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Are Natural Resources Cursed?

An Investigation of the Dynamic Effects of Resource Dependence on Institutional Quality

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Abstract

This paper examines whether natural resource dependence has a negative influence on various indicators of institutional quality when controlling for the potential effects of other geographic, economic and cultural initial conditions. Analysis of a panel of countries from 1996 to 2010 indicates that a high degree of resource dependence, measured as the share of mineral fuel exports in a country's total exports, is associated with worse government effectiveness, as well as with reduced levels of competition across the economy. Furthermore, estimation of long-run elasticities suggests that government effectiveness and the intensity of domestic competition decrease over time as the dependence on natural resources increases. An illustration of the Russian case shows that the negative effects accumulate in the long run, leading to a worse deterioration of government effectiveness in Russia than in Canada, a country with a comparable resource endowment but far better overall institutional quality. This result is corroborated by a significant negative correlation found between regional resource dependence and an indicator of regulatory capture in Russian regions, which indicates that the regulatory environment is more likely to be subverted in regions that are more dependent on extractive industries. Overall, the findings would be consistent with a situation in which a generally weak institutional environment would allow resource interests to wield the bidding power accruing from export revenues to subvert the content of laws and regulations, as well as their enforcement. The fact that this is associated with negative externalities for the rest of the economy, notably by undermining a level playing field across non-resource sectors, sheds light on a potential channel for the resource curse.

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1. Introduction

Several studies suggest that resource dependent countries have, on average, lower long run growth rates than countries with a more diversified export structure (see, for instance, Sachs and Warner, 1995, 1997 and 2001). Yet, a closer look at individual experiences exposes a stark contrast between countries where resource dependence seems to be associated with a low income trap and rising inequalities and others that succeeded in harnessing their resource wealth to achieve sustained and broad-based economic growth. The former group includes many African countries, while the latter are, by and large, higher income OECD economies, such as Canada, Australia or Norway. In this light, it seems plausible that successful experiences benefited from more favorable country characteristics. One of these is the ability of civil society and of a country's institutions to govern the consequences of resource dependence. At the same time, it is plausible that resource dependence may have the power to influence institutional development, which would, in turn, determine a country's growth potential following resource booms. This would occur, for instance, if the availability of revenues from resource exports allowed natural resource exporters to outbid other constituencies in shaping the content of laws and regulations, in a mechanism similar to that described by Olson (1965), Stigler (1971) and Peltzman (1976). A generally poor institutional environment would, of course, be more susceptible to be subverted, since effective checks and balances on the power of influential lobbies would be weak. The ultimate consequence of this *de facto* political power accruing to resource interests would be the alteration of the entire governance system of a country, in a way that is unfavorable to the diffuse protection of property rights (Acemoglu, Johnson and Robinson, 2005), thus dampening entrepreneurship, as well as incentives to invest and innovate in other sectors of the economy.

Since institutional quality is likely to be a crucial transmission channel between reliance on natural resources and long run growth, this paper takes a closer look at the effects of resource dependence on the quality of a country's institutions. Unlike previous studies, we explore the panel dimension of institutional quality and examine the nature of the dynamic interaction between resource dependence, measured as the share of mineral fuels in total exports,[3] and the evolution of six dimensions of governance. These are based on the World Bank's Worldwide Governance Indicators (WGI), which estimate six indicators[4] (Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption), covering 212 countries and territories for the period 1996 to 2010. In order to test whether resource dependence also undermines a level playing field in the economy, the analysis also examines the effects of resource dependence on the perceived intensity of competition, based on the World Economic Forum indicator for competition in local markets for the period 1998-2010. In a further step, the analysis takes a closer look at the Russian case by comparing the effects of resource dependence in Russia with Canada – an economy with a similar resource endowment but with much higher levels of institutional quality – as well as by exploring the association between resource dependence and regulatory capture across Russian regions for the period 1995-2000.

Using a system estimator based on the work of Arellano and Bover (1995) and Blundell and Bond (1998), the analysis applies a dynamic panel data model controlling for multiple aspects - including the level of economic development, size of government, trade openness, country fixed effects, and others - as well as for the path dependence of institutional outcomes, by including the lagged value of the institutional variable and by controlling for the potential endogeneity between resource dependence and institutions.

[3] We also considered the share of other, non-fuel, extractive industries in total exports as an explanatory variable for institutional quality and results turned out to be insignificant.

[4] Only Government Effectiveness turns out to be statistically significant in the analysis that follows and only results relating to this indicator are reported. Results for other WGI indicators are available upon request.

This estimation method is applied to the World Bank indicators of institutional quality and to the World Economic Forum indicator of competition.

Results indicate that a high degree of resource dependence is associated with worse government effectiveness, as well as with reduced levels of competition across the economy. Estimation of short and long run elasticities suggests that government effectiveness and the intensity of domestic competition decrease over time as the dependence on natural resources increases. The effect seems quite relevant, with a 1% increase in the average worldwide share of fuel exports in total exports leading to a 0.13% decrease in government effectiveness in the short run, and to a 0.20% decline in the long run. When considering competition in the local market, an increase of 1% in the share of fuel exports in total exports is associated with a decrease of 0.69% in the competition indicator in the short run and of 0.93% in the long run. The effect in the case of Russia for government effectiveness appears smaller than the global average but much larger than in a comparator economy such as Canada. A 1% increase in the share of fuel exports in total exports of the country would lead to a 0.15% decrease in government effectiveness in the short run, and to a 0.17% reduction in the long run. This compares to a decrease in Canada of 0.07% in the short run and 0.08% in the long run. These findings would seem to lend support to a negative long run effect of resource dependence that accumulates over time. The two channels identified are the reduction in the ability of state institutions to effectively perform their functions and the undermining of a level playing field across non-resource sectors.

This paper is organized as follows. First is an overview of the literature on the resource curse, with a particular focus on the quality of institutions as a transmission channel for the effects of resource dependence on long run growth. Next, is the analysis of the effects of resource dependence on institutional quality and the intensity of competition, making use of the World Bank and World Economic Forum indicators, followed by an application to the Russian case. A final section concludes, proposing directions for further research.

2. Natural Resources and Institutions

In resource rich economies, dependence on natural resources is sometimes regarded as a possible cause of poor long run economic performance, the so-called "resource curse" (Sachs and Warner, 2001). Researchers have proposed a number of channels - often intertwined - through which the negative effects of resource dependence may operate. A prominent explanation is offered by the phenomenon of "Dutch disease", whereby the extractive sector may cause factors of production to be drained away from manufacturing, thus impairing its potential productivity and ultimately ensuring the decline of the sector as a whole. Since manufacturing is assumed to have positive productivity spillovers, this has harmful repercussions on growth.[5]

Dutch disease explanations may be framed within theories that see *geography*, in the form of endowments, as a fundamental cause of long run economic performance. In this sense, endowments of natural resources are a given and have an impact on the economic structure and on the growth potential of countries. More generally, geography may influence the quality of land, labor and production technologies, thus determining a country's long run growth potential (Easterly and Levine, 2003). At the same time, geographic characteristics may have an impact on the nature of a country's institutions, thus

[5] See Bruno and Sachs (1982) and Sachs and Warner (1995, 1997 and 2001) for seminal models of Dutch disease. For a diagnosis of Dutch disease in the case of Russia, see Ahrend et al. (2007).

indirectly affecting long run performance via their effect on institutions.[6] For instance, the degree of hospitality of a region's climate may have determined different colonization strategies, which, in turn, resulted in divergent development paths in different regions (Acemoglu et al., 2001 and 2002; Easterly and Levine, 2003 and Engerman and Sokoloff, 2003).[7] In this framework, long term economic outcomes are determined by the nature of the institutions introduced by colonizers, which, depending on the morbidity of the climate or on initial resource endowments, led to the establishment of institutions that were either (i) *extractive*, i.e. designed to guarantee the efficient extraction of rents by a small number of European colonists or (ii) favorable to the diffuse *protection of property rights*, where European colonists were numerous. Beck and Laeven (2006) propose a similar argument in the case of transition economies, where resource dependence and the entrenchment of elites – itself reinforced by resource dependence – determined the quality of institutional transition.

Aside from the structural implications of resource endowments considered in geography-type theories, Dutch disease may also operate by influencing the *policies* pursued by countries that are highly dependent on natural resources. The most obvious example is that of resource exporting countries, which undergo a terms of trade imbalance as a consequence of their reliance on resource exports.[8] A concentrated export structure would in this case alter the relative prices between the resource and the non-resource sectors, reducing the international competitiveness of non-resource sectors. Failure to countenance such a shock in the terms of trade with appropriate trade, fiscal, exchange rate and competition policies may undermine long run growth.[9] A number of studies have also highlighted how strengthening competition, including through trade openness, tends to be conducive to institutional improvement. For instance, Frankel and Romer (1999) argue that trade openness has a strong causal effect on per capita income, instrumenting for openness with a country's natural propensity to trade based on a gravity model. An implication of this line of research is that geography matters for many poor developing countries because they are far from markets and thus less likely to realize benefits from trade. Openness may also impact institutional quality, since it may contribute to weakening vested interests by reducing rents derived from prevailing economic and institutional arrangements, and therefore lead to demand for institutions more suited to an increasingly varied, complex, and possibly risky range of transactions.[10]

Observation of the development experience of resource-abundant countries reveals a stark contrast between successes – such as those of Australia, Canada or the Scandinavian countries – and failures, as in the case of many African countries. This suggests that developing a successful modern economy based on natural resources exports crucially hinges upon the existence of appropriate policies and of the institutions that underpin them. Hence, institutions may be viewed as the ultimate driver of long run economic performance, either in isolation or in combination with other fundamental determinants, such as

[6] Acemoglu et al. (2005) propose a comprehensive treatment of the importance of institutions for long run economic performance.

[7] In order to address the possibility of reverse causality between income levels and institutional quality, these authors have used proxies for geographical and historical characteristics, such as settler mortality or distance from the equator as instruments for present day institutions. Hall and Jones (1999) also use institutional quality as one component of their ''social infrastructure'' (which explains productivity). Social infrastructure is instrumented with distance from the equator and with the prevalence of a European language.

[8] See van der Ploeg and Poelhekke (2009) for a recent treatment of the effects of resource dependence on macroeconomic volatility.

[9] The resource boom that has fuelled Russia's growth since 1999 provides insights into the role that policies may play. For instance, the establishment of a stabilization fund linked to the export revenues of oil is designed to face the fiscal consequences of the volatility of oil prices. The conditions under which Russia will access the World Trade Organization, in part dictated by its resource abundance, will in turn influence the degree of competition in local markets.

[10] Positive externalities induced by trade openness, including on institutions, are highlighted in Berg and Krueger (2003), Islam and Montenegro (2002), and Wei (2000).

geography or policies. Rodrik et al. (2004) explicitly compare the relative importance of institutions, geography and policies and find that the quality of institutions is the most important determinant of income differences across countries.

