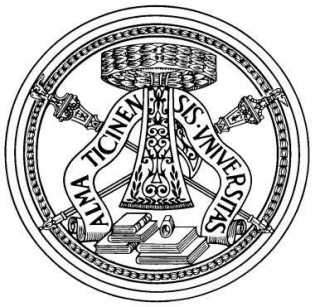

UNIVERSITY OF PAVIA

Department of Economics and Management

Master Degree

MIBE – Master in International Business and Economics

INSTITUTIONS AND FUELS TRADE: A QUANTITATIVE ANALYSIS

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Giordano Caputo

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To Chicco,

For his example in life

INDEX

I. ABSTRACT

The thesis investigates whether there is a link between governance quality and fuels dependence, from the side of both exporting and importing countries. The underpinning argument consists in the fact that a more archaic institutional environment fosters trade in polluting energy sources while hindering renewables sector development.

Institutional quality is measured employing the most widespread benchmark in literature, the *World Governance Indicators*: a subjective and composite index that measures governance along six dimensions. In order to interpret correctly thesis' findings, it is important to highlight that, since the World Bank index has a subjective nature, results are referred to the perceived institutional framework, which it is likely not to fully mirror the actual one.

The quantitative analysis exploits the panel feature of data, using the fixed-effects model with time dummy variables. Its main advantage is that not only it eliminates the effect of unobserved country characteristics but also the time related influence, resulting in more precise coefficients. Moreover, a series of control variables is inserted in order to capture main international trade determinants. The analysis is conducted on a twofold basis, keeping separate the exporting side from the importing, and draws different conclusions.

The point the thesis wants to demonstrate is that improving national institutions constitutes an effective policy towards the reduction, on one hand, of the economic dependence from fuels for exporting countries and, on the other, of the energetic dependence for importing countries.

Il presente lavoro investiga il legame tra qualità istituzionale e dipendenza da beni combustibili, dal punto di vista sia dei paesi esportatori che importatori. L'argomento che sottende l'intera tesi consta nel fatto che un ambiente istituzionale arcaico alimenta il commercio in prodotti energetici inquinanti mentre ostacola lo sviluppo del settore delle fonti rinnovabili.

La qualità istituzionale è misurata attraverso il riferimento più diffuso in letteratura, gli *World Governance Indicators*: si tratta di un indice composito a carattere soggettivo che misura la governance lungo sei dimensioni. Al fine di intrepretare correttamente le conclusioni del presente lavoro, è importante non perdere di vista il fatto che, avendo l'indice della Banca Mondiale una natura soggettiva, i risultati si riferiscono unicamente alla percezione del quadro istituzionale, il quale non rispecchia perfettamente il concreto assetto istituzionale.

L'indagine quantitativa trae vantaggio dalla struttura panel dei dati, facedo impiego del modello a effetti fissi con variabili dicotomiche temporali. Infatti, tale tecnica regressiva elimina gli effetti non solo delle caratteristiche nazionali non osservate ma anche degli eventi annuali, risultando in coefficienti più precisi. Inoltre, una serie di variabli di controllo viene inserita al fine di tenere in considerazione le determinanti classiche del commercio internazionale. L'analisi è condotta su due livelli separati ma paralleli, distinguendo tra importazioni ed esportazioni e giungendo così a conclusioni distinte.

L'argomento che il presente lavoro intende dimostrare è che il miglioramento dell'assetto istituzionale costituisce una politica effettiva per la riduzione, da un lato, della dipendenza economica da fonti non rinnovabili per i paesi esportatori e, dall'altro, di quella energetica per paesi importatori.

1. INTRODUCTION

In social sciences, in particular in economics, the adoption of the term *institution* becomes widespread with the turn of the century, as a reflection of its growing importance in the academic domain. Nevertheless, even today a unanimous definition of the concept has not arisen. The most prominent scholar on the subject is Geoffrey Hodgson, Research Professor at the University of Hertfordshire and author of a number of books and studies about the role of institutions in modern economic theory. In one of his most known works, *How economics forgot history*, he states that "Essentially, institutions are durable systems of established and embedded social rules and conventions that structure social interactions" (Hodgson 2001). In other words, they may be referred to as the rules of the game to which every individual is subject in a defined environment. Their role is not only to constraint people's behaviour by stating what the society allows and forbids, but also to enable the formation of expectations on future course of events. Examples of institutions may be language, table manners, law and all the kind of conventions people unconsciously agree upon within a culture. Institutions are not a static concept, but a rather dynamic one so that new conventions are established every day.

As structures of social order, institutions are central in the social sciences, like political science, sociology and economics. Nevertheless, this study does not consider institutions as a whole but focuses on those which have a direct impact on economic activity. In particular, three macro areas are taken into consideration: first of all the country stability and the respect of civil rights, secondly the government ability to implement sound policies and the efficiency of the overall public administration and finally the rule of law and the pervasiveness of corruption.

2. LITERATURE REVIEW

The academic world acknowledges Governance as having a direct influence on a country's economic performance. Good institutions are often associated with high income, consistent growth and significant FDI inflows.

One of the first empirical evidences on the importance of the institutional environment is the work of La Porta, Lopez-de-Silane, Shleifer and Vishny (1997), where the authors focus on capital markets. Through the comparison of 49 countries, the study points out that nations with poorer investor protection also have smaller capital markets. This leads to a more concentrated ownership, which in turns makes it more difficult for entrepreneurs to raise money. The main conclusion is that bad institutions constraints a nation's economic development.

The idea that quality of institutions is the most important proxy for national wealth is supported by Rodrik, Subramanian and Trebbi (2004), who estimate the relevance of income determinants around the world.

Kaufmann and Kraay (2002)nexplore more in detail the relationship between GDP and institutions. Generally speaking, GDP and the quality of governance are positively correlated, while the authors' main contribution is to provide evidence on the negative causal effect running from income to Governance. It implies that improvements in institutions are unlikely to occur only as a consequence of economic development. "As countries become richer, it is important not to exaggerate the conventional wisdom that higher incomes lead to demands for better institutional quality" Kaufmann and Kraay (2002). From this point of view, this study aims to corroborate Kaufmann and Kraay's hypothesis showing how low institutional quality may hinder energetic independence (measured as fossil fuels imports over GDP) for industrialized countries.

In addition, Governance has a macroeconomic impact on trade. Canonical theory explains bilateral trade through a mix of country characteristics such as factors endowment, production technology and consumers preferences. A relatively recent branch of academic research, however, indicates that understanding the actual trade level requires the consideration of national institutions as well.

One of the easiest way to assess institutional influence is to confront the volume of trade in differentiated goods, that is to say goods apt to assume several physical characteristics, with the volume of trade in commodities. The first to point out that institutional quality should foster international trade in complex goods was Douglass North in his book *Institutions, Institutional Change and Economic Performance* (1990). Ranjan and Lee (2007) test this reasoning for a particular aspect of institutions: enforcement of contracts. They derive estimating equations from a model where the degree of contract enforcement directly affects transaction costs, concluding that the degree of institutional quality positively affects the volume of trade in both types of goods, with increasing magnitude for differentiated goods.

From a dynamic perspective, Schuler (2003) analyses the change in trade composition following an institutional worsening on a short-term basis. He focuses on the former soviet countries, highlighting that, after the USSR dissolution, exports in institutional intensive sectors fell relatively more.

Far more comprehensive is Levchenko (2004)'s investigation, which models institutional differences using the Grossman-Hart-Moore framework of contract incompleteness. Better quality for developed countries means higher productivity in the institutionally dependent sectors, leading to full specialization in those goods. Emerging economies follow an opposite path resulting in the specialization in less desirable goods (i.e. goods that require the lessening of environmental or labour standards). Albeit in the short term some countries may not gain form trade, a further analysis with endogenous institutions shows that trade opening results in a race to the top with emerging countries

gaining shares of more desirable sectors. This work confirms Levchenko (2004) main results, as countries with lower Governance indicators are often specialized in the fossil fuels sector.

Anderson and Marcouiller (1999) model specification is by far the closest to the present study. They start their analysis from a simple question: why there is so little international trade compared to theoretical calculations. Their main finding is that bad institutions dramatically reduce international trade, specifically when it is not supported by the security of exchange (which is expression of a legal system capable of enforcing commercial contracts and a transparent and impartial formulation and implementation of government economic policy). The reduction is estimated using a structural model of import demand in which insecurity acts as a hidden tax on trade: inadequate institutions constrain trade as much as tariffs do.

Good governance is conventionally regarded as a necessary requirement to foster not only international trade but also investments, either domestic or foreign.[1] Inferior Governance features are connected to low investments through two channels: bad institutions act as a hidden tax on the cost of doing business and increase uncertainty regarding future returns.

Up until the first half of the ‘90s the literature on FDI location does not give much importance to institutional quality. A well know paper from that period is Wheeler and Moody. They focus on U.S. multinationals investments in manufacturing facilities abroad during the previous decade and find that agglomeration economies are what matters more. Nevertheless, the study lacks of specification, since institutional quality is bundled in an overall measure of country risk.

[1] The literature on FDI goes further in detail, explaining the effects of institutions on investments composition. To deepen the argument see Aizmann and Spiegel (2002), Albuquerque (2003), Hausmann and Fernández-Arias (2000) and Mody et al. (2003).

Mauro (1995) represents the first systematic empirical study on the role of the institutional setting. According to following papers, he shows that corruption has a negative impact on the ratio of total and private investment to gross domestic product. Wei (1997) corroborates this analysis by examining the effects of the uncertainty produced by corruption. He explicitly compares uncertainty to taxes, showing that moderate increase in corruption leads to an exceptional increase of tax rate on foreign firms.

Wei (2000) adds further recognition to the argument, recalculating the tax increase to a more conventional range. Wei's works are very close to this study, nevertheless in both he uses data only for OECD countries, while the aim of this work is to extend the analysis not only to developed economies but also to LDCs.

By testing a broader set of institutional variables (allowing for an assessment of what dimensions of the quality of governance affect foreign investors' location decisions more) Daude and Stein (2007) provide a fundamental contribution: they find that unpredictable policies, excessive regulatory burden, and lack of commitment on the part of the government seem to play a major role in deterring FDI. Even if their main reference for measuring governance quality are the World Bank's World Governance Indicators, these conclusions are robust to the use of a variety of institutional variables, using different methodologies. A supporting paper on the evidence that good governance is multidimensional is Zhuang, de Dios, and Lagman-Martin (2010). They isolate the aspects that are most important for economic performance, which are close in nature to those enlightened by Daude and Stein (2007).

However, the branch of literature closest to this work studies the consequences of natural resources endowment on economic development. Historically resource abundance has been considered as an advantage, yet, during the 1980s, a modification in the academic thinking occurred, due to a number of researches showing the opposite conclusions. They suggested that natural resources might be a curse rather than a blessing, leading to the popularization of the expression *resource curse.*

It is shown that resource dependent countries have, on average, lower long-run growth rates than those with a more diversified export structure. This happens for a number of reasons, the most important of which goes under the name of *Dutch disease*[2]. It consist in a declining competitiveness of exports caused by the appreciation of the domestic currency, which is ultimately due to natural resources outflow. Corden and Neary (1982) first model the phenomenon, showing how in a small country open to trade a sector expansion (namely the gas related) crowds out the others (manufacturing related).

Other causes of economic recession are the volatility of revenues from resources exports related to commodities price downturn and the presence of extensive corruption or the mismanagement by government.

In particular, on the latter point a most important paper is Sachs and Warner (1995)[3]. They proved empirically that economies relying heavily on natural resources exports in 1971 experienced a low growth rate in the subsequent 18 years. The interesting fact, however, is that after controlling for institutional quality variables, such as government efficiency, the relationship between GDP and natural resource exports holds unchanged. In other words, institutional quality should be irrelevant when exploiting natural resources.

Mehlum, Moene and Torvik (2006), whose conclusions undermine the claims of Sachs and Warner, represent a turning point in the literature. Countries rich in natural resources may follow two opposite path in economic development, with the resource curse

[2] Named after the recession the Netherlands suffered in the 1960s, which is deemed to start by the discovery of a natural gas field in Groningen and the heavy gas exports that followed.

[3] For a wider insight see van Wijnbergen (1984), Krugman (1987), Lane and Tornell (1996), Tornell and Lane (1999) and Torvik (2002).

phenomenon manifesting only in the first case[4]. They argue that the main reason for diverging experiences is differences in the institutional arrangement: natural resources put the institutions to a test, so that the resource curse only appears in countries where rents are distributed in a distorted way. The distinction is made between grabber friendly and producer friendly institutions, with preference for the latter.

A paper closer to this analysis is Arezki, Hamilton, and Kazimov (2011), whose authors analyse a panel of 129 commodities exporting countries. They show how resources windfalls endanger macroeconomic stability and GDP growth, although the negative effects are moderated by institutions' quality.

The growing evidence on corruption in the management of environmental resources has led to a widening branch studying the implications for the environment. Ranjan and Bakshi (2006) shows how corruption can give rise to a comparative advantage in environment-intensive industries through a sub-optimal price of environmental resources, leading to an over-exploitation of environmental resources[5]. In this case, the gains from international trade improve citizen's welfare only when corruption is endogenously determined. This study supports Ranjan and Bakshi (2006) argument, demonstrating that corruption is positively correlated with trade in the fuels sector. However, it is out of the work's purpose to estimate trade gains and the allocation thereof.

Ahmadov, Mammadov and Aslanli (2013) provide a framework to assess how quality of institutions and natural resource dependence interact. On one hand, natural resources rents damage institutions by removing incentives to reform and, on the other, weak institutional quality causes mismanagement of revenues. Zhuang, de Dios, and

[4] Some examples of growth attributed to natural resources are Norway, Canada, Australia, Botswana, examined in Acemoglu, Johnson and Robinson (2002), and USA, examined in David and Wright (1997).

[5] A whole branch of literature focuses on the influence of corruption over trade and environment. Among the others Fredriksson (1999), Eliste and Fredriksson (2000) and Schulze and Ursprung (2001).

Lagman-Martin (2010) get to the opposite but symmetrical deduction, recognising a two-way causal link: while good governance drives economic growth, it is also the product of growth itself since rising income and education level creates an ad-hoc demand. The aim of this work is to expose the negative relationship of fuels dependence not only from the exporter side but also from the importing country point of view.

Natural resources are not all alike. In fact, it is "Important to distinguish between point-based and diffuse natural resources. The former are typically associated with capital-intensive extraction and concentrated ownership while the rents associated with the latter are more widely dispersed. The idea is that point-based resources are more prone to rapacious rent seeking and the resource curse" (Arezki and van der Ploeg, 2007). The thesis focuses on the first type of resources and hence its analysis is closer to the works of Sala-i-Martin and Subramanian (2003), Lay and Mahmoud (2004), Isham, Woolcock, Pritchett, and Busby (2005) and De Rosa and Iootty (2012).

Sala-i-Martin and Subramanian (2003) investigate the case of Nigeria, one of the biggest producers of crude oil and among the top ten world exporters.[6] Through a number of indicators, it is shown that Nigerian economy worsened drastically since the discovery of reserves in 1960s, which is coupled with a situation of stunted institutional development. The empirical findings are validated by an econometric analysis that shows how fuels resources have a negative impact on GDP through a deterioration of institutional quality.

Lay and Mahmoud (2004) run a similar analysis, extending the sample to a global scale. As in this work, they take into consideration only countries with more than 1 million inhabitants and eliminate those characterized by data unavailability. Results confirm Sala-i-Martin and Subramanian (2003) hypothesis on the institutional quality as a transmission channel and proves further that fuels abundance can only have a negative impact.

[6] See the list of countries by oil exports from Wikipedia

Isham, Woolcock, Pritchett, and Busby (2005) derive institutional quality from the export structure for a cross-section of 90 developed countries. They find that the each of the institutional indicators used (similar in nature to those of the *Worldwide Governance Indicators* project) are negatively correlated with point-based natural resources, among which fuels stand.

De Rosa and Iootty (2012) is similar in content to the present study, although it presents a reverse approach that explains institutional quality on the basis of resource dependence (expressed in terms of fuels exports over total exports instead of GDP).

The thesis is organized as follows. Section 3 presents the data. Section 4 explains the methodology. Section 5 illustrates data content through descriptive analysis. Section 6 contains the main analysis. Section 7 checks the robustness of the results. Section 8 concludes.

3. DATA

3.1 Dependent Variable Data

The fuels exports and imports data are taken from the *World Trade Organization Statistics Database* section on merchandise trade. As stated it the WTO website, trade definition "covers all types of inward and outward movement of goods through a country or territory including movements through customs warehouses and free zones. Goods include all merchandise that either add to or reduce the stock of material resources of a country by entering (imports) or leaving (exports) the country's economic territory". In other words, data are grouped according to destination: exports data include locally produced as well as imported fuels, while imports data include the amount directly used in the national economic system as well as refined fuels to be re-exported.[7] Although the aim of the thesis is to test fuels dependence, where exports should be a proxy of resource abundance and imports of resource consumption by the economic activity, the magnitude of the discrepancy is judged not to invalidate the main indications of the analysis.

