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The Interplay between Bureaucracy and Globalization

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Table of content

Table of content	v
List of figures and tables	vi
Acknowledgements	vii
Vita	ix
Publications and presentations	ix
Abstract	xii
1. Introduction	1
2. Institutions in the Era of Globalization: Literature Review	4
2.1 Governance and the features of bureaucracy	4
2.2 Measuring quality of bureaucracy	6
2.3 Globalization: terms, factors, indicators	11
2.4 Bureaucracy and globalization	13
3. Globalization and Institutional Quality: A Panel Data Analysis	16
3.1 Scope of research	16
3.2 Theoretical framework and previous empirical evidence	17
3.2.1 Theoretical expectations	17
3.2.2 Previous studies	20
3.2.3 Summary	22
3.3 Data and methods	24
3.3.1 Data on institutional quality and globalization	24
3.3.2 Method	28
3.4 Results	29
3.4.1 Main results	29
3.4.2 Robustness tests	33
3.5 Concluding discussion	35
4. Fiscal Incentives and Foreign Direct Investment: A Causal Inference Approach	38
4.1 Scope of research	38
4.2 Review of literature on fiscal incentives and FDI	39
4.3 Effect of tax concession on FDI in Russian regions: a natural experiment design	40
4.4 Parametric identification strategy	46
4.4.1 Difference in differences estimation	46
4.4.2 Results of the difference in differences estimation	51
4.5 Non-parametric identification strategy	54
4.5.1 Synthetic controls method	54
4.5.2 Results of the synthetic controls method	57
4.5.3 Main findings	60
4.6 Conclusion	63
Appendices	65

References	102
Special pages	120

List of figures and tables

Figure 1 Scores for government effectiveness and regulatory quality from the WGI in 1996 and 2010	10
Figure 2 Change in economic globalization and change in government effectiveness for high-income and low-income countries, 1996-2009	26
Figure 3 The marginal effect of economic and social globalization on control of corruption at different levels of GDP per capita	34
Figure 4 FDI inflows in Russian regions in 2002 and 2008	41
Figure 5 Balance of relevant covariates between treatment and control groups in the pre-treatment period	45
Figure 6 Orange regions that attracted more FDI after tax concession	58
Figure 7 Orange regions that did not attract more FDI after tax concession	59
Figure 8 Yellow regions that attracted more FDI after tax concession	60
Figure 9 Balance of confounding factors for orange regions	61
Figure 10 Balance of confounding factors for yellow regions	62
Table 1 Concepts, questions and definitions	7
Table 2 Descriptive statistics	26
Table 3 Economic globalization: baseline models; full sample	29
Table 4 Social globalization: baseline models; full sample	30
Table 5 Different types of globalization; sub-sample of low-income countries	31
Table 6 Different types of globalization; sub-sample of high-income countries	32
Table 7 Tax rates on investment profit in Russian regions, per cent	42
Table 8 Descriptive statistics	49
Table 9 Difference in differences estimation based on GMM model	51

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Abstract

This research focuses on a twofold issue: 1) the challenges that globalization creates to institutions, having to deal with a new international order; 2) the challenges that state governance creates for global actors, having to adapt themselves to the national and sub-national peculiarities. The globalization–bureaucracy interplay is a politically contested phenomenon, in which different models of interactions among states, firms, and citizens appear and transform both nationally and internationally.

At the national level, the impact of globalization on quality of governance is examined empirically across countries. The analysis with fixed effects models is based on a panel dataset, covering over 100 countries in the period 1992–2010. The study examines an effect from both economic and social globalization factors on different governance features, including governance effectiveness, regulatory quality, control of corruption, accountability, political stability, and rule of law. The findings show that various governance features seem to diverge in how easily they respond to the new state of affairs that follows with more globalization. Moreover, in line with the theoretical predictions, globalization affects institutions differently depending on the country’s level of development. The results thus suggest that the previous findings on positive effects of international economic flows on institutional quality are likely driven by changes in rich countries.

The impact of institutional policies on globalization factors is analyzed at the sub-national level, using a panel dataset of 82 Russian regions in the period 1995–2010. The study takes an advantage of examining different types of fiscal incentives, introduced in some regions of Russia in 2003, treating them as a natural experiment and estimating the causal effect of tax concessions on foreign direct investment inflows with two causal inference techniques: difference in differences estimation and synthetic controls method. The findings confirm that tax concessions for investment lead to more foreign direct investment inflows. However, selective tax concessions for the government sanctioned important investment projects do not have the expected effect, or the effect is sporadic and weak at best. As governments seek to increase the national and sub-national attractiveness for foreign investors, these findings have important implications for the design of institutional policies.

1. Introduction

Globalization transforms modern society and economy. The states, therefore, face a challenge in adapting themselves to the global factors and networks. They ought to implement new policies or to change existing ones, seeking integration into the international order. However, one generally sees the governmental structures as highly inertial and slow to change. Once their formal methods and procedures are established, they tend to use the same methods and rules, whether the situation changes or not. And even if bureaucratic structures do change under an external pressure, it is unclear how far the development would go. Thus, one might wonder about the effect that the rigid and sluggish state bureaucracies have on globalization factors. In some cases, extensive administrative burdens and formalities restrain the development of international trade, investment, and migration. On the other hand, in those countries where many of the administrative procedures and bureaucratic institutions are weak or unspecified, global actors would find neither field to act, nor rules to follow. The question is on a mutual effect of bureaucracy and globalization in this interplay. Does globalization reduce bureaucratic barriers through, for example, multilateral agreements or international norms? Or does it create just the opposite, a new kind of “internationally widespread” bureaucracy? Does bureaucracy support international cooperation by providing the legal and institutional framework? Or on the contrary, does it fight with the global features, trying to keep its purely national power?

This research focuses on a twofold issue: 1) the challenges that globalization creates to the existing national and sub-national institutions, having to deal with an expanding international order; 2) the challenges that state governance creates for global actors, having to adapt themselves to the domestic formal and informal peculiarities. Globalization–bureaucracy interplay is a politically contested phenomenon, in which different models of interactions among states, firms, and citizens appear and transform both nationally and internationally.

Each state keeps its national interests above all. But globalization comes, to a large extent, as the weakening or even removal of the institutional buffers between domestic economy and global markets. (Ó Riain, 2000) States, therefore, should respond to pressures from local societies and global markets simultaneously that leads to the changes

not only in the state-markets interaction but also in the state structures themselves.

States are interconnected, and none could be totally isolated from the global order. States are integrated into global markets through, for instance, international trade and production distribution (Wallerstein, 2011). Besides, states compete with one another to attract mobile capital (Arrighi, 1994). Moreover, business expansion requires more bureaucratic work on creating and adapting regulations, which leads to the expansion of the state apparatus (Chase-Dunn and Grimes, 1995).

Different models of state's reaction to globalization might spread through the interaction of states or through the influence of international and supranational organizations. Globalization may pose new problems for states, but it also may reinforce states to identify and to manage those problems on behalf of their societies (Meyer et al., 1997). Contemporary theories both in political science and in economics emphasize the ways in which national and global actors interact with each other (Block, 1994; Evans, 1997). The relations among them are essentially tense, and competition fights can often result in a zero-sum game. The direction and pace of the country's development are determined by how institutions regulate these tensions, creating basis for both national actors, going global, and foreign actors, coming into the country. This development is path-dependent and reflects the mutual effect of state and private actors at the subnational, national, and international levels. In this respect, Bandelj (2009) argues that the global economy can be conceptualized as an instituted process¹. States contribute to the institutionalization of globalization by adapting formal policies, as well as informal norms, by providing both domestic and foreign actors with organizational resources, and by supporting real economic and social interactions (Bandelj, 2009).

The globalization–institutions interactions have received some attention among the political theorists, but so far have not been examined empirically. Does good governance actually promote international cooperation? Does globalization itself support better governance? Do the available measures of globalization and institutional quality provide a reliable tool to answer these questions? The answers to these questions have both theoretical and policy implications. If globalization or its various sub-components are able to

¹ She uses Polanyi's (1957 [1944]) idea about "economy as instituted process," meaning interactions between economic and noneconomic institutions.

improve quality of governance, then international factors should be taken into account not only in cross-country comparisons but also in implementation and analysis of domestic policies.

Before examining the strength and direction of the relationship between domestic bureaucracies and globalization factors, one should define how to conceptualize both bureaucracy and globalization and how to assess them. Hence, the thesis proceeds as follows. Chapter 2 discusses institutional features of bureaucracy and their reflection in the existing measures of governance quality. Then it proceeds to describing globalization as a process and as a historical phenomenon, and to explaining how bureaucracy and globalization shape and reshape each other. Chapter 3 discusses the impact of various types of globalization on institutional quality at the national level and then examines this impact empirically with the analysis of a panel dataset, covering over 100 countries in the period 1992–2010. Chapter 4 discusses the effect from the fiscal elements of institutional policies on globalization factors at the sub-national level. The effect is tested empirically, using a panel dataset of 82 regions of Russia in the period 1995–2010.

2. Institutions in the Era of Globalization: Literature Review

2.1 Governance and the features of bureaucracy

One of the most important roles of the state in market economy is in determining the rules of domestic–international interaction by creating, implementing, and adapting various types of regulations. This role, as well as many others, heavily depends on the quality of government, i.e. the functioning of executive branches and their bureaucracies. Importance of bureaucratic work is defined by the ability of public officials a) to deliver services both to market actors and to society, and b) to create and enforce rules and regulations (Olsen, 1988; Fukuyama, 2013).

Many sound theoretical models, created in the XX century, contributed to the analysis and understanding of bureaucratic structures (Weber, 1978 [1946]; Blau, 1955; Tullock, 1965; Crozier, 2009[1964]; Lipsky, 1980; Mises, 1983 [1944]; Downs, 1994 [1966]; Niskanen, 1994 [1971]).

Weber's classical analysis provides systematic arguments on the genesis and features of bureaucracy. Weber described in details the fundamental role of bureaucracy for a country's development. Particularly, he listed several features of bureaucratic structures, including the following (Weber, 1978: 196-203):

- There are some fixed jurisdictional areas, ordered by laws and administrative regulations,
- There is a hierarchy within a fixed system of super- and subordination,
- The officials undergo thorough and expert training,
- There are some general rules, stable and exhaustive,
- The officials are appointed by a superior authority,
- There is a career path within the office,
- *The officials get a fixed salary.
- *The office constitutes tenure for life, and
- *Job requires full working capacity of the official

Last three of the listed features do not reflect modern reality, though. As Fukuyama (2013) points out, fixed salaries are not compatible with the market-like incentives often offered to bureaucrats under New

Public Management. Moreover, it is common for talented individuals from the private sector or the academy in many countries to serve in government for periods of time.

Many studies dealt with the other Weberian features later on, having come, however, to rather different conclusions.

Austrian School of economics sees bureaucracy mainly as an instrument, the tool for executing laws and regulations. State function could not be realized without bureaucratic work: “There is a field, namely, the handling of the apparatus of government, in which bureaucratic methods are required by necessity” (Mises, 1983: 48). Minimal bureaucracy is required for the protection of property rights, physical property, and the people, as well as for insuring social cooperation among the members of society and market actors (Mises, 1983: 20).

However, there is always a danger of overwhelming bureaucracy, unable to correct its own errors, that would require some external (market or social) factors to intervene. “The bureaucrats see in the failure of their preceding measures a proof that further inroads into the market system are necessary” (Mises, 1983: 35).

Public choice theorists concentrate on problems of bureaucratic accountability. This school of research analyzes the pathologies of overwhelming institutions, their implications, and the possible methods of control from society. Tullock (1965) investigated harmful effects of misinformation that could be channeled within the hierarchy of administrative structures. Crozier (2009) later concludes that the lack of accountability, be it before elected officials, citizens, or pressure groups, is attributable to bureaucratic inertia (see Meier and Krause (2003) for discussion). Niskanen (1994) extended this view, claiming that bureaucracy is preoccupied with its own budget maximization and its interests contradict the interests of society, thus, making bureaucrats unresponsive to society demands. Downs (1994) argued that the individual preferences of bureaucrats might differ, thus policy making and coordinating process could become difficult. Finally, Olson (2000) claimed that the main aim of political development should be the creation of instruments like rule of law and accountability that could limit the state’s discretion.

The scholars within a principal–agent framework look for the methods of corruption control and better accountability through manipulation of

incentives, e.g. competition, manipulation of wage scales, shortening of accountability routes, etc. (see Fukuyama (2013) for discussion). Many studies, applying the principal–agent views, found various incentives and monitoring activities being effective in controlling the behaviour of bureaucrats (Miller and Moe, 1983; Moe, 1990; Scholz and Wei, 1986; Scholz, Twombly, and Headrick, 1991; Weingast and Moran, 1983).

Other studies of bureaucracy and bureaucratic performance examined the importance of the bureaucrats’ values and its impact on public policy outputs (Eisner, 1991; Khademian, 1992). Several researches showed how attempts to impose various budgeting systems have been altered and even sabotaged by bureaucrats in the implementation process (Wildavsky, 1984 [1964]; Meier and Krause, 2003). Finally, open systems theories of bureaucracy focus on how organizations cope with the political environment (Keiser, 1999), as well as on a general framework for assessing political control (Meier, 2000; Meier and Krause, 2003).

2.2 Measuring quality of bureaucracy

To assess empirically the mutual impact of bureaucracy and globalization, one should be able to measure the quality of governance with a reliable, cross-nationally comparable tool. Existing measures typically rely, in whole or in part, on surveys of either expert opinions, either market actors (international and domestic firms), or citizens. Questions in such surveys involve national laws and regulations, the level of “red tape” and administrative burdens, or perceptions of corruption (Chong and Calderón, 2000; Mauro, 1995).

These measures, however, have a number of limitations. First, as the understanding of governance features differs among the fields and theories, different experts may intend different things when responding to the same survey question (Fukuyama, 2013). Another issue is the assumption that the interests of firms (either foreign or domestic) and the interests of the nation are similar (Kurtz and Schrank, 2007). For instance, some regulations, imposed by the state (e.g. labor laws, environmental controls, or antitrust actions) may be assessed as “burdensome” and “growth-inhibiting” by the market actors. If, however, such controls do not exist, states might be judged less severely by the firms (Kurtz and Schrank, 2007). Moreover, as Rothstein (2011) points out, the existing indicators of governance quality presume some strong normative policy preferences (e.g., less rather than more regulation), which might skew their values. Finally,

since the direct assessment of many governance aspects is not possible, most of the indicators approximate them (with, for example, input-output evaluations), i.e. “measure what is measurable” (Fukuyama, 2013).

Taking into account the listed limitations, it is worth discussing the indicators from three well-known sources: the Worldwide Governance Indicators produced by the World Bank (WGI), the Global Competitiveness Report by the World Economic Forum (GCS), and the Risk Briefing assessment as well as the Democracy Index by the Economist Intelligence Unit (EIU) (table 1).

These measures have a number of advantages. First, they include different types of measures: aggregate indicators (WGI), survey (GCS), and experts’ assessment (EIU)². Secondly, unlike some other indicators, these sources cover a considerable number of countries. The WGI has started with 185 countries in 1996 and offered the scores for already 210 countries in 2010. The EIU observes 170 countries in the Democracy Index (issued early from 2006) and 179 countries in the Risk Briefing assessments (this number has increased from 120 countries in 1996). The biggest development occurred in the GCS: from 58 countries in 1996 up to 133 countries in 2010. Thirdly, they concentrate, again unlike some others, not only on one aspect of governance, e.g. corruption, but on many different features of the government functioning, including political representation, stability and balance of powers, red tape, corruption, liberal policies and their implementation, etc.

This broad range of features, however, creates also some conceptual and methodological problems. First of them is related to the enduring debate on what is governance. Due to the lack of agreement in definitions even among the political theorists, the sources of numerous “institutional” indexes and indicators try to avoid giving their own definitions. Instead, they offer a variety of questions and/ or marks to describe certain aspects of the government’s work. And although it looks sometimes like touching different parts of an elephant in the dark, the results seem quite encouraging as long as one takes into account their complexity and interdependence (table 1 and appendix A).

² The WGI as a set of the aggregate indicators rely on the GCS and the EIU among the others.

Table 1 Concepts, questions and definitions

Governance feature	Worldwide Governance Indicators (WGI)	Global Competitiveness Report (GCS)	Economist Intelligence Unit's Risk Briefing assessments (EIU)
Definition of governance	Traditions and institutions by which authority in a country is exercised	Legal and administrative framework within which individuals, firms, and governments interact to generate wealth	-
Government effectiveness	The quality of public services, the capacity of the civil service and its independence from political pressures; the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	<ul style="list-style-type: none"> - Wastefulness of government spending - Burden of government regulation - Efficiency of legal framework in settling disputes - Efficiency of legal framework in challenging regulations - Transparency of government policymaking 	<ul style="list-style-type: none"> - Is the government likely to open, liberal and pro-business policies for nationals and foreigners? - What is the quality of the bureaucracy in terms of overall competency/ training, morale/ dedication? - How pervasive is red tape? - How pervasive is corruption? - How accountable are public officials? - Is there a risk that this country could be accused of human rights abuses?
Regulatory quality	The ability of the government to provide sound policies and regulations that enable and promote private sector development	-	<ul style="list-style-type: none"> - Is the tax regime clear and predictable? - What is the risk that corporations will face discriminatory taxes? - What is the risk from retroactive taxation? - What is the risk of discriminatory tariffs? - What is the risk of excessive protection (tariff and non-tariff) in the next two years?
Control of corruption	The extent to which public power is exercised for private gain, including both corruption and "capture" of the state	<ul style="list-style-type: none"> - Diversion of public funds - Public trust of politicians - Irregular payments and bribes 	-

One can see from comparisons in table 1 that the limits of all categories are highly ambiguous and could lead to confusion. Marks of government (in)effectiveness in the GCS could be compared with the regulatory quality in terms of the WGI, while the EIU's assessment of the government effectiveness includes human rights, bureaucratic competency, red tape, corruption, and accountability all at once. Some questions for the individual indicators are excessively precise (for example, the GCS distinguishes seven types of bribes), some others, however, are rather vague (e.g. "How accountable are public officials?" in the EIU).

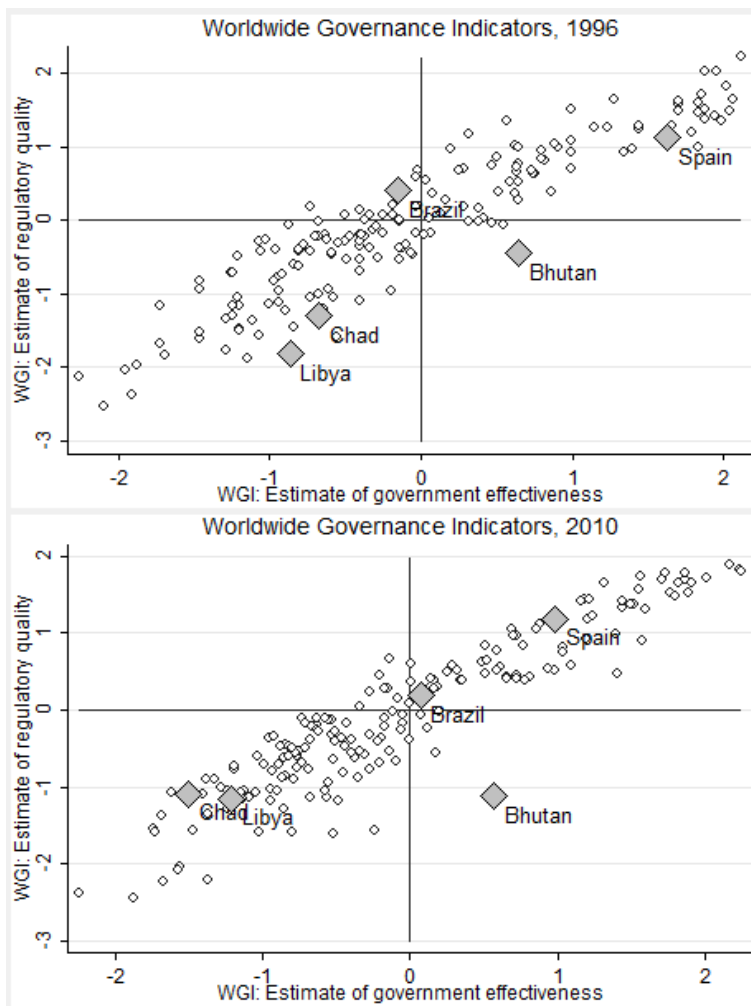
The second conceptual problem refers to the idea that Putnam et al. (1993) state as "different governments might be simply good at different things." Concentrating only on government effectiveness or control of corruption would be by no means enough for a full analysis; one should not skip any of the governance features. Moreover, it might be necessary to keep in mind possible existence of some other governance features, not listed explicitly in the institutional indexes.

Comparing two or more dimensions of governance gives some insights about possible internal factors that might affect the country's institutional quality (figure 1). On the one hand, there are some outliers scoring relatively well for one feature of governance but not for the others. For instance, Bhutan was assessed much higher for government effectiveness and political stability than for regulatory quality and accountability over the whole period. On the other hand, clear improvement or worsening of the institutional quality in general could be seen only in few cases. More often, the countries manage to improve certain aspects of governance, while having a little success in the other aspects.

The last methodological problem occurs here. Since the indicators certainly measure different things with different methods, it might well be that only the most evident cases receive reliable scores. That is: in those cases where many indicators agree on a country's institutional quality, it happens because its improvement or worsening is unquestionable. However, for many other countries fallen "in the middle," the scores and ranks are somewhat relative that could make any direct country comparisons vague and disputable. For this matter, for instance, the authors of the WGI, beside the estimation of governance indicators, report also the margins of error, highlighting their importance. While taking this into account, many significant

differences among countries can in fact be assessed using these indicators (Kaufmann et al., 2010). It is, therefore, preferable using the WGI instead of either alternative. In addition to its growing policy relevance (World Bank, 2000), it displays reasonable reliability and has a broad coverage, avoiding sample selection problems at the country-level (Kurtz and Schrank, 2007).

Figure 1 Scores for government effectiveness and regulatory quality from the WGI in 1996 and 2010



2.3 Globalization: terms, factors, indicators

Globalization may be defined as a process, a historical period, or as a political and economic phenomenon.

In the first understanding, globalization reveals itself through a variety of links and interconnections between the states. “It defines a process through which events, decisions and activities in one part of the world can come to have a significant consequence for individuals and communities in quite distant parts of the globe” (McGrew, 1990). This view is shared by many scholars, defining globalization as a set of “processes deriving from the changing character of the goods and assets that comprise the base of the international political economy” (Cerny, 1995: 596).

In the second understanding, the term ‘globalization’ might serve for describing a context in which events occur (Reich, 1998). The globalization period might be described as one that began in the mid-1970s³. Other interpretations date globalization from the end of the 1970s and the beginning of the 1980s, because of a series of events that clustered within a limited time period: spread of technologies, international debt crises, the second oil crisis; rise in inflation rates; rise of capital movement, etc.⁴

Finally, globalization is most often characterized as a complex system of political and economic phenomena. These include diffusion of technology, moving of production and capital, integration of capital markets, and the changes in the international division of labour (Reich, 1998). All these phenomena certainly have had historical precedents; nonetheless, these events have no precedents in terms of speed and intensity. Globalization thus characterizes the escalation of existing processes rather than the development of a new one (Reich, 1998).

