Economic Freedom of the Russian Federation[*]

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Abstract

The role of economic freedom in national and sub-national development has been studied extensively in both cross-country and in cross-regional studies and used to explain differences in a wide array of economic outcomes. These findings motivated us to construct an index of economic freedom for the regions of the Russian Federation (EFRF). This paper presents the EFRF index and describes the methods and choices made during its construction. Additionally, to provide a glimpse into the possibilities of the newly constructed index of economic freedom, the final section of the paper presents growth regressions on time-series cross-section data of the Russian regions. We rely on quantile regressions to allow for parameter heterogeneity and reduce the influence of outlier observations. Results indicate that economic freedom influences growth in GRP per capita, income per capita, and monthly wages across the regions of Russia in different ways and that its effect also varies across the growth distribution. The results also suggest that greater economic freedom is beneficial for regions with relatively low rates of economic growth but may be unfavorable to growth when or where growth rates are already relatively high.

1 Introduction

Research on the evolution of the economy of the Russian Federation has been greatly advanced in the recent years by the studies on the quality of Russian institutions and regional development. Such studies were generally based on attempts to measure institutional quality or economic development in Russia (Frye, 2017; Khaleeva et al., 2009; Mau and Yanovskiy, 2002; Plekhanov and Isakova, 2011; Yakovlev and Zhuravskaya, 2009). However, due to numerous limitations in data availability and methodological challenges—well familiar to all scholars working on the Russian economy and politics—these measures have generally been survey-based, limited to a relatively short period of time, or available for only a small subset of the Russian regions. These weaknesses justified a pressing need for having an institutional index that would cover a long time span, all or almost all regions, and would be based on objective data. In what follows, we describe the methods and the results of constructing an index of economic freedom for the 83 federal regions of Russia (EFRF) covering the period between 1992 and 2018.

Indices of economic freedom have been created for over 150 countries and for a variety of sub-national areas (Arman et al., 1999; Bhandari et al., 2014; Fan et al., 2011; Khandker, 2015; Maciel et al., 2019; Micu, 2015; Ruger and Sorens, 2013; Stansel, 2019, 2013; Stansel et al., 2019; Stansel and McMahon, 2018). A recent paper (Stansel and Tuszynski, 2018) reviews the literature using sub-national indices of economic freedom. The present article constructs the first index of economic freedom at the sub-national level within Russia from the country's independence in 1991 until 2018. The index ranks each region on economic freedom

at both the regional and the all-government (including federal, regional, and municipal) levels. The regional index evaluates the degree of economic freedom in each region of Russia compared with other Russian regions. Additionally, the all-government index allows comparing the degree of involvement of the federal government across the regions. This allows isolating the impact of government intervention on economic freedom within the country.

For the purposes of this research, we define economic freedom in the same way as the authors of the Economic Freedom of the World (EFW) and the Economic Freedom of North America (EFNA): "Individuals have economic freedom when (a) property they acquire without the use of force, fraud, or theft is protected from physical invasions by others and (b) they are free to use, exchange, or give their property as long as their actions do not violate the identical rights of others. Thus, an index of economic freedom should measure the extent to which rightly acquired property is protected and individuals are engaged in voluntary transactions. The freest economies operate with minimal government interference, relying upon personal choice and markets to answer basic economic questions such as what is to be produced, how it is to be produced, how much is produced, and for whom production is intended. As government imposes restrictions on these choices, there is less economic freedom" (Gwartney et al., 1996; Stansel et al., 2015).

We acknowledge that there are different interpretations of what is and what is not economic freedom (Ott and MacMahon, 2019), especially in case of a country that has transitioned from the planned economy to market economy, such as Russia. The two areas of government involvement that the regional index is based on (size of government and labor market freedom) are arguably the most important indicators of the degree of economic freedom that local businesses could experience. They do not reflect, however, the degree of the government support for local businesses (e.g., the existence of business incubators for small enterprises or pro-investment policies). Nor do they measure non-economic freedoms, such as institutional quality (e.g., control of corruption) and social stability (e.g., state capture or criminality). While measuring the quality of institutions in Russia is a non-trivial task (for a comprehensive review, see Baranov et al., 2015), we do our best to incorporate relevant information, for example, by extending the index to include information on legal protection and property rights using values on these attributes taken from the Economic Freedom of the World index; of course, the values referring to the country as a whole do not vary by region. We are also looking forward to seeing more research in this area and using every opportunity to expand and improve our index.

Based on the lean definition of economic freedom, stated above, the regional EFRF index is based on two main areas of government involvement in economic activity: size of government and labor market freedom. The all-government EFRF index introduces additional measures in these areas which are controlled by the national government but may vary by region, and includes three more broad areas—legal protection, sound money, and freedom to trade internationally—built from the corresponding scores of Russia in the Economic Freedom of the World (Gwartney et al., 2016). We take great care in constructing the all-government index in a way consistent with the methodology of both the EFW (Gwartney et al., 2016) and the EFNA (Stansel et al., 2015). Naturally, the measures of economic freedom constructed for Russia differ from those constructed for other countries, primarily due to varying degrees of federalism. For example, in cases when there would be variation in some policies across states in the US setting, there is none among the regions of Russia because such policies are set by the national government (the opposite is also true). Specifically, the extent to which regions in Russia have influenced their own tax, expenditure, and regulatory policies has varied since the break-up of the Soviet Union with recent changes being toward more centralized control (Baccini et al., 2014; Libman and Rochlitz, 2019). Nonetheless, following the well-established methodology makes it possible to hold economic freedom in the Russian regions to the same standards as in the other countries.

