Charles University in Prague

Faculty of Social Sciences
Institute of Economic Studies

BACHELOR THESIS

Dutch disease in Russia

Author: **Robert Havelka**

Supervisor: **doc. Roman Horváth Ph.D.**

Academic Year: **2012/2013**

Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

The author grants to Charles University permission to reproduce and to distribute copies of this thesis document in whole or in part.

Prague, May 16, 2013

Signature

Acknowledgments

The author is grateful to doc. Roman Horvath Ph.D. for valuable comments.

Abstract

Dutch Disease offers formal explanation to the so-called "*Resource curse*". Detection of Dutch Disease is divided into individual symptoms. We study the case of Russia, i.e. country which possesses significant reserves of natural resources. Long-term relationship between oil price and Russian real exchange rate was not established (1st symptom), but we find evidence of growth and fall of overall wage level in Russia as predicted by Dutch Disease (2nd symptom). We have been able to find statistically significant long-term relationship between Russian GDP, oil price and crude oil export volumes (3rd symptom). Oil price is found to have positive impact on the output of manufacturing sector, which implies Russian economy is to even larger extent vulnerable to oil price shocks. Last link is in direct contradiction with predictions of our model, but it is likely the result of Russian manufacturing sector not being entirely "*non-oil*", or that some manufacturing sub-sectors are not producing tradable goods.

JEL Classification	F30, P28, Q30
Keywords	Dutch disease, Russia, exchange rate

Author's e-mail	robberthz.cz@gmail.com
Supervisor's e-mail	roman.horvath@gmail.com

Abstrakt

Holandská nemoc nabízí formální vysvětlení jevu známého jako "*Prokletí přírodních zdrojů*". Tato práce studuje případ Ruska, které vlastní velké množství přírodních zdrojů. Ustanovit jestli je země nakažena Holandskou nemocí záleží na existenci určitých příznaků. Dlouhodobý vztah mezi cenou ropy a Ruským reálným měnovým kurzem nebyl potvrzen (1. příznak), ale úroveň mzdové hladiny v Rusku se pohybovala dle predikcí modelu Holandské nemoci (2. příznak). Statisticky signifikantní vztah byl nalezen mezi Ruským GDP, cenou ropy a objemem exportované surové nafty (3. příznak). Cena ropy má dlouhodobý pozitivní vliv na výstup průmyslového sektoru (4. příznak), což implikuje značnou závislost Ruské ekonomiky na ceně ropy. Poslední vztah je v přímém rozporu s předpovědí našeho modelu, ale pravděpodobně je to následek špatného rozdělení mezi ropným a průmyslovým sektorem, či mezi průmyslovým sektorem a sektorem služeb.

Klasifikace	F30, P28, Q30
Klíčová slova	Holandská nemoc, Rusko, měnový kurz

E-mail autora	robberth.cz@gmail.com
E-mail vedoucího práce	roman.horvath@gmail.com

Contents

1 List of Tables

2 List of Figures

No table of figures entries found.

3 Acronyms

ADF Augmented Dickey-Fuller

AIC Akaike Information Criterion

BEER Behavioral Equilibrium Exchange Rate

CEEC Central and Eastern Europe Countries

CPI Consumers Price Index

EU European Union

FEER Fundamental Equilibrium Exchange Rate

FSU Former Soviet Union

LM Lagrange multiplier

GDP Gross Domestic Product

OECD Organization for Economic Co-Operation and Development

PP Phillips-Peron

PPI Producers Price Index

REER Real Effective Exchange Rate

RER Real Exchange Rate

VAR Vector Auto-Regression

4 Bachelor Thesis Proposal

Author Robert Havelka

Supervisor doc. Roman Horváth Ph.D.

Proposed topic Dutch disease in Russia

Topic characteristics

Natural resources endowment often has negative implications for the state, such as negative institutional development, rent-seeking and lower economic growth. One of the phenomenon relating to utilizing and exporting natural resources is so-called "Dutch Disease", according to which profits from exports of natural resources lead to higher wages and appreciation of real exchange rate.

In the first part I will describe theoretical background of "Dutch Disease", its occurrence in other parts of the world and relevant economic policies leading to minimization of this problem with emphasis on Russia. In the second part I will carry out empirical analysis. In the third part the evaluation of empirical analysis will be provided.

Contribution of this paper comprises of using newer data than in Oomes, Kalcheva (2007) and in incorporation of different detection methods used in papers Rautava (2004) and Sosunov, Zamulin (2006).

OUTLINE

1. Introduction

2. Literature review & Theoretical background

3. Empirical Model

4. Discussion of Results

5. Conclusion

HYPOTHESES

1. Increased exploitation of natural resources leads to a decline in the manufacturing sector.

2. Increased exploitation of natural resources leads to a wage growth.

3. Increased exploitation of natural resources leads to country's appreciation of real exchange rate.

Core bibliography

Sosunov, K. & O. Zamulin (2006): “Can Oil Prices Explain the Real Appreciation of the Russian Ruble in 1998–2005?”, CEFIR/NES Working Paper No. 83, Center for Economic and Financial Research at New Economic School.

Oomes, N. & K. Kalcheva (2007): "Diagnosing Dutch disease: Does Russia have the symptoms?", BOFIT Discussion Paper No. 7, Institute for Economies in Transition, Bank of Finland)

Rautava, J. (2004): “The Role of the Oil Prices and the Real Exchange Rate in Russia's Economy – A Cointegration Approach,” Journal of Comparative Economics, Vol. 32, No. 2, pp. 315–27.

Merlevede, B., B. van Aarle, & K. Schoors (2004), “Russia from Bust to Boom: Oil, Politics or the Ruble?,” William Davidson Institute Working Paper No. 722.

Krugman, P. (1997): “The Narrow Moving Band, the Dutch Disease and the Competitive Consequences of Mrs. Thatcher,” Journal of Development Economics, Vol. 27, pp. 41–55.

1 Introduction

Russia holds very likely the most valuable reserves of natural resources in the world, Sauter et al (2012) estimated that grossly 75.4 trillion dollars is the total value of natural resources Russia possesses in its reserves, surpassing USA by 30 trillion dollars and Saudi Arabia by another 9.5 trillion dollars. The most valuable are estimated to be reserves of timber, which are approximately $28.4 trillion. Russia's reserves of natural gas account for one fourth of all proven reserves of natural gas in the whole world and in 2012 was the biggest producer of natural gas (Index Mundi 2013). In oil production Russia held second position in 2011, while proven oil reserves are 8th biggest in the world (CIA Factbook 2013). In 2011 Russia was also the biggest producer of nickel in the world and second biggest producer of aluminum. Similar positions are held in the production of copper (7th), iron (5th), coal (5th), various ferrous metals, silver (5th) and gold (4th) (Index Mundi 2013, USGS 2013).

The key building block of „*resource curse*" literature is Sachs & Warner (2001). This study tells us that resource-dependent country is eventually left with lower economic growth compared to countries, which could not rely on natural resources, and quite likely with significant decline in other sectors, above all manufacturing, not tied to natural resources. Are considerable reserves of natural resource harmful for Russia? Russian experience of the year 1998 is enough to legitimize this question as resource-dependence was one of the major contributing factors behind sharp fall of GDP and real devaluation by 35.68%[1] at that time (Sosunov & Zamulin 2006). Even using eyeball econometrics[2] one can observe that both crises, in 1998 and 2008, were coupled, i.e. followed or preceded, with significant drops in oil price, between August 1997 and August 1998 oil price decreased 36%[3] and the price moved down from 18.6 to 11.91 dollars per barrel. In 2008 oil price dropped from 132.32 to 39.95 dollars per barrel between June 2008 and December 2008 and real GDP dropped by 10.67% between June 2008 and June 2009. However, to establish a link between these two synchronous movements, one has to practice more serious analysis. Dutch Disease

[1] Authors' own calculations.

[2] Term coined by Balász Égert.

[3] Authors' own calculations on Brent Spot Price.

offers then explanation why this could possibly occur. Primary conclusions of this model rests on finding the manufacturing sector to be relatively oppressed by commodity and non-tradable sector, when oil prices are rising (Corden & Neary 1982). Manufacturing sector shrinks and it could be regarded as leading to de-industrialization, relative or absolute.

Contribution of this thesis lies first of all in using the most recent data and introducing crude oil export volumes into Dutch Disease framework. Crude oil export volumes are crucial determinant of oil income. The most up-to-date study of Dutch Disease in Russia is Dobrynskaya & Turkish (2009) and partly Égert (2009). While Dobrynskaya & Turkish (2009) uses entirely ocular econometrics[4], that is descriptive analysis, and Égert (2009) deals with 10 countries within Former Soviet Union (FSU) and does not pay special attention to Russia. It follows that, most recent and relevant are Oomes & Kalcheva (2007) and Algieri (2004). Second of all, we utilize the latest research (Égert et al 2006, Sosunov & Zamulin 2006) predicting lesser importance of Balassa-Samuelson effect for transition countries, which would imply Oomes & Kalcheva (2007) and Algieri (2004) obtained most likely inaccurate results, when they put emphasis on Balassa-Samuelson effect and did not include growth in oil export revenues in their model for instance, found to be statistically significant by Sosunov & Zamulin (2006). On top of that, Algieri (2004) does not include monetary policy variable and does not fully explain shortcomings of quantitative measures she uses. The last of all, we shall discuss previously not often mentioned fact and that is the appreciation of the real exchange rate of Russia's open sector, first comprehensively discussed in Égert et al (2006), and draw on newly published research discussing gradual improvement in quality of exported goods of developing countries.

Second chapter puts more light on the topic of natural resource curse, while the third chapter will discuss Dutch Disease closely in theoretical as well as practical way. Fourth chapter will be devoted to the so-called symptoms of Dutch Disease. Here empirical analysis will follow theoretical discussion regarding non-Dutch Disease forces interplaying with Dutch Disease ones. In fifth chapter, results will be summarized.

[4] Again self-explanatory term coined by Balász Égert.

2 Natural Resource Curse and its offered explanations

Thesis disserting on the problem of Dutch Disease shall put things into perspective and discuss the more general topic of the so-called natural resource curse, of which the Dutch Disease is not the only one possible explanation, but Institutions, Volatility and Corporate Transparency Channel count among them as well. Corporate transparency channel is one that arose only recently and have not been discussed in Dutch Disease literature yet. In reality, all 4 of these following approaches mutually overlap in Russia likely, thus even if discussed separately one shall keep in mind their cohesion.

2.1 Dutch Disease

Often suggested explanation of resource curse is so-called Dutch Disease. This name is derived from the experience of the Netherlands, which faced economic turbulences after finding large amount of natural gas reserves stored in the grounds under Groningen in 1959. The Dutch utilized these resource and started to export large quantities of natural gas in order to gain sizable profits (The Economist 1977). For the Netherlands, previously export-led economy, it meant quickly appreciating exchange rate and sinking competitiveness of its exports abroad. Subsequently, Dutch economy started sliding into recession. However, some regard these problems as a result of overly ambitious social spending that started already before 1959 (Altamirano 1999).

Sometimes mentioned with regard to Dutch Disease are international aid and loans, both of them can be associated with appreciating real exchange rate and relative decline of tradable sector (Mwanza 2004, Lane & Bulir 2002). Barder (2006) for instance argues for positive effects of aid, if invested in infrastructure, education or healthcare, they should produce such positive effects that would outweigh any negative effect Dutch Disease could have on the economy in question, positive effects would be mostly productivity gains. Citizen gain as well, with immediately higher employment and possibility of higher consumption their welfare increases. But such assumptions have to be met with reality of often bad institutions and widespread corruption in receiving countries.

2.2 Institutions

Due to discovery of natural resources even conflicts within different parts of society can arise in order to control large flows of money from exporting natural resources – such activity is called rent-seeking, and this activity does not create but draws off national wealth and eventually suppresses activity of entrepreneurs (Benson 1984, Collier & Hoeffler 2004). Institutional approach applied to explain the natural resource curse stands on three pillars – rent-seeking, bad governance and widespread corruption. These generally accepted bad influences are documented to be fuelled by "*unearned*" income[5] resource-exports produce. Agents or government have an incentive to seek rents if such behavior produces more net benefits than behavior targeted at productive activity: one that increases national wealth does not subtract from it (Oomes & Kalcheva 2007). Hausmann & Rigobon (2003) point out that such possibilities for rent-seeking lessen entrepreneurial activity. The reason is simple – for agents such activity is not as profitable as rent-seeking. Of course, benefits of rent-seeking would be lower with increased chance of arrestment, which would be implied under better-enforced laws.