In the specific context of the resource curse, and in line with the literature that sees institutions as the fundamental determinant of economic performance, a two-stage hypothesis - that natural resource dependence affects institutional conditions, in turn, determining long run economic performance - is examined in a number of recent studies, which find a strong negative association between natural resource dependence and institutional quality.[11] Poorer institutions, on their part, produce negative externalities on the wider economy by encouraging rapacious rent-seeking instead of entrepreneurial activities, and ultimately impairing long run economic performance.

Within this literature, Leite and Weidmann (1999) model a situation in which natural resource dependence, especially the extractive capital intensive kind, creates opportunities for rent-seeking behavior. Levels of corruption thus induced are empirically shown to have a negative effect on growth rates.[12] Torvik (2002) proposes a theoretical model where a greater amount of natural resources increases the number of entrepreneurs engaged in rent-seeking as opposed to productive activities. The ultimate result is reduced welfare because the increase in income from natural resources is more than offset by the reduction caused by engagement in rent-seeking. Baland and Francois (2000) present a model in which the interaction between a resource boom and entrepreneurial activity depends on the initial proportion of entrepreneurs in the economy, with a high initial proportion resulting in virtuous overall performance. This would explain the divergent patterns observed in different countries following resource booms. [13]

A limited number of cross-country studies empirically examine the joint influence of natural resource dependence and institutional quality on long run economic performance. Mehlum et al. (2006) model the growth effects of natural resource dependence as depending on the quality of institutions, which can be grabber or producer friendly, with the effects being negative only in presence of grabber friendly institutions. Their empirical section challenges the Dutch disease explanation offered by Sachs and Warner (1995), who imply that institutions *per se* are irrelevant for long run performance. Mehlum et al. (2006) use the Sachs and Warner data covering 87 countries and show that an interaction term between resource dependence and institutional quality has a strong impact on growth. Isham et al. (2005), considering a cross-section of 90 developing economies, find that various institutional measures[14] are strongly and negatively affected by an export structure dominated by resources extracted from a narrow geographic or economic base, such as oil and minerals extraction, so-called "point-source" natural resources. The same institutional measures are, in turn, found to have a strong impact on the growth performance of those countries. Sala-i-Martin and Subramanian (2003) also discover that natural

[11] Brunnschweiler (2008) and Brunnschweiler and Bulte (2008) draw a distinction between resource *abundance* and resource *dependence*, where the former is defined based on indicators of subsoil wealth, while the latter corresponds to the resource export shares as more commonly employed in the literature. Based on cross-country analysis, they find that resource abundance *per se* actually has *positive* effects on long run growth, while dependence on resource exports is found to be insignificant.

[12] Bond and Malik (2009), based on a sample of 78 developing countries, find that, while export concentration *per se* has negative effects on investment, the effects of fuel exports are positive. At the same time, other natural resource indicators turn out to be insignificant determinants of investment.

[13] Based on the argument that rent-seeking is the crucial negative consequence of resource dependence, Kolstad and Søreide (2009) maintain that policy in resource rich countries should be less focused on macroeconomic management and more on institutions to prevent rent-seeking and patronage.

[14] The indicators of institutional quality considered are rule of law, political instability, government effectiveness, control of corruption, regulatory framework, property rights and rule-based governance.

resources affect growth by impairing institutional quality[15], with only "point-source" resources having a systematic and robust effect. Also, the impact is found to be non-linear, with the negative marginal influence on growth depending on the level of natural resources. Beck and Laeven (2006) examine the effects of institutions on growth by considering the natural experiment of transition to a market economy in the countries of Eastern Europe and Central Asia. They find that natural resources – a proxy for the elite's opportunity to extract rents - and years under socialism – a proxy for the entrenchment of elites - are crucial determinants of institutional quality, which, in turn, had a significant influence on average growth rates in the first decade of transition.

2.1 A Potential Explanation: Regulatory Capture

By what means are elites able to engage in rent seeking in resource rich economies? A potential explanation is that natural resource exports provide large revenues that allow elites to effectively purchase the content of laws and regulations and their enforcement, thus subverting the entire institutional framework, with negative repercussions for the rest of the economy. This form of state capture is referred to in the literature as "regulatory capture" and appears as a plausible channel through which resource interests can affect institutions. That said, available data offer limited possibilities to test this hypothesis empirically. This is why regulatory capture by natural resource interests is best seen as a latent mechanism at play.

Subversion of the institutional environment to the detriment of society at large may have serious repercussions for long run economic performance (Acemoglu et al., 2005; Acemoglu, 2006; and Acemoglu and Robinson, 2008). Regulatory capture may occur in the presence of asymmetric information or collective action problems.[16] Along these lines, Stigler (1971) refers to Olson's (1965) theory of collective action to explain how business interests influence regulatory provisions for their own benefit in a market for regulation in which the outcomes are determined by the laws of supply and demand. Olson's logic of collective action implies that the power of a group to influence public policy is inversely related to the size of the group, in the sense that higher per capita stakes, as it is likely to be case for natural resource exporters, will give its members a stronger incentive to influence regulatory outcomes.

A number of theoretical models have been proposed to explain capture of regulation by special interests. Peltzman (1976) generalizes Stigler's model by introducing the idea that governments arbitrate among competing interests and decide not only which group regulation will favor, but also the extent of the gains accruing to each group. Becker (1983) emphasizes the demand side of the market for regulation in a framework where pressure groups compete for political favors with the objective of determining redistribution of income and other public policies. The outcome depends on the efficiency of each group in producing pressure, the effect of additional pressure on their influence, and the deadweight cost of taxes and subsidies, whose increase encourages pressure by taxpayers. Laffont and Tirole (1991) complement previous works by taking a closer look at the supply side of the market for regulation. They introduce an agency theoretic framework with informational asymmetries between legislators (principals), regulators (supervisors) and regulated interest groups (agents). The welfare of the regulated depends on

[15] Institutional quality is measured on the basis of the WGI rule of law index. As a robustness check, alternative measures of institutions are found to be equally relevant: voice and accountability, government effectiveness, control of corruption, political stability.

[16] Such theories of regulation, highlighting the role of interest groups in the formation of public policy, fall within the domain of 'public choice' theories. These stand in contrast with 'public interest' theories of regulation, emphasizing the benevolent role of legislators in correcting market imperfections.

the actions of regulators, and these two groups collude by concealing information from principals with the objective of exchanging favors.

Regulatory capture is a special case of institutional subversion and is widely believed to be harmful for economic performance because the rent-seeking associated with the capture of institutions diverts resources from productive activities and hampers allocative efficiency, firm entry, and, thorough the discouragement of innovation, dynamic efficiency[17]. Referring to forms of interaction between firms and the state, World Bank (2000) and Hellman et al. (2003) make a distinction between influence and capture. *Influence* is intrinsic to features of firms, such as their status of state-owned enterprise, their being state monopolies or to their presence in politically sensitive industries or regions. *Capture*, on the other hand, is a rational survival strategy on the part of successful new firms that have bidding power vis-à-vis politicians and bureaucrats to effectively purchase the content of laws and regulations or their enforcement. The latter seems to be the most plausible situation for natural resource exporters. An instance of the possibility of capture is provided by Grossman and Helpman (1994), who, in the context of trade policy, emphasize how policymakers may auction the content of policy to firms and award it to the highest bidder.[18]

Some empirical studies consider the wider implications of institutional subversion. These include a series of works based on various rounds of the Business Environment and Enterprise Performance Survey (BEEPS) conducted in several transition countries[19], and Slinko et al. (2005), who analyze the Russian case. A common finding is that capture is associated with both substantial benefits for captor firms and negative externalities for the wider economy. In the specific case of Russia, Slinko et al. (2005) discover that capture impairs the performance of non-influential players, while negatively affecting small business growth, tax capacity of the state, and share of social public expenditure.[20]

In the long run, an economy where competition is hampered, by captured regulation or by other means, will be less productive because its firms will face reduced incentives to be efficient. Furthermore a regulatory regime that is biased in favor of incumbents effectively restricts firm entry and exit. In this context, Aghion and Griffith (2005) note how incentives to enhance productivity are crucially affected by institutions and policies that promote or hinder firm rivalry and entry of new firms. In particular, regulations that promote competition among incumbents and favor firm churning may increase the incentive and lower the cost of incorporating new technologies into the production process, as suggested by neo-Schumpeterian growth theories.[21] Ultimately, the consequences of dampened incentives may be particularly severe for economies and sectors within countries that are far from the technological frontier, since the ability to adopt new technologies is essential to allow convergence to the levels of more developed economies.[22]

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[17] See, among others, Olson (1982), Murphy, Shleifer and Vishny (1993) and Acemoglu (2006).

[18] Regulatory capture may also be directed at the enforcement of existing rules. In this light, Glaeser et al. (2003) underline the repercussions of inequality of influence on the judicial system, with powerful actors obtaining court judgments which do not contradict their own interests.

[19] See Hellman, Jones and Kaufmann (2003); Hellman, Jones, Kaufmann and Schankerman (2000); Hellman and Schankerman (2000); Hellman and Kaufmann (2003).

[20] De Rosa (2007) also finds a negative effect of regulatory capture on the intensity of manufacturing exports to developed countries.

[21] For a review, see Aghion and Howitt (2006). Along similar lines, Conway et al. (2006) provide empirical evidence of the negative effects of anticompetitive regulations on productivity growth and, in particular, on the convergence to higher productivity levels using sectoral data for OECD countries; Alesina et al. (2005) emphasize the link between pro-competitive regulation and investment, while Bassanini and Ernst (2002) find a connection between anticompetitive regulations and innovation.

[22] Within this Schumpeterian framework, Acemoglu et al. (2006) argue that pro-competitive policies may be more essential for countries and industries that are close to the technological frontier, where neck-and-neck firm rivalry

This reasoning may be combined with the observation that natural resource dependence is often associated with poor long run economic performance. This suggests that natural resource dependence may act as an obstacle to growth by undermining a level playing field for firm entry, exit and operation. More specifically, the rents accruing from natural resource exports may be used to shape the content of laws and regulations for the benefit of captors. The subversive use of rents is easier in countries with weak institutional checks and balances, where powerful players are unhindered in their attempt to influence policymakers and regulators. Capture is also more likely to occur in countries that are less bound by international obligations, such as, for instance, those implied by EU membership in terms of competition and state aid policies. The ultimate consequence of capture is the misallocation of resources throughout the economy with negative repercussions for long run growth.

3. Effects of Resource Dependence on Government Effectiveness and Competition

A number of cross-country empirical studies investigate the impact of resource dependence on economic performance controlling for a number of country characteristics. They find that natural resource dependence affects average long run incomes only insofar as it impacts the quality of the institutional environment.[23] This study complements this literature by exploiting the time series dimension of the data while distinguishing between the effects of resource dependence on the quality of institutions *per se* and on the perceived intensity of competition (reflecting the degree to which resource dependence may undermine a level playing field in the economy).

