econometric model. The last section provides concluding remarks.

II. Related Literature

It is well-documented in the literature that resource-rich countries generally have lower levels of financial development, all things being equal. This is quite contrary to what might be expected, as Bhattacharyya and Hodler (2013) argue, since these countries have high levels of liquidity from export revenues.

What could explain this state of affairs? Several theoretical and empirical explanations have been advanced for this version of the resource curse. First, drawing on Hausman and Rigobon (2002), Hattendorff (2014) argues that the concentrated structure of resource-rich economies renders them more vulnerable to terms-of-trade shocks. Consequently, banks need higher levels of interest rates as a risk premium. As a result, higher interest rates lead to lower overall credit and investment, and thus lower financial development. The paper by Hattendorff (2014) shows empirically that export concentration tends to weaken private credit to GDP, based on cross-sectional and panel data from 93 countries for the period 1970–2007.

Relatedly, natural resource sectors tend to be enclaves in the way they operate. In the oil sector for instance, multinational companies generally depend on internal finance for their operations, and, to a lesser extent, on international capital markets. As a result, they have little need to have recourse to the local banking system, especially given that most of their costs (e.g., equipment, expatriate salaries, etc.) are paid abroad (Beck, 2010). Using a large sample of 104 developing countries over the period 1960–2007, Beck (2010) provides strong evidence of the existence of a natural resource curse in financial development, which falls more on enterprises than on households.

An interesting angle of the financial resource curse is explored by Benigno and Fornato (2013). They develop a theoretical model in which resource-rich countries' easy access to foreign capital can lead to lower productivity growth due to the Dutch disease effect. The capital inflows trigger a consumption boom, leading to a shift of productive resources toward the nontradable sector, thus lowering productivity growth, and thus reducing the need for financial resources from the financial sector. The existence of a small tradable sector in turn also leads to less support for more liberal financial development policies (Yuxiang and Chen, 2001).

Some authors argue that the resource curse evidence is strongly linked to the way natural resource countries use their windfalls. Indeed, resource-rich countries may use the revenues from their resources for consumption smoothing, which weakens the incentive to build an effective financial system to serve as a buffer to smooth consumption over the business cycle (Gylfason, 2004). On the other hand, higher investment in the natural resource sector can lead to lower investment in the financial sector and draw away skills from the financial system (Beck, 2010). Therefore, the financial system might be less important as growth depends less on finance-intensive sectors but investments in mining activities and public consumption. In the same vein, Nili and Rastad (2007) argue that the government is often heavily involved in investment, thus weakening the private sector and private lending. The lack of demand for broader financial services weaken the financial sector.

Perhaps the most frequently used argument for lower financial development in resource-rich countries is that these countries tend to have inadequate institutions for contract enforcement. The literature has documented that contract enforcement is a key ingredient for well-functioning financial systems. La Porta *et al.* (2000) and Bhattacharyya and Hodler (2013) show that oversight and enforcement institutions that regulate transactions between creditors and debtors are a key determinant of financial development. They argue that in the absence of strong oversight and enforcement institutions, creditors find it difficult to enforce contracts, and debtors may have little incentive to repay their debt. Thus, banks might be reluctant to lend in the first place, even when highly liquid.

In such an environment, the elites can thrive on rent-seeking activities, and use the proceeds from these activities to buy off political competitors. The resulting uncompetitive nature of politics reduces the incentives for fostering contract enforcement, and often fosters corruption. Bhattacharyya and Hodler (2013) confirmed empirically their theoretical predictions by employing panel data covering the period 1970 to 2005 and 133 countries. Likewise, Yuxiang and Chen (2011) argue that the enforcement and reliability of financial sector reforms requires high government credibility, which might be eroded by the rent-seeking and corruption that are typical of resource-based economies. The rent-seeking behavior can decrease the activity and credit demand of entrepreneurs, thereby lowering domestic credit and the potential for financial sector development.

Another theoretical channel advanced is that of lower levels of education in resource-rich countries. Sarmidi *et al.* (2012) posit that the easy availability of financial resources to individuals reduces the incentives for higher education and the quest for excellence. This, in turn, lowers social capital and lowers overall levels of institutional and financial development. Yuxiang and Chen (2011) add that if resource abundance is believed to weaken human capital, it might also reduce a society's general level of trust and thus the reliability of financial contracts. Using a sample of 33 middle-income countries over the period 1999–2009 and an endogenous panel threshold model, Sarmidi *et al.* (2012) find clear evidence that low human development economies experience negative contribution of natural resources to financial development, while this relationship is not valid for high human development economies.

In this paper, we augment the previous literature and provide another potential cause of the weak financial development in resource-rich countries. We hypothesize that commodity price shocks weaken financial sector development in commodity-dependent countries through many channels. First, booms and busts in commodity prices increase the vulnerability of resource rich countries, which in turn reduce the prospects of growth and thereby impede the construction of a solid financial system. Kurronen (2012) finds that the macroeconomic volatility caused by fluctuations in commodity prices may generally weaken financial development. In addition, several studies have showed that macroeconomic uncertainty shocks such as commodity price shocks negatively affect economic activity, which in turn could lower domestic credit and bank deposits (Bernanke, 1983; Kimball, 1990).

Second, the shocks in commodity prices can lead to financial fragility and banking crises, thereby weakening the financial sector. Using a large sample of 71 resource rich-countries over the period 1997–2013, Kinda, Mlachila and Ouedraogo (2016) find strong evidence that commodity price shocks weaken the financial sector by not only increasing bank non-performing loans and the occurrence of banking crises, but also reducing provisions to bank non-performing loans, bank liquidity, and bank profits (return on assets and return on equity). The authors show that these effects operate through the reduction in growth rates, government revenue, and savings, and the increase in unemployment, debt in foreign currency, and fiscal deficits. Our analysis aims to show that on the whole commodity price shocks lead to weaker financial development. We conduct an empirical study based on a sample of 68 countries over the period 1980–2014.

III. DATA AND METHODOLOGY

Our analysis will focus on a large sample of 68 resource-rich developing countries over the period 1980–2014. Before proceeding, we briefly explain the approach of the empirical study. First, our analysis will rely on indicators of financial sector development including domestic credit to the private sector, bank deposits, bank liquid liabilities, and the ratio of private credit to bank deposits. All of these variables measure the depth of the financial sector. Second, we undertake the stationarity tests for each series to make sure that it does not contain a unit root. The failure of this hypothesis leads us to use the different variables in their first differences. Third, we explore the non-linearity of the effect of commodity price shocks on the financial sector according to the level of democracy.

