Current accounts and oil price fluctuations in oil-exporting countries: the role of financial development

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Abstract

Oil-exporting countries usually experience large current account improvements following a sharp increase in oil prices. In this paper, we investigate this oil price-current account relationship on a sample of 27 oil-exporting economies. Relying upon the estimation of panel smooth transition regression models over the 1980-2010 period, we provide evidence that refines the traditional interpretation of oil price effects on current accounts. While current accounts are positively affected by oil price variations, this effect is nonlinear and depends critically on the degree of financial development of oil-exporting economies. More specifically, oil price variations exert a stronger impact on the current account position for less financially developed countries, this influence diminishing with financial deepness.

Keywords: current account; oil price; financial development; panel smooth transition regression models.

JEL Classification: F32, C33.

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1. Introduction

For many oil-producing countries, oil windfalls constitute a significant source of foreign exchange and income. Indeed, as a result of the almost $ 50 per barrel increase in oil prices over the 2002-2010 period, global oil exports have boomed. For a broad sample of exporting countries, the value of fuel export earnings more than tripled to nearly $ 1 500 billion in 2010, being well above the previous 1980 peak in real terms.[1] Given the economic significance of oil gains, the way oil producers allocate their revenue windfalls has become an issue of key importance for both academics and economic policy makers. In particular, revenue windfalls allocation has, by definition, important implications for countries' current balances and then for the global pattern of current account imbalances (Blanchard and Milesi-Ferretti, 2009; Helbling et al., 2011; Arezki and Hasanov, 2013).

One key issue when dealing with resource revenue management—that has however received little attention in the literature on oil exporters—is the countries' level of financial development and its potential impact on resources' allocation. Indeed, countries with more developed financial systems, as they are relatively self-sufficient, are expected to invest a large portion of their savings in their domestic market. This mechanism is not a new one and was already being discussed in the literature related to the Feldstein-Horioka puzzle: countries with more developed financial systems should enjoy a high saving-investment correlation and then low external imbalances. International financial integration has led to a renewed interest in the role of financial development on global imbalances.[2] As suggested by Caballero et al. (2008) and Mendoza et al. (2009) among others, while financial integration favors capital mobility, heterogeneous degrees of financial development in different regions may explain the configuration of global imbalances.

Our paper falls into this strand of the literature and aims at investigating the oil price-current account nexus in oil-exporting economies by paying special attention to the degree of financial development. Going further than the existing literature, our contribution is twofold. Firstly, we extend the traditional analysis of the role played by financial development on oil countries' current accounts[3], by investigating its *indirect* impact through the relationship between oil prices and current accounts. The baseline idea is the following: as financial deepening may serve both to achieve stabilization (by removing borrowing constraints) and precautionary savings (by creating a sovereign fund and rising foreign reserves), one can expect that financial deepness may affect the response of current account to oil price changes. Specifically, a well-developed financial system, by channeling more successfully oil revenue towards domestic investment and by lessening the need for precautionary saving, is likely to turn oil revenue windfalls into higher domestic investments. Therefore, a well-developed financial system may attenuate the positive impact of oil prices on the current account. Secondly, we test for the presence of nonlinearities in order to evaluate the extent to which the

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[1] Source: IMF, International Financial Statistics. Fuel export earnings include 26 emerging and developing countries for which fuel exports exceed 50 percent of total exports. To estimate export earnings in real terms, we use the 2005 U.S. consumer price index.
[2] See, e.g., Chinn and Ito (2007) and Gruber and Kamin (2009).
[3] See references in Section 2.

degree of financial development may mitigate this relationship. Including such threshold effects allows us to extend previous literature (see, e.g., Arezki and Hasanov, 2013) by accounting for and modeling the potential nonlinear impact exerted by the degree of financial development on the oil price–current account nexus. In this respect, our paper is part of a series of works highlighting the evidence of nonlinearities associated to oil prices[4], current account patterns[5] and financial development.[6]

To address this nonlinear dynamics and investigate those interactions, our empirical analysis relies on a Panel Smooth Transition Regression (PSTR) specification for a sample of 27 oil exporters spanning the years 1980-2010. A major strength of this approach is to derive coefficients of current account responses to oil price changes which may vary between countries and with time, depending on the level reached by a threshold variable defined here as the degree of financial development. Consequently, this methodology allows us to capture both cross-country heterogeneity and time variability of the oil price-current account nexus.

Our main finding is that, while oil price movements can have a significant impact on current accounts of oil producers, their influence critically depends on the country's level of financial development: the latter indeed exerts a nonlinear effect on the transmission of oil price changes to current accounts. Moreover, this result is robust to alternative measures of financial development and when controlling for the role of the official sector.

The remaining part of the paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 details the empirical methodology used to estimate current accounts. Section 4 discusses data and results. Section 5 concludes the paper and draws some policy implications for oil exporters.

2. Current-account adjustment to oil revenue windfalls in oil-exporting countries: a brief literature survey

Investigating the impact that oil shocks have on current accounts of oil producers is complicated by the dual purpose of stabilization and precautionary saving played by oil revenues. Oil shocks may have a counter-cyclical effect on current account if oil revenues are used to increase consumption or spent to finance domestic investment. They could equally have an amplifying effect on current accounts if they are only used for precautionary saving.

The literature dealing with windfall revenue management in oil producers has addressed this issue in several ways. The permanent income hypothesis shows that open economies

[4] Hamilton (2009) lists three main contributions in this area: Hamilton (2003) who finds a bigger effect exerted by oil price increases than oil price decreases, Kilian (2009) who shows that price increases caused by surging global demand may have less effect than those brought about losses in supply, and Blanchard and Galí (2010) who evidence a higher resilience to oil price shocks over time.

[5] Chinn and Ito (2007) have shown that the assumption of linearity between current accounts and their main determinants may be quite restrictive for Asian countries. In particular, they find that the relationship between net savings and financial development is nonlinear, depending on the financial openness and the development of the legal system.

