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

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CURRENT ACCOUNTS AND OIL PRICE FLUCTUATIONS IN OIL-EXPORTING COUNTRIES: THE ROLE OF FINANCIAL DEVELOPMENT

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HIGHLIGHTS

- We investigate the oil price-current account relationship on a sample of 27 oil-exporting economies.
- We rely upon the estimation of panel smooth transition regression models over the 1980-2010 period.
- The effect of oil price variations on current accounts is nonlinear and depends critically on the degree of financial development of oil-exporting economies.

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 positive impact on the current account position for less financial developed countries, while this influence tends to diminish when the degree of financial deepness augments.

JEL Classification: F32, C33.

Key Words: Current account; oil price; financial development; panel smooth transition regression models.

COMPTES COURANTS ET FLUCTUATIONS DES PRIX DU PETROLE DANS LES PAYS EXPORTATEURS : LE ROLE DU DEVELOPPEMENT FINANCIER

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Cécile Couharde

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Valérie Mignon

POINTS CLEFS

- Nous examinons la relation entre compte courant et prix du pétrole sur un échantillon de 27 pays exportateurs de pétrole.
- Nous recourons à l'estimation de modèles de régression à transition douce en panel sur la période 1980-2010.
- L'effet de la variation des prix du pétrole sur le compte courant est non-linéaire et dépend du degré de développement financier des pays exportateurs de pétrole.

RESUME COURT

Les pays exportateurs de pétrole connaissent généralement d'importantes améliorations de leurs comptes courants suite à une forte augmentation des prix du pétrole. Dans cet article, nous examinons la relation entre compte courant et prix du pétrole sur un échantillon de 27 pays exportateurs de pétrole. En recourant à l'estimation de modèles de régression à transition douce en panel sur la période 1980-2010, nous affinons l'interprétation traditionnelle des effets des prix du pétrole sur les comptes courants. Alors que ces derniers sont positivement affectés par les variations des prix du pétrole, nous montrons que cet effet est non-linéaire et dépend du degré de développement financier des pays exportateurs de pétrole. Plus précisément, les variations du prix du pétrole exercent un impact positif sur le compte courant pour les pays les moins développés financièrement, alors que cette influence positive tend à diminuer lorsque le degré de profondeur financière augmente.

Classification JEL : F32, C33.

Mots-clefs : Compte courant; prix du pétrole; développement financier; modèle de régression à transition douce en panel.

CURRENT ACCOUNTS AND OIL PRICE FLUCTUATIONS IN OIL-EXPORTING COUNTRIES: THE ROLE OF FINANCIAL DEVELOPMENT[♦]

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1. INTRODUCTION

With the sharp rise in oil prices since 2003, the issue of large current account surplus experienced by oil-exporting countries has become more prominent in policy discussions, especially their role in the widening of global imbalances (Blanchard and Milesi-Ferretti, 2009; Arezki and Hasanov, 2013).

In particular, the way in which revenue windfalls of oil exporters have outpaced their spending has been the subject of a number of studies and reviews. A first strand of the literature focuses on the sources of their relatively high propensity to save. Intergenerational equity arguments and uncertainty due to oil price volatility broadly support the view of saving behaviors—and then current account patterns—mainly driven by consumption smoothing considerations and/or by precautionary motive (Bems and Carvalho, 2011). A second strand of the literature seeks to investigate why in those countries high savings have not turned into domestic investment but rather into foreign assets accumulation. Three channels are at play here. The first one is concerned with the depressive effect of investment inefficiencies and absorptive capacity constraints on capital accumulation in those countries (van der Ploeg and Venables, 2012; Araujo et al., 2013). For instance, Cherif and Hasanov (2012) show that if productivity of the tradable sector is low, oil producers would optimally accumulate important buffer stock savings and invest relatively little in order to protect against excessive revenue volatility. The second channel is related to the role played by the State in the allocation between savings and investment which can sharply differ from that of private sector's preferences (Basher and Fachin, 2011).[1] Finally, the last channel, which has received less attention in the literature on oil exporters, is the level of financial development and its potential impact on resources allocation. 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 issue is

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[1] In oil economies, several political reasons can explain why resource revenues are not put to productive use (van der Ploeg and Venables, 2012). While those reasons should not be underestimated, they are however outside the scope of this paper.

