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Natural resources and the spread of HIV/AIDS: curse or blessing?

Olivier C. Sterck[1]

CSAE - University of Oxford

Abstract

This paper answers two questions: "What impact have natural resources had on the spread of the HIV/AIDS epidemic so far?" and "What role can natural resource rents play in order to finance the long-run response to HIV/AIDS?" Using a panel dataset, de Soysa and Gizelis (2013) provided evidence that oil-rich countries are more deeply affected by the HIV epidemic. They concluded that government of resource-rich countries failed to implement effective public policies for dealing with the HIV/AIDS epidemic. In this paper, I show that their results are not robust and are spurious because the dependent variables and explanatory variables considered in their analysis are non-stationary. After correcting for these issues, I find no specific relationship between resource rents and the spread of HIV/AIDS. I conclude by discussing the potential of resources rents for financing the long-term liability brought about by the HIV/AIDS epidemic in sub-Saharan Africa.

Keywords: HIV/AIDS, natural resources, resource curse, epidemics, spurious regression, non-stationarity
JEL Classification: I1, I18, E6, Q32

1. Introduction

According to UNAIDS estimates, an estimated 35.3 million people were living with HIV in 2012 (UNAIDS, 2013b). This represents an increase from previous years as more people are receiving life-saving antiretroviral therapies (ART). Considerable effort in scaling-up prevention and treatment coverage translated into a 33% decline in the number of new infections compared to 2001. The international community and high-prevalence countries act in concert to finance the fight against HIV. Between 2002 and 2007, international HIV assistance from donor governments increased more than six-fold, jumping from US$ 1.2 billion in 2002 to US$ 7.7 billion in 2008 (UNAIDS, 2013a). Domestic spending accounted for around half of all HIV-related spending in 2012.

This encouraging picture should not mask the current difficulties for closing the global AIDS resource gap. Indeed, since the 2008 financial turmoil, international HIV assistance stagnated and AIDS expenditures remain short of the global target of US$ 22-24 billion in annual financial resources (UNAIDS, 2013b). Given the stagnation in international funding for HIV/AIDS, high-prevalence countries will have to increase their own contribution to the fight against HIV/AIDS.

Within this context, the abundance of natural resources in sub-Saharan Africa may seem a panacea for financing effective public action against HIV/AIDS. However, in a recent paper, de Soysa and Gizelis (2013) (hereafter DG) showed that oil wealth is associated with a higher prevalence rate of HIV, higher death rates from AIDS and a higher prevalence of tuberculosis (TB). The authors interpret their findings by referring to the large and heavily debated literature on the resource curse (see van der Ploeg (2011) for a review of the literature). Broadly speaking, the resource curse hypothesis states that the the exportation of natural resources may have a detrimental impact on growth,

Email address: olivier.sterck@economics.ox.ac.uk (Olivier C. Sterck)

[1]CSAE, University of Oxford, Manor Road, Oxford OX1 3UQ, United Kingdom. Olivier Sterck thanks the RUSH Foundation for its financial support. This paper is part of the RUSH-funded RethinkHIV project.

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institutions and conflicts[2]. In line with the resource curse literature, DG suggest that the "resource curse affects the spread of diseases because of the effect on rulers' incentives, as rulers in resource-wealthy states are more likely to neglect public goods provision, such as health, and neglect effective public action".

In line with the analysis of DG, this paper aims to answer two intermingled questions: "Have natural resource rents had an impact on the spread of the HIV/AIDS epidemic so far?" and "What role can natural resource rents play in order to finance the long-run response to HIV/AIDS in sub-Saharan Africa?" The analysis proceeds in three steps.

In a first step, I argue that the empirical analysis of DG suffers from significant methodological and conceptual flaws which cast doubts on their findings, that is, on the existence of a resource curse on HIV/AIDS. Four arguments are developed in section 2. First, I show that the positive association between oil rents and prevalence is not robust to alternative specifications and samples. In particular, the relationship heavily depends on the inclusion in the sample of Sudan, Equatorial Guinea, and to a lesser extent Guatemala and South Africa.

Second, the causal interpretation of the positive association between oil resources and the spread of HIV and TB epidemics fails to pass placebo tests. In particular, future oil rents per capita are shown to better predict the prevalence of HIV and TB and the death rate from HIV than current rents.

Third, I argue that the positive association between oil rents and the spread of the HIV and TB epidemics is spurious because the dependent variables (HIV prevalence, death rate from AIDS and TB prevalence) and explanatory variables (oil rents per capita) are non-stationary. After differentiating the series to make them stationary, I show that the positive associations between oil rents and the spread of the HIV and TB epidemics vanish.

Finally, I show that the expected impact of good public action on HIV prevalence is ambiguous, which makes the results of DG impossible to interpret. Indeed, an appropriate response to the HIV epidemic is expected to reduce prevalence through prevention, but also to increase prevalence in the short and medium run via the provision of antiretroviral therapies (ART). The total impact of good governance on HIV/AIDS prevalence is therefore ambiguous, at least in the short and medium run. The death rates from AIDS and the prevalence of TB are affected by similar problems.

Then, in a second step, I propose a method correcting these methodological and conceptual flaws. This new analysis finds no specific relationship between oil rents and the spread of HIV/AIDS (section 3); if anything, the relationship seems to be negative.

Finally, in section 4, I conclude by discussing the potential of natural resource rents for financing the long-term liability brought about by the scaling-up of ART in sub-Saharan Africa. In particular, the analysis identifies countries where an efficient management of natural resource rents could provide the necessary fiscal space for scaling-up ART coverage in the future.

The contribution of this paper is threefold. First, it provides evidence that the resource curse on HIV is misleading. Rather, this paper shows that natural resources offer a considerable potential to create fiscal space in sub-Saharan Africa. As international HIV assistance stagnated since the 2008 financial crisis, this fiscal space may ultimately be crucial to finance the long-term liability brought about by the HIV/AIDS epidemic. Finally, this paper demonstrates the difficulty of panel data analysis with epidemiological data, and provides some tools to produce a rigorous analysis. In particular, it emphasizes the high risk of spurious nonsense regression caused by the non-stationarity of the series.

[2]For the impact of natural resources on growth, see e.g. Sachs and Warner (2001, 2005); Boschini et al. (2007); Brunnschweiler (2008); van der Ploeg and Poelhekke (2009), on institution see e.g. Ross (2001); Jensen and Wantchekon (2004); Bulte et al. (2005) and on conflict, see e.g. Fearon and Laitin (2003); Collier and Hoeffler (2004); Brunnschweiler and Bulte (2009); Collier et al. (2009). Recently, the existence of a resource curse was heavily debated (Alexeev and Conrad, 2009; Brunnschweiler and Bulte, 2008; van der Ploeg and Poelhekke, 2010).

2. Revisiting de Soysa and Gizelis (2013)

The objective of DG was to assess the impact of resource abundance on the spread of the HIV epidemic. Their analysis considered three dependent variables[3]: the logarithm of HIV prevalence, the logarithm of the death rate from AIDS, and the logarithm of TB prevalence. This section focuses on HIV prevalence as a dependent variable. In appendix, the same analysis is conducted for deaths rate from AIDS and TB prevalence, with similar results.

In their main specification, the dependent variable is the logarithm of the prevalence of HIV which is taken from the AIDSInfo database. The main explanatory variable is the oil rents per capita in current US$ from the World Bank environmental accounting indicators[4]. The control variables considered are the logarithm of income per capita taken from the World Development Indicators of 2010, the Cheibub et al. (2010) index of democracy, the incidence in the current year of an episode of civil war and the cumulative years of peace since the last episode of civil war or independence (Gleditsch et al., 2002), and finally, the average incidence of HIV/AIDS prevalence in neighboring countries.

The main results of DG are presented in table 1, columns (1) and (2). The regression presented in column (1) accounts for year fixed effects. In column (2), both year and country fixed effects are included. The positive coefficients associated with oil rents per capita suggest that oil rents are associated with a higher prevalence of HIV. This section shows that this result (1) is not robust to alternative specifications and samples, (2) fails to pass placebo tests, (3) is spurious because HIV prevalence and oil rents per capita are non-stationary and (4) is impossible to interpret because the expected impact of bad policies on HIV prevalence is ambiguous.

2.1. Robustness to alternative specifications and samples

As a first robustness check, I verified whether results of DG still hold when the control variable measuring the average incidence of HIV/AIDS prevalence in neighboring countries is expressed in logarithm. This transformation makes sense as in all the regressions of DG, the prevalence of HIV, the oil rents per capita and the income per capita are expressed in logarithm. This incoherence is corrected in columns (3) and (4). Importantly, it shows that relationship between oil rents per capita and HIV prevalence is not significant anymore when only year fixed effects are accounted for.

Then, columns (5) to (8) show that the main results of DG do not hold when HIV prevalence and oil rents per capita are expressed in level rather than in logarithm. The coefficient associated with oil rents per capita is even negative and highly significant when HIV prevalence is expressed in level and oil rents per capita are expressed in logarithm. Overall, this suggests that the only specification which is consistent with a resource curse on HIV is the one with variables expressed in logarithm and with both country and year fixed effects.

In order to assess the robustness of DG's results when alternative samples are considered, I repeated their analysis by excluding each country of the sample in turn. I focused on the specification in logarithm with year and country fixed effects as the other specifications were shown to lead to results that are inconsistent with the presence of a resource curse on HIV. Interestingly enough, I found that only a few countries are responsible for the positive relationship between oil rents per capita and HIV prevalence, namely Sudan (HIV prevalence in 2008 = 1%, oil rents per capita in 2008 = 370$), Equatorial Guinea (HIV prevalence in 2008 = 4.7%, oil rents per capita in 2008 = 17386$) and to a lesser extent Guatemala (HIV prevalence in 2008 = 0.8%, oil rents per capita in 2008 = 34$) and South Africa (HIV prevalence in 2008 = 17.9%, oil rents per capita in 2008 = 11$). Table 2 illustrates how these countries affect the coefficient associated with the logarithm of oil rents per capita. Sudan is excluded from the main regression in column (1). Equatorial Guinea is excluded in column (2). Both Sudan and Equatorial Guinea are excluded in column (3). In column (4), these two countries plus Guatemala are excluded. In column (5), the three aforementioned countries plus South Africa are excluded.

[3]The data were kindly provided by the authors.

[4]Using oil rents per capita in constant US$ rather than current US$ can arguably be preferable (van der Ploeg and Poelhekke, 2010). However, it does not change the main results of DG, nor the main criticisms of this section (results available on demand).

Table 1: Robustness to alternative specifications

	Dependent variable: HIV Prevalence (log)				Dependent variable: HIV Prevalence			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Oil Rents pc. (log)	0.038***	0.062**	0.007	0.064**			-0.095***	-0.032
	(0.013)	(0.030)	(0.010)	(0.031)			(0.028)	(0.050)
Oil Rents pc.					-0.000	0.000		
					(0.000)	(0.000)		
GDP pc. in PPP (log)	-0.345***	0.342***	-0.121***	0.296***	-0.277***	0.675***	-0.205**	0.790***
	(0.032)	(0.100)	(0.026)	(0.101)	(0.098)	(0.241)	(0.098)	(0.244)
Democracy index	0.101	0.065	0.211***	0.047	-0.206**	0.102	-0.358***	0.098
	(0.078)	(0.054)	(0.061)	(0.053)	(0.101)	(0.108)	(0.120)	(0.108)
Time last civil war	0.005***	0.006***	0.000	0.007***	0.015***	0.017***	0.013***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)
Incidence of civil war	-0.365***	-0.054	-0.331***	-0.056	-0.685***	0.119*	-0.625***	0.121*
	(0.087)	(0.045)	(0.085)	(0.046)	(0.197)	(0.067)	(0.187)	(0.068)
Neighbors' HIV prevalence	0.291***	0.097***			0.919***	1.011***	0.911***	1.013***
	(0.012)	(0.012)			(0.060)	(0.096)	(0.059)	(0.096)
Neighbors' HIV prevalence (log)			1.755***	0.712***				
			(0.046)	(0.153)				
Constant	1.050***	-5.239***	-1.306***	-5.091***	2.352***	-8.012***	2.047**	-9.032***
	(0.290)	(1.009)	(0.242)	(1.016)	(0.851)	(2.463)	(0.829)	(2.418)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2041	2041	2041	2041	2041	2041	2041	2041

Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Robustness to alternative samples

	Dependent variable: HIV Prevalence (log)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Oil Rents pc. (log)	0.022	0.026	-0.037	-0.053**	-0.068***	0.035	0.032
	(0.031)	(0.033)	(0.026)	(0.024)	(0.022)	(0.034)	(0.041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time and country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2022	2022	2003	1984	1965	383	509

Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Taken together, these regressions show that the positive relationship between oil rents per capita and HIV prevalence is driven only by these four countries. The resource curse identified by DG vanishes when these countries are excluded from the regression. The coefficient associated with oil rents per capita even becomes negative and significant in regression (4) and (5).

In the columns (6) and (7) of table 1, I further assess the robustness of the results to alternative samples. First, as HIV is the most prevalent in sub-Saharan Africa, it seems natural to assess whether the relationship holds for sub-Saharan Africa only. Column (6) shows that this is not the case. Similarly, it is intuitive to check whether the positive relationship between oil rents per capita and HIV prevalence still holds when only countries facing a generalized epidemic are considered[5]. Again, the positive relationship between oil rents per capita and HIV prevalence is not significant anymore for this alternative sample.

[5]Countries facing a generalized epidemic are defined as those whose HIV epidemic overstepped a prevalence of 1% between 1990-2008.