A single equation model is used to test the hypothesis that institutional quality, as well as its outcome in terms of competition, is affected by resource dependence when controlling for economic factors, historical trajectories and political factors. The basic idea is that institutions have a dynamic nature, as it takes time for institutional quality and its outcomes to adjust to changes not only in the level of natural resource dependence but also in other country characteristics. Therefore, a standard dynamic model (autoregressive model of order 1) is tested, as defined by the following equation:

$$IQ_{it} = \mu + \gamma IQ_{it-1} + \beta_1 lnNRD_{it} + a_4 X_{it} + \delta_i + \rho_t + \varepsilon_{it} \qquad (1)$$

where i indexes countries ($i = 1,2, \dots, N$), t indexes year ($t = 1,2, \dots, T$) and γ is a parameter reflecting the speed of adjustment of institutional quality overtime and ranging as (0,1]. IQ is a proxy of institutional quality and its outcome (competition), while NRD proxies natural resource dependence. X is a vector of controls, δ_i are country fixed effects, ρ_t are year dummies and ε_{it} are i.i.d. over the whole sample with variance σ_ε^2. As the number of countries for which the data is available is large (N=204) while the number of years is assumed to be small (t=14 or t=12, depending on the indicator of institutional quality used), asymptotic properties are considered as N becomes large with T fixed.

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results in a continued momentum to improve productivity. For countries and industries far away from the frontier, policies favourable to investment, rather than innovation, may be more appropriate, since investment in capital developed elsewhere brings with it the adoption of embodied technologies. Nonetheless, the failure to switch to an innovation policy based on competition as countries and industries approach the frontier may result in failure to attain higher productivity and, hence, higher income levels.

[23] See, for example, Sala-i-Martin and Subramanian (2003) and Isham et al. (2005).

A *first indicator of institutional quality (IQ)* is based on the Worldwide Governance Indicators (WGI) compiled by the World Bank.[24] These indicators emphasize, by construction, different aspects of governance[25]: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. Their estimation is based on several hundred individual variables measuring perceptions of governance, drawn from 33 separate data sources constructed by 30 different organizations.[26] The methodology consists of identifying various sources of data on perceptions of governance that are assigned to these six broad categories. An unobserved components model is then used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. The estimates for each country are complemented with margins of error that reflect the unavoidable uncertainty associated with measuring governance across countries. Despite these margins of error, *most comparisons result in statistically significant differences across countries and over time*. The Worldwide Governance Indicators cover the period 1996-2010 (t=15) and follow a normal distribution with a mean of zero and a standard deviation of one in each period, which implies final scores lying between -2.5 and 2.5, with higher values corresponding to better outcomes. Among the WGI indicators, only *government effectiveness* turns out to be significant in all model specifications and is shown in the analysis that follows.[27] Government effectiveness measures 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 (Kaufman, Kraay and Mastruzzi (2009)). We assume that the characteristics of the indicator of government effectiveness adequately capture distortions in the institutional and regulatory environment induced by natural resource dependence.

A *second indicator of institutional quality (IQ)* captures the indirect effect of resource dependence in terms of undermining a level playing field in the economy. To this end, we use the index of *competition in local market* from the Global Competitiveness Index (GCI) compiled by the World Economic Forum. The GCI indicators are estimated from average responses in each country to questions included in the World Economic Forum's Executive Opinion Survey. The indices are based on a representative sample of survey responses across countries. The sample of respondents is designed to be representative of the national business sector, both in terms of the share of production by industry and size of companies, and in terms of the range of different company types (domestic, foreign and partly state-owned). Sample size varies according to the size of the economy. The World Economic Forum has taken a number of measures to mitigate the possibility of country-specific perception bias. First, respondents are encouraged to compare the situation in their economies against that of other countries. In order to do this, companies are selected on the basis of international exposure, so that executives are in a position to compare the situation with other countries. Second, an effort is made to identify and exclude outliers from computations. Survey responses are aggregated to form the individual indicators underlying the GCI. The indicator of competition in the local market covers the period 1998-2010 (t=13). It rates competition from very weak ("competition is limited in most industries and price-cutting is rare") to very strong ("competition is intense in most industries as market leadership changes over time"). In order to make the interpretation of the competition indicator compatible with the WGI indicator, the original competition

[24] The complete data, as well as country reports and a definition of the methodology used to construct the indicators can be found at www.govindicators.org .

[25] Governance is defined as consisting of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.

[26] The data sources consist of surveys of firms and individuals, as well as assessments of commercial risk rating agencies, non-governmental organizations, and a number of multilateral aid agencies and other public sector organizations. A full list of these sources is provided by Kaufmann et al. (2009).

[27] Results using the other five WGI indicators are not shown here but are available upon request.

index – ranging from 1 to 7 - was rescaled to have a mean of zero and a standard deviation of one. Scores range from -4.6 to 4.6, with higher values corresponding to better outcomes.

The crucial explanatory variable of interest in model (1) is natural resource dependence (*NRD*), measured as the share of *mineral fuel exports* in total exports and is obtained from the World Bank's WDI database. According to WDI dataset, data on mineral fuels exports comprise the UN SITC section 3, which covers four main areas: (i) coal, coke and briquettes; (ii) petroleum, petroleum products and related materials; (iii) gas, natural and manufactured; and (iv) electric current. Mineral fuels exports account for 72%, on worldwide average, of total mineral resources exports in the last 10 years (see table below).

Table 1 Exports of Mineral Resources: 2000-2009

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Mineral fuel exports (% of merchandise exports)	10.23	10.06	9.21	9.38	9.93	11.24	11.62	11.39	13.56	11.92	11.93
Ores and metals exports (% of merchandise exports)	2.80	2.75	2.61	2.63	3.07	3.25	4.04	4.35	4.16	3.72	4.60
Mineral resources exports(% of merchandise exports)	13.03	12.81	11.82	12.00	13.00	14.49	15.66	15.74	17.72	15.64	16.53
Mineral fuel exports/ Mineral resources exports	78.5%	78.6%	77.9%	78.1%	76.4%	77.5%	74.2%	72.4%	76.5%	76.2%	72.2%

Source: WDI data. Note: According to UN classification ores and metal exports comprise the following commodities: crude fertilizer, minerals nes; metalliferous ores, scrap; and non-ferrous metals

The vector of controls *X* includes a variable for *press freedom* constructed by Freedom House (for years 1999-2010) as an integer ranging from 0 (perfectly free media) to 100 (no media freedom).[28] In order to facilitate interpretation, the (100 – Freedom House Index) is used, so the larger the index the greater is the media freedom. This control captures the ability of the press to increase the accountability of policymakers thus curbing corruption and increasing the effectiveness of policy.[29]

The remaining control variables reflect economic conditions. Among these, the natural log of *GDP per capita*, measured in PPP with constant 2005 US$, is intended to account for the fact that institutional quality is likely to be higher in richer countries. The natural log of share of *government expenditure* in GDP reflects the amount of resources under government's control that would be potentially available for capture by special interests. The natural log of *trade openness*, measured as the sum of exports and imports of goods and services as a share of GDP, is intended to control for the fact that exposure to international practices may be reflected in the quality of domestic institutions or may, *de facto*, increase the perceived level of competition in the domestic market in the form of import competition,.[30] Finally,

[28] Even though the Voice and Accountability indicator from the WGI also captures the degree of press freedom in a country, an alternative indicator of press freedom is used in order to avoid the inevitable problems of endogeneity that would result by the fact that all WGI indicators are drawn from the same sources of data. It is also worth noting that regression results do not substantially vary when excluding the chosen press freedom index.

[29] Besley and Burgess (2002) and Besley and Prat (2002) emphasize how political accountability can be affected by the media. The monitoring role of the media is also highlighted in a number of cross-country studies such as Ahrend (2002) and Brunetti and Weder (2003). Egorov et al. (2009) find that media are less free in oil-rich economies, especially those with non-democratic constitutions.

[30] See Berg and Krueger (2003) and references therein; Islam and Montenegro (2002) and Wei (2000). Trade openness is likely to affect competitive pressures for domestic firms. However, this is not necessarily the case. For

the natural log of *population* is a way to control for country size. All of these variables are extracted from the WDI database (for years 1996-2010).

Finally, the *year dummies* (ρ_t) account for the evolution of mineral fuel world prices while the *country fixed effects* (δ_i) include both country dummies and time-invariant country specific variables such as: OECD membership; legal origin[31] (English, French, German, Scandinavian and other); religion (measured as log proportions of Muslim and Catholic population, in 1980); and geographical characteristics (measured as the log distance to the Equator).

From model (1), institutional quality changes over time and so the *short run elasticity* of a change, for instance, in natural resource dependence could be easily obtained as:

$$\frac{\partial IQ_t}{\partial NRD_t} = \frac{\beta_1}{NRD_t}.$$

One period later it would be measured as:

$$\frac{\partial IQ_{t+1}}{\partial NRD_t} = \gamma\left(\frac{\beta_1}{NRD_t}\right);$$

two periods later:

$$\frac{\partial IQ_{t+2}}{\partial NRD_t} = \gamma^2\left(\frac{\beta_1}{NRD_t}\right);$$

and so on. Therefore, the long run effect of a change in natural resource dependence, which is just the sum of all the short run and all the interim effects, could be written as:

$$\frac{\beta_1}{NRD_t} + \gamma\left(\frac{\beta_1}{NRD_t}\right) + \gamma^2\left(\frac{\beta_1}{NRD_t}\right) + \cdots . = \frac{\left(\frac{\beta_1}{NRD_t}\right)}{(1-\gamma)}$$

This means that, given the current level of natural resource dependence and assuming that $\gamma \in (0,1]$, the long run elasticity tends to be larger (in absolute value) than the corresponding short run one. Specifically, if $\beta_1 < 0$, as expected, this would state that institutional quality deteriorates over time as natural resource dependence increases.

From model (1) the lagged dependent variable is correlated with the country fixed effects (δ_i), making both pooled OLS and within estimator inconsistent. The instrumental variable approach of the system GMM estimator - built on the work of Arellano and Bover (1995) and Blundell and Bond (1998) - can be a consistent estimation option once assumed there is no autocorrelation in the idiosyncratic errors. This estimator applies moment conditions in which lagged differences are used as instruments for the level

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instance when a large share of trade over GDP is concentrated in a narrow range of sectors, the majority of sectors in the economy may still be immune from import competition.