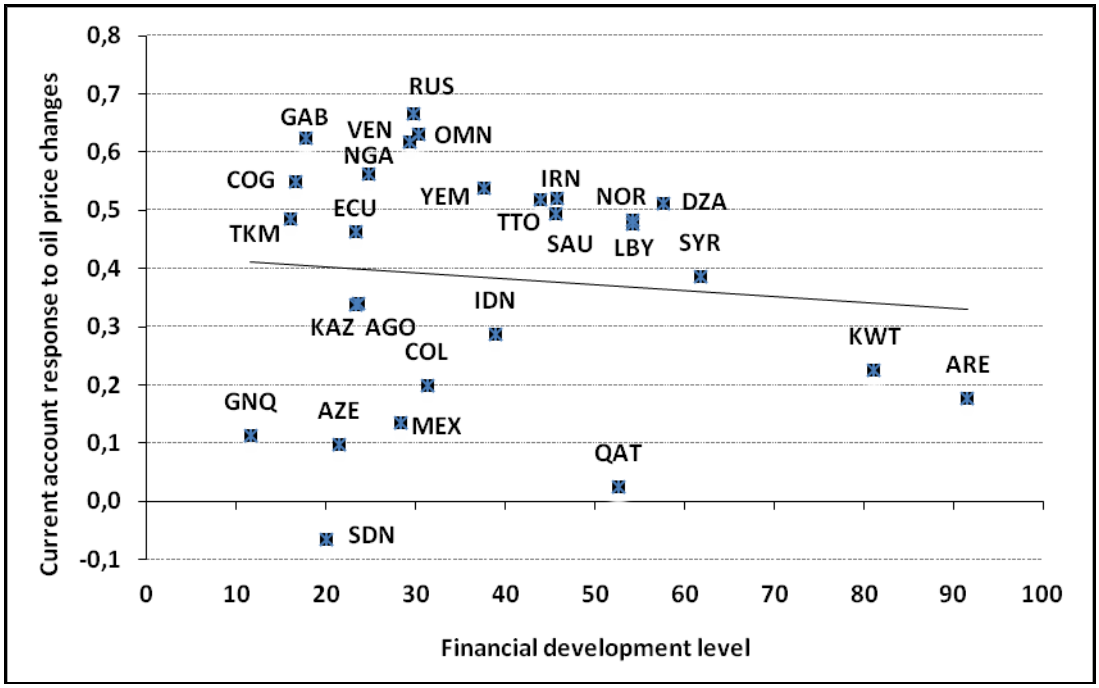
not a new one and was already being discussed in the literature related to the Feldstein-Horioka puzzle. According to this literature, countries with more developed financial systems should enjoy a high saving-investment correlation and then low external imbalances. Numerous empirical studies have proven the validity of the connection between the saving-investment correlation and the development of the financial system (Murphy, 1984; Jansen, 2000; Ho, 2003). Differences in financial development have also been cited to explain why in developing countries, inefficient financial systems tend to encourage saving and discourage investment. In particular, according the "global saving glut" thesis of Bernanke (2005, 2007), developing countries tend to run current account surpluses in order to acquire high-quality financial assets produced by efficient financial systems (see for example, Caballero et al., 2008; Mendoza et al., 2009). This last issue has been recently examined in the context of Asian countries' current surpluses (Chinn and Ito, 2007) and in the broader context of global current imbalances (Gruber and Kamin, 2009).

Our analysis is part of those works, while it focuses on the interaction between financial development and oil prices in influencing current accounts of oil exporters. More particularly, we look at whether the level of financial development matters in the relationship between current account and oil price variations. Significant and robust evidence is found that the less financially developed an oil exporter is, the higher its current account will be impacted by oil price changes.

As a simple illustration, Figure 1 shows the response of current accounts (in % of GDP) to oil price variations (Y-axis) for a sample of oil exporters[2] at different levels of financial development, measured by M2 to GDP ratio (X-axis). There is a negative relationship between the sensitivity of current accounts to oil price variations and the level of financial development: the response of the current account to oil price changes decreases as the level of financial development increases. These simple results represent preliminary evidence that current account effects of oil price changes may vary with the level of financial development. The main purpose of this paper is to explore the robustness of this finding.