Isham et al (2005) finds countries exporting large portions of oil, minerals and plantation crops to be countries of weak institutions and divided society, this in turn is according to the study strongly correlated with slower growth. Sala-i-Martin & Subramanian (2003) empirically evidences that country's reserves of natural resources have nonlinear and robust negative effect on growth through their corrosive effect on the quality of institutions. Natural resources, that have such negative impact, are found to be only fuel and minerals, i.e. resources whose rents can be easily obtained or acquired. Mauro (1995) establishes statistically significant negative link between corruption and investment and consequently through total investment channel its negative impact on growth. Academic studies often forget to mention how important for a country is in what period the discovery of its natural resources occurred. If state already has strong institutional foundations and good public institutions are in place, then such foundations would protect the state against bad effects implicated by institutional approach to natural resource curse (Leite & Weidmann 1999). Rent-seeking activities would have a lower net benefit as bodies ensuring law and order are more likely to capture bad behavior, surely Dutch Disease could still threaten the economy. Norway is prime example of economy for which oil

[5] Term coined by Deborah Brautigam in Brautigam (2008).

discovery did not lead to excessive corruption or bad governance (Index Mundi 2013).

Sala-i-Martin & Subramanian (2003) studies the specific case of Nigeria to show how rent-seeking affected the lives of ordinary people in Nigeria, between 1970 and 2000 Nigeria had seen its number of poor people to grow more than four-fold, per capita GDP in this period even slightly decreased and income inequality aggravated. On such income inequality in resource-dependent countries report Buccellato & Alessandrini (2009), they find economies exporting large share of ore, metals relative to total exports, to experience higher income inequality as well. Such situation of high inequality is not desirable purely because it divides the society. Wealth elite, small percentage of the whole society, manages to obtain decisive part of the revenues produced by exports of natural resources for themselves. For such wealth elite would more equal and less divided society equal to less benefits, thus these revenues will be further used to undermine liberal/democratic regimes or any effort to establish such regime. From the point of view of institutional economics this implies conservation of bad institutions and status quo. Russia is in fact plagued by large inequalities, both income and wealth (Index Mundi 2013). Guriev & Rachinsky (2006) point out that wealth inequality is higher than income inequality, high wealth inequality according to them is the result of privatization process, where public wealth was transferred to the hands of few individuals, and high income inequality is affected by so-called "*wage decompression*", i.e. wages are now set in a more or less free manner, which was not the case before 1990. It is therefore difficult to distinguish between the effect of privatization and the effect of natural resources alone.

2.2.1 Natural Resources and Taxation

Brautigam (2008) alludes to how much taxation contributed to creation of strong democracies in Anglo-American world, citizens' obligation to pay taxes motivated him to ask for services in return and ask for government's accountability. European states developed hand-in-hand with taxes, gradually as government needed more revenues, more sophisticated bureaucracies were established. Citizens assured themselves that government will function properly, that private property rights will be enforced and they do have to take active part in such process. Paying taxes simply means giving money to government and expecting something in return, at the same time money are required to be spent wisely. Such pressure is assumed to bring about new institutions good for economic growth and strengthen the old ones.

Such constructive relationship between government and its citizens is impaired and disrupted in the case of resource-dependent countries. Why to tax citizens, if large rents can be obtained from exporting natural resources and then serve as filler of government coffins. Citizens do not feel the need to restrain government as much as they would in the other case. Such "*unearned*" income often serves to ruling elite as tool and instrument for remaining in power, which in turn supports the preservation of bad institutions. Change is unwanted. Much of developing countries like Russia appear to be similar to European nations in their earlier times, with their large shares of agriculture for instance (Brautigam 2008). But resource-dependent countries will hardly follow in their footsteps. One positive effect of government receiving significant resource-rents could be that it allows for lower taxation of mobile factors, which should help in creation of better taxation scheme and consequently to promote growth (Hausmann & Rigobon 2003).

2.3 Volatility

As Oomes & Kalcheva (2007) point out that revenues obtained from exports of resources tend to be volatile, since one of the negative features of oil price is their erratic behavior, and supply of natural resources have low price elasticity. Hausmann & Rigobon (2003) estimated that oil prices change between 30% and 35% per year. Low price elasticity may arise from the fact that developing new oil fields is costly and most importantly it is a long-term commitment, where on the other hand changes in oil prices are habitual phenomenon. This volatility, argued by some, affects negatively economic growth. Imperfect financial markets are not able to cope with this volatility, results in theory are: agents invest less, capital is valued at higher cost (Hausmann & Rigobonn 2003). One could argue that intersection of transition countries and well-developed financial markets is zero.

Aizenman & Marion (1999) report on empirical findings establishing significant negative correlation between volatility and private investment in developing countries. Measures of volatility include government expenditure, nominal money growth and change in the real exchange rate (RER). The reason for such negative relationship is assumed to be agents' tendency to give more importance to bad outcomes than the good ones, i.e. generalized preferences, and imperfections in the capital market which disallow market participants to distribute investment optimally over good and bad times[6]. On the other hand public investment is found to be

[6] Credit ceiling for instance.

positively correlated with some of the measures of volatility, implying that in times of uncertainty government boosts public investment in order to lower political instability and support growth. Ramey & Ramey (1995) find negative correlation between volatility and growth, using data sample on 92 countries, some of them from OECD, and help to prove wrong hypothesis that business-cycle volatility does not affect long-term growth. Hausmann & Rigobon (2003) estimated that country‘s GDP generally faces up to 6% decline or increase if oil prices change by 1 standard deviation and compared it with GDP volatility of industrial countries, which is on average equal to 2%, for developing countries the number is between 2% and 4%.

2.4 Corporate Transparency channel

Another channel through which natural resources could have a corrosive impact on growth is suggested to be corporate transparency channel by Durnev & Guriev (2007). They use panel data spanning 16 years to prove hypothesis that rapacious (predatory) government in situation, when oil prices are high (or any other easily rent-generating natural resources), has stronger incentive to expropriate profits of companies in oil industry and consequently, in order for company’s profits not to be expropriated by government or its competitors, company reduces its transparency, for instance by means of „creative accounting“. Such lowered transparency, according to authors, leads to “*an inefficient capital allocation and slower economic growth*”.

Expropriation of profits by government is not improbable scenario in countries with undeveloped institutions. In times of high oil prices, oil-based companies would show a profit and this in turn would increase an appetite of various predators. Tools of the rapacious government can include excessive taxation, confiscation of the assets, regulation, demanding bribes. Company is left with the choice of hiding its money flows in order to resist the attacks of these predators or stay transparent and pay. Lower transparency will lead to company’s lower attractiveness to external capital as Durnev & Guriev (2007) point out. They present the case of Yukos, where transparency helped the company to heavily expand, but when posed a threat to the political elite, had to go out of business.

3 Dutch Disease

3.1 Core model

Corden & Neary (1982) are first who introduced model explaining how economy is affected by a boom in one of its sectors, although at first intended to enlighten results of boom in the energy sector, it is applicable to variety of situations. They use a framework of small open economy, which produces three goods: two tradable goods - energy good, i.e. X_e, and manufacture good, i.e. X_m. These two are subject to international competition, thus traded at "*exogenously given world prices*". Third good is called "*services*" and is non-tradable, price of service is determined inside the model, i.e. endogenous. All goods are used only for final consumption. Economy attains state of full employment at all times as real wages are assumed to be perfectly flexible. Commodity markets are free of distortions and factors of production freely move between sectors, however, intra-national movement of these factors is restricted. Target is to determine how manufacturing sector and distribution of income will be affected by the "*boom*" in the energy sector[7]. Authors then formulate and incorporate such affections into two parts: the resource movement effect and the spending effect.

3.2 The resource movement effect

Marginal product of labor and capital in the energy sector rise as result of boom in this sector, which motivates labor and capital to migrate to energy sector in search of higher compensation, i. e. real wages rise and return on capital increases, away from non-tradable and manufacturing sector. As a result, non-booming sectors, services and manufacturing sector, loose labor resources and their outputs shrink. The resource movement effect will eventually lead to RER appreciation, because prices in the service sector rise as a result of sector‘s lower supply, while prices in the manufacturing sector will stay the same. Corden & Neary (1982) identify this decline in output and employment in manufacturing sector with the term "*direct de-industrialization*".

[7] Here defined as Hicks-neutral improvement in technology.

3.3 The spending effect

Higher real wages in the energy sector boost real national income. Higher real income is reflected in higher spending on services, provided that marginal propensity to consume services is higher than zero, and tradables[8], which eventually affects prices in non-tradable sector in upward manner. Prices of tradables do not change, as they are exogenously given. Entailment of higher prices in services is again relatively higher domestic price level as well as appreciation of real exchange rate. Also as services are demanded relatively more, i.e. their prices increase, they will need to increase their supply. In order to do that, they will have to attract new labor resources by offering higher wages. Wage increase has to be matched by tradable sector, otherwise labor resources would move away. However, it is not possible for tradable sector to increase their prices, which implies they will have to decrease employment and eventually output in order to stay afloat (Oomes & Kalcheva 2007). Again we see manufacturing output and employment decreasing, Corden & Neary (1982) call this "*indirect de-industrialization*".

Some forces of the resource movement effect and the spending effect go against each other. However, the resource movement effect is indicated to be unimportant by Corden & Neary (1982). They predict the energy sector to employ insignificant amount of labor and other resources, which implies no considerable resources would move in reality. Oomes & Kalcheva (2007) confirms the relevance of this assumptions for the Russian case, as the number of workers in the Russian oil sector is relatively low and labor mobility is low too. Thus spending effect is expected to dominate and we are able to obtain unequivocal results for effects of Dutch Disease showed in the following table.

Table 1 Final Dutch Disease effects

Final effect	Wages	Prices	Employment	Output
oil sector	+	Exogenously given	-	-
manufacturing sector	+	Exogenously given	-	-
non-tradable sector	+	+	+	+

How does then economy function without the presence of manufacturing sector? There are few possible reasons why de-industrialization caused by Dutch Disease is threatening for the economy and could lead to lower growth in the long-run as well as

[8] Import as well as domestically produced tradables.

in the short-run. Oomes & Kalcheva (2007) puts forward three reasons for lower growth in the long-run:

i. Manufacturing sector has much more room for technological advancement than any other sector.

ii. Firms in manufacturing sectors face tougher competitive environment, Hausmann & Rigobon (2003) denotes manufacturing sector as more dynamic.

iii. Horizontal and vertical spillovers from technological advancement, the most important one is "*learning-by-doing*" spillover.

Krugman (1997) shows by means of theoretical model that manufacturing industries are unlikely to come back if they are driven out in "*resource*" times. Similarly, when economy's non-oil tradable sector is very small relative to oil sector[9] and non-tradable sector, then more significant movements in oil price will lead to what Égert (2009) calls "*boom-bust economic cycles*". Economy cannot sufficiently compensate and rely in times of low oil prices on any productive activities other than oil, partially because oil manufacturing sector processing natural resources is hit by oil price decline too and its production will fall as well. Hausmann & Rigobon (2003) describes this problem in more detail by pointing out that shocks to oil income and eventually its effects on demand for non-tradables cannot be accommodated by inter-sectoral labor mobility, instead unemployment and expenditure-switching will be the important adjustment-mechanisms for such economy. This will also increase volatility. Implication is that economic growth is heavily dependent on changes in the oil price as evidenced by Algieri (2004), where 1% increase in oil price leads to 0.0256% increase in GDP. Here one could argue if this threat is of long-run nature or it is simply short-run/shorter long-run threat for the economy, since economic growth has the tendency to catch-up fast with rebounding oil price. This catch-up in 2008 took approximately 18 months.

