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# The Natural Resource Curse and Institutions in Post-Soviet Countries

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## Abstract:

We examine the effect of natural resource exports on economic performance during the 1996-2011 period in the 15 independent countries that formerly comprised the Soviet Union. These countries were a largely homogeneous group with respect to social and institutional context; however, these countries began to demonstrate marked differences from one another with respect to these factors during the transition, which has resulted in unique cross-section and time variation. Using several panel regression models that address the endogeneity and clustering issues, our results suggest that natural resources crowd out manufacturing sector unless the quality of domestic institutions is sufficiently high.

**Keywords:** natural resource curse, institutions, manufacturing, post-Soviet countries

**JEL:** O11, O13, Q30

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# 1 Introduction

Since Sachs and Warner (1995), many empirical studies have observed that natural resource richness does not necessarily lead to higher economic growth and that abundant natural resources are, in fact, often associated with lower economic performance. Literature has proposed several mechanisms to illuminate the so-called natural resource curse (see van der Ploeg, 2011, and Frankel, 2012, for surveys), and the researchers have argued that institutions are the main driving factor at the nexus of natural resources and growth (Bulte et al., 2005; Isham et al., 2005; Brunnschweiler and Bulte, 2008). It has been also shown that manufacturing sector is typically crucial for long-term productivity growth, as it facilitates learning by doing (Matsuyama, 1992; Jones and Olken, 2008; Rodrik, 2008; Johnson et al., 2012) and that natural resource exports crowd out manufacturing sector (Sachs and Warner, 1999, and Rajan and Subramanian, 2011).

The period following the collapse of socialism in the former Soviet Union provides for what is arguably the largest natural experiment on economic reforms in recent history (Campos and Horvath, 2012). A number of large-scale market-oriented reforms were implemented in the newly independent countries that formerly comprised the Soviet Union, and the once largely homogenous group in terms of institutions began to differ markedly from one another. We gather the relevant data on post-Soviet countries and examine whether the natural resource curse exists, and if so, whether institutions can cure this curse. Although the non-linear effect of natural resources on growth has been examined in several recent studies, we continue to believe that it is worthwhile to examine this issue and verify previous findings in this field especially as we specifically focus on the performance of manufacturing sector.

We believe that this is the case because we extend the previous literature in several ways. First, we focus on a relatively homogeneous group of countries, the countries that formerly comprised the Soviet Union.<sup>1</sup> These countries share common history with similar social and institutional contexts. Therefore, our sample is more likely to form a homogeneous group, and imposing common parameters upon such a group might be reasonable.

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<sup>1</sup>Even though because of data availability our sample starts in 1996, one can argue that former Soviet Union countries are homogeneous, as least in comparison to plentiful studies estimating regressions based on sample of countries from different continents.

Second, most of the previous research focuses on cross-sectional data. However, van der Ploeg (2011) and Rajan and Subramanian (2011) emphasize that the application of panel data is crucial because cross-sectional data suffer from omitted variable bias that arises from the correlation between initial income and the omitted initial level of productivity. We follow this and apply panel data regressions for the post-Soviet countries.

Third, our sample of post-Soviet countries offers a unique opportunity to examine the effects of institutions more fully. Institutions are typically persistent and do not change significantly over short periods of time. However, institutional frameworks have changed dramatically in several post-Soviet countries over the most recent two decades. Consider Estonia. Once part of the Soviet Union, Estonia is now fully integrated into European structures and adopted the euro in 2011. According to the widely used World Bank Governance Indicators, Estonia obtained a rule of law score close to countries such as Uruguay or Botswana at the beginning of our sample in 1996. Fifteen years later (at the end of our sample), Estonia received the same score as Spain and was not far from Japan.

Fourth, the previous literature on transition economies, including that studying post-Soviet countries, does not come to an unequivocal conclusion as to whether the natural resource curse exists. The findings of Esanov et al. (2001) and Kronenberg (2004) tend to support the existence of the natural resource curse, whereas Alexeev and Conrad (2009) suggest that the net effect of natural resources on growth is close to zero. Alternatively, Ahrend (2012) finds that natural endowments have a positive effect on economic growth in Russian regions at the outset of the transition.

Our results suggest that natural resource exports crowd out manufacturing sector in post-Soviet countries only with sufficiently high institutional quality; in the absence of such institutional quality, these countries suffer from the natural resource curse. This result is robust to different regression specifications, different structures of instrumental variables and to different measurements of institutions from different sources.