[2] See Section 4 for data sources. The codes used for the countries displayed in Figure 1 are the following: Algeria: DZA; Angola: AGO; Azerbaijan: AZE; Colombia: COL; Congo: COG; Ecuador: ECU; Equatorial Guinea: GNQ; Gabon: GAB; Indonesia: IDN; Iran: IRN; Kazakhstan: KAZ; Kuwait: KWT; Libya: LBY; Mexico: MEX; Nigeria: NGA; Norway: NOR; Oman: OMN; Qatar: QAT; Russia: RUS; Saudi Arabia: SAU; Sudan: SDN; Syrian Arab Republic: SYR. Trinidad and Tobago: TTO; Turkmenistan: TKM; United Arab Emirates: ARE; Venezuela: VEN and Yemen: YEM.

Figure 1. Current account response to oil price changes and the level of financial development (1980-2010)



Note: current account responses to oil price changes have been estimated by regressing a country's current account on the lagged growth rate of oil prices. Data sources are given in Section 4.

Accordingly, we investigate the potential effects exerted by the level of financial development in the relationship between the current account and oil price changes in the case of oil-exporting economies. We go further than the existing literature by testing for the presence of nonlinearities in this relationship. In this respect, our paper is part of a series of works highlighting the evidence of nonlinearities associated to oil prices[3] and current account patterns.[4] As previously mentioned, it is also related to the most recent literature on the role of financial development in the growing trend of global imbalances (Chinn and Ito, 2007; Gruber and Kamin, 2009).

[3] 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.

[4] 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.

The baseline idea is the following: as the current account depends on the relationship between investment and saving which are both connected to the financial development, one can expect that oil exporters may be distinguished depending on their level of financial deepness. In particular, a high financially developed economy is expected to insulate more efficiently its domestic economy from oil price fluctuations. In order to test this hypothesis, our empirical analysis relies on a Panel Smooth Transition Regression (PSTR) specification for a sample of 27 oil exporters spanning the years 1980-2010. Indeed, 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 financial development.

Our main finding is that, while oil price movements can have a significant impact on current accounts of oil producers, their effect depends critically 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 presents the literature survey. 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'S ADJUSTMENT TO OIL WINDFALL REVENUE IN OIL-EXPORTING COUNTRIES: A LITERATURE SURVEY

In recent years, higher oil prices have led to a significant redistribution of global income from oil importers to oil exporters. In particular, oil-exporting countries have seen their purchasing power increase and the way they have allocated their revenue windfalls has become a key issue. Indeed, revenue windfalls allocation has, by definition, important implications for their current balances and then for the global pattern of current account imbalances.

From a theoretical standpoint, oil windfall effects on current accounts are not obvious. Indeed, conventional intergenerational equity considerations, justified by exhaustible resources endowment, suggest that income windfalls can be used to boost both savings and investment (Morsy, 2012).

On the savings side, the permanent income hypothesis shows that open economies 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. Such argument justifies the tendency for those countries to run current account surplus following an oil income windfall. Another potential savings channel operates through precautionary motive which can 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 windfall 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 general-equilibrium models (see Bouakez and Kano, 2008, and references therein).

On the investment side, resource revenue windfalls can be considered as helping relax borrowing constraints and expand financing sources for investment, inducing in this case current account deficits. This is in line with the view that thanks to resource windfalls, credit constraints can be relaxed, allowing oil exporters to take this opportunity to follow what Solow (1986) termed a "rule of thumb" for sustainability. This rule, known as the Hartwick rule[5] (Hartwick, 1977), consists in expanding the financing sources for investment projects necessary to ensure a consumption stream constant in time.[6]

Looking at recent trends, spending of oil producers have increased by less than oil revenues, which has resulted in an improvement of their current accounts. This overall trend has been confirmed by several studies (Higgins et al., 2006; IMF, 2006a; Cheung et al., 2010; Arezki and Hasanov, 2013). Whenever the nature of the current oil price shock, most empirical studies support the idea that oil exporters have behaved as if they considered recent oil price increases as temporary (Cherif and Hasanov, 2012) and/or by the desire to smooth consumption (Bems and Carvalho, 2011).

