Oil windfalls might not be the problem in oil-producing countries: evidence from the impact of oil shocks on export diversification

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Abstract

This paper examines the factors behind export diversification in oil countries. Specifically, by investigating the impact of oil booms on export diversification through a difference-in-difference framework, this paper finds that the economy's export structure before oil boom determines whether oil windfalls might affect the diversification process. Thus, an oil boom negatively affects export diversification only if countries initially exhibit low levels of diversification. In countries with a high level of diversification before the boom, an oil boom has no impact on diversification. These results are based on a large sample of 134 countries, and are robust to various sensitivity analyses. They are corroborated with data from the manufacturing sector, which show that oil booms only reduce diversification in countries with a small manufacturing sector prior to the boom. The results suggest that the initial constraints, which hampered the emergence of entrepreneurs' class prior the boom, are key elements of the failure of a diversification process in resource rich countries.

JEL Classification: F1; Q32; C23
Keywords: Export diversification; Oil resources; Panel data

Résumé

Cet article examine les facteurs à l'origine de la diversification des exportations dans les pays riches en ressources naturelles, et notamment en pétrole. Plus précisément, nous étudions l'impact des booms pétroliers sur la diversification des exportations par la méthode des doubles différences. Les résultats démontrent que la structure de l'économie avant le boom pétrolier détermine l'impact des revenus pétroliers sur le processus de diversification des exportations. Ainsi, pour des pays qui présentent initialement de faibles niveaux de diversification, un boom pétrolier aura un effet négatif sur la diversification des exportations. En comparaison, dans les pays qui présentent initialement des niveaux élevés de diversification avant le boom, le boom pétrolier n'aura aucun impact sur la diversification des exportations. Ces résultats se basent sur un large échantillon de 134 pays et s'avèrent robustes à diverses analyses de sensibilité. Ils sont aussi corroborés par les données tirées du secteur manufacturier, qui révèlent que les booms pétroliers n'affectent négativement la diversification que dans des pays présentant un faible secteur manufacturier avant le boom. Les conclusions suggèrent que les contraintes initiales, qui entravent l'émergence d'une classe d'entrepreneurs avant le boom, sont des éléments clés de l'échec des processus de diversification dans les pays riches en ressources naturelles. Au lieu de concentrer toute l'attention sur les politiques à adopter durant les épisodes de hausse des revenus tirés des ressources naturelles, il apparaît nécessaire de se pencher également sur la compréhension des facteurs qui sous-tendent la structure des économies, notamment celles des pays en développement, avant ces épisodes.

Classification JEL: F1; Q32; C23

I. Introduction

A blueprint for oil countries to protect themselves against volatility and the Dutch disease is to diversify their economies. Diversification can also help transform resource revenue into renewable assets (man-made). However, this recommendation is not buttressed by the reality, and the exports basket of many oil countries appear highly concentrated (Gylfason & Wijkman, 2015; Cherif & Hasanov, 2014; Cadot *et al*. 2013; Gelb, 2010).

This paper attempts to provide an explanation for these diversification failures in several oil countries. It provides supporting evidence that diversification in oil countries primarily depends on constraints that already undermine the development of non-resource export activities prior the resource boom. In other words, it matters whether or not a country is dominated by a single export product before the boom, has an enclave industry or a labor-intensive industry before the boom, and so on. The examples of Malaysia and Indonesia, often cited as successful diversification experiences with oil windfalls, are in fact among the developing countries with the highest level of export diversification before giant oil booms including the one of 1970s.

This proposition is tested empirically, examining the impact of oil booms on export diversification levels using a large 134 country sample over the 1965-2010 period. Results show that oil booms lead, on average, to greater export concentration when the level of diversification prior to the oil boom is not accounted for. However, when we consider the initial level of diversification, results show that oil booms lead to more concentration only if countries exhibit low levels of diversification before the boom. In countries with a high level of diversification before the boom, the oil boom has no impact on diversification. Furthermore, these results are corroborated by data from the manufacturing sector, which show that oil booms reduce diversification only in countries with a small manufacturing

sector prior to the boom. The results are robust to various sensitivity analyses, including different estimation methods and alternative scenarios.

These results echo three main arguments highlighted by distinct strands of the literature. The first argument maintains that the existence of an entrepreneur class prior to the boom, makes it possible to absorb complementary investments derived from a resource boom. This argument is derived from the theoretical predictions of Baland & Francois (2000) who find a path dependency between the presence of entrepreneurs before the boom, and the growth of a country after the boom. Thus, countries that experience a decline in growth after a boom, are those with a lower share of entrepreneurs before the boom. In contrast, countries that manage to sustain growth after a boom are those that had a broader base of entrepreneurs before the boom. The second argument presented in the works of Dunning (2005) and Omgba (2014), point to prior development of non-resource sectors as a key element that is able to influence the motivation of political elites towards diversification policies. Oil windfalls tend to be oriented towards public consumption, as opposed to investment, when the initial industrial base is small. The third argument is derived from the works of Cherif (2013) and Cherif & Hasanov (2014), notably on the interaction between resource dependence and the initial technology gap. These authors show that this gap is broadening over time, and that the issue of managing the oil boom for diversification is therefore more problematic in countries with initial low technology. In contrast, high tech countries which were already diversified before the oil revenue accrued have shown a better management of booms (Cherif & Hasanov, 2014).

This paper takes the analysis one step further by providing the first empirical evidence that can support the aforementioned arguments, while extending the contribution of the empirical literature on factors that may be correlated with diversification processes (see Imbs and Wacziarg, 2003; Cadot et *al.* 2010). Nevertheless, the focus of this paper is beyond the

traditional issue of the non-monotonic relationship between economic development and diversification, highlighted by the aforementioned works. Instead, this article focuses on diversification patterns in oil-producing countries, and it attempts to investigate the question of why some oil countries are diversifying while others fail – a question that is not yet addressed by this strand of literature.

In the second section of this paper, we review the literature and present the arguments behind the empirical tests. In the third section, we perform econometric tests that explore the relationship between oil booms and export diversification performance, focusing on export diversification levels prior to the booms. In the fourth section we conclude with the study's implications.

II. Literature review and theoretical arguments

Historically, certain scholars consider the opportunities offered by primary commodity production and exports for development to be limited. The first reason offered for this failure refers to the long-run downward trend of the terms of trade between commodities and manufactured goods (see Prebisch, 1950; Singer, 1950).[1] To address these adverse effects of commodity dependence, developing countries should diversify their exports.

Two other elements – related to literature on the resource curse[2] – have been used to advocate the necessity of economic diversification for resource-rich countries. These include Dutch disease and the volatility of commodity prices.[3]

[1] However, since the turn of the 21st century, commodity prices have consistently risen, reaching very high levels by mid-2008, although they fell rapidly afterwards and have recently been exceedingly volatile.

[2] The resource curse refers to the fact that resource-dependent countries tend to exhibit poor performances compared to those that do not depend on natural resources (see Sachs and Warner, 1995)

[3] One can also add the exhaustible nature of oil reserves to this list.

Dutch disease refers to the apparent relationship between dependence on natural resources, real exchange rate appreciation, and poor economic growth. The phenomenon can be summarized as follows: a boom (in quantity or price) within a country's natural resource sector leads to increased overall consumption within the country, resulting from an increase in revenue. This in turn, creates an increase in non-tradable sector prices, while the prices of tradable goods, which are determined by international markets, remain unchanged. This results in an appreciation of the real exchange rate and a loss of competitiveness for a nation's economy (Corden & Neary, 1982; Sachs & Warner, 1995; Apergis et al., 2014).

The volatility that usually accompanies commodity prices also creates significantly macroeconomic wealth management challenges for resource-based economies. Indeed, these economies are more subject to external shocks, where instability in the terms of trade plays an important role. Volatility in commodity prices generates volatility in fiscal revenues, in turn fueling, instability in expenditures. Spending volatility is even more damaging as the adjustments are asymmetric. Expenditures can easily be increased during boom periods, but when the effects of the boom have faded, it may be very difficult to lower them. In addition, commodity price volatility can also affect long-term growth because strongly fluctuating prices can increase uncertainty and risk, which discourages investment (Budina *et al.,* 2007).

It is worth noting that the aforementioned economic mechanisms of the resource curse can be exacerbated by the voracity effect of the elites (Tornell & Lane, 1999). Indeed, an oil boom may lead to an increase in the demand for direct transfers towards elites in the different regions of the country. Public spending by the central government can therefore increase and misallocate resources. The rigidity of these expenditures to reduction during the bust period, can lead to the accumulation of excessive debt, which in turn is conducive to economic collapse (Robinson et al., 2006; Budina et al., 2007).

While acknowledging the negative impacts of the aforementioned factors however, including volatility and Dutch disease, on oil countries' economic performance, numerous scholars question their relevance to explain the limited export diversificationof some oil countries (Hausmann et al., 2010; Cherif & Hasanov, 2014). Thus, when reviewing the specific case of Algeria for example, in light of the above factors, including Dutch disease and volatility, Hausmann et al. (2010) argue that these factors do not explain why this large oil country exhibits high export concentration levels. More broadly, examining the Gulf Cooperation Council countries which are highly endowed with oil, Cherif and Hasanov (2014) concur that the standard policy recommendations for diversification may fail short, since diversification of these countries mainly depends on the initial technology gap and the importance of oil revenue. Taken as a whole, these findings suggest that policies aimed at counteracting the constraints outlined above may not be sufficient for successful export diversification in oil countries. This paper supports these views.