2.2. Placebo test

The previous section showed that the correlation between oil rents per capita and HIV prevalence is mainly driven by four countries. A common way to assess whether a correlation between two variables is causal is to run a "placebo test". This is done in table 3, in which oil rents per capita at time t is replaced by oil rents per capita at time t+1 (column 1) and t+2 (column 2). All countries are included in the regression.

If the relationship between oil rents per capita and HIV prevalence is causal and if the specification used in DG is correct, future values of oil rents per capita should not have a significant impact on HIV prevalence. Table 3 shows that future values of oil rents per capita are positively related to HIV prevalence and the relationship remains significant. The coefficients associated with oil rents per capita are even slightly higher in the placebo regressions. This indicates that the resource curse on HIV may be a "red herring" and that the relationship between oil rents per capita and HIV prevalence may be spurious.

Table 3: Placebo tests

	Dependent variable: HIV Prevalence (log)	
	(1)	(2)
Oil Rents pc. (log) in $t + 1$	0.071**	
	(0.033)	
Oil Rents pc. (log) in $t + 2$		0.068**
		(0.035)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1908	1799
R^2		

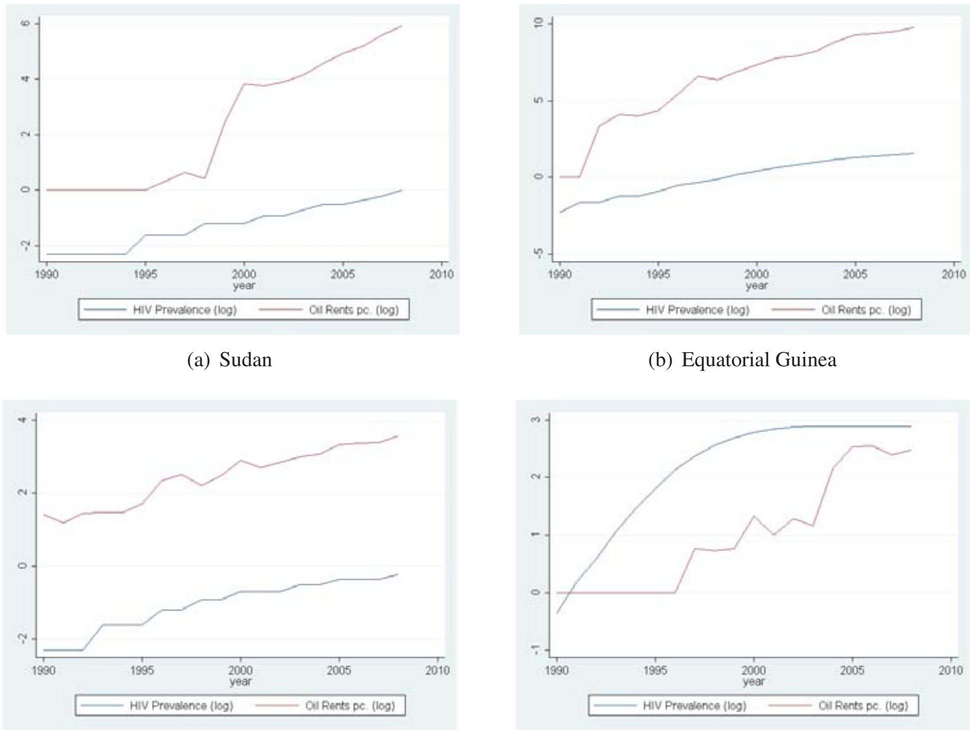
Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.3. Non-stationarity of series

Figures 1 (a) to (d) show how HIV prevalence and oil rents per capita have evolved between 1990 and 2008 in the four countries which were shown to drive the findings of DG. It shows that overall, the logarithm of HIV prevalence and the logarithm of oil rents per capita have been increasing between 1990 and 2008 in these four countries. At a first glance, however, the movement of the series does not seem to be synchronized around the increasing "trends". Taken together, these figures suggest that the positive relationship between HIV prevalence and oil rents per capita may be spurious, driven by the non-stationarity of some of the series. Not taking into account the dynamical structure and the non-stationarity of the series may result in a problem of nonsense, or spurious regression (Breitung and Pesaran, 2008). In this case, inference based on t-values can be very misleading (Verbeek, 2008; Baltagi, 2008). Non-stationarity may be induced by the presence of a unit root or by the presence of a trend. Let us examine these two possibilities.

Recently, several tests were developed in order to assess the presence of unit roots in panel data. Here, we focus on the Im-Pesaran-Shin test (Im et al., 2003), the Maddala-Wu test (Maddala and Wu, 1999) and the Hadri LM test (Hadri, 2000) because they allow for heterogeneous auto-regressive coefficients between cross-sectional observations (Verbeek, 2008; Baltagi, 2008). The null hypothesis of the Im-Pesaran-Shin and the Maddala-Wu tests is that all panels have a unit root. The alternative hypothesis is that some panels are stationary. On the contrary, the the null hypothesis of the Hadri LM test assumes that all the panels are stationary. The alternative hypothesis is that at least some of the panels contain a unit root.

Applying these tests to the logarithm of HIV prevalence results in the strong rejection of the null hypothesis for all three tests (table D.17 in appendix). This implies that some of the series have a unit root, and others not. For



(a) Sudan (b) Equatorial Guinea

(c) Guatemala (d) South Africa

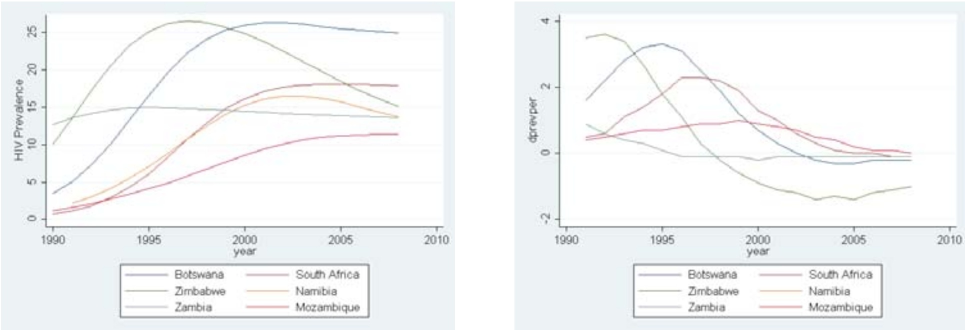
Figure 1: Oil rents per capita (log) and HIV prevalence (log) between 1990 and 2008

each cross-sectional unit, I then ran an augmented Dickey-Fuller test (H0 = the variable has a unit root) and a KPSS test (H0 = the variable has no unit root) in order to identify which series have a unit root (table D.18 in appendix). Strikingly, the null hypothesis of a unit foot failed to be rejected for two-thirds of the countries analyzed[6]. The KPSS tests are even more radical, rejecting the null hypothesis of no unit root in all but two cases (Indonesia and Chad).

In order to test for the presence of a linear trend in HIV prevalence series, I regressed these series on a time variable. In a second set of regression, I also included the square of the time variable in order to test for the presence of a non-linear trend. Strikingly, these regressions show that all HIV prevalence series but three (Sudan, Vietnam, Chile) are characterized by non-linear trends (table D.18 in appendix). Importantly, the coefficients associated with the time variables are significantly different from one country to another. In fact, this result is not surprising if one studies epidemiological models predicting the spread of the HIV epidemic over time (Keeling and Rohani, 2008). After the onset of the HIV epidemic, the prevalence of the disease is expected to experience a sharp increase, peaking at some point, and then smoothly decreasing toward its steady-state level. Because of the non-linear natural dynamics of the HIV epidemic over time, HIV prevalence should be thought has a AR(1) process with a non-linear trend. This non-linear trend is expected to be different for each country. Figure 2(a) which shows the evolution of HIV prevalence over time in the most affected countries in Africa makes this evolution over time clear. Importantly, it shows that most series of HIV prevalence are non-stationary, confirming the results of the econometric tests.

Applying the Im-Pesaran-Shin, the Maddala-Wu, and the Hadri LM tests to the logarithm of oil rents per capita gives similar results (table D.17 in appendix). The null hypothesis of the three tests are rejected, implying that some

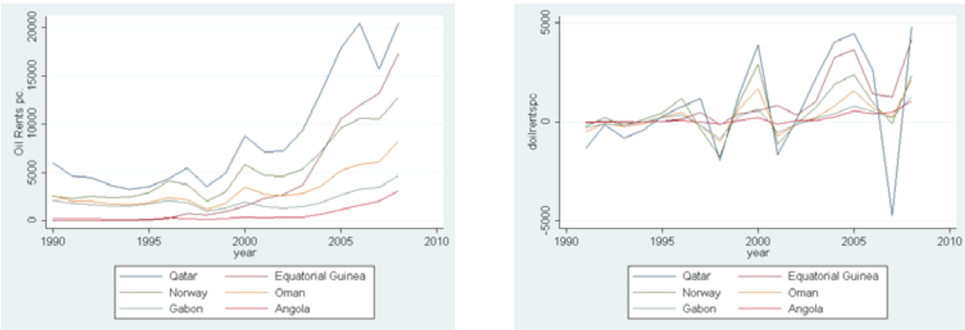
[6] In doing this exercise, I only focused on countries that have produced some oil between 1990 and 2008 and whose HIV prevalence was not constant between 1990-2008, as these are the cross-sectional units which may be held responsible for a spurious relationship between HIV prevalence and oil rents per capita.



(a) HIV prevalence (b) Δ HIV prevalence

Figure 2: Evolution of HIV prevalence between 1990 and 2008

of the series have a unit root, and others not. The augmented Dickey-Fuller tests reject the null hypothesis of a unit root for two countries only[7] (table D.21 in appendix). The KPSS tests reject the null hypothesis of no unit root for all countries. In fact, all but three series appear to be characterized by non-linear trends. Figure 3(a) shows the evolution of oil rents per capita over time for a handful of oil-rich countries. The increasing trends confirm the results of the tests: most series of oil rents per capita are non-stationary.



(a) Oil rents per capita (b) Δ Oil rents per capita

Figure 3: Oil rents per capita between 1990 and 2008

The fact that the two series of interest are non-stationary implies that the fixed effect estimator is likely to give spurious results[8] (Verbeek, 2008; Baltagi, 2008; Breitung and Pesaran, 2008). One solution often used to avoid the measurement of a nonsense relationship consists in first-differentiating the data until the series are stationary (Verbeek, 2008). However, a quick look at figure 2(b) shows that prevalence of HIV is likely to remain non-stationary after first-differentiation.

Formally, the Im-Pesaran-Shin, the Maddala-Wu and the Hadri LM tests were applied for the first-differentiated series (table D.17). For both the logarithm of HIV prevalence and the logarithm of oil rents per capita, the null hypothesis are rejected, implying that some of the series have a unit root and others not. Augmented Dickey-Fuller tests, KPSS tests and “time trend’ tests’ applied to each cross-sectional unit confirm this diagnostic (table D.19 and D.22 in appendix).

[7] Chad and Israël.

[8] The introduction of year fixed effects is not expected to prevent spurious regression phenomenon as the time trends associated to the series are different from one country to another (see appendix A).

After differentiating the series a second time, the null hyppothesis of the Im-Pesaran-Shin and the Maddala-Wu are rejected, and the null hypothesis of the Hadri LM test cannot be rejected for both series, meaning that the logarithm of HIV prevalence and the logarithm of oil rents per capita seem stationary after differentiating twice the series. Augmented Dickey-Fuller tests, KPSS tests and "time trend" tests applied to each cross-sectional unit overall confirm this diagnostic[9].

In table 4, the main regression of DG is replicated for first-differentiated and second-differentiated series. The coefficient associated with the logarithm of oil rents per capita is not significant (and negative for the second-differentiated model). This confirms that the identification of a resource curse on HIV was a "red herring" induced by the non-stationarity of dependent and independent variables.

Table 4: First- and second-difference models

	Dependent variable: HIV Prevalence (log)	
	First-difference model	Second-difference model
	(1)	(2)
Oil Rents pc. (log)	0.004	-0.015
	(0.016)	(0.024)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1902	1790

Newey-West standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.4. The ambiguous impact of prevention and treatment on HIV prevalence

DG justify the presence of a resource curse on HIV by the fact that "rulers in resource-wealthy states are more likely to neglect public goods provision, such as health, and neglect effective public action". However, I argue that the choice of HIV prevalence as a dependent variable is misleading because the impact of good/bad policies on prevalence is ambiguous.

The optimal response to the HIV/AIDS epidemic is indeed a mix of prevention and antiretroviral therapy (ART) targeted to most infectious and most at risk individuals. The expected impact of prevention is to reduce risk-taking behavior, thereby reducing HIV incidence and, ultimately, HIV prevalence. The impact of treatment is to reduce the viral load in infected individuals, thereby increasing their life expectancy and reducing their infectiousness. The impact of treatment on prevalence is therefore ambiguous. In the short and medium run, it increases prevalence through increased life expectancy. In the long run, however, prevalence is reduced because of the reduced infectiousness of HIV-positive individuals on ART. The total expected impact of an effective public response to the HIV epidemic on HIV prevalence is therefore ambiguous, at least in the short and medium run. A positive correlation between oil rents per capita and HIV prevalence can be interpreted as a neglect public goods provision, but also as an increased access to HIV treatment.

It is also important to note that prevention is expected to have a long-run impact on HIV transmission, and that this impact is expected to increase over time. Indeed, one infection prevented at time t implies one infectious individual less in the future. In turn, this uninfected individual will not transmit the disease implying that one infection prevented at time t may prevent much more than one infection after time t. The long lasting impact of prevention is not accounted for in the specification of DG.