In the merchandise trade section products are defined in accordance to Revision 3 of the Standard International Trade Classification[8]. The fuels item contains data on coal, coke and briquettes, petroleum, petroleum products and related materials, gas (natural and manufactured) and electric current.[9] The presence of the electric current in the total amount

[7] The only persistent exception is Honk Kong, to examine in detail minor changes see http://stat.wto.org/StatisticalProgram/WSDBStatProgramTechNotes.aspx?Language=E

[8] The main items can be consulted in appendix A

[9] For a deeper understanding of fuels composition see http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=14&Lg=1&Co=3

does not interfere with the analysis since electricity exchanges happen only between neighbouring countries and represent only a small percentage of total trade.

Data are expressed in current United States Dollar. Exports are registered through free on board valuation, that is to say at the transaction value is included the cost of transportation and insurance to bring the merchandise to the frontier of the exporting country. Similarly, imports are registered through the cost insurance and freight valuation.

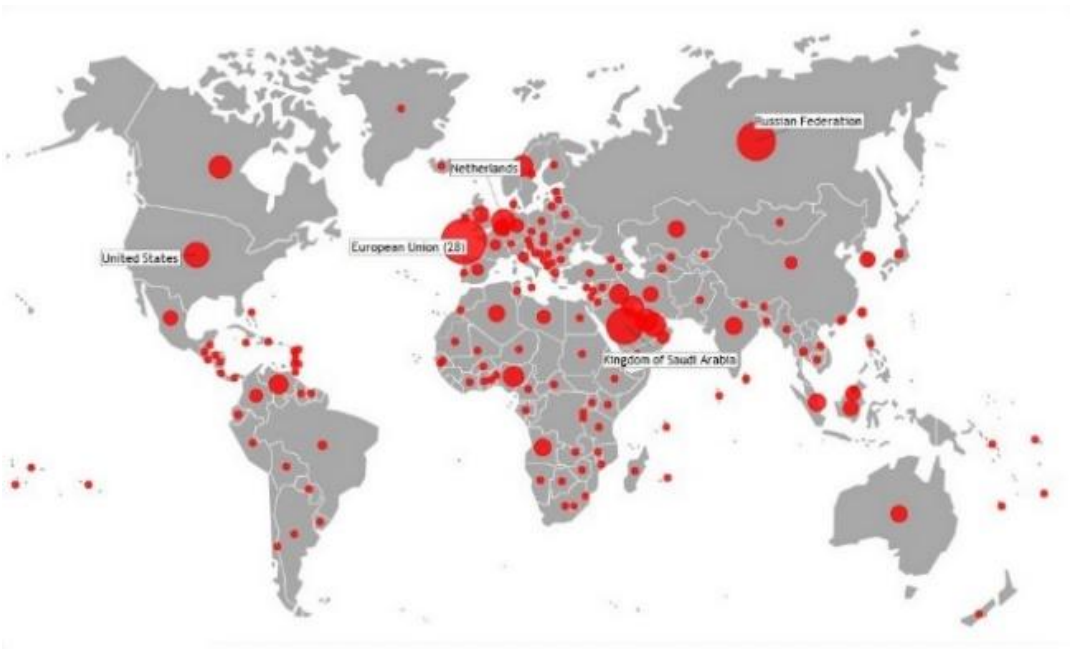
Figure 1 present absolute fuels trade flows for reporting countries at the beginning and at the end of the period. For each continent, the biggest trader is specified.

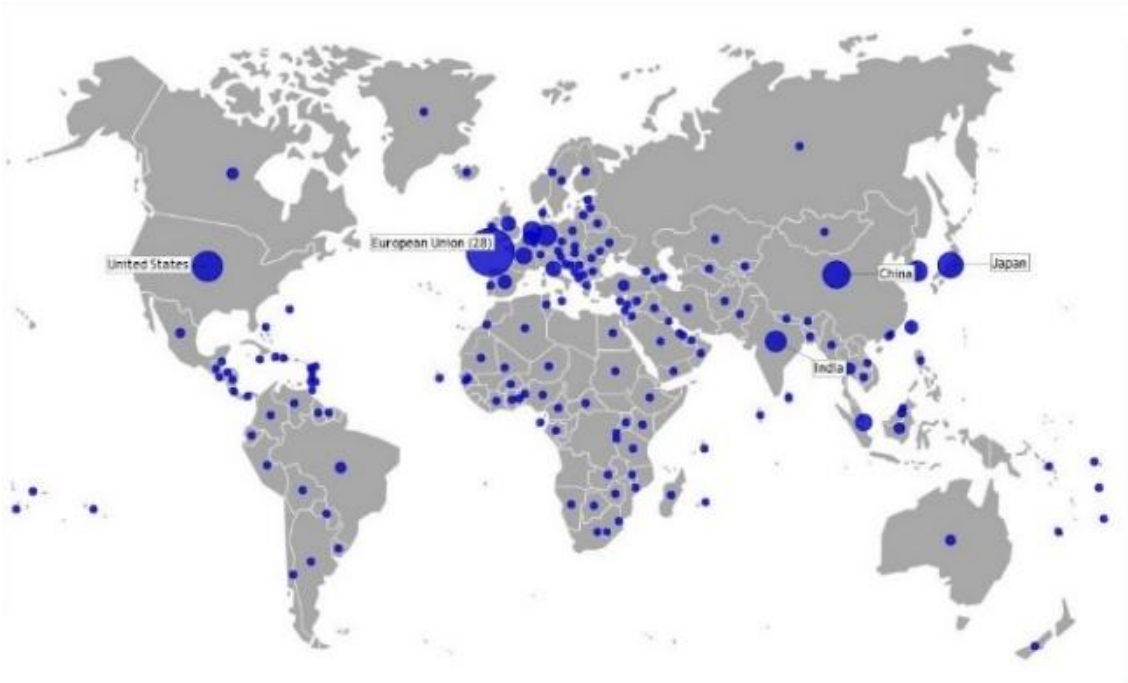
Figure 1 Fuels trade by reporting country

Absolute value of exports in 1996

Absolute value of exports in 2013

Absolute value of imports in 1996





Absolute value of imports in 2013

Source: World Trade Organization Statistics Database

Considering the absolute value of the trade flow would be misleading as, for instance, one could assume that exports from Norway have a comparable importance as those from the Great Britain. This is the reason why trade is weighted for the size of the economy, expressed as Gross Domestic Product.

GDP values are taken from the *World Bank World Development Indicators* project, which represent the most reliable source since it aggregates both *World Bank* and *OECD* national accounts data. In order to be comparable to trade flow, *GDP* is in current United States Dollar. It is calculated at purchaser's price, that is to say, as the World Bank website states, it is the "sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products". Furthermore, "It is calculated without making deductions for depreciation of fabricated

assets or for depletion and degradation of natural resources". The currency issue is handled through the conversion from domestic figures to USD by using single year official exchange rate. Whenever it does not reflect the rate effectively applied, an alternative conversion factor is used.

3.2 Institutional Quality Variables

In order to choose the best way to measure institutional quality and since it serves as the foundation of the analysis, it is essential to go deeper in the related literature. In general, researchers face the choice to use either subjective indicators or objective indicators. On one hand, objective indicators try to summarize real facts that are supported by documented evidence. Examples are the number of strikes or the number of political assassination in a country in particular period. On the other hand, subjective indicators represent individual perception of social conditions and are constructed through individual interviews with citizens or country experts. Examples of subjective indicators are freedom of expression and political stability.

Kaufmann and Kraay (2002) make further distinctions. The most important is between indicators measuring rules 'on the books' that is to say formal laws and indicators that measure the outcomes of these rules 'on the ground' that is to say their actual application. Moreover, indicators are categorized on the basis of the subject providing the governance assessment, which can be either country experts or survey respondents. The latter faced a growing use in academic research on the basis that responses from citizens directly involved in the institutions of a country give a much better indication of the institutional environment. This is even clearer when thinking that the questions are generally made to map the domestic situation, and are not designed specifically for the potential overseas investor. In the end, the merits of aggregate as opposed to individual indicators are presented with the rationale being that the former is a useful way of reducing

the noise related to measurement error. The thesis follows the general approach of using subjective aggregate indicators, in particular the *World Governance Indicators*.

Keeping in mind the features as well as the limits of the indices serving as proxy for institutional quality is essential to give a meaningful interpretation of the results. Williams and Siddique review a series of databases, from which most of the data used in this work are taken. Several subjective measures of governance are listed, in particular *Freedom House Index of Civil and Political Liberties International Country Risk Guide* (*ICRG*), *Business International*, *Transparency International*, *World Governance Indicators* (WGI) and *Economic Freedom Index*. The thesis tests the relationship between institutional quality and trade in fossil fuels by using the *World Governance Indicators*, which can be taken either as a whole or divided in its components. WGI are regarded as the most important aggregate indicators, rapidly surpassing *Transparency international*, since they not only measure corruption but cover a broader definition of governance. Regardless of the widespread adoption, they share the flaw typical of aggregate indicators, that is to say among the datasets adopted those collected early might influence the ones collected at a later date.

The *World Governance Indicators* are first developed by Kaufmann and Kraay in 1999. Along six dimensions of governance, they report the aggregate score for 215 countries over the period 1996-2013. The scale of measurement ranges from -2.5, marking the worst scenario, to 2.5, marking the best.

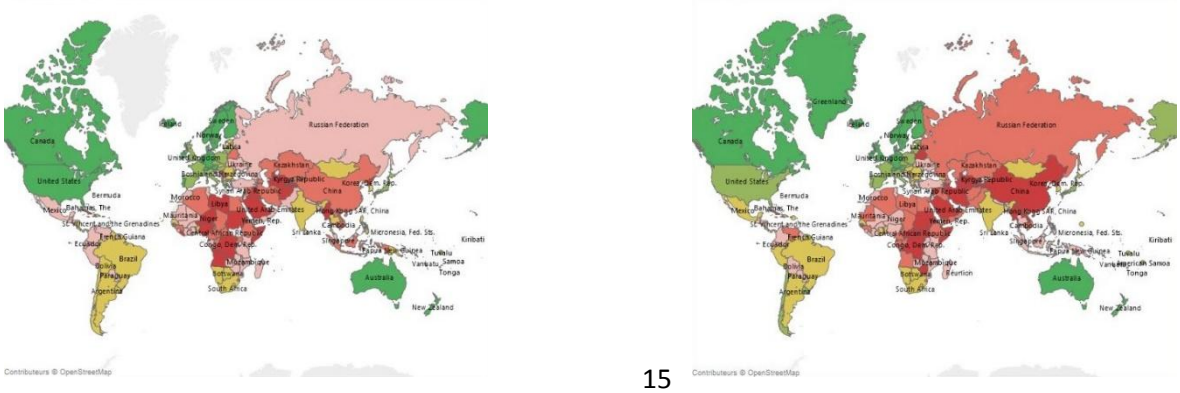
Each indicator aims at explaining a peculiar aspect of governance, so that it enjoys a certain degree of independency. A clear distinction of each one meaning is necessary to properly interpret thesis's conclusions[10]:

[10] To check the authors' definition of each indicator see appendix c

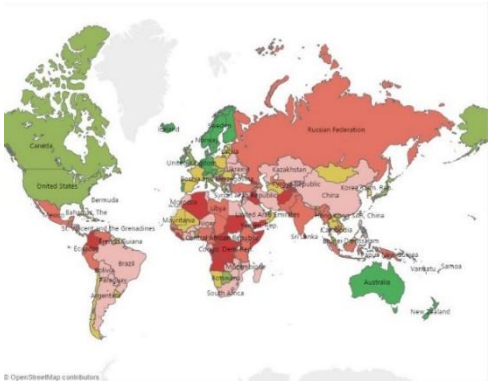
- *Voice and Accountability* captures the extent to which citizens are able to participate in the process of selecting their representative and the relative political freedom.
- *Political Stability and Absence of Violence/Terrorism* is an expression of the environment citizens are embedded in from the point of view of the safety and the absence of episodes of violence.
- *Government Effectiveness* is about the quality of the overall public administration from the side of both the government work and of the public services.
- *Regulatory Quality* resumes the quality of the legal framework the private sector is faced with.
- *Rule of Law* expresses the degree to which social and legal norms are actually applied, with special reference to those related to the business activity.
- *Control of Corruption* captures the extent to which corruption is present in the public sector.

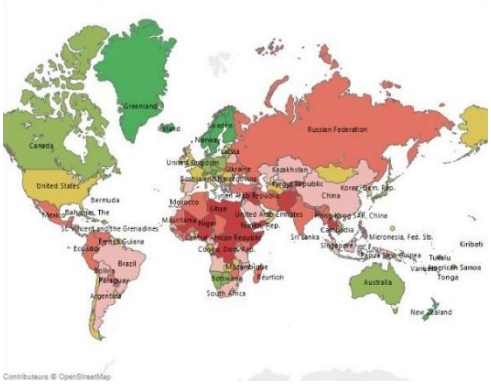
Table 2 presents the six indicators separately at the beginning of the reporting period in 1996 and at the end in 2013. Countries filled with green exhibit a high score, while those filled with red a low score.

Figure 2 World Governance Indicators by Country in 1996 and in 2013

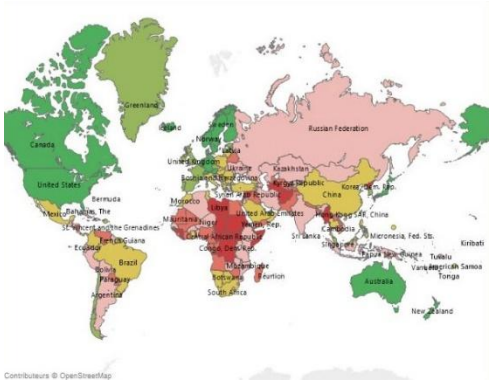


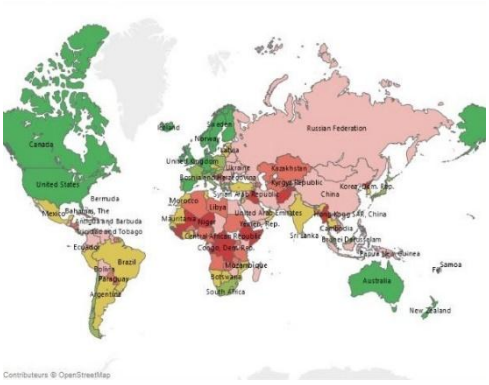
Voice and accountability



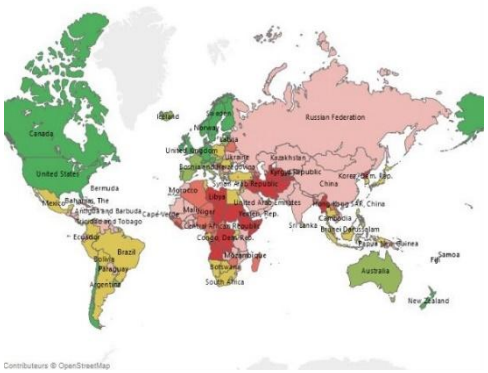


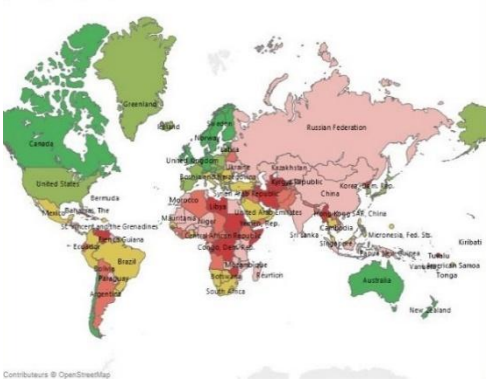
Political stability and absence of violence



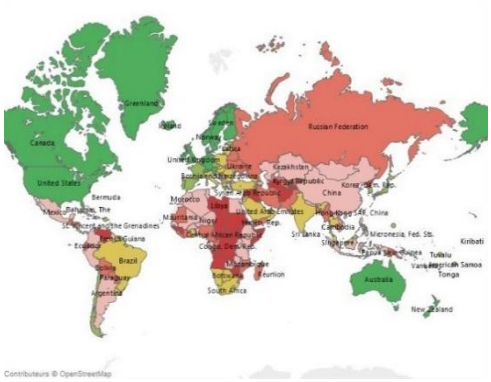


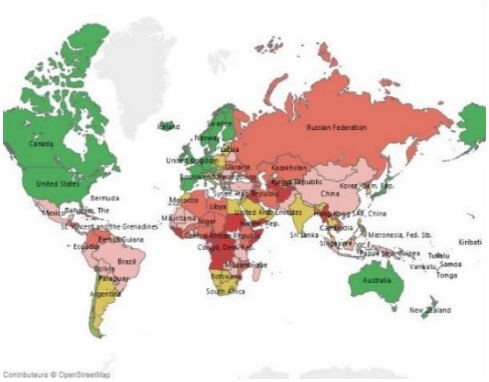
Government Effectiveness



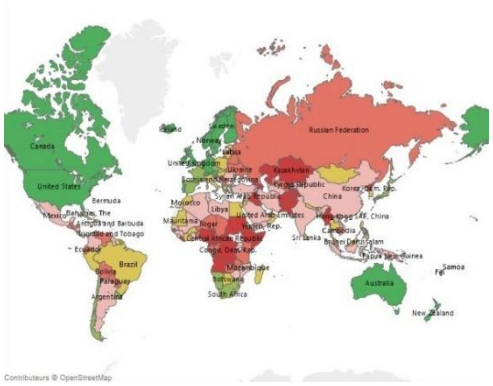


Regulatory quality





Rule of law



Control of corruption

Source: World Bank World Governance Indicators

The WGI is a composite index, that is to say it summarizes information from different primary sources, which can be either experts opinion, which involve academics and risk rating agencies among others, or survey respondents, such as enterprises and citizens surveys. Each of six aggregate are constructed by averaging together data from the

underlying sources that correspond to the concept of governance being measured. As stated on the WGI website, the report makes a distinction among four types of sources: surveys of households and firms, commercial business information providers, non-governmental organizations and public sector organizations[11].