Such intensification creates new challenges and opportunities for international and domestic actors, as well as for the states (Jones, 1995). The impact of globalization varies across countries, depending on many socio-economic factors. Great expectations about global political convergence based on liberal democratic institutions across nations (Fukuyama, 1992; Mandelbaum, 2005) did not fully come into reality.

³ For discussion, see Hirst, P. and Thompson, G. (1996). *Globalization in Question: The International Economy and the Possibilities of Governance*. Cambridge: Polity Press.

⁴ For discussion on this view, see Solomon, R. (1994). *The Transformation of the World Economy, 1980–1993*. London: MacMillan.

However, there is some evidence in support of the neoliberal concept of globalization, which expects that the countries would redefine their national interests to achieve greater openness to the world economy (Ohmae, 1991; Friedman, 2005; Rode and Gwartney, 2012). Critique of globalization regards some undesired consequences of such openness, including the increase of poverty and socio-economic divisions (Murphy, 2001), cultural conflicts and ethnic nationalism (Mansfield and Snyder, 2007), and rise of protectionist policies (Stallings, 1995; Mansfield and Milner, 1997; Helleiner and Pickel, 2005). Such consequences were especially evident in the less developed countries, as globalization could undermine national sovereignty in various areas, from finance to labour mobility (Strange, 1996).

To analyse the effect and consequences of globalization, most studies use various economic indicators, which allow reliable cross-country comparisons. Such indicators include:

- Foreign direct investment inflows (Blomström et al., 1994; Garrett, 2001; Borensztein et al., 1998; Carkovic and Levine, 2002),
- International trade flows (Frankel and Romer, 1996; Dollar and Kraay, 2004; Greenaway et al., 1999), and
- Measures of openness of trade (Dollar, 1992) and of capital (Chanda, 2005; Rodrik, 1998; Alesina et al., 1994).

While those individual indicators might provide a proxy for some sub-dimensions of globalization, it is necessary to assess several globalization factors together, as they are strongly related to each other. For a long time, the only overall-globalization study was the Globalization Index by A.T. Kearney/ Foreign Policy Magazine (2002). There were several attempts to update this index after 2005, e.g. CSGR Globalization Index by the University of Warwick⁵ and GlobalIndex by the TransEurope Research Network⁶.

Recent KOF Index of Globalization took some of the previous approaches, but with improved methodology and the expanded list of underlying factors.

⁵ CSGR Globalisation Index is used in Joyce, J. P. (2006). Promises Made, Promises Broken: A Model of IMF Program Implementation, *Economics and Politics*, 18(3): 339-365.

⁶ The authors describe GlobalIndex in Raab, M., Ruland, M., Schönberger, B., Blossfeld, H., Hofäcker, D., Buchholz, S., and Schmelzer, P. (2008): GlobalIndex – A sociological approach to globalization measurement, *International Sociology*, 23(4): 596-631.

In the KOF Index of Globalization, globalization is defined as “the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas, capital and goods. Globalization is conceptualized as a process that erodes national boundaries, integrates national economies, cultures, technologies and governance, and produces complex relations of mutual interdependence” (Dreher et al., 2008).

The KOF Index of Globalization takes account of economic, social, and political globalization (see Appendix C for details). Economic globalization is measured by trade, foreign investment, as well as the tariff restrictions. Social globalization, meaning movement of ideas, information, and people, is estimated, among other factors, by tourism, foreign population, use of the Internet, and the number of both McDonald’s restaurants and Ikea stores. Political globalization is meant to approximate political cooperation and is measured by such factors, as the number of embassies and membership of international organizations (Dreher et al., 2008).

2.4 Bureaucracy and globalization

Each state reacts to globalization in its own, national-specific way. Underlying factors for the reaction might include the level of social and political development, structure of industries, as well as cultural, educational, and ethnic structure of the society. Among all the factors, quality of institutions is of a great importance. Implementation and enforcement of regulations can become a crucial factor for a foreign or domestic investor, tourist, trader, or migrant.

Since the 1980s, the value of world trade has increased enormously and industrial capital has become unconditionally globalized (Ruggie, 1995). These factors affected governments’ ability to control their national financial policies (Ó Riain, 2000). Migration has become a significant feature of many open economies (Held et al., 1999). Moreover, globalization has had some social implications (e.g. in its impact on gender equality and income distribution groups).

Some studies find that these changes have undermined the role of the state, replacing or complementing national institutions with global norms and structures (Sklair, 1991; Robinson, 1998; Mittelman, 1997). Many scholars, however, predict that globalization makes the role of the state more important, since effective governance is crucial for

national interests within the global order (Cerny, 1995; Rode and Gwartney, 2012). The governments mediate the connections between the domestic and global actors, therefore, affecting the way, in which the national interests and assets are used within the range of opportunities available in the global economy (Ó Riain, 2000). Globalization might change links and authority of institutions across the levels of governance (Castells, 1997). This would mean reconfiguration of the state and formation of new relations both between states and the local actors and between states and the global actors.

A number of policies and regulations, used to promote domestic development, ought to be reshaped under the impact of globalization. Multilateral agreements change tariff rules and simplify custom procedures. Currency unions change monetary policies, banking regulations, and control of capital. Migration changes labour regulations and supports, to some extent, anti-discriminatory policies. Foreign investment may serve as a stimulus for adopting more liberal financial policies and even for promoting democratization. The former happens because investors seek for milder fiscal policies (e.g. in the form of tax concessions), which decrease costs for investors, instead of protectionist policies, which increase costs (Bhagwati et al., 1992; Brewer, 1993; Ellingsen and Wärneryd, 1999). Moreover, investors do expect that democratic governments can more credibly commit to market friendly policies than authoritarian governments can; hence, foreign investment could affect the path of political development of a country and provide a support for democratization reforms (Jensen, 2008; Bandelj, 2009; but see Rode and Gwartney, 2012). Some studies underline the role of foreign capital for democratic transition and global integration of a country (Bevan and Estrin, 2004; Meyer, 1998; Schmidt, 1995). Some even argued that those countries were more successful that built “capitalism from outside” (King and Szelényi, 2005; Eyal et al., 1998). Some other studies, however, demonstrated controversial impact of foreign investment. While stimulating a country’s development in a short-run, it could create dependence on foreign capital, curbing the long-run development (Dixon and Boswell, 1997; Firebaugh, 1997).

As all institutional areas are being reshaped by globalization, there is a strong need in an empirical analysis of those changes and their consequences. Globalization brings to test the strength, autonomy, and legitimacy of national institutions. At the same time, institutions

determine, to what extent various globalization factors would be able to affect the domestic order. Their interplay creates a new global order, where national-specific norms and institutions might become more important than ever.

3. Globalization and Institutional Quality: A Panel Data Analysis

3.1 Scope of research

In Moscow, Russia, the Swedish furniture retailer IKEA was asked to pay a bribe only weeks before the opening of its flagship store in 2000. Refusal to pay would lead to electricity being shut down. IKEA responded, not by paying the bribe, but by renting diesel generators large enough to power the entire shopping mall. Later, in 2006, it was revealed that the Russian executive hired to manage the diesel generators for another store, in St. Petersburg, took kickbacks from the rental company to inflate the price. IKEA's expansion in Russia was halted, and two years later senior executives were dismissed for allowing bribes.

The story about IKEA in Russia, told by among many others *The New York Times*⁷, illustrates important aspects of globalization. Trade and foreign direct investments can potentially improve economic development, benefitting both consumers and capital owners. At the same time, dysfunctional institutions, such as corruption, may thwart these potential benefits. The establishment of and actions taken by firms operating in foreign countries may also affect norms and behavior. On the one hand, IKEA's refusal to pay bribes may facilitate the fight against corruption in Russia. On the other hand, the profits generated by IKEA increase the potential gains from engaging in corrupt behavior. It is therefore not clear how the degree of corruption in Russia would change as a result of IKEA's ventures. More generally, little is known about the effects of globalization on institutional quality. This part of research aims to shed light on one particular question: Is increasing globalization on average followed by improving or deteriorating institutional quality?

Changing institutions will generally involve trade-offs between short- and long run benefits. Consequently, the time horizon and expectations of those who influence institutions—executive authorities and their bureaucracies—will be crucial in determining the effects of increased globalization. As the time horizon often is determined by the level of economic development, it is important to examine whether the globalization effect on institutional quality varies across levels of development.

⁷ Kramer, A. (2009). Ikea Tries to Build Public Case Against Russian Corruption. *The New York Times*, September 11, 2009.

The analysis employs the World Bank's Worldwide Governance Indicators (WGI) to capture several aspects of institutional quality and the KOF Globalization Index to measure economic and social globalization. The study also avoids what Blonigen and Wang (2005) call "inappropriate pooling of wealthy and poor countries" by using both sample splits and interaction effects. According to the theoretical predictions, globalization should be typically followed by improved institutional quality in rich countries, but in poor countries this relationship would be the opposite. Despite institutions changing slowly over time, the difference between rich and poor countries should allow to draw significant conclusions.

This chapter proceeds as follows. The next section discusses theoretically how globalization and economic openness is expected to affect institutions and reviews recent research. Section 3.3 discusses the measurement of institutions and presents the data, while section 3.4 contains the empirical analysis, including several robustness checks and tests of the relationship between globalization and institutional quality across levels of development. Section 3.5 concludes the analysis by summarizing the results and discusses how to interpret the findings.

3.2 Theoretical framework and previous empirical evidence

3.2.1 Theoretical expectations

North (1990) defined institutions as "rules of the game" that shape human interaction and argued that "third world countries are poor because the institutional constraints define a set of payoffs to political/ economic activity that does not encourage productive activity" (North, 1990: 3, 110). A large following literature has empirically confirmed quality of institutions as an important determinant of economic growth: Knack and Keefer (1995), Rodrik et al. (2004), Abdiweli (2003) and Doucouliagos and Ulubasoglu (2006) to mention just a few.⁸ There is no complete agreement on what institutions matter the most, though the survey by Durlauf et al. (2005) points to low corruption, political stability, property rights, and rule of law all being important for development. The importance of low corruption for growth is also confirmed by Haggard and Tiede (2011).

As the evidence of the importance of institutional quality accumulates, it is natural to examine *if* and *how* institutions change. Institutions

⁸ However, Richter and Timmons (2012) argue that the size of the effect institutions have on economic growth is relatively small.

shape human interaction, but at the same time institutions are enforced and upheld by human interaction. According to North (1998), institutional change is incremental and occurs when influential agents perceive they could do better by altering the existing institutional framework. Typically, institutions are assumed to change slowly over time (Acemoglu et al., 2005; Kingston and Caballero, 2009). Nevertheless, as discussed in the previous chapter, there are several reasons why increasing globalization may foster institutional change, many of which suggest that at least some aspects of globalization should be beneficial for institutional quality.

A fundamental reason to expect trade and economic openness to improve institutional quality is Montesquieu's idea that market interactions act as a civilizing force.⁹ The survey by Hirschman (1982) emphasizes that the practice of commercial transactions generates feelings of trust and empathy for others. Later, experimental research in East Africa reported by Ensminger (2004) indicates a strong relationship between market exchange and fairness. Ensminger notes several possible explanations, such as the idea that people are learning in the market that fair-mindedness is rewarded. Another possibility is that market experiences help people learn how to coordinate successfully with other anonymous individuals using conventions based on fairness (cf. Young, 1993).

Differences in institutional quality across countries can also be seen as a source of comparative advantage. As discussed in Bergh and Höijer (2008), globalization can increase the competition between countries with different institutions, fostering institutional reforms in countries with low institutional quality. An example is provided by Al-Marhubi (2005), who notes that the cost associated with bad policies such as unexpected monetary expansions may be higher (and the benefits smaller) in the countries that are open to world markets. As a result, openness generates incentives to create governance structures such as independent central banks and autonomous tax agencies to free monetary policy and tax collection from political influence.

Finally, as also discussed by Al-Marhubi (2005), globalization may also affect institutions through closer integration and openness, coming with an increasing global flow of information that provides alternative sources for knowledge and ideas. Such information spillovers may

⁹ “[w]herever manners are gentle there is commerce, and wherever there is commerce, manners are gentle” (Montesquieu, 1749, as cited in Hirschman, 1982).

make citizens more demanding and help nurture civil institutions. As discussed by Ostrom (2005), the fact that inefficient institutions persist, can be partly explained by people being misinformed or having biased view about the outcomes of various institutional arrangements. Many aspects of globalization can potentially mitigate such misinformation and bias, thereby fostering institutional reform.

While the OECD focus specifically on citizens' role in policymaking (OECD, 2009), information spillovers are also likely to affect institutional quality in a low-income setting. A recent illustrative example is the initiatives to tackle corruption in developing countries by encouraging anonymous reports of bribe-paying using public websites.¹⁰ Such activities may improve governance systems and procedures and reduce the scope for corruption.

Other mechanisms do not necessarily suggest that institutions improve as a result of globalization. While generally sympathetic to the idea of market integration as a civilizing force, Hirschman (1982) also noted as a counteracting force the tendency of commerce to induce an element of calculation and instrumental reason in many spheres of life.

Another likely consequence of globalization is that the distribution of power within countries will change through, for example, the transmission of technology (Romer, 1990). Along these lines, Acemoglu and Robinson (2006) show that the trade induced transfers of skill-biased technology increase the income share of the middle class, in turn improving their political power and ultimately generating better protected property rights. Similarly, Acemoglu et al. (2005a) argue that the Atlantic trade strengthened commercial interests in Western Europe.

Hardy and Maguire (2008) define institutional entrepreneurs as actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones, and provide several examples of how institutions such as labour regulation, entry barriers and property rights have been changed as a result of such individual initiatives. Importantly, it is not necessarily the case that the changes following globalization strengthen the incentives for institutional entrepreneurs to improve institutions.

¹⁰ See e.g. www.ipaidabribe.com—a website covering information reported by anonymous individuals on when having to pay a bribe in more than 450 Indian cities.

Changing institutions will in many cases involve trade-offs between short run and long run benefits. For example, both violations of rule of law and of property rights are likely to bring short run gains to those involved, while harming the long run economic development. The same goes for corruption and several policy rules as well, such as inflationary monetary policies, which may bring substantial benefits to small elite groups in the short run while being devastating for long run economic development.

For this reason, the time horizon and expectations of those who influence institutions will be crucial in determining the effects of increased globalization. Referring again to the case of IKEA in Russia, it may well be the case that those who engage in corrupt activity realize that corruption is likely to diminish the long run benefits from having IKEA expanding in Russia, but when future benefits are heavily discounted, the short run benefits of increased corruption are higher. In the latter case, the presence of IKEA creates an incentive for bureaucracies to alter institutions in order to easier be able to reap short run benefits from corruption, property rights violations, and similar activities. If, however, more weight is put on long run economic development, the effect of IKEA would be to increase the return to institutional improvements.

In poor countries, uncertainty and instability is typically higher, and life expectancy is shorter. Consequently, the incentives to improve institutions to foster long run economic development are lower, and the incentives to worsen institutions (through, for example, accepting corruption) are likely to be higher (see Acemoglu and Verdier, 2000; Fjeldstad and Tungodden, 2003; and Altindag and Xu, 2009 for further discussions). Thus, the correlation between globalization and subsequent improvements in institutional quality when examined using panel data with country fixed effects is expected to be smaller (and possibly negative) in poor countries than in rich countries.

3.2.2 Previous studies

In the wake of increasing globalization, several studies have examined whether factors such as trade and economic openness affect institutions, especially rule of law and the level of corruption. Most of these studies find a positive effect of openness on institutional quality, but none has so far examined how the effect varies with the level of development.

Recently, Bhattacharyya (2012) finds a positive effect of openness on property rights. Openness is quantified as the number of years a country has been open, as defined by the Sachs and Warner openness index, updated by Wacziarg and Welch (2003). The institutional indicator used is expropriation risk and repudiation of contracts as measured by the International Country Risk Guide. The study uses panel data, covering between 65 and 103 countries from 1980 to 2000. Results indicate that a one sample standard deviation increase in the fraction of years a country has remained open since 1950 leads to a 2.2 point increase in the property rights institutions index. To account for potential endogeneity, Bhattacharyya (2012) verifies the results by instrumenting trade openness using export partners' growth rate. In a limited sample of 31 countries, he finds a similar relationship between tariffs and executive constraints over the period 1865 to 1940.

Levchenko (2011) finds that the countries whose exogenous geographical characteristics predispose them to exporting in so-called institutionally intensive sectors have significantly higher institutional quality. The conclusion is reached by predicting the institutional intensity of exports using geographic characteristics and examining the relationship with the rule of law index from Kaufmann et al. (2005) averaged across 1996–2000 for a cross section of 141 countries.

The Kaufmann indicators (Kaufmann et al., 1999, which are the same as in Knack and Keefer, 1995) are also used by Al-Marhubi (2005), where the average of the six dimensions are explained using several indicators of economic openness: trade flows, the Sachs and Warner index, the D-index (Dollar, 1992) and the fourth dimension of the economic freedom index, freedom to trade internationally (Gwartney and Lawson, 2002). Regressions including 81 to 125 countries indicate that openness (all measures except the D-index) in 1985 is associated with improved governance in 2000 and 2001.

A positive relationship is also found by Wei (2000) using corruption (taken from Business International and Transparency International) and trade flows as a share of GDP in a cross section of 169 countries in 1978–1980 and 184 countries in 1994–1996. Similar results are reached by Bonaglia et al. (2001), who have found corruption (from Transparency International and International Country Risk Guide) being related to the GDP share of imports in 53 to 119 countries, using pooled OLS regressions for various periods between 1980 and 1998. The negative effect of import openness on corruption is confirmed by

IV-regressions where population, an English-speaking dummy, area, and remoteness are used as instruments for openness.

While the studies reviewed above all tend to find a positive relationship between openness and institutional quality, these results are not confirmed by Nicolini and Paccagnini (2011). Their study uses political rights and civil liberties (from Freedom house) as well as trade flows/ GDP in a panel data setting with 197 countries from 1976 to 2004 period. Using Granger causality tests, they fail to find a causal relationship between trade and institutions in any direction. Their use of yearly data is in contrast to other studies and may bias the results towards 0 if there are measurement errors in the data and institutions change only little from year to year.

The mechanisms discussed in previous studies are similar to those described in section 3.2.1. For example, Bhattacharyya (2012) departs from North (1990) by noting that North does not mention the impact of international trade on technological progress via technology transfer.

The most theoretically elaborated paper is Levchenko (2011), where institutions play dual roles: they generate rents for some parties within the economy and they are a source of comparative advantage in trade. The dual role of institutions means that different consequences of increasing trade openness are possible. In technologically similar countries, trade will lead to a “race to the top” in institutional quality (similar to the perspective in Bergh and Höijer, 2008). However, when technological differences are bigger, trade flows are driven by other than institutional sources of comparative advantage. In this case, trade does not create an incentive to improve institutions but rather increases the incentives for the parties earning rents to make institutions worse. The empirical results indicate that institutions do indeed improve as a result of trade openness in countries that can expect to capture the institutionally intensive sectors after trade opening. The theoretical possibility that some countries will actually make institutions worse as a result of trade openness is not supported by the empirical analysis. Levchenko (2011) suggests that the presence of the OECD countries with very high institutional quality means that no other country will find it optimal to reduce its quality of institutions after trade opening.

3.2.3 Summary

Research so far lends some support to the view that economic openness *on average* promotes institutional improvement. The results of the most

recent findings fit well with older studies such as Wei (2000) and Bonaglia et al. (2001) where more open economies are shown to exhibit less corruption. Institutional improvements can therefore be seen as a potential mechanism in the empirical relationship between globalization and economic growth (Dreher, 2006; Rode and Coll, 2012).

Several questions are however left open. Previous studies, relying on cross-sectional variation among countries, do not teach us anything about variation over time. Importantly, this also holds when instrumental variables are used in cross sections. When Levchenko (2011) shows that countries, which geographical characteristics predispose them to export in institutionally intensive sectors, have higher institutional quality, this finding does not imply that an increase in trade flows would be followed by institutional improvement.

The two existing panel data studies arrive at different results. Bhattacharyya (2012) finds a positive relationship between openness and better protected private property, whereas Nicolini and Paccagnini (2011) do not find any relationship between trade and institutions using yearly bilateral trade flow data and the Freedom House index for political rights and civil liberties. Given that institutions change slowly over time, the result may be explained by their use of yearly data.

It is also clear from previous research that most of the economic gains that can be expected from institutional improvement do take some time to materialize, while the gains from breaches of contracts, corruption, and other forms of institutional deterioration are more or less immediate for those involved in these activities. Thus institutions may well change for the worse in less developed countries where the bureaucrats who shape institutions have shorter time horizons. So far, however, no study has noted that the effect of globalization on institutions is likely to depend on the level of development as suggested by the time horizon argument, and thus potentially suffers from inappropriate pooling of low-income and high-income countries, as discussed by Blonigen and Wang (2005).

Finally, the literature on globalization and institutional quality has so far employed strict economic measures of globalization, such as trade flows or the Sachs Warner index that classifies a country as either open or not. The process of globalization, however, is a broad and multidimensional phenomenon with economic, social, and political

components (Arribas et al., 2009; Dreher et al., 2008) that may affect institutions differently, suggesting that a strict focus on economic measures might limit our understanding of the relationship between globalization and institutional change.

3.3 Data and methods

3.3.1 Data on institutional quality and globalization

Choosing a measure of institutional quality involves several trade-offs. For some particular institutions, such as democracy, data are available for all major states since 1800 in the Polity IV Project. Other institutional measures are more comprehensive, but cover much fewer countries and years.¹¹ Following the discussion in the previous chapter, the most reliable choice so far is the Worldwide Governance Indicators (WGI) by the World Bank (Kaufmann et al., 2010). This dataset captures several aspects of institutional quality, begins in 1996 and covers 193 countries by 2010, and has not been used before in this line of research. Inference using year-to-year changes is not advised, but averaging over short time periods yields a reasonably comprehensive measure of various aspects of institutional quality for both high-income and low-income countries. For a discussion on the use of WGI in research, see Apaza (2009).

For interpretation, it is important to know that the WGI compile and summarize information from several sources, including both expert assessments (such as the World Bank's Country Policy and Institutional Assessment, used by Chauvet and Collier, 2008) and public surveys (such as the Afrobarometer surveys). Each source is assigned to one of six aggregate indicators, which are then averaged and made comparable across countries using an unobserved components model (Kaufmann et al., 2010). The crucial assumption in this procedure is that the observed data from each source are a linear function of the underlying, unobserved level of governance.¹² The six aggregate indicators are *government effectiveness*, *control of corruption*, *regulatory quality*, *political stability*, *rule of law*, and *voice and accountability*. Previous studies such as Knack and Keefer (1995) and Al-Marhubi (2005) use the average of these indicators. The findings in Haggard and Tiede (2011), however, suggest that developing countries vary in the way different

¹¹ A good collection of available institutional data is accessible through the Quality of Governance (QoG) dataset by the University of Gothenburg (Teorell et al., 2011).