A. Methodology

We use a dynamic specification given the strong inertia of the indicators of financial sector development. More specifically, we estimate the following equation:

$$FinSD_{i,t} = \propto + \delta FinSD_{i,t-1} + \beta PriceShocks_{i,t} + \theta X'_{i,t} + v_i + \varphi_t + \varepsilon_{i,t} \qquad (1)$$

> Where $FinSD_{i,t}$ stands for financial sector development indicator for country i in time t, $PriceShocks_{i,t}$ is commodity price shocks. $X'_{i,t}$ stands for other explanatory variables including GDP per capita, inflation rate, trade openness, rule of law, FDI and export concentration. We include v_i to control for unobserved time-invariant country-level characteristics that are potentially correlated with the financial development indicator and φ_t to control for time-varying shocks that affect all resource rich countries. $\varepsilon_{i,t}$ is a standis a standard error term.

Financial development indicators typically have a certain inertia in their evolution, and thus do not vary so much from year to year. In order to take into account this characteristic, we employ a dynamic model that estimates the level of financial development on its lagged value and a set of control variables including commodity price shocks. This empirical model may suffer from endogeneity because of the lagged dependent variable, some unobservable variables, and the reverse causality of all right-hand variables (Aggarval, Demirgüç-Kunt, and Martínez Pería, 2010), except the commodity price shock indices. For instance, if the unobservable variable is the innate skills of the labor force, high resource countries may be more likely to face large price shocks and are also more likely to have liquid and solid banks—biasing the effect of commodity price shocks towards zero. Therefore, OLS estimation of such equation will lead to biased and inconsistent results.

Moreover, a number of authors have been concerned with the presence of endogeneity, and therefore, the need to have a valid instrumental variable. As argued in Hattendorff (2014), the direction of causality is a major concern. Indeed, the level of financial development itself can shape the trade structure. In other words, in a case of reverse causality, weak financial systems themselves may actually favor industries that do not rely heavily on external finance. A common way is to use gravity equations to predict the intensity of international trade and indirectly export concentration using geographical explanatory variables. Our modeling strategy suffers relatively less from this kind of endogeneity bias. Our main explanatory variable, commodity price shocks, is quite exogenous since most countries have little control over international commodity prices. However, a reverse causality may exist between the dependent variable and the other independent variables.

To deal with the endogeneity issues arising from simultaneity bias and omitted variables, we use GMM estimators which are more suited for dynamic panel data. Furthermore, GMM estimators allow us to correct for endogeneity of all right-hand side variables. This method is appropriate as some of the explanatory variables, $X'_{i,t}$, may themselves be a function of the dependent variable and because dynamic panel estimation in the presence of country fixed effects generally yields biased estimates (Nickel, 1981; Wooldridge, 2002).

There are two GMM estimators commonly used: the difference-GMM estimator (Arellano and Bond, 1991) and the system-GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). For the difference-GMM estimator, first equation (1) is differenced in order to remove country fixed effects, and then first differenced variables are instrumented by the lagged values of the variables in level. As for the system-GMM estimator, both equations in levels and in first differences are used in a system that allows the use of lagged differences and lagged levels of the explanatory variables as instruments.

Therefore, system-GMM estimator is an extension of the difference-GMM estimator. In this paper, our preferred estimator is the system-GMM because it has been highlighted in the literature that the lagged values of variables in levels—as it is done with the difference-GMM estimator—are sometimes poor instruments for variables in first differences. Moreover, we limit the instrument set to one lag in order to avoid the well-known problems associated with too many instruments (Roodman, 2009). To check the validity of the instruments, we use the Hansen test for over-identifying restrictions and Arellano and Bond’s test that investigates that there is no second-order serial correlation in the first-differenced residuals. We also perform several robustness checks using alternative econometric method and different sample of commodities.

B. Data

The study covers 68 commodity exporter countries over the period 1980–2014. The list of countries is included in Appendix I, Table A2. We extracted data from several sources including IMF's *WEO*, World Bank datasets, and United Nation's *Comtrade*. The *Comtrade* dataset serves as a source for data on exports and imports by commodity and country during the base year (1996).[3] To be included in the sample, each country and commodity should meet the following conditions: (i) the country should be a net exporter of the given commodity during the base year (1996); and (ii) the commodity must represent at least 10 percent of the country's total exports during the base year. The aim of the latter threshold is to include a maximum of countries. Apart from these criteria, only data availability restricted our sample.

The data on the financial development are from *Global Financial Development Database* of the World Bank. We extracted bank credit to the private sector, bank deposits, bank liquid liabilities, and the ratio of bank credit to private credit to bank deposits. We thereby follow previous studies which have also used these variables as financial development indicators. All these dependent variables are taken in their differences as they are not stationary in level (see Section IV-C). As for the commodity price shock indices, we followed the measures used in Kinda, Mlachila and Ouedraogo (2016). Shocks are measured as the estimated residuals of an econometric model of the logarithm of commodity price regressed on its lagged values (up to three) and quadratic time trend (see Appendix II for details). After estimating the commodity price shock indices, we standardize them in order to bring them together.

Regarding the independent variables in the baseline model, we included GDP per capita at 2005 constant prices to measure the level of development, inflation rate, foreign direct investment, and trade openness defined as the ratio imports plus exports over GDP. These variables are extracted from the World Bank's *World Development Indicators,* except inflation which is from the World Economic Outlook. The variables GDP per capita and trade openness are used after taking first differences since they are not stationary in level. Export concentration is from the IMF datasets[4]. We also included the variable law and order to capture the quality of governance, retrieved from *International Country Risk Guide*.

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[3] We rely on SITC1 system to extract dollar values of exports and imports of the different commodities.

[4] https://www.imf.org/external/np/res/dfidimf/diversification.htm. Accessed on 03/27/2017

Finally, institutional variables including Polity 2 and checks and balances are collected from Polity IV project.

C. Stationarity Tests

We examine the stationarity properties of each series. We begin by computing both Levin, Lin and Chu (LLC hereafter) and Im, Pesaran and Shin (IPS hereafter) tests for unit roots, including a constant and time trend in the test specifications to reflect the trending nature of the time series. We undertake the test for all variables in level and first differences. The LLC unit root test assumes common unit root processes, while IPS assumes individual unit root processes.