[9]For the logarithm of HIV prevalence, it should be noted that the KPSS tests reject the null hypothesis of stationarity for all high-prevalence countries, including oil-rich countries such as South-Africa, Angola, Nigeria, Cameroon, Ivory Coast and Thailand. This confirms that one has to be careful when making inference on HIV time series, as they are characterized by very particular non-linear trends.

3. An alternative specification

3.1. Identification strategy

The analysis of the previous section and of the appendixes showed that a rigorous assessment of the relationship between natural resource abundance and the spread of the HIV epidemic should: (1) be based on indicators that are not ambiguous, (2) account for the epidemiology of the HIV epidemic and capture the long-run impact of prevention and treatment on its spread, and finally (3) be based on a rigorous method which is not subject to the problem of spurious regression. This section proposes an alternative specification which aims to solve these challenges in a single move.

The method proposed in this section is inspired from the work of Alexeev and Conrad (2009). These authors criticized the usual approach to testing the presence of the curse of oil which consists of regressing GDP growth rates over a period of time on a measure of the economy's reliance on oil and on other control variables. Because more or less reliable GDP data is only available from 1970 onwards, this method does not take into account the fact that resource-rich countries may have grown on average more than their resource-poor counterparts, but that this higher growth rate occurred before 1970. Their empirical strategy therefore mimics the approach of Hall and Jones (1999); Easterly and Levine (2003) and Rodrik et al. (2004), by looking at the levels of GDP per capita rather than growth rates. As they argue: "After all, countries with high per capita GDP must have been growing fast at some point in time".

In line with this, two different dependent variables will be used in this section: the total number of individuals which were infected by the HIV virus, and the total number of individuals who died from AIDS. These indicators are constructed as follows. First, the total number of person which were infected by the HIV virus is simply the sum of the incidence of HIV[10] for each year between 1990 and 2008, plus the prevalence in 1990 [11]. The second indicator is the sum of deaths rates from AIDS since 1990. Unfortunately, this indicator does not take into account the deaths which occurred before 1990. It is worth noting that for most countries, this number has been quite low before 1990, at least, when compared to the death rates at the end of the 90s. However, let us keep in mind that this indicator is a lower bound for the total number of dead from AIDS. Contrary to HIV prevalence, these two new indicators are expected to be negatively affected by both prevention and antiretroviral therapies.

In order to obtain comparable results, the set of explanatory and control variables is based on the DG analysis. First, as incidence and death rates, oil rents per capita in constant $US are aggregated over the whole 1990-2008 period[12]. For the other controls, I used the value of the variables in 1990 in order to minimize the risk of endogeneity. In line with Oster (2012), I also included the distance to the origin of the HIV virus, the square of the distance and the cube of the distance as supplementary control variables.

3.2. Results

OLS estimations for the total number of infected individuals are presented in table 5. In columns (1) to (3), the dependent variable is in level, while in columns (4) to (6), the dependent variable is in logarithm. Overall, the results are consistent with the absence of a resource curse on HIV/AIDS. If anything, the relationship between oil rents and the total incidence of HIV seems to be negative but weakly significant. The coefficient associated with total oil rents per capita (log) is very small: a one standard deviation increase in total oil rents per capita (log) is expected to reduce the total incidence of by 0.017 standard deviation. Not surprisingly, the best predictor for the total incidence of HIV is the prevalence of HIV in neighboring countries in 1990, as well as the distance to the origin of the HIV virus.

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[10] It is worth noting that HIV incidence data is also non-stationary, and, as HIV prevalence, characterized by a non-linear trend which compromises the use of methods for panel data.

[11] As a robustness check, this indicator was compared to the simple sum of HIV incidence for each year between 1990 and 2008. The two indicators give similar results.

[12] Using current $US instead of constant $US does not affect the results. I also aggregated the oil rents per capita for smaller intervals (5 years) in order to assess the evolution of the impact of rents over time. However, this leads to highly multicollinear variables which cannot be used for inference.

These results are robust to alternative specifications. In particular, the coefficients and their significance are not much affected when alternative measures of natural resources wealth based World Development Indicators are considered, when the log of the total oil rents per capita is expressed in constant $US rather than in current $US, when continental dummies are included and when interaction variables between oil rents per capita (in log) and corruption, distance or a dummy for African countries are included. The use of the between-estimator with the panel data gives the similar results (this estimation method is not subject to the problem of non-stationarity).

Table 5: The impact of oil rents per capita on the total number of infections

Dependent variable:	Total Incidence			Total Incidence (log)		
	(1)	(2)	(3)	(4)	(5)	(6)
Total Oil Rents pc. (log)	-0.566*	-0.450*	-0.726**	-0.040	0.017	-0.034
	(0.293)	(0.247)	(0.310)	(0.053)	(0.030)	(0.037)
GDP pc. in PPP (log)		-0.350	0.314		-0.212	-0.144
		(1.441)	(1.614)		(0.137)	(0.145)
Democracy index		-2.858	-1.688		-0.052	-0.240
		(1.806)	(2.223)		(0.351)	(0.445)
Time last civil war		-0.032	-0.050		-0.008	-0.015
		(0.048)	(0.052)		(0.010)	(0.011)
Incidence of civil war		-4.702**	-3.479		-0.556	-0.603
		(2.357)	(2.412)		(0.428)	(0.479)
Neighbors' HIV prevalence		5.482***				
		(1.626)				
Neighbors' HIV prevalence (log)					3.018***	
					(0.370)	
Distance			-0.014***			-0.003***
			(0.004)			(0.000)
Distance^2			0.000***			0.000***
			(0.000)			(0.000)
Distance^3			-0.000***			-0.000***
			(0.000)			(0.000)
Constant	6.333***	8.816	43.940***	-0.750**	0.074	8.032***
	(2.137)	(12.207)	(12.843)	(0.316)	(1.249)	(0.929)
Observations	113	92	90	113	92	90
R^2	0.037	0.549	0.562	0.006	0.729	0.701

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Similar results are also obtained when the dependent variable is the total number of death from AIDS (in log). Table 6 suggests that the effect of total rents from oil on deaths from AIDS is negative. However, this results is only weakly significant. When the prevalence of HIV in 1990 is controlled for, the magnitude and the significance of coefficients associated with total oil rents are sharply reduced. Again, the best predictor of the spread of HIV is the prevalence of HIV in neighboring countries in 1990, the distance from the origin of the HIV virus as well as the prevalence of HIV in 1990 in the country considered. The HIV epidemic seems to be more an epidemiological issue than a governance issue.

The other control variables do not have a significant impact on the total number of people infected by the HIV virus and on the total number of death from AIDS. Only the incidence of a civil conflict in 1990 seems to have a weakly significant negative impact on the dependent variables. This may be explained by the fact that civil conflicts reduce overall the possibilities of engaging in risky sexual behavior, and this, despite too frequent abuses committed during conflict situations.

Table 6: The impact of oil rents per capita on the total number of deaths from AIDS

Dependent variable:	Total death rates from AIDS				Total death rates from AIDS (log)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total Oil Rents pc. (log)	-0.113**	-0.079*	-0.128***	-0.035	-0.027*	-0.017*	-0.028**	-0.011*
	(0.056)	(0.040)	(0.047)	(0.026)	(0.015)	(0.009)	(0.011)	(0.007)
GDP pc. in PPP (log)		-0.196	-0.066	0.081		-0.043	-0.020	0.003
		(0.265)	(0.288)	(0.151)		(0.048)	(0.053)	(0.034)
Democracy index		-0.398	-0.162	-0.304		-0.078	-0.046	-0.075
		(0.310)	(0.364)	(0.210)		(0.082)	(0.083)	(0.059)
Time last civil war		-0.004	-0.007	-0.014*		-0.002	-0.003	-0.002
		(0.009)	(0.009)	(0.008)		(0.003)	(0.003)	(0.002)
Incidence of civil war		-1.077**	-0.827*	-0.514*		-0.287**	-0.261**	-0.099
		(0.479)	(0.482)	(0.261)		(0.109)	(0.118)	(0.067)
Neighbors' HIV prevalence		1.025***		0.408*				
		(0.283)		(0.207)				
Neighbors' HIV prevalence (log)						0.863***		0.369***
						(0.141)		(0.121)
HIV Prevalence in 1990				0.834***				
				(0.202)				
HIV Prevalence in 1990 (log)								0.312***
								(0.038)
Distance			-0.003***				-0.001***	
			(0.001)				(0.000)	
Distance^2			0.000***				0.000***	
			(0.000)				(0.000)	
Distance^3			-0.000***				-0.000***	
			(0.000)				(0.000)	
Constant	1.319***	2.776	9.543***	0.115	0.474***	0.634	3.043***	0.864***
	(0.406)	(2.364)	(2.785)	(1.100)	(0.101)	(0.425)	(0.370)	(0.291)
Observations	113	92	90	92	113	92	90	92
R^2	0.040	0.558	0.581	0.824	0.031	0.708	0.736	0.874

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4. Discussion

In the previous section, we have seen that natural resources have not yet had a significant impact on the spread of the HIV/AIDS epidemic. Indeed, before the large scaling-up of antiretroviral therapies (ART) in developing countries, the spread of HIV/AIDS has mainly been driven by epidemiological and behavioral factors. This does not mean that natural resources will not have an important role to play in the future. Indeed, the fiscal space which may be potentially created via an efficient exploitation of natural resources offers a real opportunity for resource-rich countries to finance their long-term response to the HIV/AIDS epidemic. This section discusses this opportunity in the context of sub-Saharan Africa, with a focus on the long-run cost of ART.

Antiretroviral drugs have two main benefits. First, they increase the life expectancy of HIV positive individuals on ART, their life expectancy approaching that of the general population (Samji et al., 2013). Second, they sharply reduce the infectiousness of the HIV virus (Cohen et al., 2011; Tanser et al., 2013). Despite these large benefits, ART remained for long unaffordable for most HIV positive individuals in sub-Saharan Africa, the cost of ART per person per year being higher than 10,000 US$ till 2000. Since then, the cost of antiretroviral drugs in developing countries has been sharply reduced thanks to activist pressure, competition from generic manufacturers and negotiation with pharmaceutical companies. The median cost of ART in low-income countries is nowadays around 792 US$ per year per person (Galárraga and Wirtz, 2011), including personnel and laboratory costs. In this context of increasing access to cheap antiretroviral drugs, more and more developing countries have committed to universal access to ART. Despite these good intentions, the expansion of ART coverage in sub-Saharan Africa is mixed, ranging from 1% in Madagascar to more than 90% in Botswana, Cape Verde and Namibia according to 2012 UNAIDS estimates.

Funds are course necessary for financing the universal access to ART treatment. The cost per capita of universal access to ART is estimated for each sub-Saharan African country in table 7 for the year 2011[13]. This cost varies a lot across countries. It is typically lower than 5 US$ per capita in low-prevalence countries and in countries whose epidemic is at an early stage. In high-prevalence countries, the cost is much higher, reaching 89 US$ in Swaziland and 143 US$ in Botswana. As HIV positive individuals need to be treated for their whole life, it is worth noting that the cost of universal ART coverage is expected to increase in the short and medium run.

The international community has already paid a large part of the bill related to HIV/AIDS prevention and treatment in developing countries. Between 2002 and 2007, international HIV assistance from donor governments increased more than six-fold, jumping from US$ 1.2 billion in 2002 to US$ 7.7 billion in 2008 (UNAIDS, 2013a). Since then, international HIV assistance stagnated, reflecting the economic and political constraints of the post-financial crisis period. The share of international HIV assistance in the financing of the response to the HIV/AIDS epidemic varies across sub-Saharan countries, ranging from slightly more than 20% in South Africa to 98.6% in Malawi (Lule and Haacker, 2011).

Given the recent flat trend characterizing international funding for HIV/AIDS, sub-Saharan African countries will have to increase their own contribution to fulfill the objective of universal ART coverage. Within this context, natural resource rents may be a credible solution for creating fiscal space. For each country, table 7 reports the cost of universal access to ART as a fraction of GDP and as a fraction of natural resource rents. Countries are classified in 3 groups, according to their relative capacity to create fiscal space. The more stars associated to their name, the less encouraging is their situation.

The first group of countries includes Central African Republic, Mozambique, Malawi, Namibia, Zimbabwe, Swaziland and Lesotho. In these countries, the prevalence of HIV is so high compared to their GDP that the cost of universal ART coverage represents more than 1% of their GDP and more than 20% of their natural resource rents. Given this high cost, natural resource rents are not expected to be sufficient for financing the response to HIV/AIDS in these countries. If ART is scaled-up, international aid will most likely have to cover a large part of cost. The share of external financing in the response against HIV/AIDS is in fact already very high in these countries, reaching 96.5% of the cost in Mozambique and in the Central African Republic, and 98.6% of the cost in Malawi.

For a second group of countries comprising Guinea-Bissau, Togo, Uganda, Rwanda, Botswana and Kenya, the diagnosis is slightly more encouraging. The burden of the HIV/AIDS epidemic is relatively important in these countries, implying that the cost of universal ART coverage is non-negligible compared to size of their economy. These countries would typically have to dedicate between 0.5% and 1% of their GDP in order to finance alone the universal coverage of ART. For them, natural resource rents may provide a realistic but limited source of financing: more than 10% of their natural resource rents would have to be allocated to ART to cover the full cost of universal ART coverage.

For the last group, accounting for more than half of sub-Saharan African countries, the diagnostic which can be established from table 7 is promising. In these countries, the cost of universal ART coverage represents less than 10% of natural resource rents[14], which suggests that a sustainable and efficient management or natural resource rents may provide the necessary fiscal resources for financing their long-term response to the HIV/AIDS epidemic.