This paper is organized as follows. Section 2 discusses the related literature. Section 3 describes the data and introduces the econometric model. Section 4 presents the results. Concluding remarks are offered in section 5. An appendix with data descriptions and additional results follow.

## 2 Literature Survey

We provide a brief literature survey in this section and largely focus on those studies that examine how institutions shape the effect of natural resources on growth. We refer the reader to the surveys from van der Ploeg (2011) and Frankel (2012) for a more comprehensive overview of the literature on the natural resource curse.

Natural resource literature was inspired by Sachs and Warner (1995), whose empirical analysis showed that resource-scarce economies tend to exhibit higher economic performance than resource-rich economies over the long run. This finding spurred many economists to analyze its origins and test its robustness. Some studies took an additional step and suggested that institutional quality itself might be endogenous and not invariant with using natural resource in economic growth models (Brunnschweiler and Bulte, 2008).

There are several mechanisms how the natural resource curse interacts with institutions. In their theoretical model, Robinson et al. (2006) show that natural resource booms are associated with a greater size of public sector, as these booms make it more desirable for incumbent political representatives to stay in power. As a result, a socially inefficient overemployment in public sector may be so devastating that despite additional revenues from natural resources it leads to lower economic growth. It also implies underemployment in manufacturing sector.

Several empirical studies have emphasized that the effect of natural resource richness on economic growth depends on the quality of institutions. Sala-i-Martin and Subramanian (2003) find that high levels of corruption prevented Nigeria from reaping the benefits of its natural resources and from promoting growth. Others have emphasized the negative effects of natural resources on democracy (Ross, 2001), financial development (Bhattacharyya and Hodler, 2014) or found that natural resources increase the incidence of civil war (Collier and Hoeffler, 1998, or Fearon, 2005). The positive effects of natural resources on growth prevails only in countries with institutions of sufficient quality (Bulte et al., 2005, Mehlum et al., 2006). Botswana is frequently mentioned as the example of a developing country that managed to improve its institutional framework and generate higher growth in its diamond industry (Ilmi, 2007). Some studies emphasize that the natural resource curse is more concentrated in appropriable point-source resources such as oil, diamonds or minerals than in other resources (Auty, 2001, Boschini et al., 2007, Boschini et al., 2013). In an in-depth study

of former Soviet Union countries, Jones Luong and Weinthal (2010) emphasize that different ownership structures may be crucial for whether countries fall into a trap of natural resource curse and that fiscal regimes matter as well.

The natural resource literature has also been analyzed in transition countries, and the post-Soviet countries represent a large share of such countries. Previous studies focus on the effect of natural resources on growth but do not specifically examine how institutions influence the resource-growth nexus. Kronenberg (2004) finds that natural resources are negatively related to economic growth and argues that corruption is an obstacle for natural resources to translate into higher growth. Esanov et al. (2001) claim that the income from natural resources reduced the incentive to reform in transition countries in the 1990s. Pomfret (2011) and Pomfret (2012) provide an extensive discussion of natural resource management in Central Asian countries and in Azerbaijan and document that natural resource management is far from optimal and that the interactions among natural resources, ownership and institutional quality are complex. The impact of oil on economic growth in transition countries (including former Soviet countries and countries from Central and Eastern Europe) is examined by Brunnschweiler (2009), and her empirical analysis showed that oil reserves had a positive effect on economic growth over the 1996-2006 period. However, she also finds that oil reserves have a positive relationship with low democracy index scores, high levels of corruption and low human capital formation. Alexeev and Conrad (2011) analyze the relationship between point source natural resources and economic growth in transition countries and extend the previous literature in a number of ways in finding that, overall, natural resources do not represent an obstacle for economic growth in transition countries. Our study differs from previous studies on the role of natural resources for growth in transition countries primarily because we use panel data regressions in examining how institutions shape the effect of natural resources on growth.

### 3 Data and Empirical Methodology

We present our data and econometric framework in this section. Our dataset consists of 15 countries during the 1996-2011 period.<sup>2</sup> We refer the reader to

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<sup>2</sup>The list of countries is as follows: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

Figure 3.1: Natural Resource Exports and Manufacturing Performance

the Appendix, which presents data definitions, data sources, basic descriptive statistics (see Table A.1) and several scatter plots (see Figures A.1-A.3).