[31] Following the various works by La Porta and his co-authors, legal origin is included among the potential determinants of institutions by considering English legal origin as the base category and including dummy variables for French, German, Scandinavian and "other" legal origin, which are assessed relative to the benchmark of the English legal tradition."Other" legal origin includes countries whose legal tradition cannot clearly be traced to any of the Western European models considered. Such countries include those whose legal system is based on Islamic law or those that radically changed their legal system, as, for example, the former Soviet republics. Among countries in the sample, 26% are classified as of English legal origin, 42% French, 7% German, 4% Scandinavian.

equation in addition to the moment conditions of lagged levels as instruments for the differenced equation. The use of this instrumental variable approach is useful also to control for another relevant aspect, which is the fact that the share of fuel exports in total exports – as a proxy of natural resource dependence – might be highly endogenous with respect to both growth and institutions. In fact, reverse causality might be present as poor institutional quality - characterized, for instance, by poor protection of property rights as in the framework proposed by Acemoglu et al. (2005) – might undermine the incentives to invest and innovate in riskier non-resource sectors, such as manufacturing, therefore resulting in a production and export structure that is skewed towards extractive industries. Estimation of equation (1) by system GMM would then mitigate this potential problem by allowing explicit modeling of natural resources as endogenous. Among other control variables, trade openness is also considered endogenous, while GDP per capita and share of government expenditure are modeled as pre-determined variables, in the sense that they are only assumed to be correlated with past disturbances. Other variables are treated as strictly exogenous.

Another potential problem in the estimation of equation (1) is the bias that may be caused by the omission of relevant determinants of institutional quality. To this end, as explained, in addition to a number of country level characteristics, the model includes country dummies, intended to capture unobserved time invariant features of each country, as well as year dummies, which control for idiosyncratic shocks in the price of mineral fuels, and for other unobserved and time dependent determinants of institutional quality.

Table 2 presents the descriptive statistics of all variables used to assess the relationship between government effectiveness and natural resource dependence, while Table 3 displays the statistics associated with the model for competition in the local market.

Table 2 Descriptive Statistics: 1996-2010 data

Variables	N	mean	sd	min	max
Government effectiveness	2865	-0.03	1.01	-3.33	2.37
Ln(Share Fuel Exp.)	1918	1.23	2.25	-4.61	4.60
Press Freedom	2860	0.52	0.24	0.00	0.95
Ln (trade openness)	2595	4.34	0.63	-1.71	6.10
Ln(GDP per capita)	2674	8.59	1.30	5.01	11.25
Ln(Govt Exp/GDP)	2484	2.69	0.41	0.72	4.24
Ln(Population)	2940	15.35	2.18	10.16	21.01
Legal system	3136	2.53	1.47	1.00	5.00
Ln(Distance to Equator)	3088	-1.49	0.82	-4.50	-0.15
Ln(catho80)	3088	-1.91	2.00	-9.21	-0.02
Ln(muslim80)	2351	-2.83	2.43	-8.52	0.00

Table 3 Descriptive Statistics: 1998-2010 data

Variables	N	mean	sd	min	max
Competition in the local market	1293	0.00	1.00	-3.68	4.61
Ln(Share Fuel Exp.)	1685	1.28	2.23	-4.61	4.60
Press Freedom	2509	0.52	0.24	0.00	0.95
Ln (trade openness)	2240	4.35	0.64	-1.71	6.10
Ln(GDP per capita)	2323	8.61	1.30	5.51	11.25
Ln(Govt Exp/GDP)	2147	2.69	0.41	0.72	4.24
Ln(Population)	2548	15.37	2.18	10.18	21.01
Legal system	2744	2.53	1.47	1.00	5.00
Ln(Distance to Equator)	2702	-1.49	0.82	-4.50	-0.15
Ln(catho80)	2702	-1.91	2.00	-9.21	-0.02
Ln(muslim80)	2058	-2.83	2.43	-8.52	0.00

Tables 4 and 5 present the results for the government effectiveness and for the competition indicator, respectively, based on a system GMM estimator. For comparison, pooled OLS[32] and within estimators results are also presented.. Figure 1 displays the partial residual plot of the pooled OLS specification for government effectiveness and the log share of fuel in total exports, while Figure 2 presents a partial residual plot for the competition in local market indicator. As they build on pooled OLS models, these figures should be seen as indicative, emphasizing the finding that natural resource dependence seems to be negatively associated with institutional quality.

[32] For the OLS model, standard errors are clustered by country.

Table 4 Government Effectiveness and Natural Resource Dependence

Dependent Variable: Government Effectiveness	pooled OLS*	fixed effects	System GMM*
Government effectiveness(t-1)	0.9620***	0.7275***	0.3352***
	(0.008)	(0.029)	(0.046)
Ln(Share Fuel Exp.)	-0.0055***	-0.0042	-0.0159***
	(0.001)	(0.004)	(0.004)
Press Freedom/100	0.0722***	0.1203*	-0.0935
	(0.023)	(0.065)	(0.100)
Ln (trade openness)	0.0089	0.0242	0.0592*
	(0.007)	(0.031)	(0.034)
Ln(GDP per capita)	0.0192***	0.1313***	0.4016***
	(0.006)	(0.044)	(0.112)
Ln(Population)	0.0041	0.1462	0.2088**
	(0.003)	(0.103)	(0.105)
Ln(Govt Exp/GDP)	-0.0054	-0.0034	0.0342
	(0.009)	(0.041)	(0.043)
Legal:French	-0.0151*	.	4.3025
	(0.008)	.	(3.611)
Legal:German	0.0002	.	1.8517**
	(0.010)	.	(0.929)
Legal:Scandinavian	0.0315*	.	0.9669
	(0.016)	.	(5.691)
Legal:Other	0.0064	.	-5.4979*
	(0.011)	.	(2.877)
Ln(Distance to Equator)	-0.0016	.	0.0285
	(0.005)	.	(1.075)
Ln(catho80)	0.0001	.	0.4203
	(0.002)	.	(0.463)
Ln(muslim80)	0.0029	.	0.5436
	(0.002)	.	(0.482)
_cons	-0.2719***	-3.6199*	0.000
	(0.097)	(1.863)	(0.000)
Country dummies	No	Yes	Yes
Time dummies	No	Yes	Yes
N.obs	1250	1250	1250
N.of countries	110	110	110
R2	0.988	0.5899	
Sargan test (Prob>Chi2)			0.999
Arellano–Bond test for serial correlation			0.642

**Share of fuel exports and trade openness are considered to be endogenous, while GDP per capita and share of government expenses in GDP are treated as predetermined variables. All other variables are modelled as strictly exogenous * Standard errors are clustered by country.*

Table 5 Competition in the Local Market and Natural Resource Dependence

Dependent Variable: Competition in the local market	pooled OLS*	fixed effects	System GMM*
Competition level (t-1)	0.5127***	0.0936	0.2542***
	(0.068)	(0.092)	(0.053)
Ln(Share Fuel Exp.)	-0.0433**	-0.0524	-0.0828***
	(0.016)	(0.064)	(0.045)
Press Freedom/100	0.3421	0.8075	-0.0884
	(0.286)	(0.573)	(0.890)
Ln (trade openness)	0.1698***	-0.3833	-0.3438
	(0.063)	(0.297)	(0.258)
Ln(GDP per capita)	0.2153***	0.4659	0.4744***
	(0.053)	(0.337)	(0.088)
Ln(Population)	0.1598***	0.9435	4.8981**
	(0.033)	(0.900)	(2.008)
Ln(Govt Exp/GDP)	0.0599	0.2352	-0.4452***
	(0.085)	(0.322)	(0.141)
Legal:French	-0.1979***	.	-7.7587
	(0.068)	.	(5.582)
Legal:German	-0.0253	.	-7.6663
	(0.089)	.	(9.742)
Legal:Scandinavian	0.1035	.	0
	(0.099)	.	(0.000)
Legal:Other	-0.1772	.	-5.7831
	(0.113)	.	(7.146)
Ln(Distance to Equator)	-0.0454	.	-1.0741
	(0.065)	.	(2.649)
Ln(catho80)	-0.0059	.	1.0884
	(0.018)	.	(1.333)
Ln(muslim80)	0.024	.	-0.1924
	(0.018)	.	(1.032)
_cons	5.5051***	-19.6389	9.6068**
	(1.140)	(16.165)	(38.804)
Country dummies	No	Yes	Yes
Time dummies	No	Yes	Yes
N.obs	547	547	547
N.of countries	84	84	84
R2	0.6596	0.2792	
Sargan test (Prob>Chi2)			0.529
Arellano–Bond test for serial correlation			0.587

**Share of fuel exports and trade openness are considered to be endogenous, while GDP per capita and share of government expenses in GDP are treated as predetermined variables. All other variables are modelled as strictly exogenous*

