Micro and Macro Determinants of Capital Structure and Economic Growth in Russia: The Case of Oil and Gas Companies

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Finance

Eastern Mediterranean University
July, 2018
Gazimağusa, North Cyprus

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ABSTRACT

This thesis consists of two parts. The first part examines the micro and macro capital structure determinants of oil and gas companies in Russia, and the second part investigates the importance of energy sector to the Russian economic growth.

In the first part, we examine the financing decisions of companies by taking into account the effects of two subsequent major tax reforms in 2001 and 2002. Within the framework of dynamic trade-off theory of capital structure, we find a low speed of adjustment indicating that attaining the target debt ratio is not the primary concern of Russian oil and gas companies. Our estimation results also support the importance of bankruptcy and agency costs as determinants of capital structure.

We find that during the pre-tax reform period (1992-2000), the taxation settings encourage the use of debt financing. Our estimation results support the positive effect of the taxation settings (i.e., effective company tax rate and effective Miller tax rate) on the level of debt financing at company level. During the post-tax reform period (2002-2016), the tax incentives for debt financing decreased significantly due to the drastic decrease in company tax rate and the adaptation of flat tax system at the personal level. Our estimation results show that there is a negative effect on the level of debt financing at company level.

However, the average debt ratios of Russian companies increased consistently during the post-tax reform period even though there is a lower tax advantage of debt financing during this period. Our estimations show that the macro financial setting of

greater access to debt (i.e., volume of domestic credit provided by banks to private sector) is found to be the driving force behind this increase during this period.

In the second part, we investigate the causal relationship between fossil energy sources, the production cost of oil and financial development on economic growth in Russia. The results show that Russian companies' oil production cost and oil prices cause economic growth and the one-way causality is negative. We also find that there is one-way positive causality from natural gas price, financial development, and education investments to economic growth. The negative oil price effect supports the resource curse hypothesis, whereas the positive natural gas price effect does not. Russian policies should focus on lowering companies' production cost of oil, improving financial development and investing in education.

Keywords: Capital structure, Dynamic trade-off theory, Oil and gas companies, Oil production cost, Oil price, Resource curse

ÖZ

Bu tez iki bölümden oluşmaktadır. Birinci bölümde Rusya'da petrol ve gaz şirketlerinin mikro ve makro sermaye yapısı belirleyicileri incelenmekte, ikinci bölümde ise enerji sektörünün Rus ekonomik büyümesi açısından önemi araştırılmaktadır.

İlk bölümde, 2001 ve 2002 yıllarında gerçekleşen iki ana vergi reformunun etkilerini dikkate alarak şirketlerin finansman kararları incelenmektedir. Sermaye yapısı dengeleme teorisi çatısı altında, sonuçlar düşük hız ayarlaması bulmakta ve hedeflenen borç oranının Rus petrol ve gaz şirketleri için birincil hedef olmadığı ortaya koymaktadır. Sonuçlar, iflas ve vekalet maliyetlerinin sermaye yapısının belirleyicileri olarak önemini de desteklemektedir.

Birinci reform döneminde (1992-2000), vergi düzenlemelerinin borç finansmanı teşvik ettiğini görüyoruz. Sonuçlarımız, şirket vergi oranın (etkin şirket vergi oranı ve etkin Miller vergi oranı) borç finansmanı seviyesini pozitif yönde etkilediğini göstermektedir. İkinci reform döneminde (2002-2016), kurumlar vergisi oranındaki ciddi düşüş ve sabit oranlı vergi sisteminin uyarlanması nedeniyle, borç finansmanına yönelik vergi teşvikleri önemli ölçüde azalmıştır. Tahmin sonuçlarımız, vergi değişikliklerinin şirket borç finansman oranı üzerinde negatif bir etkisi olduğunu göstermektedir.

Borç finansman avantajı ikinci reform dönemde azalmış olsa da bu dönemde Rus şirketlerinin istikrarlı bir biçimde ortalama borç oranlarını artırdıklarını gözlemliyoruz. Tahmin sonuçlarımız, borçlanmaya erişimin daha fazla mümkün

olduğu bir ortamın (bankaların özel sektöre sağladığı yurtiçi kredilerin hacim büyümesi gibi), bu dönemde görülen artışın ardındaki itici güç olduğunu göstermektedir.

İkinci bölümde, fosil enerji kaynakları, petrolün üretim maliyeti ve Rusya'daki ekonomik büyüme ve finansal gelişim arasındaki nedense ilişkiyi araştırdık. Sonuçlar, Rus şirketlerinin petrol üretim maliyeti ve petrol fiyatı ekonomik büyümeye neden olduğunu ve negatif tek yönlü nedenselliğin olduğunu göstermektedir. Ayrıca doğal gaz fiyatı, finansal gelişme ve eğitime yönelik yatırımlar ekonomik büyümeyi tek yönlü olarak pozitif etkilemektedir. Negatif petrol fiyatı etkisi, kaynak laneti hipotezini desteklerken, pozitif doğal gaz fiyat etkisi bu hipotezi desteklememektedir. Rus politikaları, şirketlerin petrol üretim maliyetlerini düşürmeye, finansal gelişmeyi iyileştirmeye ve eğitime yatırım yapmaya odaklanmalıdır.

Anahtar Kelimeler: Sermaye yapısı, Dinamik dengeleme teorisi, Petrol ve gaz şirketleri, Petrol üretim maliyeti, Petrol fiyatı, Kaynak laneti

Dedicated To My Family, My Sweety,

Professors and Friends

For Their Unconditional Love and Support

ACKNOWLEDGEMENTS

First of all, I would like to express my profound gratitude to my supervisor Prof. Dr. Cahit Adaoğlu for his constructive suggestions, great support, and encouragement throughout my research. It was an honour for me to be his student, because the contribution of his superior financial knowledge and extraordinary ideas made this thesis to be valuable. His esteemed guidance and comments encouraged me to learn and work hard. I am very grateful to Prof. Dr. Cahit Adaoğlu for his generosity with his knowledge and time dedicated to complete this thesis.

I also would like to thank defence committee members Prof. Dr. Salih Katırcıoğlu, Prof. Dr. Eralp Bektaş, Prof. Dr. Mehmet İvrendi (Pamukkale University), and Prof. Dr. İ. Hakan Yetkiner (Izmir University of Economics) for all their important corrections and feedback. Their discussions have been invaluable.

I would especially like to thank Assoc. Prof. Dr. Nesrin Ozataç for the continuous support, love, and care I have obtained from her over the years. Words cannot simply express my happiness how much lucky I am for her presence in my life. She always has been there for me to lift me up from down. Her support and words every time encourage me to be myself and move forward. I am indebted to her for everything.

I also would like to thank Assoc. Prof. Dr. Korhan Gökmenoğlu for his motivational approach in driving me to think out of the box and not to be afraid to experiment implementation of creative ideas in order to be always ahead on the battlefield of work and personal life. I also learned the meaning of protection and support from him despite anything and everything.

I would like to express my gratitude to Asst. Prof. Dr. Nigar Taşpınar. Her place is special in my life. She is a wonderful and honest friend. Her advice is sincere, her wisdom is beyond imagination, and her support is priceless. I am thankful for her positive view about the life that sheds light on any situations.

I also would like to thank Hassan Javaid and Alimshan Faizulayev for all their continued support, loyalty and friendship. We have been always there for each other. Despite long distance, Hassan Javaid has been loyal and true, and always rushing to give a hand of assistance in all events. Alimshan Faizulayev has always been kind and supportive. I appreciate immensely their friendship.

I would like to mention amazing people this journey would not be possible without them. I would like to thank Ms. Emine Esen for care, love, respect and assistance during all my study. She is an amazing person with a very kind heart. I also thank Baris Eren for being always helpful and friendly, and for helping me with the careful translation of the abstract of the thesis. I also would like to express my gratitude to Prof. Dr. Hatice Jenkins for the opportunity to start my Ph.D. study and Prof. Dr. Glenn Jenkins for the support at the initial stage of this long journey. I would like to thank also Prof. Dr. Mustafa Besim and Ms. Seniha Besim for the knowledge, support, and help during my research.

I must express my gratitude to my family, grandmother, my parents, mother-in-law, brothers and sister for the prayers, unconditional love, support, and wisdom. Thank you for your belief and letting me come this far and follow my path.

The most special thank you note should be devoted to my lovely wife Sabina. There are no words to express the magnitude of my love for her. I undoubtedly could not have done this journey without her support, love, care and patience. Waiting is the hardest commitment in the family. Her faith in me has been pushing me forward. I truly thank her for her love and for always being by my side.

Finally, I would like to thank the Eastern Mediterranean Univesity, and all the wonderful people who are part of it, my students, friends, coworkers for everything amazing that I experienced during my study.

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LIST OF ABBREVIATIONS

AGENCY	Agency Cost
CAPEX	Capital Expenditure
CASH	Cash
DR	Book Debt Ratio
EG	Economic Growth
EMS	Emerging Market Score
ER	Equity Ratio
FD	Financial Development
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
MILLER	Effective Miller Tax Rate
MTBV	Market to Book Value
NG	Natural Gas Price
OIL	Oil Price
PC	Oil Production Cost
PI	Effectiveness of Public Institutions
RIR	Real Interest Rate
ROA	Return on Assets
SIZE	Size
TANG	Tangibility
TAX	Effective Company Tax Rate
VC	Volume of Domestic Credit

Chapter 1

INTRODUCTION

Oil and gas companies always have been an integral part of the Russian strategic economic and political policies. Since the beginning of the 2000s, Russia has adopted several tax reforms, issued documents in "Energy Strategies of Russia", and focused on the technological improvements of oil and gas companies. All these reforms and mechanisms are directed towards the improvement of the energy sector due to its importance for the Russian economy. The reforms during the transition period to a market economy have greatly affected the financing decisions of the Russian companies.

In the first part of the thesis, we investigate the micro and macro determinants of the capital structure of oil and gas companies, and take into account the two significant tax reforms of 2001 and 2002 in personal and company tax rates respectively. In the second part of the thesis, we investigate the causal relationship between the production cost of oil, fossil energy sources, and financial development on economic growth in Russia.

The capital structure irrelevance proposition of Modigliani and Miller (1958) has puzzled many theorists and researchers. Their irrelevance proposition advocates that capital structure does not affect the company value in a perfect market. This proposition has led to the development of the dynamic trade-off theory and the

theory explains the determinants of capital structure in an imperfect market. The dynamic trade-off theory considers the tax benefits of leverage and the bankruptcy costs (Kraus and Litzenberger, 1973). The tax benefit is the tax deductibility of interest payments, and it creates opportunities for companies to finance their projects with debt financing (Homaifar et al., 1994). Considering the dynamic settings in Russia, the dynamic trade-off theory is suitable in identifying the micro and macro determinants of capital structure. The most important condition of the dynamic trade-off theory is to take into account the behavior of companies in reaching the target debt level with different speeds of adjustment (Kane et al., 1984; Myers, 1984; McMillana and Camara, 2012).

Despite the importance of oil and gas companies in Russia – a natural resource abundant country, less attention has been devoted to investigating the capital structure of these companies. The studies on the capital structure of Russian companies focus on small samples of companies from several industries (e.g., Delcoure, 2007; Ivashkovskaya and Solntseva, 2007; Nivorozhkin, 2015;), employ models with omitted variables (e.g., Makeeva and Kozenkova, 2015; Shahina and Kokoreva 2010;) and do not consider the major tax reforms of 2001 and 2002 (e.g., Delcoure, 2007; Ivanov, 2010; Ivashkovskaya and Solntseva, 2007; Nivorozhkin, 2015).

We fully capture the Russian tax system and use a large dataset of 3,213 company-year observations. We present the changes in the Russian tax system by investigating all tax code changes from 1992 until 2016, and investigate the effect of tax reforms on the capital structure of oil and gas companies. Within the dynamic trade-off theory framework, we find that bankruptcy, agency costs, profitability,

capital expenditures, and size are important determinants of capital structure of oil and gas companies. Prior to the tax reforms in 2001 and 2002 (1992-2000), companies borrow more due to the high company tax rates. In the period following the tax reforms which decreased the tax benefits of debts financing (2002-2016), we do not observe a decrease in the average level of debt financing. On the contrary, there is an increasing trend in the average level of debt financing and the increase in the volume of credits to the energy sector is found to be the driving force behind this increase.

During Putin's presidency, the "Energy Strategies of Russia" documents for the periods of 2020, 2030 and 2035 mainly focus on policies to accelerate economic growth by using energy sources. The emphasis in these documents is given to the technological improvements. Companies' production cost of oil depends on oil prices, technology, management effectiveness, quantity of extracted crude oil and reserves (Ghalayini, 2011; Issabayev, 2015). Considering these factors, in the second part of the thesis, we examine the causal relationship of oil production cost, oil and natural gas prices on economic growth in an attempt to investigate the validity of resource curse hypothesis in Russia.

The resource curse hypothesis states that the abundance of natural resources diminishes economic growth (Auty, 1994). Specifically, economic growth is affected negatively by rent-seeking activities (Robinson, Torvik, and Verdier 2006), Dutch Disease (Sachs and Warner, 1997), mismanagement of oil revenues (Watts, 2004), and corruption (Roberts, 2015). Studies confirm that oil and natural gas rich states have a low economic growth (Karl, 2007; Sachs and Warner, 1997).

In line with the literature, we also capture the effects of financial development (Moradbeigi and Law, 2017; Tziomis and Klapper, 2012), education (Gylfason, 2001, 2004), and effectiveness of public institutions (Oomes and Kalcheva, 2007). For the first time in the literature, we capture the production cost of oil. This unique cost data enable us to determine the impact of the cost management practices in Russian oil companies on economic growth.

Our results show that oil price negatively affects Russia's economic growth and support the resource curse hypothesis. However, any decrease in the oil production cost dampens the negative impact predicted by the resource curse and causes higher economic growth. We also find a positive impact of gas price on economic growth in contrast to the negative effect found in the literature (Davis and Tilton, 2005; Sachs and Warner, 2001).

The remainder of the thesis is organized as follows. In chapter 2, we discuss the micro and macro determinants of capital structure. In chapter 3, we examine the oil production cost, financial development, and economic growth. Chapter 4 concludes the thesis.[1]

[1] The results of the second part of this thesis is published in: Bezhan Rustamov, and Cahit Adaoglu, "Oil Production Cost, Financial Development, and Economic Growth in Russia," *Energy Sources, Part B: Economics, Planning, and Policy* 13, no. 6 (2018): 301-309, doi: 10.1080/15567249.2018.1477868

Chapter 2

MICRO AND MACRO FUNDAMENTALS OF CAPITAL STRUCTURE

2.1 Introduction

Since the collapse of the Soviet Union, Russia has made vast amendments in its tax codes. The enactment of flat tax rates at the personal level in 2001 and the significant reduction in the company tax rate in 2002 are the two significant tax reforms (e.g., Kryvoruchko, 2015; Rabushka, 2003). The tax reforms have had significant impact not only at the macro level but also at the micro level, such as in the financing decisions of companies.

Taxes are one of the main determinants of companies' capital structure. In particular, the tax deductibility of interest expenses at the company level, and the taxes on equity and debt incomes at the personal level have motivated both theoretical (e.g., DeAngelo and Masulis, 1980; Miller, 1977; Modigliani and Miller, 1963) and empirical studies (e.g., Graham, 1996; Heider and Ljungqvist, 2015; MacKie-Mason, 1990). There are extensive empirical findings regarding the tax effects on capital structure in both developed (e.g., Desai et al., 2004), and developing countries (e.g., Booth et al., 2001). The findings are mixed due to the heterogeneity in tax systems across countries (e.g., Chang and Rhee, 1990; Givoly et al., 1992).