2   Methods and Data

To construct the index, we use variables that capture different facets of economic freedom in the regions and then convert these variables into standardized scores: a number from zero to ten, with zero indicating the least free and ten—the most free regions. Following the same procedure as utilized by the EFW index, as well as the EFNA index, the scores reflect the distribution of the underlying data and are calculated using

the formula:

$$EFRF_{ijt} = \left(\frac{V_{2000}^{max} - V_{it}}{V_{2000}^{max} - V_{2000}^{min}} \right) \times 10$$

where V_{it} stands for the value of an actual observation on the variable V for region i in year t, V_{2000}^{max} is the largest value of V in the base year 2000, V_{2000}^{min} equals its smallest value that year, and j stands for the index components and subcomponents. Whenever the value approaches the maximum value of the benchmark year V_{2000}^{max}, the index score $EFRF_{ijt}$ moves toward zero. Scores for each of the subcomponents are equally weighted in constructing the Area scores, and the Area scores are equally weighted in calculating the index value.[1]

The structure of the EFRF index is presented in Table 1, which also indicates the specific components and subcomponents that underlie each of the five areas: size of government, labor market freedom, legal protection, sound money, and freedom to trade internationally. The table also shows the difference between the purely regional index and the all-government index.

Table 1: Areas and components of the Economic Freedom of the Russian Federation index

Regional index	All-government index
1. Size of Government	
A. General government expenditure	A. General government expenditure
B. Transfers and subsidies	B. Transfers and subsidies
C. Government enterprises and investment	C. Government enterprises and investment
(i) State enterprises investment	(i) State enterprises investment
(ii) Regional budget investment	
	(iii) Federal and regional budget investment
	(iv) State enterprises output
2. Regulation	
A. Labor market freedom	A. Labor market freedom
	(i) Federal minimum wage legislation
(ii) Regional minimum wage for state-owned organizations	(ii) Regional minimum wage for state-owned organizations
(iii) Regional minimum wage for private-owned enterprises	(iii) Regional minimum wage for private-owned enterprises
(iv) Government employment	(iv) Government employment
	B. Overall labor market freedom
	C. Regulation of credit markets
	D. Business regulations
	3. Legal system and property rights
	4. Sound money
	5. Freedom to trade internationally

Area 1. Government Size utilizes regional government spending on general consumption expenditure, transfers and subsidies, and government enterprises and investment. The all-government index includes some federal government spending within the region, detailed below. General government consumption expenditure and transfers and subsidies are measured as a percentage of regional income, and government enterprises and investment as a percentage of total investment.

Component 1A, regional government expenditure, is based on government spending on goods and services, as well as on the share of transfers from the federal budget to the regional budget.

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[1]To make these calculations more concrete, consider the share of households receiving transfers and subsidies included in Component 1B. The maximum value of this variable in the base year 2000 is 23.5, the minimum value is 0.6. The values of the variable in Moscow in 2000 and 2004 are, respectively, 11.3 and 10.7. Given this information, one can construct the EFRF value for Component 1B for Moscow in 2000 and 2004: $EFRF_{Moscow,1B,2000} = \left(\frac{23.5-11.3}{23.5-0.6} \right) \times 10 = 5.33$ and $EFRF_{Moscow,1B,2004} = \left(\frac{23.5-10.7}{23.5-0.6} \right) \times 10 = 5.59$.

Component 1B, transfers and subsidies to consumers/households, is based on the share of households receiving transfers and subsidies and, when the data are available, on the share of housing subsidies in the regional budget expenditure.

Component 1C of the regional index accounts for government enterprises and investment and is the equally weighted sum of two subcomponents. Subcomponent 1Ci is state enterprise investment, and subcomponent 1Cii is the investment financed from the regional budget, both as a share of total investment in a region.

Area 1 for the all-government index replaces the subcomponent (1Cii) with the subcomponent (1Ciii) federal and regional budget investment, that is, it adds direct investment financed by the federal government to that of the regional government and takes that sum as a percentage of total investment. Finally, Area 1 of the all-government index also includes state enterprises output as subcomponent 1Civ, based on the output of state- and mixed-owned enterprises as a percentage of total industrial output.

Area 2. Regulation offers only one component for the regional index because the Russian regions generally have little leeway for setting economic regulations. Therefore, the regional index focuses here on freedom in the labor market; however, for the all-government index, this component is extended with three additional subcomponents (2B to 2D).

Component 2A measures labor market freedom. To calculate this component for the regional index, we use three subcomponents.

- (2Aii) minimum wage legislation at the regional level for state-owned organizations, calculated by the regional minimum wage for state-owned organizations as a percentage of per capita wage;

- (2Aiii) minimum wage legislation at the regional level for private-owned enterprises, calculated by the regional minimum wage for private-owned enterprises as a percentage of per capita wage; and

- (2Aiv) government employment, calculated as the number of public servants from all branches of government as a percentage of total regional employment.

For the all-government index we include subcomponent (2Ai) minimum wage legislation at the federal level, calculated by the federal minimum wage as a percentage of per capita wage.

Component 2B measures overall labor market freedom and is set equal to Russia's country score for component 5B in the EFW. Component 2C measures regulation of credit markets and is set equal to Russia's score for component 5A in the EFW report. Component 2D measures business regulations and is set equal to Russia's score for component 5C in the EFW report. Here, we follow the methodology of the Economic Freedom of North America in adding the scores that could not be measured otherwise with the available statistics at the regional level.

Area 3. Legal System and Property Rights is set equal to the country score for Area 2 in the EFW report. A limitation of the index is the difficulty of capturing regional variation in the effectiveness of the legal system and the protection of property rights. Other regional indices rely upon the values calculated in The Economic Freedom of the World report which, obviously, do not vary across the regions of a given country. In the Russian context, this lack of variation across the regions may be particularly problematic as attested to by the many studies (e.g., Mau and Yanovskiy, 2002; Gans-Morse, 2012; Kapeliushnikov et al., 2013; Rochlitz, 2017; Yakovlev, 2006) that identify security of property, state capture, and threats to business as important political and legal factors for the Russian context. For example, Nazrullaeva et al. (2013) concluded that law enforcement officers brought criminal charges both to extract rents from business people, particularly entrepreneurs, and to satisfy superiors who looked at "key performance indicators", like the increase in crimes prosecuted, as measures of police productivity. The former is one of a variety of forms of "corporate raiding" under which legitimate owners were driven out, often arrested on fraudulent criminal charges, and the company dismantled by the raiders who are often in the employ of market competitors, senior security services personnel or other political elite. Zhuravskaya (2008) reports that "(a) price list for the services of law enforcement agencies in the illegal seizure of property can even be found on the web." Unfortunately, the data on the protection of property rights that would cover all the Russian regions over a long time period are still scarce, making it hard to estimate this important part of economic freedom objectively. Should the data become available, we would update this area in the next editions of our index.