Figure 1 shows that we observe a somewhat negative relationship between the measure of natural resource exports and manufacturing performance for the full sample, which provides some informal evidence for the natural resource curse (or some would put it as the symptoms of Dutch disease to be more specific). Next, we split our sample into two groups: countries with high quality rule of law and countries with low quality rule of law. We label the rule of law as good, if the value of the rule of law indicator is greater than the 25th percentile. Clearly, the cut-off point at the 25th percentile is somewhat arbitrary, but this measurement illustrates our point that institutions may turn a natural resource curse into a blessing. The corresponding scatter plots are available in Figure 2. After this experiment, we observe a negative relationship between natural resources and growth only for countries with bad institutional frameworks.

The negative relationship between natural resource exports and manufacturing is clearly visible for the countries, for which natural exports represent an important share of their total exports. We present the Figure A.1, A.2 and A.3 in the Appendix, where we document this relationship for Azerbaijan, Kazakhstan and Russia using the scatter plots. When we examine the variation over time for these countries, we observe the decline in the importance of manufacturing sector after the natural resource booms, which started in the early 2000s.

The natural resources are distributed unequally in the former Soviet Union countries. Some countries such as Azerbaijan, Kazakhstan or Russia have large natural resources at their disposal. Some countries such as Moldova are rather poor in terms of point-source natural resources. In line with previous literature, we use the measure of natural resource exports per capita (fuel, metal and ore exports in millions of USD). This measure has a value of 1052 for Russia. The measure below 100 is observed for Moldova, Armenia, Georgia, Kyrgyzstan, Lithuania, Tajikistan and Ukraine, 100-1000 for Belarus, Estonia, Latvia, Turkmenistan, Uzbekistan and above 1000 for Azerbaijan, Kazakhstan, Russia. If we examine a related measure of natural resource rents to GDP in % in 2004-2012, we obtain a similar picture. This indicator is below 0,4% for Moldova, 1%-3%

Figure 3.2: Natural Resource Exports and Manufacturing Performance: Low (a) and High (a) Level of Institutions (a)(b)

for Armenia, Belarus, Estonia, Georgia, Latvia, Lithuania and Tajikistan, 3%-10% for Kyrgyzstan and Ukraine, 27% for Russia, 35-40% for Kazakhstan and Turkmenistan and 50%-55% for Azerbaijan and Uzbekistan.<sup>3</sup>

Our econometric framework largely follows Brunnschweiler and Bulte (2008)<sup>4</sup> and Isham et al. (2005), but we extend it for the panel setting. We examine the underlying factors that determine natural resource exports and institutional quality with random vs. fixed effects model and the determinants of economic growth with generalized two-stage least squares (2SLS). Using this framework, our ambition is to investigate the following: (1) what determines institutional quality; (2) whether institutions promote natural resource exports; (3) whether natural resource exports translate into lower manufacturing share in post-Soviet countries, i.e., whether the natural resource curse exists; and (4) if the resource curse exists, whether sufficient institutional quality helps alleviate the negative effects of resources on growth.

We run three different regression equations. Following earlier studies (Isham et al., 2005, or Brunnschweiler and Bulte, 2008), we first analyze the determinants of institutional quality,  $\theta_{it}$ , using Eq. (1). We use six measures of institutional quality: control of corruption, rule of law, government effectiveness, regulatory quality, political stability and absence of violence, and voice and accountability. These are commonly used indicators of institutional quality provided by the World Bank, see the Appendix for the details. Brunnschweiler and Bulte (2008) use the latitude as the instrument. We use the longitude in absolute terms ( $longitude_i$ ) as the instrument because it has a bit more straightforward interpretation for our sample, as it captures the distance to the Western Europe. In addition, we use the variable measuring the years under socialism ( $socialism_i$ ) to examine whether a longer socialist experience erodes institutional quality further. This instrument has been used by Beck and Laeven (2006) in their examination of the effect of institutions on economic growth in

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<sup>3</sup>The rents are computed as the difference between the value of production at world prices and total costs of production. The source of natural resource rent data is World Bank Development Indicators.

<sup>4</sup>Interestingly, Brunnschweiler and Bulte (2008) exclude the post-Soviet countries due to data unavailability.

transition economies.

$$\theta_{it} = \alpha_0 + \alpha_1 longitude_i + \alpha_2 socialism_i + \epsilon_{it} \quad (3.1)$$

We expect that  $\alpha_1 < 0$ , because countries closer to Brussels typically have better institutions, i.e., they are more developed.  $\alpha_2$  is likely to be negative, as Beck and Laeven (2006) argue. Spending more time under socialism is likely to further erode the institutional framework of the country.