3.3 Control Variables

The control variables include data on 4 different areas which cover countries population, fuels reserves, average price and customs duty.

The population size is taken from the *World Bank World Development Indicators* project, where the figures are "based on the de facto definition of population, which counts all residents regardless of legal status or citizenship, except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin."

Fuels reserves aim at identifying the level of resource abundance a nation can tap into. Reserves are of three types: crude oil, natural gas and coal.

Crude oil is a natural and thus unrefined petroleum product. More precisely it is defined by the United States *Energy Information Administration* as "a mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.

Depending upon the characteristics of the crude stream, it may also include:

- small amounts of hydrocarbons that exist in gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being

[11] For the complete list of WGI sources see appendix B

recovered from oil well (casinghead) gas in lease separators and are subsequently commingled with the crude stream without being separately measured. Lease condensate recovered as a liquid from natural gas wells in lease or field separation facilities and later mixed into the crude stream is also included;

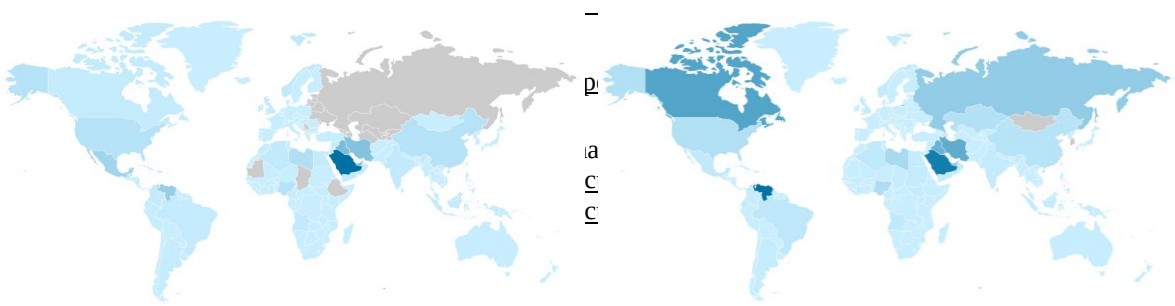
- small amounts of nonhydrocarbons produced with the oil, such as sulphur and various metals;
- drip gases, and liquid hydrocarbons produced from tar sands, oil sands, gilsonite, and oil shale.

Liquids produced at natural gas processing plants are excluded."[12]

Crude oil data are taken from the United States *Energy Information Administration*. Reserves are measured in billion barrels per year, where the standard barrel unit is defined as equivalent to 42 U.S. gallons. By common understanding, can be accounted as proved reserve only crude oil for which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from reservoirs under existing economic and operating conditions.

Figure 3 shows crude oil proved reserves: countries in light blue are resource-scarce, while those in dark blue are oil-abundant. Data for post-Soviet States in 1996 are missing in the map because not officially recognized by U.S. *EIA*[13].

Figure 3 Crude Oil Proved Reserves by Country in 1996 and in 2013

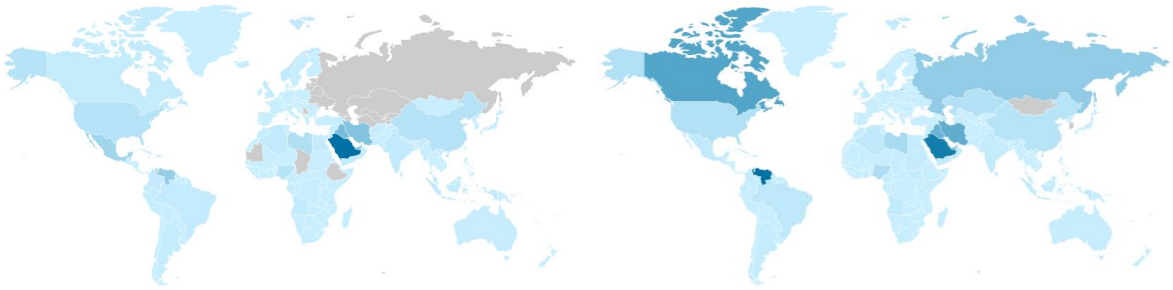


Source: United States Energy Information Administration

In the same way, data for natural gas reserves are taken from the U.S. *Energy Information Administration*. Natural gas is defined as "a gaseous mixture of hydrocarbon compounds, the primary one being methane."[14] Reserves are measured in trillion cubic feet, where a cubic foot represents "the amount of natural gas contained at standard temperature and pressure (60 degrees Fahrenheit and 14.73 pounds standard per square inch) in a cube whose edges are one foot long."[15] As for crude oil, natural gas reserves are accounted for only if they are proved quantities at the present date.

Figure 3 shows natural gas proved reserves: countries in light blue are resource-scarce, while those in dark blue are gas-abundant.

Figure 3 Natural Gas Proved Reserves by Country in 1996 and in 2013



Source: United States Energy Information Administration

Data on coal reserves, which are more difficult to find probably because they do not represent such a strategic resource as oil and gas, come from either *Europe's Energy Portal* or *British Petroleum Statistical Review of World Energy*. It is important to highlight

[14] http://www.eia.gov/tools/glossary/index.cfm?id=N

[15] http://www.eia.gov/tools/glossary/index.cfm?id=C

that they are not available for each year of the reporting period, but only for 2004, 2008, 2009, 2010, 2011 and 2013. Nevertheless, this is deemed not to interfere with analysis main results since coal reserves are concentrated in few nations and their consumption is just a small percentage of total. Indeed according to *British Petroleum* website, "total proved coal reserves in 2014 are sufficient to meet 110 years of global production, by far the largest R/P ratio for any fossil fuel"[16].

Figure 4 shows reserves-to-production ratio from 1993 to 2013 for North America, South and Central America, Europe and Eurasia, Middle East and Africa, Pacific Asia and the World.

Figure 4 reserves-to-production ratio in years

Source: *British Petroleum Statistical Review of World Energy 2014*

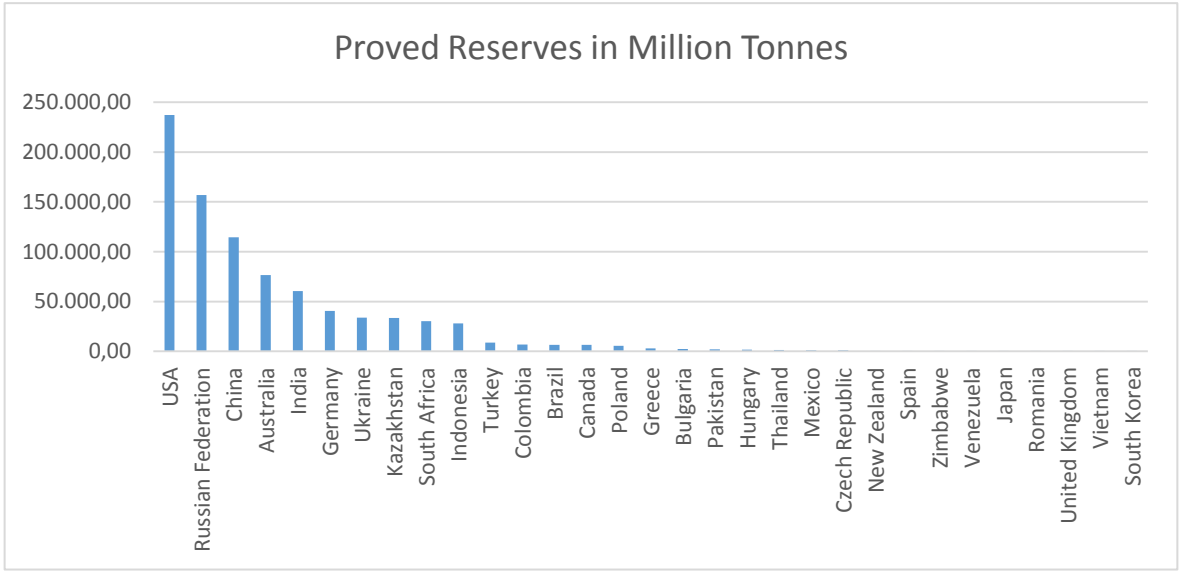
[16] http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/review-by-energy-type/coal/coal-reserves.html

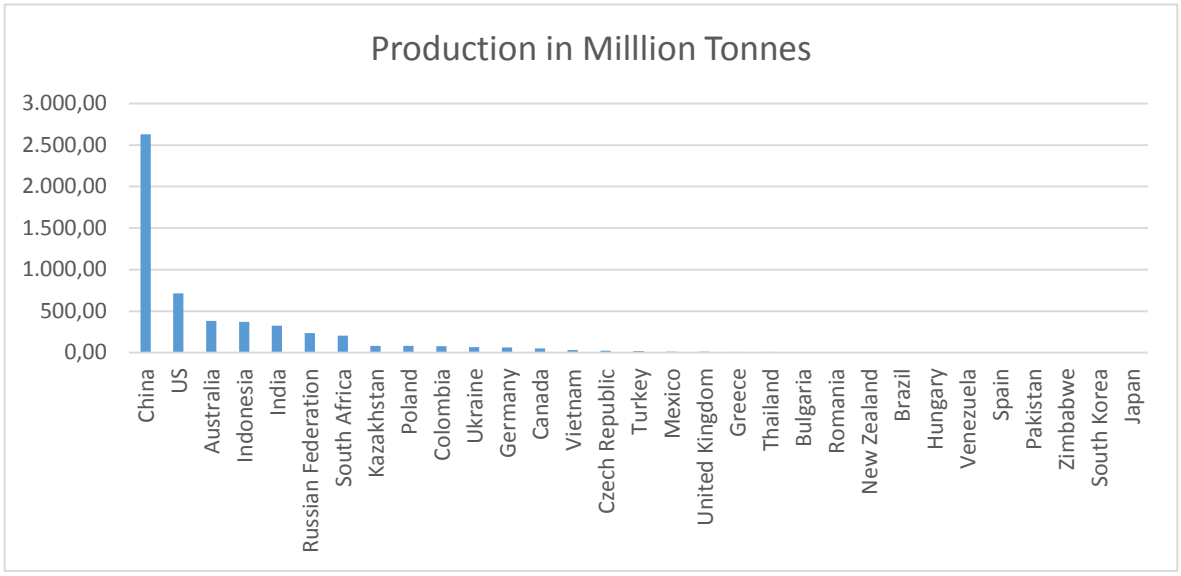
For both *Europe's Energy Portal* and *British Petroleum Statistical Review of World Energy* data, reserves are expressed in million tonnes and consist of anthracite, bituminous, sub-bituminous and lignite. On one hand, lignite and sub-bituminous are considered low rank of coals according to their physical and chemical properties, since they are characterised by high moisture levels and low carbon content and therefore a low energy content. On the other end, bituminous and anthracite fell into the category of high rank coals as they contain more carbon, have lower moisture content, and produce more energy.

As for crude oil and natural gas, coal reserves are accounted for only if they are proved quantities at the present date.

Figure 5 shows proved reserves and yearly production in million tonnes for 2013 where the scale size from top to bottom chart is 100 to 1.

Figure 5 Proved Reserves and Production in 2013





Source: *British Petroleum Statistical Review of World Energy 2014*

Fuels price variable aims at resuming non-renewable sources prices from the point of view of the buyer for different markets around the world. In fact, although non-renewables are commonly seen as a commodity, the price of a particular kind of fuels may differ greatly from the average, depending on the production site and the region where it is sold.

Data, which are taken from the *British Petroleum Statistical Review of World Energy*, consist of 3 components, respectively oil, natural gas and coal. Concerning oil, the study assumes as a reference the yearly Brent price, expressed as U.S. dollars per barrel, as

it is the most widely used marker[17], while it leaves out *Dubai* and *West Texas Intermediate* benchmarks.

The question is more complex for natural gas since it is the expression of both common natural gas and *Liquid Natural Gas LNG*. They are all defined in U.S. dollars per million *British Thermal Unit BTU*, which is the amount of energy needed to cool or heat one pound of water by one degree Fahrenheit and is equal to about 1055 joules[18]. On one hand, LNG accounts for Japanese and German markets and is expressed as CIF Cost, Insurance and Freight, that is to say it requires "the seller to arrange for the carriage of goods by sea to a port of destination, and provide the buyer with the documents necessary to obtain the goods from the carrier."[19] On the other hand, the hub benchmarks for natural gas are American's Henry Hub and British's National Balancing Point.

Finally, coals price consists of three benchmarks, which are the Northwest Europe marker, The U.S. Central Appalachian coal spot and the Asian marker. European and Asian markers are calculated as CIF prices, while the US Central Appalachian is FOB Free On Board (namely it requires "the seller to deliver goods on board a vessel designated by the buyer"[20]). All are quoted in US dollars per tonne.

Figure 6 shows prices for fuels categories. Oil is denominated in U.S. dollars per barrel, natural gas in U.S. dollars per million BTU and coal in U.S. dollars per tonne. Dollars are referred to constant 2013 currency value.

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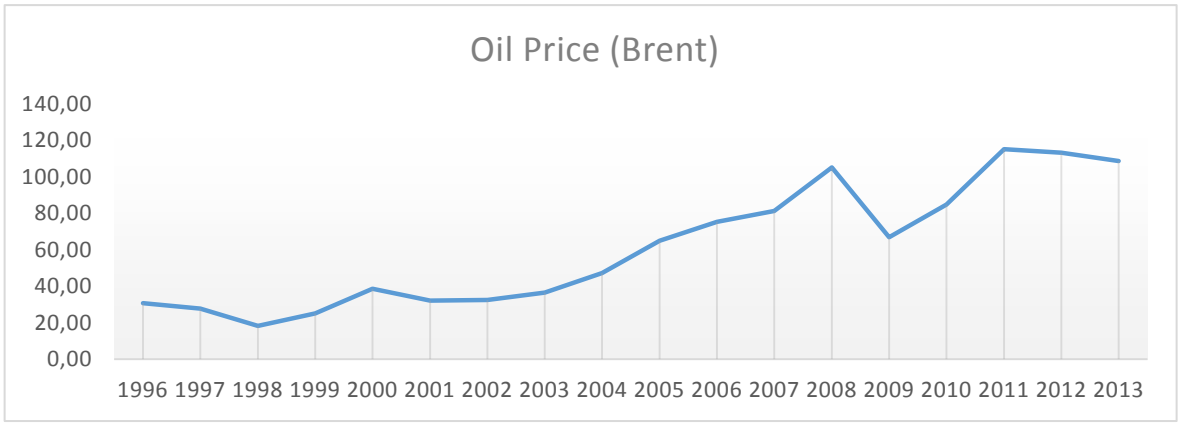
[17] http://www.investopedia.com/articles/investing/102314/understanding-benchmark-oils-brent-blend-wti-and-dubai.asp

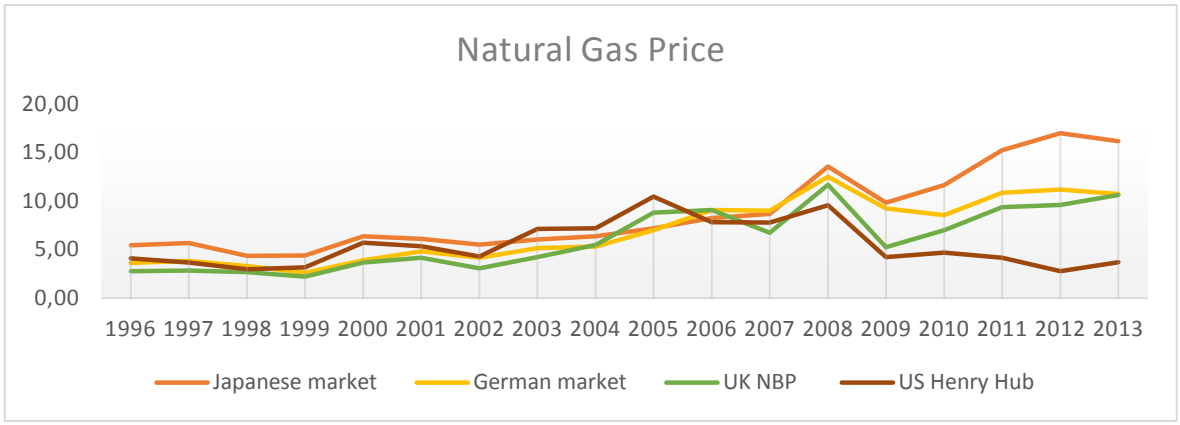
[18] http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/using-the-review/Conversionfactors.html