Single-country investigations are important because these studies can incorporate country-specific settings and can effectively capture the effects (Lin and Flannery, 2013). In cross-country studies, these effects remain unobserved (Heider and Ljungqvist, 2015). Our study is unique in the sense that it is a single-country study that fully captures the Russian tax system. The taxation settings have not been fully captured in other studies on Russia (e.g., Delcoure, 2007; Pöyry and Maury, 2010). We present the changes in the Russian tax system by investigating all tax code changes from the beginning of the transition period in 1992 until 2016. The tax rates at the personal and company levels are accurate, hand collected data.

Within the framework of dynamic trade-off theory of capital structure, we examine the impact of the 2001 and 2002 tax reforms on the capital structure of Russian oil and gas companies. Our sample is comprehensive and covers all domestic listed oil and gas companies for the period of 1992-2016. Our results show that during the pre-tax reform period (1992-2000), the Russian tax system had supported the use of debt financing. Both the effective company tax rate[2] and the effective Miller tax rate[3] (Miller, 1977) have a positive impact on leverage, primarily due to high tax rates at both the company and personal levels. However, during the period following the tax reforms (2002-2016), we detect a negative effect of the effective company tax rate on leverage and a negligible overall effective Miller tax rate effect. The results are due to the significant cut in the tax rates at both the company and personal levels, diminishing the tax advantage of debt financing.

[2] The effective company tax rate is the actual tax payments by companies. For *each* company in the sample, we calculated the effective tax rate for *every* year. We show the detailed definition in Table 2.4.

[3] In the literature, company and personal taxation of debt and equity income are considered together in calculating the tax effect of debt financing, which is also known as the Miller tax advantage of debt financing. For each company in the sample, using effective company tax rate and personal tax rates, we calculated the effective Miller tax rate (MILLER). We show the detailed definition in Table 2.4.

Even though the tax incentives for debt financing decreased substantially in the post-tax reform period, we observe that the average leverage level of Russian oil and gas companies has continually increased. We examine the macro effects to explain this consistent increase. At the macro level, companies' relatively greater access to debt financing is empirically found to be the driving reason behind this consistent increase.

Unlike the results in debt financing, both the effective company tax rate and the effective Miller tax rate had negative effects on equity financing during the whole period (i.e., 1992-2016). However, during the post-tax reform period (i.e., 2002-2016), contrary to the results for debt financing, we detect a positive effect of the effective company tax rate on equity financing and a negligible overall effective Miller tax rate effect. Overall, our results indicate that even though the 2001 and 2002 tax reforms have negative and positive effect on debt and equity financing respectively, the increase in debt financing has surpassed the increase in equity financing, especially during the post-tax reform period.

2.2 Tax-based Theories and Literature Review

Modigliani and Miller's (1958) capital structure irrelevance proposition states that capital structure does not affect company value in perfect markets. Markets are imperfect and, in particular, taxes are one such market imperfection. The static trade-off theory states that companies trade off the advantages and disadvantages of debt financing (i.e., tax benefits and financial distress costs) (Kraus and Litzenberger, 1973). Companies use the leverage up to the point where the marginal present value of tax shield benefits is equal to the marginal present value of financial distress costs.

Moreover, the static trade-off theory assumes that companies have a target debt level and are always at the target level (Abdeljawad et al., 2013).

However, the dynamic trade-off theory states that companies have a target debt level and that they adjust their debt level (i.e., leverage) towards the target level with different speeds of adjustment (Kane et al., 1984; McMillana and Camara, 2012). In addition to taxation factors, the dynamic trade-off theory also focuses on the behaviour of companies in reaching the target debt level and the associated adjustment costs (Myers, 1984). For Russia, the dynamic trade-off theory is more relevant and takes into account the existence of significant transitions at both the macro and micro levels, as well as the associated costs.

The current literature on the capital structure of Russian companies uses small sample of dataset and does not consider the effect of major tax reforms of 2001 and 2002 on capital structure of oil and gas companies. For example, Ivashkovskaya and Solntseva (2007) investigate 62 Russian companies and find that the effective tax rate affects negatively the company leverage. However, Delcoure's (2007) study on post-communist transition countries examines 33 Russian companies and finds a positive relationship between the company tax rate and leverage. Pöyry and Maury (2010) investigate 95 Russian companies, identifying their ownership and capital structures. They attempt to capture the company tax rate reform of 2002 by time dummies, even though their time span is only four years, 2000-2004. Pöyry and Maury find that after the significant reduction in company tax rates, Russian companies increased their compliance with tax laws and payment obligations. They find no change on company leverage due to the tax reform of 2002.

Some of the studies fully ignore to include the tax variable in the model to examine the capital structure of Russian companies. Shahina and Kokoreva (2010) investigate 280 firm-year observations for the period of 2004-2008. They employ dynamic trade-off theory and disregard to consider the important determinant - tax variable. They find that dynamic trade-off theory is compatible to apply for estimating the capital structure of Russian companies. Nivorozhkin (2015) analyses 288 companies for the period of 2003-2010 and also does not capture the tax settings. The main focus of the study is on assessing the impact of the contagious U.S. subprime mortgage crisis in 2008. Nivorozhkin (2015) finds that leverage increases during the post-crisis period, which is primarily due to the stimulus packages in the form of state subsidies and loans. In line with the trade-off theory, only Makeeva and Kozenkova (2015) include the bankruptcy cost in the model to estimate the taxation effect on the capital structure. They confirm the importance of the bankruptcy cost in the Russian companies and reveal the negative relationship between bankruptcy cost and the leverage. Companies possessing higher bankruptcy cost decrease the level of debt to avoid greater risk from additional borrowing.

Researchers have employed in the model the traditional determinants of capital structure, profitability, size, tangibility, and growth (e.g., Delcoure, 2007; Ivanov, 2010; Ivashkovskaya and Solntseva, 2007; Nivorozhkin, 2015; Pöyry and Maury, 2010). The negative relationship between profitability and leverage of Russian companies is confirmed by many researchers (Delcoure, 2007; Ivanov, 2010; Ivashkovskaya and Solntseva, 2007; Nivorozhkin, 2015). This relationship between profitability and leverage indicates companies in Russia prefer to exploit retained earnings to debt (Delcoure, 2007; Ivanov, 2010) because internal funds are less expensive (Pöyry and Maury, 2010). Mainly, profitable companies with liquid

financial assets shift to other sources of financing and decrease of using the debt financing. Ivanov (2010) states that the asymmetric information drives the capital structure of Russian companies. It indicates that managers possess more information about the firm than any other stakeholders in the market.

In the literature, the positive (Delcoure, 2007; Ivanov, 2010; Ivashkovskaya and Solntseva, 2007; Nivorozhkin, 2015) and negative (Makeeva and Kozenkova, 2015; Pöyry and Maury, 2010; Shahina and Kokoreva, 2010) effect for the role of size in determining the capital structure has been confirmed. Companies with greater size have higher sales that increase the retained earnings. Therefore, large companies decrease use of leverage and prefer of using retained earnings (Makeeva and Kozenkova, 2015). However, large companies do not necessarily have in possession of enough retained earnings, and they also have to borrow (Nivorozhkin, 2015). The possible explanation of this heterogeneity in findings is that size of the company does not guarantee of easy access to borrowing (Ivanov, 2010).

Inconsistent signs are also found for tangibility and growth determinants of the capital structure. In line with the trade-off theory, Delcour (2007) finds a positive relationship between tangibility and debt financing. Tangible assets are used in the form of collateral to reduce the risk of lenders. Pöyry and Maury (2010) find that tangibility variable cannot explain the increase of debt level in Russian companies. Researchers confirm positive relationship between the growth and the level of debt in Russian companies (e.g., Ivanov, 2010; Ivashkovskaya and Solntseva, 2007; Pöyry and Maury, 2010). However, Shahina and Kokoreva (2010) find negative association and Delcoure (2007) observes even no relationship between the growth and the level of debt of the companies. The possible explanation for these different findings is the

type of companies' ownership (Pöyry and Maury, 2010). Pöyry and Maury (2010) find the negative effect of the tangibility to debt financing in companies with governmental ownership and the positive effect in oligarship companies.

The literature lacks studies on examining of agency cost and macro determinants of capital structure of Russian companies. To the best of the authors' knowledge, this study will be first to observe the micro and macro determinants of Russian oil and gas companies with taking into account the enactment of flat tax rates at the personal level in 2001 and the significant reduction in the company tax rate in 2002.

2.3 Russian Tax Reforms and Implications

2.3.1 Company Taxation System and Reforms

Russia had gone through a difficult transition period in adapting the tax system of a market economy. In 1992, Russia had based its tax system on the American and European tax systems. However, the adaptation process failed due to the introduction of several taxes at high rates (Pogorletskiy and Söllner, 2002), which resulted in a shadow economy (Torgler, 2003). This led to high levels of tax evasion (Gaddy and Ickes, 1999) and the collapse of the tax system (Kryvoruchko, 2015). Consequently, in 1999, the Tax Code Part I was introduced, serving as the fundamental base for the current Tax Code Part II which was enacted in 2001.

After reading through the legal documents retrieved from ConsultantPlus (http://www.consultant.ru), we compiled the company tax rates between 1992 and 2016, and present the rates and the references to the relevant tax laws in Table 2.1. In 1992, the company tax rate was 32%, which increased to 38% in 1994. For the period of 1995-2001, the company tax rates varied between 30% and 35%. A

significant reform ("Tax Code of the Russian Federation (Part II)" N 117-ФЗ) is the cut in company tax rate to 24%, which had stayed the same for the period of 2002-2008. In 2009, the company tax rate was reduced to 20%.

Table 2.1: Company Tax Rate (1992-2016)

Year	Tax Rate	References
1992-1993	32%	The Law of the Russian Federation N 2116-1 "Company and Organization Income Tax", Enactedon 27.12.1991. Effective from 01.01.1992.
1994	38%	Presidential Decree of the Russian Federation N 2270 "On Several Amendments to the Taxation and in Relations Between Budgets of Different Levels", Enactedon 22.12.1993. Effective from 01.01.1994.
1995-1998	35%	Federal Law N 64-ФЗ "On Amendments and Additions to the Law of the Russian Federation 'On Company and Organization Income Tax'", Enacted on 13.04.1995. Effective from 25.04.1995.
1999-2000	30%	Federal Law N 62-ФЗ "On Amendments and Additions to the Law of the Russian Federation 'On Company and Organization Income Tax'", Enactedon 31.03.1999. Effective from 01.04.1999.
2001	35%	Federal Law N 118-ФЗ "On Introduction of Part II of the Tax Code of the Russian Federation and Making Amendments to Several Legislative Acts of the Russian Federation on Taxes", Enactedon 05.08.2000. Effective from 01.01.2001.
2002-2008	24%	"Tax Code of the Russian Federation (Part II)" N 117-ФЗ, Enacted on 05.08.2000. Edited on 31.12.2001. Effective from 01.01.2002.
2009-2016	20%	"Tax Code of the Russian Federation (Part II)" N 117-ФЗ, Enacted on 05.08.2000. Edited on 30.12.2008. Effective from 01.01.2009.

Source: We compile the company tax rates from the legal articles of the Tax Codes of Russia provided by ConsultantPlus (http://www.consultant.ru).

Table 2.2: Personal Tax Rate (1992-2016)

Year	Taxable Income (in Russian roubles)	Tax Rate	References
1992	Up to 200,000 200,001 – 400,000 400,001-600,000 600,001 +	12% 20% 30% 40%	The Law of the Russian Federation N 3317-1 “On Amendments and Additions to the Tax System of the Russian Federation”,Effective from 16.07.1992.
1993	Up to 1,000,000 1,000,001 – 2,000,000 2,000,001 +	12% 20% 30%	The Law of the Russian Federation N 4618-1 “On Amendments and Additions to the Laws of the Russian Federation ‘On Personal Income Tax on Individuals’”, Effective from 06.03.1993.
1994-1995	Up to 10,000,000 10,000,001 –50,000,000 50,000,000 +	12% 20% 30%	Article 6 of the Law of the Russian Federation N 1998-1 "On Personal Income Tax on Individuals”,Enacted on 07.12.1991.
1996-1997	Up to 12,000,000 12,000,001 –24,000,000 24,000,001 –36,000,000 36,000,001 –48,000,000 48,000,001 +	12% 20% 25% 30% 35%	Federal Law N 22-ФЗ“On Amendments to Article 6 Law of the Russian Federation ‘On Personal Income Tax on Individuals’”, Effective from 05.03.1996.
1998	Up to 20,000 20,001-40,000 40,001 – 60,000 60,001 – 80,000 80,001 – 100,000 100,001 +	12% 15% 20% 25% 30% 35%	Federal Law N 159-ФЗ “On Amendments and Additions to the Law of the Russian Federation ‘On Personal Income Tax on Individuals’”, Enactedon 31.12.1997. Effective from 01.01.1998.
1999	Up to 30,000 30,001-60,000 60,001 – 90,000 90,001-150,000 150,001 – 300,000 300,001 +	12% 15% 20% 25% 35% 45%	Federal Law N 65-ФЗ “On Amendments and Additions to the Law of the Russian Federation ‘On Personal Income Tax on Individuals’”,Effective from 31.03.1999.
2000	Up to 50,000 50,001-150,000 150,001 +	12% 20% 30%	Federal Law N 207-ФЗ “On Amendments and Additions to the Law of the Russian Federation ‘On Personal Income Tax on Individuals’” Enacted on 25.11.1999. Effective from 01.01.2000.
2001-2016	All Personal Incomes*	13%	“Tax Code of the Russian Federation (Part II)" N 117-ФЗ, Enacted on 05.08.2000, Effective from 1.01.2001.

Notes: *the 13% flat tax rate is applied for personal incomes of residents; interest earned from deposit accounts is taxed at 35%. In 2001, the dividend tax rate was 30%; between 2002 and 2004, the rate was 6%; between 2005 and 2013, the rate was 9%.

2.3.2 Personal Taxation System and Reforms

We also compile the tax rates at the personal level. Table 2.2 shows the personal tax rates and references. Table 2.3 shows the company tax rate and personal tax rates on

equity incomes for the period of 1992-2016. The tax rates on interest income (T_i), dividend tax rate (T_d) and capital gain tax rate (T_g) were equal for the period 1992-2000, and varied between a maximum rate of 45% and a minimum rate of 30%.

In 2001, the personal taxation system changed from that of a progressive band system to a flat tax system (Ivanova et al., 2005). The tax rates on interest income (T_i) and capital gain income (T_g) were reduced substantially to a level of 13%, which is where they have remained ever since. The dividend tax rate (T_d) was the exception, staying at a level of 30%. However, in the following years from 2002 to 2005, it was also reduced to a level of 6% and was increased to 9% thereafter.

Table 2.3: Company, Personal and Miller Tax Rates (1992-2016)

Year	**T_c**	**T_i**	**T_d**	**T_g**	**T_e**	**T_m**
1992	0.32	0.40	0.40	0.40	0.26	0.32
1993	0.32	0.30	0.30	0.30	0.21	0.32
1994	0.38	0.30	0.30	0.30	0.21	0.38
1995	0.35	0.30	0.30	0.30	0.21	0.35
1996	0.35	0.35	0.35	0.35	0.24	0.35
1997	0.35	0.35	0.35	0.35	0.24	0.35
1998	0.35	0.35	0.35	0.35	0.23	0.35
1999	0.30	0.45	0.45	0.45	0.25	0.30
2000	0.30	0.30	0.30	0.30	0.21	0.30
2001	0.35	0.13	0.30	0.13	0.22	0.42
2002	0.24	0.13	0.06	0.13	0.10	0.21
2003	0.24	0.13	0.06	0.13	0.10	0.21
2004	0.24	0.13	0.06	0.13	0.10	0.21
2005	0.24	0.13	0.09	0.13	0.11	0.22
2006	0.24	0.13	0.09	0.13	0.11	0.22
2007	0.24	0.13	0.09	0.13	0.11	0.22
2008	0.24	0.13	0.09	0.13	0.11	0.22
2009-2016	0.20	0.13	0.09	0.13	0.11	0.18

Notes: T_c: Company Tax Rate; T_i: Tax Rate on Interest Income; T_d: Dividend Tax Rate; T_g: Capital Gain Tax Rate; T_e:Tax Rate on Equity Income; T_m: Miller Tax Rate.

