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Shaping the Size of Nations: A Test of the Determinants of Secessions

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Abstract

Little is known about the empirical determinants of state formation and dissolution, despite a rich theoretical literature on the subject. This paper attempts to fill that gap by treating the dissolution of the Soviet Union as a historical experiment in state breakup. I exploit regional variation in separatist protests across the 184 provinces of the Union to measure a demand for secession. This allows for a test of economic theories predicting that the incentive to secede should be determined by the trade-off between the cost of public goods provision and preference heterogeneity. I find strong evidence for the existence of this trade-off in shaping demand for secession. Similarly, I find that economic theory is to some extent able to predict the extent to which regional elites are actually pursuing a separatist policy. However, I also show that the popular demand for secession had little causal effect on actual separatist policy once exogenous variation in the propensity to protest is taken into account.

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1 Introduction

Economists have developed a rich theoretical literature that helps to explain the unification or break-up of states. In this literature, state size is generally thought of as the result of a trade-off between the benefits of size and its costs (Alesina and Spolaore, 1997, 2003). Benefits of size stem from fixed costs in the provision of public goods, which makes living in a small state costly to each individual taxpayer. The costs of size are due to individual heterogeneity, which reduces the utility from the consumption of public goods to those individuals located far away from the government in terms of preferences or geography. If individuals are located far enough from the source of public goods, they may gain by seceding and providing public goods themselves, even if this provision is proportionally more costly. This basic trade-off can be moderated by a number of factors. If barriers to trade are generally high and they coincide with state borders, there are additional benefits from living and doing business in a larger state (Alesina et al., 2000). The political regime matters too, because autocratic rulers do not bear the full costs of heterogeneity and will therefore opt for larger states. Finally, different preferences for redistribution and differential income levels between regions can be factors leading to disintegration (Bolton and Roland, 1997).

Although these theoretical predictions can yield helpful insights into the formation and fragmentation of states, they have not yet been tested econometrically. Empirical efforts have been made to test the relationship between country size, openness and growth on a global level (Alesina et al., 2000; Spolaore and Wacziarg, 2005; Rose, 2006; Alouini and Hubert, 2015), but not the mechanism which leads to an increased number of countries, i.e. secession itself. An exception is Desmet et al. (2011), who calibrate a model of state fragmentation to successfully postdict the sequence of exit of five Yugoslav republics from their former state. Yet the small number of republics in that historical case clearly limits the scope for any econometric exploration.

This paper attempts to fill that gap by treating the dissolution of the Soviet Union as a historical experiment to test economic theories of state break-up. I exploit extensive variation in the number and size of separatist demonstrations across the 184 provinces of the Soviet Union in the late 1980s and early 1990s to construct an estimate of the popular demand for secession.[2]

This approach has a number of distinct advantages. Firstly, the liberalizing reforms of Mikhail Gorbachev provided a historic window of opportunity for separatist protests to take place without being subject to the concerted suppression that characterized the earlier Soviet Union, or indeed some of its successor states. Furthermore, the fact that 66% of Soviet provinces saw popular demand for secession provides the number of observations required for systematic testing. The provinces' heterogeneity in terms of geographical location, ethno-linguistic composition and economic development provides variation in the explanatory variables. At the same time, the fact that all secession demands originated from the same institutional framework helps to keep a number of confounding factors constant. I am also able to use demonstrations against secession as a useful cross-check on the results. Protests also provide some information on the identity of

[2]For the remainder of the paper, I use the term secessionism to refer to the demand for a fully fledged independent state. Separatism, on the other hand, is the broader category and includes the demand for extensive autonomy. Extensive autonomy encompasses demands for the territory in question to provide some of the public goods that are normally considered the prerogative of independent states, such as defense, or migration, trade, monetary and foreign policy.

the participants themselves, and they allow for the expression of multidimensional demands. They have the additional advantage of providing ample variation in both time and space, as well as variation in size.[3]

Finally, focusing on the popular demand for secession or autonomy, rather than on political outcomes, is most appropriate when testing the theoretical literature. The theory focuses on secession by popular demand, while in practice, acts of secession may have more to do with power considerations by local elites. This paper offers support for this assertion by using weather outcomes as an instrument for protest attendance. This allows for an examination of the extent to which autocratic leaders do actually engage in separatist policy as a reaction to popular demand for separatism.