More specifically, we argue that the position of an oil country in connection with its diversification performance before the resource boom may be sufficient to predict the impact of oil windfalls on the diversification of its economy. To be clear on this point, we do not argue that oil resources do not cause economic, political, or social problems. Instead, we argue that oil wealth is a problem for the diversification process if a tendency towards concentration already existed in the economy. In contrast, if a country already possesses a broader basket of export products before the oil boom, the windfall will be absorbed. Indeed, the development of non-resource export activities prior the boom might illustrate the presence of an entrepreneurial class. This class may act in two ways. First, it can influence the orientation of oil windfalls towards the private sector, while it can also simultaneously absorb complementary investments derived from the resource boom.

The most cited examples of successful diversification experiences through oil bonanzas, namely Indonesia and Malaysia, constitute obvious illustrations that support the above point. Regarding Indonesia for instance, Dunning (2005) demonstrates that the country had a well-established entrepreneurial class as well as a significant agricultural sector long before the oil boom of the 1970s. The existence of a non-oil sector had long motivated political elites to scale-up investments in its direction. This intensified during the oil boom, since they were able to use resource windfalls and did not have interest in being politically challenged by the entrepreneurial class (Dunning, 2005). In Malaysia, Jomo & Rock (1998) highlight the presence of such a class of entrepreneurs before the oil boom of the 1970s. Thus, at its independence in 1957, Malaysia already had a manufacturing sector that contributed to 11% of GDP. Even its primary sector already had a diverse range of export products including tin, rubber and palm oil (Jomo and Rock, 1998). This pre-established non-oil sector made it possible to catalyze the dynamics of diversification, including the possibility of absorbing additional investments from oil revenues, into non-oil sectors during the boom.

Unlike Malaysia or Indonesia, Gabon has a very high degree of export concentration today (Omgba, 2014) despite the fact that it also experienced an oil boom in the 1970s. As was the case in the other two countries, the Gabonese elite had an incentive to use the massive oil revenue influx to diversify the economy. Thus, with the aim of fighting against the volatility of oil resources exhaustibility, Gabonese political elites created an investment fund in 1974 (*Provision pour Investissements diversifiés*) to invest part of the oil windfall in perennial activities, hoping to lead the country towards economic diversification (Ondo Ossa, 1984). However, this initiative led to a political and economic disaster, resulting in elite capture. The limited industrial base and shortage of entrepreneurs did not permit the economy to adequately diversify the additional investment derived from oil revenue (Omgba, 2014). So, in the absence of an entrepreneurial class that was able to increase political dividends for the

elites through this diversification policy, it has become less attractive for the current Gabonese political elites to sustain this policy. Investments are being diverted from their original purpose and used instead for redistribution and public consumption, which are more attractive to elites. This concentration of resources in consumption and redistribution, and the absence of an implanted non-oil sector, will allow the emergence of a state bourgeoisie that concentrates economic and political power, and does not have an interest in supporting diversification policies.

To sum-up, through these illustrations, we support the position that an oil country's diversification performance before the resource boom, may be sufficient to predict the impact of the boom on the economic diversification. However, since other factors may come into play to explain this divergence of diversification schemes, a careful empirical analysis is needed. That is the purpose of the following section.

III. Empirical analysis

III.1. Data

Our sample includes 134 countries over the 1965 - 2010 period.[4] Table A1 in the appendix provides a list of countries split into oil producing countries (treatment group) and non-oil producing countries (comparison group) in 1965. An oil country is one that produces oil in 1965. A non-oil country is country that does not produce oil in 1965. The classification between oil producing and non-oil producing countries is derived from the petroleum database BP (2015), which consists of a list of oil-producing countries and their yearly production since 1965.

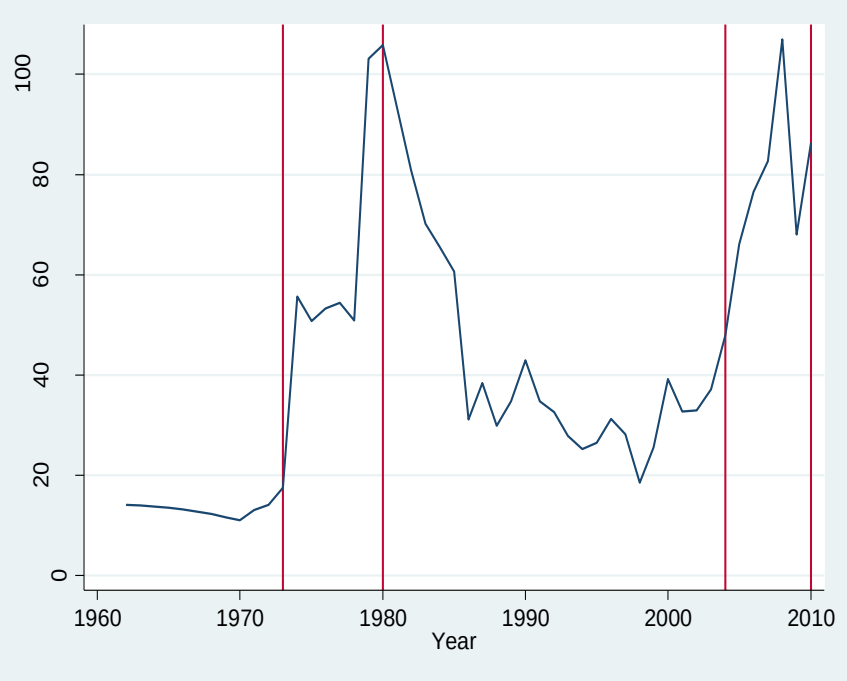
[4] Because of missing control variable data, most of our regressions include only 134 countries.

Our outcome of interest is export diversification. The export diversification index used in this paper is the Theil index, one of the most frequently used diversification indices in related studies (see Cadot *et al.* 2013). We take advantage of a recent IMF database (2014) that includes a comprehensive diversification database with Theil indices for 186 countries, mostly less developed ones, from 1962 to 2010. Data and computations are described in IMF (2014). A higher value on the Theil diversification index indicates lower diversification.

The oil boom variable (treatment variable) is a dummy variable equal to one for the years between 1974 and 1980 and the years between 2004 and 2010. These two periods represent the years covering the first and the second giant oil price shocks (see Kilian, 2009; Smith, 2015). Oil prices are drawn from BP (2015). Figure 1 depicts oil price trend including the two periods of giant price shocks.

Traditional covariates for diversification such as GDP per capita, investment, population density, and openness are from World Development Indicators (2015). In many regressions, we also control for geographical and historic factors. These factors include the legal origin, which is a dummy variable taking 1 when the legal origin is French, and 0 otherwise (from La Porta *et al*.2008); and the capital city's distance from the equator (from Rodrik *et al.* 2004). We also check for the inclusion of oil production (from BP (2015)) in successive regressions. Table A2 presents summary statistics for the sample period (1965-2010) of variables used in this paper.

Figure 1: The evolution of oil prices



Source: Authors' construction using data from BP (2015)

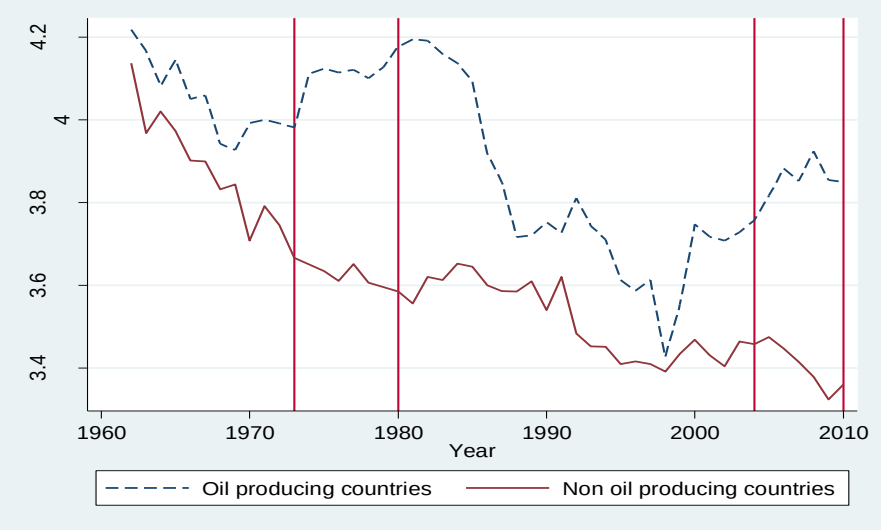
III.2. Econometric strategy

As stated above, the purpose of this paper is to study the impacts of positive oil price shocks on diversification in oil countries. Before establishing the econometric equations, we first examine the data by drafting three simple figures (Figure 2, Figure 3 and Figure 4). Figure 2 shows the export diversification trends for both oil producing and non-oil producing countries over the 1965-2010 period, utilizing the whole sample. The overall tendency is to diversify in both sub-samples. Nevertheless, this figure also displays a relationship between export diversification in oil countries and oil price shocks.