Three qualifying remarks should be made to temper this conclusion. First, as the majority of high-prevalence countries are poor, and given the numerous needs brought about by poverty, rents from natural resources will most likely not be entirely affected to the response to HIV/AIDS. Furthermore, tax collection in many of these countries

[13] For each country, I used the Spectrum software to compute the number of people needing ART in 2011 (CD4 âĽď350 cells/mm^3). This estimate was the multiplied by the median yearly cost of ART taken from Galárraga and Wirtz (2011) and divided by the population size of the country (World Development Indicators).

[14] Even though Benin, Mauritius and Sao Tome and Principe do not strictly respect this condition, they were nevertheless added to this first group of countries; indeed, the limited prevalence of HIV in these countries implies that their cost of universal ART coverage expressed in percentage of the GDP is relatively low.

remains challenging. In low-income countries, tax revenue represented on average only 13.6% of their GDP in 2009, compared to around 30% in high-income countries (Le, 2012). Given the difficulties poor countries face with tax collection, international aid for HIV/AIDS will remain essential, at least in the short and medium run.

Second, and in line with the paper of de Soysa and Gizelis (2013), natural resource rents will only have a positive impact on the response to HIV/AIDS if these rents are managed with an appropriate degree of care and control, and within an appropriate framework of ethics and values. For this purpose, recent initiatives such as the "Natural Resource Charter" (Collier, 2008) may provide essential guidelines for countries to get full benefit from their natural resources and ultimately secure the greatest social and economic benefit for their people. Complying with the principles of the "Natural Resource Charter" may turn out to be an essential step that resource-rich countries will have to complete before being able to allocate funding from natural resource rents to the fight against HIV/AIDS.

Finally, the link between natural resource rents and international aid may be complex, and may potentially affect the fiscal space available of HIV/AIDS programs (Buur et al., 2013). On the one side, the presence of large natural resource rents may reduce international aid earmarked to HIV/AIDS if donor countries prefer to redirect their funds towards countries less fortunate in terms of natural capital. On the other side, the possession of strategic resources may increase the bargaining power of resource-rich countries and thereby increases the amount of international aid they receive. More empirical research is needed to understand the complex links between international assistance and natural resource rents.

5. Conclusion

Using a panel dataset of countries between 1990 and 2008, de Soysa and Gizelis (2013) provided evidence that oil-rich countries are more deeply affected by HIV and by AIDS morbidity. They conclude that government of oil-rich countries failed to implement effective public policies for dealing with the HIV/AIDS epidemic, even though they should have more financial resources for effective public action. In this paper, I showed that their results (1) are not robust to alternative specifications and samples, (2) fail to pass placebo tests, (3) are spurious because the dependent variables (HIV and TB prevalences, deaths due to HIV/AIDS) and explanatory variables (oil rents per capita) are non-stationary, (4) are impossible to interpret because the expected impact of bad policies on the dependent variables considered is ambiguous. After correcting for these issues, I found no evidence of a positive relationship between resource rents and the spread of HIV/AIDS.

The main contributions of this paper were the following. First, it provided evidence that the resource curse identified by DG is misleading. If anything, the relationship between rents from oil and the spread of the HIV epidemic seems to be negative. This relationship is, however, only weakly significant, and (almost) disappear when the history of the epidemic is controlled for. More generally, this paper demonstrated the difficulty of panel data analysis with epidemiological data, and provided some tools to produce a rigorous analysis. In particular, it emphasized the high risk of spurious regression caused by the non-stationary series related to the HIV/AIDS epidemic. Finally, it showed that in a majority of sub-Saharan African countries, natural resources offer a considerable potential to create fiscal space. This fiscal space may then be critical to finance the long-term liability brought about by the scaling-up of antiretroviral therapies.

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Table 7: natural resource rents and HIV in sub-Saharan Africa

	HIV prevalence ages 15-49	GDP per capita	Natural resources rents per capita	Cost per capita of universal access to ART in 2011		
	(percent)	(US$, 2011)	(US$, 2011)	(US$, 2011)	(% of GDP per capita)	(% of rents per capita)
Mauritius	1.2	14,881	1	4	0.0%	447.9%
Lesotho **	23.1	1,865	24	79	4.3%	332.7%
Swaziland **	26.5	5,284	85	89	1.7%	104.5%
Zimbabwe **	14.7	524	36	33	6.2%	90.6%
Namibia **	13.3	7,170	102	69	1.0%	67.6%
Malawi **	10.8	890	35	22	2.5%	63.3%
Kenya *	6.1	1,695	24	13	0.8%	53.9%
Eritrea	0.7	534	3	2	0.3%	51.7%
Mozambique **	11.1	955	69	19	2.0%	27.3%
Sao Tome and Principe	1	1,787	16	4	0.2%	23.7%
Central African Republic **	4.4	820	42	9	1.1%	22.1%
Botswana *	23	15,509	723	143	0.9%	19.8%
Rwanda *	2.9	1,260	41	8	0.6%	18.9%
Uganda *	7.2	1,320	71	11	0.9%	16.1%
Togo *	2.9	998	48	6	0.6%	13.3%
Guinea-Bissau *	3.9	1,211	56	6	0.5%	11.1%
Benin	1.1	1,508	25	3	0.2%	10.3%
Cote d'Ivoire	3.2	1,862	144	12	0.6%	8.0%
Tanzania	5.1	1,508	126	10	0.6%	7.7%
Niger	0.5	607	15	1	0.2%	6.5%
Zambia	12.7	1,609	434	28	1.7%	6.4%
Sierra Leone	1.5	1,174	42	3	0.2%	6.3%
Cameroon	4.5	2,241	221	13	0.6%	6.0%
Ethiopia	1.3	1,052	63	4	0.3%	5.8%
South Africa	17.9	11,028	1,173	66	0.6%	5.6%
Burundi	1.3	543	56	3	0.6%	5.6%
Gambia, The	1.3	1,853	43	2	0.1%	4.8%
Liberia	0.9	593	65	2	0.4%	3.4%
Senegal	0.5	1,886	64	2	0.1%	2.9%
Ghana	1.4	1,894	271	5	0.3%	1.8%
Burkina Faso	1	1,382	163	2	0.2%	1.5%
Guinea	1.7	1,031	208	3	0.3%	1.4%
Madagascar	0.5	953	54	1	0.1%	1.4%
Congo, Dem. Rep.	1.1	396	139	2	0.5%	1.4%
Mali	0.9	1,237	176	2	0.2%	1.2%
Nigeria	3.1	2,509	897	9	0.4%	1.0%
Chad	2.7	1,431	549	5	0.4%	0.9%
Comoros	2.1	1,196	14	0	0.0%	0.5%
Congo, Rep.	2.8	4,276	3,150	10	0.2%	0.3%
Gabon	4	15,169	7,671	20	0.1%	0.3%
Angola	2.3	5,760	2,682	6	0.1%	0.2%
Equatorial Guinea	6.2	29,631	12,265	20	0.1%	0.2%

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Appendix A. Monte-Carlo experiments

In this appendix, Monte-Carlo experiments are run in order to assess the likelihood of spurious regressions for six data generating processes creating HIV prevalence and oil rents per capita series. Series were generated for 100 countries ($i \in [1, 100]$) and 20 years ($t \in [1, 20]$). For each of the six data generating processes, I ran five sets of regressions, 200 repetitions each (OLS, OLS with country fixed effects, OLS with country and year fixed effects, OLS with country and year fixed effects and Newey-West standard-errors, OLS with aggregated data).

The HIV prevalence series were generated as follows:
a) Linear Model:

- *Homogeneous trends:* $HIV_{i,t} = \max(0, 10\alpha_i + t + e_{i,t})$
- *Heterogeneous trends:* $HIV_{i,t} = \max(0, \alpha_i t + e_{i,t})$

b) Quadratic Model:

- *Homogeneous trends:* $HIV_{i,t} = \max(0, 10\alpha_i + t + e_{i,t} - 0.01t^2)$
- *Heterogeneous trends:* $HIV_{i,t} = \max(0, \alpha_i t - 0.01t^2 + e_{i,t})$

c) SI Model:

- *Homogeneous trends:* $HIV_{i,t} = \max(0, HIV_{i,t-1} + 0.025 HIV_{i,t-1}(40 - HIV_{i,t-1}) - (HIV_{i,t-9} - HIV_{i,t-10}))$
- *Heterogeneous trends:* $HIV_{i,t} = \max(0, HIV_{i,t-1} + \beta_i HIV_{i,t-1}(\gamma_i - HIV_{i,t-1}) - (HIV_{i,t-9} - HIV_{i,t-10}))$

where $\alpha_i \in U(0, 1)$, $e_{i,t} \in N(0, 1)$, $\gamma_i \in U(1, 31)$ and $\beta_i = 0.01 + (30 - \gamma_i)/500$.

The data generating process underlying the oil rents per capita series is:

$$oil_{i,t} = \begin{cases} 0 \text{ if } i < 50 \\ \delta_i t + \mu_{i,t} \text{ if } i \geq 50. \end{cases}$$

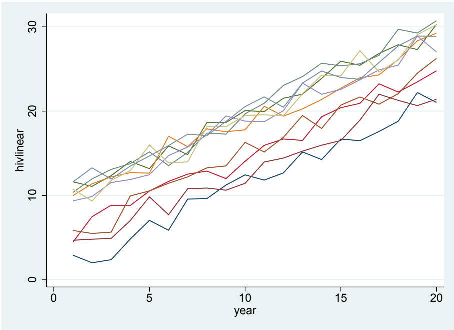
where $\delta_i \in U(0, 1)$, $\mu_{i,t} \in N(0, 1)$. A sample of HIV prevalence and oil rents series is presented in figure A.4.

The results of these Monte-Carlo experiments are summarized in table A.8. For each estimation method, the third column shows the proportion of regressions which result in a coefficient significant at a 5% threshold. In the absence of spurious relationship, each proportion should tend to 5% if the number of repetitions tends to infinity.

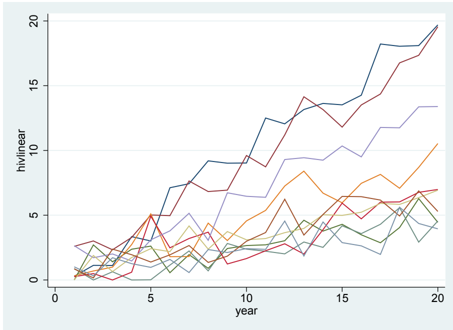
Three conclusions can be drawn from these Monte-Carlo experiments. First, table A.8 shows that OLS estimations without year fixed effects result in spurious regressions because of the non-stationarity of the series. Second, it demonstrates that introducing year fixed effects prevents spurious regressions if the trends characterizing HIV prevalence series are similar. Finally, it demonstrates that year fixed effects are not sufficient to prevent spurious regressions between HIV prevalence series and oil rents series if the trends characterizing HIV prevalence series are heterogeneous.

Table A.8: Monte-Carlo Experiment - percentage of significant coefficients at a 5% threshold (200 repetitions)

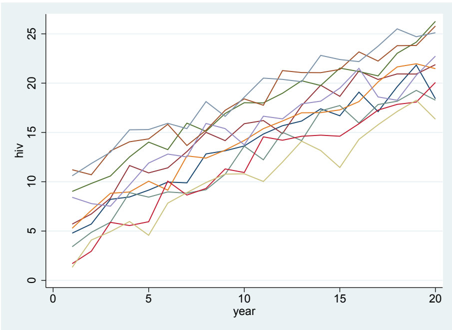
	OLS			OLS			OLS			Newey-West			Aggregate OLS		
	$\bar{\beta}$	$\bar{se}$	Signif.	$\bar{\beta}$	$\bar{se}$	Signif.	$\bar{\beta}$	$\bar{se}$	Signif.	$\bar{\beta}$	$\bar{se}$	Signif.	$\bar{\beta}$	$\bar{se}$	Signif.
Linear model															
Homogeneous trends	0.48	0.03	100%	1.40	0.04	100%	0.00	0.01	7%	0.00	0.01	8%	0.00	0.09	4%
Heterogeneous trends	0.24	0.02	100%	0.69	0.03	100%	0.01	0.02	60%	0.01	0.03	43%	0.00	0.09	4%
Quadratic model															
Homogeneous trends	0.38	0.03	100%	1.10	0.04	100%	0.00	0.01	7%	0.00	0.01	8%	0.00	0.09	4%
Heterogeneous trends	0.19	0.02	100%	0.55	0.02	100%	0.01	0.02	59%	0.01	0.03	40%	0.00	0.08	4%
SI model															
Homogeneous trends	0.98	0.08	100%	2.85	0.12	100%	0.00	0.08	16%	0.00	0.09	13%	0.00	0.17	4%
Heterogeneous trends	0.35	0.04	100%	1.03	0.04	100%	0.00	0.04	50%	0.00	0.05	33%	0.00	0.13	4%
Country FE		No			Yes			Yes			Yes			No	
Year FE		No			No			Yes			Yes			No	



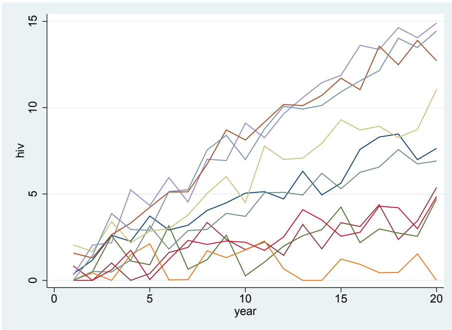
(a) Linear Homogeneous



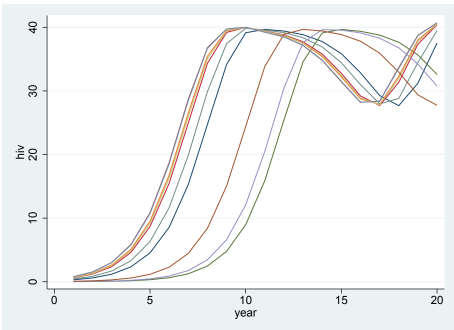
(b) Linear Heterogeneous



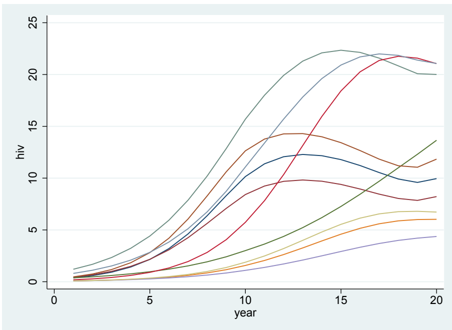
(c) Quadratic Homogeneous



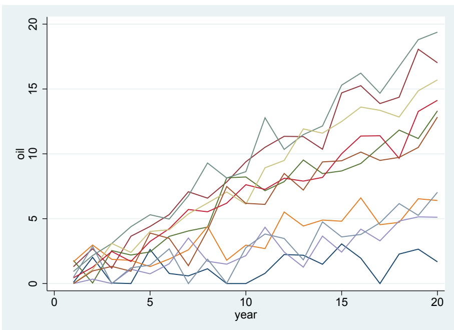
(d) Quadratic Heterogeneous



(e) SI Homogeneous



(f) SI Heterogeneous



(g) Oil

Figure A.4: Monte-Carlo expermiments: sample of HIV prevalence and oil series

Appendix B. Regressions with the death rate from AIDS as dependent variable

Appendix B.1. Robustness to alternative specifications and samples

Table B.9 shows that the results obtained by DG for the death rates from AIDS are not robust. Taking the logarithm of the HIV/AIDS prevalence in neighboring countries suppresses the significance of the coefficient associated with oil rents per capita (in log) when only year fixed effects are accounted for. When both year and country fixed effects are included in the regression, the coefficients associated with oil rents per capita remain positive in all specifications, but they are only weakly significant.