The main objective of this paper is to empirically explore the determinants of popular demand for a separate state, and the way this demand influences the decisions of regional leaders. I will have little to say about the reaction of the central government to separatism.[4] Indeed, one of the advantages of the Soviet case is that large scale repression of separatist movements by the center was very rare (see section 3.3.2). I do, however, control for military variables that proxy the repressive capacity of center. Additionally, I will not theoretically examine the collective action problem of participating in protests. Instead, I follow Finkel et al. (2015), who provide a micro-founded model of protest participation in Tsarist Russia. One of their outcomes is that the cost of protesting to the individual is decisive in influencing turnout. I therefore allow the cost of protesting to differ between regions by empirically modeling repression by local authorities.

The approach chosen in this paper is similar in spirit to a number of articles that have used participation in demonstrations to proxy for political views. Cicchetti et al. (1971) used variation in travel costs for the participants of the November 1969 protests against the war in Vietnam to derive a willingness to pay for left-wing political change. In a more recent contribution, Madestam et al. (2013) use attendance at Tea Party rallies to predict a range of local political outcomes in the US, including Republican votes in midterm elections and policy decisions by local politicians. Most importantly, the authors use precipitation as an instrument for protest attendance, which allows them to estimate a causal effect of popular protests on political outcomes. Although my paper uses a similar methodological set-up in examining political outcomes, I examine autocratic polities, as well as the determinants of protests themselves.

This paper is also related to a large body of literature that has tried to test theories of separatism and nationalism stemming from the political science literature. Most importantly, Beissinger (2002) collected protest data from the Soviet Union to explain the development of an ethnically based nationalism for large Soviet minorities. His focus was on nationalities, rather than territories. A different strand of the literature has used official declarations of autonomy by Soviet and Russian regions to provide variation in the disposition to secede (Emizet and Hezli, 1995; Treisman, 1997; Hale, 2000). A number of authors have also used variation in vote shares for separatist parties in large cross-sections of countries (Fearon and van Houten, 2002; Sorens, 2005). In addition to not all being able to offer the advantages of a multi-province historical experiment outlined above, none of these contributions tests economic theories of secession.

To preview the results, I find that the main trade-off between size and heterogeneity is strongly supported by the data. Larger territories that are more different from the center in Moscow on some ethno-linguistic or historic dimension witness a higher occurrence of separatist protests *per capita*. The prediction that

[3] As the secession theories tend to be formulated in terms of time-invariant determinants, this paper focuses on the cross-sectional determinants of protests. I do, however, exploit the dynamics of protests when looking at the timing of separatist declarations by local elites.

[4] See Treisman (1999) for a game-theoretic approach to center-local interactions that is closely modeled on post-communist Russia.

differences in inequality matters is also partially borne out. Other determinants of secession, such as potential gains from trade or redistribution only receive qualified support. I also find that separatist policy is weakly related to the same set of factors that drives popular demand for secession. Additionally, the relationship between separatist protests and elite separatism is strong in a naive regression. However, the use of weather outcomes as an exogenous determinant of protest attendance suggests that decisions by local leaders are not driven by the popular demand for secession.

The remainder of this paper is structured as follows. The next section gives an overview of economic theories of state break-up and their main predictions. Section 3 then briefly describes the political environment in the Soviet Union and Russia in from 1985 to 1994, as well as the administrative divisions that are of interest. Section 4 uses this information to construct a disaggregated measure of popular and elite separatism, as well as the independent covariates. Section 5 motivates the empirical model. Section 6 shows the results of predicting popular demand for secession, and contrasts this to separatist policy by local elites. The last section concludes and offers an outlook for further theoretical work in this field.