3.4 What are the symptoms of Dutch Disease to be tested?

Straightforward is to test the appreciation of RER as the first symptom, such appreciation is predicted to result from the increase of oil prices and consequent

[9] Oil manufacturing sector counts here as well.

increase in relative price of non-tradables. Here spending effect and resource movement effect operate hand-in-hand. To obtain correct results another determinants of RER movements will have to be included. Next symptom consists of testing the supposed decline of manufacturing sector and rise of non-tradable sector, when oil price are increasing. Oomes & Kalcheva (2007) formulates this task more precisely as a "*slowdown in manufacturing growth*" and "*acceleration in service sector growth*". Another symptom follows from the increase in wages in booming sector. If assumption of labor mobility is fulfilled then wages should equalize across economy. Thus overall wage level ought to be seen to be rising. As Dutch Disease is a wider theme, economists have the possibility to test for other symptoms as well. For instance Algieri (2004) distinguishes amid positive effect of Dutch Disease on a short-run growth, when oil prices are rising, and negative effect of Dutch Disease on a long-run growth and proceeds with testing for "*a temporary improved economic situation*".

This theoretical model of Dutch Disease obviously does not take into account specific process of "economic transition", which Russia still experiences. Specifically it is a transformation from centrally-planned economy into free-market economy. Such „*economic transition*" in Eastern Europe and FSU is evidenced to be accompanied with the fall in manufacturing sectors' employment, i.e. correction of past over-industrialization, and appreciating RER, i.e. Balassa-Samuelson effect. Therefore quantitative analysis of Russia's Dutch Disease can always end up as somewhat biased or ambiguous.

3.5 Dutch Disease in Russia and data problems

Considering the size of the problem and the degree to which the real exchange rate was steadily appreciating until 2008, the list of studies published on the topic is not long. The common denominator of all of them is the conclusion that Russian economy prior to 2007 was at least threatened by Dutch Disease or that certain negative aspects of Dutch Disease were demonstrably occurring in Russia. For period 1997-2005 Oomes & Kalcheva (2007) do find manufacturing growth to be somewhat slower than growth of other sectors and that real wages did rise significantly. Algieri (2004) tests how ratio of industrial production to service production is influenced by oil prices and finds evidence that higher oil prices affect negatively relative industrial production. Latest study by Dobrynska & Turkish (2009) uses ocular econometrics to confirm previous findings of increase in real wages, employment decrease in manufacturing sectoring and increase of employment in service sector, but does not find any sign of de-industrialization. Barisitz & Ollus

(2007) focus on the last symptom of Dutch Disease, asking if deindustrialization is in process and if manufacturing sector became less competitive in period from 2002 to 2006, when the real exchange rate was systematically increasing. Their data analysis shows imports growing faster than domestic production, primarily for machinery and equipment, in some of the sectors domestic production is even exceeded by imports. Only production of textiles is found to be declining, which implies it is the only Russian sector that is de-industrializing. Thus one can conclude that Russian manufacturers had to face increasingly harder competition from abroad in light of strengthening real exchange rate. Numerous studies were performed regarding other oil-dependent countries. Hasanov & Samadova (2010) studies impact of strengthening of the real exchange rate on "export performance of the non-oil sector" in Azerbaijan and finds significant adverse effect of oil price on export performance of Azerbaijan. Sorsa (1999) confirms that appreciation of the real exchange rate is behind the same problems in Algeria and Ogun (1998) confirms that Nigeria is plagued by the same problem. However, Sala-i-Martin & Subramanian (2003) brings evidence of Nigeria not contracting the Dutch Disease, instead emphasizes that the decisive factor is widespread corruption. Égert & Leonard (2008) do not detect Dutch Disease for the case of Kazakhstan.

Lack of empirical studies regarding Dutch Disease and generally any topic related to oil prices or industrial production in Russia is consequence of various data problems. Most importantly time series are subject to frequent revisions, as well as quite short, thus are not often appropriate or useful for long-term analysis (Rautava 2002, Algieri 2004). Data regarding Russian foreign trade have the tendency to be overvalued, specifically EU-25 exports heading to Russia in 2005 were undervalued by 40%, high-value-added imported good suffer the most with undervaluation between 55% to 90%, shadow economy play its part as well (Barisitz & Ollus 2007). Painful problem as well is change in Rosstat's statistics classification at the beginning of 2005, which made impossible to carry out long-term time series analysis after 2006 (Barisitz & Ollus 2007, Oomes & Kalcheva 2007). However, such changes occur continuously and evidently Rosstat was now able to repair some of the time series regarding industrial production.

Economist shall not count much on Russia‘s economic time series fulfilling the condition of „*ceteris paribus*“ as Russia still experiences likely great deal of change in its institutional and economic structure, thus there is possibility of changes in certain variables that are caused by unobserved or hardly quantifiable factors. Also the events of 1998 for instance left the Russia's RER undervalued and away from equilibrium, often used remedy was including dummy variables for specific dates

(Oomes & Kalcheva 2007). Even though some of our analysis uses data beginning in 1999, we will not be able to avoid similar problems, for instance in the form of the financial crisis of 2008.

4 Dutch Disease symptoms

4.1 Symptom 1: Appreciation of the real exchange rate

In this part all possible forces that could have a significant impact on Russia's real exchange rate are listed. These forces shall be divided into two categories of two: first are fundamental forces, second transitory ones. Fundamental forces are those , which do not erode competiveness of Russia's exporters, but are part of an on-going process that is not likely to be reversed in the future and this "*process*" is natural for the workings of the economy. By "*natural process*" we mean mostly catching-up of Russia to economic levels in the West, consequent changes in its industrial structure, all described by the term "*economic transition*". Transitory forces are those that generally do not last for a longer period of time, or are volatile, but still exercise a significant amount of power over Russia's real exchange rate. Much different conclusions about real misalignment and equilibrium exchange rate are obtained when using different theoretical approaches, i.e. assumptions, to model the equilibrium exchange rates of transition countries. Meta-regression analysis done by Égert & Halpern (2005) shows that estimates systematically differ considerably when one uses the Behavioral Equilibrium Exchange rate (BEER), the Fundamental Equilibrium Exchange Rate (FEER) or the Real REER. Thus more variety is needed in analysis of equilibrium exchange rates and to interpret results correctly one shall combine more approaches, specify econometric models variously and discuss differences accordingly with inter-relations among them in mind. Our primary goal is not modeling of the equilibrium exchange rate, thus simple BEER will do. Also our ambition is not to interpret or model deviations of the real exchange rate and its determinants to any advanced extent, e.g. the real exchange rate misalignment.

4.1.1 Balassa-Samuelson Effect

In case of Russia, being centrally-planned economy only twenty years ago, one needs to consider so-called Balassa-Samuelson effect, when interpreting real exchange rate movements. Balassa-Samuelson effect is tied to fast productivity growth that economies in transition, such as Russia and others, experience. The basic logic behind such faster productivity growth of less developed countries such as Russia is that, they adopted economic system of free-market economy allowing for significant economic growth only recently, whereas countries such as USA or Great Britain

support free markets continuously for significantly longer period of time. Then already developed technologies, work procedures are easier to import rather than to develop them from scratch as advanced economies had to. The prime channels of this exchange could be international trade and foreign investment.

Balassa-Samuelson model works with a small open economy divided into two sectors - one producing tradable goods, the other one non-tradable goods. We assume that nominal wage is established in the first sector and second sector adjusts to the same wage level consequently. Although in reality it is enough if wages differ, but their difference is stable over time (Égert & Leonard 2008). Wage in the tradable sector is pushed upwards with positive productivity growth here as marginal productivity of labor increases. Further we assume that productivity growth in non-tradables is close to zero for all trading partners. Very popular example of limited productivity growth of non-tradables is that of a barber, who can serve only a limited number of people, and buying better equipment will not lead to significant improvement in his speed. Then according to Balassa-Samuelson effect, the principal force behind country's real exchange rate appreciation (depreciation) against currencies of its trading partners would be a positive (negative) productivity growth differential in their sectors producing tradable goods. It follows from wage increase in non-tradable sector, which spread from tradable sector, causing the prices in non-tradable sector to increase[10] and eventually pushing CPI to rise as well.

Numerous studies in early 2000's proved applicability of this effect on transition countries. Empirical findings by Égert (2002) regarding Central European countries suggest that productivity gains in tradable sector do translate into price increases in sector producing non-tradable goods, but this rate of "*translation*" varies among individual countries. Similar situation applies for connection between productivity gains and the real exchange rate movements, productivity gains do not fully translate into real exchange rate appreciation. De Broeck & Slok (2002) study all the transition countries and for Russia and other countries, who hadn't yet seen its productivity growth to rise for a longer period of time, is Balassa-Samuelson effect found to be less significant in explaining RER appreciation. This would suggest increased applicability of Balassa-Samuelson effect to countries already on productivity-growth path as Central European countries experienced these productivity developments substantially sooner. However, later work of Égert & Podpiera (2008) summarizes the latest studies and concludes that the Balassa-Samuelson effect accounts at most

[10] They cannot compensate by productivity increase.

for only one third of the overall RER appreciation of Visegrad-4 countries in the period 1995-2006. Special attention is paid to equilibrium exchange rates of Visegrad-4 countries mostly because of the performance criteria related to their functioning in the EU. Researchers do not pay so much attention to Russia as evidenced by the small number of studies published on the topic.

4.1.2 Why Balassa-Samuelson effect is possibly not working ?

The assumption joining together real wages growth and productivity growth could be eroded if distribution of productivity gains across subsectors of the tradable sector is unequal. Égert & Podpiera (2008) mention that Central European countries were seeing larger productivity gains in high-tech sector relatively to low-tech industries. This would imply that real wages do not have to rise as much as they should. For instance Russia's sector producing "*Electrical, electronic and optical equipment*" is example of relatively successful development (Barisitz & Ollus 2007). Equalization of wages, that is pass-through from wages in tradable sector to wages in non-tradable sector, does not have to be complete and this connection is the most important one. Another significant caveat in case of Russia is the positive productivity growth in its non-tradable sector. According to Sosunov & Zamulin (2006) during the period 1999-2005 the labor productivity in construction rose by 73%, for transportation and communication. It equals 41% and 23% for retail and restaurant. If confronted with 49% labor productivity growth in manufacturing, it does not seem as such a large disparity between the two sectors is occurring in reality in terms of their relative productivity growths.

4.1.3 Balassa-Samuelson effect and Dutch Disease

Balassa-Samuelson effect should in theory help the country affected by Dutch Disease as these two forces overlap and negate each other, when it comes to wage growth in manufacturing sector. As commodity sector pushes up wages in non-oil manufacturing sector, usually it would mean falling profitability and pressure to decrease costs elsewhere for firms in this sector, but gains in productivity that open sector of transition country experiences raise marginal productivity of labor and allows the wages to rise without any pressure on prices or restructuring to decrease costs. Égert & Leonard (2008) continues: "*If there is a proportionate wage equalization across sectors and if the increases in wages feed into non-tradable prices in one-to-one fashion, Dutch Disease dominates the Balassa-Samuelson effect in the event that wage increases generated in the oil-producing sector outpace those in the non-oil manufacturing sector (due to productivity increases)*". However, detection of Dutch Disease in consequence is again becoming harder. Most

importantly, Balassa-Samuelson effect shall not be considered as a force driving country's exchange rate away from equilibrium, on the contrary.

4.1.4 Fiscal Policy Effects on the real exchange rate

Because of the nature of relationships we are studying, our interest lies primarily in determining the long-run effects of change in fiscal policy on the real exchange rate. The simplest of the models is presented for instance by Krugman & Obstfeld (2009), where increased government consumption can be of temporary or permanent nature. Temporary increased government spending affects only short-run RER. Permanent boost in government spending leads to a change in expectations and affects short-run RER as well as long-run RER. Both of them, permanent and temporary increase, lead to appreciation of RER. If we let ourselves to think about increase in government spending as increase in fiscal deficit another possible effect presents itself. Algieri (2004) mentions experiences of Italy in 1992 and Argentina in 2001-2002, when increase in fiscal deficit was followed by depreciation of exchange rate. The reason for such effect she mentions is that aggravation of fiscal deficit could lead to a loss of financial credibility, and subsequently introduce times when creditors doubt ability of government to honor its debts, interest on government bonds rises to unprecedented levels, financial markets are mistrustful. Country is then plagued by large outflows of money and what follows is a depreciation of the exchange rate. Revenues of Russian government are heavily dependent on oil and gas revenues, therefore sudden loss of credibility for Russia is not unlikely[11]. Fiscal policy in the cointegrating equation will be represented by government consumption.