Specifically, oil boom periods seem to widen the gap between oil producing countries and non-oil producing countries on export diversification. This gap narrows however once the oil boom is finished, and to some extent, the gap is similar to the one that existed prior to the

boom. This pattern might suggest two major themes. First, oil countries seem to be, on average, more concentrated than non-oil countries. This point is one that is frequently encountered in the literature (see Elbadawi *et al.* 2012; Cadot *et al.* 2013). Second, the effects of oil booms seem to be temporary, suggesting that oil windfalls do not change the trajectory of diversification in oil countries. This trajectory is closer to the one before the boom than the one prevailing during the boom periods, suggesting that pre-existing features may condition the effect of oil windfalls on export diversification.

Figure 2: Export diversification trends between oil producing and non-oil producing countries, 1965-2010



Source: Authors' construction using data from IMF (2014)

We investigate these points more deeply in Figures 3 and 4, which present the trends of export diversification between oil producing countries and non-oil producing countries, depending on diversification levels in 1965. Figure 3 exposes these trends for countries with a high level of diversification in 1965, which are countries above the diversification index's median in 1965. This figure shows some amount of export diversification reduction (an increase in export concentration) during the first oil booms of the 1970s, and the beginning of the 1980s. However, after this tremendous increase in export concentration, the index decelerates

drastically and oil countries seem to exhibit better diversification performance than their non-oil counterparts, as was the case in 1965.

In Figure 4 we undertake a similar exercise as the one in Figure 3, differentiated by the fact that we consider countries with low levels of diversification in 1965, which are countries with diversification indices below or equal to the diversification index's median in 1965. Contrary to Figure 3, Figure 4 shows a different pattern of export diversification for oil countries with low levels of diversification in 1965. One can see a reduction in diversification (an increase of export concentration) during the two giant oil booms. Clearly, in Figure 4, the trend of oil producing countries is above the one of non-oil countries, suggesting that those countries are not able to absorb oil windfalls.

Put together, the three figures produce some insights. First, the great export concentration in oil countries when compared to non-oil countries (Figure 2), might be primarily driven by the diversification performance of oil countries with high concentration levels in 1965 (Figure 4). Indeed, Figures 3 and 4 show that the diversification performance among oil countries is not homogeneous. Second, during boom periods, export diversification reacts to oil price shocks (price effect) in both groups of oil countries (high and low levels of diversification in 1965). However, only oil countries with low levels of export diversification in 1965 appear more concentrated after the boom. To sum-up, the effect of oil booms on oil countries' diversification seems to depend on the level of diversification prior to the booms. Oil windfalls affect the trajectory of the diversification only in low export diversified countries prior to the booms.

Figure 3: Index diversification trends between oil and non-oil producing countries with high levels of diversification in 1965, 1965-2010

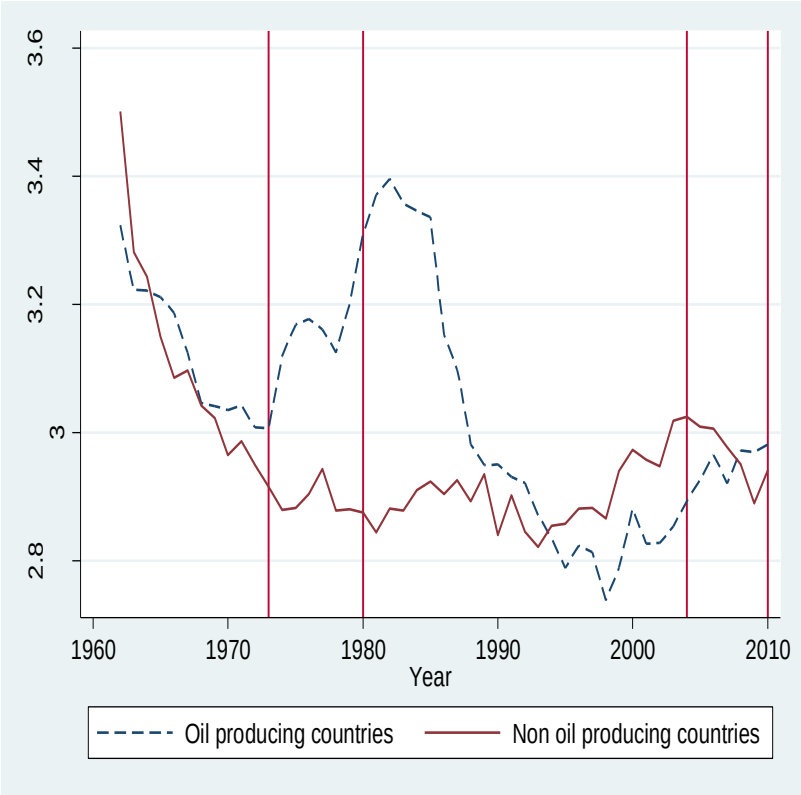
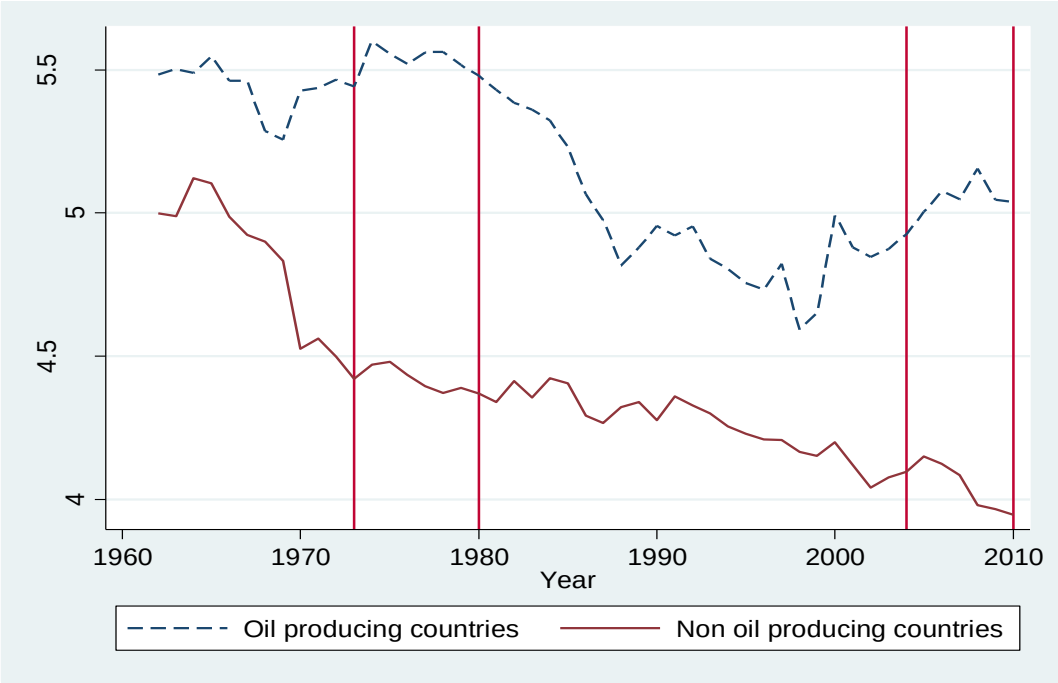


Figure 4: Index diversification trends between oil and non-oil producing countries with low levels of diversification in 1965, 1965-2010



We formalize the visual evidence observed in Figure 2 by estimating the following difference-in-differences (DD) regression:[5]

$$\boldsymbol{ED_{it} = \beta_0 + \beta_1 \mathbf{Boom}_t * \mathbf{oilcountries}_i + \beta_2 \mathbf{oilcountries}_i + \beta_3 \mathbf{Boom}_t + \delta X_{it} + \lambda_i + \mu_t + \epsilon_{it}} \quad (1)$$

In order to formalize the relationship observed in Figures 3 and 4, which constitute our main research question, we estimate the following difference-in-differences (DD) regression:

$$\boldsymbol{ED_{it} = \beta_0 + \beta_1 \mathbf{Boom}_t * \mathbf{oilcountries}_i * \mathbf{lowdivers\ in\ 1965}_i + \beta_2 \mathbf{Boom}_t * \mathbf{oilcountries}_i + \beta_3 \mathbf{Boom}_t * \mathbf{lowdivers\ in\ 1965}_i + \beta_4 \mathbf{Oilcountries}_i * \mathbf{lowdivers\ in\ 1965}_i + \beta_5 \mathbf{oilcountries}_i + \beta_6 \mathbf{Boom}_t + \beta_7 \mathbf{lowdivers\ in\ 1965}_i + \delta X_{it} + \lambda_i + \mu_t + \epsilon_{it}} \quad (2)$$

Where ED_{it} is the export diversification index in country i for year t, Boom_t is a dummy variable that takes the value of 1 in year t during oil boom years (1974-1980 and 2004-2010) and 0 otherwise. The variable oilcountries_i is a dummy variable that takes the value of 1 for oil producing countries in 1965 and 0 otherwise; $\text{lowdivers in } 1965_i$ is a dummy variable that takes the value of 1 if country i has a low level of export diversification in 1965 (the export concentration in country i in 1965 is higher than or equal to the export concentration index median for the sample in 1965), and 0 if country i has a high level of export diversification (the export concentration in country i in 1965 is lower than the export concentration index median in 1965).[6] X_{it} is a vector of control variables, λ_i is a fixed effect unique to country i, and $\boldsymbol{\mu_t}$ is a time effect common to all countries in year t.[7] The error term ϵ_{it} is a country time-varying error and is assumed to be distributed independent of λ_i and μ_t. Stated this way, the

[5] A similar approach has been used by Black *et al. (*2005), which evaluates the economic impact of the coal boom
and bust in the United States. More recently, Smith (2015) used the same approach to examine the impact of the oil price boom and subsequent bust in the 1970s, on non-oil economic activity in oil-dependent countries.