In the second step, we analyze the determinants of natural resource exports, see Eq. (2). Following Brunnschweiler and Bulte (2008), we use terms of trade (*tot*), a dummy variable for resource richness (*RR<sub>i</sub>* - dummy variable obtains the value of one if the country is resource-rich and zero otherwise) and institutional indicators. *nat* and *tot* variables are measured in logs. We expect that the terms of trade, resource richness and institutional measures exert a positive influence on natural resource exports. The effect of institutional measure on natural resource exports can be both positive or negative.

$$nat_{it} = \varphi_0 + \varphi_1 tot_{it} + \varphi_2 RR_i + \varphi_3 \theta_{it} + \eta_{it} \quad (3.2)$$

Finally, we examine the determinants of manufacturing performance.  $\theta$  and *nat* are instrumented using Eq. (1) and Eq. (2), respectively. We also include the interaction term of  $\theta$  and *nat* to examine the hypothesis that the natural resource curse is present only in countries that lack good institutions. The interaction terms were instrumented for each types of institutional quality using the interactions of instruments. In addition, we control for some standard regressors. To put additional structure into the analysis, the choice of regressors largely follows Ilmi (2007) and Brunnschweiler and Bulte (2008).

$$growth_{it} = \gamma_0 + \gamma_1 nat_{it} + \gamma_2 \theta_{it} + \gamma_3 nat_{it} \theta_{it} + X_{it} \beta + u_{it} \quad (3.3)$$

where *growth<sub>it</sub>* is the natural logarithm of manufacturing value added to GDP; *nat<sub>it</sub>* is the natural logarithm of natural resource exports of fuel, metal and ore per capita;  $\theta$  represents the institutional quality measure (we use six measures from the World Bank Governance Indicators because these are typically used in the previous literature). *X<sub>it</sub>* represents the other control variables (*lib<sub>it</sub>*, *open<sub>it</sub>*,  $\tau_{it}$ , *ed<sub>it</sub>*, *n<sub>it</sub>*, and *initialGDPpc<sub>i</sub>*). *lib<sub>it</sub>* represents EBRD trade liberalization data; *open<sub>it</sub>* denotes trade openness;  $\tau_{it}$  is average tax rate; *ed<sub>it</sub>* is external

debt;  $n_{it}$  represents population growth;  $initialGDPpc_i$  is the log of initial GDP in 1996; and  $u_{it}$  represents the error term. We choose these control variables in line with previous literature. Campos and Horvath (2012) find that trade liberalization and consequently openness is associated with higher growth in transition countries. Jones Luong and Weinthal (2010) emphasize the importance of fiscal regimes for the natural resource curse and therefore, we include the fiscal variables such as the tax to GDP ratio or the external debt. A number of studies shows that the initial GDP is a crucial variable to explain the growth performance (see, for example, Barro, 1991).

The negative impact of natural resources on economic performance is typically explained using two phenomena. First, the so-called "Dutch Disease" stipulates that natural resource richness crowds out the manufacturing sector because significant natural resource exports tend to appreciate the domestic currency. Second, the natural resource curse is explained through institutions. The discovery of point-source natural resources is often claimed to promote rent seeking and corruption. In that case, natural resources have an indirect effect on economic growth through institutions (Sachs and Warner, 2001). Given the construction of our dependent variable, our results can also be interpreted as evidence for the Dutch disease (see also Rajan and Subramanian, 2011, who use the manufacturing value added to GDP as the dependent variable, Sachs and Warner (1999) and Harb (2009) use similar measures) but taking on board the effect of institutions, too.

To capture the unobserved heterogeneity, we examined *pooled OLS (POLS)*, *fixed (FEM)* and *random effect (REM)* models. The Fixed effects are tested by the F test, while random effects are examined by the Lagrange multiplier (LM). The Hausman test determined the choice between the fixed and the random effect models (see Table 3,4 and 5). Mostly, fixed effect models were efficient.

## 4 Results

This section provides our regression results. As described in the previous section, we first present the determinants of institutional quality in post-Soviet countries and then present the regressions that examine the determinants of natural resource exports. Next, we examine the determinants of manufacturing performance in these countries and specifically analyze the significance of the interaction term between natural resource exports and institutions to address

our main hypothesis, i.e., whether the natural resource curse is limited to those countries with bad institutions.