¹² More details are available on <http://info.worldbank.org/governance/wgi/>

types of institutional quality are combined. Specifically, they note that a large cluster of developing countries combines high corruption levels with relatively well functioning property rights, whereas a second smaller cluster is worse in both dimensions and also very violent. For the scope of this analysis, it is necessary, therefore, to use these six indicators separately instead of averaging them. Details of six measures and their sources are presented in Appendix B.

As mentioned above, institutions are typically assumed to change slowly over time. This seems to be bad news for poor countries that might be stuck with dysfunctional institutions. But as recently noted by Berggren et al. (2012), institutional indicators might change a lot over time and the pattern varies substantially between countries. The same applies to the sample studied here. Data indicate notable changes in institutional quality, also among the poorest countries.

Following the discussion in the previous chapter, the log of the *KOF Index of Globalization* (Dreher et al., 2008) is used as a measure of globalization. Details of the KOF Index and its sub-components are presented in Appendix C.

As an illustration, figure 2 plots the change in economic globalization as measured by the KOF Index against the change in government effectiveness from the WGI over the period 1996–2009. As expected, the scatter plot illustrates that most countries experienced increasing economic globalization over the period. Interestingly, focusing on the upper part of the figure shows that a number of countries substantially improved their institutional quality during the same time period.

Figure 2 suggests a weak positive correlation between globalization and institutional quality. Variation is however large among observations, and differentiating between rich and poor countries allows seeing a somewhat stronger correlation seeming to exist in high-income contexts. Furthermore, figure 2 reveals that there are no obvious outliers in the sample.

The baseline specification includes several control variables, all suggested by previous empirical research on the determinants of institutional quality. Table 2 shows descriptive statistics on the variables of interest.

pure autocracy to consolidated democracy (Marshall and Jagers, 2012).

Table 2 Descriptive statistics

Variable	Mean	Std. dev.	n	N	Min	Max	Source
Government effectiveness	-0.06	1	191	752	-2.32	2.30	Worldwide Governance Indicators (2011)
Control of corruption	-0.06	1	191	752	-1.92	2.51	Worldwide Governance Indicators (2011)
Political stability	-0.05	1	193	758	-3.23	1.64	Worldwide Governance Indicators (2011)
Regulatory quality	-0.07	1	191	752	-2.53	2.16	Worldwide Governance Indicators (2011)
Rule of law	-0.07	1	193	763	-2.53	1.96	Worldwide Governance Indicators (2011)
Voice and accountability	-0.04	1	193	769	-2.22	1.67	Worldwide Governance Indicators (2011)
Log of Economic globalization	3.99	0.35	148	739	2.31	4.58	Dreher et al. (2008), updated in 2012
Log of Economic globalization: Flows	4.00	0.41	173	864	2.21	4.61	Dreher et al. (2008), updated in 2012
Log of Economic globalization: Restrictions	3.95	0.46	137	684	1.60	4.57	Dreher et al. (2008), updated in 2012
Log of Social globalization	3.67	0.55	183	912	1.82	4.53	Dreher et al. (2008), updated in 2012
Log of Social globalization: Personal contacts	3.80	0.54	179	892	1.85	4.59	Dreher et al. (2008), updated in 2012
Log of Social globalization: Information flows	3.96	0.47	175	872	1.48	4.60	Dreher et al. (2008), updated in 2012
Log of Social globalization: Cultural proximity	2.78	1.28	190	947	0.69	4.59	Dreher et al. (2008), updated in 2012
Log of GDP per capita, PPP	8.49	1.29	168	868	5.25	11.18	World Development Indicators (2012)

Table 2 (cont.)

Variable	Mean	Std. dev.	n	N	Min	Max	Source
Log of Population size	15.46	2.10	190	945	9.72	21.00	World Development Indicators (2012)
Total natural resources rent (% of GDP)	9.06	17.16	185	922	0	164.95	World Development Indicators (2012)
Percentage of population (age 15+) with completed secondary education	20.56	13.53	142	710	0.60	67.79	Barro and Lee (2010)
Log of Net development assistance and aid	19.03	1.55	139	774	12.61	23.19	World Development Indicators (2012)
Revised combined Polity IV score	3.02	6.57	159	791	-10	10	Marshall and Jagers (2012)

3.3.2 Method

The relationship between globalization and institutional quality is examined with the following equation

$$IQ_{it} = \alpha_i + \beta_i G_{it-1} + \gamma_r X_{it-1} + u_{it} \quad (1)$$

where IQ stands for institutional quality, G is globalization, X refers to a set of controls, and u_{it} is the error term. To account for unobservable heterogeneity potentially correlated with the explanatory variables, country fixed effects are included, and a random effects model is used for a robustness check.¹³

The model is estimated using four year averages over five periods: 1992–1995, 1996–1999, 2000–2003, 2004–2007, and 2008–2010. Averages are used to minimize the effects of noise and single year fluctuations in the data. To mitigate potential endogeneity, independent variables are lagged, so that average globalization from 1992–1995 is used to explain institutional quality over 1996–1999. The only variable that is used with its actual values is a share of population with secondary education, as this data only covers the years 1990, 1995, 2000, 2005, and 2010. To enhance comparability across different specifications, the sample is

¹³ The main specification does not include time fixed effects as shocks simultaneously affecting institutional quality in several countries are unlikely. When including time fixed effects, time dummies are not jointly significant at traditional levels.

restricted across the models of the same specification, thus, the effective sample is limited by data availability.

3.4 Results

3.4.1 Main results

Tables 3 and 4 present fixed effects estimation results for the relationship between economic and social globalization and the six dimensions of institutional quality, using the full sample.

Economic globalization seems to be followed by improving institutions, with four out of six dimensions reaching statistical significance at least at the ten per cent level. In contrast, the estimates for social globalization are small and never significant. The control variables generally have the expected sign, with population size and rents from natural resources being negatively related to institutional quality.

Table 3 Economic globalization: baseline models; full sample

Variables	Government Effectiveness (GE)	Control of Corruption (CC)	Regulatory Quality (RQ)	Voice and Accountability (VA)	Rule of Law (RL)	Political Stability (PS)
Economic Globalization	0.114 (1.49)	0.113 (1.19)	0.262 (2.84)***	0.304 (3.22)***	0.208 (2.54)**	0.248 (1.73)*
Population	-0.468 (4.08)***	-0.253 (1.78)*	-0.622 (4.50)***	-0.082 (0.58)	-0.354 (2.88)***	-0.232 (1.08)
GDP per Capita, PPP	0.266 (3.91)***	-0.023 (0.27)	0.057 (0.69)	-0.168 (2.01)**	0.073 (1)	0.025 (0.2)
Total natural resources rents	-0.002 (0.7)	-0.005 (1.79)*	-0.004 (1.62)	-0.006 (2.04)**	-0.005 (2.17)**	-0.002 (0.43)
Constant	4.715 (2.66)***	3.543 (1.62)	8.473 (3.98)***	1.323 (0.61)	4.012 (2.12)**	2.251 (0.68)
Observations	392	392	392	392	392	392
Number of countries	101	101	101	101	101	101
R-squared	0.96	0.94	0.95	0.95	0.96	0.91

Absolute value of t statistics in parentheses

*significant at 10%; ** significant at 5%; *** significant at 1%

Table 4 Social globalization: baseline models; full sample

Variables	GE	CC	RQ	VA	RL	PS
Social Globalization	0.04 (0.54)	-0.088 (0.94)	0.066 (0.73)	-0.005 (0.05)	-0.097 (1.21)	-0.179 (1.29)
Population	-0.295 (2.56)**	0.06 (0.41)	-0.314 (2.24)**	0.207 (1.43)	-0.017 (0.14)	0.219 (1.02)
GDP per Capita, PPP	0.284 (4.29)***	0.053 (0.64)	0.135 (1.68)*	-0.046 (0.55)	0.209 (2.93)***	0.215 (1.75)*
Total natural resources rents	-0.003 (1.72)*	-0.008 (3.12)***	-0.004 (1.81)*	-0.007 (2.65)***	-0.007 (3.18)***	-0.002 (0.66)
Constant	2.041 (1.16)	-1.376 (0.62)	3.573 (1.66)*	-3.188 (1.44)	-1.393 (0.73)	-4.986 (1.52)
Observations	417	417	417	417	417	417
Number of countries	109	109	109	109	109	109
R-squared	0.96	0.94	0.95	0.95	0.96	0.91

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

To allow for different effects in developed and developing countries, the full sample is divided into sub-samples of high-income and low-income countries (with the threshold at GDP per capita of 4000 US dollars). Moreover, to gain deeper knowledge on what globalization factors affect institutional quality, the economic and social globalization measures should be disaggregated. Tables 5 and 6 present the effects of five types of globalization on six dimensions of institutional quality, for low-income and high-income countries separately.

The results reveal some patterns that are not visible in the pooled sample. First, economic flows correlate with worsened institutions in low-income countries, with significant effects for government effectiveness and control of corruption. For rich countries, the sign is the opposite for all dimensions, and significantly so for government effectiveness, control of corruption, and political stability.

Secondly, the personal contacts as a part of social globalization correlate negatively with institutional quality in low-income countries, but not in high-income countries.

Table 5 Different types of globalization; sub-sample of low-income countries

(controls are included but not shown)

Variables	GE	CC	RQ	VA	RL	PS
Economic Flows	-0.154 (2.10)**	-0.24 (2.75)***	-0.114 (1.49)	-0.033 (0.35)	-0.073 (0.92)	-0.075 (0.51)
Number of Countries	60	60	60	60	60	60
R-squared	0.88	0.81	0.89	0.90	0.90	0.84
Economic Restrictions	0.275 (3.24)***	0.227 (2.25)**	0.28 (3.13)***	0.334 (3.26)***	0.353 (4.15)***	0.581 (3.51)***
Number of Countries	52	52	52	52	52	52
R-squared	0.89	0.81	0.88	0.91	0.91	0.85
Personal Contacts	-0.191 (1.35)	-0.47 (2.81)***	-0.124 (0.81)	-0.488 (2.82)***	-0.278 (1.87)*	-0.533 (1.95)*
Number of Countries	59	59	59	59	59	59
R-squared	0.88	0.8	0.89	0.91	0.90	0.86
Information Flows	0.035 (0.56)	-0.12 (1.62)	0.04 (0.6)	0.008 (0.1)	-0.081 (1.2)	-0.14 (1.12)
Number of Countries	59	59	59	59	59	59
R-squared	0.89	0.81	0.89	0.90	0.91	0.85
Cultural Proximity	0.032 (0.85)	-0.009 (0.19)	-0.021 (0.51)	-0.066 (1.4)	-0.037 (0.91)	-0.061 (0.81)
Number of Countries	61	61	61	61	61	61
R-squared	0.89	0.80	0.89	0.90	0.91	0.85

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Thirdly, both cultural proximity and information flows are followed by institutional improvements, often with significant effects, in high-income countries but not in low-income countries. Finally, more liberal trade policies (as measured by the economic restrictions dimension of the KOF Index) correlate with better institutions in low-income countries, but not so in high-income countries.

Running separate regressions for low-income and high-income countries drastically changes the results, in line with the theoretical expectations, discussed above. In particular the positive relationship between economic globalization and institutional quality in the baseline analysis seems to be fully driven by the relationship in richer countries. Similarly, social globalization improves institutional quality in high-income countries during the time period studied. On the other hand, economic globalization is not correlated with institutional quality

in the less developed context, and social globalization is negative and significant for four out of six institutional measures.

Table 6 Different types of globalization; sub-sample of high-income countries

(controls are included but not shown)

Variables	GE	CC	RQ	VA	RL	PS
Economic Flows	0.218 (2.96)***	0.2 (1.93)*	0.147 (1.25)	0.077 (0.8)	0.096 (1.14)	0.214 (1.72)*
Number of Countries	46	46	46	46	46	46
R-squared	0.98	0.96	0.95	0.97	0.97	0.94
Economic Restrictions	-0.07 (0.64)	-0.084 (0.57)	0.302 (1.93)*	0.001 (0.01)	-0.165 (1.4)	-0.099 (0.58)
Number of Countries	44	44	44	44	44	44
R-squared	0.97	0.96	0.95	0.96	0.97	0.95
Personal Contacts	0.077 (0.35)	0.285 (0.93)	-0.033 (0.1)	0.42 (1.58)	-0.013 (0.06)	0.395 (1.15)
Number of Countries	48	48	48	48	48	48
R-squared	0.97	0.96	0.95	0.97	0.97	0.95
Information Flows	0.212 (2.20)**	0.466 (3.61)***	0.098 (0.7)	0.201 (1.72)*	0.122 (1.18)	0.185 (1.24)
Number of Countries	47	47	47	47	47	47
R-squared	0.97	0.96	0.95	0.97	0.97	0.95
Cultural Proximity	0.066 (2.46)**	0.066 (1.78)*	0.032 (0.8)	0.101 (3.15)***	0.028 (0.97)	0.096 (2.29)**
Number of Countries	48	48	48	48	48	48
R-squared	0.97	0.96	0.95	0.97	0.97	0.95

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

In short, only liberalization of economic restrictions seems to do more good to institutions in low-income countries than in high-income countries. The other four aspects of globalization all capture some kind of human interaction such as trade, foreign investment, tourism, cultural integration, and surfing the Internet. To the extent that increases in these activities affect institutions, it leads to improvements in high-income countries and to worse institutions in low-income countries. This is very much in line with the prior theoretical arguments and suggests that the results in previous studies using samples including rich and poor countries together should be interpreted with care.

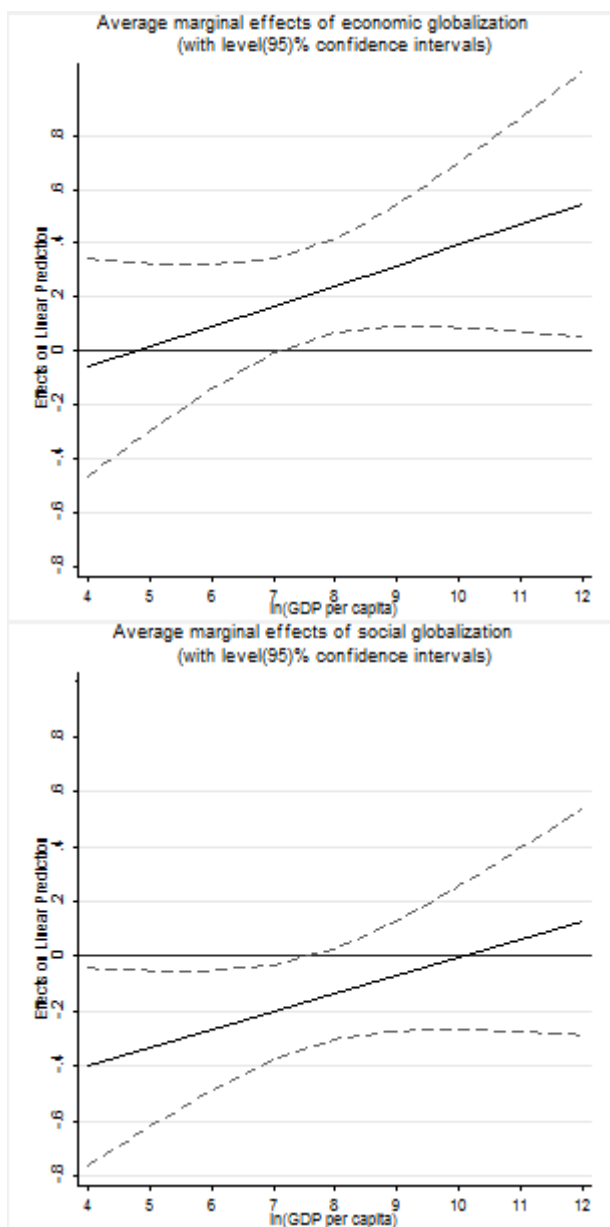
3.4.2 Robustness tests

The robustness of the results is verified with a number of additional control variables used in the empirical literature on institutional change: Political regime, represented by the Polity IV score, the share of adult population with completed secondary education and total net development assistance and aid.

The main difference between rich and poor countries remains when including these variables (results are not reported but available from the author). As expected, Polity IV score is not significant given that it changes little over time. Education has a significant negative effect on political stability but is otherwise not significant. Most interestingly, aid is typically positive and significant, suggesting either that aid improves institutional quality or that more aid is given to those countries where institutions are improving. Previous findings have associated aid with a decline in institutional quality (Brautigam and Knack, 2004) or found it having only a small impact on institutional change (Knack, 2004). This impact might also depend on the mode of aid (Selaya and Thiele, 2012). However, according to Wright (2009), there are factors that might intervene in the aid-institutions relationship, causing aid to improve a country's accountability.

In the main analysis, the strategy to identify differences between rich and poor countries is to divide the full sample. A different strategy is to include an interaction term between globalization and GDP. Doing so improves the power of the estimations and allows us to calculate the marginal effect of globalization on institutional quality at different levels of GDP per capita. Figure 3 illustrates the marginal effect of globalization on control of corruption conditional on the value of logged GDP per capita, and confidence intervals at 95 per cent. Once again the pattern found in the baseline analysis is confirmed: Economic globalization is followed by improved (here: less corrupted) institutions in rich but not in poor countries. Social globalization however seems to worsen institutions in poor but not in rich countries.

Figure 3 The marginal effect of economic and social globalization on control of corruption at different levels of GDP per capita



3.5 Concluding discussion

In 1749 Montesquieu suggested that market interactions might act as a civilizing force. Following his line of reasoning, the establishment of the Swedish furniture retailer IKEA in Russia in 2000 could affect norms and behaviour in such manner that ensuing firms establishing in the country would not have to share similar experiences with bribes and corruption. If this held true globally, it would be welcome news for developing countries. Sadly however, this seems not to be the case.

Researchers have recently started to empirically examine the relationship between economic globalization and institutional quality. The existing literature does however not consider that the relationship between globalization and institutional change may differ across contexts of development. This research complements this new and growing literature on openness and institutional quality, by arguing that state executives and their bureaucracies are likely to have different time horizons in low-income and high-income countries. As a result, increasing economic and social interactions following with globalization are likely to affect institutions differently depending on the level of development.

Using a panel dataset based on the Worldwide Governance Indicators, this study uncovered a heterogeneous effect of globalization on institutions, especially for the control of corruption measure. Most notably, the control of corruption seems to worsen when less developed countries trade more, while this is not the case in high-income countries. Similarly, more social interaction across national borders seems to worsen institutional quality in low-income contexts, but not so when the level of economic development is higher.

In contrast, more liberal trade policies seem to bring about positive institutional change in low-income countries, suggesting that the new set of constraints and new rules are more important than more economic transactions in this context.

Three major conclusions can be made from this analysis. First, the globalization process is indeed multidimensional and different parts of the process (and their specific character) seem to affect institutions very differently. Second, different types of institutions seem to differ in how easily they respond to the new state of affairs that follows with more globalization. For example, although both the rule of law indicator and the control of corruption indicator capture how well citizens and the

state respect institutions that govern economic and social interactions among them, it is mainly control of corruption that is affected by the globalization process in this setting. Third, in line with the theoretical predictions, globalization affects institutions differently depending on the country's level of development. The empirical results thus suggest that the previous findings on positive effects of economic flows on institutional quality are likely driven by changes in rich countries.

Theoretical expectation that differences in time horizon causes institutional entrepreneurs to react differently to increasing globalization is thus supported. But what are the exact mechanisms explaining these heterogeneous effects of globalization? A suggestion for future research would be to investigate the role of education, political participation, and democratic institutions.

In less democratic low-income countries, political power is often concentrated in the hands of an economic elite, for example, the major producers and investors in the economy. In this case, the short time horizon argument applies, and social and economic globalization does not provide strong incentives to improve property rights for the whole economy (i.e. for those market actors who do not belong to the elite) or to reduce corruption by altering the existing framework. As discussed by Acemoglu (2008), the economic elite protect their property rights and ensure that they do not fear expropriation, but this type of organization also typically enable the elite to get a monopoly position for themselves and exclude others to take advantage of profit opportunities, in essence violating the property rights of future potential producers.

In more democratic countries, things might be different but not necessarily so. The effect of globalization on institutions in democracies will depend on the degree to which people vote and demand accountability of local and national politicians. Again, time horizon is likely to matter, both directly and indirectly via the education channel. As shown by e.g. Campante and Chor (2011), there is a robust link between individual schooling and political participation. On average, schooling is lower in developing countries both as a result of poverty but also due to shorter time horizons: as shown by Jayachandran and Lleras-Muney (2009), low life expectancy lowers the value of human capital investments.

Examining the consequences of globalization on the world's poor is understandably a vivid research area. For example, Bergh and Nilsson

(2010) have demonstrated, also using the KOF Index of Globalization, that both economic and social globalization are positively related to life expectancy, and that this relationship holds also when rich countries are excluded from the sample. In contrast, the results of this study rather suggest that globalization such as trade and tourism bring benefits to institutional quality in rich countries but not in poor ones. Thus, there are many reasons to focus future research on the links from various forms of globalization to social norms and institutions in developing countries.

4. Fiscal Incentives and Foreign Direct Investment: A Causal Inference Approach

4.1 Scope of research

In the past several decades, many governments at national and sub-national levels in Europe, America, and Asia have sought to attract foreign direct investment (FDI) by setting up investment promotion agencies and offering various fiscal incentives (UNCTAD, 2000; OECD, 2003). While policymakers believe tax incentives help to attract FDI, multinational enterprise managers do not typically rank taxes as very important for investment decisions in their survey responses (Tavares-Lehmann et al., 2012). Such incongruence of beliefs and perceptions is puzzling. Further adding confusion to the puzzle is the fact that, after some mixed findings on taxation and FDI in the early empirical studies from 1950s to 1990s, a large body of econometric studies in the past decade appear to reach the consensus that lower tax rates encourage FDI (Tavares-Lehmann et al., 2012; Hines, 1999; Devereux, 2006; De Mooij and Ederveen, 2008).

This study offers another empirical analysis of the question whether tax concession causes more FDI. In particular, this research addresses three weaknesses from the previous studies. First, most empirical studies focus on the national level tax rates, but in many countries, tax rates on corporate profit are often affected by sub-national governments as well. Ignoring sub-national differences in corporate tax rates leads to measurement error in the tax variable and biased estimates. Secondly, many empirical studies pool together very different countries, whose unobservable heterogeneity tends to bias the estimated effect of tax rate on FDI. Thirdly, existing econometric studies focus on estimating correlation between tax rate and FDI, rather than identifying the causal effect of tax incentives on FDI. The solution to these three points is to apply the causal inference approach to a natural experiment scenario within a single country where regional governments at one point have been granted autonomy to cut corporate profit tax. The research seeks to produce more credible estimates of the causal effect of tax concession on FDI.

Russian regions after the year 2002 provide the ideal setting for such an analysis. It was the first time the federal government gave regional governments the autonomy to reduce their part of corporate profit tax. The 82 Russian regional governments adopted three different corporate profit tax regimes: a status quo flat rate, tax concessions for investment

profit, and tax concessions for the profit from important investment projects. This exogenously imposed autonomy allows testing the causal effects of different tax concessions on FDI across regions within a single country over time.

Two causal inference techniques are applied: a parametric identification strategy, based on differences in differences (DID) estimation, and a non-parametric identification strategy, based on synthetic controls method.