2.4 Tax-based Hypotheses and Macro Determinants

Taking into account the tax reforms of 2001 and 2002, our hypothesis is based on the level of tax advantage of debt financing. To capture the tax effects at the company and personal levels, we also take into account the personal tax rates for interest, dividend and capital gain income to estimate the effective Miller tax advantage of debt. In line with the tax literature, we present the average tax rate on equity income[4] (T_e) in Table 2.3. The effective Miller tax advantage of debt is calculated as:

$$1 - \frac{(1-TAX)*(1-T_e)}{(1-T_i)} \quad (1)$$

where *TAX* is the effective company tax rate; T_i is the tax rate on interest income; T_e is the average tax rate on equity income. For each company-year observations in the sample, using effective company tax rate and personal tax rates, the effective Miller tax rate (MILLER) is calculated.

In the case when $T_i = T_d = T_g$, the tax advantage of debt is equal to the company tax rate (T_c), which is equal to the Miller tax rate (T_m) as shown in Table 2.3. In 2001, both interest income and capital gain taxes were reduced significantly to the same level of 13%, and there was a slight increase in the company tax rate from 30% to 35%. In 2001, the Miller tax rate was higher than the company tax rate. Figure 2.1 shows the relationship between the company tax rate and the Miller tax rate, and the spike in 2001 can clearly be observed.

After the 2001 and 2002 tax reforms, as shown in Table 2.3 and Figure 2.1, the Miller tax rate decreased significantly to a level of 21% and continued to decrease to

[4] It is the average of the dividend (T_d) and capital gain (T_g) tax rates, assuming that half of equity income comes from dividend income and the other half comes from capital gain income (Berk and DeMarzo 2011, p. 491).

a level of 18% after a slight increase to 22% between 2005 and 2008. In Figure 2.1, a dynamic taxation environment justifies the use of a dynamic model. We observe that during the post-tax reform period (2002-2016), both the levels of the company tax rate and the Miller tax rate are lower than they were during period preceding the tax reforms (1992-2000). Additionally, personal taxation policies on interest income, dividend income, and capital gain income have resulted in a Miller tax rate being less than the company tax rate.

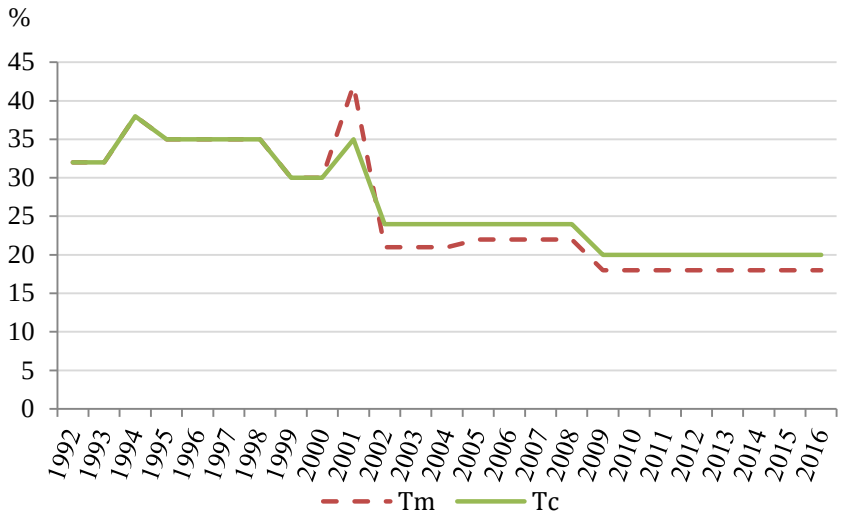

Figure 2.1: Company Tax Rate and Miller Tax Rate (1992-2016).
Notes: T_c: Company Tax Rate; T_m: Miller Tax Rate.

In Table 2.3, we observe that the most drastic company tax cut occurred in 2002, because the company tax rate decreased from 35% to 24% (i.e., 31 percent change in the company tax rate.) The average company tax rate for the period 1992-2001 is 34% (i.e., before the tax reform), and it is 22% for the period 2002-2016 (i.e., after the tax reform). We hypothesize that there was less tax advantage of debt financing (i.e., relatively lower Miller tax rates) during the post-tax reform period, and expect a decrease in the impact of the tax parameters on the level of company leverage.

In the 1990s, Russia had faced economic turmoil. The budget deficits had hindered the development of domestic financial markets (Berglof and Lehmann, 2009) and the Russian economy was hit by the debt crisis in 1998. In 2000, new reforms were undertaken in fiscal policies, regulatory system and corporate governance (Berglof and Lehmann, 2009). Additionally, at the same time, financial market reforms were introduced for the development of capital market (Davydov et al., 2014) and banking sector (Anzoategui et al., 2012) in order to stabilize the economy and to create better access to external financing for companies.

Relative to the banking sector in major emerging economies in the region (i.e., China and India), the more competitive Russian banking sector (Anzoategui et al., 2012) has provided greater supply of credits for companies (Cetorelli and Strahan, 2006). After the financial market reforms, companies have had access to the corporate bond market (Berglof and Lehmann, 2009) as well as to the equity market (Davydov et al., 2014). However, Russian companies preferred bank debt to equity due to the high political and macroeconomic risks. Despite of other alternative sources of debt financing, the domestic banking sector has remained the primary source of debt financing for companies (Davydov et al., 2014). In general, the bank loans are the dominant sources of external financing in transition economies (Klapper and Tzioumis, 2008; Tzioumis and Klapper, 2012).

Since 2000s, the volume of credits to non-financial sectors has increased (Berglof and Lehmann, 2009) by 30 percent. Due to the global financial crisis in 2007 and 2008, Russian domestic banks encountered with the liquidity problem, and it constrained the access to bank debt financing for companies. However, since the beginning of 2010, the volume of bank credits for the companies has started to

increase again (Berglof and Lehmann, 2009). In summary, we hypothesize that the financial market reforms and the increase in the volume of credits contribute to the upturn in the companies' leverage during the post-tax reform period.

2.5 Data and Methodology

2.5.1 Data

We collect company level and taxation data from a combination of sources. The process has been demanding and taken considerable time. We compile firm-level data for a total of 452 Russian oil and gas companies for the period of 1992-2016 from the Worldscope, OSIRUS and ORBIS databases. For cases with missing financial data, we hand collect the data from the official company websites and from SKRIN Database. We also obtain data from the Centre for Company Disclosure, which is one of the largest authorized agencies for public information disclosure on Russian securities. All of our data are double-checked for consistency. We present also the changes in the Russian tax system by investigating all tax code changes from the beginning of the transition period. The tax rates at the personal and company levels are accurate, hand collected data. We compile the company tax rates from the legal articles of the Tax Codes of Russia provided by ConsultantPlus. To best of our knowledge, our oil and gas company-level and taxation database for Russia is the largest and the most comprehensive dataset. Our final panel data sample consists of 3,213 company-year observations.

2.5.2 Model Variables

2.5.2.1 Dependent Variable

The dependent variable is the book debt ratio (DR). We use this ratio because the trade-off theory focuses on the book debt ratio (Fama and French, 2002) and adjustment behaviour in a dynamic setting is better detected (Abdeljawad et al.,

2013). As the bank loan covenants are written in terms of book values (Harvey et al., 2004), companies' management is mostly concerned with the book debt ratio. We also examine the effect on equity financing and use the equity ratio (ER) as the dependent variable in another model. The detailed descriptions of the dependent variables and independent variables are provided in Table 2.4.

2.5.2.2 Independent Variables

We use the effective tax rate (TAX) to measure the company tax rate, which captures the actual tax payments (Dong et al., 2014; Fernández-Rodríguez and Martínez-Arias, 2014; Fullerton, 1984; Huang and Song, 2006). For each company-year observations in the sample, using effective company tax rate and personal tax rates, the effective Miller tax rate (MILLER) is calculated. We also include the interaction terms of tax variables with size and profitability to capture the nonlinear effect of tax shields (Feld, Heckemeyer, and Overesch, 2013; Klapper and Tzioumis, 2008). We show the detailed definitions for all variables in Table 2.4.

We use the Emerging Market Score (EMS) model to estimate the bankruptcy probability of non-U.S. companies (Altman, 2005), and its full equation is shown in Table 2.4. Based on the distribution of EMS results, we categorize the companies: A company having an EMS value smaller than 4.14 is in the bankruptcy area; a company having a value between 4.15 and 5.85 is in a grey area; and a company having a value greater than 5.85 is in a safe area. According to the trade-off theory, companies with lower bankruptcy probability are expected to have greater leverage. Therefore, we should observe a positive relationship between EMS and leverage (DR).

We also consider the agency cost in our model, as it is one of the most important determinants in constructing optimal capital structure (Selim et al., 2012). The agency cost is significantly higher in emerging and transition economies such as Russia (Harvey et al., 2004). As a proxy, we use the percentage of 'total strategic holdings' (AGENCY), which is defined by Worldscope as the percentage of total strategically held shares of 5% or more that are not available to ordinary investors. Consistent with the agency theory (Jensen and Meckling, 1976), lower agency cost is associated with higher leverage. The higher the 'total strategic holding', the higher the potential agency cost resulting from higher management entrenchment, higher ownership concentration, higher wasteful investments and higher probability of wealth expropriation of minority shareholders. A higher leverage level can potentially decrease these potential agency costs (Lee et al., 2014). Considering the institutional settings in Russia, we expect a positive relationship between 'total strategic holding' and leverage. We also include the widely accepted capital structure control variables such as profitability (ROA), growth opportunity (MTBV), capital expenditures (CAPEX), size (SIZE), tangibility (TANG) and cash (CASH) in our model (Ragan and Zingales, 1995).

Following the model proposed by Booth et al. (2001), we include the macro settings to examine the effects of the growth rate (GDP), real interest rate (RIR), and proxy for the access to debt market (VC). We include industry dummies to control for industry effect, partially capturing the company fixed effects since the capital structure of companies in emerging markets is affected by industrial effects (Nirosha and Stuar, 2013). The time dummies are included to partially capture the effects of the Russian debt crisis (1998-1999), the global financial crisis (2008-2009) and other business cycles (e.g., Aivazian et al., 2005).

Table 2.4: Description of Variables

		DEFINITIONS
EXPLAINED VARIABLES	DR	Debt ratio (%) is calculated as: $\frac{(Short-term\ debt\ and\ current\ portion\ of\ long-term\ debt\ +\ Long-term\ debt)}{Total\ assets}$
	ER	Equity ratio (%) is calculated as: $\frac{Total\ equity}{Total\ assets}$
	MICRO VARIABLES	
TAX VARIABLES	TAX	Effective tax rate (%) is calculated as: $\frac{Total\ taxes\ paid}{Taxable\ income}$
	MILLER	Effective Miller tax rate (%) is calculated as: $1-\frac{(1-TAX)*(1-T_e)}{(1-T_i)}$
CONTROL VARIABLES	PERIOD	Period is the dummy variable: Value "0" indicates period 1992-2000, and "1" indicates period 2002-2016.
	AGENCY	% of total shares held strategically of 5% or more and which are not available to ordinary investors.
	EMS	Bankruptcy probability is calculated as: $6.56*\frac{Working\ capital}{Total\ assets}+3.26*\frac{Retained\ earnings}{Total\ assets}+6.72*\frac{Operating\ income}{Total\ assets}+1.05*\frac{Book\ value\ of\ equity}{Total\ liabilities}+3.25$
	ROA	Return on assets (%) is calculated as: $\frac{Net\ income}{Total\ Assets}$
	CAPEX	Capital expenditure (%) is calculated as: $\frac{Capital\ expenditure}{Total\ assets}$
	MTBV	Market to book value (%) is calculated as: $\frac{(Total\ assets-Book\ value\ of\ equity+Market\ capitalization)}{Total\ assets}$
	SIZE	Size is calculated as: $Ln\ (Total\ assets)$
	TANG	Tangible assets (%) is calculated as: $\frac{Net\ tangible\ assets}{Total\ assets}$
	CASH	Cash (%) is calculated as: $\frac{Cash\ and\ short\ term\ investments}{Total\ assets}$
	MACRO VARIABLES	
	GDP	The growth rate of the gross domestic product
	RIR	The real interest rate
	VC	Volume of domestic credit provided by banks to private sector (% GDP)

2.5.3 Model and Estimation Methodology

2.5.3.1 Model

We use the dynamic model proposed by Flannery and Rangan (2006), and use lagged control variables (e.g., Fama and French, 2002; Kayhan and Titman, 2007). The dynamic trade-off model of capital structure is defined as follows:

$$DR_{i,t} = \alpha_i + (1-\lambda)DR_{i,t-1} + \lambda \sum \beta_j X_{j,i,t-1} + \varepsilon_{i,t} \quad (2)$$

where DR is the debt ratio, X is the independent variable, and λ is the speed of adjustment towards the target debt ratio. DR can be used to measure the speed of adjustment if the determinants of capital structure are included in the model. In the literature, the partial adjustment model is used and is shown below:

$$\Delta DR = \lambda\left(DR^*_{i,t} - DR_{i,t-1}\right) + \varepsilon_{i,t} \quad (3)$$

where $DR^*_{i,t}$ is the target leverage level; λ is the speed of adjustment; and $\Delta DR_{i,t}$ is equal to the change in the leverage between *t-1* and *t*. If a company departs from the target debt ratio, the company tries to reach the target debt ratio as long as the adjustment cost is less than the cost of divergence (Abdeljawad et al., 2013). The range of the speed of adjustment is between "0" and "1". "0" indicates no adjustment towards the target leverage level, and "1" indicates full adjustment towards the target leverage level. The target leverage can be represented as a function of control variables $X_{i,t-1}$, and companies' fixed effects, α_i:

$$DR^*_{i,t} = \alpha_i + \beta X_{i,t-1} \quad (4)$$

If the $DR^*_{i,t}$ in equation (3) is replaced by the $DR^*_{i,t}$ definition in equation (4), we obtain equation (2). By using equation (2), we estimate the effects of tax reforms and macro settings on debt ratio (DR) by using the following models:

$$DR_{it} = \alpha_i + \lambda \cdot DR_{i,t-1} + \beta \cdot TX_{i,t-1} + \delta \cdot IV_{i,t-1} + \gamma \cdot MicroCV_{i,t-1} + \varphi \cdot MacroCV_{i,t} + \theta \cdot P_{i,t} + \sum_{j=1}^{T} \omega_j \cdot TD_j + \sum_{j=1}^{N} \delta_j \cdot ID_j + \varepsilon_{i,t} \quad (5)$$

$$DR_{it} = \alpha_i + \lambda \cdot DR_{i,t-1} + \beta \cdot TX_{i,t-1} + \delta \cdot IV_{i,t-1} + \xi \cdot CIV_{i,t-1} + \gamma \cdot MicroCV_{i,t-1} + \varphi \cdot MacroCV_{i,t} + \theta \cdot P_{i,t} + \sum_{j=1}^{T} \omega_j \cdot TD_j + \sum_{j=1}^{N} \delta_j \cdot ID_j + \varepsilon_{i,t} \quad (6)$$

where the subscript i is the company, and t is the time; DR is the capital structure variable - debt ratio (DR); TX is the tax variables – effective tax rate (TAX) and effective Miller tax rate (MILLER) are used in separate models; IV is the vector of interaction variables – effective tax rate interacted with period (TAX*PERIOD) and Miller tax rate interacted with period (MILLER*PERIOD) included in separate models; $MicroCV$ is the vector of micro control variables – agency cost (AGENCY), bankruptcy cost (EMS), profitability (ROA), capital expenditure (CAPEX), market to book value (MTBV), size (SIZE), tangibility (TANG), cash (CASH); $MacroCV$ is the vector of macro variables - economic growth (GDP), real interest rate (RIR), volume of credits (VC); P is the period dummy variable; TD is the time dummy variable, and T is the number of years; ID is the industry dummy variable, and N is the number of industries; ε is the disturbances.