2 Economic Theories of State Break-up

Thinking about the determinants of secession and state size has some pedigree in economics. Robinson (1960) considered the relationship between state size and and growth. Friedman (1977) posited that state size may be a function of the government's type of revenue, if revenue types vary in terms of efficiency. Since these early contributions, the literature has grown large and diverse, partly in response to the proliferation of independent states after the fall of the Soviet Union (see Ruta (2005) and Bolton et al. (1996) for surveys). I constrain myself here to outlining a number of key themes in the literature, and stating the predictions they make for the determinants of secession.

The most fundamental issue a model of state size faces, is to outline what the costs and benefits of being part of a unified state are. Without costs of size, every individual could be part of the same state, and without benefits of size, each individual could found their own state. Buchanan and Faith (1987) were among the first to entertain the idea that economies of scale in public goods provide a lower limit on state size. In their seminal contribution, Alesina and Spolaore (1997) model the state explicitly as a provider of one public good, where benefits of size arise from economies of scale in the provision of the public good. If per capita incomes among citizens are equal, larger states can spread the cost of funding that public good over a larger number of taxpayers, meaning that *per capita* costs should decrease in size.

Conversely, there is a cost attached to living in a large state, because individuals' preferences are heterogeneous. This reduces their utility from the consumption of the standardized public good. For example, linguistic minorities may not receive the same utility from receiving schooling in the language of the majority as they would in their own. Alesina and Spolaore (1997) model this heterogeneity in the spirit of a Hoteling approach, where all individuals are located uniformly on a line, and geographic distance on the line is assumed to coincide with distance in preferences. The government providing the public good is located in one place inside a country's borders. The incentive to secede should thus increase with an individual's distance to the seat of government. It should decrease with the size of the country, keeping heterogeneity constant.

A number of variations on this basic framework have been conceived. Goyal and Staal (2004) model a similar trade-off between size and heterogeneity under the restriction that provinces can secede, but not individuals. This leads to the conclusion that the incentive to secede is increasing in the size of the future state. For the purposes of this paper, where secession by provinces is a more realistic assumption than individual secession, this provides a useful benchmark result.[5] Other contributions have looked more closely at the notion of heterogeneity. Olofsgård (2003) explicitly models different ethnic groups within a state, and finds that increased cultural distance increases the likelihood of secession. Alesina et al. (2004) model a trade-off between racial heterogeneity and the size of US school districts, while Desmet et al. (2011) model the heterogeneity and size trade-off for possible unions between European countries. Finally, Alesina and Reich (2014) make heterogeneity endogenous to state policy, emphasizing that many states have historically sought to homogenize the preferences of their populations through policy and institutions.

Another important theme in the literature has been the interplay of secession and the international economic environment. Contributions by Casella and Feinstein (2002) and Wei (1991) both consider the relationship between international trade, economic development and jurisdiction size, but the predicted relationships are ambivalent. An extension of the basic Alesina and Spolaore (1997) framework described above, developed by the authors in the same paper, is able to deliver quite sharp predictions. This extension features a positive human capital externality, while the stock of human capital depends both on domestic and foreign human capital. If borders do constitute high trade barriers to the cross-border transmission of the human capital externality, then countries are more dependent on the size of their domestic human capital stock, and smaller countries are unlikely to be viable. Globalization decreases trade barriers and therefore mediates the size advantage of large countries, increasing secession incentives.[6] Etro (2004) reaches a similar conclusion under the assumption that trade openness is exogenously determined. This presents an angle to approach the issue empirically. Although seceding regions may choose their own trade policies, part of their openness is determined exogenously by geography.