[6] In the difference-in-differences estimation framework, Galiani et al. (2005) used a similar approach to assess the heterogeneous treatment effects of privatization on child mortality by the initial level of socio economic status.

[7] We chose to use the year 1965 for the classification of countries with high level export diversification and low level export diversification because we have more observation on the export diversification index in 1965 than in 1962. In 1965, we have export diversification index data on 145 countries whereas in 1962 we have export diversification index data on 140 countries. Therefore, our sample starts in 1965.

estimation method retained herein is the least squares dummy variables (LSDV). It is worth noticing that this estimation method leads to the same results as the within estimator.[8]

The difference-in-difference approach controls for time-invariant heterogeneity. The key identifying assumption of this approach is that the change in export diversification in non-oil producing countries during oil price booms is an unbiased estimate of the counterfactual. Thus, this approach relies on the assumption of parallel trends during pre-oil boom periods. Thanks to the existence of data during pre-oil boom periods, we are able to formally test this assumption. Moreover, the other key assumption that is made in this paper is that the two giant oil booms identified in the literature are exogenous to individual oil producing countries and their export diversification. Basically, this assumption is related to the absence of time-varying unobserved covariates that are correlated with both factors that lead to oil booms and export diversification. In fact, Kilian (2009) presents evidence that historically, the main determinants of oil price shocks are the combination of global aggregate demand shocks and precautionary demand shocks, rather than oil supply shocks. This evidence is in line with the assumption of exogeneity of oil price shocks to oil producing countries. Smith (2015) also discusses the exogeneous nature of the oil price shocks during the 1970s.

Finally, as pointed out by Bertrand et al. (2004), standard errors resulting from the use of repeated cross sections (or a panel) on individuals, states, or countries in treatment and control groups for several years before and after treatment, might be inconsistent because of the serial correlation problem. Thus, we address the concern of inconsistent standard errors due to serially correlated observations by following the two corrections proposed by Bertrand et al. (2004). First, we allow for an arbitrary variance-covariance structure within countries over time by computing the standard errors clustered at the country level. Second, we remove the

[8] The results using the within estimator can be obtained upon request.

time series dimension by aggregating the data into two periods: pre- and post-intervention. Specifically, we collapse the time series information into a pre-oil boom period and a post-oil boom period.

III.3. Results

III.3.1 Main results

III.3.1.1 The Average effect

Table 2 presents different specifications for estimating the impact of oil booms on export diversification, as outlined in equation 1. Results in column 1, which do not include control variables, show that oil booms reduce export diversification (accentuate export concentration) by 0.227. In column 2, we control for the level of economic development (see Cadot et al., 2011). Although the coefficient (i.e. the extent of the impact) of oil booms is reduced, it is still statistically significant and has the expected sign. In column 3, in addition to the controls included in column 2, we also control for a different subset of variables, including investment, legal origin, population density, and trade openness. Results still indicate that oil booms reduce export diversification in oil producing countries. Furthermore, in column 4, we estimate equation 1 and include only those variables that are statistically significant as controls. The specification in column 4 is our preferred specification.

In short, our preferred specification (column 4) shows that oil booms reduce export diversification in oil producing countries by 0.137. Thus, in relative terms, oil booms are associated with a 3.3% reduction in export diversification in oil producing countries.[9]

[9] The mean export diversification index in 1965 is 4.146

Table 2: Effects of oil shock on export diversification

	(1)	(2)	(3)	(4)
Boom*oilcountries	0.227***	0.197***	0.138**	0.137**
	(0.061)	(0.066)	(0.065)	(0.065)
Oilcountries	0.858***	2.383***	3.034***	3.022***
	(0.022)	(0.140)	(0.265)	(0.256)
Boom	-0.545***	-0.525***	-0.670***	-0.663***
	(0.067)	(0.088)	(0.118)	(0.115)
LnGDP_capita		-1.421***	-1.215**	-1.241**
		(0.442)	(0.612)	(0.595)
(LnGDP_capita)_squared		0.098***	0.088**	0.090**
		(0.027)	(0.037)	(0.035)
Investment			-0.007***	-0.006***
			(0.002)	(0.002)
Legal origin			-0.493**	-0.413*
			(0.237)	(0.227)
Population_density			0.000	
			(0.000)	
Openness			0.001	
			(0.001)	
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Countries	186	176	169	170
Observations	8,165	6,599	5,614	5,663
R-squared	0.837	0.873	0.889	0.890

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
The mean of export diversification in 1965 is 4.146.
Source: Authors' estimates

III.3.1.2 The heterogeneity effect

Now, we turn to Table 3, which reports the results of the main research question of this paper, namely the existence of different effects depending on the level of diversification prior the boom. Specifically, Table 3 presents the results from different specifications of equation 2, which estimate the impact of oil booms on export diversification in oil producing countries by accounting for the level of export diversification in 1965. Results in column 1, which include control variables used in Table 2 (column 4), show that oil booms reduce export diversification by 0.339 in oil producing countries only when accompanied by low levels of diversification in 1965. In contrast, oil booms have no effect one export diversification in oil countries with high levels of diversification in 1965. In column 2, we add a geographical control (distance to equator), results found in column 1 remain unchanged.

One can argue against these results by stating that they are simply driven by the price effect. An increase in the oil price may lead to more concentration in countries that are heavily endowed in oil, or which export more oil. We tackle this possible concern in columns 3 and 4. In column 3, we control for oil production in order to capture the oil endowment. Again, the results remain unchanged. Even if oil production is significant, the size of the effect of the oil booms on export diversification in oil producing countries with low levels of diversification, is similar to what we find in column 1. In column 4, we create an interaction term between the oil price variation and the low diversification in 1965 dummy. This variable allows us to take into account the fact that among the less diversified countries, some may exhibit less initial diversification because of oil. If the results of this paper only capture this group of countries, one would expect that the introduction of this interactive variable affects those results. Column 4 shows that the results are similar to those previously found before the introduction of the interactive variable, which incidentally is not significant. This would mean that the problem is not simply the prior level of concentration in oil, but it is the prior level of concentration as whole, which may illustrate the lack of an entrepreneurial class able to absorb oil windfalls as stated in section II.

Table 3: Effect of oil shock on export diversification by level of diversification in 1965

	(1)	(2)	(3)	(4)
Boom*oilcountries*lowdivers in 1965	0.339**	0.339**	0.341**	0.340**
	(0.142)	(0.142)	(0.140)	(0.138)
Boom*oilcountries	0.002	0.002	-0.018	-0.014
	(0.058)	(0.058)	(0.057)	(0.057)
Oilcountries*lowdivers in 1965	-5.362***	-2.681***	-3.021***	-1.890***
	(0.889)	(0.292)	(0.746)	(0.236)
Boom*lowdivers in 1965	-0.147**	-0.147**	-0.153**	-0.160**
	(0.074)	(0.074)	(0.073)	(0.072)
Oilcountries	3.538***	1.342***	-0.521	-1.671***
	(0.621)	(0.159)	(0.390)	(0.446)
Boom	-0.609***	-0.609***	-0.733***	-0.629***
	(0.111)	(0.111)	(0.130)	(0.115)
Lowdivers in 1965	0.853**	2.685***	1.322***	0.183
	(0.419)	(0.390)	(0.465)	(0.359)
LnGDP_capita	-1.357**	-1.357**	-1.442**	-1.453**
	(0.650)	(0.650)	(0.626)	(0.624)
(LnGDP_capita)_squared	0.094**	0.094**	0.096***	0.097***
	(0.038)	(0.038)	(0.036)	(0.036)
Investment	-0.004**	-0.004**	-0.004**	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
Legal origin	-1.165***	2.051***	-0.082***	-0.081***
	(0.179)	(0.080)	(0.005)	(0.005)
Dist Equat of capital city		-0.081***	-2.333***	-2.331***
		(0.005)	(0.228)	(0.227)
Lnoil_production			0.074**	0.076**
			(0.028)	(0.030)
Δ oil price				-0.012
				(0.016)
Δ oil price* lowdivers in 1965				0.033
				(0.032)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Countries	134	134	134	134
Observations	5,008	5,008	5,008	4,969
R-squared	0.897	0.897	0.899	0.90

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
The mean of export diversification in 1965 is 4.146.
Source: Authors' estimates

Furthermore, as an alternative specification, we integrate another proxy for institutional quality, namely a corruption variable (from ICRG, 2014). Column 2 of Table 3A shows that low corruption reduces export concentration. While one may assert that the results with the corruption variable might be biased because the level of corruption might have been influenced by oil over time, it is worth noting that controlling for corruption does not change our main result. The oil boom increases export diversification only in countries with low levels of diversification in 1965.