Those usual channels through saving behaviors have been reinforced by a lack of investment opportunities. Indeed, several oil exporters are also characterized by frictions in investment dynamics and/or absorptive capacity constraints which make them gradually invest revenue windfalls and even postpone investment projects. Those investment behaviors have been recently investigated in models that extend saving behaviors of oil exporters by accounting for some features of their investment dynamics (van der Ploeg and Venables, 2012; Araujo et al., 2013). Those models explain why the response of domestic investment to oil windfalls has been rather low, and why the increase in saving has been finally allocated entirely to greater foreign asset accumulation.

While both saving and investment behaviors can be explained as the outcome of those specific determinants, they may also have been affected by financial development. Indeed, with the increasing integration of financial markets, this last factor has been identified as essential in explaining existing global current imbalances. However, the way in which financial development impacts saving and investment behaviors is channeled through several mechanisms and depends on the degree to which the financial system has developed. On the one hand, we can expect that financial development, in countries with less developed financial systems, will expand financial intermediation and remove borrowing constraints (Chinn and Ito, 2007). Those countries will then be more prone to transform their sub-soil assets into domestic physical capital. On the other hand, financial development, in countries with more developed financial systems, can induce new financial intermediation. Those countries may then be more prone to transform their revenue windfall into permanent spending. This relationship can be, however, mitigated if new financial intermediation also lowers transaction costs and facilitates risk management. Under this scenario, financial development will tend to encourage those countries to increase their savings and to place a part of them in high quality assets that countries with deeper financial markets offer (Caballero et al., 2008; Mendoza et al., 2009).

[5] 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).

[6] 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).

Expected impacts of financial development are then rather mixed, and appear to depend on the magnitude on its effect on saving and investment, and also on the set of countries under investigation. Indeed, while empirical studies on developing countries suggest that financial deepening could induce a deterioration in net savings by discouraging savings and encouraging investment, Chinn and Ito (2007) find instead that more financial development leads to higher net saving in Asian countries. In particular, the improvement in net savings is explained by a higher positive effect of financial deepening on national savings than on investment.

Few papers analyze the impact of financial development on the current account in the case of oil exporters. On the theoretical side, Bencivenga and Smith (1991) built a three-period-live overlapping-generations model in which savers are risk averse. In this environment, they show that banks, by satisfying the liquidity preference of savers, can decrease the share of domestic savings held in the form of unproductive liquid assets. Indeed, risk averse savers hold liquid bank deposits lent to firms that can increase their investment level. Using also an overlapping-generations framework, Acemoglu and Zilibotti (1997) show that financial intermediaries and financial markets permit to improve risk diversification. As diversification opportunities increase, less saving is invested in safe assets offering lower return. Thus, capital accumulation tends to increase with the level of financial development.

On the empirical side, Arezki and Hasanov (2013) estimate current account dynamics for oil-exporting countries and the rest of the world. While they mainly focus on the role of fiscal balance, they find that financial development, proxied by the ratio of private credit to GDP, impacts significantly but negatively current accounts. According to them, this negative relationship tends to confirm that improving financial development in those countries may raise borrowing and investment opportunities, and then will tend to deteriorate their current accounts. Such a result is related to the literature stressing the positive impact of the level of financial development on capital accumulation. More specifically, the so-called capital accumulation channel shows that the presence of financial intermediaries allows to mobilize otherwise unproductive resources and to face the financing impediments due to project indivisibilities. This role that could play financial deepening and financial intermediaries in capital accumulation is particularly acute in oil-exporting countries. Firstly, they have on average a lower level of financial development than non-oil producers, because of their high dependence on natural resources which tends to slow down the development of financial institutions (Nili and Rastad, 2007; Beck, 2012). This result is evidenced by Gylfason and Zoega (2006) on a sample of 85 countries, showing that a higher level of natural resource dependence is correlated with a lower degree of financial development, measured by the ratio M2/GDP. The tendency of natural resources dependent economies to have a low level of financial development also refers to the importance of State's intervention in some of these countries. Therefore, in Arab countries, the dominance of public ownership in many large companies has also been blamed for low levels of financial development (Sala-i-Martin and Artadi, 2002). Secondly, it seems that underdeveloped financial markets have resulted in an increasing role of the banking system in many oil-exporting developing countries. However, as highlighted by Basher and Fachin (2011) for GCC[7] countries, domestic savings are often not properly channeled by the financial sector to long-term productive projects as bank lending remains predominantly short-term and trade-related.