Table 1 presents our results on the determinants of institutional quality. We find that longitude in absolute terms is typically negatively associated with institutional quality.<sup>5</sup> Next, our results indicate that countries that spent more years under socialism exhibit lower quality of institutions. This result supports the earlier findings of Beck and Laeven (2006). It is noteworthy that our explanatory variables do not have a time variation but the dependent variable has. Moulton (1986) shows that standard errors are invalid and too small in this case. This has been labeled as Moulton problem in literature. Several procedures have been proposed to correct the bias of clustered standard errors (Angrist and Pischke, 2009). We use the bias-reduced linearization (BRL) procedure developed by Bell and McCaffrey (2002) because the number of clusters is low. Our results suggest that it is indeed important to account for the Moulton problem because longitude becomes statistically insignificant in three out of six regression specifications that we estimate.

Note that we assume the clustering at the country level but as an alternative, we use clustering at the regional level. We form four different regions: Baltics, Caucasus, Central Asia and other countries. The results are robust to alternative scheme of clustering. In addition, we also re-estimate the regressions using the “acquired by Stalin after 1939” dummy instead of years under socialism dummy and the results are basically unchanged. Finally, we form a dummy variable “Resource richness”, which took a value of one for resource rich countries such as Azerbaijan, Kazakhstan or Russia. This variable was never significant using the BRL procedure. These robustness checks are available upon request.

Table 2 presents the determinants of natural resource exports. The standard errors are corrected as in Table 1 using the BRL procedure (Bell and McCaffrey, 2002). We find that the terms of trade shocks exert a positive influence on natural resource exports. Clearly, resource richness also has a positive effect on resource exports. These results correspond with Brunnschweiler and Bulte (2008), to a certain extent. Institutional quality affects natural resource exports positively. It shows that higher institutional quality encourages more natural

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<sup>5</sup>Instead of longitude, latitude is often used as the instrument in empirical growth literature, see Diamond (1997), Gallup et al. (1998) or Hall and Jones (1999). Our results are consistent with latitude as well but we prefer longitude because it has a more straightforward interpretation for our data. Note that in Tables 1 and 2 we use the random effects model because (some of) our explanatory variables do not change over time.

Table 1: The Determinants of Institutional Quality

Measure of Institutions	CRP	LAW	EFT	REG	STB	VOI
Longitude	-0.06** (0.02)	-0.08** (0.04)	-0.07 (0.05)	-0.08 (0.13)	-0.09 (0.11)	-0.15** (0.07)
Years under socialism	-0.80*** (0.28)	-1.14*** (0.30)	-0.88** (0.38)	-1.34** (0.53)	-0.70* (0.37)	-1.21** (0.46)
Number of observations	240	240	240	240	240	240
F test	11.69***	16.60***	6.34***	7.81***	6.28***	16.11***
R2 -overall	0.62	0.72	0.53	0.53	0.36	0.70

Notes: The model is estimated for six different measures of institutional quality with Random-effects GLS regression method given the time-invariance of some regressors, see top row: CRP - Control of Corruption, LAW - Rule of Law, EFT - Government Effectiveness, REG - Regulatory Quality, STB - Political Stability and Absence of Violence and VOI - Voice and Accountability. The standard errors are in parentheses. Bias-reduced linearization procedure is used to adjust the standard errors because of Moulton problem. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percent levels, respectively. Constant not reported.

resource export rather than low level of institutions suggesting that at least some level of institutional quality is vital to be able to export domestic goods.

Next, we examine whether natural resource exports crowd out manufacturing sector in post-Soviet countries. Natural resource exports and institutions are instrumented, as described above. Our results are provided in Table 3. We show seven columns; the first lacks the measure of institutional quality, while the remaining six specifications contain the individual measure of institutions. Statistical tests have been undertaken to choose the proper econometric method. Our results suggest that natural resource exports leads to shrinking of a manufacturing sector, which corresponds to the previous findings of Sachs and Warner (1999) using cross-country regressions and Rajan and Subramanian (2011) using panel regressions on the industry level. Next, we find that better institutions translate into higher manufacturing growth, which broadly corresponds to earlier findings by Beck and Laeven (2006).