III.3.1.3 Underlying mechanisms: the presence of an entrepreneurial class prior to the boom

The preceding results report that oil countries' diversification performance is related to diversification levels prior to a resource boom. These results beg the question of whether it is diversification that matters, or the presence of other factors that might be responsible for diversification in the first place. We undertake an analysis of the underlying mechanisms to account for this potential issue.

Table 4 reports a test that evaluates whether our results are explained by the importance of the manufacturing sector before the boom. Data on manufacturing sectors are from the World Development Indicators (2015). The countries that have a large manufacturing sector (Largemanufacturingin1970) are identified as those in which the variable manufacturing sector as percentage of GDP is above the median value. Table 4 shows that the coefficient associated with the interactive term Largemanufacturingin1970 * Boom* oilcountries is not significant. This suggests that oil shocks do not harm the diversification process in oil countries with a large manufacturing sector prior the boom. However, the interactive term Boom *oilcountries is positive and significant. This latter result suggests that oil shocks reduce diversification only in countries with a small manufacturing sector prior to the boom. While one should be cautious about the interpretation of the manufacturing variable results, since some countries might exhibit large manufacturing shares without a consequent entrepreneur class (E.g., ex-Soviet Union), it is worth noting that the results are consistent with the arguments highlighted in section 2. Specifically that the presence of an entrepreneurial class prior the boom makes it possible to absorb supplementary investments that may derive from the resource boom[10].

[10] One should also note that the manufacturing sector has been found to be strongly correlated with long-term growth (see Gylfason & Wijkman, 2015).

Table 4: The importance of initial industrialization

	(1)
Largemanufacturingin1970*Boom *oilcountrie	-0.200
	(0.124)
Boom *oilcountries	0.229**
	(0.114)
Largemanufacturingin1970*Oilcountries	-2.661***
	(0.146)
Largemanufacturingin1970*Boom	-0.083
	(0.063)
Oilcountries	1.391***
	(0.278)
Boom	-0.753***
	(0.139)
Largemanufacturingin1970	-0.273
	(0.233)
LnGDP_capita	-2.718***
	(0.554)
(LnGDP_capita)_squared	0.169***
	(0.033)
Investment	-0.005
	(0.003)
Dist Equat of capital city	-0.075***
	(0.006)
Legal origin	0.188
	(0.152)
Lnoil_production	0.059**
	(0.027)
Country fixed effects	Yes
Year fixed effects	Yes
Countries	101
Observations	3830
R-squared	0.910

Notes: Robust standard errors in parentheses, clustered at the country level.

* Significant at 10%, ** significant at 5%, and *** significant at 1%

III.3.1.4 Competing hypotheses

Additional issues that may surround previous results can be linked to the potential automaticity of these results. Particularly, one might conclude that shocks to oil prices will automatically make countries exports more concentrated on oil. We have already discussed this point in subsection 3.3.1. Now we will emphasize this point with supplementary tests, by separating the countries according to their initial dependence on oil rents, in order to account

for oil endowments prior to a boom. The countries with high oil dependency (Highoilrent in 1970) are the ones for which the variable oil rents as a percentage of GDP is above the median value. Column 1 of Table 5 shows the results of the interactive term (Highoilrent in 1970*Boom *oilcountries) that indicates a non-significant coefficient associated with this variable. This corroborates previous results, buttressing the assertion that the underlying effect is not automatic.

On the other hand, this paper highlights the presence of a path dependency mechanism with respect to the initial diversification levels of resource countries. In doing so, one can argue that this result is not only a question of diversification, and could be automatically found in other path dependency dimensions. To account for this potential objection, we introduce an interactive term with the legal origin variable, Legalorigin*Boom*oilcountries. The results presented in Column 2 of Table 5 demonstrate that this interactive term is not significant. Again, this suggests that the underlying effect is not automatic.

Table 5: Competing hypotheses

(1)		(2)	
Highoilrent in 1970*Boom *oilcountries	0.079	Legalorigin*Boom *oilcountries	-0.033
	(0.064)		(0.127)
Boom *oilcountries	-	Boom *oilcountries	0.142
			(0.094)
Highoilrent in 1970*Oilcountries	-1.271***	Legalorigin*Oilcountries	1.658***
	(0.232)		(0.149)
Highoilrent in 1970*Boom	0.047	Legalorigin*Boom	-0.048
	(0.045)		(0.059)
Oilcountries	-	Oilcountries	-1.152***
			(0.328)
Boom	-0.848***	Boom	-0.767***
	(0.130)		(0.140)
Highoilrent in 1970	0.926***	Legalorigin	-0.799***
	(0.143)		(0.177)
LnGDP_capita	-1.213*	LnGDP_capita	-1.320**
	(0.674)		(0.573)
(LnGDP_capita)_squared	0.088**	(LnGDP_capita)_squared	0.091***
	(0.038)		(0.034)
Investment	-0.009***	Investment	-0.005**
	(0.003)		(0.002)
Dist Equat of capital city	-0.123***	Dist Equat of capital city	-0.062***
	(0.006)		(0.002)
Legal origin	1.140***		
	(0.152)		
Lnoil_production	0.060**	Lnoil_production	0.072**
	(0.028)		(0.028)
Country fixed effects	Yes	Country fixed effects	Yes
Year fixed effects	Yes	Year fixed effects	Yes
Countries	105	Countries	170
Observations	4,108	Observations	5663
R-squared	0.905	R-squared	0.892

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.

Source: Authors' estimates

III.3. 2 Further robustness checks

III.3.2.1 Placebo tests, controlling for country specific time trends and addressing potential issues related to serial correlation

The key assumption of our identification strategy is the existence of parallel trends in export diversification between oil producing countries, and non-oil producing countries, during pre-oil boom periods. We test this assumption by performing two placebo tests. Specifically, we

test the impact of a placebo oil boom on export diversification for years prior to the two oil booms. Thus, in order to perform these placebo tests, we create a dummy variable equal to 1 for years 1965 to 1972 and 1982 to 2002, and 0 otherwise.

The first placebo test assesses whether or not the export diversification trend is parallel during the pre-oil boom periods between oil producing countries and non-oil producing countries. For this test, if the variable capturing the placebo effect (*placeboboom *oilcountries*) is not significantly different from zero, this will confirm our assumption that the export diversification trend is not significantly different in pre-oil boom periods between oil producing countries and non-oil producing countries. The second placebo test assesses whether within each group of countries, namely countries with high export diversification in 1965 and countries with low export diversification in 1965, export diversification exhibits a parallel trend during the pre-oil boom periods between oil producing and non-producing countries. For this second placebo test, if the variable capturing the placebo effect in countries with a low level of diversification in 1965 (*Placeboboom*oilcountries*lowdivers in 1965*) is not significantly different from zero, it means that there is a parallel trend in export diversification for pre-oil boom periods between oil producing countries and non-oil producing countries in the first group of countries. Similarly, if the variable capturing the placebo effect in countries with a high level of diversification in 1965 (*Placeboboom *oilcountries*) is not significantly different from zero, it means that export diversification demonstrates a parallel trend in pre-oil boom periods, between oil producing countries, and non-oil producing countries, in this second group of countries.

Furthermore, we estimate equation 2 by allowing for country-specific time trends, which would help to soak up any unobserved time-varying shocks and policies across countries in any given year, between 1965 and 2010, which might affect export diversification. Finally, we collapse the time series information into a pre-oil boom period and post-oil boom period, as

suggested by Bertrand et al. (2004) to address the potential issue of serial correlation. In particular, to obtain the data for the pre-oil boom period, we collapse time series data before the oil booms (years 1965 to 1973 and years 1981 to 2003) by group of countries (oil producing countries and non-oil producing countries). Similarly, to obtain data for the post-oil boom period, we collapse time series data during the oil booms (years 1974 to 1980 and years 2004 to 2010) by group of countries (oil producing countries and non-oil producing countries).