Overall, while being relatively scarce, empirical studies tend to show that, beyond usual determinants of current accounts, financial development seems also clearly matter and particularly in oil economies.

[7] Cooperation Council of the Arab States of the Gulf.

However, research on this field mainly relies on standard panel regression models which have two major drawbacks. Firstly, they assume that oil economies deploy their oil revenues in a similar way and that financial development exerts the same impact across them. Such an assumption is obviously too restrictive. Indeed, according to IMF (2006a), spending rates differ across oil exporters. For example, they have been relatively low in GCC countries, but considerably higher in the Islamic Republic of Iran. Moreover, as financial development in oil-exporting countries can be affected by several factors—as the dependence degree on natural resources and/or on official sector, the development stage of the economy, the financial openness—it differs also between oil economies. We may then expect a nonlinear relationship between net savings and its usual determinants, depending on the level of financial development. Secondly, the use of standard panel regression models implies that determinants of current accounts exert a constant impact over the period examined. This assumption can be also unrealistic if current accounts are examined over a large time dimension period. In particular, the speed and/or the degree with which current accounts can adjust in relation to oil price fluctuations may be a critical factor for oil-exporting countries.

In order to circumvent both these issues, we investigate the pattern of oil exporter's current accounts by accounting for nonlinear effects. More specifically, we investigate the potential threshold effect exerted by the level of financial development in the relationship between the current account and oil price changes. This threshold effect is motivated by the conjecture that, if oil prices might lead to higher savings rates, this effect might be mitigated under conditions of higher level of financial development.

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 the financial development and financial openness variables, and the 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). According to this specification, current-account regression coefficients are allowed to vary depending on the level of financial development. More specifically, the observations are divided in—say—two regimes, with estimated coefficients that vary depending on the considered regime. 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:

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

for $t = 1, \ldots, T$, and $i = 1, \ldots N$, 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, $X_{i,t}$ is a vector of control variables that can include the transition variable, and $\varepsilon_{i,t}$ is an independent and identically distributed error term. Note that since our focus is on 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 depending on the financial development degree. 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, $j = 1, \ldots, m$, 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:

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

We can generalize the PSTR 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:

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

We rely on the methodology proposed by González et al. (2005) consisting in three steps.[8] The first, identification step 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. The second, estimation step relies on the use of nonlinear least squares to obtain the parameter estimates, once the data have been demeaned (Hansen, 1999; González et al., 2005). In the third, evaluation step, various misspecification tests are applied to check the validity of the estimated PSTR model and determine the number of regimes $(r + 1)$.

[8] For 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).

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 other variables, the crude oil price (Brent) series, expressed in logarithmic terms, is extracted from the BP Statistical Review of World Energy. 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.[9] They include currency plus demand and interest bearing liabilities of banks and nonfinancial intermediaries divided by GDP. This indicator is the broadest measure of financial intermediation and includes three types of financial institutions: the central bank, deposit money banks, and other financial institutions.

Following the previous literature[10], we consider other current-account determinants that are all taken from WDI database: 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, 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 the GDP growth rate.[11]

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.[12]

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.[13] Results are

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

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

[11] 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.

[12] 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%).

[13] 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.

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 financial deepening impacts 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.

Table 2. Estimation of the PSTR model

Variable	*Coefficient*	*t-statistic*
Oil (first log. diff)	0.1997	2.1821
Oil (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	