[6] Recent evidence highlights that the level of financial development exerts a nonlinear influence on economic growth. See Fung (2009) and Rousseau and Wachtel (2011) among others.

producing exhaustible natural resources should save most of their resource windfalls abroad in order to smooth their consumption, preserve resource wealth and ensure intergenerational equity. Another potential saving channel operates through precautionary motive which may generate sizable additional savings. A common explanation is that oil exporters can consider oil price increase as temporary and have then to build up precautionary saving responding to this future uncertainty (Bems and Carvalho, 2011). A large literature related to the Harberger–Laursen–Metzler effect also shows that a temporary income windfall will largely be saved, while a permanent one will largely be consumed. This effect, initially examined by Harberger (1950) and Laursen and Metzler (1950) within a Keynesian framework, was justified by a marginal propensity to consume less than unity, inducing an increase in current consumption less than current income following a temporary improvement in a country's terms of trade. This effect has subsequently been reexamined within deterministic intertemporal specifications and, more recently, within dynamic stochastic general equilibrium models (see Bouakez and Kano, 2008, and references therein).

Oil revenue windfalls can also be considered as expanding financing sources for investment. This is in line with the view that thanks to resource windfalls, oil exporters can take this opportunity to follow what Solow (1986) termed a “rule of thumb” for sustainability. This rule, known as the Hartwick rule[7] (Hartwick, 1977), consists in expanding the financing sources for investment projects necessary to ensure a consumption stream constant in time.[8] However, low-income oil producers can face investment inefficiencies and absorptive capacity constraints on capital accumulation (van der Ploeg and Venables, 2012; Araujo et al., 2013) which makes this rule much more difficult to follow.

The recent empirical literature evidences that countries with more important oil-producing sectors tend to have higher current-account balances, as higher oil revenues tend to boost saving more than investment (Cheung et al., 2010). This result is corroborated by recent trends: spending of oil producers have increased by less than oil revenues, which has resulted in an improvement of their current accounts, an overall trend confirmed by several studies (Higgins et al., 2006; IMF, 2006a; Cheung et al., 2010; Arezki and Hasanov, 2013).

Another factor that has received increasingly attention in the analysis of current imbalances is the countries’ level of financial development. A recent explanation has indeed focused on the tendency of emerging economies and oil producers to “bypass” their inefficient financial markets by exporting their excess capital to countries with more sophisticated financial markets, contributing to a global “savings glut” (Bernanke, 2005). Mendoza et al. (2009) introduce market frictions in a two-country model inhabited by identical agents. Those frictions rest on the imperfect enforceability of contracts that limits the ability of agents to insure against idiosyncratic shocks. The degree of enforcement of financial contracts, captured by the level of financial development, differs between the two countries. Using this

[7] According to the Hartwick rule, a country should invest the rent from the exhaustible resource used at each time in the net accumulation of the produced capital good (Hartwick, 1977).

[8] Of course, without intergenerational altruism, revenue windfalls can be followed by new and even sometimes excessive borrowing as the generations will try to consume all the revenue (Mansoorian, 1991).

framework, the authors show that financially developed countries are more prone to invest in foreign risky assets with higher return, while countries with lower financial development prefer to hold foreign riskless assets. As a consequence, the process of financial integration will induce a negative net foreign asset position for the more financially developed country. Vermeulen and de Haan (2013) have tested the main implications of the Mendoza et al. (2009)'s model for a sample of 50 industrialized and developing countries over the 1970-2007 period. They find that financial development—measured by the private credit-to-GDP ratio—exerts an influence on the overall value and the composition of the net foreign asset position. More specifically, in line with Mendoza et al. (2009), they show that financial development reduces a country's long-run net foreign asset position. Caballero et al. (2008) explain the pattern of global imbalances by differences in the ability to supply financial assets to savers among regions of the world economy. Their model focuses on the interaction between the region with current-account deficits (the United States, Australia, and the United Kingdom) and the region-savers (emerging markets, oil-producing countries, and high-saving newly industrialized economies). These regions differ also in their index of financial development that measures the extent to which property rights are well defined and tradable. The authors show that the U.S. current account deficit is the counterpart of net capital inflows from the region-savers. Indeed, in this latter region, savers have few reliable domestic assets to store value at their disposal. Then the "savings glut" thesis implies that improved financial deepening could make financial markets more efficient in less financially developed countries and foster an improved allocation of excess saving in their domestic economies. Within this context, financial development is expected to reduce current account imbalances. This negative nexus would even be reinforced if financial development expands financial intermediation—financial intermediation being usually expected to reduce the need for precautionary savings by removing borrowing constraints.

Focusing on East Asian economies, Chinn and Ito (2007) present evidence against this conjecture. In those countries, financial development exerts a nonlinear effect on current account, depending on a country's capital account openness and legal system. Contrary to the savings glut thesis, the effect of further financial deepening on net saving is positive in most of these countries: financial development leads to an expansion of saving larger than the growth of investment. It is therefore questionable how financial development impacts current accounts in oil producers that usually invest a part of their oil revenues in foreign assets rather than in the domestic market.

However, this issue has received little attention in the literature. Arezki and Hasanov (2013) estimate current account dynamics for oil-exporting countries and the rest of the world. They find that financial development, proxied by the ratio private credit to GDP, impacts significantly and negatively current accounts. Their study has however the shortcoming of assuming that oil economies deploy their oil revenues in a similar way and independently of the economic environment. Such assumptions are obviously too restrictive, and as for Asian emerging markets, it is reasonable to expect that the relationship is likely to be country specific and be influenced by the economic environment. Oil countries themselves constitute a very heterogeneous group with high-income and high financially developed economies—

such as Norway—and countries with low income and less financially developed—such as African countries. Mechanisms through which financial development impacts oil-exporting countries' current accounts are also likely to vary with the economic environment. But, while financial liberalization policies in East Asia have been considered as the cause of a saving glut, it is rather the rise in oil prices that has allowed oil countries to invest excess savings abroad. Basher and Fachin (2001) document that when oil prices are particularly high, a greater fraction of revenue is temporarily saved abroad until the domestic production base has been reasonably expanded.

Accordingly, one important aspect of financial development in oil countries could be their role in allowing adequate resource allocation during periods of oil price fluctuations. Consequently, financial development could affect current accounts in oil countries not only through a direct impact on both savings and investment, but also indirectly through the relationship between oil prices and current accounts. Moreover, as financial development differs between oil countries and over time, it may also cause a potential nonlinear effect on resource allocation in oil countries and then on the adjustment pattern of their current accounts. In particular, such threshold effects, in relation with the savings glut thesis, may arise through three main mechanisms. First, the financial sector being subject to increasing returns to scale, the larger its size, the higher its technical efficiency. Second, insofar as projects offering higher rates of return share two main features—indivisibility and minimum size requirements—a minimum size of the financial sector is needed to pool resources for financing these projects (Acemoglu and Zilibotti, 1997). Third, the ability of financial sector to mitigate idiosyncratic risks to which agents have to face depends on the scale of risk diversification, the latter being in turn linked to the size of the financial sector (Bencivenga and Smith, 1991). Thus, one can expect that, if oil prices fluctuations lead to an amplifying effect on current accounts, this impact could be mitigated in financially developed countries more prone to buffer their economies against such fluctuations.