Table 6 presents results of our placebo tests, the estimation of the effect of oil booms taking into account country-specific time trends, and the estimation of the effect of oil booms when collapsing the time series information into pre- and post-oil boom periods. Column 1 shows that the interaction term capturing the placebo effect of oil booms on export diversification is not significantly different from zero. The effect size of this interaction effect is close to 0. This result suggests that the parallel trends assumption is verified between oil producing and non-oil producing countries, during the pre-oil boom periods. Column 2 shows that the first interaction term capturing the placebo effect of oil booms on export diversification in countries with a low of export diversification levelsd in 1965, and the second interaction term encapsulating the placebo effect of oil booms in countries with a high levels of export diversification, are both not significantly different from zero. These results confirm that the parallel trends assumption is verified in the pre-oil boom periods between oil producing countries and non-oil producing countries with low levels of export diversification in 1965, and between oil producing countries and non-oil producing countries with high levels of export diversification in 1965. Column 3 shows that controlling for country specific time trends does not alter our main results. Oil booms reduce export diversification only in oil producing countries with a low export diversification in 1965. Finally, column 4 also shows that our main results remain unchanged when collapsing the time series data into a pre-oil

boom period and post-oil boom period. More precisely, oil booms reduce export diversification only in oil countries with low levels of diversification in 1965. Oil booms have no effect on export diversification in countries with high levels of diversification.

Table 6: Effect of placebo oil booms, controlling for country specific time trends and estimates from two periods (a pre-oil boom period and post-oil boom period)

	(1)	(2)	(3)	(4)
PlaceboBoom*oilcountries*lowdivers in 1965		0.017		
		(0.114)		
PlacebooBoom*oilcountries	-0.008	-0.013		
	(0.085)	(0.106)		
Boom *oilcountries*lowdivers in 1965	0.341**	0.357**	0.329**	0.297**
	(0.140)	(0.161)	(0.136)	(0.117)
Boom *oilcountries	-0.025	-0.030	-0.012	-0.053
	(0.093)	(0.111)	(0.057)	(0.086)
Oilcountries*lowdivers in 1965	-2.984***	-2.996***	3.819***	-0.667
	(0.325)	(0.315)	(0.324)	(1.606)
Boom *lowdivers in 1965	-0.153**	-0.153**	-0.142*	-0.171***
	(0.073)	(0.073)	(0.072)	(0.056)
Oilcountries	-	-	-0.026	-0.791
			(0.188)	(0.838)
Boom			-	
	-0.731***	-0.731***	1.232***	-0.028
	(0.130)	(0.130)	(0.249)	(0.043)
Lowdivers in 1965	0.925***	0.923***	0.894***	2.657***
	(0.191)	(0.194)	(0.138)	(0.505)
LnGDP_capita	-1.443**	-1.443**	-1.393**	-0.291
	(0.627)	(0.627)	(0.643)	(0.530)
(LnGDP_capita)_squared	0.096***	0.096***	0.094**	0.010
	(0.036)	(0.036)	(0.038)	(0.034)
Investment	-0.004**	-0.004**	-0.004**	-0.009**
	(0.002)	(0.002)	(0.002)	(0.004)
Dist Equat of capital city			-	
	-0.058***	-0.058***	0.092***	-0.017**
	(0.005)	(0.005)	(0.008)	(0.008)
Legal origin			-	
	-1.279***	-1.282***	1.439***	-0.585
	(0.152)	(0.156)	(0.030)	(0.803)
Lnoil_production	0.074**	0.074**	0.075***	0.200***
	(0.028)	(0.028)	(0.028)	(0.073)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Country specific time trends	No	No	Yes	No
Countries	134	134	134	134
Observations	5008	5008	5008	266
R-squared	0.900	0.900	0.902	0.980

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
Source: Authors' estimates

III.3.2.2 Sample definition

One possible concern regarding the previous results is related to the fact that some countries in the sample might drive those results. For example, the economies of certain developing countries, such as China and India, have performed tremendously well, and have diversified during the last three decades. Therefore, these countries might appear as outliers in this study. In the same vein, it also appears relevant to assess whether the presence of developed countries influences the results. Moreover, some countries may change institutional status during our periods of analysis, for example the ex-Soviet Union members. Finally, the role of Saudi Arabia as the swing producer in the oil market is an ongoing controversy, therefore we find it relevant to assess whether its presence in the sample influences the results. Table 7 presents results when we remove all the aforementioned questionable cases. These results (columns 1 to 4) do not modify our original conclusions.

On the other hand, concerns could be raised about the assumption of the exogeneity of the oil shocks, especially the 1970s boom. To address these possible concerns, we excluded the 1970s shock. When excluding the 1970s shock (see column 3, Table 2B), although our first step result suggest that the oil boom has no effect on export concentration in oil producing countries,

the second step result confirm that the oil boom increases export concentration only in countries with low levels of diversification in 1965 (see column 3, Table 3B). The coefficient of interest is even higher (0.58) than what we found when combining the 1970s and 2000s (0.34) time periods. As previously found, this once again reiterates that oil booms reduce export diversification only in oil countries with initial low levels of diversification. Oil booms have no effect on export diversification in countries with high levels of diversification.

In addition to the aforementioned cases, we push the analysis forward by questioning the definition of oil countries. Indeed, some countries discovered oil after 1962 and hence moved from the control group into the treatment group. In column 5 (Table 7), we reintegrate those

cases, such as Cameroon, Chad, Kazakhstan, Oman, Syria, Tunisia, Vietnam, and Yemen which became oil producers after 1962. Additionally, we undertake a more systemic approach, instead classifying all countries as either oil producing or non-oil producing, we use an oil export variable (Net oil exports value) from Ross and Mahdavi (2015). Results in column 1 of Table 2A (in Appendix) confirm that oil exports increase export concentration. In Table 3B (in Appendix), when we directly interact the oil export variable with low levels of diversification in 1965, without making the distinction between oil producing countries and non-oil producing countries, results (column 1) show that oil exports increase export concentration only in countries with low levels of diversification in 1965. It is worth noting that the oil export variable results in several missing points (we lose 2,019 observations) and might be more affected by the endogenous problems than the variable Boom. Despite these possible restrictions, the results in column 1 of Table 3A show that oil dependence increases export concentration only if the country initially contains a low level of diversification. Furthermore, these results are also confirmed when considering only countries with a positive net export value. Column 1 of Table 2B supports our previous findings of the effect of oil booms in oil dependent countries (countries with a positive value net oil exports). Results from column 1 (Table 3B) also support the importance of the initial level of diversification, the interactive term - oil boom *positive value net oil exports*low diversification in 1965 is significant and positive, suggesting that our previous findings are not rejected.

Finally, there is a common discussion concerning the difference between resource abundance and resource dependency. Some countries like Australia can be abundant in oil but less dependent on it, while others like Chad may have relatively little oil but be heavily dependent on it as a resource. As the variable oil rent is available, we use two categorizations. In the first stage, we distinguish oil dependent countries according to their situation around the median.

As a reminder, that is to say that a high oil rent country is one with oil rent levels above the median. In the second stage, we use the World Bank classification to categorize a country as a resource dependent country or not. For the World Bank, a country is a resource dependent country if oil rents are about 3–5 percent of the gross domestic product (GDP) (see World Bank, 2014). Thus, we calculate the average oil rents in percentage of gross domestic product over our study period, and then we use this average to classify countries as resource dependent or not. Results from the first stage show that the interaction between high oil rents and initial low diversification is positive and significant (column 4 of Table 3B). This corroborates the findings of Cherif and Hasanov (2014) that show that diversification in oil countries does also depend on the importance of oil revenue. When we interact high oil rents, initial low diversification and oil boom (see column 5 of Table 3B) the coefficient is significant and positive, supporting the previous findings of this paper, that even in the case of high oil rents, booms matter for initial low diversification countries.

In the second stage, after using the World Bank classification, results confirm that oil booms increase export concentration (see column 2 of Table 2B). Results also confirm that this export concentration is only present in countries with little diversification in 1965 (see column 2 of Table 3B).

Table 7: Effect of oil shocks on export diversification in different samples

	Exclude SAU	Exclude developed countries	Exclude China and India	Exclude ex-USSR	Reintegrate CMR,NOR, OMN,SYR, TCD, TUN, YEM, KAZ VNM
	(1)	(2)	(3)	(4)	(5)
Boom *oilcountries*lowdivers in 1965	0.338**	0.352**	0.332**	0.341**	0.341**
	(0.152)	(0.145)	(0.141)	(0.140)	(0.140)
Boom *oilcountries	-0.018	-0.030	-0.020	-0.018	-0.018
	(0.057)	(0.068)	(0.059)	(0.057)	(0.057)
Oilcountries*lowdivers in 1965	-2.924***	-0.713***	3.426***	-3.021***	-3.296***
	(0.760)	(0.238)	(0.278)	(0.746)	(0.239)
Boom *lowdivers in 1965	-0.153**	-0.154**	-0.140*	-0.153**	-0.153**
	(0.073)	(0.073)	(0.074)	(0.073)	(0.073)
Oilcountries	-0.569	0.848***	-0.511	-0.521	1.480***
	(0.395)	(0.254)	(0.388)	(0.390)	(0.228)
Boom	-0.728***	-0.712***	-0.730***	-0.733***	-0.733***
	(0.129)	(0.131)	(0.129)	(0.130)	(0.130)
Lowdivers in 1965	1.261***	2.863***	1.270***	1.322***	1.580***
	(0.473)	(0.378)	(0.465)	(0.465)	(0.080)
LnGDP_capita	-1.425**	-1.430**	-2.071***	-1.442**	-1.442**
	(0.628)	(0.647)	(0.540)	(0.626)	(0.626)
(LnGDP_capita)_squared	0.095**	0.095**	0.131***	0.096***	0.096***
	(0.037)	(0.038)	(0.032)	(0.036)	(0.036)
Investment	-0.004**	-0.004**	-0.004**	-0.004**	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Dist Equat of capital city	-0.081***	-0.084***	-0.079***	-0.082***	-0.081***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.008)
Legal origin	-2.309***	2.102***	-2.218***	-2.333***	-1.247***
	(0.229)	(0.081)	(0.226)	(0.228)	(0.070)
Lnoil_production	0.074**	0.081**	0.072**	0.074**	0.074**
	(0.028)	(0.031)	(0.028)	(0.028)	(0.028)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Countries	133	130	133	134	134
Observations	4,965	4,812	4,959	5,008	5,008
R-squared	0.897	0.893	0.901	0.899	0.899

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
Source: Authors' estimates

III.3.2.3 The case of sub-Saharan Africa

An assumption behind the previous econometric tests is that oil price shocks are exogenous to oil producing countries. As discussed above, Kilian (2009) presents evidence that historically, the main determinants of oil price shocks are a combination of global aggregate demand shocks and precautionary demand shocks, rather than oil supply shocks. Therefore, this assumption is credible for the present study. However, the idea that some countries may hold a certain degree of power in setting the price of oil is heavily debated in the literature (see Hamilton, 2008).