The conditioning variables also offer a consistent story. Greater openness is associated with better economic performance, which is consistent with previous studies on the natural resource curse such as Sachs and Warner (1997) or Papyrakis and Gerlagh (2004), in addition to being consistent with earlier empirical growth literature (Barro, 1991, King and Levine, 1993, Mankiw et al., 1992). We also find that higher external debt results in lower performance, which broadly corresponds to the findings of Manzano and Rigobon (2001). Higher taxes are associated with lower growth (see also Padovano and Galli, 2001), whereas trade liberalization and population growth are insignificant. Our results also support the evidence for conditional convergence, i.e. poorer countries grow faster than rich countries (Barro, 1991).

Next, we present additional results regarding manufacturing performance in post-Soviet countries. The results are given in Table 4. We additionally include the interaction term between natural resource exports and institutional quality to examine the role of institutions in shaping the natural resource-growth nexus.<sup>6</sup> The effect of natural resource exports on growth remains negative, whereas institutions exert a positive effect. The interaction term for institutions is positive and statistically significant, which suggests that countries with good

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<sup>6</sup>We also examined alternative measures of institutional quality such that "law and order" and "democratic accountability" from the International Country Risk Guide data set. The drawback of this dataset is that it does not contain several countries in our sample limiting the number of countries in our sample to ten. The results are largely in line with the findings that we present in the paper but sometimes standard errors were larger given the low number of observations.

Table 2: The Determinants of Natural Resource Exports

	CRP	LAW	EFT	REG	STB	VOI
Terms of trade	0.74** (0.30)	0.66* (0.34)	0.82*** (0.28)	0.75*** (0.25)	0.72 (0.74)	0.81*** (0.26)
Resource richness	2.24*** (0.67)	2.05*** (0.57)	1.85** (0.73)	1.97*** (0.56)	2.06* (1.20)	2.30*** (0.44)
Institution	2.40*** (0.61)	1.93*** (0.68)	2.14*** (0.33)	1.61** (0.64)	1.81*** (0.40)	1.63*** (0.73)
Number of obs.	240	240	240	240	240	240
F/Wald test	362.1***	168.9***	24.13***	8.09***	11.49***	11.12***
R2 - overall	0.28	0.30	0.33	0.38	0.28	0.32

Notes: The dependent variable is the log of natural resource exports per capita. Notes: The model is estimated for six different measures of institutional quality with Random-effects GLS regression method given the time-invariance of some regressors, see top row: CRP - Control of Corruption, LAW - Rule of Law, EFT - Government Effectiveness, REG - Regulatory Quality, STB - Political Stability and Absence of Violence and VOI - Voice and Accountability. The standard errors are in parentheses. Bias-reduced linearization procedure is used to adjust the standard errors because of Moulton problem. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percent levels, respectively. Constant not reported.

Table 3: The Determinants of Manufacturing Performance in Post-Soviet Countries

	(0)	(1)	(2)	(3)	(4)	(5)	(6)
Natural resource export	-0.11*** (0.03)	-0.12*** (0.02)	-0.13*** (0.03)	-0.15*** (0.03)	-0.13*** (0.03)	-0.09*** (0.02)	-0.16*** (0.03)
Control of corruption		0.63*** (0.18)					
Rule of law			0.37*** (0.11)				
Gov. effectiveness				0.63** (0.16)			
Regulatory quality					0.54*** (0.14)		
Political stability						0.33** (0.16)	
Voice and accountability							0.37*** (0.08)
Trade liberalization	0.08 (0.08)	0.08 (0.08)	0.11 (0.09)	0.16* (0.09)	0.53*** (0.15)	0.08 (0.09)	0.06 (0.07)
Trade openness	0.47*** (0.09)	0.79*** (0.11)	0.57*** (0.08)	0.62*** (0.09)	0.61*** (0.09)	0.54*** (0.08)	0.58*** (0.08)
Average tax rate	-0.11** (0.04)	-0.06** (0.03)	0.06 (0.05)	-0.09* (0.06)	-0.07** (0.04)	0.03 (0.06)	-0.10** (0.04)
External debt	-0.06** (0.02)	-0.10*** (0.03)	-0.08*** (0.02)	-0.08*** (0.06)	-0.08*** (0.02)	-0.07*** (0.02)	-0.09*** (0.02)
Population growth	0.01 (0.03)	-0.14 (0.29)	-0.20 (0.30)	0.04 (0.04)	-0.07 (0.29)	0.15 (0.46)	-0.09 (0.03)
Initial GDP	0.01** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
Number of observations	207	207	207	207	207	207	207
Regression model	FEM	FEM	FEM	REM	FEM	REM	FEM
F/Wald test	14.65***	22.73***	25.65***	32.34***	24.54***	56.34***	27.12***
BP LM	92.97***	123.32***	87.67***	45.65***	77.65***	39.45***	76.45***
Hausman test	17.34***	23.35***	27.64***	3.43	65.75***	4.56	32.34***
R2 - overall	0.42	0.58	0.60	0.60	0.61	0.51	0.61