Figure 1 Government Effectiveness and Share of Fuel in Total Exports, Residuals

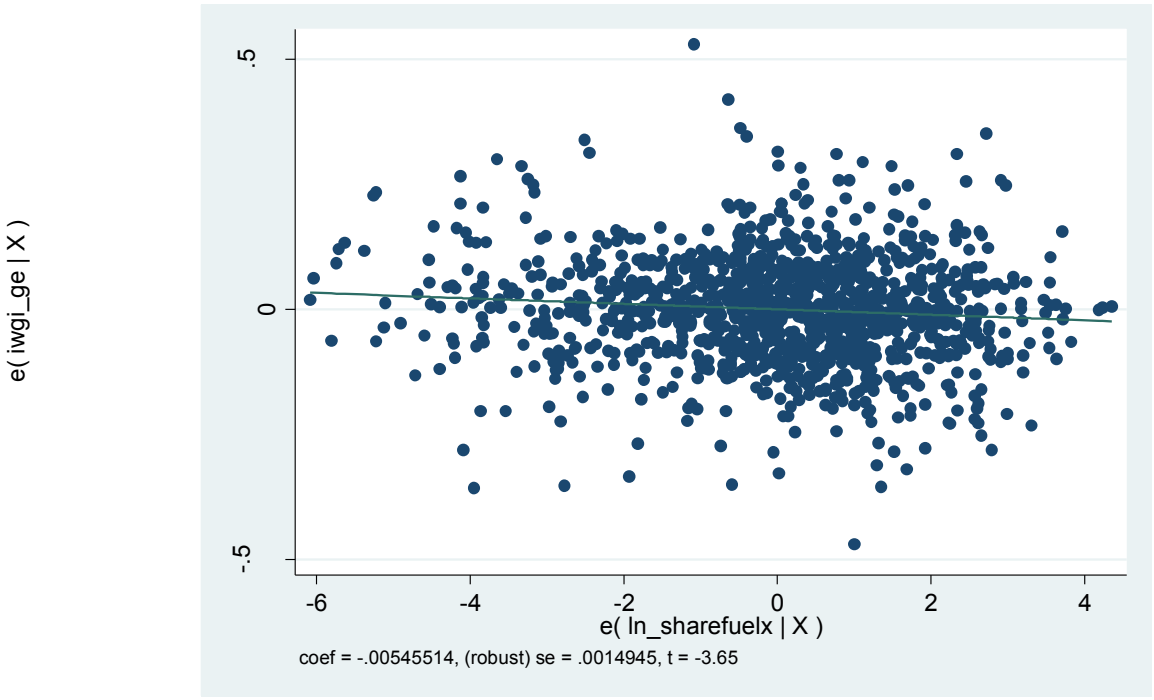
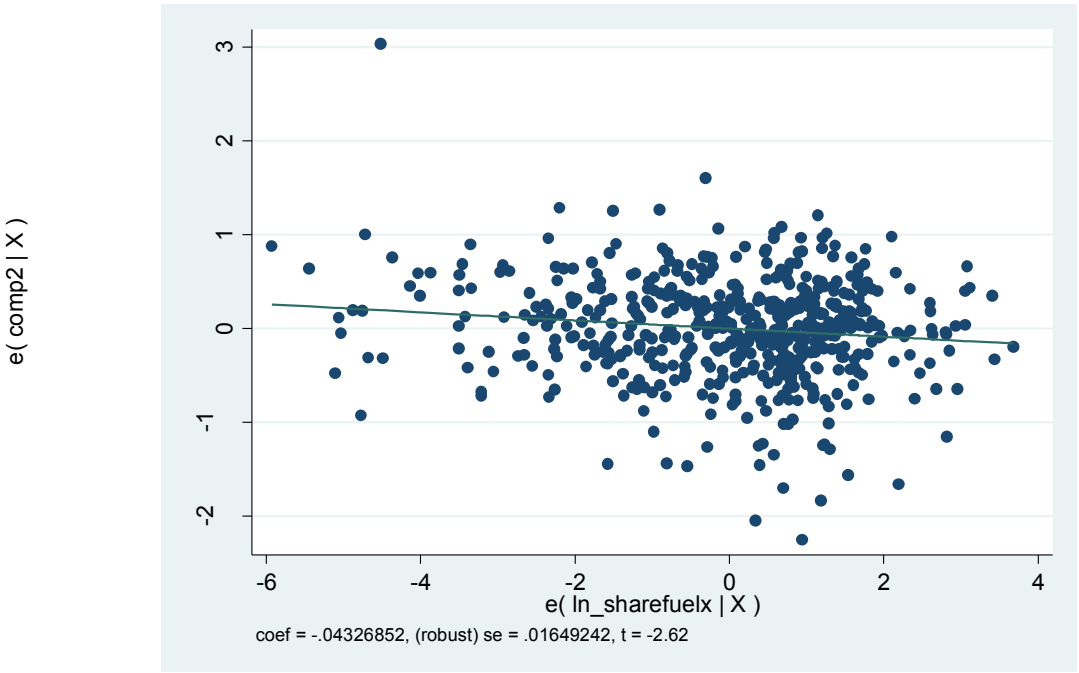


Figure 2 Competition in the Local Market and Share of Fuel in Total Exports, Residuals



Results from the system GMM estimator show that government effectiveness and intensity of domestic competition are stronger, as expected, in higher-income countries, even when accounting for country

fixed effects (Table 4 and Table 5),. Trade openness has the expected positive effect only for government effectiveness, while its impact on domestic competition is insignificant. Press freedom is insignificant for both models, while the size of the government has a negative impact on the intensity of competition across countries. Finally, among country characteristics, country size and German legal tradition have a positive effect on government effectiveness.

On average, the coefficient of natural resource dependence is negative, and statistically significant, even when controlling for country specific characteristics on press freedom, economic conditions, and geographical/religious and legal aspects. Assuming the 2010 worldwide average of share of fuel exports in total exports as being 11.93% (according to WDI data), the short and long run elasticities of the two indicators in relation to natural resource dependence are computed (see Table 6).

Table 6 Short run and Long Run elasticities of Institutional Quality to Natural Resource Dependence

	Institutional quality measured by	
	Government effectiveness Indicator	**Competition in the Local Market Indicator**
short run	-0.133	-0.694
long run	-0.200	-0.931

The results indicate that a 1% increase in the average worldwide share of fuel exports in total exports would lead to a 0.13% decrease in government effectiveness indicator in the short run, and to a 0.20% decrease in the long run. When considering the effects in terms of competition in the local market, an increase of 1% in the share of fuel exports in total exports would be associated to a decrease of 0.69% in the competition indicator in the short run and a deterioration of 0.93% in the long run. Overall, results show that the negative effects of natural resource dependence on institutional quality, proxied by government effectiveness, and on the intensity of competition tend to deteriorate over time.

4. An Application to the Russian Case

More nuanced insights into the relationship between resource dependence and institutional quality may be obtained by examination of the Russian case. The Russian economy is highly dependent on extractive industries, which have been the main driver of growth following the 1998 financial and economic crisis and into the new decade of the twenty-first century.[33] While its effects for GDP growth have been beneficial in the recent past, excessive reliance on extractive industries may have negative consequences in the future. Notably, in addition to the risks connected with lack of diversification of the economic base, resource dependence may have a negative impact on the – already poor - quality of the institutional environment, which may, in turn, contribute to jeopardize the long term growth prospects of the Russian economy.[34] Against this background, this section extends the model previously presented by estimating

[33] According to official figures, post-1998 growth was predominately driven by the manufacturing sector and, even more so, by non-tradables where productivity growth was the fastest. One of the main reasons for this growth was the very high oil price, which facilitated huge capital inflows and relatively cheap credit resources. It is noteworthy, however, that while overall economic growth has been relatively broad-based, industrial growth after 1998 was overwhelmingly driven by resource sectors and related industries

[34] De Rosa (2007) assesses the respective importance of resource dependence *per se* and of the institutional environment for the ability of Russian manufacturers to export to developed markets in the period 1996 to 2001. Results indicate that, while the impact of resource dependence is negligible, the consequences of a captured regulatory environment are substantial.

long run and short run elasticities of government effectiveness and competition to resource dependence for Russia. It also explores a regional dimension by using regional data on regulatory capture and resource dependence for the period 1995-2000.

The first objective is to determine whether the responsiveness of government effectiveness[35] to changes in natural resource dependence is higher or lower in Russia relative to Canada, a comparable country in terms of resource endowments and geography but with higher levels of institutional quality. The specification of equation (1) is modified to be estimated as follows:

$$IQ_{it} = \mu + \gamma IQ_{it-1} + \beta_1 lnNRD_{it} + \beta_2 Country + \beta_3 Country * NRD_{it} + a_4 X_{it} + \delta_i + \rho_t + \varepsilon_{it} \quad (2)$$

where Country is a dummy for the Russian Federation or Canada, and the country fixed effects (δ_i) still include country dummies. Therefore, for the particular cases of Russia and Canada, the short run effect would be measured as:

$$\frac{\partial \mathrm{IQ_t}}{\partial \mathrm{NRD_t}} = \left[\frac{(\beta_1+\beta_3)}{\mathrm{NRD_t}}\right],$$

while the long run effect would be computed as: $\left\{ \frac{\left[\frac{(\beta_1+\beta_3)}{\mathrm{NRD_t}}\right]}{(1-\gamma)} \right\}$

[35] The results for competition in local markets are not significant and are not reported.

Table 7 Government Effectiveness and Natural Resources: Russia and Canada (System GMM)

Dependent Variable: Government effectiveness	1) Canada	2) Russia
Government effectiveness(t-1)	0.1333***	0.1332***
	(0.047)	(0.046)
Ln(Share Fuel Exp.)	-0.0158***	-0.0156***
	(0.004)	(0.004)
Country*Ln(Share Fuel Exp.)	-0.0032***	-0.0786**
	(0.001)	(0.034)
Press Freedom/100	-0.0834	-0.0806
	(0.099)	(0.098)
Ln (trade openness)	-0.0642	-0.055
	(0.044)	(0.044)
Ln(GDP per capita)	0.3783***	0.3844***
	(0.107)	(0.111)
Ln(Population)	0.1854	0.2186
	(0.191)	(0.186)
Ln(Govt Exp/GDP)	0.0335	0.0332
	(0.043)	(0.044)
Legal:French	-5.8075	1.444
	(3.579)	(2.697)
Legal:German	-1.7984	1.6558
	(3.050)	(1.733)
Legal:Scandinavian	0.625	0
	(5.392)	(0.000)
Legal:Other	-5.3585*	-1.8653
	(2.765)	(1.306)
Ln(Distance to Equator)	0.0531	-0.6475
	(0.994)	(0.604)
Ln(catho80)	0.3492	-0.4525
	(0.430)	(0.460)
Ln(muslim80)	0.4596	-0.3775
	(0.465)	(0.358)
_cons	0.000	-10.5777*
	(0.000)	(6.205)
Country dummies	Yes	Yes
Time dummies	Yes	Yes
N.obs	1250	1250
Sargan test (Prob>Chi2)	0.997	0.995
Arellano–Bond test for serial correlation	0.700	0.637

**Share of fuel exports and trade openness are considered to be endogenous, while GDP per capita and share of government expenses in GDP are treated as predetermined variables. All other variables are modelled as strictly exogenous*

The system GMM results of Table 7 show that both in Russia and in Canada the coefficients of natural resource dependence are negative, as indicated by the significance of the interaction term between the country dummy and the share of mineral fuel exports. Assuming the 2010 share of fuel exports in total exports to be 64% in Russia and 26% in Canada (according to WDI data) the short and long run elasticities of government effectiveness in relation to natural resource dependence are computed (see Table 8).

Table 8 Short run and Long Run elasticities of government effectiveness to natural resource dependence: Russia and Canada

	Government Effectiveness	
	Russia	**Canada**
short run	-0.147	-0.073
long run	-0.170	-0.084

Overall, these results show that the responsiveness of government effectiveness to changes in natural resource dependence is higher in Russia than in Canada. A 1% increase in the share of fuel exports in total exports of the country would lead to a 0.15% decrease in Russia (compared to 0.07% in Canada), in the short run, and to a 0.17% reduction in the long run (compared to 0.08% in Canada). This would seem to be particularly damaging since government effectiveness would be deteriorating more over time in Russia, starting at an already much lower level than in Canada. In 2010 the scores of the government effectiveness indicator were +1.86 for Canada and -0.39 for Russia on a scale of -2.5 to +2.5. [36]

Regulatory Capture in Russian Regions

Complementing the international comparison, it is useful to have a closer look at Russia from a regional perspective. The sample of Russian regions seems appropriate to investigate the effects of resource dependence on institutional quality since the extensive decentralization promoted in the decade following the collapse of the Soviet Union generates a unique natural experiment, where the diversity of institutions across the Russian Federation may be sufficient to warrant cross-regional analysis.[37] The incidence of extractive industries on regional output is also varied, allowing for a comparative examination of the impact of natural resource dependence on institutional outcomes. The fact that analysis is carried out in one country is also an advantage, since it allows avoiding the idiosyncrasies inherent in cross-country studies, for instance, as a consequence of the difficulty that may be encountered in the comparison of institutional settings across countries.