Table B.9: Robustness to alternative specifications

	Dependent variable: Death rate from AIDS (log)				Dependent variable: Death rate from AIDS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Oil Rents pc. (log)	0.040**	0.042	0.007	0.045			-0.002*	0.003
	(0.019)	(0.036)	(0.017)	(0.038)			(0.001)	(0.002)
Oil Rents pc.					0.000	0.000**		
					(0.000)	(0.000)		
GDP pc. in PPP (log)	-0.358***	0.295**	-0.097**	0.208	-0.015***	-0.022***	-0.014***	-0.019*
	(0.050)	(0.128)	(0.048)	(0.130)	(0.004)	(0.008)	(0.004)	(0.010)
Democracy index	0.149	0.300***	0.313***	0.269**	0.003	0.024***	0.000	0.024***
	(0.125)	(0.110)	(0.109)	(0.108)	(0.004)	(0.007)	(0.005)	(0.007)
Time last civil war	0.004	-0.005	-0.001	-0.003	0.001***	0.001***	0.001***	0.001***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Incidence of civil war	-1.047***	-0.198**	-1.021***	-0.201***	-0.021***	0.013***	-0.020***	0.013***
	(0.156)	(0.077)	(0.150)	(0.077)	(0.007)	(0.004)	(0.007)	(0.004)
Neighbors' HIV prevalence	0.328***	0.171***			0.028***	0.044***	0.028***	0.044***
	(0.015)	(0.012)			(0.002)	(0.004)	(0.002)	(0.004)
Neighbors' HIV prevalence (log)			2.029***	1.258***				
			(0.064)	(0.186)				
Constant	-2.812***	-8.688***	-5.599***	-8.374***	0.114***	0.161*	0.107***	0.115
	(0.445)	(1.295)	(0.429)	(1.308)	(0.030)	(0.084)	(0.029)	(0.100)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1946	1946	1946	1946	1946	1946	1946	1946

Newey-West errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.10 shows that the positive relationship identified in table B.9 is mainly driven by Sudan and South Africa. In particular, column (1) shows that the coefficient associated with oil rents per capita is strongly reduced when Sudan is removed from the sample. The coefficient becomes even negative when both Sudan and South Africa are ignored (column (2)). Similarly, the resource curse disappear when only sub-Saharan Africa is considered (columns (3)) and when only countries facing a generalized HIV epidemic are included in the regression (column (4)).

Appendix B.2. Placebo test

The placebo test also fails when the death rate from AIDS is the dependent variable. In particular, table B.11 shows that future values of oil rents per capita are even better predictors of the current state of the epidemic than present rents. Again, this suggests that the identification of a resource curse is spurious.

Appendix B.3. Non-stationarity of series

Figures B.5 (a) and (b) show how AIDS death rates and oil rents per capita have evolved between 1990 and 2008 in Sudan and South Africa. It shows that, overall, the logarithm of death rates from AIDS and the logarithm of oil rents per capita have been increasing between 1990 and 2008 in these two countries. The movement of the series does not seem to be synchronized around the increasing trends. The Im-Pesaran-Shin, Maddala-Wu and Hadri LM tests

Table B.10: Robustness to alternative specifications

	Dependent variable: Death rate from AIDS (log)			
	(1)	(2)	(3)	(4)
Oil Rents pc. (log)	0.005	-0.016	-0.006	-0.034
	(0.037)	(0.035)	(0.081)	(0.059)
Controls	Yes	Yes	Yes	Yes
Time and country FE	Yes	Yes	Yes	Yes
Observations	1927	1908	383	509

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.11: Placebo test

	Dependent variable: Death rate from AIDS (log)	
	(1)	(2)
Oil Rents pc. (log) in $t+1$	0.058	
	(0.040)	
Oil Rents pc. (log) in $t+2$		0.067
		(0.042)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1818	1714

Newey-West standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

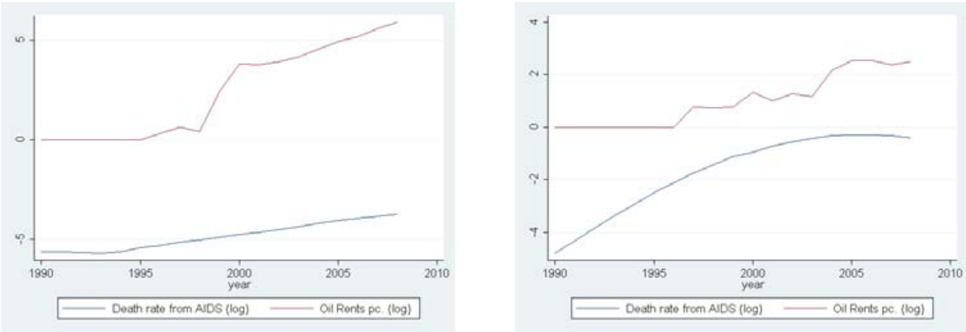
confirm this visual diagnostic (table D.17 in appendix). For some countries, the logarithm of death rates from AIDS is non-stationary, for others not. In line with this, augmented Dickey-Fuller tests and KPSS tests applied each cross-sectional unit conclude to the non-stationarity of most series (table D.24 in appendix). In fact, most series appear to be characterized by linear or non-linear time trends.

As for HIV prevalence, the Im-Pesaran-Shin, Maddala-Wu and Hadri LM tests show that death rates series should be differentiated twice before being stationary. The non-stationarity of death rates from AIDS is made clear on figure B.6, in which AIDS death rates and Δ AIDS death rates over time are drawn for high prevalence countries.

Table B.12 reproduces the second regression of table B.9 for first-differentiated and second-differentiated series. The coefficients associated with the logarithm of oil rents per capita are not significant. This confirms that the resource curse identified by DG is misleading.

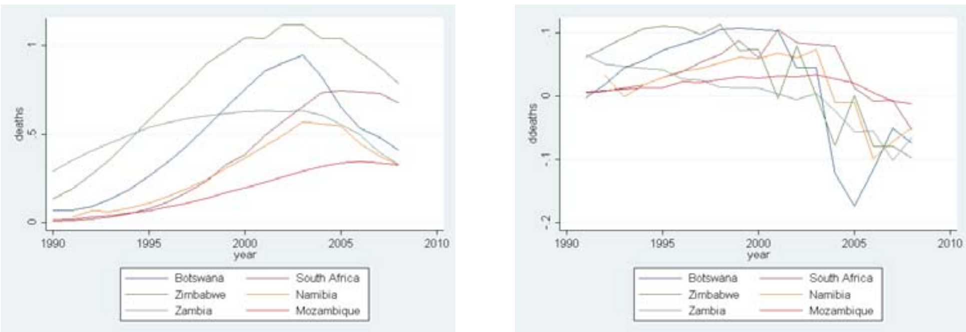
Appendix B.4. The ambiguous impact of prevention and treatment on death rate from AIDS

The expected impact of good/bad policies on deaths rate from AIDS is less ambiguous than for HIV prevalence. Indeed, both prevention and treatment are expected to reduce the death rate from AIDS. However, as for HIV prevalence, prevention is expected to have a long-run impact on the death rate from AIDS. The long lasting impact of prevention is not accounted for in the specification of DG.



(a) Sudan (b) South Africa

Figure B.5: Oil rents per capita (log) and death rates from AIDS (log) between 1990 and 2008



(a) AIDS death rates (b) Δ AIDS death rates

Figure B.6: Evolution of AIDS death rates between 1990 and 2008

Table B.12: First- and second-difference models

	Dependent variable: Death rate from AIDS (log)	
	First-difference model	Second-difference model
	(1)	(2)
Oil Rents pc. (log)	0.010	0.028
	(0.019)	(0.022)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1812	1705

Newey-West standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix C. Regressions with the prevalence of TB as dependent variable

Appendix C.1. Robustness to alternative specifications and samples

Table C.13 shows that the results obtained by DG for TB prevalence are quite robust to alternative specifications. The coefficient associated with oil rents per capita is positive and significant except in column (7), that is, when the dependent variable is in level, oil rents per capita is in log and only year fixed effects are included in the regression.

Table C.13: Robustness to alternative specifications

	Dependent variable: TB Prevalence (log)				Dependent variable: TB Prevalence			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Oil Rents pc. (log)	0.036***	0.053***	0.027**	0.054***			-2.924	11.031***
	(0.012)	(0.015)	(0.012)	(0.015)			(1.905)	(3.867)
Oil Rents pc.					0.005***	0.011***		
					(0.002)	(0.002)		
GDP pc. in PPP (log)	-0.774***	-0.161***	-0.751***	-0.173***	-80.401***	-53.673***	-76.381***	-50.126***
	(0.030)	(0.062)	(0.034)	(0.063)	(5.864)	(12.009)	(5.857)	(13.336)
Democracy index	-0.319***	-0.004	-0.367***	-0.008	-25.835**	0.305	-34.531***	-0.326
	(0.063)	(0.040)	(0.063)	(0.040)	(11.762)	(9.746)	(12.476)	(9.889)
Time last civil war	-0.004***	0.002	-0.005***	0.002*	-0.181	0.102	-0.223	0.254
	(0.001)	(0.001)	(0.002)	(0.001)	(0.249)	(0.242)	(0.253)	(0.264)
Incidence of civil war	0.110*	-0.002	0.109	-0.003	39.324**	7.344	41.103**	6.366
	(0.067)	(0.021)	(0.068)	(0.021)	(16.282)	(6.096)	(16.366)	(6.096)
Neighbors' HIV prevalence	0.070***	0.025***			22.076***	0.345	21.792***	0.020
	(0.010)	(0.006)			(2.472)	(4.202)	(2.410)	(4.086)
Neighbors' HIV prevalence (log)			0.279***	0.149**				
			(0.055)	(0.069)				
Constant	11.307***	3.745***	11.099***	3.794***	881.411***	584.370***	859.725***	492.927***
	(0.241)	(0.620)	(0.278)	(0.625)	(52.211)	(123.684)	(50.969)	(128.353)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2022	2022	2022	2022	2022	2022	2022	2022

Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.14 shows that the positive relationship between TB prevalence and oil rents per capita is mainly driven by Equatorial Guinea, South Africa, and to a lesser extent Ukraine, Gabon and Kazakhstan. In particular, column (1) shows that the coefficient associated with oil rents per capita is strongly reduced when Equatorial Guinea and South Africa are excluded from the sample. The coefficient becomes non-significant when these two countries plus Ukraine are ignored (column (2)). The exclusion of Gabon and Kazakhstan from the regressions further reduces the significance of the coefficient associated with the logarithm of oil rents per capita (column 3).

Table C.14: Robustness to alternative specifications

	Dependent variable: TB Prevalence (log)		
	(1)	(2)	(3)
Oil Rents pc. (log)	0.028*	0.023	0.015
	(0.015)	(0.015)	(0.015)
Controls	Yes	Yes	Yes
Time and Country FE	Yes	Yes	Yes
Observations	1984	1966	1929

Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix C.2. Placebo test

The placebo tests also fail when the prevalence of TB is the dependent variable. In particular, table C.15 shows that future values of oil rents per capita are even better predictors of the current state of the epidemic than present rents. This suggests that the identification of a resource curse on TB may be spurious.