3. Methodology

To investigate the potential nonlinear effect exerted by financial development on the oil price-current account relationship, two main avenues may be followed from a methodological viewpoint. The first one consists in accounting for nonlinearity by considering interaction variables in a regression model. This avenue has notably been followed by Chinn and Ito (2007) in the context of East Asian economies by introducing interactions between (i) financial development and financial openness variables, and (ii) financial development and legal variables. The second main avenue consists in modeling explicitly the nonlinearity that may be at play using nonlinear processes. In this paper, we follow this last way and rely on the PSTR methodology proposed by González et al. (2005). Note that an alternative procedure would have been to directly include an interaction term between oil prices and financial development in our estimated oil price–current account relationship. While this approach obviously allows us to account for nonlinearity, it does not provide us a way to explicitly model the dynamics exerted by such nonlinearity. In this respect, the advantage of the PSTR specification compared to the introduction of interaction terms is to allow the oil price–current account relationship to vary over time according to the level of financial development, and to provide the threshold value of financial development at which the dynamics of the relationship changes.

The PSTR methodology has also the advantage of allowing for sufficient heterogeneity in view of the diversity in our sample. Indeed, according to this specification, current-account regression coefficients are allowed to vary across countries and with time, depending on the level of financial development. More specifically, the observations are divided in—say—two regimes delimited here by a threshold reached by the level of financial development, with estimated coefficients that vary depending on the considered regime. In other words, countries can be clearly distinguished from each other based on the value of their financial deepness. The change in the estimated value of coefficients is smooth and gradual, since PSTR models are regime-switching models in which the transition from one state to the other is smooth rather than discrete. Denoting the dependent variable by $CA_{i,t}$, the current account in percent of GDP, the PSTR model is given by:

$$CA_{i,t} = \alpha_i + \beta_0 \Delta OILP_{i,t} + \beta_1 \Delta OILP_{i,t} * F(S_{i,t}; \gamma; c) + \phi' X_{it} + \varepsilon_{i,t} \quad (1)$$

for t = *1, …, T*, and i = *1, …N*, *N* being the number of countries under study. α_i denotes the country fixed effects, $\Delta OILP_{i,t}$ is the oil price expressed in first logarithmic difference, *F* is a transition function, $S_{i,t}$ stands for the transition variable defined here by the level of financial development, $X_{i,t}$ is a vector of control variables that can include the transition variable, and $\varepsilon_{i,t}$ is an independent and identically distributed error term. Since we seek to estimate the impact of the degree of financial deepening on the oil price growth - current account relationship, we consider that only the oil price coefficient varies according to the level reached by financial development. The transition function *F* is normalized and bounded between 0 and 1, and is given by (González et al., 2005):

$$F(S_{i,t}; \gamma; c) = \left[1 + exp\left(-\gamma \prod_{j=1}^{m} (S_{i,t} - c_j)\right)\right]^{-1} \quad (2)$$

γ stands for the slope parameter and c_j, *j = 1, …, m*, are the threshold parameters $(c_1 \leq c_2 \leq \cdots \leq c_m)$. The two most common cases in practice correspond to *m* = 1 (logistic) and *m* = 2 (logistic quadratic). In the case of a logistic function, the dynamics is asymmetric and the two regimes are associated with small and large values of the transition variable relative to the threshold. In the case of a logistic quadratic function, the dynamics is symmetric across the two regimes, but the intermediate regime follows a different dynamic compared to that in the extremes.

In our case, the transition variable is the degree of financial development. Depending on the realization of this variable, the link between the current account position and its determinants is specified by a continuum of parameters, namely β_0 in the first regime (when *F*(.) = 0), and $\beta_0 + \beta_1$ in the second regime (when *F*(.) = 1). If we focus on the impact of oil price variation on the current account, this means that depending on the degree of financial development, an oil price variation has a different effect on the dynamics of the current account. This effect varies between countries and time according to the value taken by the transition function as follows:

$$\frac{\partial CA_{it}}{\partial \Delta OILP_{i,t}} = \beta_0 + \beta_1 F(S_{i,t};\gamma;c) \quad (3)$$

We can generalize the PSTR model to the case of $(r+1)$ extreme regimes as follows:

$$CA_{i,t} = \alpha_i + \beta_0 \Delta OILP_{i,t} + \sum_{j=1}^{r} \beta_j \, \Delta OILP_{i,t} * F(S_{i,t};\gamma_j;c_j) + \phi' X_{it} + \varepsilon_{i,t} \quad (4)$$

In this generalization, the impact of an oil price change on the current account position in function of the transition variable is given by:

$$\frac{\partial CA_{it}}{\partial \Delta OILP_{i,t}} = \beta_0 + \sum_{j=1}^{r} \beta_j * F(S_{i,t};\gamma_j;c_j) \quad (5)$$

We rely on the methodology proposed by González et al. (2005). We start with the identification step that aims at testing for homogeneity against the PSTR alternative, and at selecting (i) between the logistic and logistic quadratic specification for the transition function, and (ii) the transition variable. Then, if the nonlinearity hypothesis is retained, we rely on nonlinear least squares to obtain the parameter estimates, once the data have been demeaned (Hansen, 1999; González et al., 2005). Finally, various misspecification tests are applied to check the validity of the estimated PSTR model and determine the number of regimes $(r+1)$.[9]

4. Data and estimation results

4.1. Data

We rely on annual data over the 1980-2010 period. The dependent variable is the current account to GDP ratio, extracted from WDI (World Development Indicators, World Bank) and WEO (World Economic Outlook, IMF). Turning to the oil price, we consider the crude oil price (Brent) series, expressed in logarithmic terms, and extracted from the BP Statistical Review of World Energy.