Area 4. Sound Money is the country score for Area 3 in the EFW report, and *Area 5. Freedom to Trade Internationally* is equal to the country score for Area 4 in the EFW report.

Data for the subcomponents of the index come from several sources. Official annual statistics reports from the Federal Statistics Service of Russia (Rosstat, 2020)—collected by one of the co-authors in the Aggregate Data for the Regions of Russia (RoR) database (Mirkina, 2014, 2017)—provide the majority of the variables. Information on minimum wages across regions was collected by the authors from the regional branches of the Federal Service for Labor and Employment, the Federation of the Independent Trade Unions of Russia (FNPR, 2020), and individual regional agreements on minimum wages for the years 1997–2020, accessed through the legal database Codex (Codex Consortium, 2020). Using the official data ensures that no observations are dropped except for when data are missing.

Several further adjustments were necessary in the Russian context with respect to the existing subnational indices of economic freedom. First, extreme rates of inflation (particularly those of the early 1990s) have become a familiar problem for all studies done in transition countries (Mirkina, 2017). Moreover, prices and living conditions vary greatly across the regions of Russia, making intra-regional comparisons particularly difficult (Tabata, 2016). To deal with inflation, we adjust all monetary terms for the consumption price index and transform the variables into constant rubles, with the year 2000 as the base, before calculating the index subcomponents.

Second, Component 1C, Government enterprises and investment, is rarely calculated at the regional level in other subnational indices of economic freedom. For instance, the EFNA uses for this component the country score for the variable 1C in the EFW report. However, we make use of the available data and calculate separate regional scores for Component 1C instead of merely applying the country score. We note that Russia has always scored 10—the highest freedom score—in the past 20 years in this component in the EFW. In the world index, this seems to indicate that the size of state enterprises investment is very low relative to total domestic investment in the country, but using that value for the regional scores would be a suspect assumption, since a large share of firms have some state ownership, and about 36 percent of the 114 largest companies were state controlled according to a recent study (Abramov et al., 2017). Given this, we find it absolutely necessary to calculate the scores for each region in this component.

Third, two adjustments are made in component 2A, Labor market freedom. One has to do with the regulations of minimum wage. Similar to other federal countries, Russia has the federal minimum wage set by the national government for all enterprises, and the regional minimum wage that is set by the regional governments and could not be lower than the federal minimum wage. The federal minimum wage varies across regions because the federal government also sets compensating coefficients for some regions, intended primarily to compensate the downsides of diverse and often harsh climate conditions in different parts of the enormous Russian territory. The regional governments differ in their approach to the minimum wage regulations when some of them regulate only the minimum wage for private-owned enterprises, some others regulate the wages only for state-owned enterprises, and the rest of them do not distinguish the type of enterprise. State-owned organizations used to have a fixed pay scale to calculate wages, with the minimum wage corresponding to unskilled job positions of the 1st category (out of 18). More high-skilled positions were placed in higher pay scale categories. For the private sector, there is no such fixed pay scale differentiating the skill levels, thus many regions try to set the minimum wage for private enterprises as high as possible, often linking it to the living wage. If the regional government does not set the minimum wage for certain types of enterprises (or any of them), the federal regulations on minimum wage apply. Considering all this, we include three separate subcomponents: for the federal minimum wage regulations, and the regional minimum wage regulations for private industries and state-owned organizations.

Our final adjustment related to labor market freedom is ignoring union density in the index, despite the fact that it features in the EFW methodology. The density of trade unions is a common subcomponent in nearly all existing indices of economic freedom, but as several studies show, union activity is nominal in the post-socialist and transition context and trade unions' role in influencing employment negotiations has never become as important in the post-Soviet states as it is in the Western countries (Clarke, 1996; Clarke and Pringle, 2007). Apart from the fact that it is hard to come across precise information on the number and activities of trade unions in Russia, we do not find union density a credible indicator of labor market freedom in the post-Soviet states.

3   Economic freedom of the Russian regions in 1992–2018

Reforms and rebounds have been defining features of the Russian economic development during the past three decades. As Figure 1 shows, transition from a planned system to an open market economy first triggered the state of wild capitalism—most commonly described as economic anarchy rather than *laissez faire*. It led to the economic downfall, rise in poverty rates and the desperate reliance of many regions, businesses, and citizens on state support. The EFRF scores in 1992–1995 reflect the chaos caused by the destruction of the previous economic links and legal foundations of the Russian economy, tumultuous privatization, the lack of established property rights protection, and the beginning of a deep economic depression in most of the regions without export-oriented industries or natural resources. Even the highly rated regions in 1992, such as Tyumen Oblast with a score of 9.59, Tomsk Oblast with a score of 9.05, and Stavropol Krai with a score of 9.07 dropped down to 6.34, 3.93, and 3.43, respectively, in 1994.