Table C.15: Placebo test

	Dependent variable: TB Prevalence (log)	
	(1)	(2)
F.Oil Rents pc. (log)	0.062***	
	(0.013)	
F2.Oil Rents pc. (log)		0.059***
		(0.015)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1890	1782

Newey-West standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix C.3. Non-stationarity of series

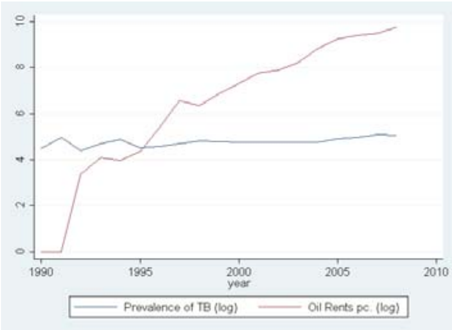
Figures C.7 (a) to (c) shows how tuberculosis and oil rents per capita have evolved between 1990 and 2008 in Equatorial Guinea, South Africa and Ukraine. It shows that TB prevalence has slightly increased over this period, while oil rents per capita have sharply increased. As for HIV prevalence and death rates from AIDS, the movement of the series does not seem to be synchronized around the increasing trends.

This observation is confirmed by the Im-Pesaran-Shin, Maddala-Wu and Hadri LM tests (table D.17 in appendix). The null hypothesis of the Im-Pesaran-Shin and Maddala-Wu tests can not be rejected for the logarithm of TB prevalence (H0: all series are non-stationary). Similarly, the Hadri LM test and individual KPSS tests for each cross-sectional units reject overall the null hypothesis that series are stationary (table D.25 in appendix). In fact, most TB series are characterized by linear or non-linear time trends. The non-stationarity of TB series clearly appears in figure 8(a), which shows the evolution of TB prevalence in the six most affected countries of the sample.

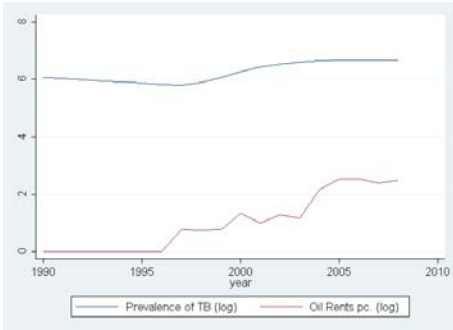
The Im-Pesaran-Shin, Maddala-Wu and Hadri LM tests show that most of the TB series become stationary after first-differentiation. In table C.16, the regression with the logarithm of TB prevalence as dependent variable is replicated for first-differentiated (column (1)) and second-differentiated series (column (2)). The coefficient associated with the logarithm of oil rents per capita is not significant (and negative). This suggests that the measurement of a resource curse on TB was also induced by the non-stationarity of dependent and independent variables.

Appendix C.4. The ambiguous impact of prevention and treatment on TB prevalence

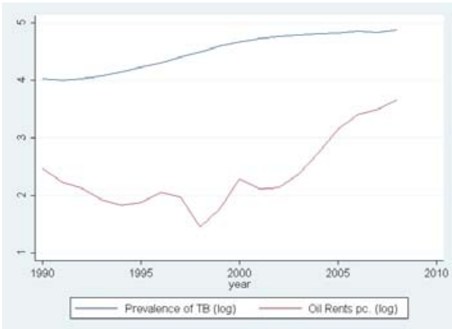
The impact of good/bad policies on the prevalence of TB is expected to be less ambiguous than for HIV prevalence, as the typical antibiotic treatment against TB is of shorter duration than long-life HIV treatments. However, as for HIV prevalence, prevention is expected to have a long-run impact on the prevalence of TB. The long lasting impact of prevention is not accounted for in the specification of DG.



(a) Equatorial Guinea

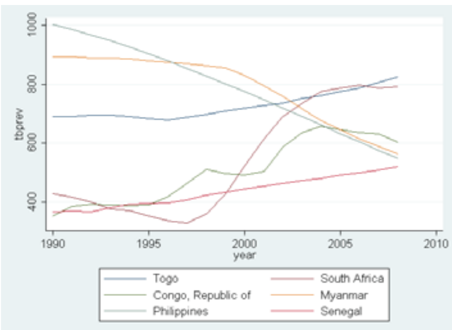


(b) South Africa

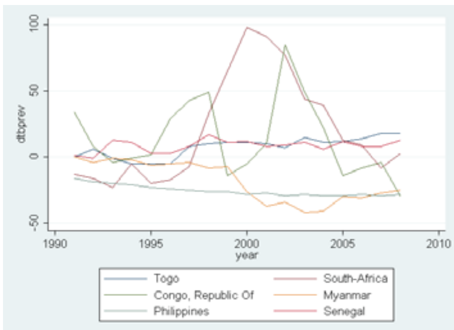


(c) Ukraine

Figure C.7: Oil rents per capita (log) and TB prevalence (log) between 1990 and 2008



(a) TB prevalence



(b) Δ TB prevalence

Figure C.8: Evolution of TB prevalence between 1990 and 2008

Table C.16: First- and second-difference models

	Dependent variable: Death rate from AIDS (log)	
	First-difference model	Second-difference model
	(1)	(2)
Oil Rents pc. (log)	-0.015	-0.025
	(0.020)	(0.033)
Controls	Yes	Yes
Time and Country FE	Yes	Yes
Observations	1884	1773

Newey-West standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix D. Supplementary tables

Table D.17: Panel unit-root tests

	Unit-root test without trend			Unit-root test with trend		
	IPS	MW	Hadri	IPS	MW	Hadri
	H0: all series have a unit root		H0: no series has has a unit root	H0: all series have a unit root		H0: no series has a unit root
HIV Prevalence (log)	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Δ HIV Prevalence (log)	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Δ^2 HIV Prevalence (log)	0.00***	0.00***	1.00	0.00***	0.00***	1.00
Oil Rents pc. (log)	1.00	1.00	0.00***	1.00	0.72	0.00***
Δ Oil Rents pc. (log)	0.00***	0.00***	0.00***	0.00***	0.00***	1.00
Δ^2 Oil Rents pc. (log)	0.00***	0.00***	1.00	0.00***	0.00***	1.00
Death rate from AIDS (log)	0.01***	0.00***	0.00***	1.00	0.99	0.00***
Δ Death rate from AIDS (log)	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Δ^2 Death rate from AIDS (log)	0.00***	0.00***	1.00	0.00***	0.00***	1.00
TB Prevalence (log)	1.00	0.35	0.00***	0.82	0.00***	0.00***
Δ TB Prevalence (log)	0.00***	0.00***	0.99	0.00***	0.00***	1.00
Δ^2 TB Prevalence (log)	0.00***	0.00***	1.00	0.00***	0.00***	1.00

Table D.18: HIV prevalence (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.96	0.01 **	0.49	1.87 ***	0.06	0.14 ***	0.0000
Equatorial Guinea	0.11	0.54	0.01 **	1.88 ***	0.33 ***	0.21 ***	-0.0056 ***
Guatemala	0.59	0.60	0.09 *	1.78 ***	0.34 ***	0.12 ***	-0.0057 ***
South Africa	0.00 ***	0.00 ***	0.00 ***	1.55 ***	0.46 ***	0.16 ***	-0.0177 ***
Russia	0.95	0.73	0.47	1.72 ***	0.27 ***	0.17 ***	0.0071 **
Ukraine	0.02 **	0.76	0.00 ***	1.74 ***	0.40 ***	0.13 ***	-0.0089 ***
Vietnam	0.89	0.40	0.31	1.82 ***	0.18 **	0.10 ***	0.0013
Austria	0.97	0.83	0.56	1.37 ***	0.38 ***	0.06 ***	0.0072 ***
Spain	0.29	0.37	0.03 **	0.47 **	0.11	-0.01 *	-0.0002
Moldova	0.69	0.96	0.13	1.62 ***	0.34 ***	0.10 ***	-0.0071 ***
Iran	0.87	0.64	0.28	1.38 ***	0.31 ***	0.05 ***	0.0046 ***
Gabon	0.00 ***	0.00 ***	0.00 ***	1.50 ***	0.46 ***	0.09 ***	-0.0102 ***
France	0.87	0.64	0.28	1.38 ***	0.31 ***	0.02 ***	0.0019 ***
Indonesia	1.00	1.00	.	0.32	0.13 *	0.01 *	0.0026 **
United Kingdom	0.85	0.58	0.25	1.48 ***	0.26 ***	0.05 ***	0.0036 **
Belarus	0.89	0.72	0.30	1.24 ***	0.33 ***	0.04 ***	0.0054 ***
Kyrgyz Republic	0.93	0.95	0.41	0.61 **	0.22 ***	0.02 ***	0.0043 ***
Tajikistan	0.92	0.89	0.37	0.85 ***	0.29 ***	0.03 ***	0.0053 ***
Canada	0.79	0.57	0.19	1.59 ***	0.17 **	0.03 ***	0.0045 ***
Colombia	0.00 ***	0.15	0.00 ***	0.82 ***	0.43 ***	0.04 ***	-0.0117 ***
Myanmar	0.00 ***	0.10	0.00 ***	1.11 ***	0.41 ***	0.05 ***	-0.0088 ***
Chad	0.55	0.99	0.12	0.19	0.14 *	0.00	-0.0047 ***
Mexico	0.27	0.75	0.03 **	1.06 ***	0.33 ***	-0.02 ***	0.0023 ***
Peru	0.48	0.51	0.06 *	0.46 **	0.34 ***	-0.01	-0.0032 ***
Malaysia	0.21	0.83	0.02 **	1.41 ***	0.35 ***	0.08 ***	-0.0083 ***
Trinidad and Tobago	0.00 ***	0.00 ***	0.00 ***	1.53 ***	0.42 ***	0.09 ***	-0.0089 ***
Argentina	0.96	0.51	0.49	1.56 ***	0.15 **	0.03 ***	0.0012 *
Angola	0.00 ***	0.00 ***	0.00 ***	1.22 ***	0.38 ***	0.05 ***	-0.0074 ***
United States	0.90	0.81	0.33	1.06 ***	0.33 ***	0.01 ***	0.0015 ***
Nigeria	0.00 ***	0.00 ***	0.00 ***	0.59 **	0.29 ***	0.02 **	-0.0066 ***
Congo, Republic Of	0.20	0.98	0.02 **	1.81 ***	0.45 ***	-0.02 ***	0.0011 ***
Denmark	0.92	0.89	0.37	0.85 ***	0.29 ***	0.03 ***	0.0053 ***
India	0.17	0.97	0.02 **	1.33 ***	0.41 ***	0.07 ***	-0.0105 ***
Bolivia	0.00 ***	0.10 *	0.00 ***	0.61 **	0.22 ***	0.02 ***	-0.0043 ***
Netherlands Antilles	0.43	0.81	0.05 *	1.24 ***	0.33 ***	0.04 ***	-0.0054 ***
Cameroon	0.00 ***	0.00 ***	0.00 ***	1.19 ***	0.40 ***	0.09 ***	-0.0140 ***
Israel	0.87	0.64	0.28	1.38 ***	0.31 ***	0.05 ***	0.0046 ***
Italy	1.00	1.00	.			0.00	0.0000
Cote D Ivoire	0.05 **	0.00 ***	0.01 ***	0.42 *	0.42 ***	0.00	-0.0109 ***
Ecuador	0.01 ***	0.01 **	0.00 ***	0.35 *	0.35 ***	0.00	-0.0045 ***
Thailand	0.07 *	0.00 ***	0.01 ***	0.51 **	0.31 ***	-0.01	-0.0054 ***
Chile	0.90	0.31	0.33	1.80 ***	0.16 **	0.10 ***	0.0013

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.19: Δ HIV prevalence (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.00 ***	0.00 ***	0.00 ***	0.06	0.04	0.00	-0.0009
Equatorial Guinea	0.00 ***	0.00 ***	0.00 ***	0.40 *	0.04	-0.02 **	0.0001
Guatemala	0.00 ***	0.00 ***	0.00 ***	0.12	0.03	-0.01	-0.0004
South Africa	0.21	0.91	0.02 **	1.71 ***	0.36 ***	-0.03 ***	0.0019 ***
Russia	0.05 *	0.22	0.01 ***	0.22	0.16 **	0.01	-0.0043
Ukraine	0.00 ***	0.00 ***	0.00 ***	0.55 **	0.04	-0.02 ***	0.0005
Vietnam	0.00 ***	0.00 ***	0.00 ***	0.10	0.10	0.00	-0.0028
Austria	0.00 ***	0.00 ***	0.00 ***	0.25	0.04	0.01	0.0002
Spain	0.00 ***	0.02 **	0.00 ***	0.08	0.07	0.00	0.0006
Moldova	0.04 **	0.13	0.01 ***	0.23	0.13 *	-0.01	-0.0025
Iran	0.00 ***	0.01 ***	0.00 ***	0.13	0.06	0.01	-0.0010
Gabon	0.46	0.91	0.06 *	1.69 ***	0.37 ***	-0.02 ***	0.0012 ***
France	0.00 ***	0.01 ***	0.00 ***	0.13	0.06	0.00	-0.0004
Indonesia	1.00	1.00	.	0.32	0.13 *	0.01 *	0.0030 **
United Kingdom	0.00 ***	0.01 ***	0.00 ***	0.11	0.07	0.00	-0.0014
Belarus	0.00 ***	0.00 ***	0.00 ***	0.15	0.05	0.01	-0.0004
Kyrgyz Republic	0.00 ***	0.00 ***	0.00 ***	0.27	0.08	0.01	0.0020
Tajikistan	0.00 ***	0.00 ***	0.00 ***	0.23	0.05	0.01	0.0010
Canada	0.00 ***	0.01 ***	0.00 ***	0.09	0.09	0.00	-0.0010
Colombia	0.13	0.00 ***	0.01 **	1.31 ***	0.11	-0.03 ***	0.0015 **
Myanmar	0.01 ***	0.00 ***	0.00 ***	0.97 ***	0.09	-0.02 ***	0.0017 *
Chad	0.80	0.00 ***	0.24	0.30	0.10	-0.01	-0.0062 *
Mexico	0.00 ***	0.00 ***	0.00 ***	0.19	0.05	0.00	-0.0001
Peru	0.00 ***	0.00 ***	0.00 ***	0.36 *	0.04	-0.01 *	0.0006
Malaysia	0.02 **	0.02 **	0.00 ***	0.31	0.06	-0.01	0.0007
Trinidad and Tobago	0.04 **	0.13	0.00 ***	1.26 ***	0.27 ***	-0.02 ***	0.0023 ***
Argentina	0.01 ***	0.03 **	0.00 ***	0.16	0.06	0.00	0.0002
Angola	0.00 ***	0.00 ***	0.00 ***	1.09 ***	0.30 ***	-0.02 ***	0.0028 ***
United States	0.00 ***	0.00 ***	0.00 ***	0.19	0.05	0.00	0.0001
Nigeria	0.00 ***	0.00 ***	0.00 ***	0.87 ***	0.30 ***	-0.02 ***	0.0036 ***
Congo, Republic Of	0.00 ***	0.00 ***	0.00 ***	0.52 **	0.07	0.00 **	0.0001
Denmark	0.00 ***	0.00 ***	0.00 ***	0.23	0.05	0.01	0.0010
India	0.00 ***	0.00 ***	0.00 ***	0.47 **	0.03	-0.02 **	-0.0012
Bolivia	0.00 ***	0.00 ***	0.00 ***	0.27	0.08	-0.01	0.0020
Netherlands Antilles	0.00 ***	0.00 ***	0.00 ***	0.15	0.05	-0.01	-0.0004
Cameroon	0.01 ***	0.95	0.00 ***	1.40 ***	0.43 ***	-0.03 ***	0.0036 ***
Israel	0.00 ***	0.01 ***	0.00 ***	0.13	0.06	0.01	0.0010
Italy	1.00	1.00	.	.	.	0.00	0.0000
Cote D Ivoire	0.00 ***	0.85	0.00 ***	1.52 ***	0.43 ***	-0.02 ***	0.0023 ***
Ecuador	0.00 ***	0.00 ***	0.00 ***	0.56 **	0.11	-0.01 **	0.0017 **
Thailand	0.00 ***	0.00 ***	0.00 ***	0.88 ***	0.29 ***	-0.01 ***	0.0028 ***
Chile	0.00 ***	0.00 ***	0.00 ***	0.09	0.08	0.00	-0.0022