The control variables are derived from previous empirical studies on current accounts[10], and are all taken from WDI database[11]: the stock of net foreign assets (NFA), expressed as percentage of GDP; an openness indicator defined as the ratio of exports plus imports of goods and nonfactor services to GDP; terms of trade given by the ratio of export prices to import prices, expressed in logarithm; population growth rate; dependency ratio defined as the ratio of dependent population (below 15 and above 65) to the working age population (between 15 and 64); GDP per capita, adjusted by PPP exchange rates, relative to the US; and

[9] For more details regarding the methodology, the reader is referred to the original contributions by Hansen (1999) and González et al. (2005), and to Colletaz and Hurlin (2006). To save space, we do not report results of misspecification tests, but they are available upon request to the authors. All the models presented here have correctly passed those tests.

[10] See Calderón et al. (2002), Chinn and Prasad (2003), Gruber and Kamin (2007), Calderón et al. (2007), Chinn and Ito (2007, 2008), Cheung et al. (2010), Brissimis et al. (2012), and references given in Section 2.

[11] Table A1 in Appendix provides some usual descriptive statistics on our data.

the GDP growth rate.[12] Finally, we use a standard indicator of financial depth, liabilities of financial system, measured by the ratio of M2 to GDP (King and Levine, 1993; Levine et al., 2000), and taken from WDI.[13] This indicator includes currency plus demand and interest bearing liabilities of banks and nonfinancial intermediaries divided by GDP. It can been considered as the broadest measure of financial intermediation as it includes three types of financial institutions: the central bank, deposit money banks, and other financial institutions.[14]

Our sample of countries is constituted by a panel of 27 oil-exporting economies, namely Algeria, Angola, Azerbaijan, Colombia, Congo, Ecuador, Equatorial Guinea, Gabon, Indonesia, Iran, Kazakhstan, Kuwait, Libya, Mexico, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, Sudan, Syrian Arab Republic, Trinidad and Tobago, Turkmenistan, United Arab Emirates, Venezuela, and Yemen.[15]

4.2. Results

We start by testing the null hypothesis of linearity in Equation (1) using the González et al. (2005) test with financial deepening—proxied here by M2 to GDP ratio—as the transition variable.[16] Results are reported in Table 1 and indicate that the null of linearity is rejected in favor of the alternative of logistic PSTR specification. This finding indicates that oil price fluctuations impact the current account (in percentage of GDP) differently, depending on the degree of financial development. We thus now proceed to the estimation of the PSTR model to investigate this property more deeply.

Table 1. Results of linearity tests (p-values)

	$r = 0$	$r = 1$
LM	0.012	0.549
F	0.016	0.562

Note: LM and F denote Lagrange Multiplier and F tests for linearity. $r = 0$ refers to the null hypothesis of linearity against the alternative of a PSTR model with two regimes. $r = 1$ refers to the null hypothesis of PSTR model with two regimes against the alternative of a PSTR model with three regimes.

[12] According to the results of a battery of panel unit root tests (available upon request to the authors), all series but oil price and terms of trade reject the unit root null hypothesis. Those two series have thus been considered in their first logarithmic differences.

[13] Other financial development measures will be considered as robustness checks, see Section 4.3.

[14] It should be noticed that dealing with oil-exporting countries, we have accounted for other specific determinants. In particular, we have considered (i) the exhaustibility of the resource through the oil proved reserves, (ii) oil trade balance to GDP ratio, and (iii) the fiscal balance to GDP ratio. Corresponding results are discussed in Section 4.3.

[15] In addition to data availability considerations, these countries have been retained because they are—with the exception of Congo, Trinidad and Tobago, and Turkmenistan—amongst the 39 major oil producers according to the Energy Information Administration. They also represent more than 60% of the total world oil production over the period under study, and the average ratio between oil exports and total exports amounts to 67% for our panel of countries—Equatorial Guinea having the lowest ratio (10.7%) and Algeria the highest (96.8%).

[16] The choice of this variable has obviously been guided by the purpose of our paper, but has also been confirmed by linearity tests: the null of linearity is the most strongly rejected when using financial development as the transition variable. Results are available upon request from the authors.

Table 2 reports the results of the estimation of our PSTR model using financial deepening (M2/GDP) as the transition variable.

Table 2. Estimation of the PSTR model

Variable	*Coefficient*	*t-statistic*
Oil price (first log. diff)	0.1997	2.1821
Oil price (first log. diff) × F	-0.1580	-1.8144
M2/GDP	-0.1371	-2.8119
NFA/GDP	0.1168	3.0381
Openness	-0.1909	-2.6246
Terms of trade (first log. diff)	0.0978	4.2167
Population growth	0.8657	2.1182
Dependency ratio	-0.3390	-5.4720
GDP PPP/GDP PPP US	0.0000	0.4719
GDP growth	0.1294	1.2486
Threshold $\hat{c}$	24.9050	
Slope coefficient $\hat{\gamma}$	417.6038	

Let us first comment the results concerning the control variables. As emphasized in Section 2, the direct effect of financial deepening on current account imbalances is expected to be negative. Indeed, financial development may be seen as reducing excessive saving given that a high level of financial deepness may induce more efficient financial markets which may, in turn, reallocate excess saving into domestic spending. This effect on spending might also be magnified if a deeper financial system reduces the need for precautionary savings by removing borrowing constraints. In line with those expectations, our results evidence a negative financial deepening effect on the current account for our panel of oil-exporting countries; a conclusion which is consistent with the findings of Kennedy and Slok (2005), Gruber and Kamin (2007), Cheung et al. (2010) and Arezki and Hasanov (2013).

Turning to the NFA to GDP ratio, its effect on the current account is, as expected, positive. Countries with large net foreign asset positions are also generally characterized by important current account surpluses. Indeed, a rise in the net foreign asset position tends to increase income issued from foreign direct investment, thus improving the current account.[17]

The relationship between the openness ratio—measured as the ratio of the sum of exports and imports to GDP—and current account is found to be negative. This result is frequently obtained in the literature dealing with developing economies (see Chinn and Prasad, 2003; Arezki and Hasanov, 2013, among others). The main explanation relies on the idea that openness accounts for some characteristics relating to trade liberalization, such as the existence of trade barriers. The latter obviously impedes flows of goods and services, as well as foreign direct investment, rendering countries less attractive to foreign capital and reducing

[17] To be complete, it should be noticed that a second, contradictory effect may also be at play. Indeed, countries with large NFA positions are able to run long-lasting trade deficits while remaining solvent; a situation that may lead to a negative relationship between NFA and current account positions. Note however that this effect is considered to be weaker by the standard open economy macroeconomic theory than the positive effect previously described.

investment opportunities. As a consequence, the effect of openness on the current account is negative.