Figure 1: Regional index of economic freedom in Russia
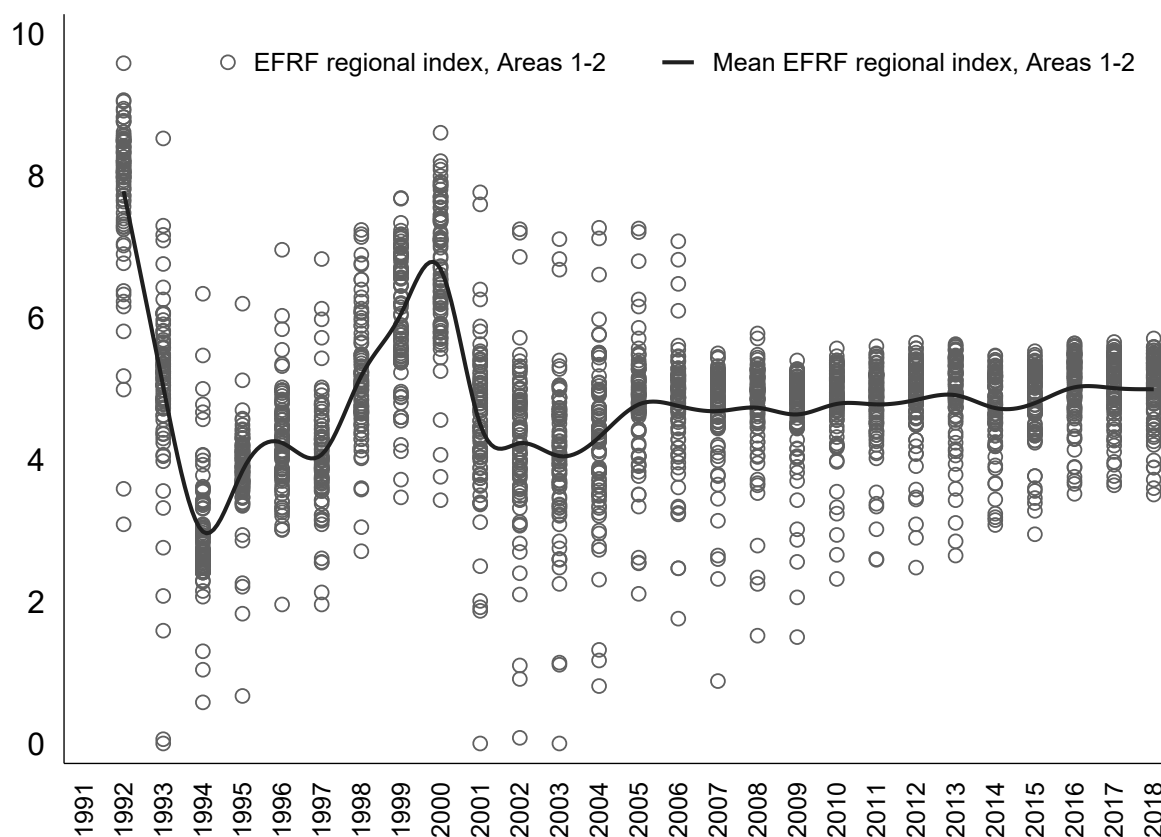
Subsequent development throughout the 1990s reflected improving legal conditions and was driven by regions with low economic freedom overcoming their economic challenges and reducing their dependence on the state. For instance, Yamalo-Nenets Autonomous Okrug and Khanty-Mansi Autonomous Okrug-Yugra went from scores at or near zero in 1993 to, respectively, 8.61 and 7.65 in 2000. By 2000, Sverdlovsk Oblast reached a score of 8.0, Astrakhan Oblast—8.09, Tomsk Oblast—8.14, and Krasnoyarsk Krai—8.21. Further adjustment of legal procedures and business practices in the 1990s also contributed to reducing heterogeneity among the regions. Although their levels of economic development still varied greatly, most regions joined in an emerging trend of increasing economic freedom.

This trend was halted, however, in the 2000s. Even the scores of highly rated regions dropped on average

by one full point over a 10-year period. Kaliningrad Oblast, the most European of the Russian regions both geographically and culturally, went from a score of 7.45 in 2000 down to 4.59 in 2010. Yamalo-Nenets Autonomous Okrug lost its leadership status when its score fell from 8.61 in 2000 to 5.15 in 2010. The new leaders of the 2010s included regions that merely managed to keep the reached degree of economic freedom throughout the reforms, sanctions, and economic crises. Figure 2 illustrates a ranking from the highest score to the lowest score among the Russian regions in 2018.

Figure 2: Summary of ratings of economic freedom at the regional level in 2018

Region	Score
Leningrad Oblast	5.7
Saint Petersburg	5.6
Samara Oblast	5.6
Moscow Oblast	5.6
Tula Oblast	5.5
Khanty-Mansi AO-Yugra	5.5
Republic of Tatarstan	5.5
Orenburg Oblast	5.5
Lipetsk Oblast	5.5
Chelyabinsk Oblast	5.5
Sverdlovsk Oblast	5.5
Voronezh Oblast	5.4
Krasnodar Krai	5.4
Republic of Bashkortostan	5.4
Ulyanovsk Oblast	5.4
Kemerovo Oblast	5.4
Moscow	5.4
Novosibirsk Oblast	5.4
Nizhny Novgorod Oblast	5.4
Yaroslavl Oblast	5.4
Tyumen Oblast	5.4
Perm Krai	5.4
Belgorod Oblast	5.4
Astrakhan Oblast	5.4
Volgograd Oblast	5.3
Tomsk Oblast	5.3
Omsk Oblast	5.3
Rostov Oblast	5.3
Udmurt Republic	5.3
Penza Oblast	5.3
Yamalo-Nenets AO	5.3
Vladimir Oblast	5.3
Kursk Oblast	5.3
Saratov Oblast	5.3
Stavropol Krai	5.2
Krasnoyarsk Krai	5.2
Komi Republic	5.2
Vologda Oblast	5.2
Primorsky Krai	5.2
Kaluga Oblast	5.2
Chuvash Republic	5.2
Smolensk Oblast	5.1