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739
KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.20: Δ^2 HIV prevalence (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.00 ***	0.00 ***	0.00 ***	0.02	0.02	0.00	0.0011
Equatorial Guinea	0.00 ***	0.00 ***	0.00 ***	0.07	0.05	0.01	-0.0027
Guatemala	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	0.0019
South Africa	0.00 ***	0.00 ***	0.00 ***	0.36 *	0.04	0.00 *	0.0002
Russia	0.00 ***	0.00 ***	0.00 ***	0.05	0.04	0.00	-0.0003
Ukraine	0.00 ***	0.00 ***	0.00 ***	0.09	0.05	0.01	-0.0026
Vietnam	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	-0.0002
Austria	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0014
Spain	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0002
Moldova	0.00 ***	0.00 ***	0.00 ***	0.05	0.04	0.00	0.0009
Iran	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0006
Gabon	0.00 ***	0.00 ***	0.00 ***	0.23	0.04	0.00	0.0003
France	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0003
Indonesia	1.00	1.00	.	0.32	0.13 *	0.01 *	0.0036 **
United Kingdom	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0004
Belarus	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0008
Kyrgyz Republic	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0013
Tajikistan	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0012
Canada	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0001
Colombia	0.00 ***	0.00 ***	0.00 ***	0.05	0.03	0.00	-0.0011
Myanmar	0.00 ***	0.00 ***	0.00 ***	0.09	0.03	0.01	-0.0005
Chad	0.00 ***	1.00	0.06 *	0.22	0.08	-0.01	0.0072
Mexico	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0004
Peru	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0007
Malaysia	0.00 ***	0.00 ***	0.00 ***	0.05	0.04	0.00	0.0016
Trinidad and Tobago	0.00 ***	0.00 ***	0.00 ***	0.21	0.02	0.01	-0.0002
Argentina	0.00 ***	0.00 ***	0.00 ***	0.08	0.05	0.00	0.0011
Angola	0.00 ***	0.00 ***	0.00 ***	0.62 **	0.10	0.01 ***	-0.0010
United States	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0003
Nigeria	0.07 *	0.36	0.01 ***	0.87 ***	0.25 ***	0.01 ***	-0.0016 ***
Congo, Republic Of	0.00 ***	0.00 ***	0.00 ***	0.09	0.04	0.00	-0.0002
Denmark	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0012
India	0.00 ***	0.00 ***	0.00 ***	0.05	0.03	-0.01	0.0003
Bolivia	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0013
Netherlands Antilles	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0008
Cameroon	0.36	0.17	0.04 **	0.93 ***	0.11	0.01 ***	-0.0002
Israel	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0006
Italy	1.00	1.00	.	.	.	0.00	0.0000
Cote D Ivoire	0.38	0.05 **	0.05 **	1.05 ***	0.10	0.00 ***	-0.0002
Ecuador	0.00 ***	0.00 ***	0.00 ***	0.09	0.03	0.01	-0.0009
Thailand	0.00 ***	0.00 ***	0.00 ***	0.50 **	0.15 **	0.01 **	-0.0017 ***
Chile	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	-0.0004

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.21: Oil rents per capita (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.97	0.49	0.57	1.83 ***	0.22 ***	0.39 ***	0.0103 *
Equatorial Guinea	0.18	0.39	0.02 **	1.72 ***	0.29 ***	0.50 ***	-0.0260 ***
Guatemala	0.90	0.08 *	0.33	1.83 ***	0.12	0.14 ***	-0.0019
South Africa	0.93	0.19	0.40	1.77 ***	0.21 **	0.17 ***	0.0066 ***
Russia	0.99	0.68	0.70	1.23 ***	0.42 ***	0.10 ***	0.0188 ***
Ukraine	0.98	0.80	0.66	1.17 ***	0.42 ***	0.08 ***	0.0150 ***
Vietnam	0.94	0.19	0.41	1.84 ***	0.16 **	0.16 ***	0.0034 **
Austria	0.98	0.86	0.60	1.11 ***	0.39 ***	0.06 ***	0.0125 ***
Spain	0.39	0.98	0.05 **	0.90 ***	0.43 ***	-0.03 ***	0.0067 ***
Moldova	1.00	0.99	0.92	1.14 ***	0.37 ***	0.03 ***	0.0055 ***
Iran	0.98	0.86	0.68	1.29 ***	0.38 ***	0.08 ***	0.0122 ***
Gabon	0.92	0.91	0.37	0.70 **	0.32 ***	0.03 **	0.0091 ***
France	0.79	0.94	0.20	0.45 *	0.41 ***	0.01	0.0109 ***
Indonesia	0.87	0.65	0.27	0.92 ***	0.32 ***	0.05 ***	0.0099 ***
United Kingdom	0.93	0.21	0.40	1.43 ***	0.21 **	0.07 ***	0.0058 ***
Belarus	0.99	0.81	0.70	1.29 ***	0.39 ***	0.08 ***	0.0127 ***
Kyrgyz Republic	0.89	0.64	0.30	0.74 ***	0.39 ***	0.03 **	0.0118 ***
Tajikistan	0.12	0.29	0.01 **	0.40 *	0.40 ***	-0.01	0.0130 ***
Canada	0.98	0.64	0.61	1.39 ***	0.36 ***	0.12 ***	0.0145 ***
Colombia	0.98	0.53	0.65	1.42 ***	0.25 ***	0.08 ***	0.7934 ***
Myanmar	1.00	0.90	0.89	1.30 ***	0.46 ***	0.09 ***	0.0147 ***
Chad	0.00 ***	0.00 ***	0.00 ***	0.39 *	0.13 *	0.43 **	-0.2069 ***
Mexico	0.98	0.66	0.60	1.37 ***	0.38 ***	0.09 ***	0.0117 ***
Peru	0.96	0.88	0.49	0.86 ***	0.37 ***	0.04 ***	0.0116 ***
Malaysia	0.98	0.82	0.66	1.22 ***	0.39 ***	0.07 ***	0.0112 ***
Trinidad and Tobago	0.97	0.71	0.60	1.21 ***	0.40 ***	0.08 ***	0.0143 ***
Argentina	0.98	0.50	0.61	1.53 ***	0.28 ***	0.09 ***	0.0073 ***
Angola	1.00	0.90	0.85	1.42 ***	0.39 ***	0.13 ***	0.0166 ***
United States	0.88	0.67	0.29	0.93 ***	0.36 ***	0.06 ***	0.0150 ***
Nigeria	0.95	0.57	0.47	1.32 ***	0.34 ***	0.08 ***	0.0105 ***
Congo, Republic Of	0.98	0.56	0.62	1.45 ***	0.31 ***	0.09 ***	0.0097 ***
Denmark	0.96	0.24	0.50	1.74 ***	0.26 ***	0.14 ***	0.0074 ***
India	0.99	0.75	0.71	1.26 ***	0.37 ***	0.07 ***	0.0106 ***
Bolivia	0.99	0.67	0.70	1.51 ***	0.37 ***	0.10 ***	0.0108 ***
Netherlands Antilles	0.91	0.88	0.34	0.71 **	0.41 ***	0.04 **	0.0159 ***
Cameroon	0.92	0.93	0.36	0.63 **	0.43 ***	0.03 *	0.0157 ***
Israel	0.00 ***	0.15	0.00 ***	0.55 **	0.33 ***	-0.01 *	0.0021 ***
Italy	0.98	0.70	0.69	1.42	0.38	0.09 ***	0.0114 ***
Cote D Ivoire	0.98	0.87	0.60	1.51 ***	0.33 ***	0.19	0.0145
Ecuador	0.98	0.80	0.68	1.40 ***	0.38 ***	0.10 ***	0.0128 ***
Thailand	1.00	0.77	0.89	1.68 ***	0.40 ***	0.17 ***	0.0134 ***
Chile	0.14	0.90	0.01 **	0.60 **	0.39 ***	-0.03 *	0.0118 ***

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.22: Δ Oil rents per capita (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.02 **	0.09 *	0.00 ***	0.19	0.11	0.02	-0.0070
Equatorial Guinea	0.00 ***	0.00 ***	0.00 ***	0.27	0.04	-0.05	0.0042
Guatemala	0.00 ***	0.00 ***	0.00 ***	0.05	0.05	0.00	-0.0017
South Africa	0.00 ***	0.00 ***	0.00 ***	0.10	0.05	0.01	-0.0032
Russia	0.03 **	0.01 **	0.00 ***	0.69 **	0.05	0.04 ***	-0.0024
Ukraine	0.02 **	0.02 **	0.00 ***	0.59 **	0.04	0.03 ***	-0.0014
Vietnam	0.00 ***	0.01 **	0.00 ***	0.05	0.04	0.00	-0.0006
Austria	0.01 **	0.01 ***	0.00 ***	0.46 *	0.03	0.02 **	-0.0002
Spain	0.12	0.02 **	0.01 **	0.57 **	0.08	0.01 **	0.0007
Moldova	0.01 ***	0.00 ***	0.00 ***	0.51 **	0.07	0.01 **	0.0014
Iran	0.01 **	0.01 **	0.00 ***	0.40 *	0.03	0.02 **	-0.0001
Gabon	0.01 **	0.02 **	0.00 ***	0.34	0.05	0.02 *	0.0011
France	0.03 **	0.01 **	0.00 ***	0.56 **	0.03	0.02 ***	0.0004
Indonesia	0.00 ***	0.01 ***	0.00 ***	0.27	0.03	0.02	0.0000
United Kingdom	0.00 ***	0.00 ***	0.00 ***	0.18	0.03	0.01	-0.0005
Belarus	0.01 **	0.01 ***	0.00 ***	0.47 **	0.03	0.02 **	-0.0006
Kyrgyz Republic	0.04 **	0.02 **	0.00 ***	0.66 **	0.05	0.02 ***	-0.0015
Tajikistan	0.15	0.03 **	0.02 **	1.15 ***	0.10	0.03 ***	-0.0018
Canada	0.00 ***	0.01 ***	0.00 ***	0.34	0.03	0.03 *	-0.0012
Colombia	0.00 ***	0.93	0.00 ***	0.31	0.04	0.02 *	-0.0001
Myanmar	0.11	0.02 **	0.01 **	0.91 ***	0.07	0.02 ***	-0.0010
Chad	0.00 ***	0.00 ***	0.00 ***	0.34	0.13 *	-0.44 **	0.3061 ***
Mexico	0.01 ***	0.01 ***	0.00 ***	0.38 *	0.04	0.02 *	-0.0014
Peru	0.01 ***	0.00 ***	0.00 ***	0.49 **	0.03	0.03 **	0.0003
Malaysia	0.01 **	0.01 ***	0.00 ***	0.46 *	0.03	0.02 **	-0.0004
Trinidad and Tobago	0.00 ***	0.00 ***	0.00 ***	0.47 **	0.03	0.03 **	-0.0014
Argentina	0.00 ***	0.01 ***	0.00 ***	0.24	0.03	0.02	-0.0002
Angola	0.01 ***	0.00 ***	0.00 ***	0.52 **	0.03	0.03 **	0.0001
United States	0.00 ***	0.01 ***	0.00 ***	0.32	0.03	0.03 *	-0.0010
Nigeria	0.01 ***	0.02 **	0.00 ***	0.29	0.04	0.02	-0.0013
Congo, Republic Of	0.00 ***	0.00 ***	0.00 ***	0.30	0.03	0.02 *	-0.0004
Denmark	0.00 ***	0.00 ***	0.00 ***	0.14	0.04	0.01	-0.0019
India	0.01 **	0.01 ***	0.00 ***	0.52 **	0.04	0.02 **	-0.0007
Bolivia	0.03 **	0.07 *	0.00 ***	0.37 *	0.05	0.02 *	-0.0014
Netherlands Antilles	0.00 ***	0.00 ***	0.00 ***	0.52 **	0.04	0.03 **	-0.0005
Cameroon	0.01 ***	0.00 ***	0.00 ***	0.62 **	0.04	0.03 ***	-0.0001
Israel	0.00 ***	0.00 ***	0.00 ***	0.59 **	0.08	0.01 ***	-0.0005
Italy	0.00 ***	0.00 ***	0.00 ***	0.39	0.03	0.02 **	-0.0009
Cote D Ivoire	0.00 ***	0.00 ***	0.00 ***	0.20	0.06	0.02	0.0017
Ecuador	0.01 ***	0.01 **	0.00 ***	0.36 *	0.04	0.02 *	-0.0004
Thailand	0.00 ***	0.00 ***	0.00 ***	0.47 **	0.03	0.03 **	-0.0010
Chile	0.07 *	0.04 **	0.01 ***	0.59 **	0.04	0.02 ***	-0.0001