Regarding now terms of trade, we find a positive effect on the current account. This result is consistent with the findings of the literature on the Harberger–Laursen–Metzler effect.[18] Indeed, if income rises more than spending following an improvement in terms of trade, as in oil exporters, the current account position will automatically improve.

Considering demographic variables, we show that population exerts a positive effect on the current account, while the dependency ratio impacts it negatively. This result may be interpreted with regard to the life-cycle hypothesis: an increase in the dependency ratio leads to a decrease in aggregate domestic saving.[19] Through this saving channel[20], higher dependency ratios affect negatively current account positions. This finding is consistent with the conclusions obtained—especially for developing countries—by Masson et al. (1998), Chinn and Prasad (2003), Gruber and Kamin (2007) or Chinn and Ito (2008) among others.

As it is standard in the literature (see Chinn and Prasad, 2003; Ju and Wei, 2006; Prasad et al, 2007; Cheung et al., 2010; and references in Section 2), the variable GDP per capita, adjusted by PPP exchange rates, relative to the US aims at capturing the stage of economic development of countries relative to the US. The underlying idea is the following: when countries are at the beginning of their development process, they run current account deficits due to important capital imports. Once they reach a higher stage of development, they undergo current account surpluses to repay accumulated debt and export capital. In our case, we find that the coefficient associated with the ratio of domestic GDP per capita to US GDP per capita is not significant. This result, also obtained by Chinn and Prasad (2003) for developing countries and Cheung et al. (2010) for a wide sample of economies, can be explained by the fact that while some countries are indeed at early stages of development with a corresponding negative impact on the current account, others have clearly reached high levels of development with a corresponding positive effect on the current account position. Negative and positive effects may thus be compensated, explaining the non-significant coefficient. Another explanation of the non-significance of the ratio of domestic GDP per capita to US GDP per capita may stem from the fact that this variable is frequently found to be correlated with financial development in broad samples of countries (see, e.g., Levine, 1997, 2005; and Demirgüç-Kunt and Levine, 2001). In our case, the correlation between the two variables amounts to 0.441 (see Table A2 in Appendix), and is even higher when using other proxies for financial deepness (see Section 4.3 for the alternative proxies and Table A2 for the values of correlations). This quite important correlation may thus also potentially explain the non-significant coefficient of the GDP per capita variable.

Finally, the GDP growth rate effect on the current account position is also non-significant. Note that from a theoretical viewpoint, the impact of economic growth is not clear-cut and

[18] See references in Section 2.

[19] To be more precise, according to the life-cycle hypothesis, the saving behavior of individuals varies with age and is hump-shaped.

[20] Note that there is no consensus in the literature regarding the theoretical effect of demographics on investment (see e.g. Higgins, 1998).

depends on whether high growth rates are perceived as transitory or long-lasting by the individuals.

Let us now turn to our main variable of interest, namely the oil price variation. Its effect appears to be clearly nonlinear, depending on the degree of financial deepening. As shown in Table 2, the estimated threshold value for the financial deepening is around 25%. In the first regime, the current account effect of oil price variation is positive for oil-exporting countries characterized by a degree of financial development below 25%. This effect strongly differs in the second regime. Indeed, in this regime encompassing oil-exporting countries characterized by a level of financial deepening higher than 25%, the oil price effect on the current account is highly diminished and tends to zero (in the extreme case, the coefficient is equal to 0.042). In other words, the more the oil-exporting countries tend to have developed financial systems, the more the oil price impact on the current account position is softened.

At a more disaggregated level, Table A3 and Figure 1 in Appendix display, for each country, the average (over the period under consideration) estimated impact of an oil price change against the average level of financial development (M2/GDP). These results confirm that the estimated average impact of an oil price variation on the current account varies from one country to another and depends negatively on the level of financial development, corroborating our previous results. Figures 2a to 2c in Appendix also illustrate such finding by exhibiting the relationship between our financial development indicator (M2 to GDP ratio), the current account balance in percentage of GDP, and the oil price for three groups of countries.[21] In the first group (Figure 2a), the ratio M2/GDP is consistently below our threshold value (25%). The main striking feature here is the strong sensitivity of the current account balance to changes in oil prices. Figure 2b considers countries with intermediate values of financial development levels (from 23.3% for Kazakhstan to 28.3% for Mexico). The figure suggests a weaker response of current account balance to oil price shocks. For countries characterized by a level of financial development higher than the threshold—from 43.8% for Trinidad and Tobago to 91.5% for United Arab Emirates (Figure 2c)—changes in oil prices have a more limited influence on current account positions.

To sum up, our results show that in the case of less financially developed oil-exporting countries—i.e., oil-exporting countries with a level of financial development below 25%—the gap between their revenue windfalls and their spending tends to be accentuated, following an increase in oil prices. Indeed, we can expect that such countries are less prone to develop hedging strategies and/or set up stabilization funds that could efficiently insulate their domestic economy from oil price movements. Moreover, as they usually face less efficient financial markets, they will fail to transform their revenue windfalls into domestic investment, restraining then their capital accumulation. This finding is in line with the evidence of a more pronounced resource curse in oil-exporting countries with poorly developed financial systems (van der Ploeg and Poelhekke, 2009). For higher financially developed oil-exporting countries, the effect of oil prices on current accounts is less pronounced and tends to decrease to reach zero, which is consistent with the fact that the corresponding economies are more

[21] This decomposition in three groups has been done by comparing each country's average level of financial development over the period under study (see Table A3 in Appendix) to the estimated threshold value (25%).

able to set up stabilization funds in combination with sophisticated financial instruments. They are then more likely to smooth the effects of oil price fluctuations on their economy by transforming their revenue windfalls into a permanent increase in consumption and/or into domestic investment.