Region	Score
Mari El Republic	5.1
Arkhangelsk Oblast	5.1
Ryazan Oblast	5.1
Tver Oblast	5.1
Ivanovo Oblast	5.0
Amur Oblast	5.0
Irkutsk Oblast	5.0
Murmansk Oblast	5.0
Republic of Mordovia	5.0
Kirov Oblast	5.0
Republic of Dagestan	5.0
Oryol Oblast	4.9
Altai Krai	4.9
Khabarovsk Krai	4.9
Novgorod Oblast	4.9
Tambov Oblast	4.8
Sakhalin Oblast	4.8
Kostroma Oblast	4.8
Sakha (Yakutia) Republic	4.8
Bryansk Oblast	4.8
Kaliningrad Oblast	4.7
Kabardino-Balkar Republic	4.7
Republic of Karelia	4.7
Republic of Adygea	4.7
Pskov Oblast	4.6
Nenets Autonomous Okrug	4.5
Republic of Khakassia	4.5
Zabaykalsky Krai	4.5
Kurgan Oblast	4.5
Magadan Oblast	4.4
Jewish AO	4.4
Republic of Buryatia	4.3
Chechen Republic	4.3
Republic of North Ossetia	4.3
Republic of Kalmykia	4.2
Republic of Ingushetia	4.0
Karachay-Cherkess Republic	3.9
Altai Republic	3.9
Kamchatka Krai	3.7
Chukotka AO	3.6
Tuva Republic	3.5

The all-government index of economic freedom stayed on a different trend, shown in Figure 3.[2] A steady increase in economic freedom in 1994–2000 was followed by a period of regional convergence in 2001–2018. The average all-government index, which is most closely related to the dynamics of the scores of Russia in the Economic Freedom of the World, also illustrates a slow but steady improvement. Over the whole period of liberalization and market reforms, the average Russian region came from a score of 4.5 in 1992 up to 6.1 in 2018. This is just below Russia's own scores in the Economic Freedom of the World (rising from 5.23 in 2000 to 6.74 in 2018) and is roughly equivalent to the progress made by Nigeria, Sierra Leone, and Tanzania over the same years.

Figure 4 shows that regions with similar ratings in economic freedom tend to be geographically clustered. Most regions with high scores in economic freedom belong to the European part of Russia, while Caucasian regions, as well as regions in the Far East rarely reach the top quintile.

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[2]For illustration purposes, we omit Areas 3–5 in Figure 3 as they do not vary from region to region in a given year and would oversimplify the picture.

Figure 3: All-government index of economic freedom in the regions of Russia
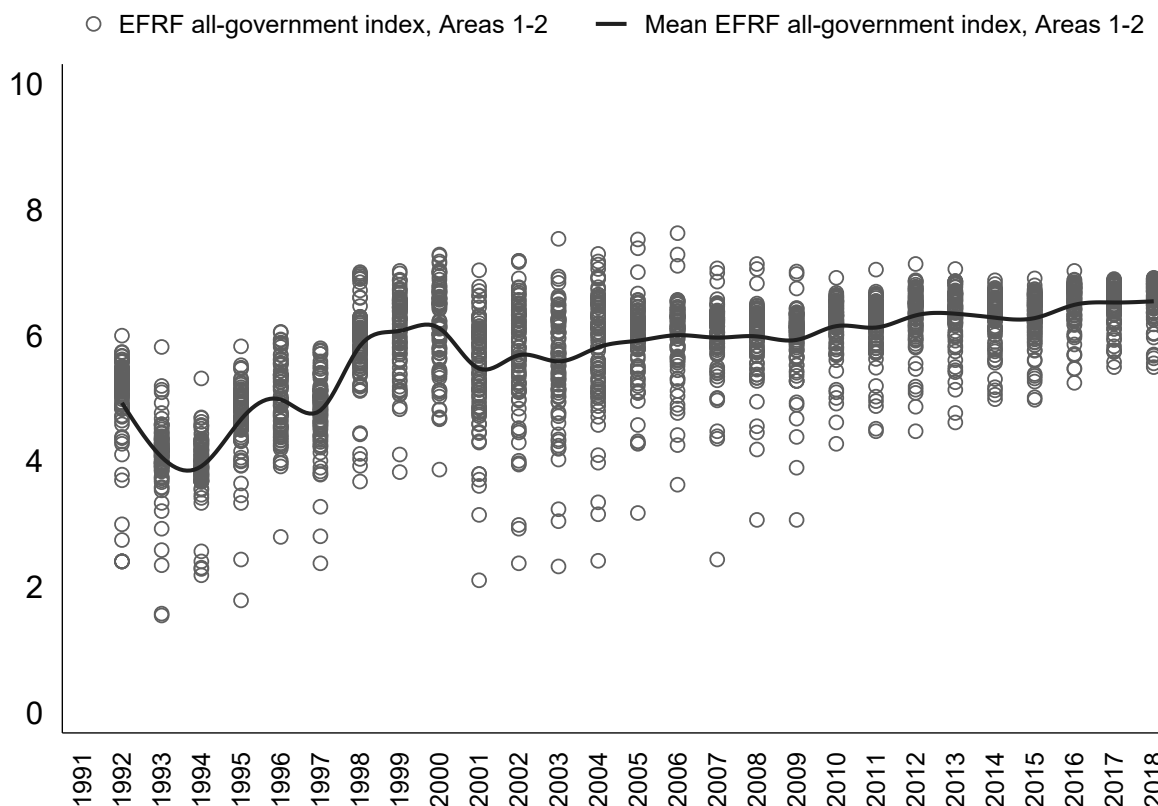

4   Economic Freedom and Income Growth in the Russian Federation

Growth regressions have been estimated for the Russian Federation by numerous authors, although, to the best of our knowledge, none has previously used quantile regression. Static panel regression models remain the most common estimation technique, though dynamic panel models and spatial econometric models are becoming more and more widespread. The focus of these growth regressions is often on the issue of convergence of income per capita across the Russian regions, whether that be conditional or unconditional β-convergence, and the factors which influence the rate of convergence. Migration within Russia is a commonly studied determinant of convergence. Another important issue is the role of institutions, like the extent of economic reform.