Table 2 reports the results of the estimation of our PSTR model using financial deepening (M2/GDP) as the transition variable. Let us first comment the results concerning the control variables. As emphasized in Section 2, the effect of financial deepening on current account imbalances is not clear-cut. Indeed, on the one hand, financial development may be seen as reducing current surplus given that a high level of financial development may induce more sophisticated savings instruments which may in turn be more easily transformed into spending. This effect on spending might also be magnified by higher investment rates if removing borrowing constraints improves credit conditions and financial intermediation (Arezki and Hasanov, 2013). On the other hand, if one considers that high degree of financial development is associated with higher returns and lower risks of investment, it could have a positive effect on accumulation of foreign assets, then widening current surplus. Our findings show that the financial deepening effect on the current account is negative for our panel of oil-exporting countries. This conclusion is consistent with the findings of Kennedy and Slok (2005), Gruber and Kamin (2007), Cheung et al. (2010) and Arezki and Hasanov (2013). However, its interpretation has to be made in the light of oil exporters' specific features. Indeed, for countries characterized by a high level of development, financial deepening may raise the return of their savings and facilitates then its transformation into a permanent increase in public and private consumption. In this respect, some countries have set up long-run inter-generational savings funds with the objective of using interest income to finance a 'permanent' increase in consumption (as for example Norway). For economies characterized by a low developed financial system, the borrowing constraint may potentially be important. Financial deepening by relaxing this constraint may not only encourage those economies to increase international borrowing at the expense of their precautionary savings, but can also improve their credit conditions and then their domestic investment. Those interpretations are thus somewhat different from that provided by Cheung et al. (2010) relying on the "bypass" effect through financial capital flows and "global saving glut" phenomena (Bernanke, 2005, 2007). Indeed, the main argument resulting from our result is that the more developed financial systems are, not necessarily the less saving but rather the more spending (consumption and/or investment) a country will be enable to undertake.

Turning to the NFA to GDP ratio, its effect on the current account is positive. This result is not surprising given that 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.[14]

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

[14] 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.

Regarding now terms of trade, we find a positive effect on the current account. This result, consistent with the findings of the literature on the Harberger–Laursen–Metzler effect, is not surprising. Indeed, if one considers that an improvement in terms of trade raises income and that spending increases less than income, as in oil exporters, saving will necessarily increase.

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.[15] Through this saving channel[16], 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 reach 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.

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

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

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

At a more disaggregated level, Table A1 and Figure 2 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 average estimated impacts of an oil price variation on the current account vary from one country to another and depend negatively on the level of financial development, corroborating our primary intuition given by Figure 1. Figures 3a to 3c 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.[17] In the first group (Figure 3a), 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 3b 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 3c)— 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 financial 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 borrowing constraints, frictions in investment dynamics and/or absorptive capacity constraints, 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 financial 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 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 public and private consumption.

4.3. Robustness checks

4.3.1.1. 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 measure used to proxy financial deepness. Financial development refers to a set of phenomena acting on the financial system[18] and may indeed be proxied

[17] 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 A1 in Appendix) to the estimated threshold value (25%).

[18] 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.

by various indicators[19], 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 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 allow us to focus on another channel of financial development through the role played by traditional bank intermediation, while the M2/GDP ratio reflects instead the effect of the depth and the liquidity of financial markets. Series are extracted from Beck and Demirgüç-Kunt (2009) 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 (first log. diff)	0.1161	3.5312	0.1546	3.4420
Oil (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	

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

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 oil price – current account relationship is also highlighted for all retained proxies: oil price variations exert a positive impact on the current account position for less financial developed countries, while this influence tends to diminish when the degree of financial deepness augments.

4.3.2. Inclusion of fiscal balance to GDP ratio

As supplementary robustness checks, we have estimated various PSTR specifications adding 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). The first two variables appeared non-significant in our regressions, and the main interesting results are obtained with the third one. Indeed, while the fiscal balance to GDP ratio is a standard current account determinant[20], it exerts a particularly high impact in oil-exporting countries because of the larger role played by the government which usually exclusively holds oil export revenues (Basher and Fachin 2011; Arezki and Hasanov, 2013). While increasing public savings is usually associated with larger current surplus, two additional effects may be at play in the case of oil exporters. On one hand, this positive relationship can be mitigated by the possibility that consumers follow a Ricardian behavior. In particular, if they fully anticipate a rise in oil revenues, they can boost their private consumption by increasing their private borrowing as has happened in Kazakhstan where private borrowing has offset public saving. On the other hand, this positive relationship may be magnified by the fact that, in the most indebted countries, some of the revenue saved by the government—giving the limiting tax raising capacity—will be invested in debt reduction (van der Ploeg and Venables, 2011). The Ricardian equivalence hypothesis is rejected by our estimations (reported in Table 4) since we get a positive and significant coefficient associated with the fiscal balance variable. In addition, and this is a key finding, introducing this variable in our model does not change the obtained results: 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 the threshold value that decreased 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%. This finding supports 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.[21]

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

[21] 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.