4.3. Robustness checks

As robustness checks, we have estimated various alternative PSTR specifications.[22] Considering first methodological issues, we have replaced explanatory variables that could be potentially endogenous (NFA to GDP ratio, openness, GDP growth rate, and relative GDP per capita) by their lagged values. Results remain unchanged, whatever the proxy retained for financial development, putting forward the robustness of our results to endogeneity issues. Second, given the key role played by financial deepness in our analysis, we have considered alternative proxies for this variable. Finally, we have added other potential current-account determinants to our baseline model (Table 2). Among those additional variables and given that we are dealing with oil-exporting countries, we have considered oil proved reserves (source: BP Statistical Review of World Energy), oil trade balance to GDP ratio (source: WEO), and the fiscal balance to GDP ratio (source: WEO). While the first two variables appeared non-significant in our regressions, we evidence a significant positive relationship between the fiscal balance and the current account position. Let us now present the results of some of those robustness checks.

Choice of the financial development variable

As noticed by Cheung et al. (2010) among others, empirical results regarding the impact of the level of financial development on the current account are rather mixed, depending notably on the set of countries under investigation, as well as the measure used to proxy financial deepness. Financial development refers to a set of phenomena acting on the financial system[23] and may indeed be proxied by various indicators[24], among which private credit to GDP ratio, stock market capitalization to GDP ratio, stock market turnover as share of GDP, growth rate of stock market capitalization as share of GDP, private bond market capitalization to GDP ratio, *etc.* (see King and Levine, 1993; Levine, 1997; Levine et al., 2000; Demirgüç-Kunt and Levine, 2008; Cheung et al., 2010; Čihák et al., 2013). Unfortunately, working on a large sample of oil-exporting countries obviously reduces the potential measures due to data availability issues. To investigate the robustness of our results to the choice of the financial development proxy, we thus retain the indicators for which data are available for most of the countries of our sample, namely private credit to GDP ratio and bank deposits to GDP ratio. The first indicator is a financial depth measure defined as the credit issued to the private sector by banks and other financial intermediaries divided by GDP, and constitutes a measure of general financial intermediary activities provided to the private sector. The second

[22] To save space, we do not report here all the estimations, but complete results are available upon request to the authors.

[23] For instance, IMF (2006b) has constructed a financial development index which encompasses the degree of traditional bank intermediation, the degree to which new financial intermediation has developed and the role played by financial markets.

[24] See Demirgüç-Kunt and Levine (1996, 1999) and the recent contribution by Čihák et al. (2013).

indicator is the ratio of deposits in banks to economic activity, and is a measure of deposit resources available to the financial sector for its lending activities. Thus these two indicators capture another channel of financial development through the ability of agents to transfer consumption across time due to bank intermediation.

Series are extracted from Beck and Demirgüç-Kunt (2009)'s database and are available for all countries of our sample but three, namely Qatar, Turkmenistan, and United Arab Emirates. Results of the PSTR estimation using these two measures are given in Table 3.

Table 3. Estimation of the PSTR model, robustness to the financial development variable

	Private credit/GDP		*Bank deposits/GDP*	
Variable	*Coefficient*	*t-statistic*	*Coefficient*	*t-statistic*
Oil price (first log. diff)	0.1161	3.5312	0.1546	3.4420
Oil price (first log. diff) × F	-0.0707	-1.9867	-0.1245	-2.8208
Financial deepness	-0.0111	-0.2857	-0.2463	-3.9263
NFA/GDP	-0.2173	-3.0095	0.0945	2.5069
Openness	0.0517	1.4064	-0.2302	-3.2020
Terms of trade (first log. diff)	0.0950	4.0480	0.1027	4.3990
Population growth	1.4495	1.5456	1.8649	2.0106
Dependency ratio	-0.4511	-6.3275	-0.4947	-6.4536
GDP PPP/GDP PPP US	0.1814	2.2445	0.1283	1.6031
GDP growth	0.1311	1.2965	0.1372	1.3843
Threshold $\hat{c}$	17.6816		14.6673	
Slope coefficient $\hat{\gamma}$	785.6743		766.9978	

Results in Table 3 show that our findings are robust to the choice of the proxy retained for financial development. Indeed, in addition to the fact that the control variables generally have a similar impact whatever the considered financial development indicator, our main result concerning the nonlinear impact of financial development on the oil price – current account relationship remains valid for all retained proxies: current accounts are more sensitive to oil price fluctuations in less financially developed countries, while this influence tends to diminish when the degree of financial deepness augments.

Inclusion of fiscal balance to GDP ratio

If the fiscal balance to GDP ratio is a standard current account determinant[25], it may have a profound impact on the adjustment patterns of current accounts in oil-exporting countries because of the larger role played by the government which typically exclusively holds oil export revenues (Basher and Fachin 2011; Arezki and Hasanov, 2013). Moreover, the role played by the State in the allocation between savings and investment in those countries can also sharply differ from that of private sector's preferences (Basher and Fachin, 2011).[26] In

[25] See Debelle and Faruquee (1996) for a survey.

[26] In oil economies, several political reasons can explain why resource revenues are not put to productive use (van der Ploeg and Venables, 2012). In addition, as stressed by Bhattacharyya and Hodler (2014), rent seeking behavior in rich-resource countries may negatively impact the level of financial development as weak political

these circumstances, the inclusion of fiscal balance may alter the direct and indirect impacts of financial development on current accounts.

Interestingly, our empirical results (reported in Table 4) show very little differences when the fiscal balance is taken into account. We get similar global effects of the other control variables on the current account position and, more importantly, we find the same result regarding the nonlinear impact of financial deepening on the oil price - current account relationship. The main difference with our baseline specification lies in lower effects exerted by financial development. Its direct impact on current account is -0.04 against -0.14 in the first specification. The threshold value also decreases from 25% to 9%, meaning that the current account effect of oil price variation is positive for oil-exporting countries characterized by a degree of financial development below 9%. These findings support the dominant role played by the official sector in both petrodollar recycling and its significant bearing on saving and investment choices (Higgins et al., 2006; Basher and Fachin 2011). As a result, taking into account the fiscal balance in the analysis tends to weaken the relationship between the level of financial development and the current account. Nevertheless, even controlling for the role of the official sector, the nonlinear effect of financial development is still significant, illustrating thus the robustness of our findings.[27]

Table 4. Estimation of the PSTR model, including the fiscal balance to GDP ratio

Variable	*Coefficient*	*t-statistic*
Oil price (first log. diff)	0.5286	3.7813
Oil price (first log. diff) × F	-0.5384	-3.8341
M2/GDP	-0.0367	-0.6986
NFA/GDP	0.1087	3.0178
Openness	-0.1921	-2.8525
Terms of trade (first log. diff)	0.1314	4.8298
Population growth	0.3380	0.9755
Dependency ratio	-0.2364	-4.0581
GDP PPP/GDP PPP US	0.2140	2.3512
GDP growth	0.0703	0.7034
Fiscal balance/GDP	0.6630	7.0677
Threshold $\hat{c}$	8.9603	
Slope coefficient $\hat{\gamma}$	398.0092	

5. Conclusion

In this paper, we reexamine the role played by oil price fluctuations in current imbalances on a sample of 27 oil-exporting countries over the 1980-2010 period. Relying upon the estimation of nonlinear, panel smooth transition regression models, our findings show that oil price variations nonlinearly impact the current account position, depending on countries'

institutions lower the quality of contracting financial institutions. While those reasons should not be underestimated, they are however outside the scope of this paper.