This chapter proceeds as follows. Section 4.2 provides a brief overview of the empirical literature on tax and FDI. Section 4.3 discusses why Russian regions provide an ideal natural experiment case. Section 4.4 presents the parametric identification strategy and the results for the DID analysis. Section 4.5 discusses the non-parametric identification strategy and the results from synthetic control method. Section 4.6 concludes.

4.2 Review of literature on fiscal incentives and FDI

Many scholars provide extensive reviews of studies on the topic (see, e.g., Tavares-Lehmann et al., 2012; Hines, 1996; Devereux, 2006; De Mooij and Ederveen, 2008). Empirical studies typically regress a measure of foreign investment on some tax variable(s) while controlling for other factors affecting investment. As noted in some surveys of the literature, these studies differ in various respects. The dependent variable is often FDI flows, FDI stock, the number of foreign locations, or investment in property, plant, and equipment. The tax variables also differ across studies, including statutory tax rate, tax base, average tax rate, effective tax rate, effective marginal tax rate, effective average tax rate, and bilateral corporate effective tax rates. The design could be time series, cross-sectional, and panels, and could be at firm, industry, sub-national, country, and bilateral levels. Studies from earlier decades tend to reach mixed findings regarding the impact of corporate taxes on FDI, but most recent research (e.g., Becker et al., 2012; Bellak and Leibrecht, 2009; Bellak et al., 2009; Blonigen and Davies, 2004; Egger et al., 2009; Grubert and Mutti, 2004) tends to find that corporate taxes have significant effects on FDI.

As noted earlier, most of the extant studies tend to focus on national corporate tax rates and pool heterogeneous countries together in their samples. Only a very small number of studies examine the impact of corporate taxes by sub-national governments on FDI. For example,

Bartik (1985), Slemrod (1990), Papke (1991), and Hines (1996) examine how state-level corporate income taxes affect FDI allocation (investment and/ or plant location) among 50 US states. Swenson (1994) studies how average tax rates affect aggregate FDI inflows in 18 different industries into 50 US states in the period 1979–1991. Becker et al. (2012) study the effect of business tax rates by German municipalities on location decisions of multinational companies. Since in many countries, other than the USA and Germany, sub-national governments have some autonomy levying taxes on corporations, more research is in order to study the impact of tax policies of regional governments on FDI. Focusing on within-country variations holds constant the unobserved heterogeneity between countries that tends to bias the estimated effect of tax on FDI, thus isolating the effect of interest.

More importantly, extant empirical studies largely estimate the correlation between tax and FDI and have little confidence in claiming and finding the causal effect of tax on FDI. It has been demonstrated that policy evaluation based on conventional regression models without addressing causal inference issues is most likely to generate biased estimates (Abadie et al., 2010; Abadie and Gardeazabal, 2003; Abadie, 2004; Rubin, 1977; Holland, 1986; Angrist and Pischke, 2008). This study takes advantage of recent progress in the causal inference methods to provide better estimates of the causal effect of tax concession on FDI.

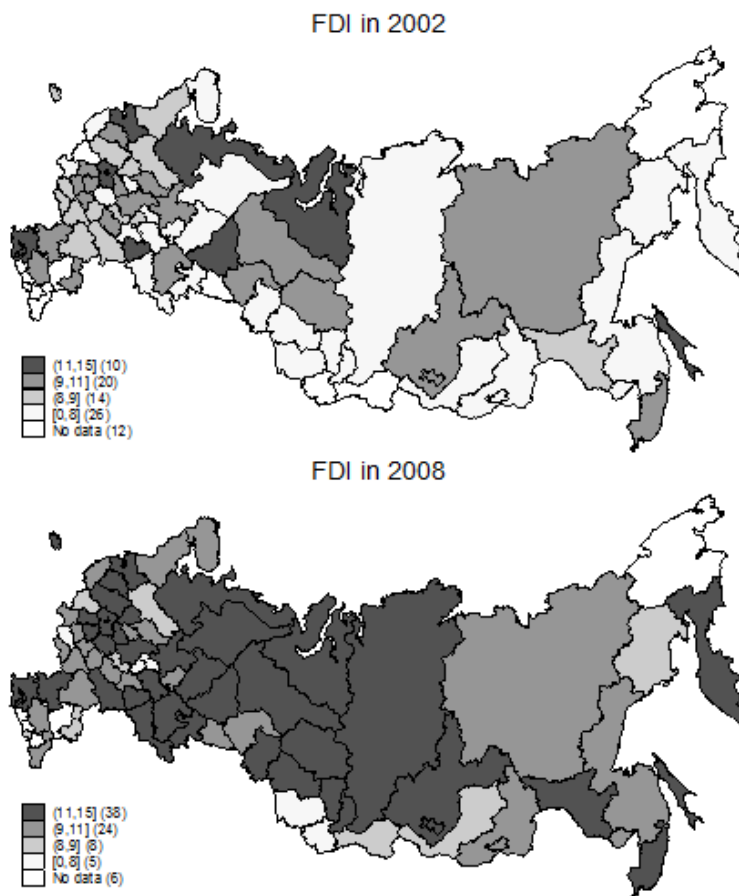
4.3 Effect of tax concession on FDI in Russian regions: a natural experiment design

This research aims to explain how tax concessions for investment profit might influence FDI inflows in Russian regions. The dependent variable is the amount of foreign direct investment inflows into a Russian region in a given year, measured in 2000 constant dollars and log transformed (figure 4). Data are from Federal Statistic Service of Russia (Rosstat)¹⁴. Foreign investment refers to the investment of foreign capital into the objects of entrepreneurial activity, as well as other kinds of property and intellectual values, including services and information. The FDI data reflect a direct-investor ownership of at least 10 per cent of the ordinary shares in the equity capital of an enterprise,

¹⁴ FDI Data are reported by both Rosstat and the Bank of Russia in accordance with the methodology set out by the International Monetary Fund, but only Rosstat offers the data disaggregated by regions and by sectors.

resident in Russia, by a direct investor, resident of a foreign country. Direct investment can be in form of equity capital, reinvested earnings, intra-company loans, and financial leasing.

Figure 4 FDI inflows in Russian regions in 2002 and 2008



FDI comprises not only the initial transaction establishing the relationship between an investor and an enterprise, but also all subsequent transactions between them; however, it does not include investment made in monetary institutions and banks (for statistical

purposes, the latter is included into other foreign investment)¹⁵. Figure 4 maps the intensity of FDI inflows in 82 Russian regions. It is interesting to note the striking increase of FDI inflows in some regions between the years 2002 and 2008.

The tax variable under study is the corporate profit tax rate. Changes in corporate profit tax in Russian regions with the new Tax Code in 2002 provide a natural experiment to evaluate the causal effect of tax concession on FDI inflows. As in many other countries, Russian profit tax is the tax on the income of legal entities, imposed on net annual profits. The revenues from profit tax are one of the main sources of the regional budgets revenues, making for 20 up to 70 per cent of their non-transferable income. All other taxes existing in Russia are either low (hence, insignificant for the regional tax revenues), either imposed at the federal level (so that the regional authorities do not have any power over the tax rates). Even though corporate profit tax rate in Russia had both a federal and a regional component, setting the rates for both components was traditionally the prerogative of the federal government. But the Russian Tax Code, which entered into force in 2002, introduced a new regime for corporate profit tax: The regions were given the autonomy to reduce the regional part of the profit tax rate. With this newly granted power, the Russian regions experimented with three types of profit tax regimes: a flat rate for corporate profit tax in general, tax concessions for direct investment profit, and tax concessions for profit from important investment projects. Table 7 presents more detailed information about these profit tax rates in 80 Russian regions from 1992 to 2010.

Table 7 Tax rates on investment profit in Russian regions, per cent

Number of regions	Group	1992-1993	1994-2001	2002	2003	2004	2005-2008	2009-2010
37	Green	32	35	24	24	24	24	20
9	Orange1	32	35	24	24	20 to 22.5	20 to 22	15.5 to 17.5
1	Orange2	32	35	24	24	24	23.5	19
25	Yellow1	32	35	24	24	20 to 23.5	19.5 to 23	15 to 18.5
8	Yellow2	32	35	24	24	24	20	15.5

¹⁵ Meyer and Pind (1999) and Vinhas de Souza (2008) address the issue of low reliability of Russian statistics on FDI in details. Some methodology comparisons are presented also in *Foreign direct investment statistics: how countries measure FDI 2001*. (2003). Washington, D.C.: International Monetary Fund.

Based on the total profit tax rates, table 7 categorizes 80 Russian regions, excluding two outliers (Kaliningrad Oblast and Jewish Autonomous Oblast), into three groups, labelled with different colours henceforth for simplifying references within this research.

Green regions have only one flat tax rate, following the federal decisions about its decrease. *Orange* regions keep the standard tax rates at the same level as green regions but introduce tax concessions for investment projects. *Yellow* regions also keep the standard tax rates at the same level as green and orange regions but introduce tax concessions for so-called “important investment projects.”

The regional tax concessions, which occurred in some regions but not in others during the period 2002–2008, provide an ideal case for testing their causal effect on FDI. The sample design is based on the following reasoning.

Over time, the federal part of the tax rate rose and shrank, whereas the regional part increased steadily since 2003, but the total rate was the same during 2002–2008, an important fact for the research design.

The total tax rate for profit, though changed before 2002 and in 2009, was stable at 24 per cent during 2002–2008. Thus, this study focuses on the period 2002–2008, which allows holding constant the total tax rate for profit and evaluating precisely the effect of the fiscal policy shock implemented at the regional level regarding investment profit in 2003.

The control group in the analysis is green regions. Their tax rate on profit from direct investment stayed at 24 per cent from 2002 to 2008, even when regions were allowed to lower their tax rates. It is worth noting three regions are excluded from the green group, namely Moscow City, Moscow Oblast, and Chechen Republic, because they are outliers in many of their attributes, rendering incomparable comparisons. Hence, the pool of green regions includes 34 regions.

The first treatment group is orange regions. An investor in such a region is eligible for the reduced tax rate for the net income received from direct investment. Note here that nine regions (referred to as “orange1” in table 7) decrease their tax rates for investment profit in 2003 (entered into force in 2004), so that their total tax rates were placed somewhere between 20 and 22.5 per cent. Orange2 includes one region (Buryatia Republic), which has implemented its tax concession not in 2003 but in 2004 (entered into force in 2005). Since the tax concession in Buryatia is likely to be influenced by other regions and thus

endogenous, the treatment group includes only nine orange1 regions that implemented tax concession simultaneously as soon as they were able to do so.

The second treatment group is yellow regions. These thirty-three regions have the same total rate for corporate profit as the green regions, but they decrease the tax rate for so-called important investment projects. If an investor receives an approval by the regional government to be included in the list of investment projects considered important for regional development, he/ she becomes eligible to apply the reduced tax rate on investment profit. Since there are no common criteria for “importance” of investment projects, each regional administration selects them independently. This provides regional bureaucracy with a great deal of discretionary decision-making power. Based on the timing of tax policy change, this group is also divided into two types (referred to as “yellow1” and “yellow2” in table 7). Yellow1 consists of 25 regions that lowered their rates for important investment projects in 2003 (entered into force in 2004), so that the total tax rates were placed somewhere between 20 and 23.5 per cent. Yellow2 consists of eight regions that lowered their rates for important investment projects in various years later than 2004, probably influenced by changes in other regions. In the further analysis, the second treatment group includes only 25 yellow1 regions that implemented tax concession simultaneously as soon as they were able to do so.

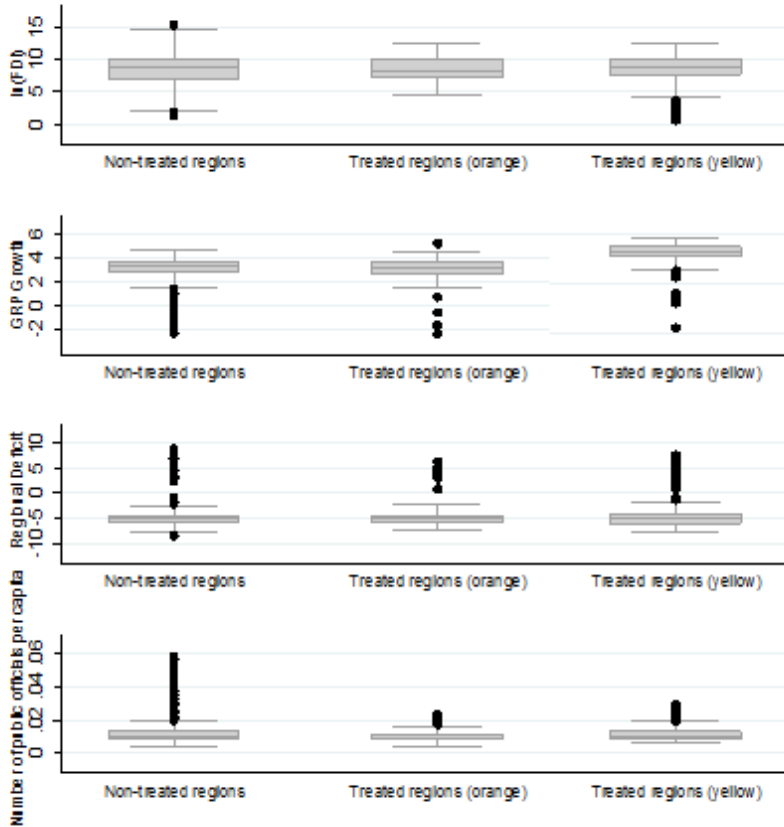
Now one may wonder whether the treatment regions are geographically clustered. Appendix D maps the geographical locations of the three key groups: green1 (control), orange1 (treatment group 1), and yellow1 (treatment group 2). It shows little evidence that either orange or yellow regions are geographically clustered, though they tend to be located in the Western part of Russia.

To further ensure that the control and treatment regions were similar in other various dimensions before regional tax concessions in 2003, the difference of means is tested between green and yellow/ orange regions with respect to FDI inflows, GRP growth rate, regional budget deficit, and number of public officials per capita¹⁶. None of the tests shows a significant difference between control and treatment regions. Figure 5

¹⁶ A detailed description of the covariates is provided in the following section. Regional deficit is obtained as follows: Regional budget revenue – (Budgetary transfers from federal budget + Regional budget expenses). Data are in million US dollars (logged) and come from the Rosstat’s dataset.

shows the box plots for each variable for green, orange, and yellow regions.

Figure 5 Balance of relevant covariates between treatment and control groups in the pre-treatment period



Note: t-tests show that differences in means are not statistically different from zero.

The distributions of FDI inflows, economic growth, regional budget deficit, and the per capita number of public officials are very similar in the pre-treatment period between treatment (orange and yellow) and control regions. There is little evidence that orange and yellow regions implemented tax concessions to catch up with green regions, or that green regions faced more budgetary constraints such that they could

not cut tax, or that institutional capacity was very different when tax concession was adopted in some regions but not in others. Hence, the treatment and control regions are quite balanced in the pre-treatment period.

4.4 Parametric identification strategy

4.4.1 Difference in differences estimation

In comparative studies, researchers compare the units exposed to the treatment with one or more unexposed units (Abadie et al., 2010). While estimating the effect of tax concession on FDI, one faces the fundamental problem of causal inference: the impossibility of observing the counterfactual, i.e., the outcome for the same unit in the absence of the treatment. Ideally, to overcome this problem, one would conduct an experiment in which tax concessions are randomly assigned to the Russian regions. The difference between the average level of FDI for the treated regions and the average level of FDI for the control group would constitute the causal effect of the tax concession. This is because both groups would be comparable with respect to (un)observed confounders. Of course, in reality, tax concessions are never completely randomly assigned to the regions. If confronted with non-random assignment, causal inference methods serve to overcome the obstacles to estimating causal effects (Rubin, 1974, 1977; Holland, 1986; Angrist and Pischke, 2008).

The difference in differences estimation (henceforth DID) allows approximating randomization by design and generating causal inference. Within the DID framework as discussed in Angrist and Pischke (2008), the estimation can take the following form in the context of FDI and tax concession between one treatment and one control group.

$$FDI_{it} = \beta_1 + \beta_2 Treat_i + \beta_3 Cut_t + \beta_4 (Treat_i \times Cut_t) + \varepsilon_{it} \quad (2)$$

where FDI_{it} denotes observed FDI inflow in region i and period t , ε_{it} denotes random error, $Treat_i$ indicates a dummy for the treatment region, β_2 denotes the time-invariant region fixed effect in the absence of a tax concession, Cut_t denotes a time dummy that equals one after tax cut is introduced, β_3 denotes the tax cut year fixed effect common among regions, and $(Treat_i \times Cut_t)$ denotes the interaction term between treatment regions that implement tax concessions at some point and the tax cut year dummy. In this setup, β_4 denotes the

difference in differences effect of interest, i.e. the effect of tax concessions on FDI.

The setup in equation 2, when applied to Russian regions in this analysis, requires several modifications. First, there are many regions within each group (both treatment and control) that have unobserved heterogeneity to control for. Hence, a fixed effect dummy for each region η_i is included instead of $\beta_2 Treat_i$.¹⁷ Second, instead of one tax cut year, there are multiple years, as each year might have had a specific effect common to all regions. Hence, a year fixed effect dummy for each year θ_t is included instead of $\beta_3 Cut_t$.¹⁸ Third, there are two different types of tax concessions implemented by Russian regions in 2003. Hence, the effects of two concession types should be estimated separately. Specifically, *OrangeCut* is a dummy that scores one for those regions that cut tax on investment profit in 2003 and zero otherwise. *YellowCut* is a dummy that scores one for those regions that cut tax on profit from important investment projects in 2003 and zero otherwise. Their coefficients represent the tax concession effect on FDI in this setting. Finally, one should control for observed covariates, which have been commonly found to affect FDI. Such covariates not only control for compositional effects but also improve the precision of the estimates. Thus, the DID regression model is defined as follows:

$$FDI_{it} = \beta_1 + \beta_2 OrangeCut_{i,t-1} + \beta_3 YellowCut_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 FDI_{i,t-1} + \eta_i + \theta_t + \varepsilon_{it} \quad (3)$$

To account for various confounding factors, several control variables are included, namely GRP per capita, population, trade, real economic growth, natural resources potential, investment risk, number of public officials per capita, political stability, special economic zone, labour cost, human capital, spatial correlation, and lagged dependent variable. Time-varying covariates are lagged by one year to avoid the post-treatment bias.

Gross regional product (GRP) per capita, measured in 2000 constant USD and log transformed, indicates the level of economic development in a region for a given year. The variable logged *population* accounts for

¹⁷ Hausman test shows that region fixed effects are more preferable than region random effects.

¹⁸ Wald test confirms that year fixed effects are necessary in some models.

regional market size, often an important driver in attracting FDI, and also serves as a proxy for regional labour force (Ahrend, 2000; Ledyeva, 2007). The variable *trade*, measured as the logged sum of import to and export from a region, controls for the effect of trade on FDI, which could be positive (e.g., intra-firm trade) or negative (e.g., tariff jumping investment). The variable real economic growth (*GRP Growth*) is another traditional measure of regional economic development. Data for these variables come from the Rosstat dataset.

FDI often depends on the presence of natural resources that has been found significant in some previous studies (Asiedu and Lien, 2011; Kayam, Hisarciklilar, and Yabrukov, 2007). To control for it, there is regional *rating of natural resources potential*, compiled by the Russian rating agency "Expert." Another control indicator is *ranking of investment risks* relative to the Russian average, compiled by the same agency. Both variables range from 1 to 82, with 1 being the best rank, thus both variables are expected to have a negative sign¹⁹.

The *number of public officials per capita* is included as a simplified proxy for bureaucratic quality of regions. Inflated public administration often associates with higher administrative burdens and is expected to discourage foreign investors. Data on number of public officials come from the Rosstat dataset. The analysis also employs a proxy of political stability in a region, measured as the *governor's tenure in office*. Longer governor tenure is associated with more stable and predictable institutional policy, attracting more investment inflows. This variable was calculated by the author.

Another control variable is a dummy for so-called *Special Economic Zones* (SEZ). Special Economic Zones were created in some regions over years in form of industrial areas, tourism zones, and innovation parks. The residents of a SEZ receive tax holidays for the first 10–15 years of their activity and pay zero import tariffs. SEZ are expected to attract foreign companies, hence this dummy should have a positive sign²⁰. This variable was calculated by the author.

The model also includes an average *nominal wage per capita* and a *share of employed with secondary education* in total employment. As Broadman

¹⁹ It is worth noting that both rating were widely used in some previous studies, but often found insignificant (see Broadman and Recanatini (2001) for discussion).

²⁰ It is necessary to keep in mind, though, that most of the SEZ were established in 2006–2007 and they became fully functional in 2009–2010, thus, their actual impact might be beyond the period under study.

and Recanatini (2001) argue, both the cost and the quality of labour may be key factors in attracting investment. Under assumption that the investors seek for lower labour costs and for high-skilled workers, nominal wage is expected to be negatively linked to investment, while a share of employed with higher education should have a positive impact on FDI. Data for these two variables come from the Rosstat dataset.

As discussed earlier, no pattern of spatial correlation of FDI flows among regions is observed visually from figure 4. Nonetheless, conservative estimate should include a *spatial lag of FDI*. Specifically, the lagged dependent variable is multiplied by a connectivity matrix that captures *contiguity* among all the Russian regions in the sample. Concretely, the connectivity matrix has ones for those regions that share the border and zeros for those regions that do not. This variable controls for the fact that FDI might be geographically clustered. The lagged dependent variable in the spatial lag (rather than modelling a simultaneous effect of FDI) allows avoiding endogeneity in estimating such a model (Beck et al., 2006). Descriptive statistics on the variables of interest as well as their sources is presented in table 8²¹.

Because FDI tends to have inertia, the model includes the lagged dependent variable on the right hand side to control for temporal dependence. Note that using both the lagged dependent variable and region fixed effects on the right hand-side would make OLS estimates biased (Nickell, 1981). Hence, the Arellano-Bover/ Blundell-Bond system GMM estimator applies. It employs the moment conditions of lagged levels as instruments for the differenced equation together with the moment conditions of lagged differences as instruments for the level equation. The Arellano-Bover/ Blundell-Bond estimator allows also to identify the effects of time invariant variable, provides a larger set of moment conditions both to overcome some weak instrument biases of first differenced estimators and to reduce the finite sample bias in panels with short T and persistent regressors, and addresses the endogeneity of various variables with appropriate instruments. In particular, the lagged dependent variable, per capita GRP, trade openness, real economic growth, spatial lag, share of public officials, and investment risk are all treated as endogenous and all other

²¹ Kamchatka Krai in 2005 is the only outlier in the sample according to the Cook's D value. Removing it does not change the results.

covariates as exogenous²². Robust standard errors are estimated to correct for heteroskedasticity (Roodman, 2009)²³.