In equation (6), we add CIV variable, which is the vector of interaction terms with continuous variables[5] - effective company tax rate and effective Miler tax rate interacted with size (TAX*SIZE; MILLER*SIZE), and with profitability (TAX*ROA; MILLER*ROA). We estimate the effect of effective company tax rate and effective Miller tax rate in separate models.

[5] Interacted continuous variables are centered. Centering is when the mean of each variable deducted from each value of all interacted variables. This eliminates the multicollinearity problem and provides meaningful interpretation of the findings (Robinson and Schumacker 2009).

We also estimate the following models to examine the effects of tax reforms and macro settings on the equity ratio as a dependent variable (Klapper and Tzioumis, 2008; Tzioumis and Klapper, 2012):

$$ER_{it} = \alpha_i + \lambda \cdot ER_{i,t-1} + \beta \cdot TX_{i,t-1} + \delta \cdot IV_{i,t-1} + \gamma \cdot MicroCV_{i,t-1} + \varphi \cdot MacroCV_{i,t} + \theta \cdot P_{i,t} + \sum_{j=1}^{T} \omega_j \cdot TD_j + \sum_{j=1}^{N} \delta_j \cdot ID_j + \varepsilon_{i,t} \quad (7)$$

$$ER_{it} = \alpha_i + \lambda \cdot ER_{i,t-1} + \beta \cdot TX_{i,t-1} + \delta \cdot IV_{i,t-1} + \xi \cdot CIV_{i,t-1} + \gamma \cdot MicroCV_{i,t-1} + \varphi \cdot MacroCV_{i,t} + \theta \cdot P_{i,t} + \sum_{j=1}^{T} \omega_j \cdot TD_j + \sum_{j=1}^{N} \delta_j \cdot ID_j + \varepsilon_{i,t} \quad (8)$$

where the subscript i is the company, and t is the time; ER is the capital structure variable - equity ratio. The descriptions of all other notations in equations (7) and (8) are the same as explained in equations (5) and (6). In equations (5), (6), (7) and (8), the IV is used to estimate the change in the tax advantage of debt financing after the tax reforms. The *P* (i.e., PERIOD dummy variable) is the variable interacted with TX (i.e., with TAX as well as with MILLER). The value "0" is set for the period 1992-2000 (i.e., pre-tax reform period) and the value "1" for the period 2002-2016 (i.e., post-tax reform period).[6]

In line with our hypothesis of a lower tax advantage of debt financing, for the dependent variable *DR*, we expect to have a negative total effect for both the effective company tax rate and the effective Miller tax rate (i.e., the sum of the coefficients of TX and TX*P). For the dependent variable *ER*, the expected sign for the total effect (i.e., the sum of the coefficients of TX and TX*P) is expected to be positive, contrary to the expected sign for the case of dependent variable *DR*.

[6] We do not include data in 2001 in our analysis since it is the transition year and the personal tax reform was enacted in 2001. The data in 2002 is included because the company tax reform was enacted at the beginning of 2002, and the year-end data capture the effects of tax reforms of 2001 and 2002.

2.5.3.2 Estimation Methodology

A dynamic model with lagged dependent variable and lagged regressors suffers from endogeneity problem. As long as the current realization of the dependent variable is the function of its past realization and other control variables, the endogeneity problem is observed because the error term of the model is correlated with the regressors. Static method econometric estimations (e.g., random effects, fixed effects) cannot solve the endogeneity problem. Since the regressand is a function of the error term, it follows that the lagged of regressand is also the function of the error term. By applying the fixed effects estimation method, we can remove the unobservable individual-specific effects, but the correlation between the lagged regressand and the residuals remains (Baltagi, 2001).

In our dynamic panel data, we also observe the endogeneity problem. We carried the Durbin-Wu-Hausman test to examine the endogeneity problem in our model (Baum, Schaffer, and Stillman, 2003). We obtained the Durbin-Wu-Hausman F-statistic of 33.05, which rejects the null hypothesis of exogeneity of regressors at 1% significance level. In order to solve the problem of endogeneity, Anderson and Hsiao (1981) suggest to carry the first differencing of the model and also to use instrumental variables for the differenced lagged of independent variables. Instrumental variables are uncorrelated with the error term and are correlated with the endogenous variable. By using the differencng method, we cannot be fully sure that we will have efficient results since instrumental variable estimation provides an inefficient result for the estimates, and does not use all the moment conditions (Baltagi, 2001).

Arellano and Bond (1991) propose a more efficient estimation than instrumental variable estimation proposed by Anderson and Hsiao (1981). It is called the Generalized Method of Moments (GMM) that is more efficient compared to the static method estimations (e.g., random effects, fixed effects). It provides consistent estimates (Cameron and Trivedi, 2005). The advantages of using GMM are not only limited to solving the endogeneity problems in the panel data but it also allows for the heteroscedasticity of unknown form and estimates parameters even if the model cannot be solved analytically from the first order conditions (Verbek, 2004).

Difference and System GMM are the two popular dynamic panel data estimations. These estimations can be applied for the cases of data set having a short time period and many cross-sections, the dynamic panel model, the endogeneity problem, and the presence of autocorrelation and heteroscedasticity within cross-secions. The Difference GMM is based on transforming all regressors by differencing. In the dynamic panel data, the Difference GMM provides a biased estimation due to weak instruments (Baltagi, 2001). The weak instruments can also be observed in the Level GMM. Thus, the System GMM is formed based on two equations; the original equation and transformed equations by taking additional moment condition.

System GMM reduces the finite sample bias and improves the estimation efficiency when the extra additional moment condition is valid (Baltagi, 2001). The additional assumption in the System GMM is that the transformed instrumental variables are not correlated with the fixed effects. This assumption improves the efficiency of estimations as more instruments can be applied. In this regard, the System GMM performs well in the dynamic model context having unbalanced panel data, and it corrects for the endogeneity problem (Flannery and Hankins, 2013). System GMM

estimator based on the estimation of the equation in differences and levels (Blundell and Bond, 1998). Difference approach removes the unobserved effects (i.e., including the firm-specific effect) by taking the first difference of the equation (Arellano and Bond, 1991). The system GMM uses all the available information in data set and it is considered the most efficient estimator in the dynamic model with the presence of unobserved heterogeneity effects (i.e., including the firm-specific effect) (Blonigen and Taylor, 1999; Hempell, 2006; O'Connor and Rafferty, 2012). In all of our estimations we apply the two-step system GMM panel estimation methodology (Arellano and Bover, 1995; Blundell and Bond, 1998). In panel data estimations, the two-step system GMM solves endogeneity problems without being affected by the distribution characteristics of variables (Davidson and Mackinnon, 2004). In the presence of heteroscedasticity in the model, the two-step system GMM has the minimum bias effect in estimators. For the specification test, Hansen's (1982) J-statistic is used to identify the overidentification restrictions, and the Arellano and Bond (1991) AR statistic is used to check for autocorrelation.

2.6 Empirical Results

2.6.1 Descriptive Analysis

Table 2.5 provides the descriptive statistics for the periods of 1992-2000 and 2002-2016. As shown in Table 2.5, both mean and median debt ratios (DR) (Mean: 0.22; Median: 0.20) for the post-tax reform (2002-2016) period are greater than the values for the pre-tax reform (1992-2000) period (Mean: 0.18; Median: 0.13). Similarly, both mean and median equity ratios (ER) (Mean: 0.57; Median: 0.60) for the post-tax reform (2002-2016) period are greater than the values for the pre-tax reform (1992-2000) period (Mean: 0.42; Median: 0.44). Focusing on the median values, which are less affected by outliers, the differences in median values of the two periods for both

DR and ER are statistically significant.

The mean and median effective company tax rates (TAX) are very close to each other for the two periods, and we observe a slight increase during the period of 2002-2016, because lower company tax rates following the tax reforms encouraged companies to pay taxes. However, only the median values of TAX for the two periods are significantly different. For the period preceding the tax reforms, the median TAX is 0.25 and for post-tax reform period, it increases to 0.27. We also observe that both the mean and median of MILLER decreased during the post-tax reform period and both decreases are statistically significant. The median MILLER decreases from 0.47 to 0.32.

The post-tax reform period also includes several other reforms such as tight fiscal policies, better regulatory system, and developments in corporate governance, capital market and banking sector. The company tax rate decreased from 35% to 24% in 2002 and remained at the same low rate till 2009 (i.e., decreased to 20%). The drastic decrease in 2002 followed by another decrease in 2009 triggered tax payment incentives and lessened tax evasions, and consequently, increased the effective company tax rate (Ivanova, 2005; Rabushka, 2003). Table 2.5 also shows that the median values of control variables, namely ROA, CAPEX, CASH, MTBV, SIZE and TANG, increase during the post-tax reform period. Except for MTBV, the increases in median values are all statistically significant.

In Table 2.6, Panel A and Panel B show the correlation matrix of all variables for the two periods. The correlations results indicate that TAX and MILLER are the only two variables having a high correlation of approximately 0.98. As shown in

equations (5) and (6), this result require that these two tax factors be used separately to avoid the multicollinearity problem. The variance inflation factor (VIF) results indicate an extremely high linear correlation between MILLER and TAX. All other variables have VIF less than 10, and tolerances (1/VIF) are greater than 0.1, indicating that we do not have a multicollinearity problem among other variables.

2.6.2 Estimation Results: Dynamic Trade-off Model

In Table 2.7, four models are estimated. The first two models ((1) and (2)) examine the effect of the effective company tax rate (TAX), and the other two models ((3) and (4)) examine the effect of the effective Miller tax rate (MILLER) on the debt ratio (DR). The interaction terms of taxation variables with size and profitability are included in models (2) and (4). The industry and time dummy variables are included in all models.

Consistent with the dynamic trade-off theory, in both model (1) and model (2), the effective company tax rate (TAX) is positive and statistically significant for the period of 1992-2000. The positive coefficient supports the theoretical expectation that Russian companies utilize the tax advantage of debt financing.

The results of model (1) and (2) show that TAX*PERIOD has a negative sign and is statistically significant in both models. The negative sign is in line with our hypothesis that the effect of the company tax rate on the debt ratio decreases. The total effect of the tax cut is negative in both models (i.e., the sum of the coefficients of TAX and TAX*PERIOD), and the tax advantage of debt financing diminished during this period. The dummy variable PERIOD sign is negative and statistically significant in all the four models, and the negative sign indicates that level of company leverage decreases during the post-tax reform period.

Models (3) and (4) estimation results show that the effective Miller tax rate (MILLER) is positive and statistically significant for the period of 1992-2000. Taking into the account taxation settings at both the company and personal levels, once again, the positive coefficient supports the theoretical expectation that Russian companies utilize the tax advantage of debt financing. However, the magnitude of the coefficient is far less than the one for the TAX because it also captures taxation effects at the personal level.

Table 2.5: Descriptive Statistics for periods 1992-2000 (pre-tax reforms period) and 2002-2016 (post-tax reforms period)

	Pre-tax Reforms Period 1992-2000					**Post-tax Reforms Period 2002-2016**					**Difference Tests**	
Variables	**Mean**	**Median**	**Max**	**Min**	**SD**	**Mean**	**Median**	**Max**	**Min**	**SD**	**Mean t-test**	**Median U-test**
DR	0.18	0.13	0.58	0.00	0.12	0.22	0.20	3.20	0.00	0.18	-10.35(0.00)	42.27 (0.00)
ER	0.42	0.44	0.86	0.03	0.15	0.57	0.60	0.91	0.20	0.24	-8.27 (0.26)	42.63 (0.00)
TAX	0.27	0.25	1.03	0.00	0.21	0.29	0.27	1.35	0.00	0.19	-1.02 (0.21)	5.79 (0.02)
MILLER	0.48	0.47	1.68	0.22	0.26	0.35	0.32	1.73	0.10	0.22	7.15 (0.00)	10.74 (0.00)
AGENCY	0.07	0.00	0.11	0.00	0.10	0.15	0.00	1.00	0.00	0.25	-38.45 (0.00)	58.64 (0.00)
ROA	0.15	0.14	0.66	-0.25	0.17	0.18	0.16	1.38	-0.83	0.16	-2.48 (0.19)	8.01 (0.02)
CAPEX	0.06	0.05	0.31	0.00	0.10	0.13	0.07	0.66	0.00	0.13	-1.46 (0.08)	13.58 (0.00)
CASH	0.06	0.04	0.38	0.00	0.18	0.15	0.07	3.00	0.00	0.25	-8.62 (0.00)	15.71 (0.00)
MTBV	0.72	0.37	10.0	0.00	1.18	1.07	0.41	10.0	0.00	1.86	-3.25 (0.00)	0.84 (0.26)
SIZE	0.16	0.17	0.22	0.11	0.02	0.16	0.19	0.23	0.05	0.02	7.18 (0.00)	13.11 (0.00)
TANG	0.74	0.76	0.96	0.01	0.17	0.79	0.81	1.00	0.00	0.24	22.84 (0.00)	16.25 (0.00)

Notes: The mean t-test and the non-parametric Mann-Whitney U-test are used to test for differences in mean and median between two periods respectively. The values in parentheses are the p-values. SD is the standard deviation.

Table 2.6: Correlation Matrix

Panel A: Pre-tax Reforms Period (1992-2000)

Variables	DR	ER	TAX	MILLER	AGENCY	ROA	CAPEX	EMS	CASH	MTBV	SIZE	VIF	1/VIF
TAX	-0.07	-0.03										39.43	0.02
MILLER	-0.09	0.05	0.98*									37.87	0.03
AGENCY	0.04	0.23	-0.04	-0.06								1.45	0.65
ROA	-0.27*	0.25*	0.12	0.10	0.33*							2.10	0.48
CAPEX	0.31*	-0.23*	0.09	0.07	-0.03	0.32*						1.99	0.50
EMS	-0.20*	0.25*	0.10	0.10	-0.22*	0.21*	0.10					1.37	0.73
CASH	-0.20*	0.05	0.10	0.07	0.30*	0.42*	0.24*	0.08				1.16	0.87
MTBV	0.03	-0.15*	0.11	0.08	0.15	0.05	0.08	0.07	0.10			1.15	0.87
SIZE	-0.02	-0.18	0.27*	0.23*	-0.37*	0.19*	0.15	0.04	0.18*	-0.12		1.07	0.93
TANG	0.09	0.33*	-0.09	-0.07	-0.62*	-0.32*	-0.05	0.07	-0.52*	-0.11	-0.08	1.04	0.96

Panel B: Post-tax Reforms Period (2002-2016)

Variables	DR	ER	TAX	MILLER	AGENCY	ROA	CAPEX	EMS	CASH	MTBV	SIZE	VIF	1/VIF
TAX	-0.11*	0.13*										11.74	0.09
MILLER	-0.10*	0.06	0.98*									15.86	0.07
AGENCY	0.03*	-0.07*	-0.09*	-0.06*								1.25	0.72
ROA	-0.20*	0.37*	0.08*	0.09*	-0.03							1.47	0.72
CAPEX	0.24	0.14*	0.04	-0.02	0.09*	0.25*						1.24	0.81
EMS	-0.31*	0.42*	0.10*	0.12*	0.05	0.19*	0.15*					1.15	0.87
CASH	-0.07*	0.10*	-0.06*	-0.06	-0.08*	0.13*	-0.17*	0.07*				1.13	0.89
MTBV	0.05	-0.07	-0.05	-0.09	0.11*	0.16*	0.19*	-0.03*	-0.06			1.12	0.89
SIZE	0.14*	0.12*	-0.05	-0.03	0.28*	0.15*	0.31*	0.11*	-0.14*	0.17*		1.09	0.91
TANG	0.08*	0.17*	-0.08**	-0.05*	0.08*	0.07*	0.31*	-0.07*	-0.28*	0.09*	0.41*	1.05	0.95

Notes: We test for the statistical significance of correlations by using Pearson's correlation test. VIF is a variance inflation factor. *statistically significant at a minimum level of 5%.