[27] Note that we have chosen to report as our baseline specification the model without the fiscal balance variable (Table 2) since this series is highly correlated with oil price in the case of oil-exporting countries, thus leading to collinearity issues.

degree of financial development. More specifically, there exists a threshold of financial deepness—estimated at 25%—below which current accounts are more sensitive to oil price fluctuations and beyond which the magnitude of this effect declines. In other words, oil price variations are strongly transmitted to current account position for less financially developed oil-exporting countries, while this influence is less pronounced when the degree of financial deepness augments. Using various measures for financial development and controlling for the role of fiscal balances make no qualitative differences, putting forward the robustness of our findings.

Our findings have important policy implications. Rising oil prices are not the main driver of current surplus in high financially developed oil exporters, their role being only significant in less financially developed economies. What seems to be rather at stake is the role played by the financial development process in the allocation of accumulated oil revenues and in the ability of these countries to isolate their economy from oil price fluctuations. On the whole, our findings suggest that the most salient issue in improving external adjustment of oil-exporting countries and, more generally, in addressing global economic imbalances, may not be a reversal in oil price dynamics but rather the capacity of these economies to set up an efficient financial system.

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Appendix

Table A1. Descriptive statistics

Variable	Mean	S.D.	Min	Max	Obs.
Current account/GDP(in %)	1.658	19.222	-240.496	106.836	754
Oil price (first log. diff in %)	2.565	25.090	-64.706	46.104	30
M2/GDP (in %)	38.835	24.033	4.827	192.239	727
Private credit/GDP (in %)	21.445	16.862	0.983	92.381	578
Bank deposits/GDP (in %)	24.876	16.621	3.104	96.503	562
NFA/GDP (in %)	15.228	23.958	-55.711	164.719	725
Openness (in %)	73.984	33.906	11.087	275.232	720
Terms of trade (first log. diff in %)	0.876	28.514	-204.874	137.697	723
Population growth (in %)	2.535	2.093	-2.753	18.588	833
Dependency ratio (in %)	69.993	20.341	16.988	123.256	837
GDP PPP/GDP PPP US (in %)	39.970	54.102	3.027	483.204	735
GDP growth (in %)	4.141	7.692	-24.700	71.188	728
Fiscal balance/GDP (in %)	1.480	11.238	-151.309	43.303	500

Table A2. Correlations between variables

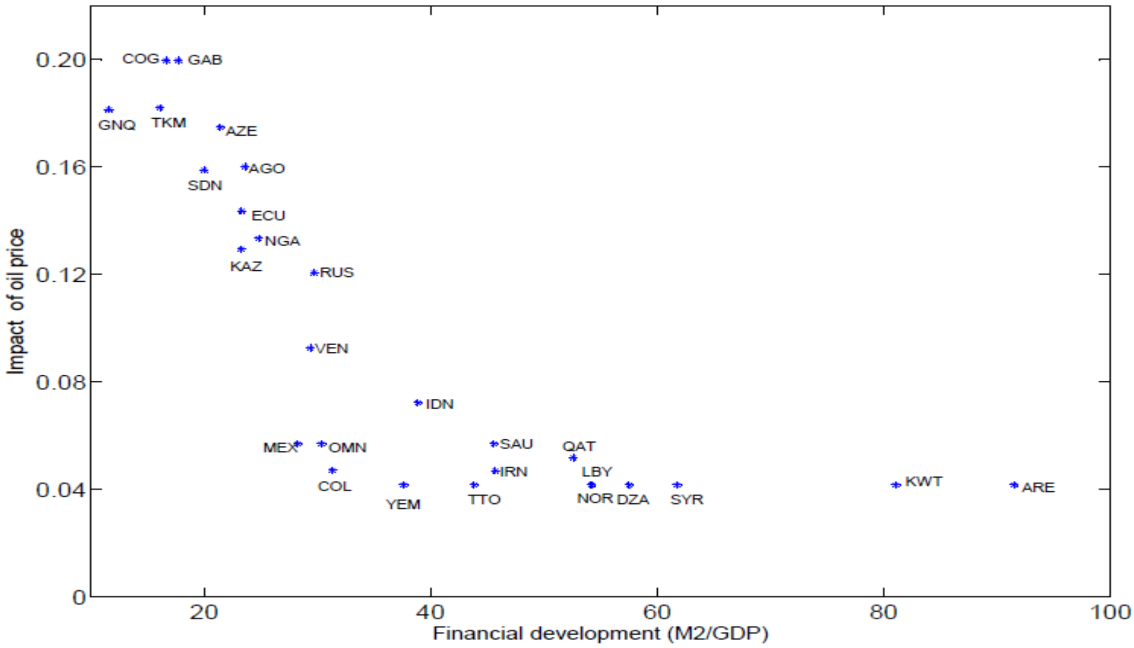
	CA./GDP (in %)	Oil price change (in %)	M2/GDP (in %)	Private credit/GDP (in %)	Bank deposits/GDP (in %)	NFA/GDP (in %)	Openness (in %)	TOT change (in %)	Pop. growth (in %)	Depend. ratio (in %)	Relat. GDP (in %)	GDP growth (in %)	Fiscal bal./GDP (in %)
CA/GDP (in %)	1.000												
Oil price change (in %)	0.252	1.000											
M2/GDP (in %)	0.356	-0.082	1.000										
Private credit/GDP (in %)	0.253	-0.097	0.584	1.000									
Bank deposits/GDP (in %)	0.356	-0.086	0.902	0.690	1.000								
NFA/GDP (in %)	0.433	0.124	0.434	0.020	0.271	1.000							
Openness (in %)	-0.217	0.114	-0.191	-0.143	-0.176	0.176	1.000						
TOT change (in %)	0.248	0.487	-0.103	-0.013	-0.069	-0.043	0.052	1.000					
Pop. growth (in %)	-0.095	-0.078	-0.038	-0.193	-0.120	0.008	0.302	-0.046	1.000				
Depend. ratio (in %)	-0.374	-0.091	-0.397	-0.533	-0.489	-0.276	0.120	-0.058	0.521	1.000			
Relat. GDP (in %)	0.383	0.031	0.441	0.657	0.576	0.126	0.124	0.027	0.023	-0.465	1.000		
GDP growth (in %)	-0.203	0.128	-0.242	-0.220	-0.232	-0.022	0.431	0.117	0.085	-0.080	-0.057	1.000	
Fiscal bal./GDP (in %)	0.490	0.257	0.254	0.343	0.329	0.228	0.174	0.143	0.084	-0.386	0.426	-0.029	1.000