Table 8 Descriptive statistics

Variable	Obs.	Mean	Std.dev.	Min	Max	Source
FDI flows	1159	9.18	2.50	0.10	16.38	Rosstat (2012)
Orange regions	1722	0.04	0.19	0	1	Author's calculations
Yellow regions	1722	0.10	0.30	0	1	Author's calculations
GRP per capita	1292	7.69	0.81	5.35	10.66	Rosstat (2012)
GRP growth	1209	2.85	1.31	-4.46	5.26	Rosstat (2012)
Population	1712	7.16	0.85	3.89	9.35	Rosstat (2012)
Trade	1116	6.49	1.79	0.10	12.37	Rosstat (2012)
Rating of natural resources potential	1230	41.50	23.68	1.00	82.00	Rating agency Expert (2012)
Rating of investment risk	1230	41.50	23.68	1.00	82.00	Rating agency Expert (2012)
Length of governor's stay in power	1312	6.26	4.39	1.00	20.00	Authors' calculations
Public officials per capita	1299	0.01	0.01	0.004	0.06	Rosstat (2012)
SEZ	1312	0.07	0.26	0.00	1.00	Author's calculations
Spatial lag	1312	43.26	22.82	0.00	111.00	Author's calculations
Nominal wage per capita	1710	5.16	0.99	2.42	7.91	Rosstat (2012)
Employed with secondary education	1185	21.05	5.68	7.30	51.20	Rosstat (2012)

DID estimation identifies a causal effect if and only if the parallel trends assumption holds. That is, the average outcomes for treatment and control groups should follow a parallel trend over time. Only then one can use the observable difference in outcomes for the control group as the counterfactual for the treatment group. In the absence of a proper test for the parallel trend assumption, region-specific time trends are included on the right hand-side for some models to check if the coefficients change (Angrist and Pischke, 2008: 238).

²² Variance inflation factor (VIF) statistics show no concern for multicollinearity.

²³ Breusch-Pagan test shows that it is necessary to correct for heteroskedasticity.

4.4.2 Results of the difference in differences estimation

Table 9 shows the DID estimation results. For the system GMM estimator to be valid, two assumptions and diagnostic tests are important. First, for the instruments to be valid, the error term should be free from serial correlation. With first differencing in the system GMM, in order for the moment conditions to be valid, the differenced errors should be serially correlated at order one, but not at any higher order. Hence, the AR(1) and AR(2) tests in first differenced residuals are important. Second, an assumption underlying the validity of the system GMM estimates is that the instruments are exogenous. The Sargen/ Hansen overidentification restriction tests allow testing the joint null hypothesis that the instruments are valid and uncorrelated with the error term, and that the excluded instruments are correctly excluded. Results for both tests in table 9 suggest that serial correlation and instrument exogeneity are reassuring.

The first two columns in table 9 report the estimates of the sample with all Russian regions for which data are available, with varying number of control variables. The coefficients of both OrangeCut and YellowCut are positive, though only the former ones are statistically significant at the conventional level. Thus, preliminary evidence suggests that tax concessions for investment profit increase FDI inflows, but that tax concessions for profits from only important investment projects do not.

Table 9 Difference in differences estimation based on GMM model

Variables	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI
OrangeCut	0.68* (0.39)	0.76* (0.39)	0.66 (0.42)	0.72* (0.42)	1.18* (0.71)	1.20* (0.71)
YellowCut	0.40 (0.33)	0.45 (0.32)	0.21 (0.35)	0.28 (0.35)	0.84 (0.67)	0.86 (0.68)
Lagged FDI	0.09 (0.06)	0.09 (0.06)	0.08 (0.06)	0.08 (0.06)	-0.06 (0.07)	-0.06 (0.07)
GRP per capita	-0.22 (0.88)	-0.26 (0.86)	0.21 (1.11)	0.32 (1.11)	1.92 (1.90)	2.11 (1.99)
Population	6.09 (9.57)	5.42 (9.56)	4.93 (11.24)	3.07 (10.83)	89.49 (62.58)	89.83 (61.95)
Trade	-0.64** (0.25)	-0.63** (0.25)	-0.65** (0.28)	-0.66** (0.28)	-0.51 (0.35)	-0.52 (0.35)
GRP Growth	0.02 (0.11)	0.01 (0.11)	0.02 (0.12)	0.02 (0.12)	0.12 (0.15)	0.12 (0.15)

Table 9 (cont.)

Variables	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI
Rating of natural resources	0.03 (0.05)	0.02 (0.05)	0.03 (0.05)	0.03 (0.05)	0.06 (0.05)	0.06 (0.05)
Public officials per capita	307.10** (134.40)	307.43** (134.69)	349.16** (170.37)	347.09** (169.36)	337.22 (347.89)	321.63 (334.63)
SEZ	-0.02 (0.41)	0.03 (0.42)	0.03 (0.45)	0.07 (0.46)	0.34 (0.54)	0.34 (0.54)
Rating of investment risk	-0.01** (0.01)	-0.01*** (0.01)	-0.01** (0.01)	-0.01** (0.01)	-0.02** (0.01)	-0.02** (0.01)
Spatial lag	-0.00 (0.02)	-0.00 (0.02)	0.01 (0.02)	0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)
Length of governor's stay in power	0.04 (0.03)	0.04 (0.03)	0.03 (0.03)	0.04 (0.03)	-0.00 (0.04)	-0.00 (0.04)
Nominal wage per capita		0.01 (0.03)		0.02 (0.03)		0.02 (0.03)
Employed with secondary education		0.00 (0.02)		-0.01 (0.02)		-0.01 (0.02)
Arellano-Bond test for AR(1)	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**
Arellano-Bond test for AR(2)	0.17	0.16	0.19	0.21	0.5	0.61
Sargan-Hansen test -- χ^2	53.97	47.31	31.75	29.85	11.60	5.67
Dropping regions	no	no	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Region-specific Time Trends	no	no	no	no	yes	yes
Observations	458	458	378	378	378	378
Number of id	69	69	56	56	56	56

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The χ^2 test is not statistically significant at the conventional level, showing that the models are not over-identified

Models (3) and (4) show the results with both outliers and the regions, which implemented tax concessions after 2004, dropped. Excluding these regions allows assessing that the results are neither driven by outliers nor by the regions, which fiscal policy could have been influenced by some other regions that introduced tax concessions earlier. The effect of OrangeCut and YellowCut is positive in both

models, but only the effect of OrangeCut in Model (4) is statistically significant.

Models (5) and (6) show the results when controlled for region-specific time trends. As noted, including such trends is a way to check whether the parallel-trend assumption holds. Coefficients for both OrangeCut and YellowCut are positive, but only the former ones are statistically significant.

The results allow concluding that tax concession for investment profit causes significantly more FDI inflows, but that tax concession for selective important investment projects does not. The important new finding is that not all tax concessions increase FDI inflows. These results are robust regardless of whether the sample is restricted or not and regardless of control for region-specific time trends. How large is the substantive effect of tax concession on investment profit? With the coefficient estimate of model 6 (1.2) being the most reliable estimate, tax concession for investment profit increases FDI inflows by 232 per cent. This estimate is very close to the semi-elasticity estimates in the previous empirical studies.

Only a few control variables turn out to be statistically significant in the models. This is in line with previous studies on FDI in Russia (Strasky and Pashinova, 2012). In addition, it is also consistent with the earlier discussion that the regions between treatment and control groups appear to be roughly balanced on many dimensions.

To further ensure the validity of the findings in table 9, several placebo tests are reported in Appendix E. First, in the baseline model, FDI is replaced with three variables that should be orthogonal to tax concessions: number of suicide in the female urban population, number of divorce, and number of marriage. Tax concession should have no effect on such dependent variables. If it does, it would imply that orange and yellow regions differ substantially from the other regions that did not implement tax concessions. Such social differences between treatment and control groups could affect both the level of FDI and tax concession, threatening the whole identification strategy. Therefore, it is reassuring that both the orange regions treatment and the yellow regions treatment are never statistically significant at the conventional level. Second, both treatments are replaced with two dummies that score one respectively for orange regions and yellow regions in pre-treatment periods and zeros for all the other regions and in the years 2004–2008. Such dummies are commonly referred as leads

in the econometrics literature. Again these two variables do not have a statistically significant effect.

Note that the lagged dependent variable is never statistically significant. The main models are thus recreated without lagged FDI, using Driscoll-Kraay standard errors to control for spatial correlation and first order autocorrelation (Appendix F). Results of this specification are similar to those reported in table 9.

4.5 Non-parametric identification strategy

4.5.1 Synthetic controls method

DID estimation is “based on the presumption of time-invariant (or group-invariant) omitted variables” (Angrist and Pischke, 2008: 243). For many causal questions, including the scope of this research, the idea that omitted variables are time-invariant is not always plausible. Although the specification above includes a lagged dependent variable, as well as both region and year fixed effects, conditions for consistent estimates of such models are quite demanding (Angrist and Pischke, 2008: 245). This section complements the parametric estimation with the synthetic control method—a non-parametric estimation technique, which allows building a more credible counter-factual (Abadie and Gardeazabal, 2003; Abadie, 2004). The synthetic controls method was pioneered by Abadie and Gardeazabal (2003) in a study on terrorism in the Basque Country and further developed by Abadie et al. (2010). The idea behind synthetic controls method is a simple one: a combination of control units often provides a better comparison for the treated unit than any single unit alone. In other words, a synthetic controls approach allows building a more credible counterfactual to test the effect of tax concession on FDI inflows.

The synthetic controls method works by testing whether tax concession implemented by a region i in 2003 leads to a larger inflow of FDI in the years 2004-2008 compared to the similar Russian regions that did not implement any tax concession. Because comparison units are meant to approximate the counterfactual without the treatment, it is important to restrict the donor pool to regions with outcomes that are thought to be driven by the same structural process as the treatment regions but that were not subject to structural shocks to the outcome variable during the period of study (Abadie et al., 2012). The comparison regions, which constitute the synthetic control group, are selected using an algorithm based on their similarity to the treated region i before the treatment,

both with respect to confounding factors and past level of FDI. In other words, “the synthetic control algorithm estimates the missing counterfactual as a weighted average of the outcomes of potential controls” (Billmeier and Nannicini, 2012: 12).

Key elements of the estimation are the weights of the synthetic control units. Specifically, the synthetic controls algorithm estimates the weights in a non-parametric way so that the distance (or pseudo-distance) between the vector of pre-treatment covariates of the treated region and the vector of pre-treatment covariates of the potential synthetic control is minimized²⁴. For instance, being Amur Oblast the treated region i , the synthetic controls algorithm detects the closest regions to Amur Oblast according to a large number of characteristics captured by the control variables among all regions, which do not implement any tax concessions, i.e., green regions. One can then compare whether the increase in FDI for Amur Oblast is large compared to the increase in FDI for regions chosen as synthetic control units. This procedure then repeats for all the treated regions in the sample, i.e., for both orange and yellow groups.

To build the synthetic controls group, all control variables, described in the parametric estimation, are approximated in the pre-treatment period. A further covariate *privatization* is included²⁵, which captures the number of companies privatized in each region i in year t . Although privatization reforms are decided by the federal government, one should make sure that FDI inflows does not increase due to other institutional reforms. Importantly, the lagged dependent variable is also included in the pre-treatment period. Doing so allows isolating any anticipatory effects, i.e., those control variables that change in anticipation of future tax concessions before such tax concessions are actually implemented. All predictor variables are averaged over the entire pre-treatment period, from 1995 to 2002.

Moreover, following Billmeier and Nannicini (2012), two types of experiment are implemented. Type-A experiment restricts the choice of

²⁴ Following Abadie, Diamond, and Hainmueller (2010) and Billmeier and Nannicini (2012), a constrained quadratic programming routine is used, which finds the best fitting W-weights conditional on the regression based V-matrix. The model relies on a fully nested optimization procedure that searches among all (diagonal) positive semi-definite Vmatrices and sets of W-weights for the best fitting convex combination of the control units.

²⁵ It is impossible to include this covariate in the DID estimator, since the number of observations would drop substantially.

synthetic control units to those regions that are in the same economic zone of the treated unit²⁶. The intuition here is to adjust the control unit by intentionally pooling the regions with similar characteristics in such a way that the pre-treatment variation in the outcome would be minimal between the treated and control units. The idea behind the type-A experiment is that “researchers trying to minimize biases caused by interpolating across regions with very different characteristics may restrict the donor pool to regions with similar characteristics to the region exposed to the event or intervention of interest” (Abadie et al., 2010).

Type-B experiment uses all the regions in the green group. There is a clear trade-off between these two types of experiments. The former experiment minimizes the possibility of comparing the treated units with heterogeneous regions, since many confounding factors are likely to cluster geographically. The latter experiment increases the sample size and the power of the test. Appendix G lists the regions included in the control group for each treated unit for both type-A and type-B experiments.

The synthetic controls approach has three main advantages over DID estimation. The first advantage is its transparency since the regions that end up in the counterfactual, as well as their weights, can be easily identified. The second advantage is flexibility since the control group can be appropriately restricted to those regions that are most similar to the treatment unit, making the comparison more meaningful than in parametric estimation. Third, “while panel models only control for confounding factors that are time invariant (fixed effect) or share a common trend (difference in differences), the model specified above allows the effect of unobservable confounding factors to vary with time” (Billmeier and Nannicini, 2012: 13).

The synthetic controls method does not come without shortcoming. As Billmeier and Nannicini (2012: 13) note, the synthetic controls method would still suffer from reverse causation if the timing of tax concessions were decided by expectations on future increase in FDI. Although such a possibility exists, the qualitative evidence suggests that the timing of the tax reform in 2002–2003 can be considered completely exogenous to the level of FDI inflows in Russian regions.

²⁶ The Russian regions are clustered geographically into 12 economic zones. The regions within each economic zone were explored at the same time, hence they shared common history; they also often have similar climate, transport infrastructure, and industrial mix.

What cannot be considered exogenous is the decision of regions to use such a reform to grant tax concession.

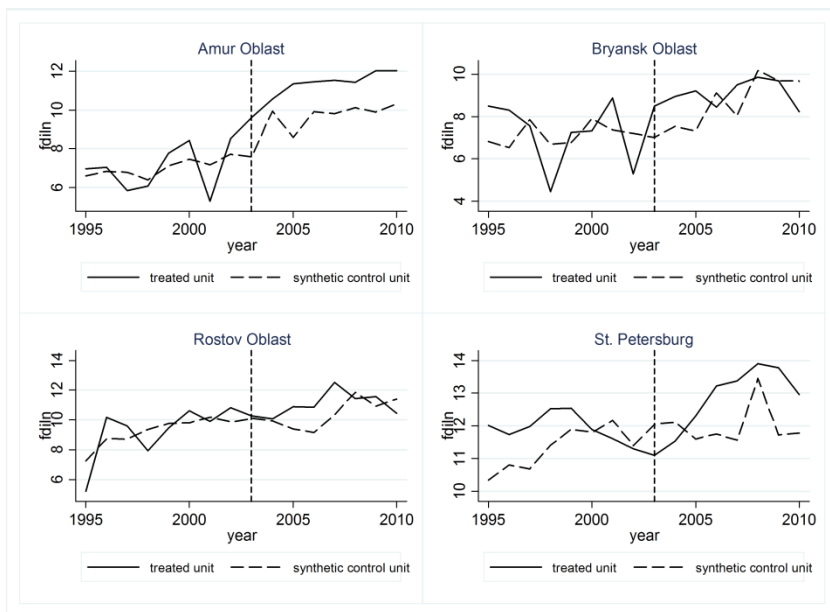
4.5.2 Results of the synthetic controls method

The results are presented graphically for both type-A and type-B experiments, primarily for orange regions. Figures 6–8 represent graphically the time series of the dependent variable, log of FDI, for the treated unit (solid line) and for the synthetic control unit (dashed line), both in the entire pre-treatment period, i.e. 1995–2002, and in the post-treatment period, i.e. 2003–2008.

Appendix H compares the results from type-A and type-B experiments for each treated region with the constructed synthetic control. Figure 6 shows that five orange regions face a substantial increase of FDI inflows after tax concession: Amur Oblast, Bryansk Oblast, Rostov Oblast, Udmurt Republic, and Saint Petersburg. Note that for two regions, Kabardino-Balkar Republic and Republic of Kalmykia, FDI data are not available. In sum, for five out of seven regions tax concessions lead to a noteworthy increase of FDI inflows between 2003 and 2008.

Figure 6 shows several informative features. Saint Petersburg and Udmurt Republic had a lower level of FDI compared to their control groups in the pre-treatment period, whereas both orange regions caught up first and then outperformed their control groups in term of FDI inflows during the tax concession period. Conversely, Amur Oblast, Bryansk Oblast and Rostov Oblast had higher level of FDI compared to their control group in 2003, though the gap was minimal, and they further increased the gap as a result of tax concessions. However, Rostov Oblast faced a steady decline of FDI post 2007. Moreover, for Amur Oblast and Bryansk Oblast there is evidence of an important anticipatory effect already in 2002. Finally, while the evidence of an increase of FDI is weak for Chuvash Republic and Perm Krai, their FDI increased in 2007 and 2008 and remained higher than in their control groups.

Figure 6 Orange regions that attracted more FDI after tax concession



There are a couple of further considerations worth making. First, all the covariates are quite balanced between the treated unit and the control group. This is quite evident also from the figures, in which the level of FDI is very similar between treated and control units in the pre-treatment period. Second, the root mean square prediction error (RMSPE) is quite low for all seven regions, confirming that the overall fit of the models is good. All in all, the synthetic controls analysis seems to confirm the results of the DID estimation: tax concession leads to more FDI in the orange regions over time.

Figure 7 Orange regions that did not attract more FDI after tax concession

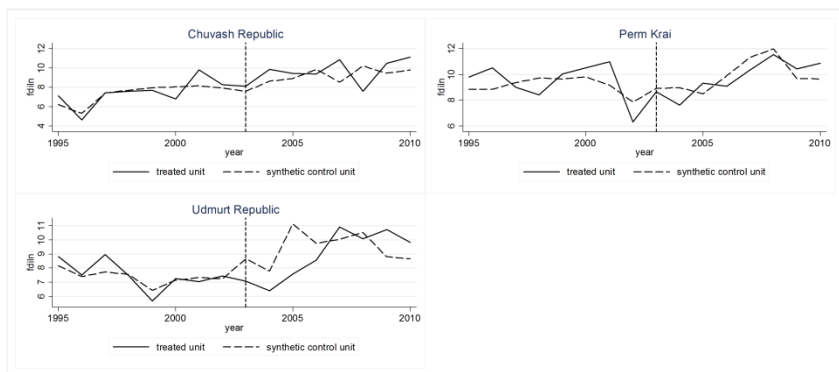
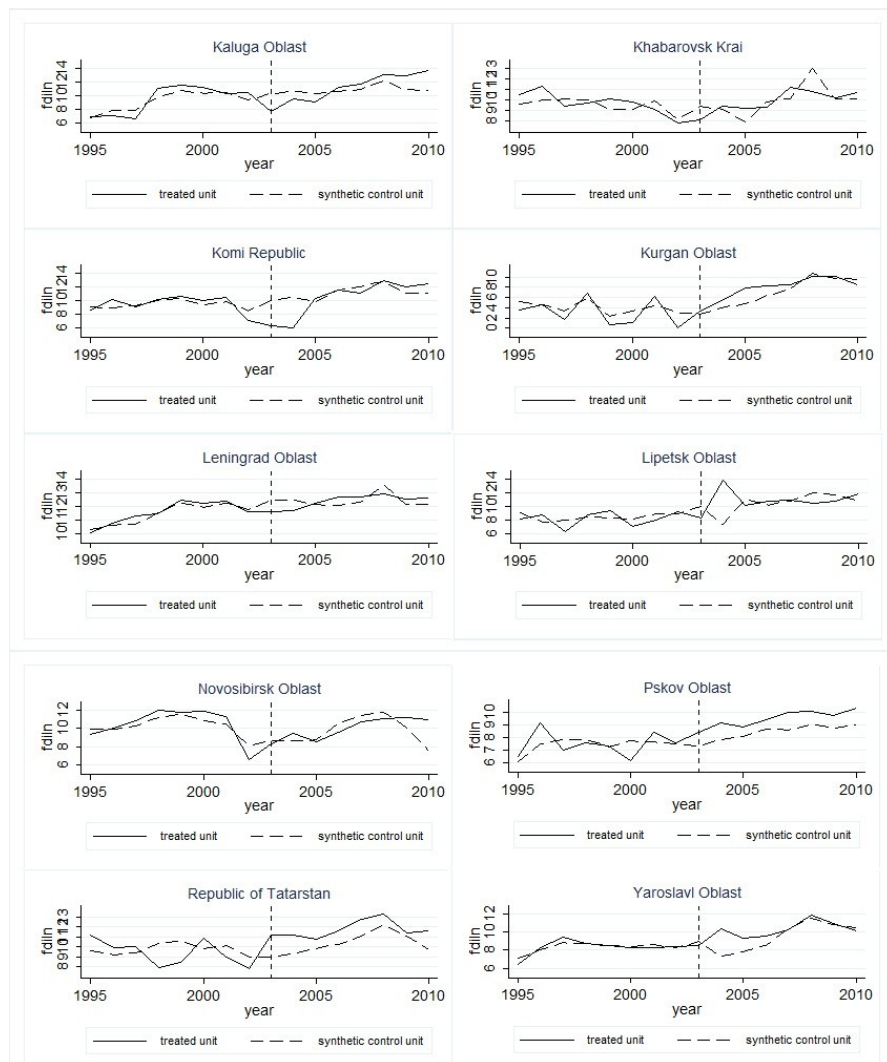


Figure 8 shows ten yellow regions that experience a rise in FDI inflows after tax concession: Kaluga Oblast, Khabarovsk Krai, Komi Republic, Kurgan Oblast, Leningrad Oblast, Novosibirsk Oblast, Lipetsk Oblast, Pskov Oblast, Republic of Tatarstan, and Yaroslavl Oblast. However, such a positive effect of tax concessions on FDI is not always confirmed by both type-A and type-B experiments. For other 15 regions, there is no evidence that tax concessions for “important investment projects” have had any effect on FDI. Note that yellow regions tend to have lower level of FDI compared to their control group in the pre-treatment period, though the gap is quite small. Thus, these regions might have used tax concession to catch up with the other Russian regions.

All covariates are quite balanced between the treated units and the control groups and the RMSPE is quite low. All in all, the synthetic controls analysis seems to confirm again the result of the DID estimation: tax concession for “important investment projects” has only weak impact on FDI in the yellow regions.

Figure 8 Yellow regions that attracted more FDI after tax concession



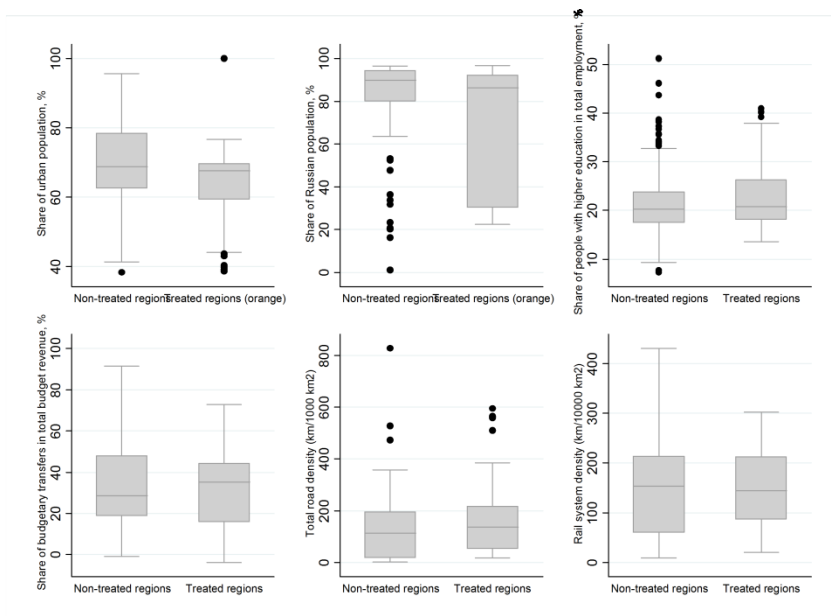
4.5.3 Main findings

Given the large number of case studies included in the synthetic control analysis, it is worth to further discuss the main findings. In particular, it is necessary to highlight some common characteristics of those regions that successfully increased FDI inflows after having implemented tax

concessions. Appendix I summarizes the results for the two groups of regions and report relevant variables, which might have an impact on FDI in combination with tax concession. For a given variable x the symbol “†” implies that a region i lays above the mean for that specific variable.