We undertake additional checks on the uncertain influence of market power on our results. We focus our empirical tests on the sub-Saharan African countries in our sample. Indeed, despite Nigeria and Angola's membership in the Organization of the Petroleum Exporting Countries (OPEC), there is no supportive evidence that either country dictates the pricing of oil. We argue that African oil producers are more price takers than price makers, so a giant oil shock would certainly be exogenous to them.

Moreover, sub-Saharan African countries are comparable in many respects. For example, many African countries gained their political independence in the 1960s, and they are mainly specialized in products from primary sectors, making a focus on this group of countries warranted. Table 8 presents the results of our sub-sample of African countries. Previous results are not rejected in this sub-sample.

Table 8: Effect of oil shock on export diversification in the Sub-Saharan African sample

	SSA
Boom *oilcountries*lowdivers in 1965	0.415**
	(0.183)
Boom *oilcountries	-0.110
	(0.136)
Oilcountries*lowdivers in 1965	-
Boom *lowdivers in 1965	-0.471***
	(0.154)
Oilcountries	0.472
	(0.382)
Boom	0.185
	(0.266)
Lowdivers in 1965	-0.629**
	(0.297)
LnGDP_capita	-0.165
	(1.482)
(LnGDP_capita)_squared	0.008
	(0.094)
Investment	-0.007***
	(0.002)
Dist Equat of capital city	-0.028
	(0.023)
Legal origin	-1.898***
	(0.483)
Lnoil_production	0.253***
	(0.077)
Country fixed effects	Yes
Year fixed effects	Yes
Countries	37
Observations	1,316
R-squared	0.798

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
Source: Authors' estimates

III.3.2.4 What happens during the busts?

The objective of this paper is to evaluate export diversification patterns of oil countries during boom episodes. However, it is well known that oil prices are volatile, boom episodes are usually followed by bust periods, and it therefore makes sense to ask what would be the consequence to export diversification during bust episodes. Thus, in Tables 2A and 3A, we analyze whether oil busts affect export diversification. Using Figure 1 of this paper (which

shows the evolution of oil price) as a basis, we have retained two bust periods which are in accordance with the literature (see Smith 2015). The first period runs from 1981 to 1986 and the second period from 1987 to 2003. In column 2 of Table 2A we combine the two busts; we find that the combined bust has no effect on export diversification. However, column 3 and column 4 of Table 2A presents the results when examining the first and second bust separately. In the first period (1981-1986), the results demonstrate that oil busts increases export concentration in oil countries but in the second period (1987-2003), the results provide evidence that the bust increases export diversification. Furthermore, we evaluate the effect of busts by level of diversification in 1965. Colum 3 of Table 3A shows there is no differential effect by the level of diversification in 1965 on the combined bust on export diversification. The same result is obtained when we consider the first bust (column 4 of Table 3A) and the second bust (column 5 of Table 3A) separately. Put together, two premises can already be potentially highlighted, notably on the perception of countries about the nature of the bust. The results of the first bust period (1981-1986) might suggest that countries interpret this bust as transitory, so they do not immediately embark on diversification strategies. In the second period of the bust (beginning in 1987), the authorities perceived that the bust could become permanent, and understood that they had to look for other sources of income, since oil revenues could dry up. This decline in oil revenues may therefore be conducive to the adoption of diversification strategies (for some country cases, see Cherif and Hasanov, 2014).

IV. Conclusion

In a large sample of countries, we examine the impact of oil booms on export diversification levels. We demonstrate that oil booms lead, on average, to more concentration when the level of diversification prior the oil booms it is not accounted for. However, when we consider the initial level of diversification, results show that an oil boom leads to more concentration only if countries exhibit low levels of diversification before the boom. In countries with high levels of diversification before the boom, an oil boom has no impact on diversification. The results are corroborated with data from the manufacturing sector, which show that an oil boom reduces diversification only in countries with a small manufacturing sector prior to the boom.

These results suggest that the lack of diversification in oil countries is not a result of oil windfalls, but rather existing impediments to the take-off and sustainability of diversification processes that existed before the advent of oil windfalls. Consequently, oil countries that have a larger range of export products prior to oil booms, are the most likely ones to absorb oil windfalls, and as a result succeed in the management of oil booms. Instead of focusing all of the attention on adopted policy during boom episodes, attention could also be paid to understanding the factors behind the economy's structure before boom episodes.

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Appendix

Table A1
Table A1: List of countries by oil producing status in 1965

Oil producing countries	non-oil producing countries			
Algeria	Afghanistan	Ethiopia	Mauritania	Tajikistan
Angola	Albania	Faeroe Islands	Mauritius	Tanzania
Argentina	Andorra	Fiji	Moldova	Togo
Australia	Antigua and Barbuda	Finland	Mongolia	Tonga
Azerbaijan	Armenia	France	Morocco	Tunisia
Brazil	Aruba	French Polynesia	Mozambique	Turkey
Canada	Austria	Gambia, The	Myanmar	Uganda
China	Bahamas, The	Georgia	Nepal	Ukraine
Colombia	Bahrain	Germany	Netherlands	United Kingdom
Congo, Rep.	Bangladesh	Ghana	New Caledonia	Uruguay
Ecuador	Barbados	Greece	New Zealand	Vietnam
Egypt, Arab Rep.	Belarus	Greenland	Nicaragua	Yemen, Rep.
Gabon	Belgium	Grenada	Niger	Zambia
India	Belize	Guatemala	Norway	Zimbabwe
Indonesia	Benin	Guinea	Oman	
Iran, Islamic Rep.	Bermuda	Guinea-Bissau	Pakistan	
Iraq	Bolivia	Guyana	Panama	
Italy	Bosnia and Herzegovina	Haiti	Papua New Guinea	
Kuwait	Bulgaria	Honduras	Paraguay	
Libya	Burkina Faso	Hong Kong SAR, China	Philippines	
Malaysia	Burundi	Hungary	Poland	
Mexico	Cabo Verde	Iceland	Portugal	
Nigeria	Cambodia	Ireland	Rwanda	
Peru	Cameroon	Israel	Samoa	
Qatar	Cayman Islands	Jamaica	Sao Tome and Principe	
Russian Federation	Central African Republic	Japan	Senegal	
Saudi Arabia	Chad	Jordan	Serbia	
Thailand	Chile	Kazakhstan	Seychelles	
Trinidad and Tobago	Comoros	Kenya	Sierra Leone	
Turkmenistan	Congo, Dem. Rep.	Kiribati	Singapore	
United Arab Emirates	Costa Rica	Korea, Dem. Rep.	Slovak Republic	
United States	Cote d'Ivoire	Korea, Rep.	Slovenia	
Uzbekistan	Croatia	Kyrgyz Republic	Solomon Islands	
Venezuela, RB	Cuba	Lao PDR	Somalia	
		Latvia	South Africa	
	Cyprus	Lebanon	Spain	
	Czech Republic	Liberia	Sri Lanka	
	Denmark	Lithuania	St. Kitts and Nevis	
	Djibouti	Macao SAR, China	St. Lucia	
	Dominica	Macedonia, FYR	St. Vincent and the Grenadines	
	Dominican Republic	Madagascar	Sudan	
	El Salvador	Malawi	Suriname	
	Equatorial Guinea	Maldives	Sweden	

	Eritrea	Mali	Switzerland
	Estonia	Malta	Syrian Arab Republic

Source: Authors' construction

Table A2: Descriptive statistics

Variables	Mean	Std. Dev	Min	Max	Obs
Diversification index	3.644	1.269	0.960	6.437	8,165
Oil producing countries in 1965	0.182	0.386	0	1	9,114
Oil production	296.889	1142.253	0	11416.33	9,014
Log GDP	7.856	1.599	4.227	11.316	6,750
Log GDP square	64.281	25.729	17.874	128.070	6,750
Investment(%GDP)	22.093	10.152	-2.424	219.069	5,961
Population density	242.603	1265.12	0.102	21595.35	8,877
Openness(%GDP)	74.191	49.676	0.308	531.737	6,663
Dist from Equ. of capita city	25.193	17.017	0	64	8,869
legal origin is of French origin	0.455	0.498	0	1	8,820