4.1.5 Change in the structure of exports/industrial production

Certainly trend in appreciation of Russia's currency is visible and we can undoubtedly explain in theory the appreciation of its RER with an increase in prices in non-tradable goods sector, but what if the RER of tradable goods sector appreciates as well? Naturally, assumption of prices in tradable sector set exogenously in world markets does not hold in reality, but the violation of this assumption would have to be substantial enough in order for the overall RER to be driven by changes in the open sectors‘ RER.

[11] In the period January 2013 – February 2013 oil and gas revenues made up 49.3% of total government revenues in Russia (EEG 2013).

4.1.1.1 Why do tradable prices differ?

When speaking about dissimilar tradable prices across countries, the first reason coming to mind are transportation costs that arise when actors trade in international environment. Transportation costs can be in form of tariff and non-tariff barriers (Krugman & Obstgeld 2009, ch. 9). Second possible reason would be pricing-to-market. However, both reasons do not go far enough to explain continuous rise of tradable prices. Cincibuch & Podpiera (2006) show for some transition countries that pricing-to-market is important, when it comes to real exchange rate volatility, but it cannot produce trend in an appreciation of the real exchange rate.

If the assumption about exogenous tradable prices holds then appreciation of RER deflated by CPI[12] comes solely from increases in non-tradable prices, but case when the RER deflated by PPI appreciates as well, then tradable prices are behind such appreciation obviously. Égert et al (2006) show graph of Russia's PPI-deflated and CPI-deflated real exchange rate between 1990 and 2003 and one can conclude using ocular econometrics that PPI-deflated real exchange rate is relatively stronger than CPI-deflated real exchange rate for the whole period, while at the same time relatively stable difference is preserved between these two since 1992. Égert et al (2006) continues arguing: "*the Balassa-Samuelson effect can explain only the difference between the CPI-deflated RER and the PPI-deflated RER and cannot account for the entirety of long-term real exchange rate movements*". This means that prices in tradable sector do rise and it is an attribute of systematic nature. Lommatzsch & Tober (2004) find that productivity increase is one of the sources of appreciation of PPI-deflated real exchange rate in Czech Republic, Hungary and Poland. Authors use productivity growth as proxy for production of relatively higher-value-added goods, thus it is completely different reason for including this variable into regression model than in case of Balassa-Samuelson effect. When one considers already mentioned studies on Balassa-Samuelson effect, which found productivity growth to be significant determinant in appreciation of CPI-deflated real exchange rate in transition countries, and observed behavior of both real exchange rates in Russia between 1992 and 2003, conclusion should be that tradable prices are behind appreciation of CPI-deflated real exchange rate in Russia. We assume here that transition countries are similar in relevant aspects, because no study, such as Lommatzsch & Tober (2004), was performed in case of Russia. On the other hand, Russia's RER deflated by CPI can be undervalued, and thus not good approximation of reality, simply because transition countries tend to give less weight to services and

[12] Taken as proxy for overall inflation.

more weight to industrial goods in their consumer's baskets than advanced economies and CPI is lower than it otherwise should be (Égert et al 2006). Also non-tradable sector is likely to produce some output, which is in turn used by tradable sector as input, thus tradable prices will rise indirectly as a result of Balassa-Samuelson effect.

4.1.1.2 Changing structure of exports as explanation?

Why would tradable price rise continuously as economy is growing? Égert et al (2006) presents hypothesis specific to situation of transition that thanks to goods of low quality, which are produced by domestic producers at the beginning of economic transformation, domestic and foreign consumers initially prefer to buy and consume foreign goods of higher quality. Gradually such preferences should change and move away from foreign goods, and consumers of domestic and foreign origin should start consuming more of domestic production for simple reason of better quality. This better quality is ensured by growing labor productivity in the manufacturing sector. Égert et al (2006) states that manufacturers then can ask for higher selling prices regarding their products, since they are of better quality and domestic consumers are often biased against foreign goods, i.e. patriotic sentiment, cultural preferences. Here the channel of transmission of productivity gains to the RER is same for tradable sector as well as for non-tradable sector, tradable prices rise and if the hike in tradable prices is higher for our economy than for economies of our trading partners, our economy achieves relatively higher price level and consequently the RER appreciates. This explanation is supported by research (Lommatzsch & Tober 2004, Cincibuch & Podpiera 2006).

4.1.1.3 Natural change of industrial configuration?

Ito et al (1999) expands on the topic and ties such transition-specific change in domestic production with the very nature of growth less developed countries are facing. According to their hypothesis, economy has to move from production of agricultural products towards production of more and more sophisticated goods in order to grow. They argue that for growth to be sustainable particular change in export structure must occur. Country occupying the lower ranks of economic development, which was Russia's case at the beginning of transition, cannot immediately start producing high-value added goods such as computer chips, even foreign investors need well-educated workers and certain kinds of sophisticated support. Thus our country is left with producing agricultural and textile goods and certainly experiences large productivity gains in this area and others due to catching-up. Large productivity gains cannot be experienced forever, textiles and agricultural products will become eventually less profitable, international competitiveness of labor-intensive industries, such as textiles, is easily damaged due to wage increases or

trade protectionism from abroad. And there is only a limited space for such products in global markets. Gradually as people learn, e.g. better morale, the economy can move towards producing more sophisticated goods, such as machinery, which requires know-how and skilled workforce. This way tradable prices rise and positive inflation differential in tradable prices with developed countries induces the RER of open sector to appreciate.

Ito et al (1999) uses as proxy for country's export advancement the ratio of machinery exports to total exports, for some countries in sample it is found to be significant, of course use of such measure can be questioned. Large part of statistical analysis concerning Balassa-Samuelson effect and country's export advancement is being able to truly define what sector or goods are tradable and which non-tradable.

4.1.1.4 Imperfect substitutability

Ricci & MacDonald (2002) studies case of imperfect substitutability of tradable goods and its effect on economy's RER. If tradable goods are imperfectly substitutable, as it is case in Russia (Ahrend 2006, Sosunov & Zamulin 2006), rising productivity in tradable sector has not only boosting impact on prices in non-tradable sector, but affects prices of tradable goods as well. Thanks to home bias Ricci & MacDonald (2002) show by means of theoretical model that such increase in productivity is going to have negative impact on prices of goods produced by domestic tradable sector. This creates two kinds of pressures on the real exchange rate, one is of strengthening sort caused by Balassa-Samuelson effect and the other one is of debilitating sort caused by fall in domestic prices thanks to imperfect substitutability and home bias, which lowers domestic price level relatively to foreign one. The result of clash of those two forces depends on how important standing occupies non-tradable sector in our economy (Égert et al 2006). If the share of non-tradable sector is not minor, then Balassa-Samuelson effect should prevail over effect of smaller domestic prices on overall price level (Ricci & MacDonald 2002, Égert et al 2006).

4.1.2 Increase/Decrease in oil export revenues

Study by Sosunov & Zamulin (2006) is the only one introducing effect of changes in the oil export revenues on movements of the real exchange rate in Russia. Logic behind this factor as presented in Sosunov & Zamulin (2006) is simple. If revenues from exporting oil and other natural resources unexpectedly rise, then agents receiving such revenues, i.e. consumers, will see their incomes rise and spend more money in markets on imported goods and goods produced at home. With imported goods being sold at exogenously given world prices, only those prices of goods

produced at home will rise and as a result the domestic price level increases. Oil-exporting country sees its exchange rate appreciate in real terms.

Why introduce oil export revenues into fundamental forces? Even though the volume of exported oil almost doubled in volume between 1999-2005, this increase shall not be seen as something easily reversible, as large investments were made into oil-extracting sector, for instance to open new oil fields and better equipment (Sosunov & Zamulin 2006). Oil income can be decomposed into oil price and oil export volume, the second component is missing in all of the previous studies.

4.1.3 International Reserves

Central Bank of Russia has the tendency to store rather significant amounts of foreign exchange, most likely with the goal of reducing pressures on the appreciation of real exchange rate (Sosunov & Zamulin 2007). Although in the long-run it should lead to inflation and ultimately to appreciation of real exchange rate. Here Dobrynskaya & Turkish (2009) consider the role of the Stabilization Fund, according to them increased government savings contained inflationary pressures.

4.1.4 State-controlled prices of utilities

Transition countries still have relatively important proportions of regulated prices contained in their CPIs. Following table shows the share of administered prices in Russia's CPI, the last available data from 2007 show that 6.7% of prices in CPI were regulated. These regulated[13]prices are generally tied to services.

Table 2 Share of administered prices in CPI (%) for Russia

2003	2004	2005	2006	2007	2008	2009
13	13	13	6.7	6.7	na	na

Source: EBRD Transition Report (2009).

In case of Russia, Sosunov & Zamulin (2006) mentions that government regulated important segments of prices in sectors, such as electricity, railroads and gas. Also for transition countries in Central and Eastern Europe (CEEC) the real exchange rate of non-market services is relatively more undervalued the real exchange rate of tradables or services, which are market-based (Égert et al 2006). This would imply future possibilities of real exchange appreciation depending on how these countries

[13] Also administered, we shall consider them as interchangeable.

decide to deal with regulated prices. Russia's real exchange rate is in fact highly correlated with movements in the regulated prices (Sosunov & Zamulin 2006).

4.1.5 Empirical part

In general, macroeconomic time series tend to be non-stationary, typically integrated of order one, i.e. I(1), thus usual statistical inference need not to be valid as regressing two I(1) time series can lead to spurious regression. For each variable Augmented Dickey-Fuller (ADF) test is carried out with an intercept or with an intercept and trend, both in levels and differences, in order to establish presence of unit root in individual variables. Null hypothesis for both ADF test is that of non-stationarity of time series in question. ADF test is considered by many to be more precise than Phillips-Peron (PP) test, thus will be given priority. Concept of cointegration, presented in Engle & Granger (1987), helps us to determine if there is truly statistically significant long-term relationship between two I(1) variables, later extended by Johansen (1988) to cover cases of cointegrating relationships among numerous variables, i.e. more than two relationships, and estimate how many of such cointegrating vectors exist (Greene 2005, p. 655-657). Tested model will be:

$$REER=f(OIL\_PRICE, PROD, GOV\_CONS, INT\_RESERVES).$$

Government consumption (GOV_CONS), international reserves (INT_RESERVES) and oil price appear to have unit root (Appendix 1, Table 8). Only productivity (PROD) does not have unit root, according to ADF test productivity is trend-stationary. This implies that productivity is not fit to be included in our model. Construction of this variable is constrained by unavailability of data. Oomes & Kalcheva (2007) constructed this variable as ratio of Russia industrial[14] output per worker to the equally weighted Euro area and U.S. industrial output per worker. Data on Russia's industrial output are available on monthly basis, but industrial employment data are available to public only on yearly basis (Rosstat 2013). Naturally, this results in rather inconsistent time series with large disparities between years. Data on industrial employment in Euro area are fragmented and consequently one cannot construct labor productivity on monthly basis (Eurostat 2013). Our productivity variable thus omits productivity growth in Euro area and this could be the second reason, why productivity variable does not have an unit root. It is important to note that Balassa-Samuelson effect works with the productivity growth of country relative to other trading partners, not with the absolute growth. Due to

[14] Here we define „industrial" as consisting of „Manufacturing", „Mining and quarrying" and „Electricity, gas and water supply".

such problems it is not possible as well to follow practice of Lommatzsch & Tober (2004) in order to establish effect of productivity growth on PPI-deflated real exchange rate. Relative roductivity growth appears to be significant determinant of REER. Statistical attributes of model Oomes & Kalcheva (2007) used improved significantly upon including this variable in cointegrating equation. Oomes & Kalcheva (2007) also use corruption variable to account for rent-seeking and other negative institutional effects, but do not find it statistically significant. Although, as they point out, there are inherent problems with measuring corruption and it is not suitable for time series analyses as only yearly data are available.