Some variables stand out as clear intervening factors in attracting FDI. Before discussing such factors, figures 9 and 10 show the box plots of each variable for treated units and for the control group. The distributions of treated and control units are generally balanced. That is crucial for the whole identification strategy, since it mitigates the concerns about confounding factors explaining both why FDI inflows increase and why regions decide to implement tax concession. In other words, regions, which cut tax rates, are “as good as randomly assigned” once conditioned on control variables.

Figure 9 Balance of confounding factors for orange regions

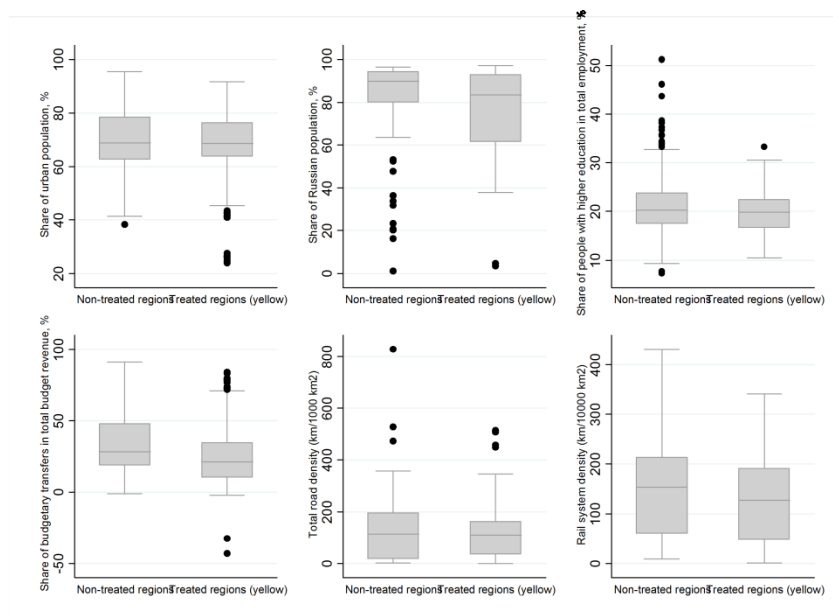


Note: t-tests show that differences in mean are not statistically different from zero

First, having good transport infrastructure and a high percentage of urban population seems to be an important intervening factor in attracting FDI inflows for both orange and yellow regions. This is

hardly surprising. Both high level of urbanization and an extensive transport network reduce transport costs and, generally, simplify market expansion (Ledyaeva, 2007; Kayam et al., 2007; Iwasaki and Suganuma, 2005; Broadman and Recanatini, 2001). For instance, the regions, which territory lies wholly or partially behind the Arctic Circle (e.g. Republic of Karelia, Komi Republic, Yakutia Republic, and Yamalo-Nenets Autonomous Okrug), face the lack of proper transport infrastructure, as building of either paved roads or railways is extremely difficult in the conditions of permafrost and ground ice. Moreover, any air connections in these regions interrupt during the winter months. Even though these regions are main producers in mining industry, especially in oil and gas extraction, the natural resources endowment, apparently, could not be the only factor to attract foreign investment in there in the absence of appropriate transport infrastructure.

Figure 10 Balance of confounding factors for yellow regions



Note: t-tests show that differences in means are not statistically different from zero

Secondly, virtually every region that increased FDI after tax concession has a relatively high share of Russian population. As Broadman and Recanatini (2001) point out, the ethnic composition of population might

be a proxy for social (in)stability. The higher the ethnic diversity in a region is, the higher the possibility of social conflicts and violence, which might discourage foreign investors.

Thirdly, natural resources do not appear to matter in attracting FDI for those regions that implemented tax concessions. Indeed, virtually all of the orange and yellow regions, which increase FDI inflows after tax concession, have a share of mining industry below mean. This finding is in line with the previous studies: Russian FDI inflows are attracted mainly by the manufacturing sector and not by natural resources endowment (Vinhas de Souza, 2008; Bradshaw, 1997; Asiedu and Lien, 2011; Strasky and Pashinova, 2012).

Finally, there is weak evidence that the regions, which increase FDI after tax concession, are geographically clustered. This is surely not the case for successful orange regions, which are not in the same economic zone. Successful yellow regions are also spread-out across the whole country, though Northern and Western regions seem to perform better than Southern and Eastern ones. All in all, there is little evidence that FDI are geographically clustered in Russia, a result consistent with the finding in the parametric estimation as well.

4.6 Conclusion

This study applies the causal inference approach to answer the question of whether tax concession increases FDI. Even though there is a huge body of empirical literature on tax policy and FDI, their findings have several caveats. This research addresses those weaknesses by taking advantage of the exogenously (federally) imposed fiscal policy shock in Russian regions after 2002, treating it as a natural experiment and estimating the causal effect of tax concession on FDI inflows with two causal inference techniques: difference in differences estimation and synthetic controls method. It further allows investigating the effects of two different types of tax concessions: one for investment profit and the other for profit from important investment projects.

The findings of this study are interesting and illuminating. First, using the new causal-inference oriented techniques, the finding of previous studies is confirmed: tax concession for investment profit leads to more FDI inflows. The estimated size of effect is also consistent with the most common estimate in the empirical literature. Second finding is that not all tax concessions increase FDI inflows. Selective tax concession on

government sanctioned important investment projects does not have the expected effect, or the effect is sporadic and weak at best.

These findings have important implications. Governments that use fiscal incentives to attract foreign capital should be aware that policy design matters. Consistent tax concession policies are also transparent and stable and thus likely to be effective, making the tax concession worth the investor's while. On the other hand, when government picks and chooses winners, it likely introduces more ambiguity, uncertainty, and rent-seeking behaviour. When government cuts tax selectively, investors may not respond to such often idiosyncratic benefits with systematic enthusiasm and investments.

One popular view in the fiscal decentralization literature is that decentralization empowers sub-national units, increases efficiency in allocation of resources, and leads to more investment and faster economic performance. The findings of this study spell a cautionary tale, offering a conditional view instead. Whether fiscal autonomy leads to more attractiveness for international market actors should depend on the type of policy the sub-national government adopts.

Appendices

Appendix A.

Table A1. Concepts, questions, and definitions in indicators of governance quality

Governance feature	Worldwide Governance Indicators (WGI)	Global Competitiveness Report (GCS)	Economist Intelligence Unit's Risk Briefing assessments (EIU)
Definition of governance	Traditions and institutions by which authority in a country is exercised	Legal and administrative framework within which individuals, firms, and governments interact to generate wealth	-
Government effectiveness	The quality of public services, the capacity of the civil service and its independence from political pressures; the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	<ul style="list-style-type: none"> - Wastefulness of government spending - Burden of government regulation - Efficiency of legal framework in settling disputes - Efficiency of legal framework in challenging regulations - Transparency of government policymaking 	<ul style="list-style-type: none"> - Is the government likely to espouse and implement open, liberal and pro-business policies for nationals and foreigners? - What is the quality of the bureaucracy in terms of overall competency/ training; morale/ dedication; and compensation/ status? -How pervasive is red tape? - How pervasive is corruption among public officials? - How accountable are public officials? - Is there a risk that this country could be accused of serious human rights abuses?
Control of corruption	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	<ul style="list-style-type: none"> - Diversion of public funds - Public trust of politicians - Irregular payments and bribes 	-

Table A1. Concepts, questions, and definitions in indicators of governance quality(cont.)

Governance feature	Worldwide Governance Indicators (WGI)	Global Competitiveness Report (GCS)	Economist Intelligence Unit's Risk Briefing assessments (EIU)
Regulatory quality	The ability of the government to provide sound policies and regulations that enable and promote private sector development	-	<ul style="list-style-type: none"> - Is the tax regime clear and predictable? - What is the risk that corporations will face discriminatory taxes? - Is the corporate tax rate low? - What is the risk from retroactive taxation? - What is the risk that the country will be subject to a trade embargo sponsored either by a major international organization, a significant trading partner, or one or more of the G8 countries? - What is the risk of discriminatory tariffs? - What is the risk of excessive protection (tariff and non-tariff) in the next two years?

Source:

Kaufmann, D., Kraay, A., and Mastruzzi, M. (2010). *The Worldwide Governance Indicators: Methodology and Analytical Issues*. World Bank Policy Research Working Paper 5430.

Table A2: Concepts, questions, and definitions in indicators of quality of democracy

Governance feature	Worldwide Governance Indicators (WGI)	Global Competitiveness Report (GCS)	Economist Intelligence Unit's Risk Briefing assessments (EIU)
Voice and accountability	The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	-	-
Rule of law	The extent to which agents have confidence in and abide by the rules of society, including the quality of contract enforcement and property rights, the police, and the courts, as well as the likelihood of crime and violence	<ul style="list-style-type: none"> - Property rights - Intellectual property protection - Judicial independence - Favoritism in decisions of government officials 	<ul style="list-style-type: none"> - How vulnerable is the legal process to interference or distortion to serve particular interests? - What is the risk that contract rights will not be enforced? - To what extent is the judicial process speedy and efficient? - To what extent do the authorities favour domestic interests over foreign companies in legal matters? - What is government policy on actively promoting competition and curbing unfair business practices? - To what degree are private property rights guaranteed and protected? - What is the risk that business financial statements are inconsistent or misleading? - Are price controls in place, and what is the risk that these would be extended in times of economic stress?

Table A2: Concepts, questions, and definitions in indicators of quality of democracy (cont.)

Political stability and absence of violence	The likelihood that the government will be destabilized by unconstitutional or violent means, including terrorism	<ul style="list-style-type: none"> - Business costs of terrorism - Business costs of crime and violence - Organized crime - Reliability of police services 	<ul style="list-style-type: none"> - What is the risk of significant social unrest during the next two years? - How clear, established, and accepted are constitutional mechanisms for the orderly transfer of power from one government to another? - Is there a risk that international disputes/ tensions will negatively affect the economy and/ or polity?
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Source:

Kaufmann, D., Kraay, A., and Mastruzzi, M. (2010). *The Worldwide Governance Indicators: Methodology and Analytical Issues*. World Bank Policy Research Working Paper 5430.

Appendix C. Sub-dimensions of the KOF Index of Globalization

Indices	Weights in total
A. Economic Globalization	36%
i) Actual Flows	50%
Trade (percent of GDP)*	21%
Foreign Direct Investment, stocks (percent of GDP)*	28%
Portfolio Investment (percent of GDP)*	24%
Income Payments to Foreign Nationals (percent of GDP)*	27%
ii) Restrictions	50%
Hidden Import Barriers	24%
Mean Tariff Rate	27%
Taxes on International Trade (percent of current revenue)	26%
Capital Account Restrictions	23%
B. Social Globalization	37%
i) Data on Personal Contact	34%
Telephone Traffic*	25%
Transfers (percent of GDP)*	3%
International Tourism*	26%
Foreign Population (percent of total population)	21%
International letters (per capita)	24%
ii) Data on Information Flows	35%
Internet Users (per 1000 people)*	33%
Television (per 1000 people)	36%
Trade in Newspapers (percent of GDP)	31%
iii) Data on Cultural Proximity	31%
Number of McDonald's Restaurants (per capita)	45%
Number of Ikea (per capita)	45%
Trade in books (percent of GDP)	10%
C. Political Globalization	26%
Embassies in Country*	25%
Membership in International Organizations*	28%
Participation in U.N. Security Council Missions*	22%
International Treaties	26%

Source:

Dreher, A. (2006). Does Globalization Affect Growth? Empirical Evidence from a new Index, *Applied Economics* 38(10): 1091-1110.

Dreher, A., Gaston, N., and Martens, P. (2008). *Measuring Globalization - Gauging its Consequence*, New York: Springer.

Notes:

The percentage indicates the weight used to derive the indexes of political, economic, and social globalization.

*: These variables have been used in the AT.Kearney/ Foreign Policy Index as well.

Appendix E. Placebo Tests

Variables	(7) Suicide	(8) Divorce	(9) Marriage	(10) ln(FDI)
Orange regions	1.90 (1.31)	0.18 (0.17)	0.05 (0.16)	
Yellow regions	0.84 (1.06)	0.02 (0.13)	-0.03 (0.11)	
Orange regions (leads)				-0.68 (0.42)
Yellow regions (leads)				-0.06 (0.32)
Lagged Suicide	0.07 (0.07)			
Lagged Divorce		0.50*** (0.06)		
Lagged Marriage			0.00 (0.06)	
Lagged ln(FDI)				0.19*** (0.06)
ln(GRP per capita)	1.99 (2.71)	-0.48* (0.26)	0.55* (0.31)	0.03 (0.28)
ln(Population)	6.95 (20.32)	7.16** (2.95)	1.85 (1.88)	6.79 (6.57)
ln(Trade)	0.25 (0.45)	-0.21*** (0.05)	-0.01 (0.04)	-0.59*** (0.18)
GRP Growth				0.10 (0.08)
Natural Resources				0.01 (0.04)
Public officials per capita				112.00 (132.34)
SEZ				-0.35 (0.54)
Rating of investment risk				-0.01*** (0.00)
Spatial lag				0.00 (0.02)
Length of governor's stay in power				0.02 (0.03)
Secondary education				0.01 (0.03)
Nominal wage per capita				0.00 (0.01)
Arellano-Bond test for AR(1)	0.00***	0.00***	0.00***	0.00***
Arellano-Bond test for AR(2)	0.56	0.13	0.04**	0.04**

Appendix E. Placebo Tests (cont.)

Variables	(7) Suicide	(8) Divorce	(9) Marriage	(10) ln(FDI)
Sargan-Hansen test	54.68	53.92	57.66	26.93
Observations	439	455	455	540
Number of id	64	65	65	56

Notes: All models include region and year fixed effects. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The χ^2 test is not statistically significant at the conventional level, showing that our models are not over-identified.

Appendix F. Regression with Driscoll-Kraay standard errors and first order autocorrelation

VARIABLES	(11) FDI	(12) FDI	(13) FDI	(14) FDI	(15) FDI	(16) FDI
Orange regions	0.49* (0.22)	0.51* (0.21)	0.46 (0.25)	0.52* (0.24)	1.19* (0.56)	1.18* (0.58)
Yellow region	0.26 (0.24)	0.26 (0.24)	0.15 (0.26)	0.19 (0.28)	0.82*** (0.19)	0.82*** (0.21)
GRP per capita	-0.53 (0.38)	-0.46 (0.40)	0.65 (0.45)	0.75 (0.46)	2.97 (1.71)	3.11* (1.59)
Population	1.53 (3.67)	0.04 (4.15)	1.22 (6.53)	-1.31 (8.40)	93.72 (50.36)	93.36 (51.04)
Trade	-0.10 (0.25)	-0.11 (0.25)	-0.05 (0.24)	-0.07 (0.24)	0.23 (0.32)	0.22 (0.32)
GRP Growth	0.13 (0.14)	0.11 (0.13)	0.09 (0.12)	0.07 (0.11)	0.07 (0.16)	0.04 (0.15)
Natural Resources	-0.01 (0.02)	-0.01 (0.02)	-0.02 (0.02)	-0.02 (0.02)	0.06 (0.05)	0.06 (0.05)
Public officials per capita	327.69*** (75.83)	339.32*** (80.12)	456.83*** (97.32)	471.82*** (100.87)	402.56** (109.80)	433.63** (125.73)
SEZ	0.28 (0.22)	0.26 (0.22)	0.11 (0.24)	0.13 (0.23)	-0.03 (0.45)	-0.05 (0.44)
Rating of investment risk	-0.01** (0.00)	-0.01** (0.00)	-0.01** (0.01)	-0.01* (0.01)	-0.02 (0.01)	-0.02 (0.01)
Spatial lag	0.05 (0.03)	0.04 (0.03)	0.06 (0.04)	0.06 (0.04)	0.03 (0.06)	0.03 (0.05)
Length of governor's stay in power	0.00 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	-0.02 (0.02)	-0.02 (0.02)
Nominal wage per capita		0.03 (0.05)		0.05 (0.06)		0.00 (0.07)
Secondary education		0.01 (0.01)		0.02 (0.01)		0.01 (0.01)
Constant	0.00 (0.00)	0.00 (0.00)	-8.89 (47.76)	5.65 (59.73)	0.00 (0.00)	0.00 (0.00)
Dropping regions	no	no	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Region-specific Time Trends	no	no	no	no	yes	yes
Observations	485	485	395	395	395	395
Number of groups	74	74	60	60	60	60

Appendix G. List of the regions used as control units for each treated region within a relevant economic zone (Experiment A) and within Russia as a whole (Experiment B)

The regions that have tax concessions for investment (orange group)

Amur Oblast

Experiment A. Synthetic control is based on: Chukotka Autonomous Okrug (0.425), Sakhalin Oblast (0.575). Other potential control units include: Kamchatka Krai, Magadan Oblast, Primorsky Krai.

Experiment B. Synthetic control is based on: Chukotka Autonomous Okrug (0.083), Kirov Oblast (0.034), Krasnoyarsk Krai (0.05), Republic of Ingushetia (0.138), Sakhalin Oblast (0.407), Zabaykalsky Krai (0.289). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Krasnodar Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast.

Bryansk Oblast

Experiment A. Synthetic control is based on: Ivanovo Oblast (0.047), Ryazan Oblast (0.953). Other potential control units include: Oryol Oblast, Tula Oblast, Tver Oblast.

Experiment B. Synthetic control is based on: Altai Krai (0.039), Chelyabinsk Oblast (0.001), Ivanovo Oblast (0.225), Kamchatka Krai (0.095), Kirov Oblast (0.046), Nizhny Novgorod Oblast (0.352), Oryol Oblast (0.059), Republic of Adygea (0.094), Republic of Ingushetia (0.085), Tula Oblast (0.004). Other potential control units include: Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Karachay-Cherkess Republic, Krasnodar Krai,

Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Omsk Oblast, Primorsky Krai, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Chuvash Republic

Experiment A. Synthetic control is based on: Kirov Oblast (0.327), Mari El Republic (0.368), Nizhny Novgorod Oblast (0.305).

Experiment B. Synthetic control is based on: Belgorod Oblast (0.23), Ivanovo Oblast (0.214), Omsk Oblast (0.056), Oryol Oblast (0.188), Republic of Adygea (0.132), Republic of Bashkortostan (0.154), Republic of Ingushetia (0.025). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Primorsky Krai, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Perm Krai

Experiment A. Synthetic control is based on: Chelyabinsk Oblast (0.706), Republic of Bashkortostan (0.294). Other potential control units include: Sverdlovsk Oblast.

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.261), Kamchatka Krai (0.128), Krasnodar Krai (0.008), Murmansk Oblast (0.311), Nizhny Novgorod Oblast (0.059), Sakhalin Oblast (0.021), Sverdlovsk Oblast (0.212). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Karachay-Cherkess Republic,

Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Rostov Oblast

Experiment A. Synthetic control is based on: Krasnodar Krai (0.641), Republic of Adygea (0.304), Republic of Ingushetia (0.055). Other potential control units include: Karachay-Cherkess Republic, Republic of North Ossetia-Alania.

Experiment B. Synthetic control is based on: Belgorod Oblast (0.056), Krasnodar Krai (0.078), Nizhny Novgorod Oblast (0.211), Oryol Oblast (0.001), Primorsky Krai (0.1), Republic of Adygea (0.204), Republic of Ingushetia (0.003), Republic of North Ossetia-Alania (0.001), Sverdlovsk Oblast (0.314), Tomsk Oblast (0.033). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Omsk Oblast, Republic of Bashkortostan, Republic of Khakassia, Ryazan Oblast, Sakhalin Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

St. Petersburg

Experiment B. Synthetic control is based on: Krasnodar Krai (0.247), Primorsky Krai (0.458), Sakhalin Oblast (0.296). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Republic of Adygea, Republic of Bashkortostan, Republic

of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Udmurt Republic

Experiment A. Synthetic control is based on: Republic of Bashkortostan (1). Other potential control units include: Chelyabinsk Oblast, Sverdlovsk Oblast.

Experiment B. Synthetic control is based on: Kirov Oblast (0.051), Mari El Republic (0.185), Murmansk Oblast (0.104), Omsk Oblast (0.451), Primorsky Krai (0.21). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

The regions that have tax concessions for important investment (yellow group)

Altai Republic

Experiment A. Synthetic control is based on: Omsk Oblast (0.518), Tomsk Oblast (0.482). Other potential control units include: Altai Krai.

Experiment B. Synthetic control is based on: Chukotka Autonomous Okrug (0.049), Magadan Oblast (0.078), Republic of Ingushetia (0.113), Republic of North Ossetia-Alania (0.76). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai,

Kursk Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Khakassia, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Astrakhan Oblast

Experiment B. Synthetic control is based on: Arkhangelsk Oblast (0.25), Krasnodar Krai (0.001), Kursk Oblast (0.001), Omsk Oblast (0.353), Republic of Ingushetia (0.021), Sakhalin Oblast (0.2), Tuva Republic (0.173). Other potential control units include: Altai Krai, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Kaluga Oblast

Experiment A. Synthetic control is based on: Oryol Oblast (0.51), Tver Oblast (0.49). Other potential control units include: Ivanovo Oblast, Ryazan Oblast, Tula Oblast.

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.213), Krasnodar Krai (0.298), Republic of Adygea (0.321), Republic of Ingushetia (0.011), Sakhalin Oblast (0.157). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula

Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Kemerovo Oblast

Experiment A. Synthetic control is based on: Altai Krai (0.112), Omsk Oblast (0.506), Tomsk Oblast (0.382).

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.4), Krasnoyarsk Krai (0.089), Republic of Bashkortostan (0.235), Republic of Khakassia (0.274), Sverdlovsk Oblast (0.002). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Khabarovsk Krai

Experiment A. Synthetic control is based on: Chukotka Autonomous Okrug (0.044), Magadan Oblast (0.499), Primorsky Krai (0.355), Sakhalin Oblast (0.101). Other potential control units include: Kamchatka Krai.

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.202), Kamchatka Krai (0.167), Oryol Oblast (0.002), Primorsky Krai (0.569), Tomsk Oblast (0.059). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania,

Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Khanty-Mansi Autonomous Okrug-Yugra

Experiment A. Synthetic control is based on: Altai Krai (0.521), Omsk Oblast (0.479). Other potential control units include: Tomsk Oblast.