A quite different strand of the literature focuses on income differences as the primary feature of heterogeneity in the population. Buchanan and Faith (1987) show that the richer segments of the population may have an incentive to overtax the poorer segments. Because these are too poor to fund the fixed costs of a separate state, they cannot credibly threaten secession. A conclusion along similar lines is reached by Dagan and Volij (2000), who argue that richer individuals are more likely to secede from a state in the presence of extensive redistribution. An influential paper by Bolton and Roland (1997) formalizes such insights in the framework of a two region model, where regions have both different income levels as well as different income distributions. In this setting, the richer region may still want to separate in order to avoid paying transfers to the poorer region. A more subtle effect, however, is given by the possibility that the poorer region with a more unequal income distribution may desire secession too, because it seeks to implement more redistribution than it could accomplish in the union. In other words, both differences in income levels, as well as differences in the income distribution, may drive secession.

[5] I will consequently concentrate on the size of the future state in the empirical specification, following Goyal and Staal (2004).

[6] The authors also develop this idea in a separate paper (Alesina et al., 2000) using a model which features actual free trade within a country rather than human capital externalities. The results are relatively similar. In applying the model to the context of the late Soviet Union, however, free trade among the regions is clearly too strong an assumption, while the focus on human capital is more suitable. It should be noted that the basic model delivering the trade-off between size and heterogeneity does not require free exchange, which would have rendered its application to the Soviet context more difficult.

Two themes that are intimately connected to the issues described above are the effectiveness of transfers, and the way that decisions on transfers and borders are made. On transfers, the literature is divided on whether transfers between regions or between individuals can successfully prevent secession. In the framework by Bolton and Roland (1997), this is not necessarily the case. Haimanko et al. (2005) on the other hand, argue that a full-compensation scheme can prevent state break-up even in highly polarized states.

With regard to the decision making mechanism used, the main interest for the purposes of this paper is the decision rule on borders. In the framework by Alesina and Spolaore (1997), the main dichotomy is between democratic and autocratic rules. If democratic procedures are used and unilateral secession is permitted, individuals located near the border may have a higher incentive to secede, because they do not fully bear the efficiency loss of smaller states, which is partly borne by those left behind in the rump state. Under dictatorship, conversely, countries will be larger because the dictator seeks to maximize tax revenue, while not bearing the costs of excessive heterogeneity. The literature does not consider the case where the seceding units themselves are run by local 'petty' dictators or revenue maximizing elites, as would seem to befit many of the regions of the late Soviet Union (Suny, 1993).

3 Historical Background

Before discussing the choice of data and method in the remainder of the paper, it is necessary to briefly consider the historical context of separatism in the Soviet Union, as well as the most salient features of the Soviet Union's administrative divisions.

3.1 Soviet Federal Structure and Ethnicity

The Union's federal system can be likened to a pyramid (figure 1). Its structure reflected the substantial geographical and ethno-linguistic diversity of the Soviet Union. This in turn reflected the fact that the Soviet Union was, geographically, to a large extent a continuation of the multinational Russian Empire. The Empire had grown outwards from the small Grand Duchy of Moscow between the 15th and 19th centuries, gradually absorbing the multitude of smaller states and peoples on its borders. By the time of the last Soviet census in 1989, demographers counted 60 distinct nationalities of more than 100,000 members within the Soviet borders (Goskomstat SSSR, 1991).

The center of this multinational Union, located in Moscow, wielded most power. Some authority was delegated to the next level, which comprised the 15 *Union Republics*. These Union Republics were supposed to be the 'sovereign' home states for the country's 15 major nationalities. Each Union Republic possessed its own state symbols, Communist Party, separate parliaments, police forces, educational institutions as well as an extensive government bureaucracy.