Source: Authors' calculation

Table 2A: Effects of oil shock on export diversification using net oil exports value, taking into effects of a bust on export diversification

	(1)	(2)	(3)	(4)
Bust81_2003*oilcountries		-0.087		
		(0.076)		
Bust81_2003		-0.693***		
		(0.125)		
Bust81_86*oilcountries			0.267**	
			(0.105)	
Bust81_86			-0.774***	
			(0.123)	
Bust87_2003* oilcountries				-0.210***
				(0.071)
Bust87_2003				-0.790***
				(0.128)
Net oil exports value	3.26e-12**			
	(0.000)			
Oilcountries		3.136***	3.093***	3.161***
		(0.254)	(0.252)	(0.252)
LnGDP_capita	-1.605**	-1.206**	-1.218**	-1.147*
	(0.739)	(0.598)	(0.596)	(0.601)
(LnGDP_capita)_squared	0.125***	0.088**	0.088**	0.084**
	(0.047)	(0.035)	(0.035)	(0.036)
Investment	-0.005*	-0.006***	-0.006***	-0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
Legal origin	-2.067***	-0.416*	-0.400*	-0.456**
	(0.129)	(0.227)	(0.227)	(0.227)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Countries	156	170	170	170
Observations	3,436	5,663	5663	5,663
R-squared	0.924	0.890	0.891	0.890

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.

Source: Authors' estimates

Table 2B: Effects of oil shock on export diversification using different classifications of oil exporters and excluding the shock of 1970

	(1)	(2)	(3)
Boom*oilcountries			0.140
			(0.099)
Oilcountries			3.035***
			(0.258)
Boom*oilrents%GDP>3%		0.173**	
		(0.069)	
Oilrents%GDP>3%		-0.958***	
		(0.163)	
Boom*Net oil exports	0.151**		
value>0	(0.064)		
Net oil exports value>0	-0.314		
	(0.351)		
Boom	-0.682***	-0.667***	-1.128***
	(0.114)	(0.114)	(0.144)
LnGDP_capita	-1.322**	-1.268**	-1.282**
	(0.613)	(0.597)	(0.593)
(LnGDP_capita)_squared	0.095***	0.091**	0.092***
	(0.036)	(0.035)	(0.035)
Investment	-0.005**	-0.006**	-0.006**
	(0.002)	(0.002)	(0.002)
Legal origin	-0.215***	-0.423*	-0.397*
	(0.070)	(0.226)	(0.228)
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Countries	156	170	170
Observations	5297	5663	5663
R-squared	0.899	0.891	0.890

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
The mean of export diversification in 1965 was 4.146.
Source: Authors' estimates

Table 3A: Effects of oil shock on export diversification using net oil export value, taking into account institutional variables and effects of bust on export diversification by level of diversification in 1965

	(1)	(2)	(3)	(4)	(5)
Boom *oilcountries*lowdivers in 1965		0.992**			
		(0.444)			
Boom *oilcountries		-0.052			
		(0.107)			
Oilcountries*lowdivers in 1965		1.760***			
		(0.427)			
Boom *lowdivers in 1965		-0.275**			
		(0.137)			
Boom		-0.446***			
		(0.109)			
Oilcountries		-0.132	-0.598	-0.607	-0.669*
		(0.545)	(0.393)	(0.392)	(0.387)
Lowdivers in 1965		3.305***	1.191**	1.236***	
		(0.919)	(0.457)	(0.459)	
Corruption		-0.050*			
		(0.026)			
Boom*oilcountries*lowdivers in 1965* Corruption		-0.245			
		(0.181)			
Net oil exports value	3.48e-13				
	(0.000)				
Net oil exports value*lowdivers in 1965	6.08e-12 *				
	(0.000)				
Bust81_2003*oilcountries*lowdivers in 1965			-0.126		
			(0.169)		
Bust81_2003			-0.781***		
			(0.146)		
Bust81_86*oilcountries*lowdivers in 1965				-0.258	
				(0.188)	
Bust81_86				-0.972***	
				(0.141)	
Bust87_2003*oilcountries*lowdivers in 1965					0.007
					(0.155)
Buest87_2003					-0.881***
					(0.145)
		(0.919)	-1.440**	-1.445**	-1.355**
LnGDP_capita	-2.160**	-1.905**	(0.628)	(0.627)	(0.626)
	(0.855)	(0.946)	0.096***	0.096***	0.090**
(LnGDP_capita)_squared	0.148***	0.134**	(0.037)	(0.036)	(0.036)
	(0.053)	(0.058)	-0.004**	-0.004**	-0.005**
Investment	-0.004	-0.005	(0.002)	(0.002)	(0.002)
	(0.003)	(0.004)	-2.305***	-2.310***	-2.269***
Legal origin	0.196	-1.133**	(0.228)	(0.230)	(0.226)
	(0.358)	(0.546)	-0.081***	-0.081***	-0.081***
Dist Equat of capital city	0.020***	-0.029*	(0.005)	(0.005)	(0.004)
	(0.005)	(0.016)	0.078***	0.074***	0.084***
Lnoil_production	0.163***	0.186*	(0.027)	(0.028)	(0.026)
	(0.044)	(0.105)			
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Countries	127	111	134	134	134
Observations	2950	2756	5008	5008	5008
R-squared	0.937	0.932	0899.	0.900	0.901

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
The mean of export diversification in 1965 is 4.146.
Source: Authors' estimates

Table 3B: Effects of oil shock on export diversification using different classifications of oil exporters and excluding the shock of 1970

	(1)	(2)	(3)	(4)	(5)
Boom*lowdivers in 1965*					0.294**
Highoilrent in 1970					(0.141)
Boom*lowdivers in 1965					-0.132
					(0.089)
Highoilrent in 1970*Boom					0.012
					(0.052)
Highoilrent in 1970* lowdivers in				2.572***	2.510***
1965				(0.839)	(0.831)
Highoilrent in 1970				-1.132**	-1.112**
				(0.452)	(0.446)
Boom*oilrents%GDP>3%*lowdivers		0.243*			
in 1965		(0.138)			
Boom*Oilrents%GDP>3%		0.043			
		(0.093)			
Oilrents%GDP>3%*lowdivers in		-1.367***			
1965		(0.384)			
Boom*lowdivers in 1965		-0.178**			
		(0.082)			
Oilrents%GDP>3%		-0.486			
		(0.395)			
Boom* Net oil exports	0.329**				
value>0*lowdivers in 1965	(0.138)				
Boom*Net oil exports value>0	-0.003				
	(0.079)				
Net oil exports*lowdivers in 1965	-0.478				
Value >0	(0.379)				
Boom*lowdivers in 1965	-0.202**				
	(0.090)				
Net oil exports value>0	0.807***				
	(0.101)				
Lowdivers in 1965	2.872***	0.250	1.436***	-0.528	-0.507
	(0.506)	0.511	(0.464)	(0.703)	(0.693)
Boom*oilcountries*lowdivers in			0.583***		
1965			(0.203)		
Boom*oilcountries			-0.132		
			(0.112)		
Oilcountries*lowdivers in 1965			-3.140***		
			(0.762)		
Boom*lowdivers in 1965			-0.403***		
			(0.102)		
Oilcountries			-0.436	-1.178**	-1.218**
			(0.388)	(0.467)	(0.464)
Boom	-0.736***	-0.7369***	-1.088***		-0.797***
	(0.128)	(0.127)	(0.161)		(0.135)
LnGDP_capita	-1.505**	-1.474**	-1.366**	-1.332*	-1.297*
	(0.636)	(0.630)	(0.604)	(0.727)	(0.720)
(LnGDP_capita)_squared	0.101***	0.098***	0.092***	0.094**	0.091**
	(0.037)	(0.037)	(0.035)	(0.041)	(0.040)
Investment	-0.003	-0.004*	-0.004**	-0.009**	-0.009**
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Legal origin	-0.029***	-0.065***	-0.082***	-0.076***	-3.064***
	(0.003)	(0.009)	(0.004)	(0.011)	(0.407)
Dist Equat of capital city	1.448***	-0.853***	-2.356***	-3.018***	-0.076***
	(0.409)	(0.131)	(0.224)	(0.411)	(0.011)
Lnoil_production	0.067**	0.070**	0.076***	0.067**	0.062**
	(0.028)	(0.028)	(0.028)	(0.027)	(0.028)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Countries	127	134	134	99	99
Observations	4798	5008	5008	3,947	3,947
R-squared	0.906	0.900	0.902	0.907	0.908

Notes: Robust standard errors in parentheses, clustered at the country level.
* Significant at 10%, ** significant at 5%, and *** significant at 1%.
The mean of export diversification in 1965 was 4.146.
Source: Authors' estimates