Table 2.7: Estimation Results of Leverage Ratio

		Models			
		(1)	(2)	(3)	(4)
Lagged Debt	$DR_{(t-1)}$	0.90 (5.36)***	0.79 (3.94)***	0.91 (6.19)***	0.87 (6.21)***
TAX VARIABLES	$TAX_{(t-1)}$	0.58 (1.42)*	0.51 (2.39)**		
	$TAX*PERIOD_{(t-1)}$	-0.64 (-1.69)*	-0.56 (-2.59)**		
	$TAX*ROA_{(t-1)}$		-0.75 (-2.47)**		
	$TAX*SIZE_{(t-1)}$		0.37 (1.85)*		
	$MILLER_{(t-1)}$			0.03 (1.79)*	0.02 (1.75)*
	$MILLER*PERIOD_{(t-1)}$			-0.04 (-1.85)*	-0.02 (-1.88)*
	$MILLER*ROA_{(t-1)}$				-0.06 (-1.95)*
	$MILLER*SIZE_{(t-1)}$				0.009 (2.10)**
CONTROL VARIABLES	PERIOD	-0.12 (-2.64)**	-0.13 (-2.61)**	-0.07 (-2.46)**	-0.09 (-2.48)**
	$AGENCY_{(t-1)}$	0.08 (2.48)**	0.06 (4.19)***	0.08 (1.79)*	0.07 (2.73)**
	$EMS_{(t-1)}$	0.04 (1.75)*	0.06 (2.79)**	0.09 (1.61)*	0.05 (2.17)**
	$ROA_{(t-1)}$	-0.13 (-2.41)**	-0.12 (-4.94)***	-0.23 (-1.54)*	-0.09 (-0.54)
	$CAPEX_{(t-1)}$	0.10 (0.54)	0.55 (3.37)***	0.27 (2.39)**	0.60 (2.94)***
	$MTBV_{(t-1)}$	-0.01 (-1.79)*	-0.03 (-0.85)	-0.02 (-1.75)*	-0.001 (-0.40)
	$SIZE_{(t-1)}$	-0.03 (-1.84)*	-0.07 (-2.49)**	-0.05 (-2.59)**	-0.05 (-2.24)**
	$TANG_{(t-1)}$	-0.03 (-0.61)	-0.04 (-0.22)	-0.15 (-1.42)	0.07 (1.12)
	$CASH_{(t-1)}$	-0.07 (-0.49)	-0.09 (-0.67)	-0.07 (-3.74)***	-0.06 (-1.95)**
	GDP	-0.11 (-1.98)*	-0.13 (-1.95)*	0.02 (0.05)	-0.15 (-2.47)**
	RIR	-0.08 (-0.66)	-0.006 (-0.45)	-0.06 (-1.35)	-0.002 (-0.91)
	VC	0.24 (2.57)**	0.28 (2.68)**	0.05 (0.79)	0.02 (1.79)*
	Constant	-0.03 (-1.04)	0.04 (1.75)*	-0.05 (-1.12)	0.02 (1.24)
	Industry Dummy	Yes	Yes	Yes	Yes
	Time Dummy	Yes	Yes	Yes	Yes
	Instruments	L1, L2	L1, L2	L1, L2	L1, L2
	AR(2)	0.47	0.42	0.27	0.31
	Hansen (p-value)	0.22	0.18	0.24	0.21
	Observations	2,473	2,473	2,481	2,481

Notes: The values of AR(2) are the significant levels of the second-order serial autocorrelation;Hansen (p-value) indicates the significance level of Hansen's J statistic. Settings applied for STATA xtabond2 codes are small, robust and two-step and collapse. The values in parentheses are t-stats. ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

In Table 2.7, the interacted variable MILLER*PERIOD has a negative and statistically significant coefficient in both models (3) and (4). The results show that the total effect of the tax cuts is the same and is approximately zero in both models (i.e., the sum of the coefficients of MILLER and MILLER*PERIOD). The result is in line with our hypothesis that the impact of tax factors on the debt ratio decreased after the tax reforms.

The lagged DR ($DR_{(t-1)}$) is positive in all four models and statistically significant. The results support the significant importance of lagged debt ratio in determining the level of leverage based on the dynamic trade-off theory. Focusing on models (2) and (4) which includes tax variables as an interaction terms with company profitability and size, the coefficients for lagged DR are 0.79 and 0.87, respectively. Accordingly, the speed of adjustments (λ) for models (2) and (4) are 21% and 13%, respectively. Depending on the costs and benefits of rebalancing that can vary among companies, heterogeneity is observed within the same country (Abdeljawad et al., 2013).

The micro control variables AGENCY, EMS, ROA, CAPEX, SIZE are statistically significant, and have consistent signs almost in all models. The AGENCY variable captures the agency cost and has a positive sign. It is in line with the agency hypothesis that there is a positive relationship between agency cost and leverage, and the leverage acts as a mechanism for alleviating agency problems (Jensen and Meckling, 1976). Mainly, the low agency cost of leverage is observed in developing countries that have to some extent developed financial market (Gonenc and Haan, 2014). The EMS variable has a positive sign, indicating the presence of financial distress costs. The higher the EMS score, the lower bankruptcy probability, hence giving companies higher debt capacity (Fama and French, 2002). The positive sign of CAPEX implies that capital expenditures have more collateral value and increase the debt capacity (Frank and Goyal, 2009).

The ROA variable has a negative coefficient in line with the dynamic version of the trade-off theory (Fischer et al., 1989). Profitable companies depart from the optimal level of leverage up to the level when high cost of adjusting the level of leverage exceeds the cost of having suboptimal composition of financing (Hovakimian et al.,

2004). The coefficients of interaction terms TAX*ROA in the model (2) and MILLER*ROA in the model (4) are negative and statistically significant. The negative coefficient indicates that the effect of effective company tax rate (TAX) on leverage (DR) is less for profitable companies. The main effect of TAX becomes negative (i.e., the sum of the coefficients of TAX and TAX*ROA). The profitability level of company has a moderating effect on the relationship of the effective tax rate on the level of company leverage.

The SIZE variable has a negative effect on the level of leverage. Larger companies tend to borrow less relative to smaller companies. One of the explanations is that large firms have less asymmetric information, and prefer issuing equity rather than borrowing debt. Another explanation for the negative relationship is due to costly external financing, and large companies rely more on internal sources of funds (Rajan and Zingales, 1995). Similarly, Klapper and Tzioumis (2008), and Tzioumis and Klapper (2012) show that in a transition country, larger Croatian companies have more favourable taxation flexibilities and are less affected by tax changes. The coefficients of interaction terms TAX*SIZE in the model (2) and MILLER*SIZE in the model (4) are positive and statistically significant. The results show that size positively affects the relationship between tax advantage of debt and the level of leverage. If the size of the company increases, the effect of taxes on the level of debt also increases. The main effect of TAX becomes more positive (i.e., the sum of the coefficients of TAX and TAX*SIZE).

Considering the settings in Russia and the dynamic version of the trade-off theory of capital structure, we do not have strong empirical evidence for the micro control variables, namely, CASH, MTBV, and TANG, because their statistical significance

is not consistent among the estimated models. CASH variable has negative sign in all models. It is significant in model (3) and (4), which takes into consideration both the personal and company taxes (MILLER). Companies with high cash holdings decrease their level of leverage (Opler et al., 1999). The MTBV variable has negative sign in all four models, but it is significant only in models (1) and (3). This negative association of growth opportunities (i.e., MTBV) and leverage in G7 countries was examined by Rajan and Zingales (1995). Companies with high growth opportunity decrease the level of leverage because of having probability of losing more value in the case of bankruptcy (Frank and Goyal, 2007).

TANG variable is statistically insignificant in all models, and have negative sign in models (1-3), and positive sign in model 4. On the one hand, the positive sign is in line with the trade-off theory. Companies with high tangible assets tend to increase their leverage (Frank and Goyal, 2007), and especially, for Russian companies, the asset tangibility serves as a significant collateral for bank debts in order to alleviate the moral hazard and the adverse selection problems. On the other hand, the negative relationship supports the pecking order theory. Tangibility lessens the asymmetric information, and lessens the cost of issuing equity (Haris and Raviv, 1991). Specifically, Booth et al. (2001) argue that the impact of the tangibility on level of leverage depends on different types of debts. Companies with high tangible assets tend to increase their long-term debt. Profitable companies with high tangible assets decrease their total debt.

Until the 2000s, Russia had experienced negative real GDP growth and significantly high real interest rates. Especially, for the period before 2003, GDP growth was heavily driven by production, and after, by capital inflows (Kaitila, 2016). This can

be observed in Figure 2.2, which shows that economic growth picked up together with negative real interest rates. Favourable economic conditions should increase the debt capacity of companies. Starting in 1999, in Figure 2.2, we observe a sharp increase in the volume of bank credit to the private sector, which indicates that companies have had easier access to bank debt financing.

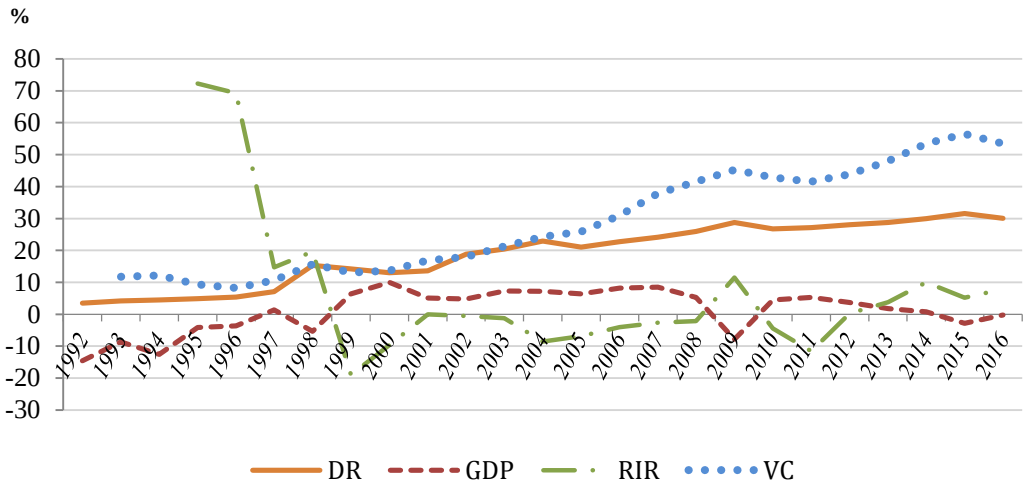

Figure 2.2: Average Debt Ratio, Growth Rate, Real Interest Rate andAccess to Debt Market (1992-2016).
Notes: DR: The average debt ratio; GDP: The growth rate in gross domestic product; RIR: Real interest rate; VC: Volume of domestic credit provided by banks to private sector

In line with our expectations, the macro-control variables, GDP and VC, are statistically significant and have negative and positive coefficients respectively in Table 2.7. Economic growth spurs the development of the stock market and opens access to equity financing rather than debt financing (Booth et al., 2001). Greater supply of bank credits means greater access to bank loans, which positively impact the level of company leverage. RIR has negative coefficient in all models as an increase in RIR makes it expensive for companies to borrow. However, RIR is statistically insignificant in all models.

Table 2.8: Estimation Results of Equity Ratio

		Models			
		(1)	(2)	(3)	(4)
Lagged Equity	$ER_{(t-1)}$	0.97 (6.84)***	0.98 (5.34)***	0.98 (5.85)***	0.97 (3.73)***
TAX VARIABLES	$TAX_{(t-1)}$	-3.26 (-2.99)**	-1.95 (-1.70)*		
	$TAX*PERIOD_{(t-1)}$	3.35 (2.45)**	2.04 (1.65)*		
	$TAX*ROA_{(t-1)}$		0.53 (0.41)		
	$TAX*SIZE_{(t-1)}$		-4.17 (-1.06)		
	$MILLER_{(t-1)}$			-0.007 (-1.65)*	-0.003 (-1.82)*
	$MILLER*PERIOD_{(t-1)}$			0.007 (1.76)*	0.003 (1.67)*
	$MILLER*ROA_{(t-1)}$				0.012 (0.59)
	$MILLER*SIZE_{(t-1)}$				-0.003 (-1.70)*
CONTROL VARIABLES	PERIOD	0.010 (2.74)**	0.007 (1.75)*	0.004 (2.33)*	0.009 (1.60)*
	$AGENCY_{(t-1)}$	-0.12 (-2.46)**	-0.15 (-3.05)***	-0.12 (-2.46)**	-0.11 (-1.90)*
	$EMS_{(t-1)}$	-0.14 (-4.47)**	-0.12 (-2.87)**	-0.08 (-3.66)***	-0.07 (-2.99)***
	$ROA_{(t-1)}$	0.41 (2.63)***	0.25 (1.49)	0.56 (4.61)***	0.37 (1.47)
	$CAPEX_{(t-1)}$	-1.35 (-3.78)***	-1.31 (-4.34)***	-1.55 (-3.73)***	-1.32 (-2.38)**
	$MTBV_{(t-1)}$	0.08 (1.90)*	0.03 (1.67)*	0.03 (1.75)*	0.04 (0.64)
	$SIZE_{(t-1)}$	0.24 (2.38)**	0.26 (1.87)*	0.06 (2.71)***	0.1 (2.40)**
	$TANG_{(t-1)}$	-0.13 (-0.18)	-0.16 (-0.38)	0.27 (0.72)	0.22 (0.48)
	$CASH_{(t-1)}$	0.58 (2.42)	0.67 (3.12)***	0.03 (1.85)*	0.04 (1.81)*
	GDP	0.26 (0.71)	1.27 (2.37)**	0.02 (0.05)	0.34 (1.62)*
	RIR	0.07 (0.90)	0.01 (2.87)***	0.002 (0.70)	0.004 (1.95)*
	VC	0.04 (0.70)	-0.03 (-1.77)*	-0.02 (1.84)*	-0.02 (-1.73)*
	Constant	-1.26 (-1.51)	-2.41 (-1.62)	-0.13 (-4.31)***	-0.24 (-1.21)
	Industry Dummy	Yes	Yes	Yes	Yes
	Time Dummy	Yes	Yes	Yes	Yes
	Instruments	L1, L2	L1, L2	L1, L2	L1, L2
	AR(2)	0.21	0.28	0.34	0.24
	Hansen (p-value)	0.18	0.21	0.19	0.14
	Observations	2,475	2,475	2,482	2,482

Notes: The values of AR(2) are the significant levels of the second-order serial autocorrelation; Hansen (p-value) indicates the significance level of Hansen's J statistic. Settings applied for STATA xtabond2 codes are small, robust and two-step and collapse. The values in parentheses are t-stats. ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

To extend our findings, we estimate four additional models to examine the effects of tax reforms on the equity ratio. In Table 2.8, the first two models ((1) and (2)) examine the effect of the effective company tax rate (TAX), and the other two models ((3) and (4)) examine the effect of the effective Miller tax rate (MILLER) on the equity ratio (ER). The interaction terms of taxation variables with size and profitability are included in models (2) and (4). The industry and time dummy variables are included in all models.

In both models (1) and (2), the company tax rate (TAX) is negative and statistically significant for the period of 1992-2000. The negative coefficient supports our finding that Russian companies shifts to equity financing if the tax advantage of debt decreases. The results of model (1) and (2) show that TAX*PERIOD has a positive sign and is statistically significant in both models. The positive sign indicates that in the post-tax reform period (2002-2016), the effect of tax is positive for equity financing. The plausible explanation is the drastic tax cut (i.e., from 35% to 24% in 2002) diminishes the magnitude of tax advantage of debt financing. The total effect of the tax cut on equity financing is positive in both models (i.e., the sum of the coefficients of TAX and TAX*PERIOD). The dummy variable PERIOD is positive and statistically significant in all four models, indicating an increase in the level of equity financing during the post-tax reform period.