Notes: The F test determines the choice between the POLS model and the FEM. The LM test determines the choice between the POLS Model and the REM. The Hausman test determines the choice between the FEM and the REM. The null hypothesis is that REM is efficient. Mostly, we rejected the null hypothesis of Hausman test, therefore REM is inconsistent and FEM is applied. The cluster-robust standard errors are shown in parentheses. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percentage levels, respectively. Constant not reported.

Table 4: The Determinants of Manufacturing Performance in Post-Soviet Countries: The Interactions of Natural Resources and Institutions

	(1)	(2)	(3)	(4)	(5)	(6)
Natural resource export (NAT)	-0.18*** (0.01)	-0.19** (0.08)	-0.15* (0.09)	-0.17** (0.09)	-0.11** (0.06)	-0.06 (0.10)
Control of Corruption (CRP)	0.22** (0.13)					
CRP*NAT	0.18*** (0.07)					
Rule of Law (LAW)		0.27*** (0.04)				
LAW*NAT		0.14*** (0.05)				
Effectiveness (EFT)			0.24** (0.11)			
EFT*NAT			0.09 (0.06)			
Regulatory Quality (REG)				0.27*** (0.03)		
REG*NAT				0.17* (0.09)		
Stability (STB)					0.11* (0.07)	
STB*NAT					0.05** (0.03)	
Voice and Accountability (VOI)						0.71** (0.38)
VOI*NAT						0.068* (0.04)
Number of observations	207	207	207	207	207	207
Regression model	FEM	FEM	FEM	FEM	FEM	FEM
F/Wald	19.03***	14.54***	15.23***	14.23***	16.23***	12.65***
BP LM	168.46***	233.12***	123.23***	122.23***	122.12***	124.32***
Hausman test	32.23***	62.23***	87.34***	56.23***	54.34***	56.34***
R2 - overall	0.66	0.65	0.62	0.61	0.57	0.58

Notes: The F test determines the choice between the POLS model and the FEM. The LM test determines the choice between the POLS Model and the REM. The Hausman test determines the choice between the FEM and the REM. The null hypothesis is REM is efficient. We rejected the null hypothesis and therefore, FEM is applied. The cluster-robust standard errors are shown in parentheses. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percentage levels, respectively. Control variables and constant not reported.

institutions do not suffer from the natural resource curse. This result is robust to the different measures of institutions and different regression specifications and is interesting because recent empirical evidence suggests that that natural resource curse may be 'red herring' after the endogeneity of some regressors are controlled for (see Brunnschweiler and Bulte ,2008, or Arezki and van der Ploeg, 2010).

Based on the results presented in Table 4, we compute the threshold value for the countries to escape the natural resource curse, i.e. the level of the institutional quality above which the countries benefit from natural resources. Using the estimated coefficients from Table 4 and taking a first derivative of growth performance with respect to our natural resources measure and setting the resulting affine function to zero, we observe that the critical value for the institutional quality is around two. For example, Azerbaijan, Kazakhstan and Russia, three countries heavily depending on natural resources, exhibit the values below two, i.e. according to our results, suffer from the natural resource curse. On the other hand, our results suggest that Baltic countries do not suffer from natural resource curse.

## 5 Concluding Remarks

We examine how natural resource exports and the quality of institutions influence manufacturing performance with data from a panel of post-Soviet countries over the last two decades. More specifically, we investigate whether good institutions are the way to overcome the natural resource curse. Post-Soviet countries offer a unique laboratory for this exercise, as institutions in these countries were changing dramatically. Therefore, we examine the role of institutions on natural resource curse not only across countries but also over time.

Our results point to an existence of natural resource curse in post-Soviet countries. We find that natural resource exports crowds out manufacturing sector when a wide range of economic, social and political characteristics are controlled for.

Nevertheless, our results indicate that the natural resources are a curse only in countries characterized by bad institutions. Importantly, we find that this non-linear effect holds regardless of the measure of institution that we use. Therefore, the results provide a clear message to policy makers about the positive role that institutions play in economic performance. According to our

results, institutions not only have a positive and direct effect on the performance of manufacturing sector, they also support growth indirectly by helping to alleviate the natural resource curse. Next, we find that more years spent under socialism result in a greater detrimental effect on the quality of institutions, which suggests that the lack of democratic rules results in the deterioration of institutional quality.