Experiment B. Synthetic control is based on: Krasnoyarsk Krai (0.229), Republic of Bashkortostan (0.354), Sakhalin Oblast (0.418). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Komi Republic

Experiment A. Synthetic control is based on: Murmansk Oblast (1). Other potential control units include: Arkhangelsk Oblast.

Experiment B. Synthetic control is based on: Arkhangelsk Oblast (0.001), Chelyabinsk Oblast (0.283), Chukotka Autonomous Okrug (0.076), Irkutsk Oblast (0.001), Kamchatka Krai (0.171), Krasnodar Krai (0.001), Krasnoyarsk Krai (0.004), Republic of Bashkortostan (0.025), Sakhalin Oblast (0.435), Sverdlovsk Oblast (0.001), Zabaykalsky Krai (0.001). Other potential control units include: Altai Krai, Belgorod Oblast, Ivanovo Oblast, Karachay-Cherkess Republic, Kirov Oblast, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of Khakassia,

Republic of North Ossetia-Alania, Ryazan Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast.

Kurgan Oblast

Experiment A. Synthetic control is based on: Republic of Bashkortostan (1). Other potential control units include: Chelyabinsk Oblast, Sverdlovsk Oblast.

Experiment B. Synthetic control is based on: Kamchatka Krai (0.238), Omsk Oblast (0.131), Republic of Bashkortostan (0.054), Republic of Khakassia (0.287), Tomsk Oblast (0.001), Tuva Republic (0.289). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tula Oblast, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Leningrad Oblast

Experiment B. Synthetic control is based on: Krasnodar Krai (0.202), Nizhny Novgorod Oblast (0.02), Primorsky Krai (0.284), Sakhalin Oblast (0.393), Sverdlovsk Oblast (0.1). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Omsk Oblast, Oryol Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Lipetsk Oblast

Experiment A. Synthetic control is based on: Kursk Oblast (0.678), Voronezh Oblast (0.322). Other potential control units include: Belgorod Oblast.

Experiment B. Synthetic control is based on: Chukotka Autonomous Okrug (0.022), Irkutsk Oblast (0.45), Magadan Oblast (0.016), Omsk Oblast (0.287), Tomsk Oblast (0.225). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Novosibirsk Oblast

Experiment A. Synthetic control is based on: Altai Krai (0.914), Omsk Oblast (0.086), Other potential control units include: Tomsk Oblast.

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.379), Krasnodar Krai (0.327), Magadan Oblast (0.294). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Kursk Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Orenburg Oblast

Experiment A. Synthetic control is based on: Chelyabinsk Oblast (0.334), Republic of Bashkortostan (0.554), Sverdlovsk Oblast (0.112).

Experiment B. Synthetic control is based on: Belgorod Oblast (0.413), Chukotka Autonomous Okrug (0.019), Krasnodar Krai (0.39), Kursk Oblast (0.115), Omsk Oblast (0.014), Republic of Khakassia (0.049). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Penza Oblast

Experiment B. Synthetic control is based on: Altai Krai (0.045), Kirov Oblast (0.222), Mari El Republic (0.121), Omsk Oblast (0.267), Oryol Oblast (0.212), Tuva Republic (0.134). Other potential control units include: Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Murmansk Oblast, Nizhny Novgorod Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Pskov Oblast

Experiment B. Synthetic control is based on: Oryol Oblast (0.093), Republic of Ingushetia (0.262), Ryazan Oblast (0.001), Sakhalin Oblast (0.153), Tula Oblast (0.491). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast,

Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Sverdlovsk Oblast, Tomsk Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Republic of Dagestan

Experiment A. Synthetic control is based on: Karachay-Cherkess Republic (0.633), Krasnodar Krai (0.055), Republic of Ingushetia (0.312). Other potential control units include: Republic of Adygea, Republic of North Ossetia-Alania.

Experiment B. Synthetic control is based on: Altai Krai (0.208), Mari El Republic (0.338), Republic of Bashkortostan (0.049), Republic of Ingushetia (0.343), Republic of North Ossetia-Alania (0.061). Other potential control units include: Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Khakassia, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Republic of Karelia

Experiment A. Synthetic control is based on: Arkhangelsk Oblast (0.291), Murmansk Oblast (0.709).

Experiment B. Synthetic control is based on: Chukotka Autonomous Okrug (0.088), Irkutsk Oblast (0.021), Murmansk Oblast (0.062), Omsk Oblast (0.216), Oryol Oblast (0.301), Republic of Bashkortostan (0.125),

Sakhalin Oblast (0.188). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Nizhny Novgorod Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Republic of Mordovia

Experiment A. Synthetic control is based on: Kirov Oblast (0.494), Mari El Republic (0.038), Nizhny Novgorod Oblast (0.468).

Experiment B. Synthetic control is based on: Murmansk Oblast (0.044), Oryol Oblast (0.539), Republic of Adygea (0.145), Republic of Ingushetia (0.008), Tomsk Oblast (0.142), Tuva Republic (0.122). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Nizhny Novgorod Oblast, Omsk Oblast, Primorsky Krai, Republic of Bashkortostan, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tula Oblast, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Republic of Tatarstan

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.185), Irkutsk Oblast (0.271), Krasnodar Krai (0.189), Krasnoyarsk Krai (0.03), Magadan Oblast (0.085), Republic of Bashkortostan (0.207), Tomsk Oblast (0.032). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Kursk Oblast, Mari El Republic, Murmansk Oblast, Nizhny

Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Sakha (Yakutia) Republic

Experiment A. Synthetic control is based on: Chukotka Autonomous Okrug (0.246), Primorsky Krai (0.754). Other potential control units include: Kamchatka Krai, Magadan Oblast, Sakhalin Oblast.

Experiment B. Synthetic control is based on: Arkhangelsk Oblast (0.339), Chukotka Autonomous Okrug (0.07), Magadan Oblast (0.002), Primorsky Krai (0.365), Zabaykalsky Krai (0.223). Other potential control units include: Altai Krai, Belgorod Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast.

Stavropol Krai

Experiment A. Synthetic control is based on: Krasnodar Krai (0.845), Republic of Adygea (0.026), Republic of Ingushetia (0.13). Other potential control units include: Karachay-Cherkess Republic, Republic of North Ossetia-Alania.

Experiment B. Synthetic control is based on: Kirov Oblast (0.102), Nizhny Novgorod Oblast (0.335), Omsk Oblast (0.016), Oryol Oblast (0.222), Primorsky Krai (0.317), Ryazan Oblast (0.008). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast,

Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Tyumen Oblast

Experiment A. Synthetic control is based on: Altai Krai (0.568), Omsk Oblast (0.432). Other potential control units include: Tomsk Oblast.

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.137), Krasnoyarsk Krai (0.549), Sakhalin Oblast (0.314). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Volgograd Oblast

Experiment B. Synthetic control is based on: Chelyabinsk Oblast (0.33), Krasnodar Krai (0.064), Kursk Oblast (0.076), Omsk Oblast (0.096), Primorsky Krai (0.369), Republic of Ingushetia (0.001), Sverdlovsk Oblast (0.063). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnoyarsk Krai, Magadan Oblast, Mari El Republic, Murmansk Oblast, Nizhny Novgorod Oblast, Oryol Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Khakassia,

Republic of North Ossetia-Alania, Ryazan Oblast, Sakhalin Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Vologda Oblast

Experiment A. Synthetic control is based on: Arkhangelsk Oblast (0.298), Murmansk Oblast (0.702).

Experiment B. Synthetic control is based on: Chukotka Autonomous Okrug (0.115), Krasnoyarsk Krai (0.308), Nizhny Novgorod Oblast (0.574), Sakhalin Oblast (0.001), Tula Oblast (0.002). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Murmansk Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tomsk Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Yamalo-Nenets Autonomous Okrug

Experiment A. Synthetic control is based on: Altai Krai (0.316), Omsk Oblast (0.449), Tomsk Oblast (0.235).

Experiment B. Synthetic control is based on: Belgorod Oblast (0.281), Murmansk Oblast (0.278), Sakhalin Oblast (0.321), Tomsk Oblast (0.12). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Magadan Oblast, Mari El Republic, Nizhny Novgorod Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Adygea, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Republic of North Ossetia-Alania, Ryazan Oblast, Sverdlovsk Oblast, Tula

Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

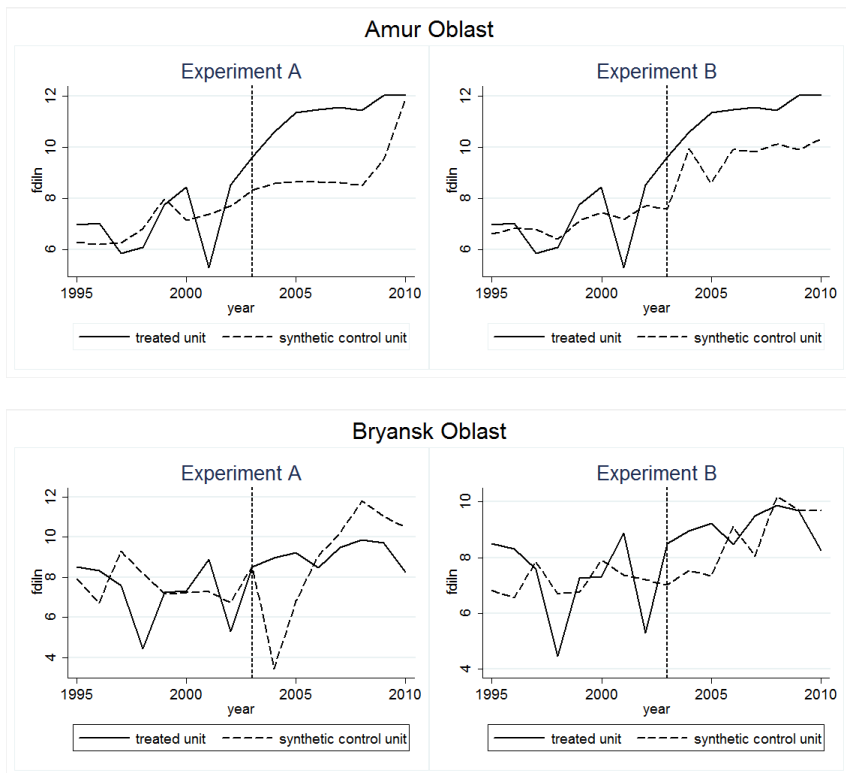
Yaroslavl Oblast

Experiment A. Synthetic control is based on: Ryazan Oblast (0.543), Tula Oblast (0.457). Other potential control units include: Ivanovo Oblast, Oryol Oblast, Tver Oblast.

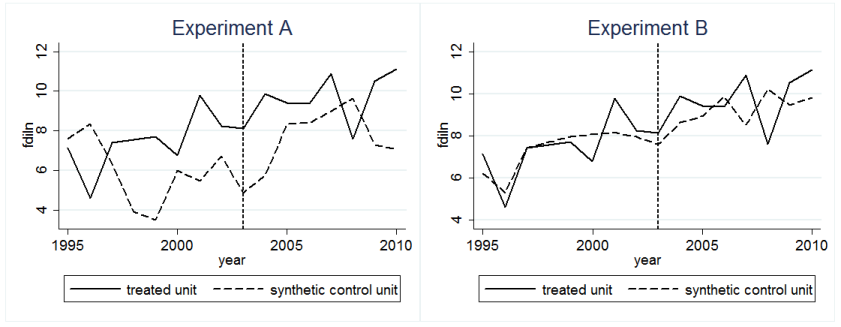
Experiment B. Synthetic control is based on: Magadan Oblast (0.045), Nizhny Novgorod Oblast (0.2), Republic of Adygea (0.146), Republic of North Ossetia-Alania (0.031), Ryazan Oblast (0.355), Sverdlovsk Oblast (0.223). Other potential control units include: Altai Krai, Arkhangelsk Oblast, Belgorod Oblast, Chelyabinsk Oblast, Chukotka Autonomous Okrug, Irkutsk Oblast, Ivanovo Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kursk Oblast, Mari El Republic, Murmansk Oblast, Omsk Oblast, Oryol Oblast, Primorsky Krai, Republic of Bashkortostan, Republic of Ingushetia, Republic of Khakassia, Sakhalin Oblast, Tomsk Oblast, Tula Oblast, Tuva Republic, Tver Oblast, Voronezh Oblast, Zabaykalsky Krai.

Appendix H. Results of the synthetic controls analysis: treated units and their synthetic controls

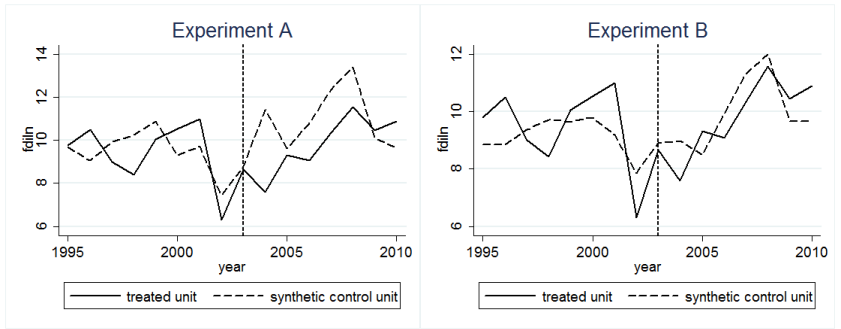
The regions that have tax concessions for investment (orange group)



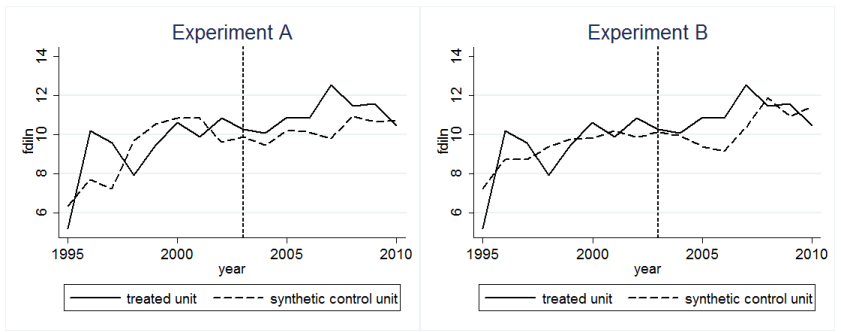
Chuvash Republic

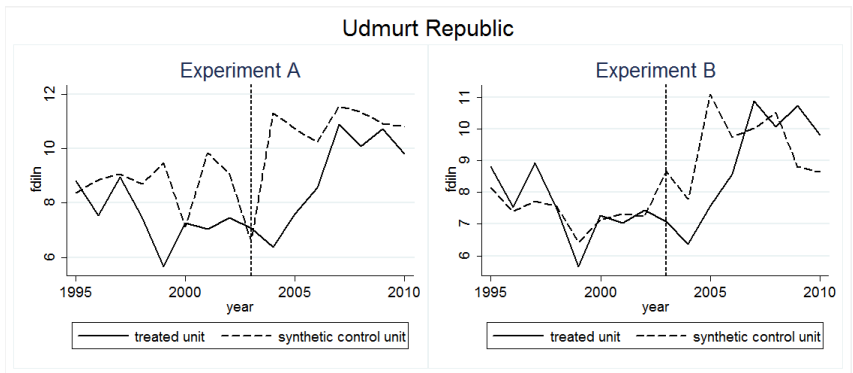
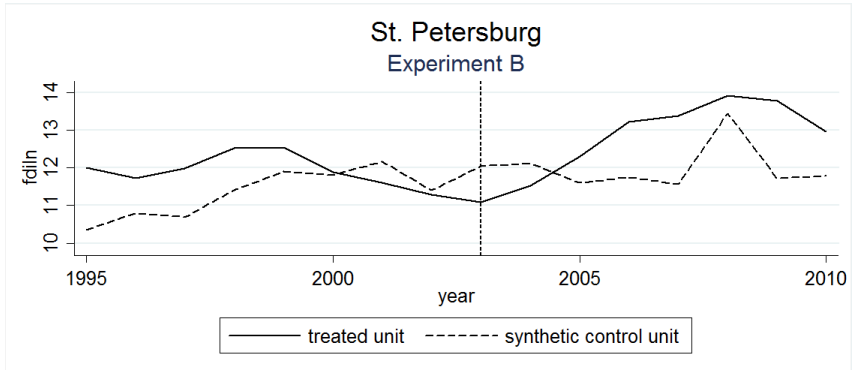


Perm Krai

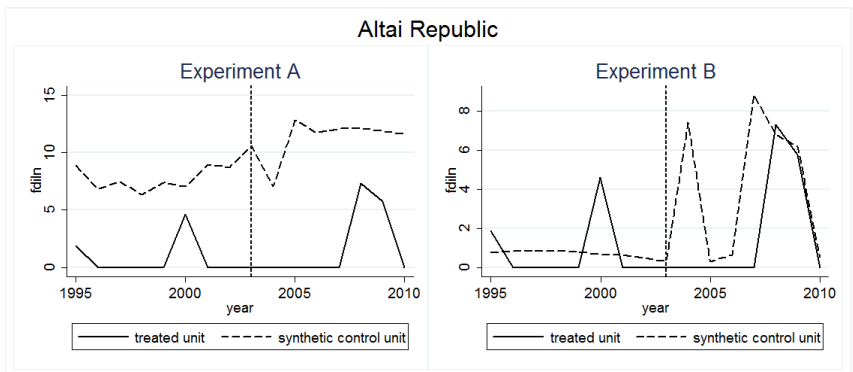


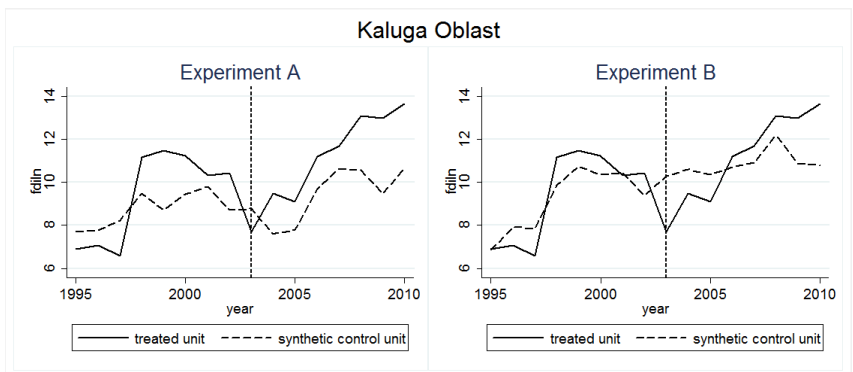
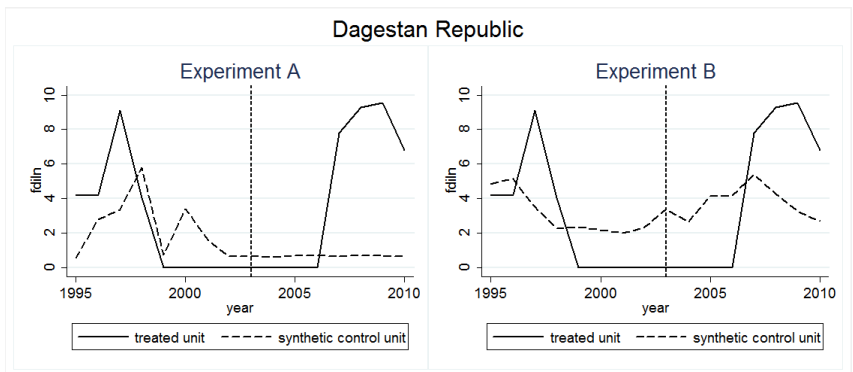
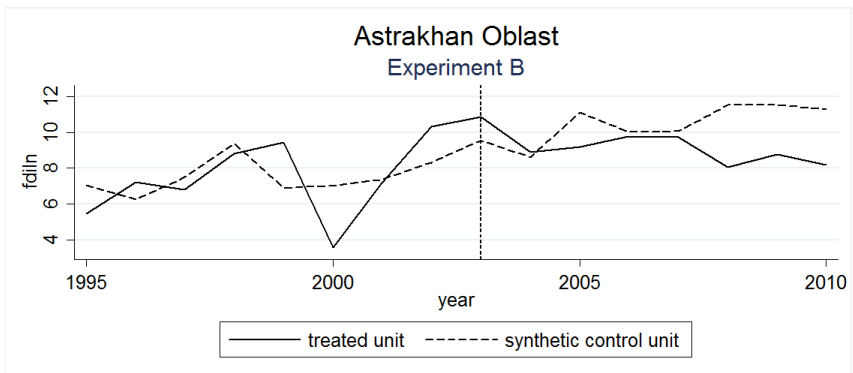
Rostov Oblast



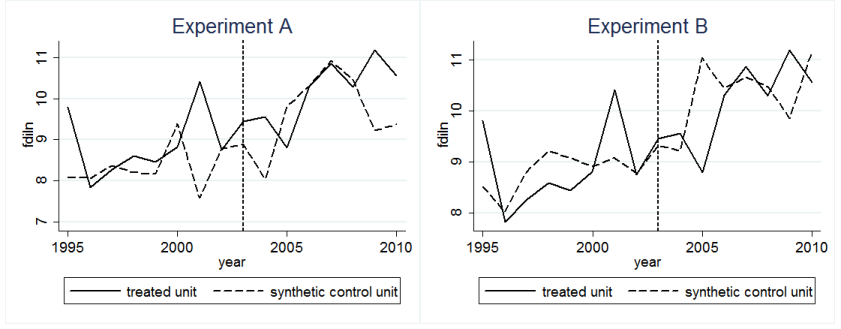


The regions that have tax concessions for important investment (yellow group)