The results, reported in Table 1, show that all the financial development variables including bank credit to the private sector, bank deposits, bank liquid liabilities, and the ratio of credit to bank deposits contain unit roots when the variables are taken in levels. However, when these variables are expressed in first difference, the hypothesis of non-stationarity is rejected at 1 percent level. Moreover, we found that the level of development and trade openness are also stationary in first difference. Therefore, these variables will be taken in their first differences in the empirical model.

Table 1. Stationarity Tests

	LLC		IPS		Result
	Level	First difference	Level	First difference	
FDI	-5.31 (0.00)***	-20.41 (0.00)***	-7.30 (0.00)***	-30.36 (0.00)***	I(0)
GDPPC	-2.69 (0.00)***	-13.42 (0.00)***	2.40 (0.99)	-16.02 (0.00)***	I(1)
Liquid liabilities	-2.70 (0.35)	-12.17 (0.00)***	-2.20 (0.14)	-11.01 (0.00)***	I(1)
Bank deposits	-1.16 (0.12)	-10.94 (0.00)***	-0.82 (0.20)	-10.73 (0.00)***	I(1)
Inflation	-353.82 (0.00)***	-151.52 (0.00)***	-73.60 (0.00)***	-67.24 (0.00)***	I(0)
Rule of law	-0.26 (0.00)***	-14.86 (0.00)***	0.74 (0.01)***	-12.80 (0.00)***	I(0)
Trade	-3.63 (0.27)	-19.84 (0.00)***	-4.44 (0.12)	-25.77 (0.00)***	I(1)
Polity2	-12.53 (0.00)***	-33.52 (0.00)***	-4.26 (0.00)***	-20.49 (0.00)***	I(0)
Priv. Credit	1.13 (0.87)	-15.09 (0.00)***	2.14 (0.98)	-17.91 (0.00)***	I(1)
Priv. Credit to deposits	-1.67 (0.47)	-13.91 (0.00)***	-1.61 (0.53)	-17.42(0.00)***	I(1)

*** denotes it is significant at 1%

IV. EMPIRICAL RESULTS

A. Baseline Results

In this section, we analyze how commodity price shocks can potentially weaken the development of the financial sector. The baseline results are reported in Tables 2 and 3. The results for all commodities and all types of shocks are reported in Table 2, while the estimates for only positive and negative shocks are reported in Table 3. Statistical tests do not invalidate the econometric method. In other words, the null hypothesis of the Hansen and the *AR* (*2*) tests are not rejected. Moreover, the significance in the coefficients associated with the lagged dependent variables highlights an inertia effect that legitimates the dynamic panel specification.

The empirical evidence supports our hypothesis. We find that commodity price shocks strongly undermine the development of the financial sector in resource-dependent countries. Indeed, as expected, the coefficients associated with commodity price shocks are negative and strongly significant at 1 percent level in Table 1, columns [1–3]. Thus, commodity price shocks reduce the level of bank credit to the private sector, bank deposits, bank liquid liabilities, and the ratio of private credit to bank deposits. More precisely, a one standard deviation increase in commodity price shocks leads to a decline in bank credit to the private sector by 0.47 percent of GDP,[5] bank deposits by 0.49 percent of GDP and 0.56 percent of GDP for bank liquid liabilities. As a result of the reduction in private credit and bank deposits, the ratio of private credit to deposit decline by 1.28 units.

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[5] This number is obtained by multiplying the coefficient estimate by the mean of credit to the private sector, and then dividing by the standard deviation of credit to the private sector. This applies to the other figures of this section.

Table 2. Baseline Results: All Commodities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Fixed effects				GMM			
Variables	Priv. credit	Bank deposits	Liq. Liabilities	Priv. Credit to deposit	Priv. credit	Bank deposits	Liq. Liabilities	Priv. Credit to deposit
Dep. Variable (-1)	0.0370	0.1229***	-0.0149	-0.0093	-0.1648	-0.2600	-0.6111***	0.0406
	(0.027)	(0.026)	(0.027)	(0.027)	(0.119)	(0.192)	(0.120)	(0.048)
Price Shocks	-0.4911**	-0.4375***	-0.4999***	-0.8295*	-0.3419**	-0.3303**	-0.3432**	-0.5312*
	(0.218)	(0.124)	(0.164)	(0.424)	(0.134)	(0.135)	(0.154)	(0.292)
$\Delta(GDPPC)$	-0.0007	-0.0025***	-0.0028***	0.0020**	-0.0005	-0.0021***	-0.0018	0.0024
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)
Inflation	-0.0005	-0.0003	-0.0004	0.0003	-0.0006	-0.0002	-0.0003	-0.0009
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0329	0.0215*	0.0193	-0.0390	0.0333*	-0.0011	0.0041	0.0588*
	(0.020)	(0.011)	(0.015)	(0.039)	(0.018)	(0.014)	(0.019)	(0.032)
Law and Order	0.6738**	0.3252**	0.4579**	0.7260	0.5517***	0.4737***	0.6714***	0.7237**
	(0.272)	(0.155)	(0.205)	(0.529)	(0.149)	(0.149)	(0.171)	(0.320)
FDI	0.1190**	0.0833**	0.0687	-0.0203	0.1079***	0.0684*	0.0564	0.1079
	(0.059)	(0.033)	(0.044)	(0.114)	(0.038)	(0.040)	(0.045)	(0.066)
Export concentration	0.3230	0.5182**	0.7274**	0.4480	-0.3282*	-0.2510**	-0.4150**	0.0147
	(0.449)	(0.254)	(0.337)	(0.864)	(0.170)	(0.122)	(0.164)	(0.342)
Constant	-3.6281*	-2.6795**	-3.8627**	-7.7674*	-0.0915	0.2182	0.5824	-2.8005*
	(2.194)	(1.247)	(1.652)	(4.311)	(0.684)	(0.482)	(0.780)	(1.515)
Observations	1,537	1,412	1,412	1,531	1,537	1,412	1,412	1,531
R-squared	0.055	0.150	0.131	0.057				
Number of countries	68	68	68	68	68	68	68	68
Hansen test p-value					0.262	0.490	0.455	0.311
AR(1)					0.114	0.348	0.598	7.35e-07
AR(2)					0.226	0.148	0.0625	0.719

Robust standard errors in parentheses. *** p<0.01, significant at 1%, ** p<0.05 significant at 5%, * p<0.1 significant at 10%

Moreover, the results are clear and compelling both for positive and negative price shocks (Table 3). The coefficients associated with commodity price shocks are negative and significant in all columns, except columns (3) and (8). In addition, the impact on domestic credit to the private sector is clearly stronger during positive shocks than during negative shocks. Indeed, a one standard deviation increase in positive commodity price shocks reduces credit to the private sector by 0.67 percent of GDP, against 0.57 percent of GDP when it comes to negative commodity price shocks. On the contrary, the harmful effects of commodity price shocks on bank deposits and bank liquid liabilities are higher in the cases of negative shocks than the positive ones. A one standard deviation increase in price shocks reduce bank deposits by 0.50 percent of GDP during negative commodities price shocks, against a reduction of 0.40 percent of GDP in bank deposits during positive shocks.