Trace statistic confirms existence of 3 cointegrating equations and Maximum Eigenvalue statistic confirms the existence of 1 cointegrating equation at the 0.05 level for the model without PROD. Intercept was included in cointegrating equation as well as in VAR equation.

Table 3 Symptom 1: Cointegrating equation

Sample (adjusted): 1997M08 2012M12
Included observations: 185 after adjustments

Trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.171571	70.47271	47.85613	0.0001
At most 1 *	0.098183	35.65127	29.79707	0.0094
At most 2 *	0.066504	16.53265	15.49471	0.0348
At most 3	0.020337	3.801151	3.841466	0.0512

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

Maximum Eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.171571	34.82143	27.58434	0.0049
At most 1	0.098183	19.11862	21.13162	0.0934
At most 2	0.066504	12.73150	14.26460	0.0861
At most 3	0.020337	3.801151	3.841466	0.0512

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

It should be noted that including crude oil export volumes led to statistically insignificant results. All variables are significantly different from zero at the 0.05 level, however, our model exhibits serial correlation and heteroscedasticity in its residuals, consequently normality of residuals was not achieved as well (Appendix 1, Table 9, Table 10, Table 11). We tried to include various dummy variables in order to

account for Russian financial crisis in 1998 and 2008, but satisfactory results were not reached again. Any conclusions thus cannot be made regarding the effect oil price have on the Russian real exchange rate, because theoretical assumptions of cointegration were not met. We can only speculate to what extent plays the role of not including relative productivity growth in our unsatisfactory results.

4.2 Symptom 2: Rising wage level

Resource movement effect and spending effect are both clear on behavior of wages in our three sectors. Resource movement effect causes wages in oil sector to increase and this supports the wage increases in other sectors due to inter-sector equalization. Spending effect causes wages to increase in non-tradable sector, this in turn should increase wages in rest of the economy, again due to process of wage-equalization. Even though both effects cause wages to increase in all sectors, the origin of these positive pressures on overall wage level comes from different sectors. We established that spending effect should dominate the resource movement one, which implies that non-tradable sector is the generator of wage increase.

To properly determine what sector is really the generator of wage increase, we would need more detailed data. Rosstat (2013) provides only yearly data on nominal wages for different subsectors of the economy, thus we have to rely on descriptive analysis herein. Increase in overall wage level is studied by computing real wage growth rate for sectors of Russia's economy. Between years 2000 and 2008 real wages grew very fast in all sectors. In "*manufacturing*" this growth was higher than in "*mining and quarrying*" across the whole period. There are not significant differences in real wage growth rate between manufacturing sector and service sectors. Such behavior of wages is consistent with predictions of Dutch Disease, when oil price is rising. The observed trend reversed in 2009, when real wages actually fell in most sectors. In 2010 and 2011 real wages again started to grow significantly. Brent Spot price dropped from 113.24 dollars per barrel in August 2008 to 39.95 dollars per barrel 4 months later, 16 months later it reached 124.23 dollars per barrel. We can conclude that observed behavior of wages is roughly consistent with oil price movements and Dutch Disease is likely to be in play.

Rapid growth of real wages in the years before 2008 can be explained by factors not tied to Dutch Disease. First important player could be fast productivity growth, which raises marginal productivity of labor, and is likely to be behind a strong wage growth. Wage growth for all sectors adjusted for productivity growth between 2002 and 2004

is reported to be close to zero[15] (Oomes & Kalcheva 2007). Last two of them could be so-called "*wage decompression*" and "*wage de-shadowization*", the first was already described, the latter Oomes & Kalcheva (2007) describes as process that introduces unrecorded wages into official statistics, thus real wages are seem to be increasing, but in fact they are not.

4.3 Symptom 3: Short-run effect of Dutch Disease

Suitable example of this symptom is the historic experience of Venezuela between 1920-1980s and thereafter. During these 60 years since 1920s, when oil price were rising, Venezuela was at the top of economic rankings with its growth in per capita income and other growth indicators, however, once oil incomes fell down, Venezuela started to occupy the bottom of these rankings for the next 20 years (Hausmann & Rigobon 2003). Venezuela didn't have any back-up plan in case resource rents disappear. Back-up plan would be competitive non-oil manufacturing sector on which country could rely on in times oil income fall. Russia's growth since 1999 is astonishing, average annual real growth of GDP was 6.84% for the period 1999-2008 and average real growth of GDP per capita was 6.6% for the same period. Some say this growth was spurred by the process of wide import substitution following the devaluation in 1998, some say it was mostly caused by the oil price increase (Merlevede et al 2007, Sosunov & Zamulin 2006). Between January 1999 – June 2008 oil price has risen by approximately 1091%, i.e. from 11.11 dollars per barrel to 132.32 dollars per barrel, while oil export volumes of crude oil increased from 34.5 million tons to 66.3 million tons between Q1 1999 – Q4 2004, which is 92,2% increase, after Q1 2005 exported volumes stayed relatively stagnant, i.e. between 57.7 – 65.2 million tons. Exports of natural gas for the period Q1 1997 – Q4 2012 stayed always within 40 000 – 58 000 millions of cubic meters, exports of Oil Products on the other hand also increased from 14.3 million tons in Q1 1999 to 34.4 million tons in Q4 2012 Aggregating these changes leads to conclusion that oil income increased significantly since 1999.

4.3.1 Literature review

Rautava (2002) establishes formally the link between oil prices and GDP with data spanning Q1 1995 – Q3 2001, the only explanatory variable is the oil price, author finds out that 10% increase in oil prices leads to 2.2% growth of GDP, however, this

[15] Although author stresses that these calculations should be "*interpreted with caution*" due to incomplete data.

doesn't take into account the effect that oil prices have on the real exchange rate, which in turn affects GDP. Algieri (2004) offers remedy with including this symptom into Dutch Disease framework, which allowed to extract the effect oil prices have on the real exchange rate and in turn extract the impact of the real exchange rate has on GDP. Author establishes for the period September 1999 – May 2002 that 10% long-run increase in oil price leads to 2.1% increase in GDP and 10% long-run appreciation of the real exchange rate leads to 2.2% drop in GDP. At the same time 10% long-run increase in oil price leads to appreciation of the real exchange rate by 8.38%, thus final effect of 10% increase in oil price is 0.256% rise in GDP. One possible explanation of negative relationship between the real exchange rate and GDP is that appreciation makes Russia's non-oil exports less competitive in international markets, which in turn lowers GDP. Ito (2008) estimates for sample ranging from Q1 1997 to Q4 2007 that 10% oil price increase causes real GDP to increase by 0.77% over the next year and by 2.55% over the next 4 years, also this increase in oil price impacts positively on inflation by 1.18% over the next year and 3.69% over the next 4 years. Early research did not take into account the full effect of oil revenues on GDP, i.e. the effect of increase in volume of exported crude oil alone was not accounted for. Lastly, Égert (2009) analyses panel data of FSU countries using 5-year and 8-year averages and finds that oil exports have positive impact on the growth in the long-run. However, one can hypothesize what dataset is sufficiently long to investigate the long-term effects Dutch Disease could produce. Some studies integrate this symptom into macro-model of the whole economy (Merlevede et al 2007).

4.3.2 Empirical part

We are going to use newly reviewed data on nominal GDP published by Rosstat (2013) in 2013 for the period Q1 1999-Q3 2012, also the Central Bank of Russia newly publishes quarterly data for crude oil exports spanning Q1 1997 – Q4 2012, these data are already seasonally adjusted by means of X12. The same seasonal adjustment will be made to GDP and GDP deflator as both time series visibly exhibit seasonality. All variables were transformed using log function. We can conclude, due to ADF tests carried out, that all involved time series are integrated of order one (Appendix 1, Table 8). We can proceed with testing for cointegration. Tested model will be

$$GDP=f(OIL\_PRICE, OIL\_EXPORT\_VOLUME, REER).$$

Oil price and oil export volumes are predicted to have positive effect on GDP, REER should have negative effect on GDP due to reduction of non-oil exports following the

appreciation of RER. Both statistics, Trace statistic and Maximum Eigenvalue statistic, confirm the existence of 1 Cointegrating Equation at the 0.05 level. Following two tables summarize the results.

Table 4 Symptom 3: Johansen cointegration tests

Included observations: 52 after adjustments
Trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.493244	61.50613	47.85613	0.0016
At most 1	0.265389	26.16038	29.79707	0.1240
At most 2	0.135753	10.12285	15.49471	0.2714
At most 3	0.047603	2.536218	3.841466	0.1113

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Maximum Eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.493244	35.34575	27.58434	0.0041
At most 1	0.265389	16.03753	21.13162	0.2227
At most 2	0.135753	7.586635	14.26460	0.4223
At most 3	0.047603	2.536218	3.841466	0.1113

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5 Symptom 3: Cointegrating equation

(standard error in parentheses, t-Statistics in brackets)

LGDP	LOILE	LOILP	LREER
1.000000	0.293577	0.540511	-0.424627
	(0.11027)	(0.07325)	(0.21310)
	[-2.66237]	[-7.37903]	[1.99265]

Intercept was included in VAR equation as well as in Cointegrating Equation and number of lags (2) was selected based on Akaike Information Criterion (AIC). Oil price and oil export volumes are statistically different from zero at the 0.05 level, variable standing for the real effective exchange rate (REER) is statistically different from zero at the 0.06 level. Residuals were tested for serial correlation, heteroscedasticity and normality (Appendix 1, Table X, Table X, Table X). The Lagrange-Multiplier test for serial correlation confirmed no significant autocorrelation up to 6^{th} lag and White test for heteroscedasticity confirmed that null

hypothesis of homoscedasticity could not be rejected at the 0.05 level. Normality of residuals was not achieved, most likely due to outliers present in our sample.

Our results suggest that 1% increase in oil price leads to 0.54% increase in GDP, 1% increase in oil export volumes leads to 0.29% increase in GDP and 1% increase in REER leads to reduction of GDP by 0.42%. Because we were not able to establish significant link between oil price and REER, we cannot say with certainty if increase in oil price leads to indirect reduction of GDP through REER. Oil export volumes were found to be insignificant determinant of REER, thus there is no counter-reduction of GDP through REER.

4.4 Symptom 4: De-industrialization

In theory, both resource movement effect and spending effect should cause fall in employment and in the output of manufacturing sector, eventually leading to de-industrialization. If spending effect dominates, as predicted, the resource move out from oil sector and manufacturing sector into non-tradable sector. This leaves us with a clear goal to test for the signs of de-industrialization. Most often, deindustrialization is defined as declining ratio of employment in manufacturing sector and total employment. However, what completes the picture is second definition of de-industrialization: falling ratio of manufacturing output and total output. If the employment ratio falls, but the output ratio remain stable or even increases, we face the situation best described by Rowthorn & Wells (1987, p. 5-6) as "*positive deindustrialization*". Positive because service sectors, i.e. non-tradable sectors, are generally regarded as sectors that are less dynamic and do not see their productivities to grow as much as manufacturing sector. Then if manufacturing sector sees its productivity numbers be higher than service sector, its employment declines, but its output relatively to output of service sector stays stable or even grow. Such de-industrialization can hardly be regarded as bad.

It is also possible to test for relative de-industrialization. Relative de-industrialization means that manufacturing sector is being out-grown in terms of output by service sector. Absolute de-industrialization would mean that output alone of manufacturing sector is falling, which however does not have to apply for the case of relative de-industrialization. In our setting, it is reasonable to test for relative de-industrialization only as there are other forces, specific for Russia, that push the output of manufacturing sector up and in consequence absolute de-industrialization is not an option. Also Saeger (1997) finds that country's relative endowments of natural resources predict with statistical significance country's share of manufacturing

employment relative to total employment. The same applies between per capita GDP and above-mentioned manufacturing employment ratio.