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.23: Δ^2 Oil rents per capita (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.00 ***	0.00 ***	0.00 ***	0.04	0.03	-0.01	-0.0004
Equatorial Guinea	0.00 ***	0.00 ***	0.00 ***	0.04	0.03	-0.02	0.0088
Guatemala	0.00 ***	0.00 ***	0.00 ***	0.04	0.03	-0.01	0.0028
South Africa	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	-0.0005
Russia	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0003
Ukraine	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0004
Vietnam	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0002
Austria	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0002
Spain	0.00 ***	0.00 ***	0.00 ***	0.09	0.05	0.00	-0.0008
Moldova	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	-0.0001
Iran	0.00 ***	0.01 ***	0.00 ***	0.03	0.03	0.00	0.0004
Gabon	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0009
France	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0010
Indonesia	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0009
United Kingdom	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0016
Belarus	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0007
Kyrgyz Republic	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0004
Tajikistan	0.00 ***	0.00 ***	0.00 ***	0.06	0.03	0.00	0.0003
Canada	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0010
Colombia	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0023
Myanmar	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	-0.0004
Chad	0.00 ***	1.00	0.03 **	0.36 *	0.12	0.63 ***	-0.3230 ***
Mexico	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0002
Peru	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0023
Malaysia	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0010
Trinidad and Tobago	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0007
Argentina	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0015
Angola	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0005
United States	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0007
Nigeria	0.00 ***	0.01 ***	0.00 ***	0.03	0.03	0.00	0.0005
Congo, Republic Of	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0020
Denmark	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0006
India	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0011
Bolivia	0.00 ***	0.02 **	0.00 ***	0.04	0.03	0.00	0.0003
Netherlands Antilles	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	-0.01	-0.0005
Cameroon	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0004
Israel	0.00 ***	0.00 ***	0.00 ***	0.04	0.03	0.00	0.0004
Italy	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0009
Cote D Ivoire	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	-0.01	0.0026
Ecuador	0.00 ***	0.00 ***	0.00 ***	0.03	0.03	0.00	0.0007
Thailand	0.00 ***	0.00 ***	0.00 ***	0.03	0.02	0.00	0.0006
Chile	0.00 ***	0.02 **	0.00 ***	0.04	0.04	0.00	0.0016

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.24: Deaths rate from AIDS (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	1.00	0.00 ***	0.96	1.90 ***	0.27 ***	0.12 ***	0.0027 ***
Equatorial Guinea	0.93	0.46	0.40	1.68 ***	0.30 ***	0.13 ***	0.0082 ***
Guatemala	0.03 **	0.12	0.00 ***	1.53 ***	0.33 ***	0.12 ***	-0.0107 ***
South Africa	0.00 ***	1.00	0.00 ***	1.76 ***	0.46 ***	0.25 ***	-0.0179 ***
Russia	.	.	.	. ***	. ***	.	.
Ukraine	0.00 ***	1.00	0.00 ***	1.87 ***	0.43 ***	0.19 ***	-0.0069 ***
Vietnam	0.68	0.70	0.12	1.90 ***	0.21 **	0.19 ***	-0.0032 ***
Austria	0.82	0.37	0.22	1.76 ***	0.20 **	0.00 ***	0.0000
Spain	0.89	0.52	0.30	1.49 ***	0.17 **	-0.08 ***	-0.0015
Moldova	0.75	0.72	0.16	1.83 ***	0.24 ***	0.17 ***	-0.0058 **
Iran	1.00	0.31	0.99	1.75 ***	0.45 ***	0.10 ***	0.0072 ***
Gabon	0.15	0.70	0.02 **	1.61 ***	0.36 ***	0.11 ***	-0.0100 ***
France	0.74	0.99	0.16	1.76 ***	0.29 ***	-0.15 ***	0.0057 *
Indonesia	1.00	0.96	0.97	1.55 ***	0.46 ***	0.22 ***	0.0242 ***
United Kingdom	0.87	0.75	0.27	1.63 ***	0.21 **	-0.09 ***	0.0014
Belarus	0.98	0.61	0.60	1.68 ***	0.33 ***	0.15 ***	0.0100 ***
Kyrgyz Republic	0.84	0.90	0.24	0.57 **	0.29 ***	0.02 **	0.0053 ***
Tajikistan	0.83	0.30	0.23	1.74 ***	0.14 *	0.11 ***	0.0013
Canada	0.91	0.23	0.36	1.61 ***	0.10	-0.10 ***	-0.0027
Colombia	0.00 ***	0.39	0.00 ***	1.58 ***	0.43 ***	0.15 ***	-0.0155 ***
Myanmar	0.00 ***	0.02 **	0.00 ***	1.64 ***	0.45 ***	0.14 ***	-0.0134 ***
Chad	0.46	0.87	0.10 *	0.16	0.16 **	0.00	-0.0125 ***
Mexico	.	.	.	. ***	. ***	.	.
Peru	0.00 ***	0.00 ***	0.00 ***	1.27 ***	0.44 ***	0.06 ***	-0.0112 ***
Malaysia	0.00 ***	0.14	0.00 ***	1.58 ***	0.41 ***	0.17 ***	-0.0160 ***
Trinidad and Tobago	0.49	0.87	0.07 *	1.69 ***	0.37 ***	0.14 ***	-0.0105 ***
Argentina	0.86	0.77	0.26	1.34 ***	0.24 ***	-0.02 ***	0.0010
Angola	0.00 ***	0.99	0.00 ***	1.61 ***	0.45 ***	0.11 ***	-0.0111 ***
United States	0.93	0.78	0.40	1.77 ***	0.23 ***	-0.09 ***	0.0016
Nigeria	0.00 ***	0.00 ***	0.00 ***	1.33 ***	0.42 ***	0.12 ***	-0.0164 ***
Congo, Republic Of	0.27	0.02 **	0.03 **	0.42 *	0.41 ***	0.00	-0.0050 ***
Denmark	0.33	0.46	0.04 **	0.47 **	0.14 *	-0.02 *	-0.0020
India	0.00 ***	0.99	0.00 ***	1.71 ***	0.46 ***	0.18 ***	-0.0145 ***
Bolivia	0.00 ***	0.01 **	0.00 ***	1.03 ***	0.26 ***	0.04 ***	-0.0069 ***
Netherlands Antilles	0.86	0.25	0.26	1.40 ***	0.21 **	-0.13 ***	-0.0051
Cameroon	0.00 ***	0.99	0.00 ***	1.61 ***	0.47 ***	0.18 ***	-0.0176 ***
Israel	0.38	0.28	0.04 **	0.95 ***	0.10	-0.03 ***	-0.0012
Italy	0.95	0.43	0.47	1.71	0.22	-0.13 ***	0.0024
Cote D Ivoire	0.00 ***	0.01 **	0.00 ***	1.35 ***	0.46 ***	0.10 ***	-0.0150 ***
Ecuador	0.00 ***	0.00 ***	0.00 ***	1.18 ***	0.36 ***	0.09 ***	-0.0143 ***
Thailand	0.00 ***	0.00 ***	0.00 ***	0.69 **	0.41 ***	0.09 **	-0.0283 ***
Chile	.	***	.	. ***	. ***	.	.

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739

KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216

Table D.25: TB prevalence (log): unit-root tests, linear and quadratic trends for each oil-rich country

	Dfuller (H0= the variable has a unit root)			KPSS (H0= the variable has no unit root)		Linear trend	Quadratic trend
	no trend	trend	drift	no trend	trend	Beta	Beta
Sudan	0.00 ***	0.08 *	0.00 ***	0.29	0.09	-0.01 *	0.0009
Equatorial Guinea	0.03 **	0.00 ***	0.00 ***	0.85 ***	0.08	0.02 ***	0.0018
Guatemala	0.99	0.11	0.76	1.80 ***	0.16 **	-0.02 ***	-0.0005 **
South Africa	0.97	0.66	0.58	1.61 ***	0.32 ***	0.05 ***	0.0036 ***
Russia	0.67	0.77	0.12	1.65 ***	0.20 **	-0.03 ***	0.0012 **
Ukraine	0.74	0.99	0.16	1.88 ***	0.36 ***	0.06 ***	-0.0018 ***
Vietnam	0.85	0.94	0.26	1.77 ***	0.27 ***	-0.01 ***	0.0004 **
Austria	1.00	0.99	0.98	1.81 ***	0.38 ***	-0.04 ***	-0.0019 ***
Spain	0.42	0.00 ***	0.05 *	1.20 ***	0.10	-0.03 ***	-0.0013
Moldova	0.92	0.80	0.37	0.94 ***	0.25 ***	0.01 ***	0.0013 **
Iran	1.00	0.99	0.91	1.40 ***	0.40 ***	-0.03 ***	-0.0033 ***
Gabon	1.00	0.64	1.00	1.71 ***	0.37 ***	0.05 ***	0.0037 ***
France	0.77	0.87	0.18	1.80 ***	0.17 **	-0.05 ***	0.0009
Indonesia	1.00	0.91	0.93	1.51 ***	0.47 ***	-0.02 ***	-0.0028 ***
United Kingdom	0.32	0.78	0.04 **	0.65 **	0.16 **	0.01 **	0.0008
Belarus	0.56	0.99	0.08 *	1.59 ***	0.41 ***	-0.03 ***	0.0027 ***
Kyrgyz Republic	0.47	0.99	0.06 *	1.07 ***	0.44 ***	-0.01 ***	0.0030 ***
Tajikistan	0.97	0.90	0.56	1.82 ***	0.32 ***	0.05 ***	0.0017 ***
Canada	0.95	0.42	0.45	1.90 ***	0.21 **	-0.03 ***	-0.0004 **
Colombia	0.95	0.44	0.48	1.86 ***	0.22 ***	-0.03 ***	-0.0006 *
Myanmar	1.00	0.98	1.00	1.68 ***	0.48 ***	-0.03 ***	-0.0022 ***
Chad	1.00	0.00 ***	0.85	0.59 **	0.14 *	-0.03 ***	-0.0046 ***
Mexico	1.00	0.97	0.93	1.88 ***	0.14 *	-0.09 ***	-0.0004
Peru	0.67	0.18	0.12	1.83 ***	0.17 **	-0.07 ***	0.0002
Malaysia	0.12	0.96	0.01 **	1.87 ***	0.45 ***	-0.04 ***	0.0012 ***
Trinidad and Tobago	0.26 **	0.40	0.03 **	0.57 **	0.18 **	0.02 ***	-0.0008
Argentina	0.01	0.58	0.00 ***	1.85 ***	0.32 ***	-0.04 ***	0.0011 ***
Angola	0.69	0.65	0.13	0.94 ***	0.28 ***	-0.01 ***	-0.0016 **
United States	0.93	0.89	0.39	1.91 ***	0.26 ***	-0.06 ***	0.0007
Nigeria	0.98	1.00	0.62	0.43 *	0.32 ***	0.00	-0.0023 ***
Congo, Republic Of	0.60	0.92	0.10 *	1.82 ***	0.14 *	0.04 ***	-0.0005
Denmark	0.89	0.92	0.30	0.61 **	0.43 ***	-0.01	-0.0062 ***
India	1.00	1.00	1.00	1.36 ***	0.46 ***	-0.02 ***	-0.0031 ***
Bolivia	0.88	0.52	0.30	1.87 ***	0.16 **	-0.03 ***	0.0005 **
Netherlands Antilles	0.99 **	0.11	0.85	1.60 ***	0.31 ***	-0.03 ***	-0.0029 ***
Cameroon	0.01	1.00	0.00 ***	1.48 ***	0.42 ***	0.03 ***	-0.0041 ***
Israel	0.99	0.96	0.69	1.09 ***	0.33 ***	-0.02 ***	0.0032 ***
Italy	0.97	0.58	0.56	1.43	0.37	-0.02 ***	-0.0028 ***
Cote D Ivoire	1.00	1.00	1.00	0.84 ***	0.35 ***	-0.01 ***	-0.0018 ***
Ecuador	0.33	0.48	0.04 **	1.83 ***	0.35 ***	-0.05 ***	0.0014 ***
Thailand	0.66	0.91	0.12	0.28	0.27 ***	0.00	-0.0010 **
Chile	0.40 ***	0.29	0.05 **	1.79 ***	0.19 **	-0.07 ***	0.0025 ***

KPSS without trend - thresholds: 10%: 0.347 5% : 0.463 2.5%: 0.574 1% : 0.739
KPSS with trend - thresholds: 10%: 0.119 5% : 0.146 2.5%: 0.176 1% : 0.216