[19] http://www.investopedia.com/terms/c/cif.asp

[20] http://www.investopedia.com/terms/f/fob.asp

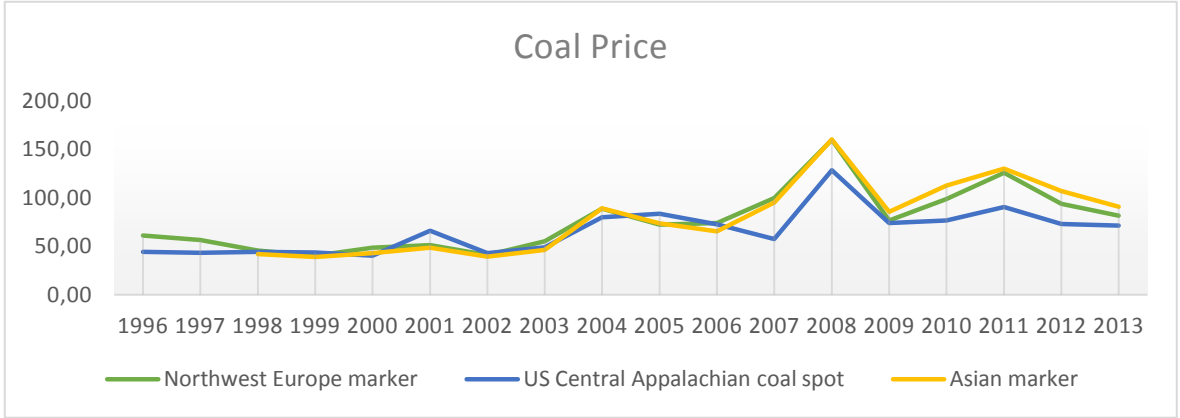
Figure 6 Fuels Prices





Source: British Petroleum Statistical Review of World Energy 2014

The tariff variable uses data on fuels imports custom duties from the *World Integrated Trade Solution WITS* database. They are AHS Weighted Average tariff rate, that is to say the lowest available tariff for that product (a preferential tariff if exists, otherwise



the Most Favoured Nation MFN one). The figure is calculated on *Harmonized Commodity Description and Coding Systems HS* chapter 27 merchandise (i.e. mineral fuels, oils and product of their distillation) and is defined as the average tariff rates of included HS 6-digit subheading products weighted by the country's own imports from the world in the same or nearest available year as tariff. The tariff rate for each HS 6-digit product is itself a simple average rate of included tariff lines[21]

[21] For a detail of the alternative tariff measures see http://wits.worldbank.org/wits/wits/witshelp/Content/Data_Retrieval/P/Intro/C2.Types_of_Tariffs.htm

4. METHODOLOGY

The thesis follows the approach of Anderson and Marcouiller (1999), who develop a model of import demand to test international trade dynamics in a context of uncertainty (with the exception that the study uses absolute and not relative values). Import demand is a function of the population, institutional quality, fuels reserves, average price and custom duties. An original contribution regarding the existing literature consist in investigating trade from the point of view of both the importer and the exporter countries. This is achieved by conducting a two-fold analysis that takes into consideration not only the import but also the export demand, which are modelled in a similar fashion.

Regarding the dependent variable, for both fuels exports and imports, it is not expressed in absolute terms but it is weighted for the Gross National Product, in order to account for differences due to the size of the economy. Indeed, the consumption of energetic goods is positively related to the economic activity level so that the fuels imports are on average greater for large economies. On the other hand, major fuels exporters are generally characterized by bigger GDPs because revenues from non-renewables account for a significant part of national wealth.

The import demand model is as follows:

$$IMP = \beta_0 + \beta_1 CR + \beta_2 GQ + \beta_3 ER + \beta_4 ln(1+POP) + \beta_5 ln(1+RES) + \beta_6 ln(1+PRI) + \beta_7 TARIM + \varepsilon \quad (1)$$

Where:

IMP is the fuels imports in percentage over GDP, *CR*, *GQ* and *ER* are the variables for institutional quality that groups together similar aspects[22], *POP* is the national population, *RES* is the amount of fuels proved reserves, *PRI* is the average price for one barrel of oil equivalent and *TARIM* is the tariff rate on fuels imports.

The export demand model is as follows:

$$EXP = \beta_0 + \beta_1 CR + \beta_2 GQ + \beta_3 ER + \beta_4 ln(1+POP) + \beta_5 ln(1+RES) + \beta_6 ln(1+PRI) + \beta_7 TAREX + \varepsilon \quad (2)$$

Where:

EXP is the fuels exports in percentage over GDP and *TAREX* is the global average tariff rate on fuels exports.

The study uses natural logarithms rather that levels of *Population*, *Reserves* and *Price* variables for two main reasons. First of all, the scatter plot of *Population* and *Reserves* presents a positive skew so that applying logarithmic transformations makes the distribution more normal. Secondly, since the dependent variable is expressed in percentage the relationship is better modelled with logarithms: due to their percentage interpretation, i.e. percentage change in X results in percentage change in Y, we are looking at elasticity.

The logarithmic specification is widely used in the empirical literature. Nevertheless, a problem that normally arises is how to deal with zero-value observations. Indeed, the dataset includes a number of null observations, specially referring to resource-scarce countries, which would be dropped by taking logarithms. The problem of zero values of the dependent variables is typical in gravity equations for trade, and it has been

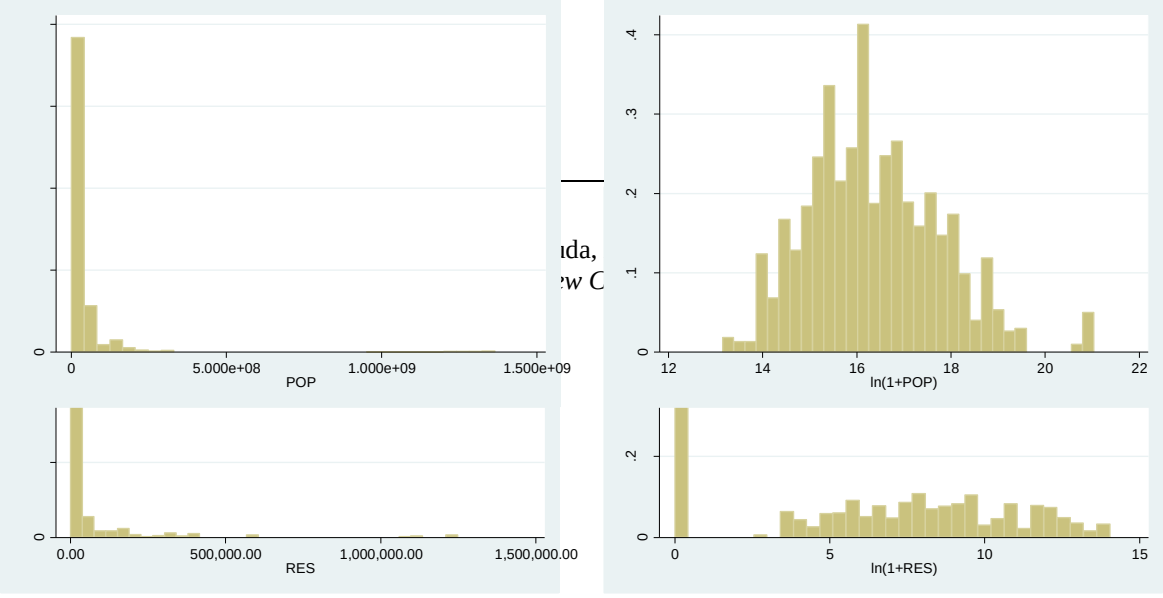
[22] See below how those variable are constructed

dealt with in different ways. The thesis uses an approach borrowed by Daude and Stein (2007) and first developed by Eichengreen and Irwin (1995), who studies the impact of government policies on international trade flows in the 1930s. Given that *ln(1+X)* approximates the outcome of *ln(X)*, they proposes a simple linear transformation from *X* to *ln(1+X)*, for which he information carried by null values is conserved.

Figure 1 shows the change in variables distribution subsequent to the transformation in natural logarithms. In the first two cases it works best, with the only anomaly being the elevate frequency of zero-values in the *Reserves* variable, which indicates resource-scarce countries. On the other hand, for the price variable it is more important the interpretation argument.

Figure 1 Frequency distributions of *Population*, *Reserves* and *Price* before and after the logarithmic transformation

The sample is constructed following Lay and Mahmoud (2004): to ensure that it is not dominated by too many small countries, only those with more than one million inhabitants in 2015 have been included. Data presented separately for autonomous regions that are not independent entities are summed back to the relative sovereign nation figure[23]. For Serbia and Montenegro figures are presented together under the wording Yugoslavia since until 2005 there is no separate measurement. This is done under the assumption that



institutional quality in those countries does not show a significant difference since they shared a common government for most of the recent history. Finally, countries for which poor or no data is available are excluded from the sample.[24] The final panel consist of 132 countries for which yearly observation are presented thought the period 1996-2013.[25]

Missing data are handled interpolating the available figures where lack of information is deemed to be not significant. In order to do so the *XonGrid* add-in is used: it consists of a free Excel library apt to perform different kinds of interpolations, namely the study applies the Kriging function with Method = 1.5.[26] Occasionally, when the result of the interpolation does not fit the nature of the data (e.g. whether the add-in yields a negative figure when the variable can assume only positive values), the closes available figure is used in place of the missing data.

When setting the data structure, the choice is among cross-section, time series or panel data. A cross-sectional data set consists of a sample of individual taken at a given point in time (minor timing differences are ignored), whereas time series consists of observations on a variable over time. Cross sections and time series allow only for simple regression analysis; on the contrary, panel data are a more powerful instrument. The thesis follows the approach of De Rosa and Iootty (2012), who exploit a panel data to examine natural resource dependence influence on institutional quality. A panel data set consists of a time series for each member of the sample. In particular, when the sample members are monitored for the same time period it is called balanced dataset. This brings several advantages compared to other data structures. First of all, it allows for the use of year

[24] Those are Afghanistan, Chad, Costa Rica, Croatia, East Timor, Eritrea, Guatemala, Guinea-Bissau, Honduras, Ivory Coast, Kosovo, Laos, Lesotho, Liberia, Morocco, North Korea, Palestine, Sierra Leone, Somalia, South Sudan and Uzbekistan.

[25] See appendix D for the complete list of countries in the sample

[26] For XonGrid specifications see http://xongrid.sourceforge.net/

dummy variable in order to analyse changes in key aspects over time. Then, it is possible to check for country fixed effects, that is to say non-observed time-invariant characteristics proper of a country that have an influence on the independent variables. In the same ways, also factors that do not have an impact on predictors can be controlled for, thanks to the use of fixed effects model.[27]

Institutional quality is measured according to the World Bank *World Governance Indicators*. For the period between 1996 and 2002 they were updated every two years, so that data for 1997, 1999 and 2001 are missing: the issue is solved by calculating simple averages.

The *WGIs* measure governance along six dimensions, which are *Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption*. The clustering of institutional quality into different aspects allows to study whether some aspects of governance matter more than others in fuels trade.

The way *World Bank* indicators are dealt with follows the approach of Daude and Stein (2007). Table 6, which presents simple correlations among the indicators, highlights that they are strongly related one with another, the median of the simple correlation being *0.51*.

[27] For a deeper understanding of panel data advantages and drawback see Wooldridge

Table 1 Simple Correlation of *World Governance Indicators*

	VA	***PS***	***GE***	***RQ***	***RL***	***CC***
Voice and Accountability (VA)	1.0000					
Political Stability and Absence of Violence/Terrorism (PS)	0.4834	1.0000				
Government Effectiveness (GE)	0.9317	0.5068	1.0000			
Regulatory Quality (RQ)	0.8714	0.3202	0.9011	1.0000		
Rule of Law (RL)	-0.3686	0.3309	-0.1647	-0.2237	1.0000	
Control of Corruption (CC)	0.8531	0.6135	0.8888	0.8363	-0.1669	1.0000

It is not difficult explaining why it is so, since there are various mechanism that link institutions one to another. For instance, in his study on the role of corruption for economic growth, Mauro (1995) states that "corruption may be expected to be more widespread in countries where red tape slows[28] down bureaucratic procedures. In fact, when individuals offer speed money[29] to officials, they contribute to establishing a custom, so that the granting of, say, a license will be artificially delayed until a bribe is received". Thus, if used as single variables, the indicators would yield multicollinearity issues and limit the extent of the analysis. The solution is borrowed from Daude and Stein (2007) and

[28]The idiom *red tape* refers to excessive bureaucratic regulation.

[29] *Speed money* is another term for bribe

consists in grouping together those that measure similar aspects. In this sense, *Voice and Accountability* and *Political Stability and Absence of Violence/Terrorism* are averaged together into *Civil Rights*, *Government Effectiveness* and *Regulatory Quality* into *Government Quality* and *Rule of Law* and *Control of Corruption* into *Economic Regulation*.[30] The final variables are hence the expression of respectively the civil rights and social climate the citizens are faced with, the quality of the government and of the overall public administration and finally the quality of norms regulating economic activity.

Besides institutional quality, the thesis accounts for the influence of four variables: *Population*, fuels *Reserves*, *Price* and *Tariff*.

The variable *Reserves* indicates the quantity of non-renewable resources a country can economically exploit.[31] It is denominated in million *Barrel of Oil Equivalent BOE*[32] so as to put emphasis on the key fact that mineral fuels are valued according to the energy they contain. Non renewables is a general term, which includes oil natural gas and coal. Both natural gas and coal data are denominated in different units, so, first of all, they are converted into BOE. Natural gas is expressed in Trillion Cubic Feet and is converted to Million BOE with factor equal to 172.45[33], while coal is expressed in Million Tonnes and is converted multiplying by 4.79[34]. Since coal data are available only for limited number of

[30] See http://info.worldbank.org/governance/wgi/index.aspx#faq-1 for the exact definition of the *World Governance Indicators*

[31] See the meaning of *proved reserves*

[32] A BOE is equivalent to the amount of energy found in a barrel of crude oil. There are 42 gallons in one barrel of oil, which will contain approximately 1,700 kilowatt hours kWh.

[33] 1 TCF = 172.45 MLN BOE

[34] 1 MLN Tonne = 4.79 MLN BOE

years, the study uses an average amount. In fact, the reserves thereof are deemed not to change significantly from year to year due to the low P/R ratio.[35]

Price is a country-invariant predictor that indicates, on one side, the average cost importers are supposed to pay for a unitary amount of energy generated by non-renewable sources and, on the other, the average revenue exporters are supposed to collect from the sale of a unitary amount of fossil energy. To this purpose the final value must collect the information on prices for all non-renewables source: the goal is achieved by weighting single prices for the relative share in fuels international trade.[36] Trade share for oil ranges from *55%* to *72%*, for natural gas from *8%* to *13%* and for coal from *18%* to *34%*. *Price* is expressed in constant U.S. Dollars with 2013 as the reference year (since natural gas and coal prices are expressed in the above-mentioned unit of measurement, they are first converted in BOE Dollars)[37].

The *Tariff* variable is a proxy of the custom barriers on fuels merchandise. It assumes different specifications according to the transaction point of view. In the import demand model it expresses the additional cost faced by individuals willing to get access to non-renewables resource. In this case, it is defined as the tariff rate actually applied on HS chapter 27 mineral fuels. On the contrary, in the export demand model it expresses the additional mark-up rate producers must on average account for when trading with foreign partners: here it is defined as the average tariff rate weighted by GDP.

The robustness of results from the main analysis is controlled in two ways. First by eliminating from the sample the countries characterized by extreme observations and then by dividing the sample in two sub-groups on the basis of the *Human Development Index*.

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[35] See previous chapter

[36] Data on fuels global trade are taken form the *British Petroleum Statistical Review of World Energy 2014*

[37] See units of measurement and conversion factors above

5. DESCRIPTIVE STATISTICS

A deeper analysis of the variables along their statistical properties is essential to understand the validity of the thesis results. In order to do so, the mean, mean standard error, median, standard deviation, variance, skewness and kurtosis are defined as shown in Table 2 and 4. Moreover, Table 3 presents the same statistics for the level specification of *lnPopulation*, *lnReserves* and *lnPrice*.

5.1 Descriptive Statistics for Import Demand Model

Regarding the import demand model, the average sample observation has a population of approximately 47 million individuals and imports an amount of non-renewable source equal to 5.00% of the GDP each year, to which applies a tariff equal to 5.35%. It counts on approximately 50 trillions of BOE on proved reserves, while it faces on the market an energy price of around 36.5 U.S. Dollars (at 2013 value) per BOE. It is characterized by a slightly negative institutional quality of *Civil Rights* and *Economic Regulation*, while it shows a slightly positive value for *Government Quality*. The sample mean is quiet close to the true population mean because its standard error is, in general, relatively small (so that mean values offer a good representation of the average population).[38] Nevertheless, it is important to point out that the

[38] The only exceptions are *Government Quality* and *Economic Regulation*, whose SE is respectively 55.22% and 34.60% of the mean. The figure amounts to 2.05% for *Imports*, 12.66% for *Civil Rights*, 0.18% for *lnPopulation*, 1.65% for *lnReserves*, 0.25% for *lnPrice* and 2.83% for *TariffIM*.

standard deviation assumes high values, meaning that single observations vary greatly among each other (i.e. data are widely spread around the mean).