4.4.1 Other forces mirroring Dutch Disease

One of the main sources of industrial restructuring of Russian economy is its previous existence as centrally-planned economy. During Soviet times, the communist planners put emphasis on particular industrial sectors, which resulted in over-industrialization. Services were ignored due to belief that they are relatively inferior and are not basis for fast economic growth. Consequently we see reversal of this process, when catering to the needs of consumers after 1992 kick-started fast growth of service sector and industrial restructuring. By industrial restructuring it is meant fast industrial productivity growth, falling industrial employment and rising industrial output, however, service sector still outgrows industrial sector. Second source of observed restructuring could be tied to topic, which is discussed with regard to developed economies.. It is widely acknowledged that high-income economies have larger shares of service sector, i.e. larger share of employment is located there, but low-income economies on the other hand tend to have larger shares of agricultural sector (Mickiewicz & Zalewska 2002, Schaeffer 1997). Then if such low-income economy grows, it is predicted that agricultural sector will lose its share and manufacturing sector and service sector will see their shares to grow in importance. However, as manufacturing sector expands, economy is predicted to hit certain point in which reversal of this expansion will start to occur and manufacturing sector from then on will face relative decline. At the same time service sector does not follow such stop of expansion, instead it is supposed to grow even in the future (Mickiewicz & Zalewska 2002). The last part is called "*tertiarization process*" and is caused in theory by relatively faster productivity growth in manufacturing sector than in service sector, which allows for more labor resources to be transferred into services as manufacturing sector does not need them anymore. Most important implication is that de-industrialization going hand-in-hand with oil price increase need not to be sign of Dutch Disease, it could still be contribution of natural restructuring towards free-market economy or an advancement taking Russia into group of advanced economies.

4.4.2 Literature review

Symptom of relative de-industrialization is tested most often using descriptive analysis. Barisitz & Ollus (2007) compare the growth of industrial domestic production with the growth of industrial imports for different sub-sectors of industry for the period 2002 – 2006, when oil prices were rising, they also use only EU-25's export data as proxy for total imports, these make up for stable 44% share of the total

amount of imports. They conclude that domestic industrial production was growing slower than imports in most of the sub-sectors, however, as they point out, that did not have to erode competitiveness of domestic producers due to transition-specific factors, such as high import elasticity. Production of textile product is the only sector to be evidently de-industrializing. Dobrynskaya & Turkish (2009) uses descriptive analysis and notes that employment in manufacturing sector fell, but the average year-on-year growth rate of production in manufacturing sector between 1999-2007 was higher than in services, agriculture and oil extracting. Algieri (2004) formally tests how ratio of industrial output and service output is affected by changes in oil prices for the period April 1994 – May 2002, author finds significant negative relationship equal to decrease of 0.084% in the output ratio if oil price rises by 1%. Oomes & Kalcheva (2007) uses as a dependent variable only production in non-oil manufacturing sectors, i.e. tests for absolute de-industrialization. The results are statistically significant, but only light industry is negatively affected by increase of oil price, while others, such as machinery, forestry, food, are positively affected by an increase of oil price. Explanation coming into mind is that these sectors are stil somewhat dependent on oil prices. Ahrend (2006) argues by means of revealed comparative advantage that Russia does not have any sectors internationally competitive other than sectors tied to natural resources.

4.4.3 Empirical part

As we argued, more appropriate is to test for relative de-industrialization. However, we are constrained by availability of data Rosstat (2013) provides on service sector. Data on national accounts are severely fragmented as consistent detailed quarterly data on production of GDP are available only from 2004 to 2011. Also linear interpolation of quarterly data often leads to serial correlation in residuals as evidenced by experience of the author. On the other hand, data on output of manufacturing sector are available on monthly basis since 1995. Rosstat (2013) newly does provide monthly data on service sector, but it seems that these data are only related to non-market services, official explanation Rosstat (2013) does not provide. We do not have any other choice than follow practice of Oomes & Kalcheva (2007) and use as dependent variable only manufacturing output. We will be effectively testing for absolute de-industrialization Tested model will be as follows:

$$MAN\_OUTPUT=f(t, OIL\_PRICE, REER, FOREIGN\_DEMAND).$$

Foreign demand is represented by Russia's total exports to Eurozone 17, including this variable should account for changes in manufacturing output caused by changes in foreign demand, expected sign is positive. Including trend variable is important in

order to account for so-called "transition effect", which consists of large productivity gains being experienced manufacturing sector and consequent output improvement. "*Transition effect*" in this regard somewhat overlaps with "*tertiarization process*". If data on productivity are available, trend does not have to included. The expected effect of oil price on manufacturing output is negative, the same applies for REER. ADF tests were carried out, all included time series appear to have unit root (Appendix 1, Table 8). Trace statistic and Maximum Eigenvalue statistic confirm the existence of 1 cointegrating equation, in this equation intercept and trend were included (Appendix 1, Table 16). Cointegrating equation is in the following table.

Table 6 Symptom 4: Cointegrating equation, model 1

(standard error in parentheses, t-Statistics in brackets)

LMAN	LOILP	LREER	LEUIMP	@TREND(99M02)
1.000000	-0.334203	2.473454	0.743021	-0.003011
	(0.11560)	(0.61156)	(0.38554)	(0.00220)
	[-2.891]	[4.0445]	[1.92722]	[1.3686]

Inspecting residuals of our model tells us that there is significant serial correlation in residuals at the two 5th lag (Appendix 1, Table 17). More important fact is that REER has very large positive effect on manufacturing output, i.e. 1% increase in REER leads to 2.5% increase in manufacturing output, and previous literature already established significant positive relationship between oil price and REER. So even if 1% increase in oil price leads to 0.33% reduction in manufacturing output, it will more than compensate for such decline by pushing manufacturing output up through appreciation of REER at the same time[16]. We had to drop foreign demand from our model, after that we were able to confirm the existence of 1 cointegrating equation and achieve serially uncorrelated residuals, on the other hand, normality and homoscedasticity of residuals was still not achieved (Appendix 1, Table 18, Table 19, Table 20, Table 21).

Table **7** Symptom 4: Cointegrating equation, model 2

(standard error in parentheses, t-Statistics are in brackets)

LMAN	LOILP	LREER	@TREND(99M02)
1.000000	0.382351	0.609782	-0.003255
	(0.04836)	(0.16001)	(0.00082)
	[7.90634]	[3.8109]	[-3.9695]

[16] Elasticity of REER with respect to oil price was estimated to be 0.31 (Spatafora & Stavrev 2003) or 0.58 (Oomes & Kalcheva 2007).

It appears that manufacturing output is significantly related to oil price in a positive way, the same applies for REER. First relationship is in line with what Oomes & Kalcheva (2007) finds for some individual sub-sectors, apparently Russian manufacturing sector cannot be labeled as "*non-oil*" completely. Our results suggest that oil manufacturing sector prevails over non-oil manufacturing sector. Large part of the economy is indirectly dependent on oil prices in a very significant way. Absolute de-industrialization is not confirmed, but such results completely change the relevance of assumptions about dominance of spending effect. Resource movement effect can have significant impact, because oil sector and oil manufacturing sector are relatively large, when combined. This also supports Russia's significant vulnerability to oil price shocks. If we are to work with purely a non-oil manufacturing sector, results could be different. REER and included trend do not have the expected signs and author of this thesis is not able to explain why right now. Maybe trend has negative effect only because of the fall of manufacturing output in the second half of 2008, again including relative productivity growth would be more appropriate. If trend and REER are not included in our equation, results stay the same, only elasticity of manufacturing output with respect to oil price mildly decreases by 0.003.

5 Conclusion

This thesis took upon itself to study the degree of resource-dependence Russia exhibits. Resource-dependence is studied within the framework of Dutch Disease, which provides solid theoretical foundations for our inquiries. We divide detection of Dutch Disease into four following symptoms: 1. an appreciation of the real exchange rate; 2. short-run dependency of Russia's economy on oil income; 3. an increase/decrease in overall wage level; 4. absolute de-industrialization.

Testing the first symptom was plagued by unavailability of certain data. We were unable to introduce relative productivity growth of Russia's industrial sector into our cointegrating equation. Relative productivity growth is important determinant of movements of the real exchange rate as evidenced by other studies, but it remains unclear if this relationship can be ascribed to Balassa-Samuelson effect or to the effect of quality improvements in goods produced by Russia's open sector. Consequently, satisfying statistical results were not reached regarding the link between the real exchange rate and oil price. However, previous studies always confirmed statistically significant positive effect of oil price on Russia's real exchange rate.

Regarding the second symptom we introduced new variable into Dutch Disease framework in the form of oil export volumes. Other studies used only oil price and REER, when explaining movements of Russia's GDP, and it seems it was not enough. Both, oil price and oil export volumes, affect Russia's GDP in a significant positive way. Elasticity of GDP with respect to oil price, oil export volumes is estimated to be 0.541, respectively 0.294. REER is linked with GDP in a negative way, namely 1% increase in REER implies 0.425% reduction of GDP. Because other studies did confirm significant positive relationship between oil price and REER, the elasticity of GDP with respect to oil price should be lower than we estimated, i.e. oil price also reduces GDP through REER. Between oil export volumes and REER we didn't find statistically significant relationship, i.e. that particular elasticity is correct in the present form. We can conclude that Russia's GDP is heavily dependent on oil income.

Behavior of overall wage level was tested using descriptive analysis. The movements in overall wage level are roughly consistent with the predictions of our model. When oil price was increasing, wages were significantly increasing as well. When oil prices

fell, wages fell across almost all sub-sectors of Russia's economy also. However, observed behavior of wages could result from significant gains in productivity and decrease of real wages in 2009 could be partially result of general slowdown in rest of the world. On the other hand, real wages picked up again in 2010 and 2011 considerably, while at the same time oil prices grew as well and were almost reaching historical maxima.

Last symptom provided surprising results. Even though our model predicts shrinking manufacturing sector, when oil price is rising, we achieved completely opposite result. Manufacturing output is found to be positively related with oil price, the elasticity of manufacturing output with respect to oil price is estimated to be 0.38. Such result is not contradictory, it only implies wrong division between oil and manufacturing sector and between manufacturing and service sector. Also it completes the picture as to why is Russia's GDP so dependent on oil income. We simply cannot assume that manufacturing sector is predominantly non-oil, i.e. oil manufacturing sector prevails.

Russia shows some signs of Dutch Disease, but it is not possible to confirm fully the presence of Dutch Disease. Especially non-oil manufacturing sector appears to be very small, which confirms conclusion of Ahrend (2006). This implies relevance of the resource movement effect, which is crucial part of Dutch Disease model.

Russia's economy needs more diversification and internationally competitive sectors not dependent on oil price. One of Sala-i-Martin & Subramanian (2003) propositions regarding resource-dependent countries with undeveloped institutions is to distribute oil-revenues evenly and directly to citizens, so government has to rely on general taxation, not on resource revenues. This in turn would give incentive to a government to provide better services and public goods for citizens, accountability would be called for. Mentioned side effect of that proposition is loss of importance for central government, more power would be transferred to local governments. Public redistribution of resource-revenues would lead to increase in private savings at the expense of government savings, follows question if stabilization is best done by private or state sector. Hausmann & Rigobon (2003) argues that private sector is more fit for the task of smoothing consumption, i.e. in good times be saving and in bad times increase spending to balance expenses, because the government solution has the effect of overspending, which follows from particular attribute of fiscal spending, where costs are shared by everyone, but benefits are private, thanks to that group of voters will fear their share of profit could be spend on somebody else in the future and thus they will pressure the government to spend it now while resource

prices are high. To protect itself against Dutch Disease Russia has to simply continue in diversification of its economy

There is a need for further research on less aggregated level. More emphasis could be put on finding, what sub-sectors of Russian economy are in fact internationally competitive, i.e. if some manufacturing sub-sectors are non-tradable in practice, and what subsectors are producing complementary goods relative to imports. The division between oil, tradable and non-tradable sectors is not clear-cut. Also inter-sectoral labor mobility, Balassa-Samuelson effect and rising prices in non-oil tradable sector are rarely discussed in Russia's case. Partially a will for research in these areas is constrained by unavailable data. It would be useful to use PPI-deflated real exchange rate rather than CPI-deflated one in order to see formally, if variable expressing productivity growth is still cointegrated with this exchange rate.

6 Bibliography

Aizenman, J. & N. Marion (1999): "Volatility and Investment: Interpreting Evidence from Developing Countries," Economica, Vol. 66, pp. 157–79.