Taking into account the taxation settings at both company and personal levels, the positive coefficient is in line with our previous findings that Russian companies increase their equity financing. The effective Miller tax rate (MILLER) is negative and statistically significant for the period of 1992-2000 (Models 3 and 4). The interacted variable MILLER*PERIOD has a positive and statistically significant coefficient in both models (3) and (4). The results indicate that the total effect of the tax cuts is same and is approximately zero in both models (i.e., the sum of the coefficients of MILLER and MILLER*PERIOD).

The coefficient of interaction terms TAX*ROA in the model (2) and MILLER*ROA in the model (4) has positive sign but both are statistically insignificant, indicating that level of profitability of companies does not have a moderating effect on the relationship between the main effect of effective tax rates on level of equity. The

coefficient of interaction terms TAX*SIZE in the model (2) and MILLER*SIZE in the model (4) is negative, but only MILLER*SIZE is statistically significant. The results reveal that the effect of effective Miller tax rate on the level of equity is less for bigger size of companies. The main effect of Miller tax rate becomes more negative (i.e., the sum of the coefficients of Miller and Miller*SIZE).

The control variables also substantiate our earlier findings in Table 2.7. The micro control variables AGENCY, EMS, CAPEX, MTBV, SIZE and CASH are highly statistically significant and have coherent signs in all models. The explanations of signs are just the opposite of their impacts on level of leverage. ROA has a consistent sign and only statistically significant in models (1) and (3). TANG variable is again statistically insignificant and has inconsistent signs. The macro control variables GDP, RIR and VC support our expectations. Mainly, VC variable has a statistically significant negative sign in three models, except for in model (1) with no statistical significance. A greater access to debt financing decreases the dependency on equity financing. The economic growth stimulates the development of stock market and result in more equity issues. The RIR variable has a positive coefficient indicating that equity financing becomes more favourable during the times of high real interest rates.

2.6.3 Robustness Results

The results of robustness estimations are shown in Table 2.9. Our first robustness check (Models (1) and (2)) focuses on the sample of *active* companies, and we exclude the yearly observations in which companies have *losses.*[7] Companies can

[7] Companies with losses have a right to carry them forward. In Russia, the Article 283 "Loss Carried Forward" has been amended in the Russian Tax Code (Part II) on 31.12.2001, and has become effective from 1.01.2002. Companies incurring losses in the previous tax period (periods) may lessen the tax base of the current accounting period by carrying losses forward for the full amount of losses

only benefit from tax benefits of debt financing if they have positive pre-tax earnings. The time dummy variable is also included to capture the effects of crises years. The results of Models (1) and (2) are consistent with our main findings, that the total effect of the tax cut is negative for the level of leverage. The company profit has a moderating function in the effect of the tax on the level of leverage. For more profitable companies, the main effect of tax variables on level of leverage becomes less positive. Our main findings on micro and macro control variables are also supported by the estimation results in Models (1) and (2). The noteworthy result is the negative market to book value effect in all models of Table 2.9. The market to book value becomes a significant factor in line with the trade-off theory that high growth companies tend to rely more on equity financing because of higher bankruptcy costs. Tangibility remains insignificant and has inconsistent signs.

The whole period (i.e., 1992-2016) includes less drastic tax cut years (i.e., 1995, 1999 and 2009 in Table 2.3). Our second robustness check analyses the effect of the 2002 tax cut by shortening the sample period (i.e., 1995-2008). For this sample period, the interaction term is used to estimate the change in the tax advantage of debt financing after the tax reform in 2002. The PERIOD dummy variable is the variable interacted with TAX in Model (3). The value "0" is set for the period 1995-1998 (i.e., the company tax rate is 35%) and the value "1" for the period 2002-2008 (i.e., the company tax rate is 24%).[8]

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or only part of the amount. In the case of incurring losses, companies have a right to carry losses forward for ten years beginning from the year when the loss occurred. If the company experiences losses for more than one tax period, the carry forward of those losses is made in the order in which they are incurred.

[8] We do not include data in 1999-2000 in our analysis due to the fact that those years with different tax rates. Also, we do not include year data 1995 and 2001 in our analysis, because those years are considered to be the transition years. The company tax rate of 35% (35%) was effective from 25.04.1995 (1.01.2001). The data in 2002 is included because the company tax reform was effective from 01.01.2002, and the year-end data capture the effects of tax reforms of 2002.

Table 2.9: Robustness Results

		Models			
		(1)	(2)	(3)	(4)
Lagged Debt	$DR_{(t-1)}$	0.62 (3.57)***	0.51 (4.77)***	0.76 (3.81)***	0.69 (5.23)***
TAX VARIABLES	$TAX_{(t-1)}$	0.39 (5.65)***		0.65 (2.24)**	0.12 (1.65)*
	$TAX*PERIOD_{(t-1)}$	-0.46 (-2.64)**		-0.74 (-2.36)**	-0.14 (-3.72)**
	$TAX*ROA_{(t-1)}$	-0.32 (-3.54)***		-0.35 (-1.74)*	-0.29 (-1.68)*
	$TAX*SIZE_{(t-1)}$	0.21 (0.68)		1.66 (0.32)	0.62 (1.26)
	$MILLER_{(t-1)}$		0.09 (3.35)***		
	$MILLER*PERIOD_{(t-1)}$		-0.10 (-2.44)**		
	$MILLER*ROA_{(t-1)}$		-0.03 (-1.71)*		
	$MILLER*SIZE_{(t-1)}$		0.001 (0.36)		
CONTROL VARIABLES	PERIOD	-0.16 (-2.18)**	-0.005 (-2.11)**	-0.24 (-2.27)**	-0.001 (-2.87)***
	$AGENCY_{(t-1)}$	0.11 (3.75)***	0.04 (3.34)***	0.15 (3.93)***	0.09 (2.53)**
	$EMS_{(t-1)}$	0.01 (1.78)*	0.002 (1.64)*	0.43 (2.25)**	0.02 (2.47)**
	$ROA_{(t-1)}$	-0.09 (-3.21)**	-0.04 (-3.66)***	-0.12 (-1.88)*	-0.07 (-2.61)**
	$CAPEX_{(t-1)}$	0.06 (0.49)	0.24 (1.21)	1.05 (0.44)	1.36 (0.96)
	$MTBV_{(t-1)}$	-0.16 (-2.67)**	-0.03 (-1.63)*	-0.2 (-0.34)	-0.04 (-2.63)**
	$SIZE_{(t-1)}$	-0.08 (-1.64)*	-0.07 (-1.51)*	-0.2 (-0.67)	-0.08 (-1.84)*
	$TANG_{(t-1)}$	0.05 (1.13)	-0.02 (-0.76)	0.15 (1.73)*	-0.03 (-1.22)
	$CASH_{(t-1)}$	-0.07 (-1.66)*	-0.08 (-1.77)*	-1.16 (-1.35)	-0.14 (-2.43)**
	GDP	-0.14 (-1.94)**	-0.10 (-2.69)**	-0.07 (-2.14)**	-0.12 (-2.65)**
	RIR	-0.02 (-1.25)	-0.01 (-1.58)*	-0.0001 (-0.37)	-0.02 (-1.74)*
	VC	0.36 (4.17)***	0.19 (3.25)***	0.15 (1.62)*	0.27 (2.58)**
	Constant	0.02 (3.49)***	0.14 (1.89)*	0.02 (2.12)**	0.12 (2.44)**
	Industry Dummy	Yes	Yes	Yes	Yes
	Time Dummy	Yes	Yes	Yes	Yes
	Instruments	L1, L2	L1, L2	L1, L2	L1, L2
	AR(2)	0.46	0.56	0.31	0.35
	Hansen (p-value)	0.16	0.21	0.19	0.17
	Observations	2,013	2,013	1,004	1,682

Notes: Model (1) and (2) based on the sample of only active companies without company-year losses. Model (3) and (4) estimations based on the period of 1995-2008 and 2002-2013 respectively. The values of AR(2) are the significant levels of the second-order serial autocorrelation; Hansen (p-value) indicates the significance level of Hansen's J statistic. Settings applied for STATA xtabond2 codes are small, robust and two-step and collapse. The values in parentheses are t-stats. ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

We show the estimation results in Model (3), and our main finding does not change. The tax cut decreases the level of leverage is robust even when we shorten the sample period and eliminate the effects of other tax cuts.

Our third robustness check focuses on the effect of less drastic tax cut in 2009 on the level of company leverage for the sample period of 2002-2016. We also include the

interaction term (i.e., TAX*PERIOD) to estimate the effect of the tax cut in Model (4) of Table 9. The value "0" is set for the period 2002-2008 (i.e., the company tax rate is 24%) and the value "1" for the period 2009-2016 (i.e., the company tax rate is 20%). The results show that the total effect of the tax cut is negative even though it was a small tax cut (i.e., from 24% to 20%). The total effect of the 2009 tax cut (-0.02) is smaller compared to the total effect of the 2002 tax cut (-0.07). This result indicates that the magnitude of tax cut matters for the total effect on the level of leverage for Russian companies. The higher the magnitude of the tax cut, the more negative the effect on the level of leverage. The control variables are in line with our previous findings and have consistent signs. Finally, in our robustness checks, we do not consider the tax change in 1994 (i.e., an increase from 32% to 38% in the company tax rate) because the change had lasted for one year and the period 1992-1994 had been the most drastic transition period economically and politically. Moreover, we do not have enough observations to apply our estimation methodology.

2.7 Conclusions

We examine the effects of the two tax reforms of 2001 and 2002 in the financing choices of Russian companies. The descriptive analysis showed significant changes in the key company ratios for the two periods: 1) 1992-2000 (the pre-tax reforms period) and 2) 2002-2016 (the post-tax reforms period). Within the theoretical framework of the dynamic trade-off model, our findings show a relationship between taxation policies and company debt ratios at the micro level. During the pre-tax reforms period, high company tax rates had provided greater incentives for debt financing. However, during the post-tax reforms period, the tax advantage of debt financing decreased significantly due to the significant cut in the company tax rate.

This has also led to an increase in the level of company equity.

Even though the tax advantage of debt financing diminished during the post-tax reforms period, we observe a consistent increase in the average debt ratios of Russian companies. This has led us to examine the macro factors. Our empirical analysis shows that the volume of credit to the private sector is the driving factor behind this consistent increase. In future studies focusing on emerging economies, we strongly recommend that both micro and macro level factors be considered in analysing companies' financing decisions.

We test the presence of the bankruptcy costs and agency costs in Russian companies. We use the emerging market score (EMS) model to estimate the presence of the bankruptcy costs and use the total strategic holdings as a proxy of agency costs. We find a positive relationship between EMS and debt financing. Russian companies with lower bankruptcy probability have greater leverage, and it is in line with the trade-off theory. Our findings are also consistent with the agency theory. Russian companies alleviate the agency costs by using debt financing. Considering the institutional settings in Russia, debt financing can potentially decrease wasteful investments and wealth expropriation of minority shareholders.

Chapter 3

OIL PRODUCTION COST, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

3.1 Introduction

Fossil energy resources have always been an integral part of the strategic economic and political policies of the Russian Federation (thereafter, Russia). These policies are determined and implemented centrally by the Russian government. In the 2000s, the revenue from oil and gas sources have constituted more than 50% of all exports. Moreover, almost 30% of the federal budget is supported by oil and natural gas revenue (Korppoo, 2018). In this study, we examine the causal relationship of oil and natural gas prices, oil production cost, financial development, education and effectiveness of public institutions on economic growth in Russia.

The resource curse hypothesis states that abundance of the natural resources diminish the economic growth (Auty, 1994). Economic growth is affected negatively by several factors, such as rent-seeking activity (Robinson, Torvik, and Verdier, 2006), Dutch disease (Sachs and Warner, 1997), mismanagement of oil revenue (Watts, 2004), and corruption (Roberts, 2015). Studies confirm (Karl, 2007; Sachs and Warner, 1997) that oil and natural gas rich states are disposed to have a low economic growth. However, some studies also find that fossil energy sources have positive effect on economic growth in countries that have continuous and sustainable financial development (Moradbeigi and Law, 2017), strong political and public

institutions (Robinson, Torvik, and Verdier, 2006), and high investments in education (Gylfason, Herbertsson, and Zoega, 1999).

For the first time in the literature, this study captures the production cost of oil. Our unique cost data enable us to determine the impact of the cost management practices in Russian oil companies on economic growth. Our production cost data do not include trade and transport costs, non-deductible value-added taxes and subsidies that can lead to the endogeneity problem in the estimations.

Though being an important variable that can potentially reduce the negative effect of oil price volatility on economic growth, the production cost of fossil energy sources has not attracted the attention of researchers. The documents of "Energy Strategies of Russia" for the periods of 2020, 2030 and 2035 ratified during Putin's presidency, mainly focused on developing government policies to accelerate economic growth by using energy sources.

Our results show that the Russian government should encourage investments in new technology to lower the production costs, as cost efficiency dampens the negative effects of resource curse and causes higher economic growth. Like the findings in similar studies (e.g., Gylfason, 2001; Moradbeigi and Law, 2017), we also show the positive effects of financial and human capital developments on economic growth. Unlike the findings in similar studies (e.g., Davis and Tilton, 2005, Sachs and Warner, 2001), we find that natural gas price positively affects Russia's economic growth. However, oil price negatively affects Russia's economic growth and supports the resource curse hypothesis.

3.2 Russian Economic Settings, Fossil Energy Prices, and Oil Production Cost

Figure 3.1 shows the trends in Russia's economic growth, the oil price and the Russian natural gas price between 1992 and 2016. In the 1990s, the Russian economy experienced a severe decrease in GDP while transitioning to the market system. One of the contributing factors in this decrease is the low prices of fossil energy sources in the early 1990s (Cooper, 2009). In 1998, oil price decreased from 19.1 U.S. dollars per barrel to 12.8 U.S. dollars. In the same year, real GDP decreased by 5.3% accompanied by the collapse of the Russian financial system (see Figure 3.1) (Gaddy and Ickes, 2010). Russia's economy was also affected by the 1997 Asian financial crisis. Subsequently, the Global Financial Crisis of 2008, the economic sanctions (2014-2016), and the volatility in oil and natural gas prices contributed to the drastic change in the Russian economic growth (see Figure 3.1).

Between 1999 and 2008, oil price increased from 18 U.S. dollars per barrel in 1999 to 97 U.S. dollars per barrel. Moreover, the price of the Russian natural gas increased by about 5.29% (from 2.13 to 13.41 U.S. dollars per million metric). During the same period, Russia has an average of 7% economic growth because of the increase in fossil energy prices (Benedictow, Fjærtoft, and Løfsnæs, 2013). Likewise, the positive trend is observed in economic growth, oil and Russian natural gas prices between 2010 and 2013.

Figure 3.2 shows the trends in the level of financial development and economic growth between 1992 and 2016. In the early 1990s, financial markets developed fast resulting in the flow of credits to households and companies. However, the economy

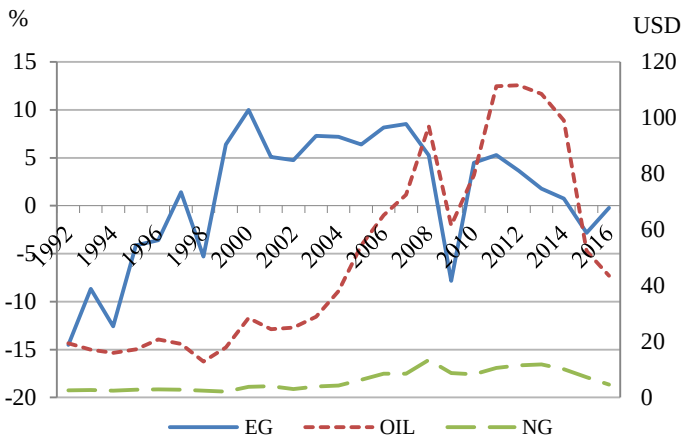

Figure 3.1: Oil Price, Russian Natural Gas Price and Economic Growth (1992-2016)
Notes: EG (on the left side) - Economic growth (annual percentage growth rate of GDP based on constant 2010 USD); Oil Prices (on the rigt side) - average annual crude oil price (U.S. dollars per barrel); NG (on the right side) - Russian natural gas prices (U.S. dollars per million metric British thermal unit)

as a whole was in stagnation (Berglof and Bolton, 2002). In 1998, the Asian crisis hit the financial markets and the level of credits decreased. Afterwards, we observe a sharp increase in domestic credits to the real sector resulting in economic growth. Russian reforms in the 2000s improved the banking sector (Anzoategui, Peria, and Melesky, 2012) and increased the volume of credits (Cetorelli and Strahan, 2006). During the Global Financial Crisis and the economic sanctions (2014-2016), Russian economy had high volatility in economic growth. In Figure 3.2, we observe that during these periods, the Russian government continually increased the volume of credits to the real sector to recover the economy in spite of the volatility in GDP.