Berkowitz and DeJong (2002; 2005) studied two short periods in the 1990s, finding that regional growth was positively influenced by the number of new enterprises, which were themselves positively associated with the level of education in the region and the regional support for economic reform. Solanko (2008) examined the period from 1992 through 2005 and found convergence, especially among the regions she identified as initially rich. There was much less evidence of convergence among the initially poor regions. Guriev and Vakulenko (2015) sought to understand the lack of convergence in the 1990s compared to convergence in the 2000s. They concluded that the earlier period saw severe barriers to labor mobility, largely the result of poverty, while economic growth raised incomes in the poor regions enabling citizens of those regions to migrate, which powered convergence. Lehmann and Silvagni (2013) and Lehmann et al. (2020) used dynamic

Figure 4: Geographic distribution of economic freedom across the regions of Russia in 2018

Quintiles (# of regions)
5.42 - 5.71 (16)
5.26 - 5.42 (17)
4.99 - 5.26 (16)
4.57 - 4.99 (17)
3.51 - 4.57 (17)
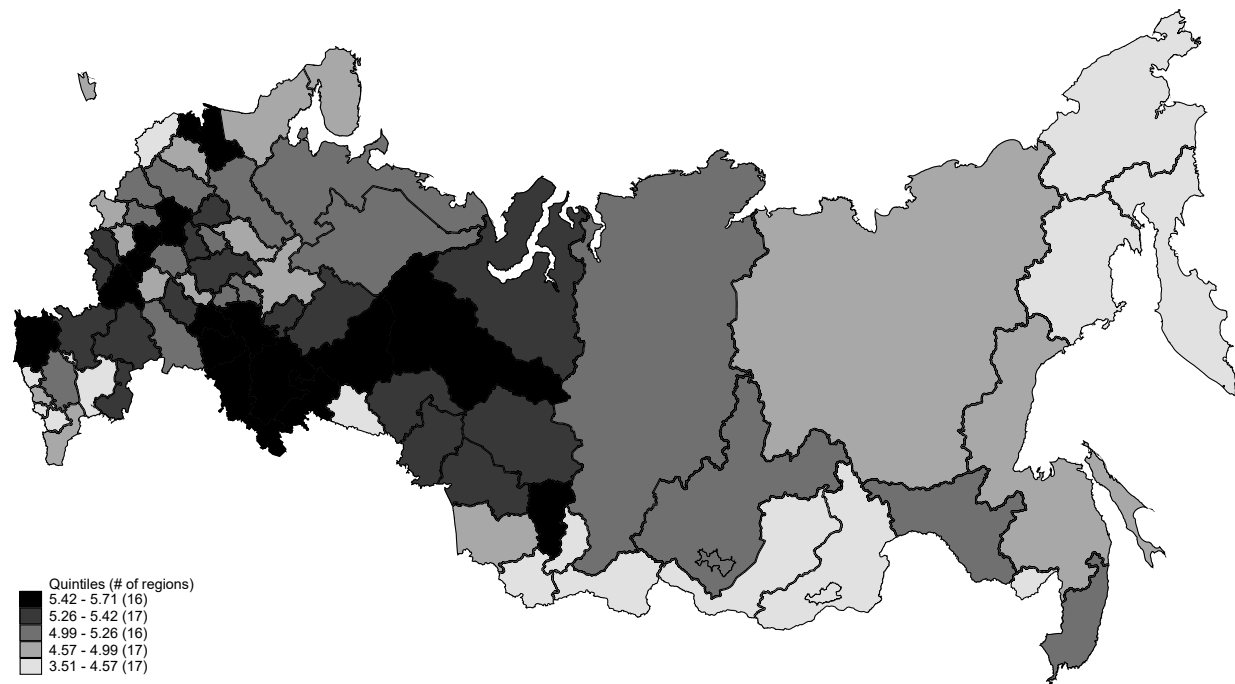
panel data methods to study regional economic growth in Russia. Lehmann and Silvagni (2013) studied the period 1995 through 2010 finding that the results differed between Anderson-Hsiao and system-GMM estimates. The former indicated convergence only very weakly, statistically significant at the 10 percent level, while the latter indicated divergence over the full run of the data and in the 2001–2010 sub-period.

Buccellato (2007) used spatial econometric methods to study regional growth rates in Russia. His data covered 77 regions and the years from 1999 through 2004. His analysis showed that typical analysis of convergence overestimated the absolute value of β relative to a model with a spatial lag. He also found that a key driver of divergence among the Russian regions was the production of hydrocarbons. Maslikhina (2018) compared convergence over three distinct time periods, with the last covering the period 2005 through 2015. The evidence suggested that convergence was slower in the last period than in the middle period, 2001–2005, however left it impossible to conclude that convergence occurred during the earliest period, 1994–2001. Lehmann et al. (2020) also used spatial econometric techniques and studied the period from 1996 through 2017, finding a convergence rate of about 2 percent per year but no influence on the rate of growth from human capital. On the other hand, they did find that interregional migration and interdependence among the regions influenced the rate of convergence.

When analyzing economic growth, Ahrend (2005; 2012) emphasized political and institutional features rather than regional convergence and concluded that reform and better regional leadership might have made a difference in regional economic growth, at least since the crisis of 1998. Martinez-Vazquez and Timofeev (2014) also paid little attention to convergence, noting only that real per capita economic product was a control for convergence. Their focus was, instead, on inequality and policies of equalization of own-sourced local government revenues. They found that greater inequality in these revenues in 1999 was positively associated with higher average growth, while equalization of revenues through grants and revenue sharing was associated with lower average growth over the period 2000–2004.

It is clear from the existing studies, therefore, that there are multiple factors affecting economic growth at the regional level in Russia. We contribute to this literature by exploring the role of economic freedom as one of those factors. Previous studies, done at the regional level in other countries, suggest that economic freedom may be, indeed, one of the main determining factors in economic development of sub-national areas

(Ashby and Sobel, 2008; Bennett, 2016; Bjørnskov, 2017; Compton et al., 2014; Subasat and Bellos, 2011; Wiseman, 2017; Yankow, 2014).

The remainder of this section reports results from estimating quantile regressions of economic growth using a one-year lagged value of the economic freedom index to explain one of three different measures of regional income. The first is the growth rate of real gross regional product per capita as is standard in the growth literature. The second dependent variable is the growth in monthly income per capita. The final dependent variable is the growth in monthly wages per capita. These alternative outcomes provide some nuance to the role of economic freedom and a robustness check for the results.