However, the decline in bank liquid liabilities following commodity price shocks occurs only during the negative ones. The coefficient associated with commodity price shocks is negative and strongly at 1 percent level in column (7), while it is not significant in column (3). A one standard deviation increase in negative price shocks leads to a decline of 0.81 percent of GDP in bank liquid liabilities, higher than the average one (column 3, Table 2). Our findings are consistent with the theory of resource curse in financial development according to which resource-rich countries are likely to have a low level of financial development (Beck, 2010; Hattendorff, 2014).

Turning now to the control variables, we found that they are all consistent with the empirical literature. On the one hand, the results show that trade openness, rule of law, and FDI are all positively associated with the different financial development variables. On the other hand, it is interesting to note that the coefficient associated with GDP per capita is negative. This implies that, contrary to what has often been observed in the literature, higher per capita income does not necessary confer higher levels of financial development in commodity rich countries.

Table 3. Baseline Results: Positive and Negative Shocks

	Positive shocks				Negative shocks			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Priv. credit	Bank deposit	Liq. Liabilities	Priv. credit to deposits	Priv. credit	Bank deposit	Liq. Liabilities	Priv. credit to deposits
Dep. Variable (-1)	-0.7598***	-0.5943***	-0.6038***	-0.4961***	-0.1082	-0.1936*	-0.3697	-0.4277***
	(0.216)	(0.057)	(0.071)	(0.162)	(0.093)	(0.110)	(0.273)	(0.124)
Price Shocks	-0.3353*	-0.2674*	-0.1650	-1.0375***	-0.4126**	-0.3632**	-0.5277**	-0.1505
	(0.198)	(0.137)	(0.171)	(0.322)	(0.163)	(0.151)	(0.242)	(0.343)
$\Delta(GDPPC)$	-0.0002	-0.0003	-0.0002	0.0000	-0.0010	-0.0048***	-0.0051***	0.0051**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Inflation	-0.0006	-0.0002	-0.0004	-0.0009	0.0001	-0.0002**	-0.0004**	0.0000
	(0.001)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta(Trade)$	0.0497	0.0030	-0.0045	-0.0096	0.0204	-0.0022	0.0008	0.0489
	(0.040)	(0.025)	(0.034)	(0.067)	(0.019)	(0.014)	(0.020)	(0.037)
Law and Order	0.7508***	0.2394	0.2283	1.5261***	0.7680***	0.7627***	0.8874***	0.9071*
	(0.279)	(0.183)	(0.230)	(0.380)	(0.185)	(0.191)	(0.234)	(0.497)
FDI	0.1871*	0.1428**	0.1719***	0.1058	0.0746**	0.0213	0.0561	0.2174**
	(0.104)	(0.055)	(0.060)	(0.103)	(0.037)	(0.037)	(0.043)	(0.085)
Export concentration	-0.7506***	-0.3112*	-0.3076	-0.5727	-0.2368	-0.1952	-0.1742	0.1800
	(0.254)	(0.170)	(0.212)	(0.621)	(0.203)	(0.176)	(0.215)	(0.637)
Constant	1.2835	0.9052	0.7628	-1.8287	-1.2685	-0.7706	-1.0713	-4.5919*
	(1.016)	(0.793)	(0.971)	(2.360)	(0.945)	(0.882)	(1.087)	(2.746)
Observations	732	686	684	728	805	726	728	803
Number of countries	68	68	68	68	68	68	68	68
Hansen test p-value	0.198	0.655	0.454	0.216	0.281	0.379	0.602	0.659
AR(1)	0.800	0.747	0.527	0.423	0.145	0.376	0.820	0.233
AR(2)	0.282	0.0333	0.0135	0.0601	0.236	0.343	0.525	0.00649

Robust standard errors in parentheses. *** p<0.01, significant at 1%, ** p<0.05 significant at 5%, * p<0.1 significant at 10%

B. Democratic Institutions Matter

In this section, we estimate whether the degree of democracy matters. Previous studies argue that the natural resource rents undermine financial development only in countries with poor quality of governance. For instance, Bhattacharyya and Roland Hodler (2010) even showed theoretically and empirically that resource revenues hinder financial development in countries with poor political institutions, but not in countries with comparatively better political institutions. Democratic governments may suffer less from macroeconomic instability because leaders of democratic governments are limited by the risk-averse citizens in their choices, and they are able to ensure better law enforcement. We then explore this hypothesis by generating an interactive variable between the indices of commodity price shocks and the degree of democracy. We use the variable Polity extracted from Polity IV (Marshall *et al.*, 2011). This variable is the difference between a democracy index (0 to 10) and an autocracy index (0 to 10), with higher values representing better quality of governance or better democracy.

Table 4. Role of Democratic Institutions

	(1)	(2)	(3)	(4)
Variables	**Priv. credit**	**Bank deposits**	**Liq. Liabilities**	**Priv. credit to deposits**
Dep. Variable (-1)	-0.3015**	-0.0027	-0.2126	-0.5559***
	(0.113)	(0.164)	(0.265)	(0.141)
Price Shocks	-1.5135**	-1.6987**	-1.5569**	-2.3437
	(0.669)	(0.637)	(0.755)	(2.040)
Price shocks * Polity2	0.0903*	0.0968*	0.1004*	0.1319
	(0.049)	(0.056)	(0.052)	(0.124)
Polity2	0.0150	0.0265	0.0391	0.0400
	(0.027)	(0.018)	(0.026)	(0.081)
$\Delta(GDPPC)$	-0.0002	-0.0021***	-0.0030**	0.0009
	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.0003	-0.0001	-0.0002**	-0.0000
	(0.001)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0559**	0.0149	0.0070	0.0854**
	(0.021)	(0.017)	(0.020)	(0.042)
Law and Order	0.6177***	0.3081***	0.5114**	0.7941
	(0.201)	(0.114)	(0.198)	(0.534)
FDI	0.1449***	0.0648**	0.0689**	0.2471**
	(0.040)	(0.028)	(0.032)	(0.109)
Export concentration	-0.1421	-0.0032	-0.0868	0.1243
	(0.167)	(0.098)	(0.156)	(0.543)
Constant	-1.0692	-0.4830	-0.5736	-4.0534
	(0.973)	(0.536)	(0.875)	(2.873)
Observations	1,350	1,243	1,243	1,348
Number of countries	57	57	57	57
Hansen test p-value	0.263	0.894	0.542	0.376
AR(1)	0.306	0.0759	0.289	0.535
AR(2)	0.218	0.812	0.703	0.00250