Ahrend, R. (2006): "Russian Industrial Restructuring: Trends in Productivity, Competitiveness and Comparative Advantage," Post-Communist Economies, Taylor and Francis Journals, vol. 18(3), pages 277-295.

Algieri, B. (2004): "The Effects Of The Dutch Disease In Russia," Discussion Papers 18721, University of Bonn, Center for Development Research (ZEF). [Online; accessed 21-April-2012].

Altamirano, N. (1999): "Sustainable Development and Exhaustible Resources: The Dutch Disease is not a Disease at all, " Research Report No. 08, University of California,.

Barder, O. M. (2006): "A Policymakers' Guide to Dutch Disease," Working Paper No. 91., Center for Global Development. Available at SSRN: http://ssrn.com/abstract=983124 or http://dx.doi.org/10.2139/ssrn.983124. [Online; accessed 25-April-2012].

Barisitz, S. & S. Ollus (2007): "The Russian Nonfuel Sector: Signs of the Dutch Disease? Evidence from EU-25 Import Competition," Focus on European Economic Integration, Oesterreichische Nationalbank (Austrian Central Bank), issue 1, pages 150-166.

Benson, B. L. (1984): "Rent Seeking from a Property Rights Perspective," Southern Economic Journal Vol. 51, No. 2, pp. 388-400.

Brautigam, D. (2008): "Taxation and Governance in Africa: Take a Second Look," Development Policy Outlook No. 1, American Enterprise Institute for Public Policy Research. [Online; accessed 25-April-2012].

Buccellato, T. & M. Alessandrini (2009): " Natural Resources: a Blessing or a Curse? The Role of Inequality," Discussion Paper 98, The Centre for Financial and Management Studies, University of London. [Online; accessed 22-December-2012].

Cincibuch, M. & J. Podpiera (2006): “Beyond Balassa-Samuelson: Real appreciation in tradables in transition countries,“ The Economics of Transition, The European Bank for Reconstruction and Development, vol. 14(3), pages 547-573, 07.

Collier, P. and A. Hoeffler (2004) “Greed and Grievance in Civil War,” Oxford Economic Papers, Vol. 56, No. 4, pp. 563–95.

Corden, W. M. & J. P. Neary (1982): “Booming Sector and De-Industrialisation in a Small Open Economy,“ Economic Journal, Royal Economic Society, vol. 92(368), pages 825-48, December.

De Broeck, M. & T. Sløk (2001): “Interpreting real exchange rate movements in transition countries,” BOFIT Discussion Papers 7/2001, Bank of Finland, Institute for Economies in Transition. [Online; accessed 20-December-2012].

Dobrynskaya, V. & E. Turkish (2009): “Is Russia Sick with the Dutch Disease?,” Working Papers 2009-20, CEPII research center. [Online; accessed 25-December-2012].

Durnev, A. & S. Guriev (2007): “The Resource Curse: A Corporate Transparency Channel,“ Working Papers w0108, Center for Economic and Financial Research (CEFIR). [Online; accessed 23-December-2012].

EBRD (2009): “Transition Report 2003.“

Égert, B. (2002): “Investigating the Balassa-Samuelson hypothesis in transition: Do we understand what we see?,“ BOFIT Discussion Papers 6/2002, Bank of Finland, Institute for Economies in Transition. [Online; accessed 20-April-2012].

Égert, B. & L. Halpern (2005): “Equilibrium Exchange Rates in Central and Eastern Europe: A Meta-Regression Analysis,“ William Davidson Institute Working Papers Series wp769, William Davidson Institute at the University of Michigan. [Online; accessed 20-April-2012].

Égert, B. & L. Halpern & R. MacDonald (2006): “Equilibrium Exchange Rates in Transition Economies: Taking Stock of the Issues,“ Working Papers 106, Oesterreichische Nationalbank (Austrian Central Bank). [Online; accessed 20-April-2012].

Égert, B. & C. Leonard (2008): "Dutch Disease Scare in Kazakhstan: Is it real?," Open Economies Review, Springer, vol. 19(2), pages 147-165, April.

Égert, B. & J. Podpiera (2008): "Structural Inflation and Real Exchange Rate Appreciation in Visegrad-4 Countries: Balassa-Samuelson or Something Else?, " CEPR Policy Insight 20. [Online; accessed 20-April-2012].

Égert, B. (2009): "Dutch disease in former Soviet Union: Witch-hunting?," BOFIT Discussion Papers 4/2009, Bank of Finland, Institute for Economies in Transition. [Online; accessed 20-April-2012].

Engle, R. F. & C. W. Granger (1987): "Co-integration and Error Correction: Representation, Estimation, and Testing," Econometrica, Econometric Society, vol. 55(2), pages 251-76, March.

Guriev, S. & A. Rachinsky (2006): "The Evolution of Personal Wealth in the Former Soviet Union and Central and Eastern Europe," Working Papers RP2006/120, World Institute for Development Economic Research (UNU-WIDER). [Online; accessed 20-April-2012].

Greene, W.H. (2003): "Econometric analysis, " 5th edition. Upper Saddle River, NJ: Prentice Hall, chapter 20.

Hasanov, F. & I. Samadova (2010): "The Impact of Real Effective Exchange Rate on the Non-Oil Export: The Case of Azerbaijan". Available at SSRN: http://ssrn.com/abstract=1784286 or http://dx.doi.org/10.2139/ssrn.1784286

Hausmann, R. & R. Rigobon (2003): "An Alternative Interpretation of the ‚Resource Curse': Theory and Policy Implications," NBER Working Papers 9424, National Bureau of Economic Research, Inc. [Online; accessed 20-April-2012].

Isham, J., L. Pritchett, M. Woolcock & G. Busby (2005): "The Varieties of Rentier Experience: How Natural Resource Endowments Affect the Political Economy of Economic Growth," The World Bank Economic Review, Vol. 19, No. 2, pp.141–174.

Ito, T. & P. Isard & S. Symansky (1999): "Economic Growth and Real Exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia," NBER Chapters, in: Changes in Exchange Rates in Rapidly Developing Countries: Theory, Practice, and Policy Issues (NBER-EASE volume 7), pages 109-132, National Bureau of Economic Research, Inc.

Ito, K. (2008): "Oil price and macroeconomy in Russia," Economics Bulletin, AccessEcon, vol. 17(17), pages 1-9.

Johansen, S. (1988): "Statistical analysis of cointegration vectors," Journal of Economic Dynamics and Control, Elsevier, vol. 12(2-3), pages 231-254.

Krugman, P. R. (1997): "The Narrow Moving Band, the Dutch Disease and the Competitive Consequences of Mrs. Thatcher," Journal of Development Economics, Vol. 27, pp. 41–55.

Krugman, P. R. & M. Obstfeld (2009): "International Economics: Theory and Policy". 8th ed. Boston: Pearson Addison-Wesley.

Lane, D. T. & A. Bulir (2002): "Aid and Fiscal Management," IMF Working Papers 02/112, International Monetary Fund. [Online; accessed 20-April-2012].

Leite, C. & J. Weidmann (1999): "Does Mother Nature Corrupt – Natural Resources, Corruption, and Economic Growth," IMF Working Papers 99/85, International Monetary Fund. [Online; accessed 20-April-2012].

Lommatzsch, K. & S. Tober (2004): "What is behind the real appreciation of the accession countries' currencies?: An investigation of the PPI-based real exchange rate," Economic Systems, Elsevier, vol. 28(4), pages 383-403, December.

MacKinnon, J. G. (1996): "Numerical Distribution Functions for Unit Root and Cointegration Tests," Journal of Applied Econometrics, John Wiley & Sons, Ltd., vol. 11(6), pages 601-18, Nov.-Dec..

MacKinnon, J. G. & A. G. Haug & L. Michelis (1999): "Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration," Journal of Applied Econometrics, John Wiley & Sons, Ltd., vol. 14(5), pages 563-77, Sept.-Oct.

Mauro, P. (1995): "Corruption and Growth," The Quarterly Journal of Economics, MIT Press, vol. 110(3), pages 681-712, August.

Merlevede, B. & K. Schoors & B. van Aarle (2007): "Russia from Bust to Boom: Oil, Politics or the Ruble?," Working Papers of Faculty of Economics and Business Administration, Ghent University, Belgium 07/461. [Online; accessed 22-April-2012].

Mickiewicz, T. & A. Zalewska (2002): "Deindustrialisation. Lessons from the Structural Outcomes of Post-Communist Transition," William Davidson Institute Working Papers Series 463, William Davidson Institute at the University of Michigan. [Online; accessed 20-April-2012].

Mwanza, N. (2004): "Financing Uganda's Poverty Reduction Strategy: Is Aid Causing More Pain Than Gain?," IMF Working Papers 04/170, International Monetary Fund.

Ogun, O. (1998): "Real exchange rate movements and export growth: Nigeria, 1960-1990," Papers 82, African Economic Research Consortium.

Oomes , N. & K. Kalcheva (2007): "Diagnosing Dutch disease: Does Russia have the symptoms?," BOFIT Discussion Papers 7/2007, Bank of Finland, Institute for Economies in Transition.

Ramey, G. & V. A. Ramey (1995): "Cross-Country Evidence on the Link between Volatility and Growth," American Economic Review, American Economic Association, vol. 85(5), pages 1138-51, December.

Rautava, J. (2002): "The role of oil prices and the real exchange rate in Russia's economy," Macroeconomics 0209004, EconWPA. [Online; accessed 24-April-2012].

Rautava, J. (2004): "The Role of the Oil Prices and the Real Exchange Rate in Russia's Economy – A Cointegration Approach," Journal of Comparative Economics, Vol. 32, No. 2, pp. 315–27.

Ricci, L. A. & R. MacDonald (2002): "Purchasing Power Parity and New Trade Theory," IMF Working Papers 02/32, International Monetary Fund. [Online; accessed 23-April-2012].

Rowthorn, B. & J. R. Wells (1987): "Deindustrialization and foreign trade". Cambridge, UK: Cambridge University Press.

Saeger, S. (1997): "Globalization and deindustrialization: Myth and reality in the OECD," Review of World Economics (Weltwirtschaftliches Archiv), Springer, vol. 133(4), pages 579-608, December.

Sachs, J. D. & Warner, A. M., (2001): "The curse of natural resources," European Economic Review, Elsevier, vol. 45(4-6), pages 827-838, May.

Sala-i-Martin, X. & A. Subramanian (2003): "Addressing the Natural Resource Curse: An Illustration from Nigeria," NBER Working Papers 9804, National Bureau of Economic Research, Inc. [Online; accessed 22-April-2012].

Sorsa, P. (1999): "Algeria – The Real Exchange Rate, Export Diversification, and Trade Protection," IMF Working Papers 99/49, International Monetary Fund. [Online; accessed 20-April-2012].

Sosunov, K. & O. Zamulin (2006): "Can Oil Prices Explain the Real Appreciation of the Russian Ruble in 1998-2005?," Working Papers w0083, Center for Economic and Financial Research (CEFIR). [Online; accessed 28-April-2012].

Sosunov, K. & O. Zamulin, (2007): "Monetary Policy in an Economy Sick with Dutch Disease," Working Papers w0101, Center for Economic and Financial Research (CEFIR). [Online; accessed 28-April-2012].

Spatafora, N, E. Stavrev (2003): "The Equilibrium Real Exchange Rate in a Commodity Exporting Country: The Case of Russia," IMF Working Papers 03/93, International Monetary Fund. [Online; accessed 20-April-2012].

The Economist (1977): "The Dutch Disease," November 26, pp. 82-83.

Web References

CIA Factbook (2013), Central Intelligence Agency – The World Factbook. https://www.cia.gov/library/publications/the-world-factbook/

EEG (2013), Economic Expert Group. http://www.eeg.ru

Eurostat (2013), Eurostat. http://epp.eurostat.ec.europa.eu/

Index Mundi (2013). www.indexmundi.com

OECD (2013), OECD Main Economic Indicators. http://stats.oecd.org/mei/

Rosstat (2013), Federal State Statistics Service of Russian Federation. http://www.gks.ru/

Sauter, M. B., Ch. B. Stockdale & P. Ausick (2012): "The World's Most Resource-Rich Countries," 24/7 Wall St.. [Online; accessed 1-December-2012].