Against this background, this section examines the relevance of resource dependence in determining the degree of regulatory capture at the regional level. Analysis controls for a number of regional characteristics and initial conditions. A specific mechanism is hypothesized to explore the relationship between resource dependence and institutional quality in greater detail. The driving force is the

[36]Legislation and taxation of extractive industries in Russia changed between 1996 and 2010. Marginal taxation of, especially, the oil sector considerably increased during the period. This implies that resource interests may have had less leverage to influence (and help deteriorate) the institutional framework.

[37] Developments in the last decade suggest a strong political will to roll back decentralization. The creation of seven Federal Districts in 2000, agglomerating pre-existing city, oblast, okrug and krai administrations, as well as autonomous republics, was a first step in this direction. The seven Federal Districts are Central, South, North West, Volga, Ural, Siberian, Far East. Control over regional decision-making has also been strengthened in the form of direct appointment of regional governors by the president of the Russian Federation.

exceptional bidding power that accrues to powerful resource interests from export revenues. This allows them to mold laws and regulation in a way that is supportive of their own special interests.

The baseline model employed for estimation by OLS is:

$$RC_i = \beta + \beta_1 NRD_i + \beta_2 X_i + \varepsilon_i \qquad (3)$$

In the equation above, *RC* stands for the 1995-2000 average of the Slinko et al (2005) index of regulatory capture in region i while *NRD* stands for the 1995-2000 averages of natural resource dependence measured as share of regional exports and industrial production. X includes a number of controls that may affect the degree of regulatory capture, including a 1995-2000 average index of regional employment or output concentration (dominance); the degree of transparency of regional institutions; distance from Moscow, a dummy for the status of ethnic republic and regional business sector development.

The dependent variable in equation (3) is an index of *regulatory capture* (*RC*) constructed by Slinko et al. (2005) and is a unique example of an objectively quantified measure of the degree to which laws and regulations favor influential interests. It covers 73 Russian regions and is based upon the close examination of regional laws and regulations, enacted in the period 1995-2000, and found to contain preferential treatments for the up to 20 largest firms in a region. Preferential treatments are defined as tax breaks, investment credits, subsidies, subsidized loans from the budget and official delays in tax payments. The regional indicator of regulatory capture is defined as the Herfindahl-Hirschman concentration index of preferential treatments for the five firms with the largest number of preferential treatments. [38]

The degree of regional *resource dependence* (*NRD*) is obtained from the Goskomstat statistical Yearbook of Russian Region. Two measures of regional dependence on extractive industries can be obtained from official statistical data. The first is a measure of the incidence of energy (oil and gas) and mineral (ferrous and non-ferrous metals) in total regional exports. The second is a measure of the share of fuel and mineral output in gross regional industrial production.

X contains a number of possible determinants of regulatory capture. First is the presence of dominant players in a region. Russia is still characterized by a situation where a small number of very large firms dominate many regional economies. In order to account for the possibility that regulations may be captured by virtue of the influence exerted by such dominant regional players (World Bank, 2000), regression analysis controls for the degree of employment or output concentration. This regional *dominance* effect is proxied by the 1995-2000 average Herfindahl-Hirschman index of concentration of employment and output. [39] The logic for considering output and employment concentration as determinants of regulatory capture can be derived from Olson's (1965) theory of collective action, which implies that lobbying by interest groups will be more effective for smaller group sizes – with the group composed of a handful of very large players or even only one firm in the extreme case of Russian "mono-towns"- since a small size implies higher per capita stakes. This results in greater incentives on the part of individual members of small groups to exert lobbying pressure. At the same time, the observation that capture is a feature of firms that are able to effectively *purchase* the content of legislation (World Bank, 2000 and Hellman et al., 2003) suggests that concentration by itself is not sufficient to explain the existence of regulatory capture. A necessary condition is that firms have sufficient monetary resources to bid for the content of legislation in a competition for preferential treatments with other interest groups. In

[38] The Herfindahl-Hirschman index (HHI) is calculated by squaring the preferential treatments share of each firm and then summing the resulting numbers.

[39] These variables were obtained from Goskomstat and from the Centre for Economic and Financial Research (CEFIR).

such a competition, apart from direct monetary bribes, captors can also exchange favors (a form of indirect monetary transfer) with key elected officials. An instance of this could be monetary contributions to political campaigns, as well as control over the votes of employees, shareholders, suppliers, and citizens of communities where these powerful industries are located (Laffont and Tirole, 1991). As previously noted, this kind of institutional subversion, associated with bidding power, may be at the root of regulatory capture. In resource dependent economies, extractive industries, with the exceptional income they derive from export revenues, are obvious candidates for the role of captors.[40]

Replicating the potential role of press freedom as a check on government power included in the cross-country section, analysis also controls for the degree of *transparency* of regional institutions, as measured by the average values of the 2002 Mediasoyuz survey of transparency of regional executives, legislatures, courts of general jurisdiction and arbitration courts.[41] These indicators are based on a poll of over 1000 journalists from Mediasoyuz – the Russian union of journalist - conducted in all Russian regions. A number of criteria were used to assess the transparency of regional institutions: frequency of citations of a particular regional authority in the press; democracy and correctness of accreditation rules for journalist; rapidity of response to journalists' enquiries; existence and quality of internet site; frequency of press-conferences.

Other controls for regional characteristics are also included. The first variable, *distance from Moscow*, represents geography. Peripherality of regions with respect to the capital is intended to capture idiosyncrasies in regional development which inherently descend from the immensity of the Russian territory. Moscow is not only geographically closer to the west than most of the Russian territory, but it is also the undisputed economic, financial and political center of the Federation. Geographical distance can delay adoption of internationally accepted business practices and reduce the incentives for foreign direct investment, thus precluding access to foreign capital and export markets. This may be hypothesized to be reflected in the quality of the institutional environment, including the extent of regulatory capture. Cultural differences in initial conditions are, albeit imperfectly, captured by the status of *ethnic republic*. Apart from highlighting the possible effects of local traditions on institutions, it represents the degree of autonomy from federal power, which is usually greater in ethnic republics. The upshot would be that estimation will make it possible to assess to what extent administrative decentralization may ameliorate or deteriorate the quality of institutions. Finally, regional *business development* is also considered, and is constructed as the share of small businesses per capita in 1995 obtained from Goskomstat. Greater incidence of small businesses may be associated with a more dynamic regional economy and larger progress in transition at the beginning of the sample period. It may also be argued that a larger constituency of small businesses may act as a counterweight to the influence of larger players on the regulatory process.

Table 9 reports the results of OLS estimation of equation 3 above, while Figure 3 displays the partial residual plot of the two specifications in Table 9.

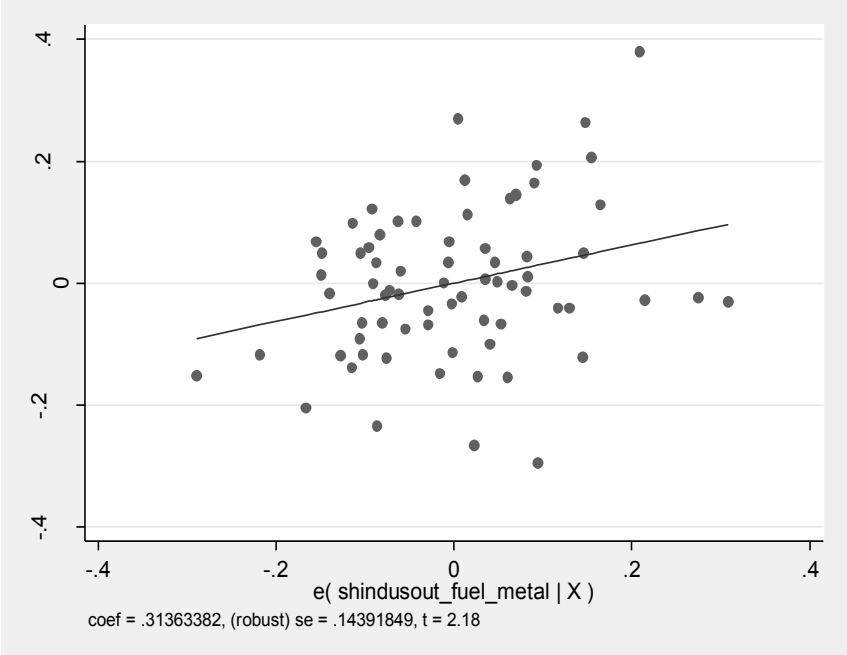
[40] In order to exhaustively address the issue of influence versus capture, the analysis that follows should be able to go beyond the indicators of regulatory capture – measured as the concentration of preferential treatments – and examine the effects of output concentration and resource dependence of the various types of preferential treatments used to construct the summary index of regulatory capture. Unfortunately, such comprehensive treatment is not possible, due to the unavailability of underlying data on preferential treatments.

[41] The Mediasoyuz survey was conducted in 2002 by the press agency www.strana.ru.Since similar variables for previous years are not available, the assessment of transparency in 2002 is used as proxies for the previous period average. Although, strictly speaking, this procedure is incorrect, it is realistic to assume that such variables are stable in the short run, and, therefore, posterior values can sensibly be used as proxies for previous years (1995-2000).