Table A3. Individual estimated impact of an oil price change on the current account

Country	Code	Financial development (M2/GDP)	Impact of oil price
Algeria	DZA	57.53	0.0417
Angola	AGO	23.60	0.1602
Azerbaijan	AZE	21.41	0.1748
Colombia	COL	31.31	0.0471
Congo	COG	16.66	0.1997
Ecuador	ECU	23.31	0.1436
Equatorial Guinea	GNQ	11.58	0.1815
Gabon	GAB	17.71	0.1997
Indonesia	IDN	38.86	0.0723
Iran	IRN	45.70	0.0470
Kazakhstan	KAZ	23.27	0.1295
Kuwait	KWT	81.07	0.0417
Libya	LBY	54.21	0.0417
Mexico	MEX	28.26	0.0570
Nigeria	NGA	24.80	0.1334
Norway	NOR	54.17	0.0417
Oman	OMN	30.34	0.0570
Qatar	QAT	52.58	0.0519
Russia	RUS	29.70	0.1207
Saudi Arabia	SAU	45.59	0.0570
Sudan	SDN	19.99	0.1589
Syrian Arab Republic	SYR	61.75	0.0417
Trinidad and Tobago	TTO	43.84	0.0417
Turkmenistan	TKM	16.08	0.1821
United Arab Emirates	ARE	91.52	0.0417
Venezuela	VEN	29.35	0.0927
Yemen	YEM	37.61	0.0417
All countries		37.47	0.1000

Note: For each country, the average level of financial development (proxied by M2/GDP) and the average estimated impact are computed over the total period under consideration. For the line "All countries" figures are the average across countries.

Figure 1. Average estimated impact of an oil price change on the current account (1980-2010)



Note: For each country, the observation represents the average estimated impact over the total period under consideration against the corresponding average level of financial development.

Figures 2. Relationship between oil prices and current accounts in oil exporters: the role of the level of financial development

Figure 2a. Oil exporters with a low level of financial development

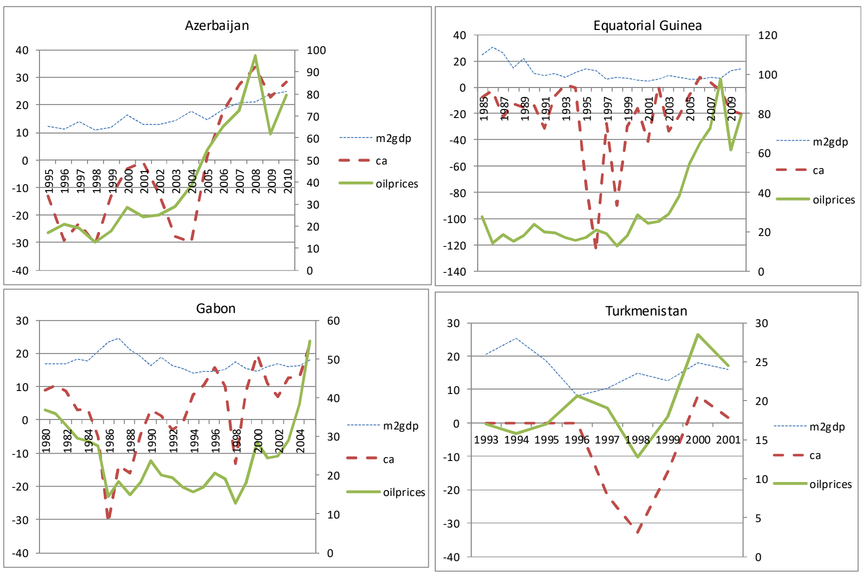


Figure 2b. Oil exporters with an intermediate level of financial development

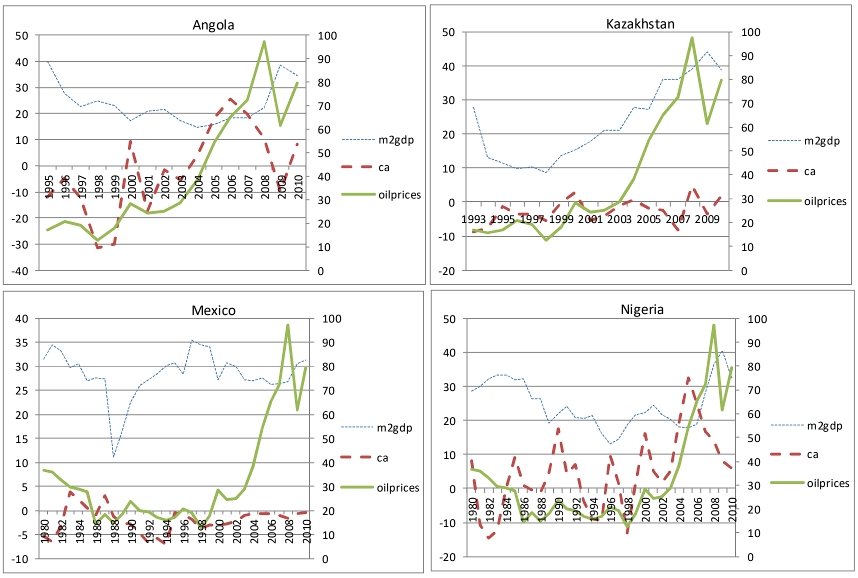


Figure 2c. Oil exporters with a high level of financial development