The units below the Union republic level, sometimes informally called *provinces* (Beissinger, 2002), constituted the middle level of the federal hierarchy. This level comprised 159 units by the time of the 1989 census. They can be divided into two groups. Territories in the first group, called Autonomous Republics (ASSR), Autonomous Oblasts (AO) or Autonomous Okrugs (AOk) had a special administrative status. They were the home territories of 'minor' nationalities. Of these, the ASSRs were in theory the more senior federal units, and were supposed to receive more funding and autonomy rights, but in practice the difference

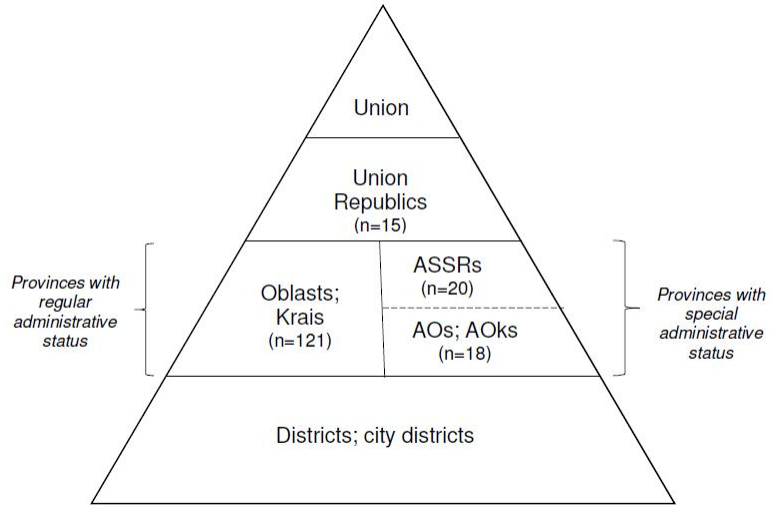

Figure 1: Federal structure of the Soviet Union according to the 1989 census

seems to have been less clear (Walker, 2003). Maps A.1 and A.2 display these territories. The second group of provinces, those that had no special administrative status, were called Oblasts or Krais. Nonetheless, even these units often contained substantial ethnic diversity.[7]

This was partly due to the role of traditional diasporas such as Armenians and Jews in the Caucasus and Central Asia, but also to Tsarist colonization and Soviet industrialization policies. These moved ethnic Russians from their original locations of settlement into the Baltics, southern Ukraine, Siberia, and Central Asia (Suny, 1993). These regions therefore contained substantial Russian, or Russian-speaking, minorities. In some cases, such as eastern and southern Ukraine, northern Kazakhstan, as well as most of Siberia, they constituted majorities. In addition, Stalin's brutal nationality policies of the 1940s had seen to the deportation of millions of members of Caucasian nationalities, as well as ethnic Germans and Koreans, to Central Asia. Many still lived in there in the 1980s. However, as diaspora members, work migrants, and former deportees were not considered to be 'native' by Soviet policymakers, they were not given their own federal subunits in the locations where they resided.

Finally, the sub-provincial level of federal administration was made up of *districts* ('raions'), which included some large towns that comprised their own district. Another regional division, quite apart from the administrative division just outlined, was sometimes used for economic planning and statistical purposes. To that end, the USSR was divided into 21 *economic regions*, each of which comprised a set of provinces with a high degree of economic and historic similarity.

Soviet economic and fiscal policy interacted with this federal system in several ways. On the one hand, planners strove to equalize interregional income differences (van Selm, 1997), which they tried to accomplish using direct fiscal transfers between the central Union budget and the budgets of subordinate republican governments. Through this system, the economically more developed western Union Republics became net donors to the poorer Union Republics in Central Asia, for whom direct transfers constituted 18-25% of local government revenues (Orlowski, 1995).

[7]For example, Crimea and the russophone eastern provinces of Soviet Ukraine were regular Oblasts.

On the other hand, the Soviets also constructed a complicated system of indirect transfers, which was based on the mandatory exchange of underpriced raw materials and energy against overpriced manufactured goods. This system tended to benefit the industrial producers of consumer goods located in the Baltics and Belarus, and tended to work to the disadvantage of those regions in Russian Siberia, Azerbaijan and Central Asia that were resource abundant (Orlowski, 1993). At the same time, Soviet leaders, including Gorbachev, periodically started campaigns to emphasize economic criteria at the expense of proportional national representation in personnel decisions. This effectively worked to the advantage of ethnic Russians, who generally constituted the better educated managerial and technical elite in Soviet enterprises (Schroeder, 1990). The resulting sense of discrimination was heightened by the fact that the provision of goods was generally perceived to be better in Moscow than in the periphery (Hanson, 2003).