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

Results are reported in Table 4. We found that the coefficient associated with the interactive variable is positive and strongly significant in all columns. This finding highlights that the harmful effect of commodity price shocks on financial sector development is dampened in countries with higher level of democracy. In order words, quality of governance matters. Not only are shock-related weaknesses in domestic credit mitigated in countries with better democracy (column 1), but also the levels of deposits and bank liquid liabilities are higher in these countries (Columns 2 and 3). Our results then confirm those in previous studies (Bhattacharyya and Hodler, 2010).

C. Robustness Checks

We now check the robustness of our results. To that end, we undertake six exercises. First, we use another measure of commodity price shocks by employing the first method explained in Kinda, Mlachila, and Ouedraogo (2016). This approach uses the change in price as a metric for shocks (Arezki and Brückner, 2010; Brückner and Ciccone, 2010). The results are reported in Table 5. They are consistent with our hypothesis according to which commodity price shocks undermine the level of financial development. The coefficients associated with commodity price shocks are negative and statistically different from zero in all columns.

Table 5. Robustness Tests: Alternative Measure of Price Shock Indices

	(1)	(2)	(3)	(4)
Variables	**Priv. credit**	**Bank deposit**	**Liq. Liabilities**	**Priv. credit to deposits**
Dep. Variable (-1)	-0.0618	0.0293	0.0989	-0.1340
	(0.123)	(0.142)	(0.134)	(0.209)
Price Shocks	-0.0750***	-0.0750***	-0.1228***	-0.0462**
	(0.025)	(0.021)	(0.033)	(0.022)
$\Delta(GDPPC)$	-0.0006*	-0.0025***	-0.0028***	0.0023
	(0.000)	(0.000)	(0.001)	(0.002)
Inflation	-0.0012	-0.0003*	-0.0003	-0.0010
	(0.002)	(0.000)	(0.000)	(0.002)
$\Delta(Trade)$	0.0300	0.0053	0.0106	0.0678
	(0.021)	(0.020)	(0.027)	(0.048)
Law and Order	0.8443***	0.4861***	0.6289***	0.8238
	(0.199)	(0.130)	(0.144)	(0.492)
FDI	0.1027**	0.0561	0.0896**	0.1487*
	(0.046)	(0.037)	(0.039)	(0.079)
Export concentration	-0.2309	-0.0959	-0.0116	-0.2397
	(0.187)	(0.140)	(0.135)	(0.552)
Constant	-1.1034	-0.1726	-0.8422	-1.7134
	(0.843)	(0.657)	(0.610)	(2.548)
Observations	1,057	966	966	1,057
Number of countries	48	48	48	48
Hansen test p-value	0.330	0.638	0.574	0.383
AR(1)	0.123	0.0897	0.186	0.0972
AR(2)	0.253	0.726	0.440	0.350

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

Second, we perform the estimates on two groups of commodities: one group containing oil and metal commodities, and the second group for food commodities. The results reported in Table 6 confirm our previous findings. Moreover, we found that the coefficients associated i^{th} commodity price shocks in columns [1–4], Table 6 are higher than those of columns [5–8] and Table 2. This finding means that the harmful effects of price shocks are greater in oil and metal exporter countries.

Table 6. Robustness Tests: Varieties of Commodities

	Oil and Metal commodities				Food commodities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Priv. credit	Bank deposits	Liq. Liabilities	Priv. credit to deposits	Priv. credit	Bank deposits	Liq. Liabilities	Priv. credit to deposits
Dep. Variable (-1)	-0.2211***	-0.3575***	-0.3575***	-0.0578	-0.0477	-0.1389	-0.0138	-0.5544***
	(0.068)	(0.067)	(0.108)	(0.192)	(0.153)	(0.152)	(0.123)	(0.144)
Price Shocks	-0.4010**	-0.5682***	-0.6843***	-0.3789	-0.2259*	-0.1575**	-0.1514*	-0.4121
	(0.187)	(0.193)	(0.237)	(0.410)	(0.129)	(0.072)	(0.078)	(0.293)
$\Delta(GDPPC)$	-0.0005	-0.0020**	-0.0025**	0.0012	0.0003	-0.0024**	-0.0043**	0.0054
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.006)
Inflation	-0.0009	-0.0002	-0.0002	-0.0002	-0.0011	-0.0002**	-0.0003*	0.0000
	(0.001)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0275	0.0047	0.0041	0.0682	0.0443*	-0.0013	-0.0026	0.0250
	(0.024)	(0.022)	(0.028)	(0.050)	(0.025)	(0.013)	(0.019)	(0.037)
Law and Order	0.8532***	0.6140***	0.7072***	0.9235**	0.5386***	0.3494***	0.3480***	0.6410
	(0.199)	(0.182)	(0.216)	(0.380)	(0.156)	(0.112)	(0.104)	(0.520)
FDI	0.0837	0.0439	0.0383	0.1439*	0.1421**	0.0958**	0.1112**	0.0833
	(0.051)	(0.052)	(0.051)	(0.075)	(0.055)	(0.037)	(0.047)	(0.111)
Export concentration	-0.4500**	-0.2917*	-0.3555*	-0.0296	-0.2865*	-0.2489**	-0.3273**	-0.7511
	(0.219)	(0.170)	(0.181)	(0.428)	(0.153)	(0.117)	(0.144)	(0.710)
Constant	-0.3444	0.1284	0.1417	-3.5545*	-0.3538	0.4724	0.8094	-0.3709
	(0.976)	(0.783)	(0.834)	(1.894)	(0.689)	(0.467)	(0.596)	(2.832)
Observations	1,056	965	965	1,056	1,303	1,232	1,232	1,295
Number of countries	48	48	48	48	56	57	57	56
Hansen test p-value	0.286	0.254	0.295	0.532	0.352	0.754	0.443	0.372
AR(1)	0.0741	0.174	0.252	0.0494	0.122	0.207	0.188	0.568
AR(2)	0.228	0.0940	0.903	0.430	0.263	0.408	0.495	0.00348