Companies' production cost of oil depends on oil prices, technology, management effectiveness, a quantity of crude oil extracted and reserves (Ghalayini, 2011; Issabayev, 2015). Table 3.1 shows the selling price of the oil (SP), the production cost (PC) and the change in production cost (ΔPC) for the period of 1992-2016 in Russia.

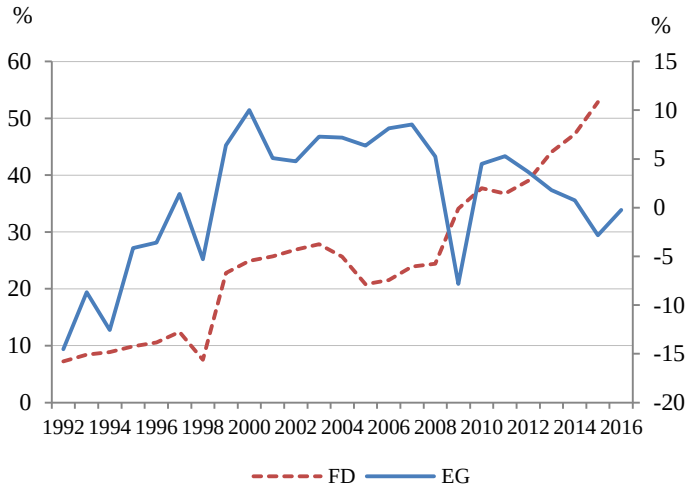

Figure 3.2: Financial Development and Economic Growth (1992-2016)
Notes: EG (on the right side) - Economic growth (annual percentage growth rate of GDP based on constant 2010 USD); FD (on the left side) - Financial Development (Domestic credit provided by financial sector to real sector in % of GDP)

The average PC (21.25 USD) is more than two times less than the SP (49.66 USD). Reduction of production cost happened in 1998, 2001, 2006, 2008 and 2014. All these years are corresponding to the events: Asian crises in 1998, September 11 Attacks in the USA, Global Financial Crises of 2007-2008, and International sanctions on Russia in 2014. During the tough time of the economy, Russia faces with a drop of demand for oil, production decreases, and investments on oil sector decreases which result in the decrease of the production cost of oil. Except only 2006, this considered to be the fourth year of high economic growth in Russia. Total foreign reserves of Russia were $258 billion, with an addition of $65 billion in its oil stabilization fund in 2006. Russia starts to invest in the oil sector to renew technological equipment, which assists to decrease the cost of production (Gaddy, 2007).

Table 3.1: Selling Price, Production Cost, and Change in Production Cost of Oil

Year	SP	PC	ΔPC
1992	19.40	7.03	
1993	17.10	8.45	0.20
1994	16.0	9.12	0.08
1995	17.20	9.39	0.03
1996	20.80	9.57	0.02
1997	19.10	8.40	-0.12
1998	12.80	5.06	-0.40
1999	17.90	5.29	0.05
2000	28.40	7.87	0.49
2001	24.45	7.36	-0.06
2002	25.01	8.78	0.19
2003	28.83	9.62	0.10
2004	38.10	17.05	0.77
2005	54.38	24.38	0.43
2006	65.14	23.30	-0.04
2007	72.52	39.48	0.69
2008	96.99	19.19	-0.51
2009	61.51	30.11	0.57
2010	79.47	35.58	0.18
2011	111.27	57.16	0.61
2012	111.63	47.62	-0.17
2013	108.56	50.80	0.07
2014	99.03	37.30	-0.27
2015	52.35	26.65	-0.29
2016	43.55	26.80	0.01

Notes: SP is selling price of oil (USD/per barrel); PC is production cost of oil (USD/per barrel); ΔPC is the change in production cost of oil. Method of calculation for PC: Average Russian companies' production cost of oil data in tons of oil in Russian Ruble is obtained from Federal State Statistics Service (Rosstat) http://www.gks.ru/. Then, the data is converted to barrels of oil, and based on the historical average exchange rate, it is converted to USD.

3.3 Resource Curse Hypothesis and Literature Review

The effect of fossil energy sources on economic growth is widely discussed in the literature. Before the 1980s, economists perceived that energy sources facilitate economic growth through proliferation in production and industrial development (Balassa, 1980; Rostow, 1961). Conversely, the resource curse hypothesis argues that

the abundance of energy sources weakens policies on industrial progress, fosters rent-seeking activity, and hence adversely affects the economic growth (Auty, 1993).

Researchers perceive that in the countries those abundant with natural resources, rent-seeking activities might deteriorate the social and the macroeconomic fundamentals and lead to several problems, including corruption (Diaz-Briquets and Pérez-López, 2006), high unemployment, lower economic growth (Mauro, 1995) and high poverty rates (Ross, 2003). The sluggish economic growth of resource-based countries is facilitated due to moving to industrialization with the slow pace and less effort (Auty, 1993; Davis, 1995). This occurs because of high capital inflow (Corden and Neary, 1982) that leads to an appreciation of the exchange rate (Auty, 1985), which is known as "Dutch Disease" (Corden and Neary, 1982; Gelb, 1988) that shrinks other exports oriented sectors (Bruno and Sachs, 1982).

The resource curse hypothesis is empirically supported by many studies (e.g., Gylfason, Herbertsson, and Zoega, 1999; Torvik, 2002) that show oil and natural gas-rich countries are more prone to lower economic growth. The literature on the resource curse hypothesis suggests that economic growth is affected negatively by several factors, such as rent-seeking activity (Robinson, Torvik, and Verdier, 2006), "Dutch Disease" (Sachs and Warner, 1997), mismanagement of oil revenue (Watts, 2004), and corruption (Roberts, 2015). However, some studies also find that fossil energy sources have positive effect on economic growth in countries that have continuous and sustainable financial development (Moradbeigi and Law, 2017), strong political and public institutions (Robinson, Torvik, and Verdier, 2006), and high investments in education (Gylfason, Herbertsson, and Zoega, 1999).

Many studies have carried research to examine the validity of resource curse in the case of Russia (Dulger et al., 2013; Egert, 2012; Ito, 2017; Mironov and Petronevich, 2015; Oomes and Kalcheva, 2007; Spatafora and Stavrev, 2003). Researchers have investigated empirically the presence of "Dutch Disease" by examining the association between oil price and real exchange rate (Egert, 2012; ; Ito, 2017; Mironov and Petronevich, 2015). The sign of symptoms of "Dutch Disease" is observed in Russia (Dulger et al., 2013; Oomes and Kalcheva, 2007) due to the price increase of commodities and appreciation of real exchange rate (Egert, 2012). However, these symptoms are not immense to confirm the validity of resource curse in Russia (Tabata, 2012), because appreciation of real exchange rate may delude researchers to misdiagnose the "Disease". This appreciation of real exchange rate can happen due to the transitional phase of the planned economy to the market economy (Mironov and Petronevich, 2015).

Despite the empirical researches in observing the resource curse by examining the association between oil price and real exchange rate, less attention is devoted to investigating the association between oil price and economic growth in the case of Russia. Rautava (2004) investigated the relationship between oil price and real GDP for the period of 1995-2002 in the case of Russia. She found the positive relationship between oil price and Russian real GDP. It suggests that the resource curse hypothesis is rejected in an oil abundant economy. Considering this gap in the literature, we will observe the causal relationship between oil and natural gas prices and economic growth in Russia. The literature also lacks studies on the association of company's oil production cost and economic growth in the case of Russia. To the best of our knowledge, this study will be first to observe the causal relationship of oil and natural gas prices, oil production cost, financial development, education and

effectiveness of public institutions on economic growth in Russia in a country abundant in fossil energy sources.

3.4 Data and Methodology

3.4.1 Data

We collect the data from the Russian Federation Federal State Statistics Service, Datasream, and World Bank databases for the period of 1992-2016. The average Russian companies' oil production cost (in tons of oil in Russian Ruble) is obtained from the Federal State Statistics Service (Rosstat). Then, the data is converted to barrels of oil, and based on the historical average exchange rate, it is converted to USD. The investments in public institutions are designated for improving transparency and reducing corruption as a percentage of gross domestic product, and investment in education as a percentage of gross domestic product are collected from the Federal State Statistics Service (Rosstat). Crude oil price (USD per barrel) and natural gas price (USD per million metrics) are gathered from the Datastream database. We collected the gross domestic product per capita in constant 2010 USD, and domestic credit provided through the financial sector as a percentage of gross domestic product from the World Bank database.

3.4.2 Model Variables

Oil and natural gas prices both directly and indirectly affect economic growth in Russia – a heavily resource-based economy. Changes in oil and natural gas prices affect the economic growth through impacts on the currency value, the fiscal policy and the energy sector (Berument, Ceylan, and Dogan, 2010). In line with the measure suggested in the energy economics literature (e.g., Brini, Amarab, and Jemmalic 2017; Shahbaz et al., 2017), the oil price is measured by crude oil price (USD per barrel) in real prices. Russia has the largest natural gas reserves in the world. Thus, in

the model, we include the natural gas price measured by the Russian natural gas price (USD per million metrics).

In the 2000s, Russia's new reforms aimed at improving the capital market (Davydov, Nikkinen, and Vahamaa, 2014) and the banking sector (Anzoategui, Peria, and Melesky, 2012) stimulated credit flow to the real sector (Cetorelli and Strahan, 2006). In transition economies, financial development is one of the key factors contributing to economic growth, as these economies are bank-oriented countries and bank loans are the main sources of financing (Tziomis and Klapper, 2012). Considering the importance of financial development in a transition country, such as Russia, the model developed in this paper includes financial development variable that is measured by domestic credit provided through the financial sector (% of GDP) (Badeeb and Lean, 2017; Bekhet, Matar, and Yasmin 2017; Nili and Rastad, 2007).

The oil production cost is included in the model, as it enables measuring the production cost efficiency in Russia and its effect on economic growth. The variable captures the product cost in a country like Russia, where long-term investment strategies rely on using new fossil energy production technologies and human capital improvements. Such investments increase the cost efficiency of fossil energy extraction and decrease the production cost (Issabayev, 2015). Here, oil production cost is measured in USD/per barrel.

The budget dependency on resource revenue can decrease the effectiveness of public and economic institutions because of poor revenue management (Oomes and Kalcheva, 2007). According to Benramdane (2017) "countries well-endowed with point resources, then, are expected to have 'bad policies,' and suffer from the so-

called renter effects, repression effects, or policies that postpone the transition to competitive industrialization and diversification of the economy" (p. 339). In this paper, the effectiveness of public institutions is measured by the magnitude of investments in public institutions designated for improving transparency and reducing corruption as a percentage of GDP. The budget dependency on resource revenue can also reduce investments in education, owing to lesser importance of the manufacturing sector for the economy, which can adversely affect economic growth (Gylfason, 2001, 2004). Investment in education is measured as a percentage of GDP.

3.4.3 Model and Estimation Methodology

3.4.3.1 Model

In our study, the following empirical model is estimated:

$$EG_t = f(OIL_t, NG_t, FD_t, PC_t, ED_t, PI_t,) \quad (1)$$

where EG, OIL, NG, FD, PC, ED, PI are economic growth, oil price, natural gas price, financial development, oil production cost, education investment, and effectiveness of public institutions respectively. We transform all the variables into the natural log as transformation provides the reliable empirical specification (Shahbaz and Lean, 2012). In the model, we include pertinent variables, considering Russia's unique institutional aspects and the state of its economy. As suggested in the literature (e.g., Casu and Molyneux, 2000), all variables are converted into the same currency (USD) and deflated by the consumer price index (CPI) to capture the exchange rate and inflation effects.

3.4.3.2 Estimation Methodology

Zivot and Andrews (1992) test is conducted to observe the stationarity of the series. Three models are proposed to test the unit root of the series: 1) model A – with one break point in the intercept; 2) model B – with one break point in the slope of the trend function; 3) model C – with one break point in the intercept and trend. The models are the following:

Model A: $\Delta z_t = \beta_0 + \alpha z_{t-1} + \lambda t + \Phi DU_t + \sum_{j=1}^{k} \Omega_j \Delta z_{t-j} + \varepsilon_t$ (2)

Model B: $\Delta z_t = \beta_0 + \alpha z_{t-1} + \lambda t + \eta DT_t + \sum_{j=1}^{k} \Omega_j \Delta z_{t-j} + \varepsilon_t$ (3)

Model C: $\Delta z_t = \beta_0 + \alpha z_{t-1} + \lambda t + \Phi DU_t + \eta DT_t + \sum_{j=1}^{k} \Omega_j \Delta z_{t-j} + \varepsilon_t$ (4)

where, DU_t is a mean switch indicator at breakpoint, and DT is the trend shift. DU_t equals to 1 and DT_t equals to $t-TB$ if t is greater than TB and 0 otherwise. Δ is the first difference operator, ε_t is the i.i.d error term and Δz_{t-j} are the lagged dependent variables. k is the optimal lag length determined by the Akaike's Information Criterion.

After testing for the stationarity and specifying that all the series are integrated of the same orders, we employ the Maki (2012) co-integration test. The advantage of the test is that the break points are endogenously identified. The H_0: There is no co-integration between the series, and H_1: There is co-integration between series through specified number of breaks.

The Maki cointegration test based on the models: level shift (Equation 5); regime-shifts model allowing for structural breaks of δ in addition to α (Equation 6); regime-shifts model with trend (Equation 7); model with structural breaks of levels, trends, and independent variables (Equation 8). The four models are shown below:

$$z_t = \alpha + \sum_{j=1}^{k} \alpha_j D_{j,t} + \delta' h_t + \varepsilon_t \quad (5)$$

$$z_t = \alpha + \sum_{j=1}^{k} \alpha_j D_{j,t} + \delta' h_t + \sum_{j=1}^{k} \delta' h_t D_{j,t} + \varepsilon_t \quad (6)$$

$$z_t = \alpha + \sum_{j=1}^{k} \alpha_j D_{j,t} + \partial t + \delta' h_t + \sum_{j=1}^{k} \delta' h_t D_{j,t} + \varepsilon_t \quad (7)$$

$$z_t = \alpha + \sum_{j=1}^{k} \alpha_j D_{j,t} + \partial t + \sum_{j=1}^{k} \partial_j t D_{j,t} + \delta' h_t + \sum_{j=1}^{k} \delta' h_t D_{j,t} + \varepsilon_t \quad (8)$$

where $t = 1, 2, \cdots, T$. z_t and $h_t = (h_{1t}, \cdots, h_{mt})'$ represent variables integrated of the first order, and ε_t is the error term. z_t is a scalar, and $h_t = (h_{1t}, \cdots, h_{mt})'$ is an $(m \times 1)$ vector. Maki (2012) considers that a $(n \times 1)$ vector s_t is generated by $s_t = (z_t, h_t')' = s_{t-1} + \varepsilon_t$, where ϵ_t are i.i.d. with zero mean. $D_{j,t}$ equals to 1 if $t > T_{Bj}$ $(j = 1, \cdots, k)$ and $D_{j,t}$ equals to 0 otherwise, where k is the maximum number of breaks and T_{Bj} is the time period of the break.