Quantile regressions are becoming more common in the study of economic growth (Barreto and Hughes, 2004; Canarella and Pollard, 2004; Crespo-Cuaresma et al., 2011; Adrian et al., 2019)[3] because they allow the relationship between the explanatory variables and growth to be different at different places in the growth distribution. Quantile regression is robust to outliers and provides insight into the outlying observations. For example, Barreto and Hughes (2004) discuss "under performers and over achievers" by which they mean countries whose growth is unexpectedly low or high relative to what ordinary regressions predict. These large (in absolute value terms) errors are interpreted as incorporating omitted influences that may differ in their impact or arise because of parameter heterogeneity that traditional OLS methods do not capture.

Canarella and Pollard (2004) estimate cross-country growth equations with focus on parameter heterogeneity. For example, their model implies a difference between local and global conditional convergence. Specifically, if the coefficient on initial income is negative and statistically significant at all quantiles, that supports global convergence but if that coefficient is negative and significant only for some quantiles, then there is support for local convergence. Their results suggest global convergence; however, the coefficient is larger in absolute value at higher quantiles, and with larger t-statistics for those as well. They interpret this as support of global convergence but not as strong as the evidence from the OLS model they estimated. Barreto and Hughes (2004) also include the initial level of GDP per capita as a regressor in their cross-country growth regressions. Their evidence is that "conditional convergence is not as strongly observed at the lower percentiles as it is at the mean or at the median," a result similar to that of Canarella and Pollard (2004).

Barreto and Hughes (2004) also report that investment has no effect at the lower quantiles of the growth distribution but generally does at the higher quantiles. They suggest these differences are the result of institutional differences. Crespo-Cuaresma et al. (2011) state the results of their quantile regression analysis of economic growth of regions of the European Union point to problems with policy implications drawn from ordinary least squares models; the impact of relevant variables is dependent on numerous characteristics, including some that may be unmodeled. Of course, unmodeled influences may reflect institutions, including economic freedom.

The models here are estimated using simultaneous quantile regression, so that the quantile regression for each quantile is estimated jointly with those of each other quantile and include only the previous period level of the income measure whose growth is being estimated, the lagged value of the economic freedom index and year dummies. The advantage of this is that it improves the efficiency of the estimates and, therefore, the reliability of hypothesis tests. Each model is estimated at each decile of the distribution, from the 10th to the 90th, so each model has nine sets of coefficients for the effect of the economic freedom index and every other explanatory variable. This makes for an unwieldy number of coefficient estimates and enormous tables, so the results are summarized in the text and marginal effects are displayed in figures.

The principal finding of the analysis is that the impact of economic freedom varies across the quantiles of the growth distribution. In Figure 5, each panel shows the marginal effect of economic freedom on a different measure of income growth, growth in wages, growth in GRP per capita, or growth in personal income per capita. The figure also shows the estimated marginal effect from an OLS model and the confidence interval around that effect, the three horizontal lines. At low quantiles of growth, an increase in economic freedom raises growth but at higher quantiles of growth more freedom lowers growth. Moreover, the OLS estimate and the quantile estimate of the marginal effect are frequently statistically different, which is especially true at the higher quantiles, above about the 60th percentile. It is also clear from the figures that the marginal effects at low quantiles are significantly different than those at higher quantiles. Table 2 shows the p-values

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[3]Adrian et al. (2019) analyze time-series data covering the United States to estimate the relationship between GDP growth and financial and economic conditions. Their study does not include a geographic dimension.

of tests of equality of the coefficients on the Economic Freedom variable between adjacent deciles. For instance, the effect of economic freedom on growth of GRP per capita is different between the 30th and 40th percentiles. However, the effects of economic freedom on the 40th and 50th percentiles are not different, nor is there a difference between the 50th and 60th percentile.

Table 2: Tests in differences in slopes by decile, p-value

Decile	GRP	Income	Wages
10th-20th	0.008	0.001	0.618
20th-30th	0.039	0.001	0.001
30th-40th	0.640	0.144	0.006
40th-50th	0.006	0.003	0.309
50th-60th	0.000	0.095	0.234
60th-70th	0.226	0.059	0.736
70th-80th	0.474	0.569	0.127
80th-90th	0.069	0.001	0.538

Figure 5 makes this point clearer. The effects of additional economic freedom are small but positive at low levels of the dependent variable but decline and become negative at the highest percentiles of the income measure. The figure also demonstrates how misleading OLS estimates of the effect of economic freedom might be, as the OLS estimate is outside the 95 percent confidence interval for the quantile regression coefficients especially at the high end of the distribution.