Robust standard errors in parentheses. *** p<0.01, significant at 1%, ** p<0.05 significant at 5%, * p<0.1 significant at 10%

Third, we use an alternative measure of indicator of financial development. We aim to generate a composite index based on the four variables used so far. To do so, we employ the principal component analysis (PCA) which is increasingly used in studies (e.g., David *et al.*, 2015). With the PCA a new variable is created as linear combinations of the original set of four variables. PCA identifies how the 4 indicators may be summarized in a simple way to give a new meaningful measure of financial development. Having computed the new variable, we estimate equation (1) for the different samples performed above. Results are reported in Table 7. They are all consistent with our hypothesis according to which commodity price shocks weaken the financial sector. The coefficients associated with commodity price shocks are all negative and strongly significant in all columns. Moreover, we still find that the impacts are dampened in countries with high level of democracy.

Table 7. Robustness Tests: Alternative Dependent Variable

Variables	All commodities (1)	Positive shocks (2)	Negative shocks (3)	Oil and metals (4)	Food (5)	Alternative price shocks measure (6)
Dep. Variable (-1)	-0.3619***	-0.6772***	-0.1571	-0.4686***	-0.4636***	-0.3173***
	(0.090)	(0.079)	(0.139)	(0.076)	(0.156)	(0.094)
Price Shocks	-0.1617***	-0.0917*	-0.1942***	-0.2309**	-0.0409	-0.0357***
	(0.047)	(0.053)	(0.047)	(0.091)	(0.030)	(0.013)
$\Delta(GDPPC)$	-0.0009**	0.0002	-0.0016***	-0.0007*	-0.0010**	-0.0006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.0002	-0.0006	-0.0001	-0.0002	-0.0002	-0.0004
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0048	-0.0012	0.0031	0.0065	0.0080	0.0071
	(0.007)	(0.010)	(0.005)	(0.009)	(0.007)	(0.009)
Law and Order	0.2202***	0.1547*	0.3113***	0.3029***	0.2272***	0.3161***
	(0.048)	(0.080)	(0.073)	(0.071)	(0.067)	(0.066)
FDI	0.0334**	0.0421**	0.0187	0.0222	0.0516***	0.0265
	(0.016)	(0.020)	(0.013)	(0.017)	(0.016)	(0.017)
Export concentration	-0.1211**	-0.1818***	-0.0126	-0.1248**	-0.1463**	-0.0708
	(0.051)	(0.067)	(0.069)	(0.060)	(0.058)	(0.065)
Constant	-0.3142	-0.1051	-0.9722**	-0.5357*	-0.2573	-0.6867**
	(0.191)	(0.340)	(0.370)	(0.277)	(0.253)	(0.269)
Observations	1,352	656	696	910	1,170	911
Number of countries	66	66	66	46	55	46
Hansen test p-value	0.255	0.404	0.362	0.357	0.291	0.129
AR(1)	0.205	0.813	0.283	0.290	0.559	0.170
AR(2)	0.106	0.139	0.859	0.0777	0.105	0.226

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

Fourth, we use an alternative econometric method. As Bruno (2005) has argued, a weakness of GMM estimators is that its properties hold when N is large, so it can be severely biased and imprecise in panel data with a small number of cross-sectional units. This is typically the case in most macro panels. In addition, one issue with regard to GMM that still remains problematic is the number of instruments which grows quadratically in T and GMM becomes inconsistent as the number of instruments diverges. To address this problem, we employ the bias-corrected least-squares dummy variable (LSDV) dynamic panel data estimator, which is a promising approach that can be a more efficient alternative to simple GMM with potentially better finite-sample performance. Results are reported in Table 8. Our findings remain broadly consistent with those in Table 2.

Table 8. Robustness Checks: Using an Alternative Econometric Method

	(1)	(2)	(3)	(4)
Variables	**Priv. credit**	**Bank deposit**	**Liq. Liabilities**	**Priv. credit to deposits**
Dep. Variable (-1)	0.0898	0.1693	0.0453	0.0401
	(0.028)	(0.027)	(0.027)	(0.027)
Price Shocks	-0.2794*	-0.5252***	-0.5864***	0.0774
	(0.156)	(0.092)	(0.124)	(0.296)
$\Delta(GDPPC)$	-0.0006	-0.0026***	-0.0031***	0.0026**
	(0.001)	(0.000)	(0.000)	(0.001)
Inflation	-0.0005	-0.0004*	-0.0006**	0.0005
	(0.000)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0261	0.0033	-0.0097	0.0047
	(0.017)	(0.010)	(0.014)	(0.035)
Law and Order	0.5769**	0.3512**	0.4587**	0.9234*
	(0.267)	(0.142)	(0.195)	(0.502)
FDI	0.1456**	0.1125***	0.1145***	0.1185
	(0.057)	(0.033)	(0.044)	(0.107)
Export concentration	0.4236	0.5200*	0.6753*	0.5023
	(0.448)	(0.266)	(0.347)	(0.837)
Observations	1,537	1,412	1,412	1,531
Number of countries	68	68	68	68

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

Fifth, in the same vein of exploring alternative econometric methods, we now use the Augmented Mean Group (AMG) estimator of Eberhardt and Teal (2011). To this end, we abandon the GMM dynamic panel specification and use a panel error correction model. Indeed, GMM estimations of dynamic panels could lead to inconsistent and misleading long-term coefficients, a possible problem that is exacerbated when the period is long (Pesaran *et al.*, 1999). These models force the parameters to be identical across groups, but the intercept can differ between groups. We employ the AMG estimator to address this issue. The AMG estimator is a two-step procedure conceptually similar to the Pesaran and Smith (1995)'s standard Mean Group estimator, but augmented to take into account country-specific conditions. According to Pesaran and Smith (1995), the mean group estimator provides consistent estimates of the parameter averages. It allows the parameters to be freely independent across groups and does not consider potential homogeneity between groups. It also allows for a differential impact of unobservable variables across countries whilst imposing linearity on their evolution (Eberhardt and Teal, 2011). Results of estimates using the Augmented Mean Group estimator are reported in Table 9. They are strongly consistent with our hypothesis according to which commodity price shocks undermine the development of the financial sector.