Identifying the co-integration relationship between series permits us to proceed with the causality test. Next, a modified Wald (MWALD) test proposed by Toda and Yamamoto (1995), based on the following model, is applied:

$$z_t = \alpha + \sum_{i=1}^{k+\rho} \delta_j z_{t-i} + \sum_{j=1}^{m+\rho} \partial_j x_{t-j} + \delta' h_t + \varepsilon_t \quad (9)$$

where ρ is the maximum order of integration of the time series; k and m are the optimal lag length; and ε is the error term. The maximum order of integration of the time series in the system should be specified and generate a vector autoregressive model in their levels with $m + \rho$ lags.

The signs and the robustness of the long-run relationship are estimated by Fully-Modified Ordinary Least Squares (FMOLS), originally proposed by Phillips and Hansen (1990). The precondition for conducting the test is confirming the series of integrated of order one, and existence of the long-run relationship between series.

The FMOLS corrects for serial correlation, endogeneity, and asymptotically eliminates the sample bias (Narayan and Narayan, 2005).

3.5 Empirical Results

3.5.1 Estimation Results

In Table 3.2, the correlation matrix shows that financial development, education and effectiveness of public institutions are positively correlated with economic growth. However, oil and natural gas prices, as well as production cost, are negatively correlated with economic growth.

Table 3.2: Correlation Matrix

Variables	EG	OIL	NG	FD	PC	ED
OIL	-0.165					
NG	-0.039	0.528				
FD	0.628	-0.276	-0.510			
PC	-0.448	0.733	0.531	-0.486		
ED	0.686	0.650	0.611	0.221	0.447	
PI	0.870	0.284	0.437	-0.580	-0.061	0.279

Notes: EG – economic growth, OIL – oil price, NG – natural gas price, FD – financial development, PC – production cost, ED – education, PI – effectiveness of public institutions.

Table 3.3 provides the Zivot and Andrews (1992) unit root test results under one structural break in series. We obtain strongly significant results at the 1% significance level for ln NG, ln OIL and ln PI in the three models, with a break in intercept, a break in the trend, and a break in both the trend and intercept. The null hypothesis for these series can be rejected at the 1% significance level. Also, significant results at 1%, 5% and 10% are obtained for ln FD, ln PC, ln ED series. These indicate that all series *(ln OIL, ln NG, ln FD, ln PC, ln ED, ln PI*) become stationary in their first difference.

Table 3.3: Zivot – Andrews (ZA) Tests for Unit Root

	Statistics (First Difference)			
	ZA_B	ZA_T	ZA_I	Conclusion
ln EG	−5.274**	−4.631*	−5.783***	I (1)
Break Year	1994	2001	2014	
Lag Length	0	0	0	
ln OIL	−7.257***	−6.194***	−8.716***	I (1)
Break Year	1996	1998	2000	
Lag Length	1	1	1	
ln NG	−8.349***	−7.975***	−5.851***	I (1)
Break Year	2000	2008	2013	
Lag Length	1	1	1	
ln FD	−5.720***	−7.993***	−7.804***	I (1)
Break Year	2013	1997	1999	
Lag Length	1	1	1	
ln PC	−5.764***	−6.826***	−6.948***	I (1)
Break Year	2006	2008	2014	
Lag Length	1	1	1	
ln ED	−6.827***	−5.264**	−5.764***	I (1)
Break Year	1993	1999	2008	
Lag Length	1	1	1	
ln PI	−5.645***	−5.267**	−5.241**	I (1)
Break Year	1993	2000	2014	
Lag Length	1	1	1	

Notes: EG – economic growth, OIL – oil price, NG – natural gas price, FD – financial development, PC – production cost, ED – education, PI – effectiveness of public institutions. ZA_B – the model with one break point in the intercept and trend; ZA_T - the model with a break with one break point in the slope of the trend function in the trend; ZA_I - the model with one break point in the intercept. The critical values for 1%, 5%, and 10% significant levels are 5.34, 4.93 and 4.58 respectively. ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

The Maki (2012) co integration test can be employed to examine the possible long-run equilibrium relationship between oil and natural gas prices, oil production cost, financial development, education, effectiveness of public institutions and economic growth, because all the series are integrated in the same order, I(1). Table 3.4 presents the Maki co-integration test results. It shows that the null hypothesis of non-existence of co-integration between series is rejected that confirm the existence of

the long-run equilibrium relationship between series with more than one multiple structural breaks. The common break points are in 1992, 1999, 2001, 2008 and 2014.

Table 3.4: Maki (2012) Cointegration Test

Number of Break Points		Test Statistics [critical values]	Break Points
$T_B \leq 1$			
	Model 0	-6.18 [−6.16]**	1998
	Model 1	-6.51 [−6.42]**	2000
	Model 2	-6.62 [−6.54]*	2008
	Model 3	-7.86 [−7.72] *	2014
$T_B \leq 2$			
	Model 0	-7.54 [−6.34]***	1992; 1998
	Model 1	-6.78 [−6.54]**	1999; 2008
	Model 2	-7.05 [−7.12]*	1999; 2014
	Model 3	-9.17 [−8.72]**	1994; 2001
$T_B \leq 3$			
	Model 0	-6.10 [−5.52]**	1992; 1999; 2001
	Model 1	-6.25 [−6.03]**	1994; 1999; 2008
	Model 2	-7.19 [−7.52]	1999; 2001; 2008
	Model 3	-7.65 [−8.11]	1994; 2006; 2014
$T_B \leq 4$			
	Model 0	-6.51 [−6.02]**	1992; 1999; 2001; 2008
	Model 1	-6.09 [−6.17]	1992; 2001; 2006; 2008
	Model 2	-7.84 [−8.12]	1994; 1999; 2001; 2014
	Model 3	-7.76 [−8.45]	1999; 2001; 2006; 2014

Notes: Critical values are in corner brackets. Citical values at 0.05 level are obtained through applying codes provided by Daiki Maki (2012). ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

Subsequently, we examine the existence of the causal relationship between the series by applying the Toda and Yamamoto (1995) causality test. Table 3.5 shows the results of the long-run causality between oil prices, natural gas prices, oil production cost, financial development, education, effectiveness of public institutions and economic growth. The results show that there is a *one-way* directional causality from fossil energy sources, financial development, production cost of oil, and education *to*

economic growth. However, no causality found between effectiveness of public institutions and economic growth.

Table 3.5: Results of Toda Yamamoto Causality F-tests

Hypothesis	**p-value**	**Causal**
ln OIL *causes* ln EG	0.002	Yes
ln EG *causes* ln OIL	0.257	No
ln NG *causes* ln EG	0.012	Yes
ln EG *causes* ln NG	0.724	No
ln FD *causes* ln EG	0.000	Yes
ln EG *causes* ln FD	0.245	No
ln PC *causes* ln EG	0.015	Yes
ln EG *causes* ln PC	0.461	No
ln ED *causes* ln EG	0.005	Yes
ln EG *causes* ln ED	0.152	No
ln PI *causes* ln EG	0.174	No
ln EG *causes* ln PI	0.266	No

Notes: EG – economic growth, OIL – oil price, NG – natural gas price, FD – financial development, PC – production cost, ED – education, PI – effectiveness of public institutions.

Table 3.6: Results of FMOLS Regression

Dependent Variable = ln EG			
Variable	C**oefficient**		**Prob.**
Constant	2.342***		(0.00)
ln OIL	-0.624***		(0.00)
ln NG	0.042**		(0.04)
ln FD	8.465**		(0.02)
ln PC	-0.003*		(0.09)
ln ED	3.762**		(0.01)
ln PI	1.371		(0.12)
R-square	0.951	Adjusted R-square	0.904
Durbin-Watson stat	2.17		

Notes: EG – economic growth, OIL – oil price, NG – natural gas price, FD – financial development, PC – production cost, ED – education, PI – effectiveness of public institutions. The number of lags was determined by the Schwarz information criteria, with a maximum of five lags. The bandwidth was selected by the Newey-West Bartlett kernel estimator. ***significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

We apply FMOLS test to find the sign of causality direction that is established by the Toda and Yamamoto causality test. Table 3.6 shows the estimation results. Economic growth decreases by 0.624% for each 1% increase in oil prices and this finding supports the resource curse hypothesis. However, the natural gas price positively

affects economic growth and this finding contradicts the resource curse hypothesis. One explanation for this finding is the mismanagement of oil revenues (Watts, 2004). Many studies find a similar result in both developed and developing countries (e.g., Benramdane, 2017; Das et al., 2018). Another explanation is the higher oil rents relative to the natural gas rents. The average oil rents (% of GDP) is more than two times bigger than the average natural gas rents (% of GDP).[9] The argument is that the abundance of natural resource rents fosters rent-seeking activities and hence, diminishes economic growth (Auty, 1993). Researchers perceive that rent-seeking activities might deteriorate the social and the macroeconomic fundamentals and lead to several problems, including corruption (Diaz-Briquets and Pérez-López, 2006), high unemployment, lower economic growth (Mauro, 1995).

Our results also show the positive impact of financial development on economic growth. The finding indicates that increasing the domestic credit to the real sector through financial markets can reduce the negative effects of resource curse paradox. We also find that the production cost of oil has a negative impact on economic growth. Russian oil companies can decrease the production costs through effective cost control mechanisms. The better the effectiveness in controlling the cost, the lower the production cost, resulting in a positive impact on economic growth. No autocorrelation problem is detected in the model.

3.6 Conclusions

In this study, we investigate the causal relationship between fossil energy sources, the production cost of oil companies, financial development, and economic growth in Russia. Our findings are based on hand-collected data and recently developed

[9] We used the data from the Worldbank database to estimate the average natural gas rents (% of GDP) and the average oil rents (% of GDP). The average natural gas rents (% of GDP) is 8.26 percent, and the average natural gas rents (% of GDP) is 3.63 percent.

empirical estimations. The results reveal that both the companies' production cost of oil and oil price affect economic growth negatively (i.e., one-way directional effect). Policy-wise, this negative effect on economic growth can be mitigated by effective oil production cost controls. Our results show that financial development affects economic growth positively (i.e., one-way directional effect).

The Russian policies should focus on the flow of cheap credit to the energy sector and encourage the investments in new technology for lowering the production costs. These policies will also lead to higher government revenue that can be invested in education and financial development. Our results show that there is a strong positive one-way causality from financial development and education to economic growth in Russia.

Chapter 4

CONCLUSIONS

Considering the importance of energy sector for the Russian economy, this thesis investigates the micro and macro determinants of capital structure of oil and gas companies by focusing on the tax reforms, and also examines the role of oil production cost, financial development and fossil energy prices on economic growth in Russia. These two topics are discussed in Chapter 2 and 3 respectively.

In Chapter 2, the main emphasis is to examine the impact of two major tax reforms in 2001 and 2002 on the capital structure of Russian oil and gas companies between 1992-2016. The former tax reform is the enactment of flat tax rates at the personal level, and the latter tax reform is the significant decrease in the company tax rate. To the best of our knowledge, our hand-collected taxation data for Russia is the largest and the most comprehensive dataset. We present the changes in the Russian tax system by investigating all tax codes changes from the beginning of transition period in 1992 until 2016. Using the Worldscope, OSIRUS and ORBIS databases, we compile a dataset of 3,213 company-year observations for all listed oil and gas companies.

We employ a dynamic model and use lagged control variables (Flannery and Rangan, 2006; Kayhan and Titman, 2007). The two-step system GMM panel econometric methodology is applied for estimation purposes (Arellano and Bover,

1995; Blundell and Bond, 1998). We also employ Hansen's (1982) J-statistic and the Arellano and Bond (1991) AR statistic to identify overidentification restrictions and check for autocorrelation respectively.

The descriptive statistics show that mean and median debt ratio for the pre-tax reform period is less than for the post-tax reform period. The differences in median of the two periods for both debt and equity ratios are statistically significant. We observe a slight increase in mean and median effective company tax rate for the period of 2002-2016 due to lower statutory company tax rate that have encouraged companies to pay taxes. The mean of control variables, namely agency cost, profitability, capital expenditures, cash, size and tangibility also increase during the post-tax reform. However, the effective Miller tax rate decreased during the post-tax period due to decline in the tax advantage of debt.

Our empirical results show that tax reforms have an impact on the financing decision of oil and gas companies. During the pre-tax reform period (1992-2000), high company statutory tax rates provided greater incentives for debt financing. Our estimation results support the positive effect of the taxation settings (i.e., effective company tax rate and effective Miller tax rate) on the level of debt financing at company level. During the post-tax reform period (2002-2016), the tax incentives for debt financing decreased significantly due to the drastic decrease in company tax rate and the adaptation of flat tax system at the personal level. Our estimation results show that there is a negative effect of taxation settings on the level of debt financing at company level.

However, the average debt ratios of Russian companies increased consistently during the post-tax reform period even though there is a lower tax advantage of debt financing during this period. This has led us to include the macro factors in the model. Our estimations show that the macro financial setting of greater access to debt (i.e., volume of domestic credit provided by banks to private sector) is found to be the driving force behind this increase during this period. We also find that the tax reform led to an increase in the level of company equity financing.

Another important finding is that the two continuous interaction terms of profitability and size with the tax variables have a moderating effect on the relationship of the tax advantage of debt and the level of leverage. The impact of the effective tax rate on leverage is less for profitable companies. However, the effect of taxes on the level of leverage increases with the size of the company.

Based on the dynamic model estimations, our results support the significant importance of lagged debt ratio in determining the level of leverage. Oil and gas companies depart from the target debt ratio and try to reach this target with the speed of adjustment 21% (13%) for the model including effective company tax rate (effective Miller tax rate). This heterogeneity in the speed of adjustment indicates that costs and benefits of rebalancing vary among oil and gas companies.

The agency cost, bankruptcy cost, profitability, capital expenditures and size are found to be statistically important determinants. We find that Russian oil and gas companies with lower bankruptcy probability, have greater leverage, and it is in line with the dynamic trade-off theory of capital structure. Considering the institutional settings in Russia, debt financing can potentially decrease wasteful investments and

wealth expropriation of minority shareholders. Capital expenditures increase the debt capacity because they have more collateral value and it is in line with the prediction of the dymaic trade-off theory. We find that larger companies tend to borrow less relative to smaller companies.

Our findings are robust even when we extend our models to examine the effects of tax reforms on the equity ratio. We observe that during the post-tax reform period (2002-2016), taxation settings positively impact equity financing due to the decrease in the tax advantage of debt financing. We also confirm our main findings by estimating for the less drastic tax cut in 2009 and focusing on the sample of active companies. The tax cut decreases the level of leverage even when we shorten the sample period and eliminate the effects of other tax cuts. Our robustness results indicate that the higher the magnitude of the tax cut, the more negative the effect on the level of leverage.

Chapter 3 examines the causal relationship between the production cost of oil companies, financial development, oil and natural gas prices, education and effectiveness of public institutions on economic growth in Russia. Our unique hand-collected production cost of oil data enable us to determine the impact of the cost management practices in Russian oil companies on economic growth. Our production cost data do not include trade and transport costs, non-deductible value-added taxes and subsidies that can lead to the endogeneity problem in the estimations.

We conduct Maki (2012) co-integration test under multiple structural breaks and confirm the existence of the long-run equilibrium relationship between the series.

Subsequently, Toda and Yamamoto (1995) causality test is adapted to examine the existence of the causal relationship between the series. We find that there is a one-way directional causality from fossil energy sources, financial development, production cost of oil, and education to economic growth.

We apply FMOLS estimation to find the sign of causality direction. The results show that both oil production cost and oil price affect economic growth negatively. The negative impact of oil prices on economic growth supports the resource curse hypothesis. It indicates that the abundance of energy sources weakens policies on industrial progress, and hence, adversely affects the economic growth in Russia. This negative effect on economic growth can be mitigated by effective oil production cost controls. Our results show that the Russian government should encourage investments in new technology to lower the production costs, as cost efficiency dampens the negative effects of resource curse and causes higher economic growth.

We also find that financial development and education affect economic growth positively. The Russian policies should focus on the availability of cheap credit to the energy sector and encourage the investments in new technology for lowering the production costs. These policies will also lead to higher government revenues that can be invested in education and financial development.

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