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## Appendix

### Data definitions and its sources

*growth*: the log of manufacturing value added as a percentage of GDP. Source: World Bank, World Development Indicators.

*nat*: the natural logarithm of natural resource export (fuel, metal and ore) per capita. Source: World Bank, World Development Indicators.

*Institutional quality defined and measured by Kaufmann, Kraay and Mastruzzi, on a scale of 0 -5: a higher degree represents higher governance performance*. Source: World Bank, World Governance Indicators.

*control of corruption*: the term that captures the perceptions of the extent to which public power is exercised for private gain, including both small-scale and large-scale forms of corruption, in addition to the "capture" of the state by elites and private interests.

*rule of law*: the term that captures the perceptions of the extent to which agents have confidence in and abide by the rules of society, and, in particular, the quality of contract enforcement, the enforcement of property rights, confidence in the police and the courts, and the likelihood of crime and violence.

*government effectiveness*: the term that captures the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies

*regulatory quality*: the term that captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

*political stability and absence of violence*: the term that captures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism.

*voice and accountability*: the term that measures the perceptions of the extent to which a country's citizens are able to participate in selecting their government, including freedom of expression, freedom of association, and a free media.

Figure A.1: Azerbaijan: Natural Resource - Manufacturing Value Added Nexus

Figure A.2: Kazakhstan: Natural Resource - Manufacturing Value Added Nexus

*tot*: terms of trade, which is measured as the ratio of the export price index to the import price index. Authors' calculation. Source of price indexes: World Bank, World Development Indicators.

*latitude*: the value of the latitude of a country on a scale of 0-100. Source: OpenData by Socrata.

*longitude*: the value of the longitude of a country on a scale of 0-100. Source: OpenData by Socrata.

*socialism*: information regarding years under socialism is collected by the authors for each country from different sources.

*lib*: trade liberalization, which is measured on a scale from 1 to 4.3, where 1 represents little or no change from a rigid centrally planned economy and 4.3 represents the standards of an industrialized market economy. Source: EBRD, Transition Indicators.

*open*: trade openness is the sum of the percentages of merchandise export and import on GDP. Source: World Bank, World Development Indicators.

$\tau$ : tax rate is measured as the percentage equal to the proportion that tax revenue is of GDP. Tax revenue refers to compulsory transfers to the central government for public purposes. Source: World Bank, World Development Indicators.

*ed*: external debt, which is measured as a percentage of external debt stocks to gross national income. Total external debt is debt owed to nonresidents that is repayable in currency, goods, or services, where it represents the sum of public, publicly guaranteed, and private non guaranteed long-term debt, use of IMF credit, and short-term debt. Source: World Bank, World Development Indicators.

*n*: population growth is the exponential rate of growth of midyear population during one year, expressed as a percentage. Source: World Bank, World Development Indicators.

*initial GDP* per capita of countries is based on 1996. Source: World Development Indicator.

Table A.1: Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Manufacturing value added	222	16.92	6.88	4.09	36.56
Natural resource export	240	398.67	739.15	12.03	4571.25
Trade liberalization	240	3.41	1.03	1	4.30
Trade openness	240	0.82	0.3	0.29	1.69
Average tax rate	238	0.10	0.03	0.01	0.18
External debt	218	55.65	34.42	2.03	162.11
Population growth	238	0.2	1.02	-2.52	2.82
Initial GDP	240	3834.4	2543.18	860.87	8530.55
Control of Corruption (CRP)	240	1.84	0.57	1.01	3.47
Rule of Law (LAW)	240	1.86	0.71	0.81	3.68
Regulatory Quality (REG)	240	2.12	0.96	0.32	3.94
Government Effectiveness (EFT)	240	2.02	0.67	0.82	3.72
Political Stability (STB)	240	2.16	0.73	0.26	3.51
Voice and Accountability (VOI)	240	1.90	0.91	0.37	3.60
Terms of trade	240	0.94	0.35	0.34	2.87
Latitude	240	47.48	7.25	37.93	59.43
Longitude	240	45.34	18.28	24.10	74.58
Years under Socialism	240	65	9.03	50	76

Figure A.3: Russia: Natural Resource - Manufacturing Value Added Nexus

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