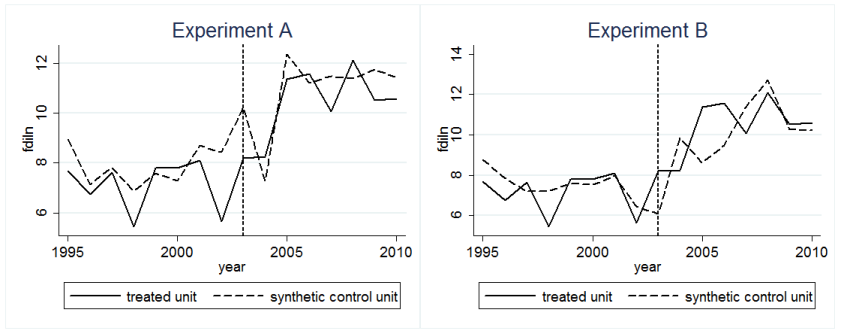




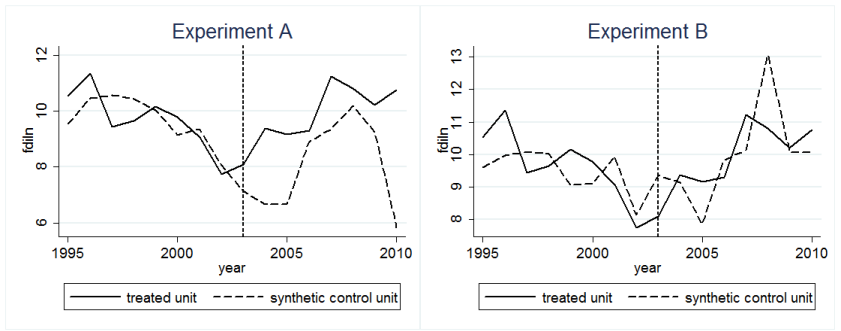
Republic of Karelia



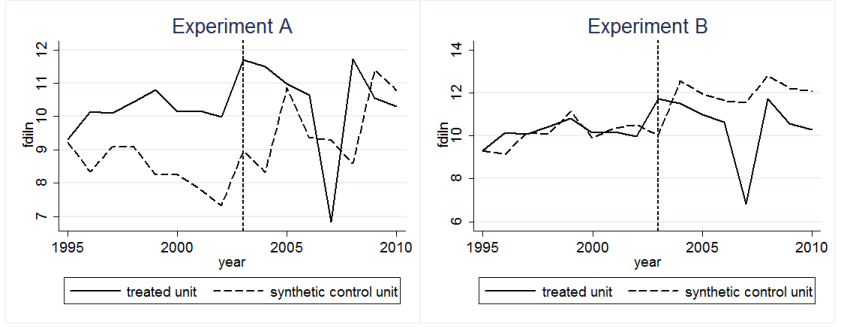
Kemerovo Oblast



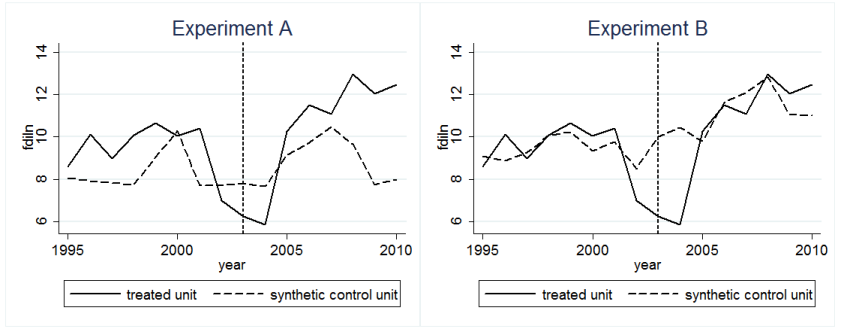
Khabarovsk Krai



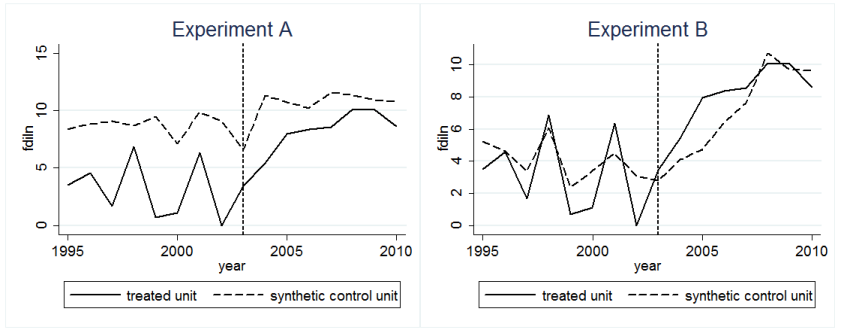
Khanty-Mansi Autonomous Okrug

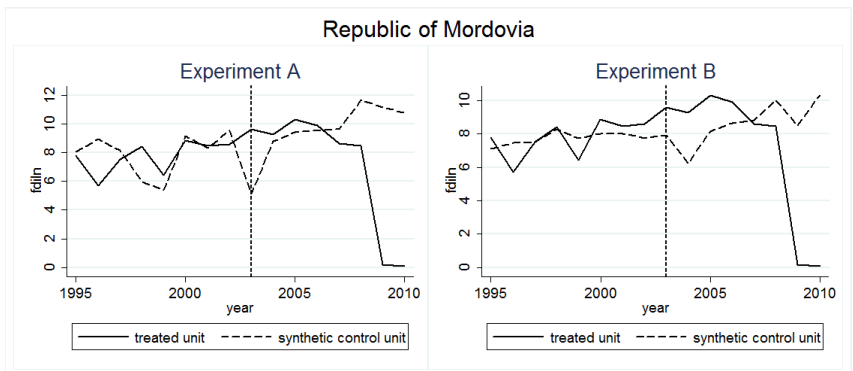
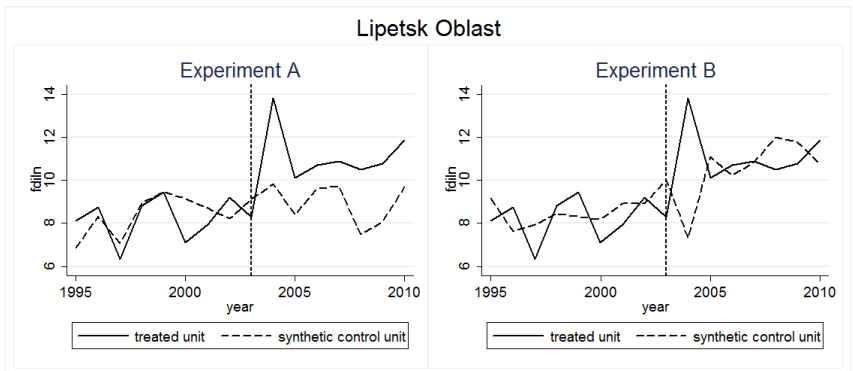
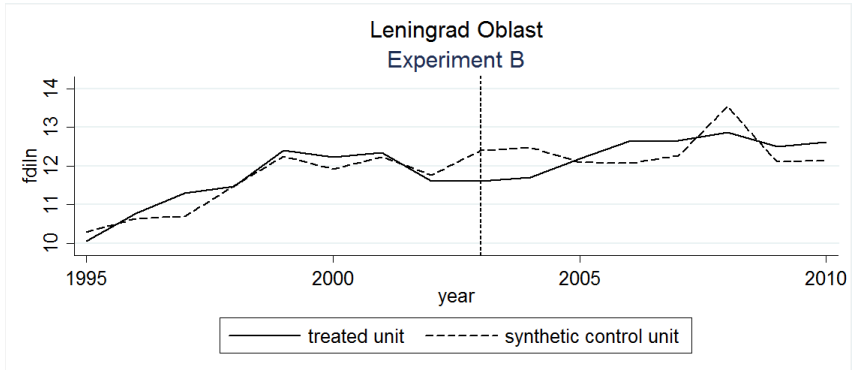


Komi Republic

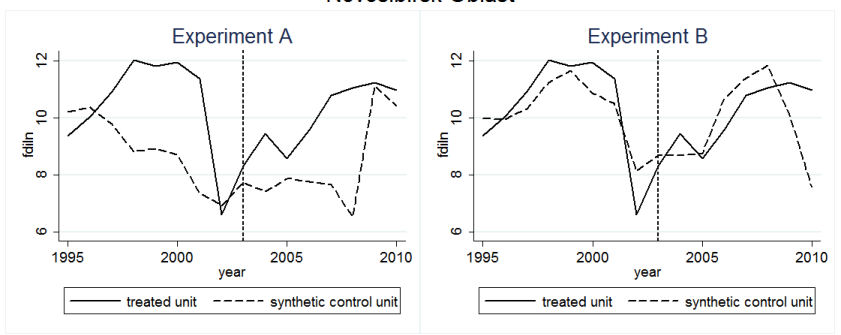


Kurgan Oblast

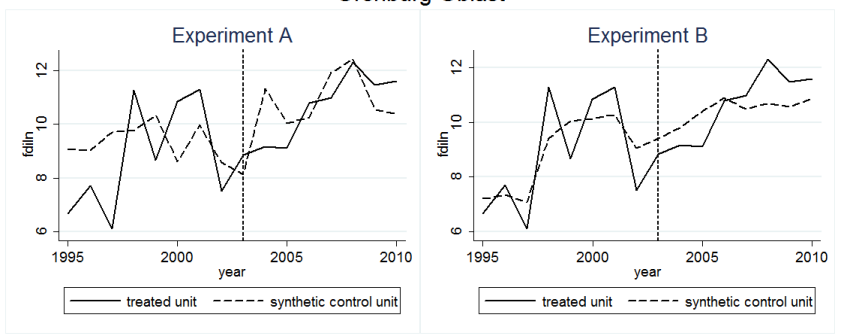




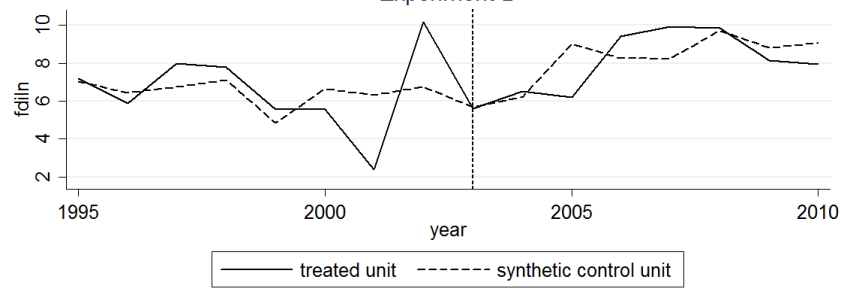
Novosibirsk Oblast

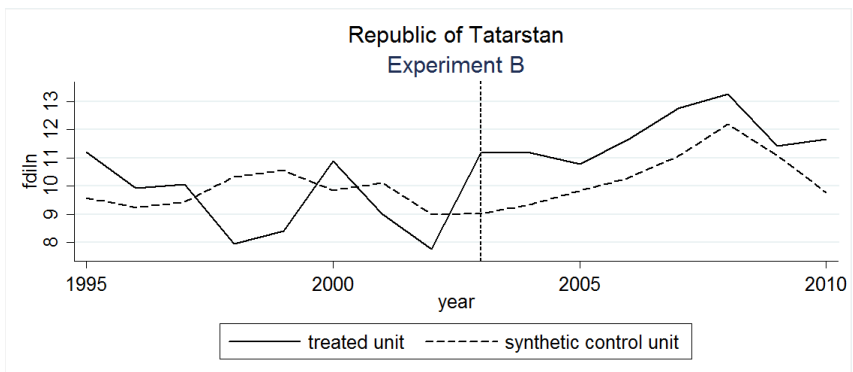
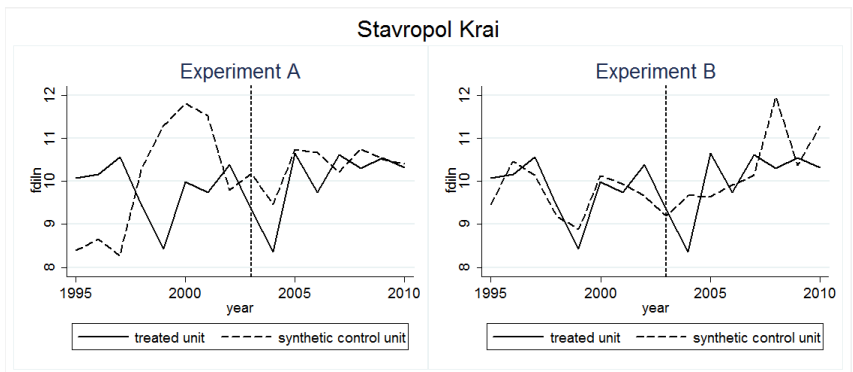
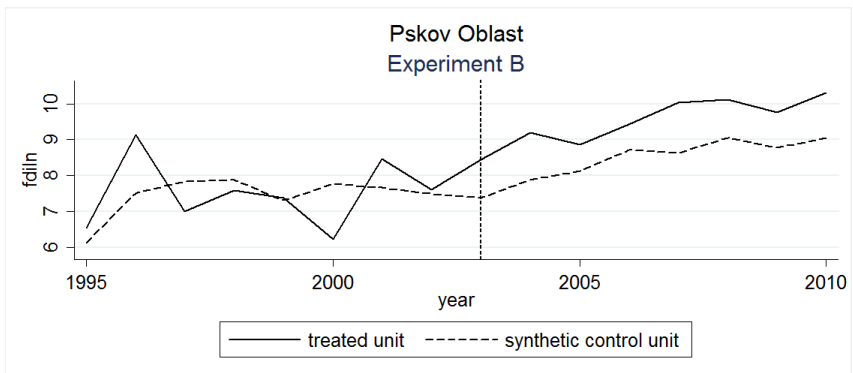


Orenburg Oblast

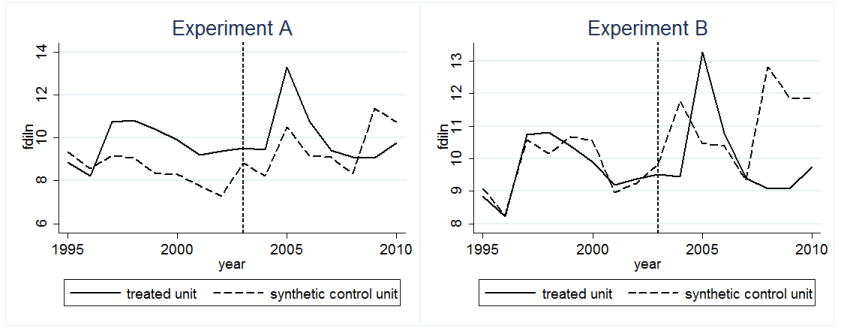


Penza Oblast Experiment B

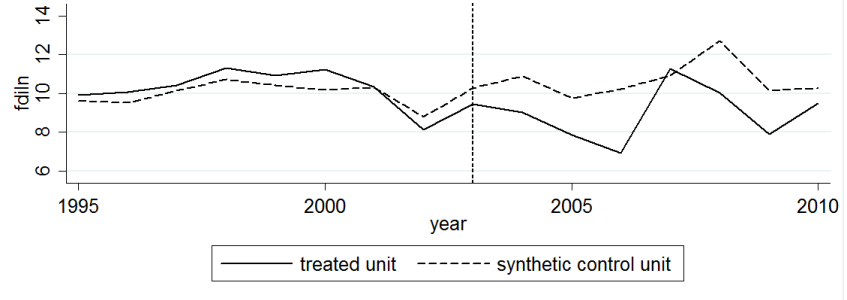




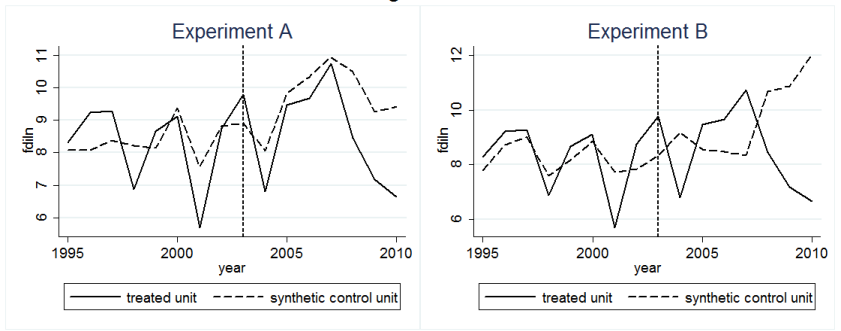
Tyumen Oblast



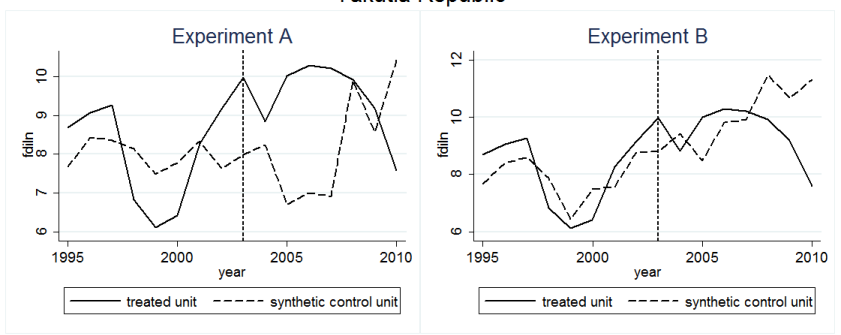
Volgograd Oblast Experiment B



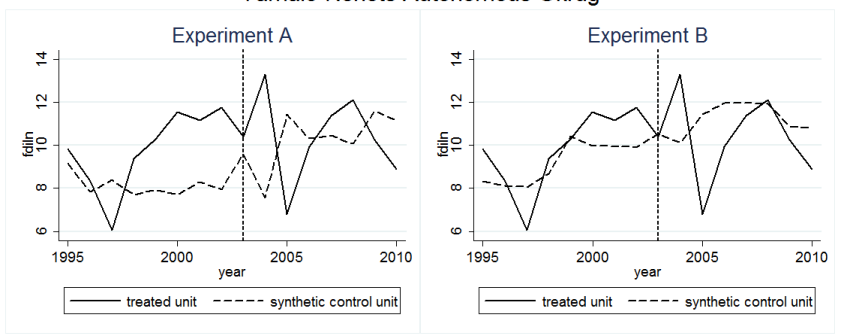
Vologda Oblast



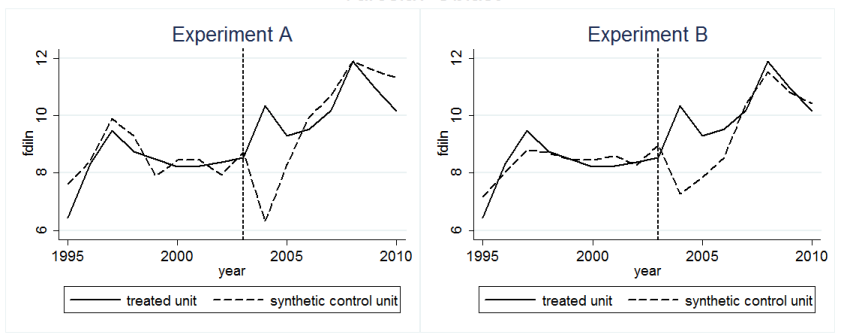
Yakutia Republic



Yamalo-Nenets Autonomous Okrug



Yaroslav Oblast



Appendix I. Regional factors that might have an impact on attractiveness for foreign investment

Region	High share of urban population	High share of Russian population	High share of employed with secondary education	Developed transport infrastructure	Independence from transfers from the federal budget	Low share of mining industry
<i>Orange regions that attracted more FDI after tax cut</i>						
Amur Oblast		‡				‡
Bryansk Oblast	‡	‡	‡	‡		‡
Rostov Oblast		‡	‡	‡	‡	‡
Saint Petersburg	‡	‡	‡	‡	‡	‡
<i>Other orange regions</i>						
Chuvash Republic						‡
Kabardino-Balkar Republic			‡			‡
Republic of Kalmykia			‡			‡
Perm Krai	‡	‡			‡	
Udmurt Republic	‡				‡	
<i>Yellow regions that attracted more FDI after tax cut</i>						
Kaluga Oblast	‡	‡	‡	‡	‡	‡
Khabarovsk Krai	‡	‡	‡	‡	‡	‡
Komi Republic	‡				‡	
Kurgan Oblast		‡				‡
Leningrad Oblast		‡		‡	‡	‡
Lipetsk Oblast		‡		‡	‡	‡
Novosibirsk Oblast	‡	‡	‡	‡	‡	‡
Pskov Oblast	‡	‡		‡		‡

Appendix I. Regional factors that might have an impact on attractiveness for foreign investment (cont.)

Region	High share of urban population	High share of Russian population	High share of employed with secondary education	Developed transport infrastructure	Independence from transfers from the federal budget	Low share of mining industry
Republic of Tatarstan	‡			‡	‡	
Yaroslavl Oblast	‡	‡	‡	‡	‡	‡
<i>Other yellow regions</i>						
Altai Republic			‡			‡
Astrakhan Oblast				‡		‡
Kemerovo Oblast	‡	‡			‡	
Khanty-Mansi Okrug	‡				‡	
Orenburg Oblast		‡		‡	‡	
Penza Oblast		‡	‡			‡
Republic of Dagestan			‡			‡
Republic of Karelia	‡	‡			‡	
Republic of Mordovia			‡			‡
Yakutia Republic			‡			
Stavropol Krai		‡	‡	‡		‡
Tyumen Oblast	‡	‡	‡		‡	
Volgograd Oblast	‡	‡			‡	‡
Vologda Oblast	‡	‡		‡	‡	‡
Yamalo-Nenets Okrug	‡				‡	

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Special pages

Appendix B. The most representative sources for the Worldwide Governance Indicators (WGI)

WGI source	Government effectiveness	Control of corruption	Regulatory quality	Voice and accountability	Rule of law	Political stability and absence of violence
Meaning	Perceptions of the quality of the civil service and of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism
Economist Intelligence Unit	Quality of bureaucracy / institutional effectiveness Excessive bureaucracy / red tape	Corruption among public officials	Unfair competitive practices Price controls Discriminatory tariffs Excessive protections Discriminatory taxes	Democracy Index Vested interests Accountability of public officials Human rights Freedom of association	Organized crime Fairness of judicial process Speediness of judicial process Expropriation Intellectual property rights protection	Orderly transfers Armed conflict Violent demonstrations Social unrest International tensions / terrorist threat
Reporters Without Borders				Press Freedom Index		

Appendix B. The most representative sources for the Worldwide Governance Indicators (cont.)

Freedom House		Corruption		Political rights Civil liberties Press Freedom Index Civil society Electoral process	Judicial framework and independence	
World Economic Forum Global Competitiveness Report	Infrastructure Quality of primary education	Public trust in politicians Diversion of public funds Bribery: Trade Bribery: Utilities Bribery: Taxes Bribery: Judiciary State capture	Tax system distortionary Trade barriers Local competition Ease of starting a new business Anti-monopoly policy	Transparency of government policymaking Freedom of the press Favouritism in decisions of government officials Effectiveness of law-making body	Cost of crime/violence Reliability of police services Judicial independence Efficiency of legal framework for challenging regulations IPR protection Property rights Informal sector	Cost of terrorism
International Country Risk Guide	Bureaucratic quality	Corruption	Investment profile	Military in politics Democratic accountability	Law and Order	Government stability Internal conflict External conflict Ethnic tensions
US State Department					Trafficking in people	
Global Insight Business Conditions Indicators	Bureaucracy Policy consistency and forward planning	Corruption	Tax effectiveness Legislation	Institutional permanence	Judicial independence Crime	Civil unrest Terrorism

Appendix B. The most representative sources for the Worldwide Governance Indicators (cont.)

Institutional Profiles Database	Quality of the supply of public goods: education and basic health Capacity of political authorities to implement reforms	Level of petty, large-scale and political corruption	Ease of Starting a business Administered prices and market prices Competition: productive sector: ease of market entry for new firms Competition between businesses: competition regulation arrangements	Political rights and functioning of political institutions Freedom of the press Freedom of assembly and demonstration Respect for minorities Transparency of economic policy Award of public procurement contracts and delegation of public service Free movement of persons, information, etc.	Security of persons and goods Organized criminal activity Effectiveness of fiscal system Security of property rights Security of contracts between private agents Settlement of economic disputes Intellectual property protection Agricultural sector: security of rights and property transactions	Conflicts of ethnic, religious, regional nature Violent actions by underground political organizations Violent social conflicts External public security
Afrobarometer	Government handling of public services (health, education)	How many government officials do you think are involved in corruption? How many tax officials do you think are involved in corruption?		How much do you trust the parliament? How satisfied are you with the way democracy works in your country? Free and fair elections	Over the past year, how often have you feared crime in your own home? How much do you trust the courts of law? Trust in police	

Appendix D. Classification of control and treatment groups, based on tax concession for investment