Looking more in detail at data distribution, most of the variables exhibit positive skewness, which indicates that the distribution is not symmetrical but it is skewed to the left. The opposite is true for *lnPRICE*. Moreover, some of them exhibit kurtosis: *Imports* and *TariffIM* have values higher than 3 and hence are characterized by a sharp peak with heavy tails, while *lnRESERVES* and *lnPRICE* have values lower than 3, indicating flat tops. In conclusion, variables do not show normality, with the exception of *Civil Rights*. The point is made clearer by graphic analysis of frequency distributions as presented in Figure 1.

5.2 Descriptive Statistics for Export Demand Model

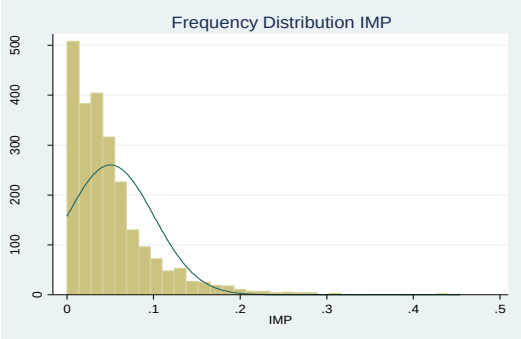
Regarding the export demand model, the average sample observation is naturally similar to that of import demand (since *Exports* and *TariffEX* are the only two variables that diverge). In particular, the difference is that the GDP is for the 8.62% composed of fuels exports, with regards to which the foreign tariff is around 1.59%. As above, the sample mean is quiet close to the true population mean (so that it offers a good representation)[39] and the standard deviation assumes high values, meaning that data are widely spread.

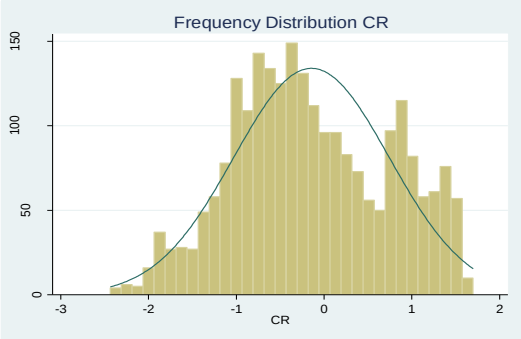
Looking more in detail at data distribution, both *Exports* and *TariffEX* exhibit positive skewness and so their distribution is skewed to the left. Moreover, *Exports* exhibits kurtosis as well and so has a sharp peak with heavy

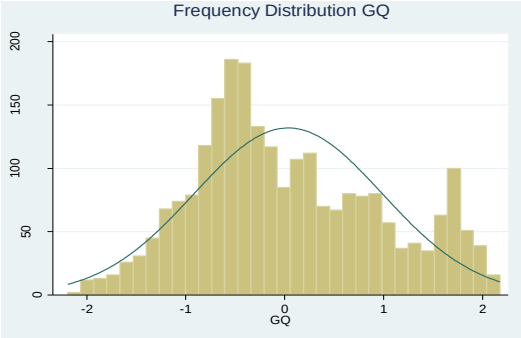
[39] For *Exports* and *TariffEX* the SE is respectively 3.63 % and 0.77 % of the mean.

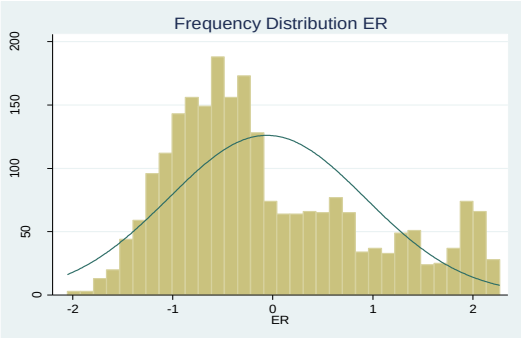
tails. In conclusion, neither variable shows normality. Figure 2, which presents the distribution frequency along with a reference line for normality, highlight the issue.

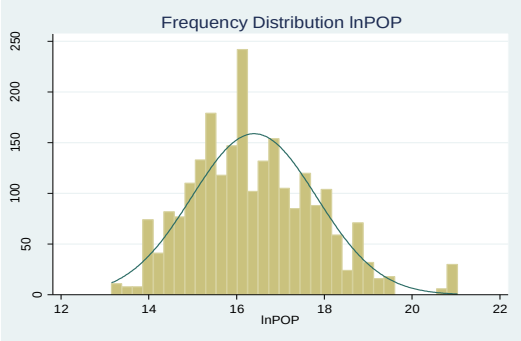
Figure 1 Frequency Distributions of Import Demand Variables

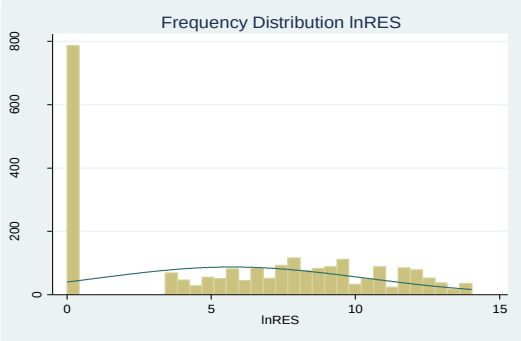


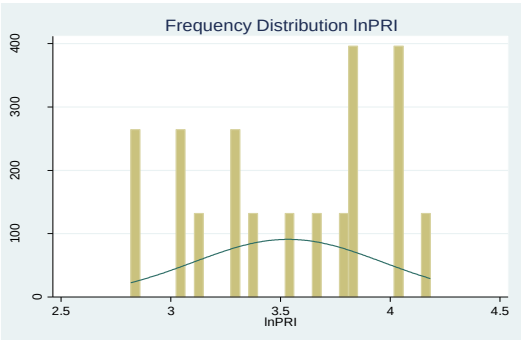












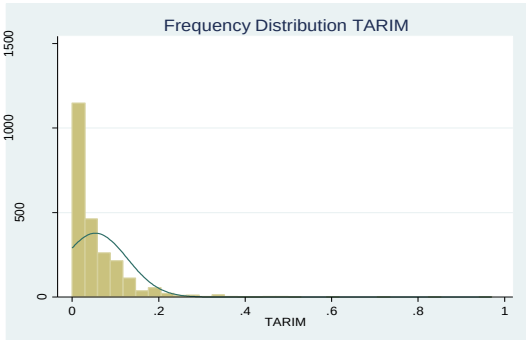
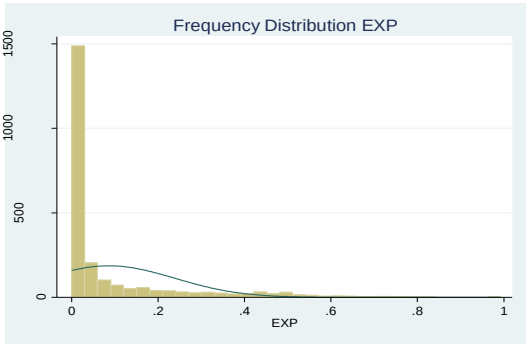
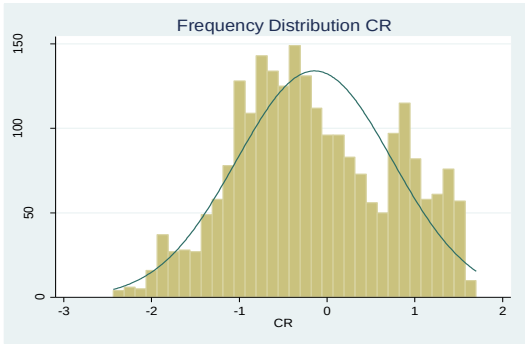
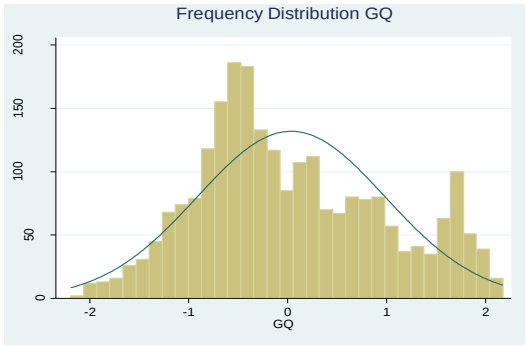
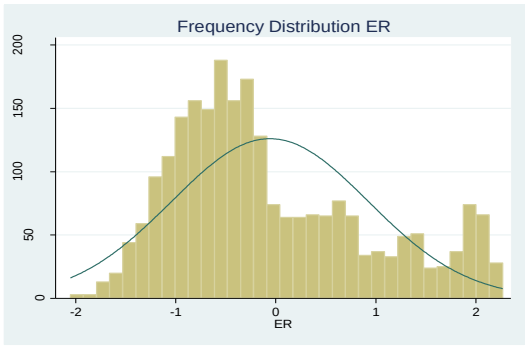


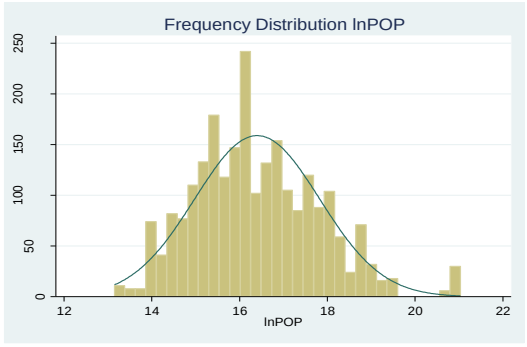
Figure 1 Frequency Distributions of Export Demand Variables

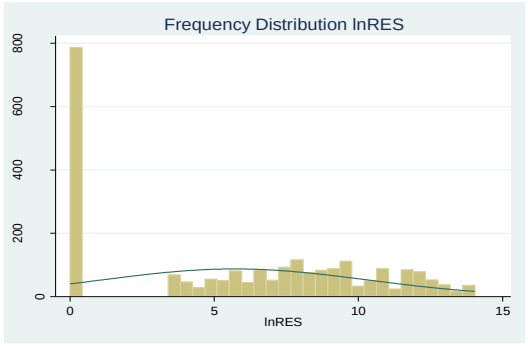


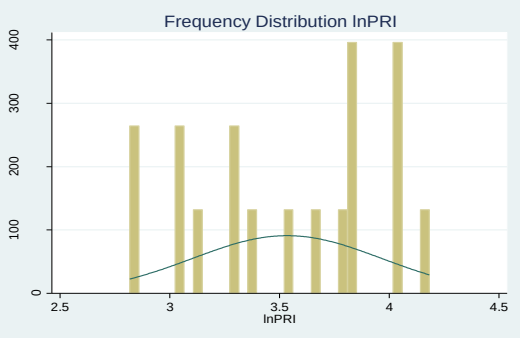


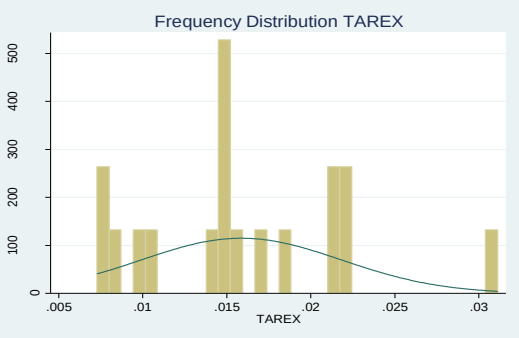









Frequency Distribution lnPRI
0
100
200
300
400
2.5
3
3.5
4
4.5
lnPRI


Frequency Distribution TAREX
0
100
200
300
400
500
.005
.01
.015
.02
.025
.03
TAREX

6. MAIN ANALYSIS

6.1 Pooled OLS Regression for Import Demand Model

The first column of Table 9 presents the estimates of pooled OLS regression with robust standard errors[40] of equation (1) control variables. In general terms, they are consistent with theoretical suppositions. *LnPopulation* has a negative impact on relative imports, meaning that bigger countries are less dependent from foreign supply: this is in line with existing literature, as it is a matter of fact that they tend to trade less with the rest of the world. The same negative relationship is shared by *lnReserves* and *TariffIM*. In the first case, the higher the amount of non-renewables available to a country the higher the energy demand being satisfied, while, in the latter case, the increasing customs barriers makes trade more difficult. The only exception is *LnPrice*, which surprisingly encourages trade. The reason can be found in the fact that the final figure for *Price* doesn't fully respect the amount actually paid for specific non-renewables categories on local markets.

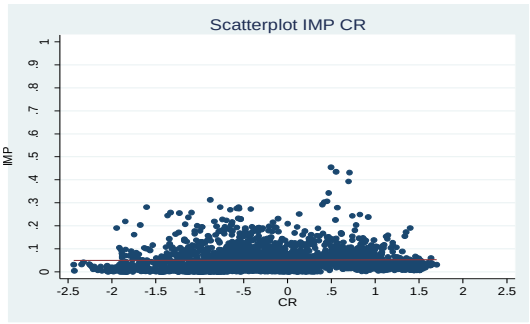
Column (5) shows estimates of pooled OLS regression for equation (1) when accounting for institutional quality. For the above variables, the sign of the relationship is unchanged, even if they present slightly different coefficients. On one hand, *Civil Rights* and *Economic Regulation* show negative values. This is in line with what supposed, since better institutional environment should reduce the consumption of polluting energy products and stimulates renewable sources industry. On the other hand, the fact that a better *Government Quality* prompts fuels trade represents an original finding and

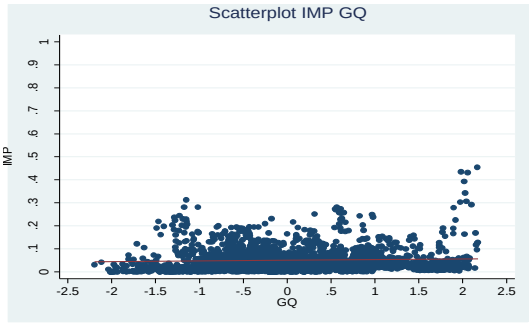
[40] See section 6.3 for the reasons of the employ of robust standard errors instead of ordinary ones

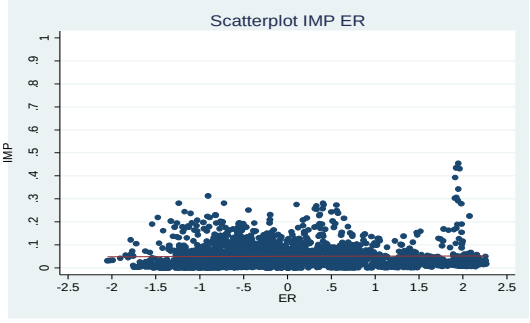
could indicate that a better government has a stronger strategic vision, thus being able to secure supplies of key resources for its country.

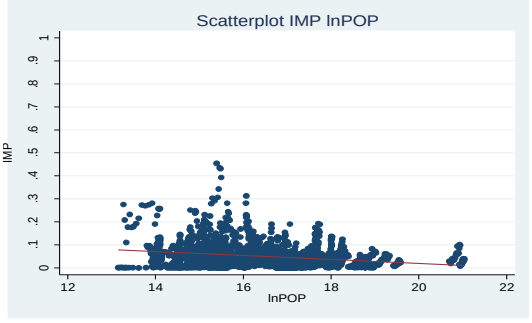
The relationship can also be described from a graphical perspective as in Figure 1, which shows the two way distribution of single observations along with a trend line.

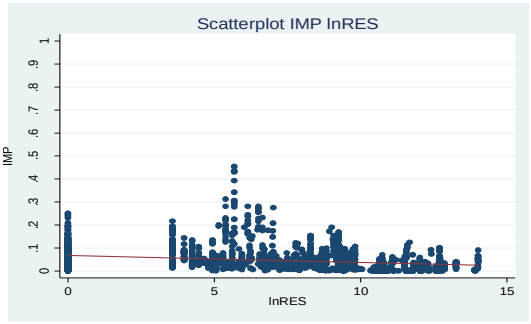
Figure 1 Scatter Plot of Import Demand Variables

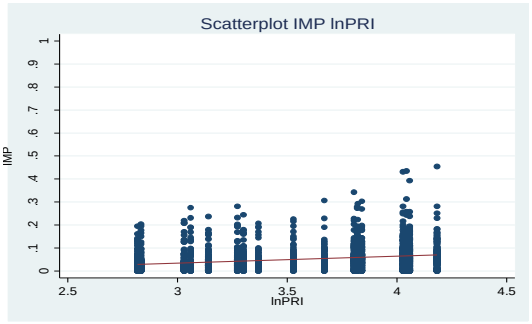


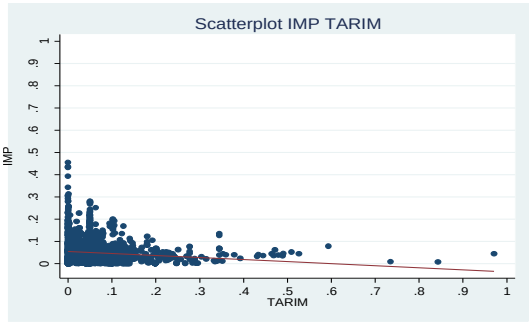












Finally, it is important to highlight that the model explains just a small part of the regressand total variation since the R-squared exhibits a low value. Nevertheless, it doesn't invalidate the conclusions drawn from coefficients sign since all variables are statistically significant.