USGS (2013), U.S. Geological Survey. http://www.usgs.gov/

7 Appendix 1: Tables

Table 8 Unit Root tests

	Augmented Dickey-Fuller test statistic**			
	ADF Level		ADF 1st difference	
Constant	t-Statistic	Prob.*	t-Statistic	Prob.*
LREER	-1.730187	0.4142	-9.078878	0
LOILP	-1.571467	0.4948	-10.63434	0
LOILE	-2.332031	0.1659	-2.484508	0.1251
LNIR	-0.709187	0.8407	-5.393689	0
LGDP	-1.741569	0.405	-7.786544	0
LGOV	-0.031086	0.9537	-5.073848	0
LPROD	0.442941	0.9842	-10.4531	0
LMAN	-1.445872	0.5586	-16.804	0
LEUIMP	-3.015948	0.0356	-18.96536	0
Constant and linear trend				
LREER	-2.169511	0.5029	-9.170757	0
LOILP	-3.201459	0.0878	-10.60941	0
LOILE	-0.534957	0.9787	-8.60697	0
LNIR	-1.624289	0.7799	-5.387849	0.0001
LGDP	-1.441157	0.8372	-7.99569	0
LGOV	-3.394942	0.0552	-5.120396	0.0002
LPROD	-3.809658	0.0184	-10.59048	0
LMAN	-2.252275	0.4573	-16.7895	0
LEUIMP	-3.204849	0.0873	-18.94256	0

Null hypothesis: Series contains unit root

*MacKinnon (1996) one-sided p-values.

** Lag Length: Automatic based on SIC

Table 9 Symptom 1: Residual Serial Correlation LM Test

Null hypothesis: no serial correlation at lag h

Lags	LM-Stat	Prob
1	40.47851	0.0007
2	39.81641	0.0008
3	37.81788	0.0016
4	19.75337	0.2315

5	31.56811	0.0114
6	35.00092	0.0040
7	12.82417	0.6856
8	32.38893	0.0089
9	34.12988	0.0052
10	30.40507	0.0160
11	25.22636	0.0659
12	7.372882	0.9654

Probs from chi-square with 16 df.

Table 10 Symptom 1: Residual White Heteroscedasticity Test

Null hypothesis of homoscedasticity

Joint test:

Chi-sq	df	Prob.
739.8414	420	0.0000

Table 11 Symptom 1: Residual Normality Test

Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.
1	-2.336615	73.06247	1	0.0000
2	-0.689023	13.15964	1	0.0003
3	1.071182	26.73214	1	0.0000
4	-0.683536	12.98103	1	0.0003
Joint		125.9353	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	26.84236	101.5123	1	0.0000
2	8.041779	55.25042	1	0.0000
3	12.24133	95.83509	1	0.0000
4	3.298331	5.539297	1	0.0186
Joint		258.1371	4	0.0000

Component	Jarque-Bera	df	Prob.
1	174.5747	2	0.0000
2	68.41006	2	0.0000
3	122.5672	2	0.0000
4	18.52033	2	0.0001
Joint	384.0724	8	0.0000

Table 12 Symptom 2: Growth rate of real wages (% change)

Year	2000 - 2005	2005 - 2007	2008	2009	2010	2011
Total in the economy	86.63%	37.99%	13.92%	-1.01%	3.65%	6.97%
Agriculture, hunting and forestry	79.51%	47.61%	24.66%	4.69%	2.14%	9.38%
Fishing	74.39%	23.69%	18.50%	8.70%	-4.98%	3.54%
Mining and quarrying	61.06%	21.58%	4.86%	-2.31%	4.05%	7.29%
mining of energy producing minerals	62.85%	20.97%	4.07%	-2.36%	2.54%	5.67%
mining except of energy producing minerals	59.75%	24.01%	6.85%	-3.90%	8.86%	12.53%
Manufacturing	72.68%	32.04%	11.34%	-5.49%	6.28%	7.73%
manufacture of food products, beverages and tobacco	62.26%	30.65%	12.57%	3.56%	1.86%	3.19%
manufacture of textiles and textile products	59.10%	44.43%	15.01%	-2.10%	5.43%	0.09%
manufacture of leather, leather products and footwear	68.91%	39.63%	13.06%	-3.02%	3.87%	1.28%
manufacture of wood and products of wood	64.40%	28.65%	14.91%	-11.94%	7.43%	7.32%
manufacture of pulp, paper and paper products; publishing and printing	66.89%	25.53%	14.56%	-8.38%	4.77%	8.00%
manufacture of coke and refined petroleum products	91.35%	26.37%	8.94%	-0.07%	0.71%	10.29%
manufacture of chemicals and chemical products	74.76%	26.32%	11.38%	-2.17%	5.64%	8.20%
manufacture of rubber and plastics products	55.89%	40.21%	8.20%	-5.94%	5.06%	3.60%
manufacture of other non-metallic mineral products	76.07%	45.64%	10.82%	-10.75%	4.09%	7.51%
manufacture of basic metals and fabricated metal products	29.09%	25.20%	7.93%	-10.05%	9.09%	8.00%
manufacture of machinery and equipment	105.77%	39.96%	12.39%	-8.40%	9.41%	8.97%
manufacture of electrical, electronic and optical equipment	98.90%	38.66%	13.37%	-4.29%	7.46%	7.89%
manufacture of transport equipment	85.31%	28.55%	10.39%	-8.60%	10.79%	12.42%
other manufacturing	50.88%	37.45%	11.23%	-9.21%	0.25%	6.43%
Electricity, gas and water supply	63.40%	25.64%	8.98%	4.29%	3.30%	5.70%
Construction	66.12%	37.60%	16.31%	-11.24%	8.06%	7.50%
Wholesale and retail trade; repair of motor vehicles	100.47%	54.25%	16.79%	-1.90%	6.56%	7.00%
Hotels and restaurants	78.40%	33.90%	10.25%	-0.71%	-0.78%	5.17%
Transport and communications	70.96%	24.04%	12.91%	-0.91%	5.47%	6.23%
out of them communication	91.85%	19.96%	10.87%	-3.76%	7.25%	4.86%
Financial intermediation	108.22%	34.37%	6.77%	-7.61%	9.51%	6.58%
Real estate, renting and business activities	102.06%	41.67%	14.56%	-2.54%	4.56%	6.77%
Public administration and defence, compulsory social security	95.97%	33.27%	13.05%	3.45%	-3.92%	4.32%
Education	112.37%	40.76%	15.64%	8.66%	-2.90%	6.26%
Health and social work	114.87%	49.05%	16.73%	4.76%	-2.67%	5.74%
Other community, social and personal service activities	97.09%	44.29%	17.00%	2.50%	-0.14%	5.59%

Source: Rosstat (2013) and authors' own calculations using CPI deflator and CPI inflation

Table 13 Symptom 3 : Residual Serial Correlation LM Test

Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	15.02999	0.5224
2	11.93259	0.7486
3	6.967405	0.9739

4	9.021303	0.9125
5	11.09976	0.8033
6	8.211709	0.9423

Probs from chi-square with 16 df.

Table 14 Symptom 3: Residual White Heteroscedasticity Test

Null hypothesis of homoscedasticity

Joint test:

Chi-sq	df	Prob.
194.6099	180	0.2162

Table 15 Symptom 3: Residual Normality Test

Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.
1	-0.323146	1.080303	1	0.2986
2	0.614734	3.611321	1	0.0574
3	-1.799164	19.36483	1	0.0000
4	0.184114	0.358792	1	0.5492
Joint		24.41525	4	0.0001

Component	Kurtosis	Chi-sq	df	Prob.
1	4.022267	4.162920	1	0.0413
2	4.240061	2.036502	1	0.1536
3	9.094759	0.040732	1	0.8401
4	2.603639	0.044839	1	0.8323
Joint		6.284992	4	0.1789

Component	Jarque-Bera	df	Prob.
1	5.243223	2	0.0727
2	5.647823	2	0.0594
3	19.40557	2	0.0001
4	0.403630	2	0.8172
Joint	30.70024	8	0.0002

Table 16 Symptom 4: Johansen cointegration test, model 1

Included observations: 151 after adjustments
Trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.245124	82.21147	63.87610	0.0007
At most 1	0.129198	39.74994	42.91525	0.1001
At most 2	0.082544	18.86042	25.87211	0.2891
At most 3	0.038012	5.851751	12.51798	0.4794

Maximum Eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.245124	42.46153	32.11832	0.0019
At most 1	0.129198	20.88951	25.82321	0.1961
At most 2	0.082544	13.00867	19.38704	0.3273
At most 3	0.038012	5.851751	12.51798	0.4794

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 17 Symptom 4: Residual Serial Correlation LM Test, Model 1

Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	10.70524	0.8273
2	13.57873	0.6301
3	24.77142	0.0740
4	8.351171	0.9377
5	26.16208	0.0518
6	24.36215	0.0819
7	13.47216	0.6380
8	15.94086	0.4571
9	11.96536	0.7464
10	7.445181	0.9637
11	18.88693	0.2746
12	21.18851	0.1714

Probs from chi-square with 16 df.

Table 18 Symptom 4: Johansen cointegration test, model 2

Included observations: 164 after adjustments
Trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**

None *	0.161567	44.64545	42.91525	0.0332
At most 1	0.068315	15.74520	25.87211	0.5131
At most 2	0.024931	4.140549	12.51798	0.7217

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Maximum Eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.161567	28.90025	25.82321	0.0191
At most 1	0.068315	11.60465	19.38704	0.4528
At most 2	0.024931	4.140549	12.51798	0.7217

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 19 Symptom 4: Residual Serial Correlation LM Test, model 2

Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	5.357783	0.8021
2	8.682264	0.4671
3	11.62747	0.2351
4	12.32671	0.1955
5	12.38939	0.1922
6	14.48305	0.1062
7	2.468076	0.9817
8	4.993391	0.8349
9	11.52295	0.2416
10	4.988189	0.8353
11	2.643982	0.9768
12	4.621366	0.8660

Probs from chi-square with 9 df.

Table 20 Symptom 4: Residual Normality Test, model 2

Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.
1	1.624068	42.94547	1	0.0000
2	-0.060668	0.108934	1	0.7414
3	-0.666482	11.18908	1	0.0008
Joint		54.24348	3	0.0000

Component	Kurtosis	Chi-sq	df	Prob.

1	13.80348	32.96397	1	0.0000
2	3.922789	7.395055	1	0.0065
3	3.184382	5.556882	1	0.0184
Joint		45.91591	3	0.0000

Component	Jarque-Bera	df	Prob.
1	75.90944	2	0.0000
2	7.503989	2	0.0235
3	16.74596	2	0.0002
Joint	100.1594	6	0.0000

Table 21 Symptom 4: Residual White Heteroscedasticity Test, model 2

Null hypothesis of homoscedasticity		
Joint test:		
Chi-sq	df	Prob.
261.1917	156	0.0000

Table 22 Data description and sources

VARIABLE	SOURCE	FREQUENCY	DESCRIPTION
REER	IMF IFS	Monthly	CPI-based
Oil price	US Energy Information Administration	Monthly	Brent Spot price, Urals oil price is only available from 2006 to us, correlation is estimated to be 0.92 using post-2006 prices
Government consumption	OECD Main Economic Indicators	Quarterly, linearly interpolated	
GDP Deflator	OECD Main Economic Indicators	Quarterly	Seasonally adjusted.
GDP	Rosstat	Quarterly	Seasonally adjusted.
Manufacturing and Industrial output	OECD Main Economic Indicators	Monthly	Already seasonally adjusted.
Foreign demand	Eurostat	Monthly	Already seasonally adjusted. Volume-based index for total imports from Russia.
International reserves	Central Bank of Russia	Monthly	
Crude oil export volumes	Central Bank of Russia	Quarterly, linearly interpolated	Already seasonally adjusted.
Relative productivity growth	OECD Main Economic Indicators, US Department of Labor	Monthly, Annualy	The ratio of Russia's industrial output per worker to the U.S. Industrial output per worker. Industrial output per worker is the ratio of index of industrial production to the index of industrial employment

8 Appendix 2: Content of Enclosed DVD

There is a DVD enclosed to this thesis which contains empirical data.

- Folder 1: Empirical data