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

Variable	*Coefficient*	*t-statistic*
Oil (first log. diff)	0.5286	3.7813
Oil (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' degree of financial development. More specifically, there exists a threshold of financial deepness—estimated at 25%—below which an increase in oil price improves the current account position and beyond which the intensity of this positive effect declines. In other words, oil price variations exert a positive impact on the current account position for less financial developed oil-exporting countries, while this influence is less pronounced when the degree of financial deepness augments. Variations with the definitions of financial development and controlling for the role of fiscal balances make no qualitative differences, putting forward the robustness of our findings.

Possible implications of our results are important. Rising oil prices are not the main driver of current surplus in high-developed financial oil exporters, their role being only significant in less developed financial 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 institutional capacity of these economies to set up an efficient financial system.

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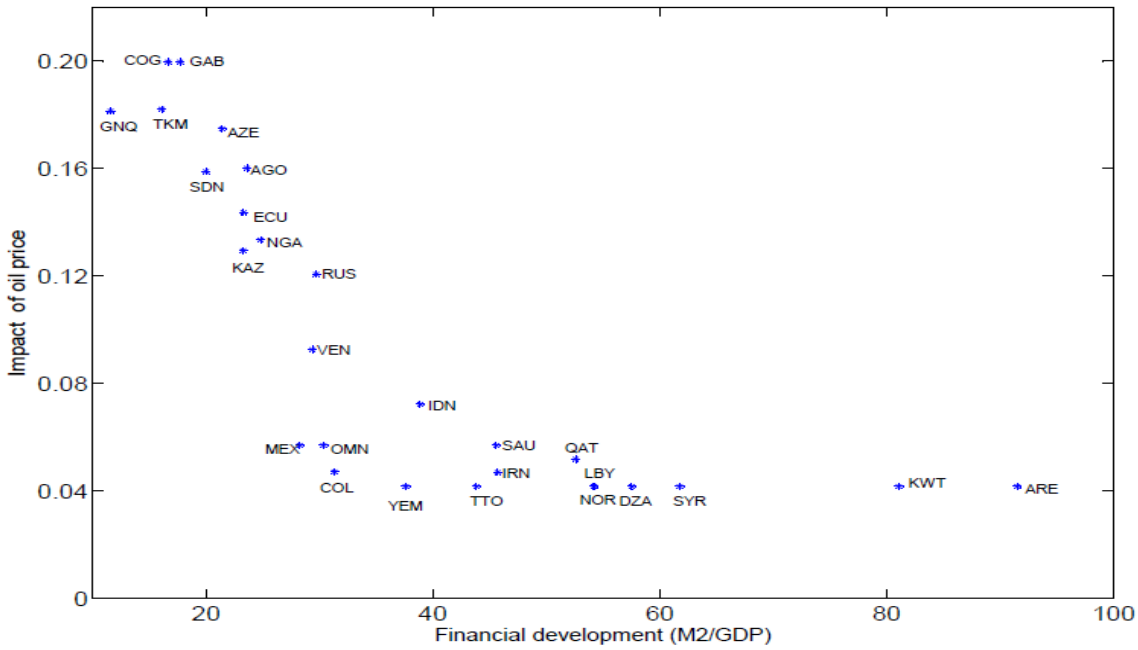
APPENDIX

Table A1. 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 2. 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 3. Relationship between oil prices and current accounts in oil exporters: the role of the level of financial development