6.2 Pooled OLS Regression for Export Demand Model

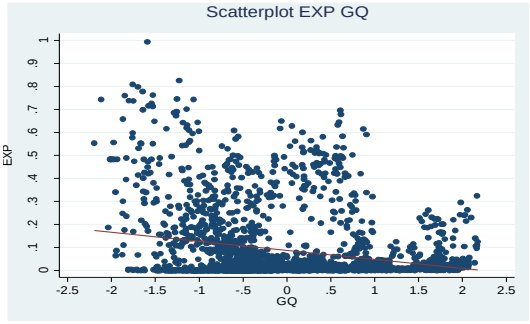
Column (1) of Table 10 presents the estimates of pooled OLS regression with robust standard errors[41] of equation (1) control variables. A striking result is that customs duties are not statistically significant: this is, most likely, due to the way *TariffEX* is built since it represents just an indication of the average level of tariffs on fuels imports and does not coincide with the rate actually applied. On the contrary, the other control variables are significant: *LnPopulation* shows a negative influence on the percentage of exports over GDP since it decreases the amount of fuels available for trade, while both *LnReserves* and *LnPrice* have a positive impact because more reserves and higher prices boost exports.

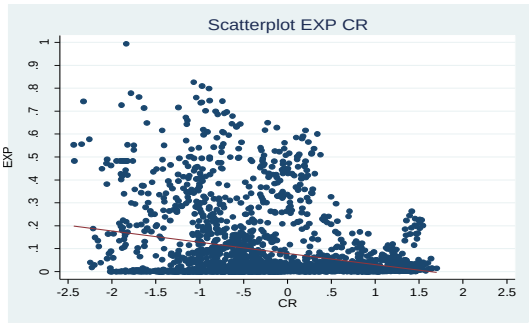
Column (5) shows estimates of pooled OLS regression for equation (2) when accounting for institutional quality. Results do not change considerably but it is important to highlight the improvement in R-squared, which indicates that institutional differences play a major role in explaining fuels exports. Regarding governance variables, the first two have a negative relationship with export while the last one has a positive impact. Thus, a climate of wider freedom and a modern public sector seem stimulate economic activity in more skill-intensive industries, reducing the importance of fuels exports in the overall economy, while an improved economic regulation seem to link countries in the international trade system, stimulating the foreign demand of non-renewables.

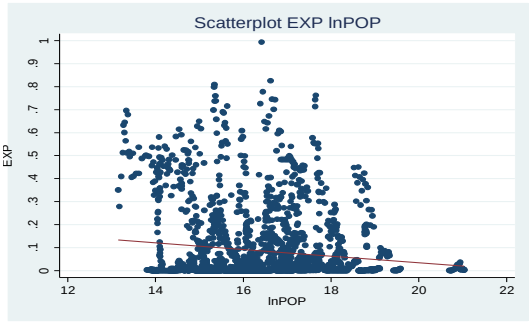
Figure 2 provides a graphical tool to analyse in detail the relationship among independent variables and fuels exports weight on the overall economy.

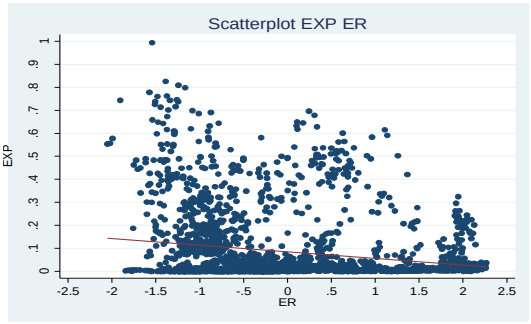
[41] See section 6.4 for the reasons of the employ of robust standard errors instead of ordinary ones

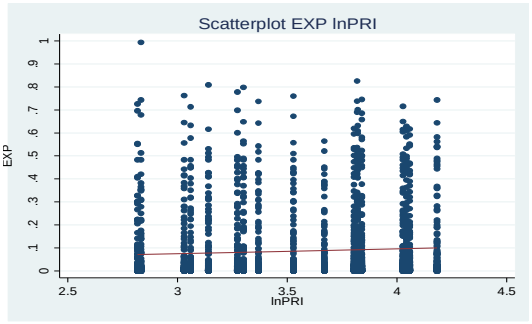
Figure 1 Scatter Plot of Export Demand Variables

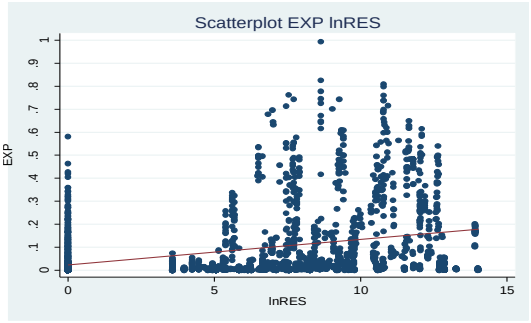


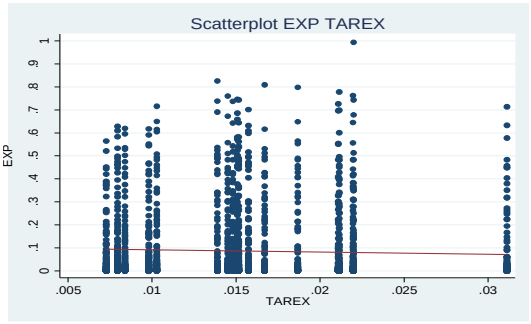










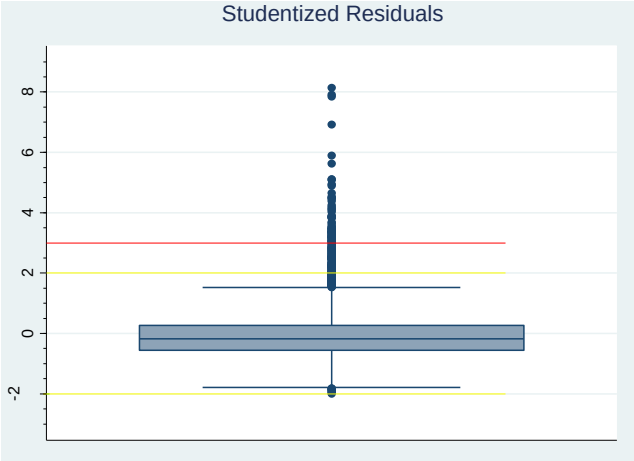


6.3 Regression Diagnostics for Import Demand Model

Before proceeding with deeper regression analysis, it is important to verify some data characteristics which may interfere with estimates. In particular, the study reports the presence of outliers, the residuals normality and homoscedasticity and the variables multicollinearity. All diagnostics are performed on the regression output for the extended specification of equation (1).

First of all, the investigation deals with the presence of outliers, that is to say observations with large residuals. This is done by examining the studentized residuals, defined as residuals divided by their standard deviation. Figure 2 shows a box plot of the studentized residuals, where dots indicates observations for which standardized residuals are far from 0. The thresholds for an observation to be considered significant is both *+/- 2*, indicating a moderate case, and *+/-3*, indicating a severe case.

Figure 2 Studentized Residuals Box Plot

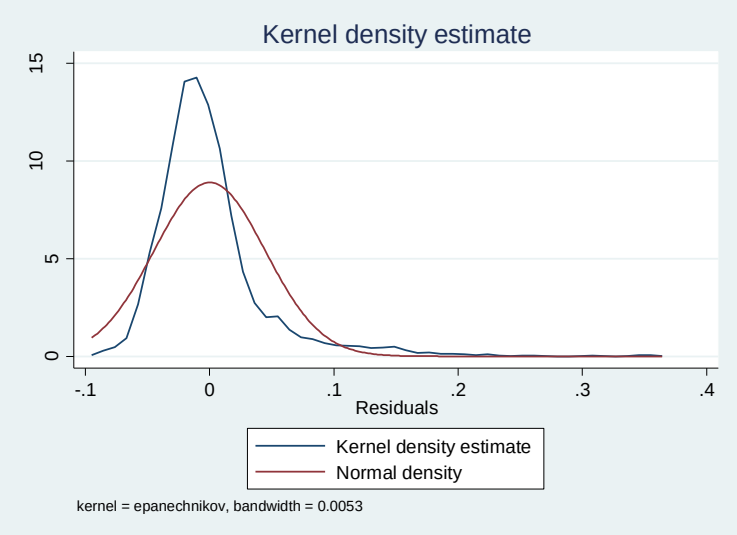


Graphically, it is evident that most of the extreme observations fall beyond the upper limits, while none in the negative part. Namely, *115* observation assume a standardized residual of more than *+2*, nevertheless, this is deemed not to be a factor of concern since they represent just approximatively *5%* of the sample. Anyhow, it is important to consider that those observations cluster in few countries[42]: in the robustness chapter it is checked whether regression results are affected when removing flawed nations from the sample.

Secondly, the thesis investigates whether residuals are normally distributed, since this is generally required for valid hypothesis testing. A graphical analysis is the most convenient tool for a comprehensive overview. Figure 3 shows a kernel density estimates of residuals where the red line indicates a normal distribution.

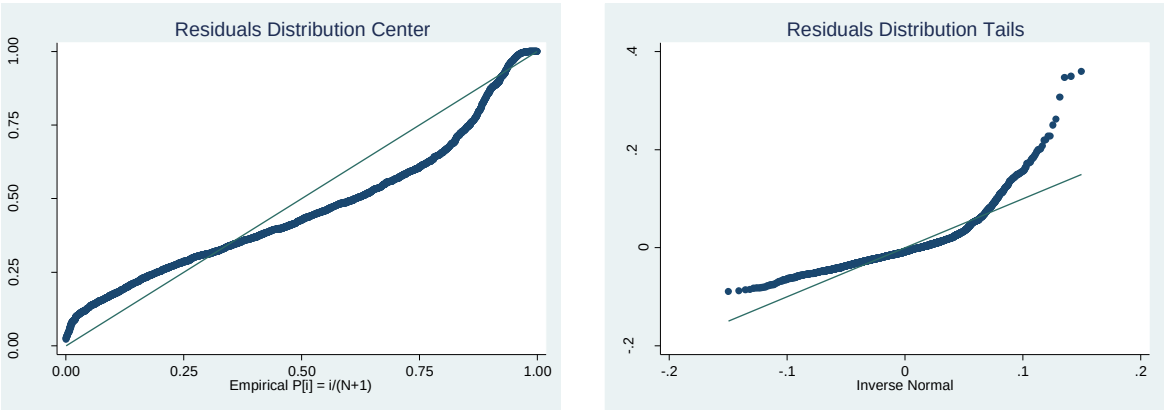
[42] Those are: Bahrain with around *94%* of observations, Belarus with *100%*, Jordan with *28%*, the Kyrgyz Republic with *28%*, Moldova with *50%*, Singapore with *78%*, Tajikistan with *56%* and Ukraine with *67%*.

Figure 3 Kernel Density Plot



It is evident that there are normality issues so that a deeper examination is required: middle range and tails values are presented separately. Figure 4 shows two graphs: the first draws a standardized normal probability plot, while the second the residuals quantile against the quantile of the normal distribution.

Figure 4 Standardized Normal Probability and Quantile Plots

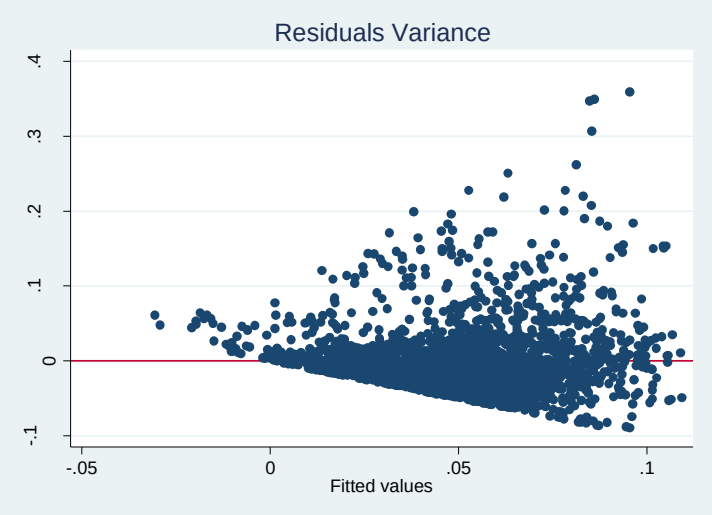


The standardized normal probability plot is sensitive to normality in the middle range of data: it is evident that residuals are close to the reference line but do not overlap perfectly, indicating non-normality. On the contrary, the quantile plot, which is sensitive to normality in the outer regions, departs from the reference line, especially in the right area. In this case, numerical tests are necessary to identify with accuracy the outliers. According to the inter-quartile range test severe outliers consist of those points that are either 3 inter-quartile-ranges below the first quartile or 3 inter-quartile-ranges above the third quartile. The presence of any severe outliers should be sufficient evidence to reject normality at a 5% significance level, while mild outliers are considered to be common. From table 11, which shows IQR test results, it is evident the presence of a number of extreme values. Even if the assumption of normality of residuals is rejected, the sample size is large enough to conclude that the regression results are still approximately correct. Moreover, in the robustness check it is verified the effect of removing countries which show extreme observations.[43]

Another assumption to verify is residuals homoscedasticity, i.e. whether they are homogenously distributed along the fitted values of the dependent variable. Figure 5 shows the scatterplot of residuals against fitted values: it is evident that residuals variance is not constant since it increases as the predicted values get bigger.

[43] The threshold for a country to be excluded from the sample is that at least *28%* of observations present a significant deviation. Those countries are the same highlighted through the employ of studentized residuals.

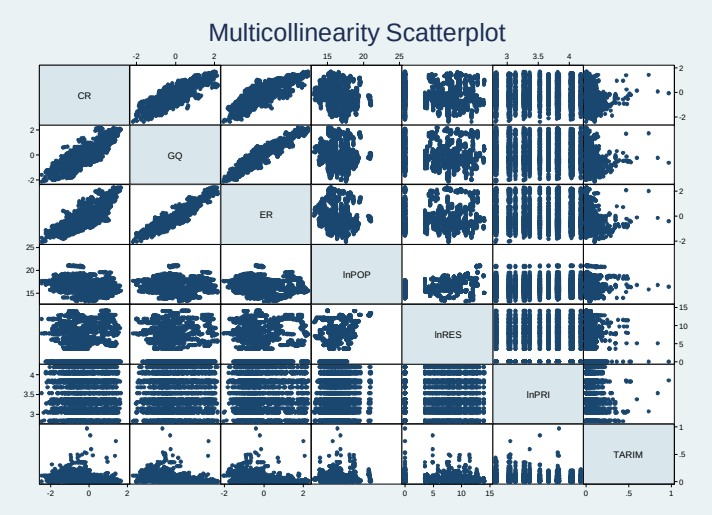
Figure 5 Residuals against Fitted Values of Imports over GDP



This is confirmed also by means of the Breusch-Pagan test, which assess the null hypothesis of homoscedasticity (results are presented in table 11). In order to solve the problem, the regression is run with robust standard error, which relax the assumption of homoscedasticity and do not interfere with coefficient estimates.

Finally and most importantly the thesis checks for multicollinearity, i.e. the occurrence that control variables are linearly related. The risk resides in the fact that the estimates of the coefficients become unstable and the standard errors can get inflated. From the graphical analysis, depicted in figure 6, it is evident that the institutional quality variables are related, hence, it is better to look more in detail through the use of numerical tests.

Figure 6 Independent Variables Matrix Scatterplot

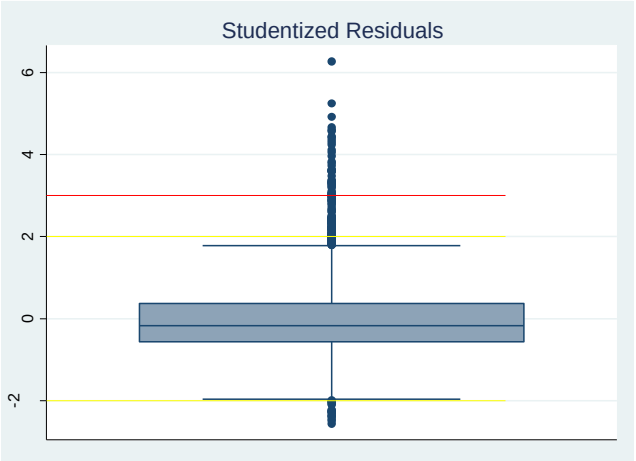


The Variance Inflation Factor test returns an index, which, when higher than 10, indicates possible multicollinearity. From table 11 it is clear that *Government Quality* and *Economic Regulation* are concerned, so that it is convenient to analyse the issue more in detail. In order to do so, as presented in table 9, separate regressions are run for each institutional quality variable: when regressed separately *Government Quality* and *Economic Regulation* are statistically insignificant. This is explained by the fact that the various aspects of institutional quality are linked one with another (i.e. a country with strong freedom protection is unlikely to have inefficient governments and archaic business regulation and vice versa). The most surprising result, however, is that the significant variable in explaining fuels imports is also the less related to the entrepreneurial activity, so that from now on the attention is focused on *Civil Rights*.