Table 9 Russia: Natural Resource Dependence and Regulatory Capture

Dependent Variable: Regulatory Capture (1995-2000)		
HHout	0.365	0.045
	(0.750)	(0.570)
HHemp	-0.885	-0.701
	(2.174)	(1.342)
transparency	0.002	0.001
	(0.004)	(0.004)
sme95	-0.008	-0.003
	(0.008)	(0.007)
ethnic	0.071	0.063
	(0.043)	(0.039)
distmo	-0.007	-0.011**
	(0.005)	(0.004)
export_energymetalshare	**0.193***	
	(0.104)	
export_energymetalshare_HHout (interaction)	-0.745	
	(1.291)	
export_energymetalshare_HHemp (interaction)	1.416	
	(3.704)	
shindusout_fuel_metal		**0.314****
		(0.144)
shindusout_fuel_metal_HHout (interaction)		-1.056
		(1.686)
shindusout_fuel_metal_HHemp (interaction)		2.697
		(4.876)
_cons	-0.06	-0.029
	(0.053)	(0.047)
R-squared	0.186	0.244
N. obs	72	72

Figure 3 Natural Resource Dependence and Regulatory Capture in Russian Regions, Residuals



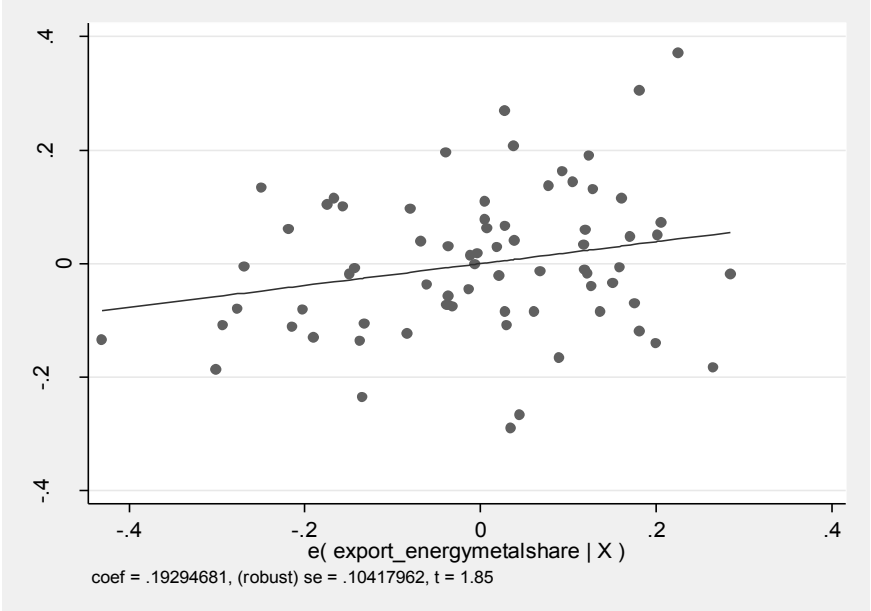


Table 9 and Figure 3 suggest that natural resource dependence is significantly correlated with the degree of regulatory capture, with its index value increasing by 1.9% for a 10% increase in regional resource exports and by 3.1% for a 10% increase in the incidence of natural resources in regional output.[42] Output or employment concentration among the largest firms in a region, both in isolation and in the interaction with resource dependence, has no effect. This is consistent with the possibility that the critical factor affecting regulatory capture may not be the dominance of regional players *per se*, but, rather, regional dependence on natural resources. If this were the case, it would not be merely the size of regional actors

[42] See Appendix C for the values of the Slinko et al. (2005) index.

that determines their influence on regional lawmaking; rather, the discriminating factor would be their operation in extractive industries. An implication would be that subversion of the regulatory environment would take the form of capture, represented by the mounting influence of expanding and cash-rich sectors, and not of influence *per se*, which would be implied by the attempts on the part of firms in declining industries to be shielded from competition. The degree of transparency of regional institutions is inconsequential for reducing regulatory capture, as was the case for the press freedom variable in the previous worldwide analysis. In the case of Russia, it should be noted that the level of transparency is probably low across the board and presents insufficient variation across regions for its effect on regional regulatory capture to become apparent. This may also suggest that natural resource interests have a disproportionately large power and that both civil society and regional institutions are ineffective in restraining their grip on regional lawmaking. Apart from distance from Moscow (which is negatively associate with the degree of regulatory capture in the second specification of Table 9), none of the other controls reflecting regional conditions turn out to be significant.[43]

5. Concluding Remarks

Abundance of natural resources may, conceivably, provide an opportunity for rapid economic growth and improving living standards. The evidence worldwide, however, is quite contradictory in this respect. Countries with already high incomes per capita receive a further boost from resource driven growth, while others, usually with lower initial incomes, find themselves in a poverty trap that appears to be exacerbated by the dependence of their economy on natural resources. This is often referred to in the literature as a "resource curse" that prevents many economies from reaping the high potential benefits of resource exports. Many explanations have been proposed as to what drives the curse.

One of the most popular is the "Dutch disease" whereby high resource exports distort the price of tradables relative to non-tradables in a way that places non-resource sectors at a competitive disadvantage internationally. The upshot of this effect is that, in the long run, entrepreneurship, together with financial and human resources, are drained away from non-resource sectors, which are assumed to have higher potential spillovers, for instance in terms of innovation, for the rest of the economy. This story, however, is unlikely to provide an exhaustive explanation of the potentially perverse effects of resource dependence. To begin with, the "Dutch disease" – termed after a resource boom that occurred in the Netherlands in the 1970s – turned out not to be a disease at all. Following the initial impact of rising costs in the Dutch economy in the years immediately following the resource boom, the Netherlands found the means to match higher costs with higher productivity and prosper, turning out to be today one of the most diversified and innovative economies in the World.

What is, then, driving the effects of resource dependence, transforming it into a blessing or a curse? The example of the Netherlands may help shed light on the answer. The Netherlands also happens to be one of the least corrupt economies, with a highly efficient government. In other words, it has one of the highest levels of institutional quality globally. The effect of natural resources on economic growth – as also shown by the experiences of other high income countries – is likely to be driven by the ability of a country's institutions to govern the effects of resource abundance and transform it into an asset for the country. This contrasts with the experiences of scores of less advanced economies, where rapacious rent-seeking enabled by resource abundance appears to have the upper hand. Institutional quality, a key driver

[43] In some model specifications not reported here, the degree of perceived business corruption also turns out to be insignificant. This might suggest there is no association between the degree of regulatory capture and general corruption levels. This result, however, should be interpreted with care, since the corruption indicator is only available for a limited number of regions.

of long run growth, is likely to be affected by resource abundance and, at the same time, to influence its effects on the economy. The endogenous interaction between natural resources and institutions appears to have the ability to provide an answer as to what makes resource abundance a blessing or a curse.

In this light, this paper investigates the effect of resource dependence, measured as the share of mineral fuel exports in total exports, on institutional quality. This task presents several challenges.

First, institutional quality is not easily quantifiable, since it is normally based on more or less subjective information. In this respect, the fact that most assessments of institutional quality concur in identifying countries as having good or bad institutions should provide some comfort. At the same time, institutional quality can have several dimensions and it may be worth exploring its various facets. This is made possible by use of the Worldwide Governance Indicators (WGI), which is one of the most ambitious and comprehensive attempts to capture the nuances of institutional quality worldwide. In addition, in order to capture the distortions to markets that may be induced by resource dependence, as an indirect measure of institutional quality, we also use an indicator of the intensity of competition in local markets, compiled by the World Economic Forum (WEF).

Second, the quality of the governing environment is likely to be endogenously determined with the degree of resource dependence, since exporters of natural resource are likely to influence the rules of the game in their society, while, at the same time, being constrained in their behavior by these same rules. In order to control for this effect, the analysis employs a system GMM estimator that allows mitigating the consequences of reverse causality, while also controlling for country characteristics that may, conceivably, also contribute to shaping the institutional environment.

Results point towards a significant effect of natural resource dependence in worsening the quality of the institutional environment. Moreover, this effect appears to accumulate over time, as indicated by the fact that the (negative) response of institutional quality to resource dependence is higher in the long run. This is true for both the WGI indicator of government effectiveness and for the WEF indicator of intensity of competition, both covering the period from the mid-nineties to 2010. These findings are quite striking and point to the importance of protecting a country's institutions from the perils of resource dependence.

This is likely to require more detailed analysis in each country to achieve a more nuanced understanding of the mechanisms that are at play, causing the quality of institutions to negatively respond to resource interests. As a first step in this direction, the last part of the analysis focuses on the case of the Russian Federation. This is done by comparing the effects of resource dependence in Russia with Canada, an economy that is comparable in terms of endowments and geography. Results indicate that resource dependence not only has more negative consequences on government effectiveness in Russia in the short term, but the negative effects also tend to accumulate faster, contributing to further deterioration of an already poorer institutional environment than in Canada. In other words, it appears that resource dependence could be driving a divergence in institutional quality. The Russia analysis also points towards a potential mechanism that may explain the negative influence of natural resources on institutional development: the exceptional bidding power that natural resource interests may wield in the attempt to capture the content of laws and regulation, as well as their enforcement. This is confirmed by the negative association across 73 Russian regions between an indicator of regulatory capture and various measures of resource dependence.

Overall, more detailed analysis could be carried out on the mechanisms that underlie the negative consequences of resource dependence for a country's growth prospects. This paper points to regulatory capture as one such mechanism. The objective of further research should be to uncover the motives and the channels through which natural resource exporters engage in rent seeking, undermining a level playing field in the economy and, ultimately, a its long term growth potential.

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Appendix A: Data Sources

Cross-country Analysis

World Development Indicators Database

This comprehensive database of indicators is used to define *fuel and metal exports as a share of total exports*; *openness* (the share of exports and imports in GDP) as well as the *log of GDP per capita in 1980*.

Worldwide Governance Indicators

The Worldwide Governance Indicators (WGI) measure six dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. They cover 212 countries and territories for 1996, 1998, 2000, and annually for 2002-2010. The indicators are based on several hundred individual variables measuring perceptions of governance, drawn from 33 separate data sources constructed by 30 different organizations. These individual measures of governance are assigned to categories capturing the six dimensions of governance, and an unobserved components model is used to construct six aggregate governance indicators in each period.

Control of Corruption – measuring the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Regulatory Quality – measuring the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Voice and Accountability – measuring the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Political Stability and Absence of Violence – measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism.

Government Effectiveness – measuring 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.

Rule of Law – measuring the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence.

World Economic Forum

The World Economic Forum *Global Competitiveness Index* is based on both survey data and factual data. The source of survey data is the World Economic Forum's *Executive Opinion Survey*. Survey questions ask participants to evaluate, on a scale of 1 to 7, the current condition of their particular operating environment. At one end of the scale, 1 represents the worst possible operating condition or situation, and, at the other end, of the scale, 7 represents the best. The indices are based on representative sample of

survey responses across countries. The sample of respondents is designed to be representative of the national business sector, both in terms of the share of production by industry and size of companies, and the range of different company types (domestic, foreign and partly state-owned). Sample size varies according to the size of the economy. The World Economic Forum has taken a number of measures to mitigate the possibility of country-specific perception bias. First, respondents are encouraged to compare the situation in their economies against that of other countries. In order to do this, companies are selected on the basis of international exposure, so that executives are in a position to compare the situation with other countries. Second, an effort is made to identify and exclude outliers from computations.

For the purposes of our analysis one indicator from the World Economic Forum is used, based on responses to the *Executive Opinion Survey*:

Competition in the Local Market – measuring the intensity of local competition. This indicator is estimated on the basis of the survey question: "*Competition in the local market is (1 = limited in most industries and price-cutting is rare, 7 = intense in most industries as market leadership changes over time).*"

Russia Analysis

Goskomstat Yearbook of Russian Regions (1970-2001)

It contains many economic and social regional indicators. In the present study use is made of the yearbook for the construction of region-specific variables, such as incidence of extractive industries in Gross Regional Industrial Production, US dollar value of natural resource exports, number of dominant firms, share of output of dominant firms, SME per capita.