Figure 5: Marginal effect of economic freedom by decile

(a) Wages   (b) GRP   (c) Income
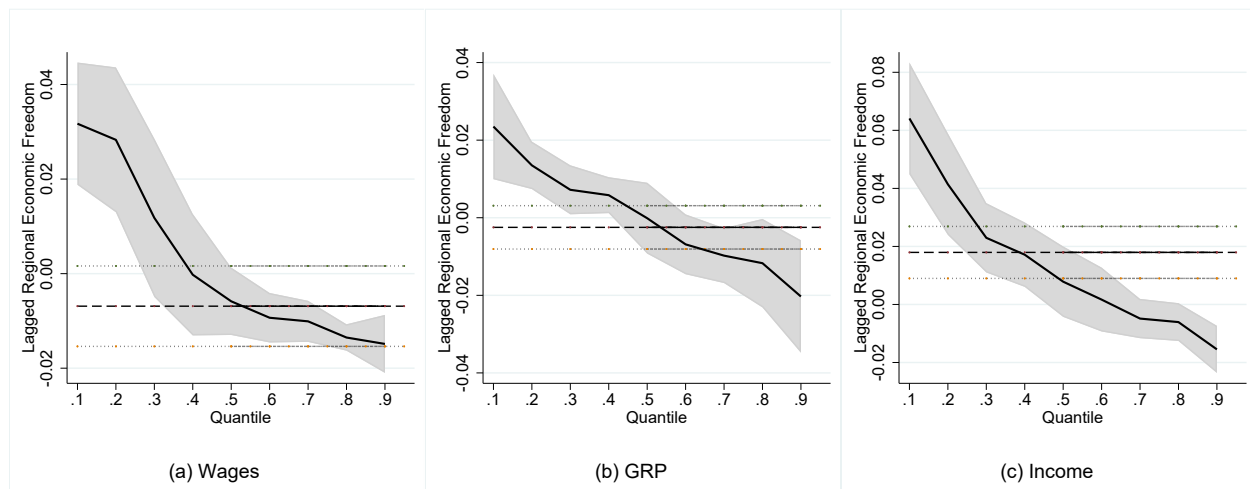
The effects of economic freedom are not the only effects of interest, of course. Each model also includes the initial value of the relevant measure of income, that is, the one period lag of the undifferenced dependent variable. Figure 6 shows the effects of the initial values on the growth in the variable. The coefficients on these variables address the issue of convergence, or β-convergence. Because the model includes year fixed effects and the economic freedom index, the model exhibits (or not) conditional β-convergence.

There are interesting implications from these convergence parameters. First, as has been found from other quantile regression models (Canarella and Pollard, 2004; Barreto and Hughes, 2004), convergence is not the same throughout the distribution. For each income variable, the rate of convergence is much faster at the lower deciles of the growth distribution than at higher deciles. Indeed, for monthly personal income and monthly wages, the figures indicate very rapid convergence at the 10th percentile of the growth distribution but the 90th percentile these variables begin to approximate the 2 percent "iron law of convergence" value

(Barro, 2015). The pattern of faster convergence at the low end than at the high end of the distribution holds across all three measures of income but, importantly, from about the 50th percentile up, GRP per capita growth actually diverges rather than converges. In other words, evidence on convergence or divergence depends upon the income variable measured and where in the growth rate distribution one looks.

Figure 6: Marginal effect of initial income by decile

(a) Wages   (b) GRP   (c) Income
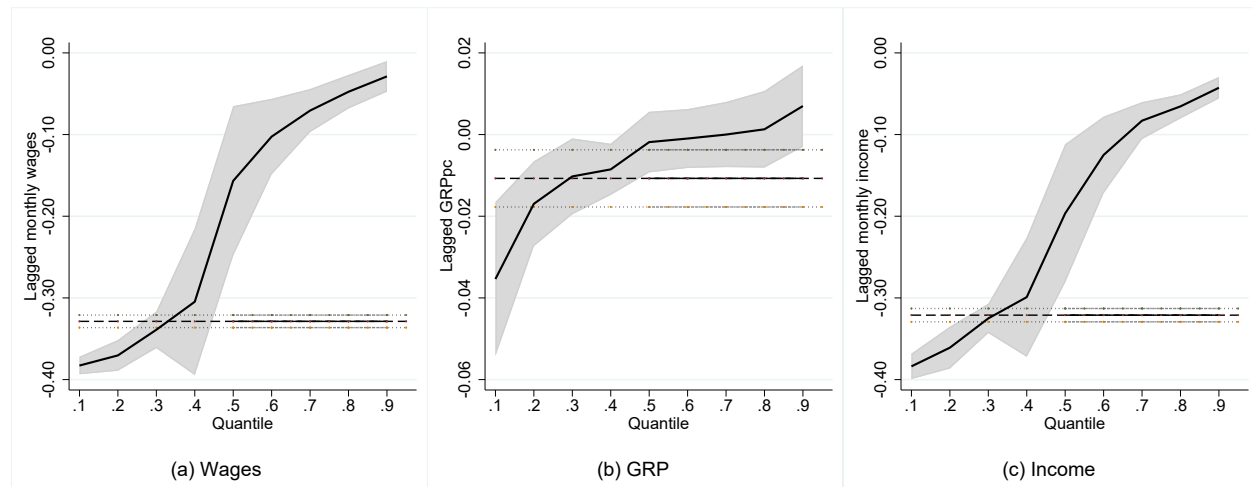
5   Conclusion

The role of economic freedom in national and sub-national development has been studied extensively in both cross-country and in cross-regional studies. Economic freedom has also been used to explain differences in a wide array of economic outcomes with the general result that greater economic freedom is linked to higher values of desirable outcomes (for a review, see Hall and Lawson, 2014). These findings motivated us to construct an index of economic freedom for the regions of the Russian Federation (EFRF). The primary goal was to construct the index tracing the evolution of economic freedom across regions along with the country transition from the planned system to the market economy. We make the index available for use to international scholars interested in doing research on Russia in the same way as the Economic Freedom of the World and the Economic Freedom of North America indices have been used. This paper presents the EFRF index and describes the methods and choices made during its construction.

Ultimately, the worth of any index comes from its capacity to explain the social, political, and economic phenomena of interest. To provide a glimpse into the possibilities of the newly constructed index of economic freedom, the final section of the paper presents growth regressions on time-series cross-section data of the Russian regions. We rely on quantile regressions as an estimation method to allow for parameter heterogeneity and reduce the influence of outlier observations. Results indicate that economic freedom influences growth in GRP per capita, income per capita, and monthly wages across the regions of Russia in different ways and that its effect also varies across the growth distribution. The results also suggest that greater economic freedom is beneficial for regions with relatively low rates of economic growth but may be unfavorable to growth when or where growth rates are already relatively high.

These results, of course, are preliminary and intended to illustrate the potential use of the EFRF index rather than draw any definitive conclusions about the factors of economic growth in the regions of the Russian Federation. For instance, the regression models have no additional explanatory variables, such as measurements of human capital, openness to trade, institutional quality, or corruption. It is our hope that the introduction of the index of economic freedom for the Russian regions would enable further studies in this area. With that thought in mind, we leave these developments to other researchers for whom we make the index available.

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