6.4 Regression Diagnostics for Export Demand Model

The same diagnostics are performed on regression results for the extended specification of equation (2). First of all, the investigation of outliers does not yield negative indications: *80* cases show moderate deviation and *42* severe deviation, that is to say around *5.6%* of the total. Figure 2 shows a box plot of the studentized residuals, where the thresholds is *+/- 2* for a mild case and *+/-3* for a severe case.

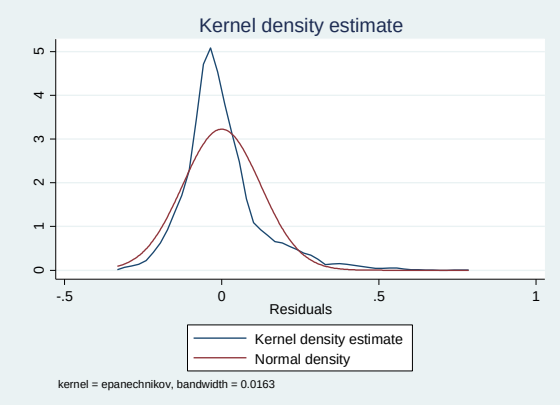
Figure 7 Studentized Residuals Box Plot



It is important to highlight that, like for the import demand model, the observations cluster in few countries[44] so that in the robustness check the effect of removing those countries is analysed.

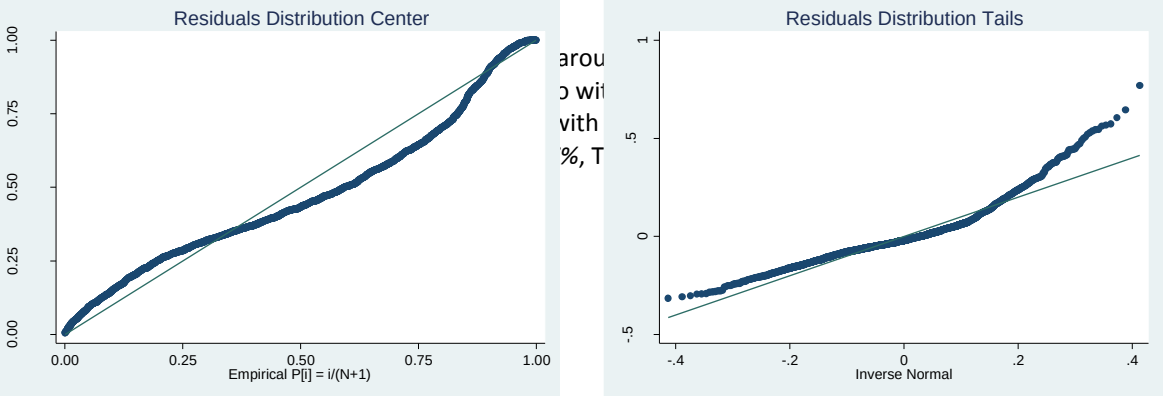
Secondly, the normality of residuals is verified. Figure 8 shows the kernel density estimate of residuals distribution along with a red line indicating the reference for normality.

Figure 8 Residuals Normality



It is evident that there are normality issues so that a deeper examination is required: middle range and tails values are presented separately in figure 9.

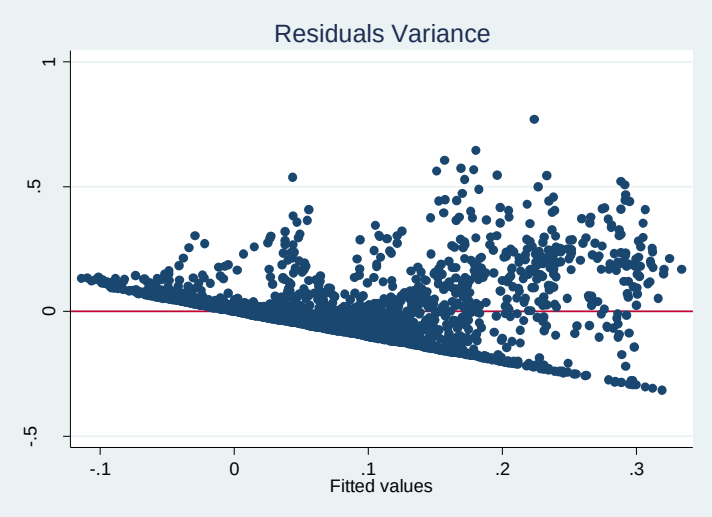
Figure 9 Standardized Normal Probability and Quantile Plots



The standardized normal probability indicate that the problem regards the centre distribution, while the quantiles plot shows that the tail is not left unaffected. In addition, the inter-quartile range test yields consistent results (which are presented in table 8), so that normality is rejected. Nevertheless, as for the import demand model, the sample size is large enough to conclude that the regression results are still approximately correct. Finally, in the robustness check it is verified the effect of removing countries which show extreme observations.[45]

In the third place, as for the import demand model, the residuals are not homogenously distributed along the fitted values of the dependent variable. Figure 10 shows the scatterplot of residuals against fitted values, from which heteroskedasticity can be perceived clearly.

Figure 10 Residuals against Fitted Values of Exports over GDP

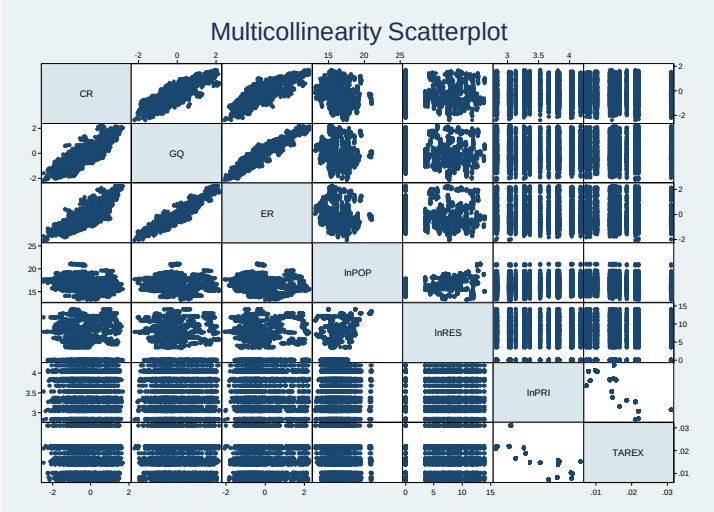


e is that e countries are the same highlighted through the employ of studentized residuals.

Heteroskedasticity is confirmed also by means of the Breusch-Pagan test, whose results are presented in table 8. In order to solve the problem, as for the import demand model, the regression is run with robust standard error.

Finally and most importantly the thesis checks for multicollinearity: both the graphical analysis, presented in figure 11, and the numerical test, presented in table 8, highlight that the institutional variables are linearly related.

Figure 11 Independent Variables Matrix Scatterplot



Nevertheless, according to the separate regressions, whose results are presented in table 10, all institutional variables are statistically significant so that, contrary to the import demand model, the different governance dimensions are determinant in explaining fuels exports. Moreover, it is

important to highlight that *Economic Regulation* reverts the sign from positive to negative, which is more coherent with thesis' arguments. As a consequence, for the export demand model, the governance variables are treated as if they were one, with a significant and negative coefficient.

6.5 Fixed-Effects Regression for Import Demand Model

In order to take advantage of the panel nature of data, which can provide much more information that normal cross-section, the thesis employs a different regression model called fixed-effects. Its main assumption consist in that some elements not inserted into the reference equation influence the predictors: those omitted characteristics must be specific to each entity and not vary over time. The key fact is that the effect of the unobserved features is removed so that predictors' coefficients are estimated more correctly. In practice, it is equivalent to generate country dummy variables and include them in the standard linear regression. Fixed effects model are widely used in the literature, nevertheless, before proceeding it is necessary to discard the option of random-effects. The latter assumes that the variation across countries is random and so it is not correlated with the independent variables. In order to decide between the two, the work resorts to the Hausman test, which verifies the hypothesis that coefficients estimated through the random-effects are the same as the ones estimated by the fixed effects: since the test yields a significant P-value[46] it is possible to discard the random effect option.

Table 10 shows fixed-effects regression (with robust standard errors) when inserting time dummies, which are a way to capture the influence of characteristics that change over-time. As expected, the overall efficiency of the

[46] See Table 9

model decreases with a lower P-value, although the regressors still explain around *13%* of imports total variation. The reference governance indicator, *Civil Rights*, is still very significant (a major point if compared with decrease in significance of other variables) and, most importantly, in absolute terms its coefficient grows, indicating a stronger link with fuels imports. Regarding the control variables it is important to highlight that the features of the relationship with fuels dependence does not go through major modifications, even if their significance is compromised.

6.6 Fixed-Effects Regression for Export Demand Model

As for the import demand model, in order to decide between fixed-effects and random-effects, the thesis refers to the Hausman test. Once again, tests results, which are presented in table 9, yield a significant P-value so that the fixed-effects regression is preferred.

In this case results, which are presented in table 11, are mixed, so conclusions are drawn from the only institutional quality variable which do not presents collinearity, that is to say *Civil Rights*. Even if it is not significant it still indicates that there is a negative relationship between governance and fuels exports. As for the control variables, there is no important change besides the fact that customs duties are automatically excluded from the regression because of collinearity.

7. ROBUSTNESS

In the robustness analysis the study is going to verify whether the results of the main analysis are sensitive to different assumptions. In particular, when excluding nations characterized by extreme observations and dividing the sample into subgroups. All results are estimated through the fixed-effects model with time dummies.

*7.*1 Robustness Checks for Import Demand Model

Table 12 shows the first robustness check, which deals with the exclusion of those countries that present a substantial number of extreme observations, as highlighted in section 7.3. As expected the general situation in unchanged, but, since extreme observations creates interference, the removal produced better estimates. We have an improved significance for both the governance variables, in particular *Economic Regulation*, and the control variables, with the exception of *TariffIM*.

Another control consists in discerning countries on the basis of the *Human Development Index*. The HDI is a composite measure, which takes into consideration life expectancy, education and income and it is used to rank countries into four stages of development. With the HDI score as a reference, the sample is divided into two subgroups: on one side are the countries which rank under *very high human development*, on the other the countries with lower development standards. Column (1) to (3) of table 13 presents the estimates for developed nations: since all share modern governance structures, institutional quality variables are useless in explaining imports variation. On the contrary, for less developed countries, whose estimates are showed in column (4) to (6), changes in those variables have a significant impact on fuels imports. This

means that, when taking into consideration less modern economies, an effective policy to reduce foreign fuels dependence is improving the institutional environment.

7.2 Robustness Checks for Export Demand Model

Table 14 shows the estimates in the case countries that present a substantial number of extreme observations, as highlighted in section 7.4, are excluded from the sample. Contrary to the import demand model, this compromised the variables significance and their ability to explain exports variations. As a consequence, the extreme observations must be regarded not as negative elements generating interference but as an important source of data.

The last control, whose estimates are presented in table 15, consists in discerning countries on the basis of the *Human Development Index*. As for the import demand model, the sample is divided into two subgroups: on one side the developed countries, on the other the less developed ones. Column (1) to (3) presents the estimates for developed nations: institutional quality variables are useless in explaining export variation and the goodness of model decreases consistently. Accordingly, for less developed countries, whose estimates are showed in column (4) to (6), institutional quality variables are not significant and the model R-squared is close to *0*.

8. CONCLUSIONS

In the present thesis it has been analysed the relationship that links the non-renewable sources trade among countries and the institutional quality. The main finding is that national institutions have a significant impact both statistically and economically. Nevertheless, the conclusions are different if the relationship is seen from the point of view of fuels exports or imports.

The impact of institutional quality variables on the weight of imports in the overall economy is negative. This means that an improvement in the institutional framework of one country reduces the dependency from foreign entities, by decreasing the relative importance of non-renewables imports. This is a very important point if one takes into consideration the actual geopolitical scenario, where a large group of countries are highly dependent on foreign energy supplies from a small number of producers.

On the contrary, the impact of governance on the weight of exports in the overall economy is not unambiguous, even if data still indicate a negative relationship. In general, the improvement in the institutional asset reduces the dependency on foreign purchases of national resources; nevertheless, economic factors, such as resources average price, have a stronger influence on exports variation.

Another major finding consists in that, even if the different dimensions of institutional quality measure single aspects of a society, when referring to fuels trade they can be considered a unique indicator, meaning that more extended civil rights are accompanied usually by stronger governments and modern economic regulation.

The way institutional quality actually acts on fuels dependence is not analysed in this work and represents an area of further research. The hypothesis done is that a better institutional quality, on one hand, stimulates renewable sources sectors and boosts energetic efficiency so that the final result is that less fuels imports are needed. On the other, it fosters more skilled intensive sectors, which are not based on resource abundance, resulting in a bigger importance of the service sector in the economy.

Another area of research that the present work does not deal with consists in the empirical verification of data indications through the study and comparison of real cases. In particular, it should be analyses whether endogenous changes in the institutional framework lead to the similar conclusions.

Table 2 Descriptive Statistics for Import Demand

	IMP	CR	PS	ER	lnPOP	lnRES	lnPRI	TARIM
Mean	0.050	-0.144	0.035	-0.058	16.400	5.712	3.535	0.054
SE(Mean)	0.001	0.018	0.020	0.020	0.029	0.094	0.009	0.002
P50	0.038	-0.254	-0.155	-0.318	16.215	6.584	3.599	0.033
Sd	0.050	0.886	0.951	0.984	1.426	4.593	0.431	0.074
Variance	0.003	0.786	0.905	0.969	2.033	21.097	0.185	0.005
Skewness	2.390	0.075	0.365	0.715	0.500	-0.047	-0.195	3.716
Kurtosis	12.159	2.240	2.346	2.592	3.262	1.601	1.714	28.431
N	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000
Sum	119.424	-341.177	83.977	-138.651	38,967.220	13,571.260	8,398.409	127.231
Range	0.454	4.136	4.368	4.319	7.888	14.037	1.366	0.971
Min	0.000	-2.437	-2.193	-2.052	13.147	0.000	2.817	0.000
Max	0.454	1.699	2.174	2.267	21.035	14.037	4.184	0.971

Table 3 Descriptive Statistics for Population, Reserves ad Price Variables

	IMP	POP	RES	PRI
Mean	0.050	47,100,000.000	50,227.800	36.456
SE(Mean)	0.001	3,114,770.000	3,350.624	0.310
P50	0.038	11,000,000.000	722.515	35.653
Sd	0.050	152,000,000.000	163,323.600	15.133
Variance	0.003	23,100,000,000,000,000.000	26,700,000,000.000	229.018
Skewness	2.390	7.051	5.294	0.236
Kurtosis	12.159	55.149	34.353	1.767
N	2,376.000	2,376.000	2,376.000	2,376.000
Sum	119.424	112,000,000,000.000	119,000,000.000	86,618.370
Range	0.454	1,360,000,000.000	1,248,266.000	48.871
Min	0.000	512,476.000	0.000	15.731
Max	0.454	1,370,000,000.000	1,248,266.000	64.602

Table 4 Descriptive Statistics for Export Demand

	EXP	CR	GQ	ER	lnPOP	lnRES	lnPRI	TAREX
Mean	0.086	-0.144	0.035	-0.058	16.400	5.712	3.535	0.016
SE(Mean)	0.003	0.018	0.020	0.020	0.029	0.094	0.009	0.000
P50	0.013	-0.254	-0.155	-0.318	16.215	6.584	3.599	0.015
Sd	0.153	0.886	0.951	0.984	1.426	4.593	0.431	0.006
Variance	0.023	0.786	0.905	0.969	2.033	21.097	0.185	0.000
Skewness	2.276	0.075	0.365	0.715	0.500	-0.047	-0.195	0.619
Kurtosis	7.827	2.240	2.346	2.592	3.262	1.601	1.714	3.229
N	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000	2,376.000
Sum	204.750	-341.177	83.977	-138.651	38,967.220	13,571.260	8,398.409	37.698
Range	0.993	4.136	4.368	4.319	7.888	14.037	1.366	0.024
Min	0.000	-2.437	-2.193	-2.052	13.147	0.000	2.817	0.007
Max	0.993	1.699	2.174	2.267	21.035	14.037	4.184	0.031

Table 5 Pooled OLS Estimates of Import Demand Model

Indipendent Variables	[1]	[2]	[3]	[4]	[5]
Civil Rights	-	-0.003	-	-	-0.013
		[0.001]***			[0.003]***
Government Quality	-	-	0.001	-	0.024
			[0.001]		[0.004]***
Economic Regulation	-	-	-	-0.001	-0.014
				[0.001]	[0.003]***
lnPopulation	-0.006	-0.006	-0.006	-0.006	-0.007
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***
lnReserves	-0.002	-0.002	-0.002	-0.002	-0.002
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
lnPrices	0.029	0.029	0.029	0.029	0.028
	[0.002]***	[0.002]***	[0.002]***	[0.002]***	[0.002]***
TariffIM	-0.065	-0.078	-0.061	-0.071	-0.063
	[0.011]***	[0.013]***	[0.012]***	[0.012]***	[0.013]***
_cons	0.061	0.069	0.059	0.064	0.080
	[0.014]***	[0.015]***	[0.014]***	[0.014]***	[0.015]***
Observations	2376	2376	2376	2376	2376
R-squared	0.18	0.18	0.18	0.18	0.20