Table 9: Robustness Checks: Using Augmented Mean Group Estimator

	(1)	(2)	(3)	(4)
VARIABLES	**Priv. credit**	**Bank deposit**	**Liq. Liabilities**	**Priv. credit to deposits**
Price shocks	-0.6012**	-0.3446**	-0.3762**	-1.7485***
	(0.250)	(0.141)	(0.175)	(0.612)
$\Delta(GDPPC)$	0.0090*	-0.0178***	-0.0189***	0.0344**
	(0.005)	(0.007)	(0.007)	(0.014)
Inflation	-0.0909	-0.0655	-0.0763*	-0.0741
	(0.068)	(0.044)	(0.041)	(0.092)
$\Delta(Trade)$	0.1705	0.0610**	0.0616	0.0887
	(0.110)	(0.030)	(0.040)	(0.119)
Law and Order	1.7458	0.2840	0.9222	2.1851
	(1.252)	(0.859)	(1.098)	(2.636)
FDI	-0.2087	0.0192	-0.0880	-0.2688
	(0.225)	(0.124)	(0.205)	(0.287)
Export concentration	-4.1062	0.2624	0.1818	-1.7698
	(3.746)	(0.959)	(1.045)	(3.142)
Constant	0.2432	1.4954***	2.6846***	-1.0955
	(0.272)	(0.232)	(0.379)	(0.679)
Observations	1,471	1,321	1,321	1,473
Number of countries	66	60	60	66
RMSE	4.2143	2.3555	2.9535	9.6868

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

Finally, we check the role of institutions by using *checks and balances* instead of *Polity 2*. The variable *checks and balances* measures the level of constraints on the executive. It may give an idea on whether or not the citizens have a voice in the use of natural resources and the allocation and execution of contracts. Results reported in Table 10 are consistent with our previous finding according to which the impact of commodity price shocks on financial development is dampened in countries with good quality of institutions.

Table 10. Robustness: Using Alternative Institutional Variables

	(1)	(2)	(3)	(4)
Variables	**Priv. credit**	**Bank deposits**	**Liq. Liabilities**	**Priv. credit to deposits**
Dep. Variable (-1)	-0.3683***	-0.3001*	-0.2030	-0.6735***
	(0.097)	(0.165)	(0.144)	(0.138)
Price Shocks	-4.7071*	-6.0434***	-5.6651**	-0.5960
	(2.597)	(1.982)	(2.185)	(3.928)
Price shocks * checks and balances	0.1616	0.2595***	0.1904*	0.2870
	(0.139)	(0.093)	(0.102)	(0.286)
Checks and balances	1.3297*	1.5128**	1.4094**	0.0898
	(0.794)	(0.676)	(0.666)	(1.031)
$\Delta(GDPPC)$	-0.0001	-0.0012	-0.0020*	0.0013
	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.0004	-0.0000	-0.0001	-0.0001
	(0.001)	(0.000)	(0.000)	(0.001)
$\Delta(Trade)$	0.0512**	0.0431**	0.0287	0.0375
	(0.025)	(0.021)	(0.022)	(0.051)
Law and Order	0.6390***	0.3726***	0.4016***	1.0681**
	(0.183)	(0.138)	(0.147)	(0.431)
FDI	0.1680***	0.1180**	0.1182***	0.1879*
	(0.058)	(0.045)	(0.039)	(0.109)
Export concentration	-0.2250	0.2151	0.1198	-0.0829
	(0.247)	(0.187)	(0.237)	(0.565)
Constant	-1.1774	-2.0545**	-1.5288	-4.2891
	(1.281)	(0.913)	(1.108)	(2.586)
Observations	1,510	1,389	1,389	1,504
Number of countries	68	68	68	68
Hansen test p-value	0.392	0.728	0.559	0.292
AR(1)	0.129	0.0280	0.108	0.863
AR(2)	0.181	0.652	0.570	0.000482

Robust standard errors in parentheses. *** p<0.01, significant at 1%,
** p<0.05 significant at 5%, * p<0.1 significant at 10%

V. Concluding Remarks

In this paper, we have provided a novel empirical characterization of the financial development resource curse in resource rich-countries. Our study illustrates how fluctuations in commodity prices undermine the development of the financial sector in resource-dependent countries. To do so, we explored empirically the extent to which actual data confirm our hypothesis. We used a large sample of 68 resource-rich developing countries over the period 1980–2014, and employed the dynamic panel GMM in our baseline to perform our analysis. The econometric part of this paper studies the link between commodity price shocks and financial sector development using a comprehensive set of financial development indicators, including bank credit to the private sector, bank deposits, bank liquid liabilities, and the ratio private credit to bank deposits. Our baseline results are complemented and confirmed by a battery of robustness checks. These are aimed at exploring the use of a different measure of commodity price shocks, varieties of commodities, a different definition of financial development, different econometric methodologies, etc.

Our empirical results can be interpreted in the following manner. First, the evidence is consistent with the idea of financial development curse in resource-rich countries. The effect of commodity price shocks—whatever their nature—on the various indicators of the financial sector development is always negative. This implies that commodity price shocks tend to undermine the development of the financial sector. However, this is not a *fait accompli*. Second, the quality of institutions matters. Countries with more democratic governments and good quality of institutions tend to limit the impact of the financial development resource curse as they are able to ensure better law enforcement and limit the misuse of the commodity windfalls.

Our results raise several policy issues as booms and busts in commodity prices are recurrent. The ideas that commodity price shocks may matter in weakening financial development and that democracy is an important counter-weight were simply not well-established so far in the literature. Mitigating the effects of fluctuations in commodity prices can reduce their negative impact on financial sector development. This could be done, for instance, by maintaining sufficient fiscal buffers (e.g., through the establishment of a sovereign wealth fund). Second, and in the same vein, developing counter-cyclical capital buffers can reduce the impact of commodity price shocks on bank balance sheets. Finally, the role of good governance is particularly important in resource-rich countries. Democratic governments and good quality of institutions may help ensuring a better enforcement of law related to financial services but also they could reduce the misallocation of natural resource windfalls.