Slinko et al. (2005) Index of Regulatory Capture (1995-2000)

This index is constructed by Slinko et al. (2005) for 73 Russian regions. It is computed by considering regional laws containing preferential treatment for the five largest non-state firms and the larger SOEs on a regional basis. The index is directly used in the analysis and was kindly provided by Ekaterina Zhuravskaya.

Mediasoyuz Survey (2001)

The survey was conducted by Mediasoyuz, the Russian union of journalists and published in April 2002. It contains survey data on transparency of various regional institutions for all Russian regions. The survey was used for the variables describing the transparency of regional governments, regional Dumas, courts of general jurisdiction and arbitration courts. The survey results were kindly provided by Evgeniy Yakovlev of CEFIR, Moscow.

Appendix B: Definition of Variables

Variables used in Cross-country Analysis		
Institutional Quality	***Government Effectiveness***	The variable is compiled from a combination survey sources and captures 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. The variable is measured on a scale of -2.5 (worst) to +2.5 (best) and is used for the period 1996-2009.*Source WGI Kaufmann et al. (2009).*
	Competition in Local Market	The variable is estimated from the World Economic Forum's Executive Opinion Survey and measures the intensity of local competition. The variable is measured on a scale of 1 (worst: "Competition in the local market is limited in most industries and price-cutting is rare") to 7 (best: "Competition in the local market is = intense in most industries as market leadership changes over time"). *Source World Economic Forum*.
Natural Resources	***Mineral Fuel Exports***	UN SITC section 3, which covers four main areas: i) coal, coke and briquettes; ii) petroleum, petroleum products and related materials; iii) gas, natural and manufactured; and iv) electric current. *Source World Development Indicators Database*.
Other	***Press Freedom***	Constructed by Freedom House (for years 1999-2009) as an integer ranging from 0 (perfectly free media) to 100 (no media freedom). This control captures the ability of the press to increase the accountability of policymakers thus curbing corruption and increasing the effectiveness of policy.
	Government Expenditure	Government expenditure share of GDP. *Source World Development Indicators Database*.
	Log GDP per Capita	Natural logarithm of GDP per. *Source World Development Indicators Database*.
	Distance from Equator	Absolute value of latitude normalized between 0 and 1. *Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*
	Share of Catholic population 1980	*Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*
	Share of Muslim population 1980	*Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*
	English legal origin	*Source Levine et al. (1999) Database and ,for missing countries, author's calculations based on various sources.*
	French legal origin	*Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*

	German legal origin	*Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*
	Scandinavian legal origin	*Source Levine et al. (1999) Database and, for missing countries, author's calculations based on various sources.*
	Openness (% of X and M in GDP)	Sum of exports and imports as a share of GDP, 1980-2005 average. *Source World Development Indicators Database*.

Variables used in Russia Regional Analysis		
Institutional Quality	***Regulatory Capture***	Index of Regulatory Capture. *Source Slinko et al. (2005).*
	Transparency of State institutions	Average indicator of transparency of regional government, duma, courts of general jurisdiction and arbitration courts. *Source Mediasoyuz Survey*.
	Business Corruption	Entrepreneurs' perception of business corruption. *Source TI-INDEM (2002)*. (See Appendix C for index values).
Natural Resources	***export_energymetalshare***	Cumulative share of fuel (oil and gas) and mineral (ferrous and non-ferrous metals) exports in total exports. *Source Goskomstat Yearbook of Russian Regions*.
	shindusout_fuel_metal	Cumulative share of fuel (oil and gas) and mineral (ferrous and non-ferrous metals) in Gross Regional Industrial Production. *Source Goskomstat Yearbook of Russian Regions*.
Other	***SME per thousand inhabitants in 1995***	Small enterprises per thousand inhabitants. *Source Goskomstat Yearbook of Russian Regions*.
	Ethnic Republic	Dummy with a value of one if the region is an ethnic republic. *Source Goskomstat Yearbook of Russian Regions*.
	Distance from Moscow	Logarithm of the distance from Moscow in km. *Source Goskomstat Yearbook of Russian Regions*.
	Dominance	Herfindahl-Hirschman Index (HHI) measuring the size of firms, by employment, in the various regions. It is defined as the sum of the squares of the employment of each individual firm. As such, it can range from 0 to 1 moving from a very large amount of very small firms to a single employer. *Source CEFIR*.

Appendix C: Russia – Institutional Indicators

	Transparency of Regional Executive (Mediasoyuz survey)	*Transparency of Regional Duma (Mediasoyuz survey)*	*Transparency of Courts of General Jurisdiction (Mediasoyuz survey)*	*Transparency of Arbitration Courts (Mediasoyuz survey)*	*Business Corruption (TI-Russia and INDEM)*	*Index of Regulatory Capture (Slinko et al, 2005)*
Adygeya republic	0.91	0.28	0.71	0.38		0.00
Altai krai	3.53	2.88	2.39	1.27	0.03	-0.03
Altai republic	2.78	1.54	1.21	0.13		0.05
Amur oblast	2.29	1.01	1.29	1.11	0.01	0.04
Arkhangelsk oblast	3.27	1.99	1.03	1.01	0.01	-0.31
Astrakhan oblast	5.47	2.62	2.35	1.64		-0.10
Bashkortostan republic	2.96	0.25	0.15	0.03	0.02	0.00
Belgorod oblast	4.47	2.81	1.15	1.94	0.02	-0.09
Bryansk oblast	2.07	1.67	1.44	1.19		0.09
Buryat republic	1.86	2.15	2.52	1.16		
Chechnya republic	2.77					
Chelyabinsk oblast	5.56	4.92	3.49	3.34	0.04	0.42
Chita oblast	4.17	3.97	1.17	0.19		-0.03
Chukotka autonomous okrug	7.02	3.33	1.41	0.61		
Chuvash republic	5.58	0.11	2.14	2.67		-0.20
Dagestan republic	0.23	0.47	0.56	0.67		0.01
Evrei autonomous oblast	4.12	3.94	3.52	2.89		-0.07
Ingush republic	2.51	1.39	1.52	1.64		
Irkutsk oblast	3.88	2.74	1.55	1.77		-0.31
Ivanovo oblast	1.90	0.05	1.48	1.74		-0.13
Kabardino-Balkar republic	2.96	1.61	1.23	1.47		0.14
Kaliningrad oblast	4.17	3.60	1.19	2.91		-0.01
Kalmyk republic	1.01	1.06	0.17	0.98		
Kaluga oblast	1.57	1.23	1.45	1.37		-0.14
Kamchatka oblast	3.12	1.94	1.55	1.58		-0.24
Karachaevo-Cherkess republic	2.18	0.74	0.12	0.22		-0.17
Karelia republic	2.74	1.83	1.34	0.83	0.02	-0.03
Kemerovo oblast	5.38	1.49	0.54	1.19	0.27	0.00
Khabarovsk krai	4.83	3.55	2.24	2.34	0.10	-0.10
Khakasia republic	3.51	2.93	2.66	0.35		0.02
Kirov oblast	0.92	1.09	0.71	0.18		0.08
Komi republic	2.95	0.45	0.67	0.46		0.40
Kostroma oblast	4.09	3.70	2.85	0.34		0.00
Krasnodar krai	3.78	1.80	1.36	1.66	0.03	0.05
Krasnoyarsk krai	2.53	4.07	3.06	0.16	0.01	0.02
Kurgan oblast	1.14	1.89	1.57	1.76	0.05	0.19
Kursk oblast	3.46	2.76	2.48	2.91		0.16
Leningrad oblast	1.25	0.22	0.51	0.44	0.10	
Lipetsk oblast	5.02	4.56	0.48	0.38		0.00
Magadan oblast	2.07	1.72	1.34	1.48		0.19
Mari-El republic	4.76	0.42	1.98	1.55		0.02
Mordovia republic	3.63	2.96	1.95	1.51		0.04
Moscow city	8.75	7.11	6.94	5.90	0.34	0.07
Moscow oblast	0.03	0.03	0.09	1.57	0.26	0.04
Murmansk oblast	2.58	2.42	1.11	1.87		0.19
Nizhny Novgorod oblast	4.68	3.23	1.48	0.61	0.34	-0.01
North Osetiya republic	0.40	0.64	1.87	1.15		
Novgorod oblast	0.52	1.03	0.18	0.84		-0.07
Novosibirsk oblast	6.18	3.44	1.38	1.12	0.06	-0.15
Omsk oblast	1.57	1.91	0.27	1.11	0.00	0.14
Orenburg oblast	2.97	1.09	1.81	0.04		0.18
Oryol oblast	0.93	1.12	1.13	1.16		-0.15
Penza oblast	5.96	3.26	1.59	0.43		0.04
Perm oblast	3.70	3.37	1.62	1.78	0.01	0.00
Primorskii krai	3.39	2.06	1.73	1.03	0.01	-0.07
Pskov oblast	3.79	3.35	3.11	0.89	0.00	-0.07
Rostov oblast	3.51	2.94	1.67	1.45	0.01	0.01
Ryazan oblast	2.02	0.09	0.55	0.82	0.16	-0.17
Sakha (Yakutia) republic	2.65	1.97	1.19	1.78		0.06
Sakhalin oblast	5.54	4.38	2.44	1.39		-0.12
Samara oblast	6.38	4.50	2.59	1.89	0.03	-0.05
Saratov oblast	6.28	5.11	1.39	1.14	0.20	-0.02
Smolensk oblast	3.66	2.45	1.23	0.96		-0.10
St. Petersburg city	7.98	6.46	5.70	5.18	0.15	-0.20
Stavropol krai	3.74	2.69	0.86	1.08	0.06	0.06
Sverdlovsk oblast	5.94	3.97	1.24	1.69	0.05	-0.01
Tambov oblast	5.78	4.92	2.07	2.00	0.03	-0.14
Tatarstan republic	7.30	6.10	2.38	0.03	0.02	0.21
Tomsk oblast	5.21	4.66	3.65	1.97	0.10	0.14
Tula oblast	3.45	2.70	1.93	1.32	0.23	0.04
Tuva republic	0.77	1.19	1.30	2.53		
Tver oblast	5.09	4.19	1.58	1.30	0.01	0.00
Tyumen oblast	7.95	5.33	3.61	2.53	0.01	0.07
Udmurtia Republic	4.84	1.92	2.05	0.47	0.14	0.26
Ulyanovsk oblast	5.67	4.74	3.98	1.05	0.20	-0.13
Vladimir oblast	3.26	2.58	1.72	1.89		0.12
Volgograd oblast	5.03	4.10	4.14	3.41	0.08	0.02
Vologda oblast	3.05	2.05	1.12	1.31		0.13
Voronezh oblast	4.70	3.64	2.33	2.79	0.08	-0.09
Yaroslavl oblast	4.38	0.80	1.03	0.33	0.02	-0.11
o/w Yamalo-Nenets autonomous okrug	4.49	3.35	1.75	0.51		