***, **, * significant at 1%, 5%

Table 6 Pooled OLS Estimates of Export Demand Model

Indipendent Variables	[1]	[2]	[3]	[4]	[5]
Civil Rights	-	-0.059	-	-	-0.064
		[0.003]***			[0.007]***
Government Quality	-	-	-0.049	-	-0.065
			[0.003]***		[0.010]***
Economic Regulation	-	-	-	-0.040	0.069
				[0.003]***	[0.008]***
lnPopulation	-0.037	-0.045	-0.041	-0.041	-0.043
	[0.003]***	[0.003]***	[0.003]***	[0.003]***	[0.002]***
lnReserves	0.016	0.016	0.017	0.017	0.016
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***
lnPrices	0.029	0.029	0.030	0.029	0.031
	[0.010]***	[0.009]***	[0.009]***	[0.010]***	[0.009]***
TariffEX	0.305	0.354	0.205	0.246	0.330
	[0.690]	[0.645]	[0.656]	[0.664]	[0.642]
_cons	0.489	0.610	0.552	0.555	0.589
	[0.057]***	[0.055]***	[0.055]***	[0.056]***	[0.054]***
Observations	2376	2376	2376	2376	2376
R-squared	0.21	0.32	0.30	0.28	0.34

***, **, * significant at 1%, 5%

Table 7 Post-estimation Tests for Import Demand Model

Interquartile Range Test

	Low	High
Inner Fences	-0.244	0.220
Mild Outliers (Absolute)	18	110
Mild Outliers (Percentage)	0.76%	4.63%
Outer Fences	-0.418	0.393
Severe Outliers (Absolute)	0	35
Severe Outliers (Percentage)	0.00%	1.47%

Breusch-Pagan Test

chi2(1)	351.57
Prob>chi2	0

Variance Inflation Factor Test

Dependent Variables	VIF	1/VIF
Civil Rights	4.76	0.21
Government Quality	11.38	0.09
Economic Regulation	10.35	0.10
lnPopulation	1.31	0.77
lnReserves	1.26	0.80
lnPrice	1.04	0.97
TariffIM	1.20	0.84
Mean	4.47	

Table 8 Post-estimation Tests for Export Demand Model

Interquartile Range Test

	Low	High
Inner Fences	-0.244	0.220
Mild Outliers (Absolute)	18	110
Mild Outliers (Percentage)	0.76%	4.63%
Outer Fences	-0.418	0.393
Severe Outliers (Absolute)	0	35
Severe Outliers (Percentage)	0.00%	1.47%

Breusch-Pagan Test

chi2(1)	1079.26
Prob>chi2	0

Variance Inflation Factor Test

Dependent Variables	VIF	1/VIF
Civil Rights	4.75	0.21
Government Quality	11.22	0.09
Economic Regulation	10.35	0.10
lnPopulation	1.31	0.77
lnReserves	1.26	0.80
lnPrice	2.35	0.43
TariffIM	2.35	0.43
Mean	4.80	

Table 9 Fixed-Effects vs Random-Effects

Hausman Test for Import Demand Model	
chi2(7)	20.06
Prob>chi2	0.0012

Hausman Test for Export Demand Model	
chi2(7)	39.28
Prob>chi2	0

Table 10 Fixed-Effects Regression for Import Demand Model

Fixed-Effects Estimates

Indipendent Variables	[1]	[2]	[3]	[4]	[5]
Civil Rights	-	-0.017	-	-	-0.018
		[0.005]***			[0.005]***
Government Quality	-	-	-0.009	-	-0.003
			[0.006]		[0.008]
Economic Regulation	-	-	-	-0.009	0.003
				[0.006]	[0.008]
LnPopulation	-0.023	-0.025	-0.023	-0.024	-0.025
	[0.015]	[0.014]*	[0.014]	[0.015]*	[0.014]*
LnReserves	-0.003	-0.003	-0.003	-0.003	-0.003
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
LnPrice	0.031	0.032	0.032	0.032	0.032
	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***
TariffIM	-0.025	-0.018	-0.026	-0.025	-0.018
	[0.024]	[0.022]	[0.024]	[0.024]	[0.022]
_cons	0.336	0.370	0.342	0.350	0.368
	[0.225]	[0.219]*	[0.223]	[0.227]	[0.219]*
Observations	2376	2376	2376	2376	2376
R-squared	0.14	0.13	0.13	0.14	0.13

***, **, * significant at 1%, 5%, and 10%, respectively.

Table 11 Fixed-Effects Regression for Export Demand Model

Fixed-Effects Estimates

Indipendent Variables	[1]	[2]	[3]	[4]	[5]
Civil Rights	-	-0.002	-	-	0.002
		[0.013]			[0.016]
Government Quality	-	-	0.011	-	0.032
			[0.018]		[0.023]
Economic Regulation	-	-	-	-0.015	-0.036
				[0.017]	[0.024]
lnPopulation	-0.016	-0.016	-0.015	-0.018	-0.018
	[0.038]	[0.038]	[0.037]	[0.039]	[0.037]
lnReserves	0.011	0.011	0.011	0.011	0.012
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]*
lnPrices	0.031	0.031	0.031	0.032	0.031
	[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.010]***
TariffEX	0.000	0.000	0.000	0.000	0.000
	[omitted]	[omitted]	[omitted]	[omitted]	[omitted]
_cons	0.169	0.173	0.162	0.192	0.200
	[0.597]	[0.598]	[0.588]	[0.612]	[0.590]
Observations	2376	2376	2376	2376	2376
R-squared	0.20	0.21	0.14	0.25	0.17

***, **, * significant at 1%, 5%, and 10%, respectively.

Table 12 Extreme Observations Check for Import Demand Model

Indipendent Variables	[1]	[2]	[3]
Civil Rights	-0.013	-	-
	[0.004]***		
Government Quality	-	-0.006	-
		[0.006]	
Economic Regulation	-	-	-0.010
			[0.005]**
LnPopulation	-0.034	-0.033	-0.034
	[0.013]***	[0.013]**	[0.013]**
LnReserves	-0.009	-0.009	-0.009
	[0.003]***	[0.003]***	[0.003]***
LnPrice	0.034	0.034	0.034
	[0.004]***	[0.004]***	[0.004]***
TariffIM	-0.010	-0.015	-0.014
	[0.018]	[0.019]	[0.019]
_cons	0.532	0.515	0.528
	[0.201]***	[0.205]**	[0.211]**
Observations	2232	2232	2232
R-squared	0.14	0.15	0.15

***, **, * significant at 1%, 5%, and 10%, respectively.

Table 13 HDI Check for Import Demand Model

Indipendent Variables	[1]	[2]	[3]	[4]	[5]	[6]
Civil Rights	0.000	-	-	-0.018	-	-
	[0.010]			[0.005]***		
Government Quality	-	0.005	-	-	-0.012	-
		[0.011]			[0.007]	
Economic Regulation	-	-	0.015	-	-	-0.016
			[0.012]			[0.007]**
LnPopulation	-0.027	-0.027	-0.027	-0.008	-0.008	-0.009
	[0.016]*	[0.016]*	[0.016]*	[0.029]	[0.030]	[0.030]
LnReserves	-0.005	-0.005	-0.006	-0.002	-0.002	-0.002
	[0.005]	[0.004]	[0.004]	[0.005]	[0.005]	[0.005]
LnPrice	0.040	0.040	0.039	0.026	0.025	0.025
	[0.008]***	[0.008]***	[0.007]***	[0.008]***	[0.008]***	[0.008]***
TariffIM	0.016	0.018	0.016	-0.035	-0.045	-0.044
	[0.020]	[0.020]	[0.022]	[0.029]	[0.030]	[0.030]
_cons	0.372	0.378	0.364	0.099	0.111	0.122
	[0.251]	[0.253]	[0.250]	[0.455]	[0.463]	[0.468]
Observations	738	738	738	1638	1638	1638
R-squared	0.17	0.17	0.15	0.11	0.14	0.12

Columns 1 to 3 report results on High HDI countries while columns 4 to 6 results on the rest of the sample

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

Table 14 Extreme Observations Check for Export Demand Model

Indipendent Variables	[1]	[2]	[3]
Civil Rights	0.006	-	-
	[0.009]		
Government Quality	-	0.005	-
		[0.014]	
Economic Regulation	-	-	0.006
			[0.012]
lnPopulation	-0.022	-0.022	-0.021
	[0.039]	[0.039]	[0.039]
lnReserves	0.004	0.004	0.004
	[0.004]	[0.004]	[0.004]
lnPrices	0.027	0.026	0.026
	[0.006]***	[0.006]***	[0.006]***
TariffEX	0.000	0.000	0.000
	[omitted]	[omitted]	[omitted]
_cons	0.297	0.297	0.282
	[0.619]	[0.624]	[0.628]
Observations	2142	2142	2142
R-squared	0.08	0.09	0.09

***, **, * significant at 1%, 5%, and 10%, respectively.

Table 15 HDI Check for Export Demand Model

Indipendent Variables	[1]	[2]	[3]	[4]	[5]	[6]
Civil Rights	0.000	-	-	-0.018	-	-
	[0.010]			[0.005]***		
Government Quality	-	0.005	-	-	-0.012	-
		[0.011]			[0.007]	
Economic Regulation	-	-	0.015	-	-	-0.016
			[0.012]			[0.007]**
LnPopulation	-0.027	-0.027	-0.027	-0.008	-0.008	-0.009
	[0.016]*	[0.016]*	[0.016]*	[0.029]	[0.030]	[0.030]
LnReserves	-0.005	-0.005	-0.006	-0.002	-0.002	-0.002
	[0.005]	[0.004]	[0.004]	[0.005]	[0.005]	[0.005]
LnPrice	0.040	0.040	0.039	0.026	0.025	0.025
	[0.008]***	[0.008]***	[0.007]***	[0.008]***	[0.008]***	[0.008]***
TariffM	0.016	0.018	0.016	-0.035	-0.045	-0.044
	[0.020]	[0.020]	[0.022]	[0.029]	[0.030]	[0.030]
_cons	0.372	0.378	0.364	0.099	0.111	0.122
	[0.251]	[0.253]	[0.250]	[0.455]	[0.463]	[0.468]
Observations	738	738	738	1638	1638	1638
R-squared	0.17	0.17	0.15	0.11	0.14	0.12

Columns 1 to 3 report results on High HDI countries while columns 4 to 6 results on the rest of the sample

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

II. APPENDIX

Appendix A

Detailed structure and explanatory notes

Standard International Trade Classification, Rev.3[47]

0 - Food and live animals

1 - Beverages and tobacco

2 - Crude materials, inedible, except fuels

3 - Mineral fuels, lubricants and related materials

- 32 - Coal, coke and briquettes
- 33 - Petroleum, petroleum products and related materials
- 34 - Gas, natural and manufactured
- 35 - Electric current

4 - Animal and vegetable oils, fats and waxes

5 - Chemicals and related products, n.e.s.

6 - Manufactured goods classified chiefly by material

7 - Machinery and transport equipment

8 - Miscellaneous manufactured articles

9 - Commodities and transactions not classified elsewhere in the SITC

I - Gold, monetary

II - Gold coin and current coin

[47] For the detailed version see http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14

Appendix B

Worldwide Governance Indicators Data Sources

Data Sources Used in 2013 Update of Worldwide Governance Indicators

Code	Source	Type*	Public	Country Coverage	Represe -ntative	1996	1998	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ADB	African Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	54			x	x	x	x	x	x	x	x	x	x	x	x	x	x
AFR	Afrobarometer	Survey	Yes	22				x	x	x	x	x	x	x	x	x	x	x	x	x
ASD	Asian Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	28				x	x	x	x	x	x	x	x	x	x	x	x	x
BPS	Business Enterprise Environment Survey	Survey	Yes	30				x	x	x	x	x	x	x	x	x	x	x	x	x
BTI	Bertelsmann Transformation Index	Expert (NGO)	Yes	129					x	x	x	x	x	x	x	x	x	x	x	x
CCR	Freedom House Countries at the Crossroads	Expert (NGO)	Yes	69							x	x	x	x	x	x	x	x	x	x
EBR	European Bank for Reconstruction and Development Transition Report	Expert (GOV)	Yes	33		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
EIU	Economist Intelligence Unit Riskwire & Democracy Index	Expert (CBIP)	Yes	183	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
FRH	Freedom House	Expert (NGO)	Yes	198	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GCB	Transparency International Global Corruption Barometer Survey	Survey	Yes	115					x	x	x	x	x	x	x	x	x	x	x	x
GCS	World Economic Forum Global Competitiveness Report	Survey	Yes	144	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GII	Global Integrity Index	Expert (NGO)	Yes	62						x	x	x	x	x	x	x	x	x	x	x
GWP	Gallup World Poll	Survey	Yes	161	Y								x	x	x	x	x	x	x	x
HER	Heritage Foundation Index of Economic Freedom	Expert (NGO)	Yes	183	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
HUM	Cingranelli Richards Human Rights Database and Political Terror Scale	Expert (GOV)	Yes	194	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IFD	IFAD Rural Sector Performance Assessments	Expert (GOV)	Yes	98							x	x	x	x	x	x	x	x	x	x
IJT	iJET Country Security Risk Ratings	Expert (CBIP)	Yes	197	Y						x	x	x	x	x	x	x	x	x	x
IPD	Institutional Profiles Database	Expert (GOV)	Yes	143	Y								x	x	x	x	x	x	x	x
IRP	IREEP African Electoral Index	Expert (NGO)	Yes	54				x	x	x	x	x	x	x	x	x	x	x	x	x
LBO	Latinobarometro	Survey	Yes	18		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MSI	International Research and Exchanges Board Media Sustainability Index	Expert (NGO)	Yes	71					x	x	x	x	x	x	x	x	x	x	x	x
OBI	International Budget Project Open Budget Index	Expert (NGO)	Yes	100								x	x	x	x	x	x	x	x	x
PIA	World Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	136		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PRC	Political Economic Risk Consultancy Corruption in Asia Survey	Survey	Yes	17			x	x	x	x	x	x	x	x	x	x	x	x	x	x
PRS	Political Risk Services International Country Risk Guide	Expert (CBIP)	Yes	140	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RSF	Reporters Without Borders Press Freedom Index	Expert (NGO)	Yes	177	Y				x	x	x	x	x	x	x	x	x	x	x	x
TPR	US State Department Trafficking in People report	Expert (GOV)	Yes	185	Y			x	x	x	x	x	x	x	x	x	x	x	x	x
VAB	Vanderbilt University Americas Barometer	Survey	Yes	26							x	x	x	x	x	x	x	x	x	x
WCY	Institute for Management and Development World Competitiveness Yearbook	Survey	Yes	59		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
WJP	World Justice Project Rule of Law Index	Expert (NGO)/Survey	Yes	97														x	x	x
WMO	Global Insight Business Conditions and Risk Indicators	Expert (CBIP)	Yes	203	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*Types of Expert Assessments: CBIP – Commercial Business Information Provider, GOV – Public Sector Data Provider, NGO -- Nongovernmental Organization Data Provider

Appendix C

World Governance Indicators Definition

1. *Voice and Accountability* – capturing perceptions of 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.

2. *Political Stability and Absence of Violence/Terrorism* – capturing perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.

3. *Government Effectiveness* – capturing 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.

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

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

6. *Control of Corruption* – capturing perceptions of 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.

Countries in the Sample

Albania	El Salvador	Malawi	Senegal
Algeria	Estonia	Malaysia	Singapore
Angola	Ethiopia	Mali	Slovak Republic
Argentina	Finland	Mauritania	Slovenia
Armenia	France	Mauritius	South Africa
Australia	Gabon	Mexico	Spain
Austria	Gambia	Moldova	Sri Lanka
Azerbaijan	Georgia	Mongolia	Sudan
Bahrain	Germany	Mozambique	Swaziland
Bangladesh	Ghana	Myanmar	Sweden
Belarus	Greece	Namibia	Switzerland
Belgium	Guinea	Nepal	Syrian
Benin	Hungary	Netherlands	Taiwan
Bolivia	India	New Zealand	Tajikistan
Bosnia and Herzegovina	Indonesia	Nicaragua	Tanzania
Botswana	Iran	Niger	Thailand
Brazil	Iraq	Nigeria	Togo
Bulgaria	Ireland	North Korea	Trinidad and Tobago
Burkina Faso	Israel	Norway	Tunisia
Burundi	Italy	Oman	Turkey
Cambodia	Jamaica	Pakistan	Turkmenistan
Cameroon	Japan	Panama	Uganda
Canada	Jordan	Papua New Guinea	Ukraine
Central African Republic	Kazakhstan	Paraguay	United Arab Emirates
Chile	Kenya	Peru	United Kingdom
China	Kuwait	Philippines	United States
Colombia	Kyrgyz Republic	Poland	Uruguay
Congo	Latvia	Portugal	Venezuela
Cuba	Lebanon	Qatar	Vietnam
Czech Republic	Libya	Romania	Yemen
Denmark	Lithuania	Russia	Yugoslavia
Ecuador	Macedonia	Rwanda	Zambia
Egypt	Madagascar	Saudi Arabia	Zimbabwe

Appendix D

III. REFERENCES

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