APPENDIX I: SAMPLE AND DESCRIPTIVE STATISTICS

Table A 1. Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.18595	.934934	0.5465	0.5465
Comp2	1.25101	.76139	0.3128	0.8592
Comp3	.489623	.416205	0.1224	0.9816
Comp4	.0734184	.	0.0184	1.0000

Principal components (eigenvectors)				
Variable	Comp1	Comp2	Comp3	Comp4
Priv. Credit	0.4356	0.5008	-0.7441	-0.0761
Bank deposits	0.6405	-0.2037	0.1640	0.7221
Liquid liabilities	0.6306	-0.2026	0.3029	-0.6852
Priv. Credit to deposits	0.0491	0.8165	0.5724	0.0568

Table A 2. Countries Included in Sample

Albania	Indonesia	Peru
Argentina	India	Philippines
Azerbaijan	Jamaica	Paraguay
Burkina Faso	Kazakhstan	Qatar
Bangladesh	Kenya	Russian Federation
Bulgaria	Kuwait	Saudi Arabia
Bolivia	Libya	Sudan
Botswana	Lithuania	Senegal
Brazil	Latvia	El Salvador
Chile	Morocco	Suriname
Cote d'Ivoire	Moldova	Syrian Arab Republic
Cameroon	Madagascar	Togo
Colombia	Mexico	Thailand
Costa Rica	Mali	Trinidad and Tobago
Dominican Republic	Mongolia	Tunisia
Algeria	Mozambique	Turkey
Ecuador	Malawi	Uganda
Egypt. Arab Rep.	Malaysia	Ukraine
Gabon	Nigeria	Uruguay
Ghana	Nicaragua	Venezuela. RB
Guinea	Oman	Yemen. Rep.
Guatemala	Pakistan	South Africa
Honduras	Panama	Zambia
Croatia		

Table A 3. Summary Descriptive Statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Private credit	2,448	29.4	24.0	22.4	1.2	165.7
Bank deposits	2,066	31.0	23.5	23.0	1.6	126.2
Liquid liabilities	2,066	38.8	32.1	24.2	3.1	132.3
Private credit to deposits	2,420	87.5	81.8	36.0	6.0	200.0
Price shocks	2,413	0.0	0.0	1.0	-3.4	5.7
GDPPC	2,625	3,436	1,858	5,473	137	62,169
Inflation	2,615	46.1	6.8	435.4	-72.7	13,109.5
Trade	2,488	56.7	51.2	28.7	6.7	243.1
Law and Order	1,739	3.1	3.0	1.1	0.5	6.0
FDI	2,600	3.1	1.6	6.1	-55.2	161.8
Export concentration	2,390	3.8	3.7	1.1	1.6	6.3

Appendix II. Price Shock Measures

The literature has quantified commodity price shocks through two approaches. The first approach uses the change in price as a metric for shocks (Arezki and Brückner 2010, Brückner and Ciccone 2010). This method computes a country specific index by using the following formula:

$$PriceShocks_{i,t} = \sum_{ceC} \theta_{i,c} \, \Delta \log\left(ComPrice_{c,t}\right) \tag{1}$$

Where $(ComPrice_{c,t})$ is the international price of commodity *c* in year *t*, and $\theta_{i,c}$ is the average (time-invariant) value of exports of commodity *c* in the GDP of country i.

A disadvantage of this measure is that it does not account for the potential trend related to price change. This method does not attempt to isolate the trend and therefore does not ensure that the price index is stationary.[6] Furthermore, policy makers and company owners could make some forecasts on commodity prices evolution and then act endogenously to the price shock. This means that if they anticipate that the commodity price will decrease, they may accordingly adjust their policies and therefore address the anticipated price bust. Such policies could thus increase the endogeneity of the commodity price shock indices.

The second approach uses a regression that explains the price index by its lags (up to three) and a time trend, and considers the residuals as the shock indicator. This method computes shocks following two steps. In the first stage, a geometrically-weighted price index is computed following Deaton and Miller (1995):

$$PI_{i,t} = \sum_{j=1}^{n} \prod P_{j,t}^{wi,j} \tag{2}$$

Where $PI_{i,t}$ is the commodity price index in country i for the year *t*; $P_{j,t}$ is the world price of item *j* at time *t* and $w_{i,j}$ is the country-specific weighting of the commodity at the base year (the share of commodity *j* in total exports). As is common in the literature (see Combes and others, 2014; Musayev, 2014), we take the mid-point of the sample period (2005) as base year. Then the individual 2005 export values for each commodity are divided by this total in order to compute 2005 country-commodity specific weights, $w_{i,j}$.

$$w_{i,j} = \frac{P_j * Q_{i,j}}{\sum_{j=1}^{n} P_j * Q_{i,j}} \tag{3}$$

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[6] This is important since price can be I(1) or I(2).

(continued)

Where $Q_{i,j}$ denotes the export volume of commodity j at the base year. These values are held fixed over time and applied to the world price indices of the same commodities ($P_{j,t}$) to form the country-specific geometrically-weighted index of commodity export prices ($PI_{i,t}$).[7]

The second step consists of computing the shock variables. More formally, shocks are measured as the estimated residuals of an econometric model of the logarithm of commodity price regressed on its lagged values (up to three) and quadratic time trend as follows: [8]

$$lnPI_{i,t} = \alpha_{i,0} + \alpha_{i,1}t + \delta_{i,1}t^2 + \sum_p^3 \theta_{i,p} lnPI_{i,t-p} + \varepsilon_{i,t} \quad (4)$$

The residuals from the equations above are the shocks. By doing so, one *de facto* makes the price shock indices stationary and removes predictable elements from the stationary process.

We build on the second approach in the subsequent empirical analysis because it is more robust and attempts to isolate the trend. Since policy makers can make forecasts on commodity prices, removing the predictable elements up to three years ensures the unpredictability of price shocks.[9] Furthermore, because we focus on commodity price shocks, holding a constant base year deals with shocks from supply side.[10] Musayev (2014) stressed that since the index uses a constant base year, it does not cope well with shifts in the structure of trade. In particular, the index does not capture resource discoveries and other quantity shocks after the base year. Nor does it capture temporary volume shocks other than those which happen to occur in the base year itself.

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[7] Furthermore, the fact that the decline in a given commodity could be offset by the increase in another commodity is taken in the analysis.

[8] We compared the linear time trend and the quadratic one, and we found that the quadratic time trend fit better the price indices. See in appendix some figures on selected countries.

[9] We will also use the first approach in robustness checks.

[10] Commodity producers could adjust production to price trends. For instance, they could reduce the production of commodities if there is negative price shock and vice versa.

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