Figure 3a. Oil exporters with a low level of financial development

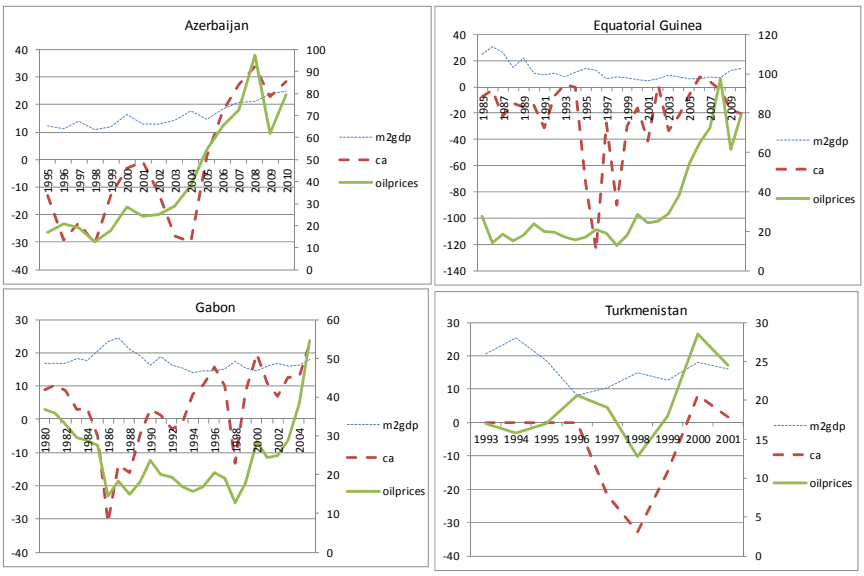


Figure 3b. Oil exporters with an intermediate level of financial development

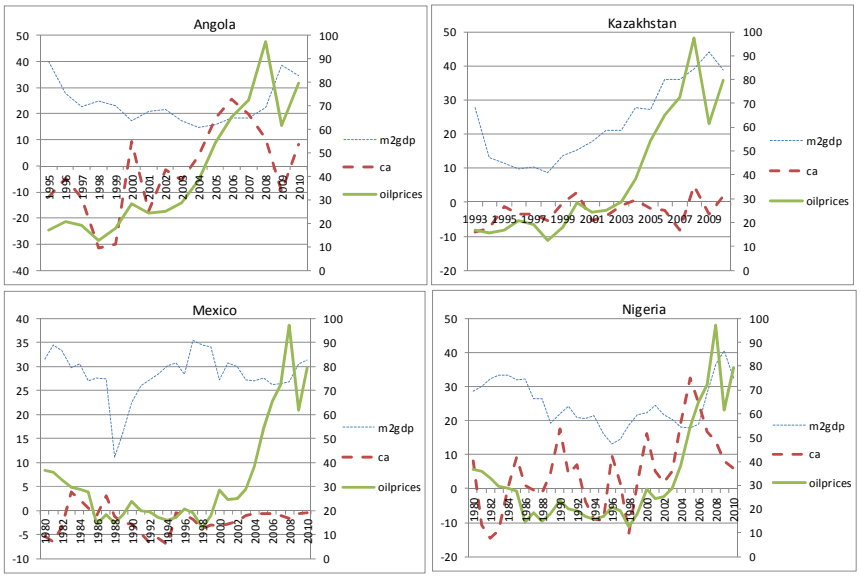
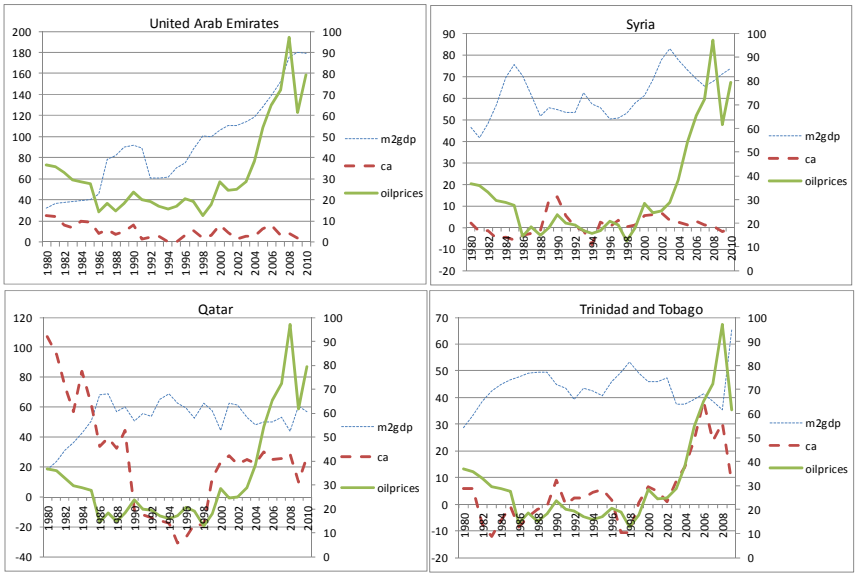



Figure 3c. Oil exporters with a high level of financial development