3.2 Protests and Repression

Although this federal structure clearly had the potential for conflict, open dissent in favor of secession was rare for most of Soviet rule. Stability was partly ensured by the cooption of local national elites, many of whom gained substantial discretionary power during the last decades of Soviet rule and effectively became local petty dictators (Suny, 1993). Those few individuals that did dare advocating regional autonomy or even independence were confined to labor camps or psychiatric clinics. Where any form of public unrest did surface on a broader scale, as in the town of Novocherkassk in 1962, Soviet authorities did not hesitate to use lethal military force to quell the unrest. The threat of harsh repression was continuous, and it was credible (Beissinger, 2002; Harrison, 2002).

This changed with the advent of Gorbachev, who took office in 1985. Gorbachev initiated a liberalizing reform program that encouraged free public discussions on the future of the Soviet state. This was bold by Soviet standards, and it was quickly taken up by dissidents to include discussions of regional rights and autonomy too. Gorbachev also made repeated statements emphasizing political rather than military solutions to territorial conflicts (Fowkes, 1997). After the 19th All-Union Party Conference in July 1988, liberalization went beyond the rhetorical (Hale, 2000). At the Party Conference, it was decided that the citizens of federal units were to select members of a new parliament, the Congress of Peoples' Deputies, based on partly competitive elections. It also called on state organs to respect citizens' legal rights, such as the right to assembly. For the first time in Soviet history, this enabled legally sanctioned demonstrations to be held (Beissinger, 2002). In essence, these reforms helped to transform a narrow dissident movement into broad based popular protest (Walker, 2003).

Mass demonstrations advocating regional autonomy and even secession increased markedly in number and in extent, first in the Baltic states, and then elsewhere. Regional elites started calling for more autonomy too. The Estonian local Parliament, the Supreme Soviet, passed a resolution declaring the "Sovereignty of the Estonian Soviet Socialist Republic" . Other local parliaments and leaders, including within Russia itself, followed suit in the months and years afterwards. In parallel, interethnic tensions flared up in the Caucasus and Central Asia, most notably between Armenians and Azerbaijanis, where conflict quickly turned violent.

Repression did not abide completely, but shifted down markedly in its extent, and also changed qualitatively in two important respects. For one, the responsibility of policing demonstrations was moved from the central authorities to local bodies. These were in a weak position to regulate protests and often did not have the effective means to control large crowds comprising up to 100,000 participants (Beissinger, 2002). Sec-

ondly, the use of large scale military force was reserved to quell interethnic violence, rather than secessionist demonstrations. Where violence was used in attempts to control demonstrations, the initiative seems to have been taken by local officials, and the central government was quick to deny any involvement (Fowkes, 1997). Effectually, the regime of repression had become weak, fragmentary and idiosyncratic.[8]

The official end of the Soviet Union in December 1991 did not stop completely halt the tide of separatistm. Separatist protests had already begun to spread to lower level federal units at the same time as they had engulfed the 15 Union Republics. Accordingly, a number of provinces outside Russia, especially in the Caucasus, demanded their individual secession. Moreover, the Baltic States, Ukraine and Moldova faced pressure from Russian minorities. Russia itself faced separatist demands from many of its regions, with Tatarstan and the North Caucasian provinces being the most significant in terms of popular local support (Treisman, 1997).[9]

The Russian government had been astonishingly supportive of these regional separatisms. Yeltsin, at that time already Russian president, famously told Russia's regions to "Take all the sovereignty you can swallow" in August 1990 (Walker, 2003). Only in the course of the years 1994-1996 were the secessionist movements gradually contained as the central Russian government concluded a series of power sharing treaties with individual provinces (Hughes, 2001). In the case of Chechnya, the conflict escalated into war in 1994.

In sum, the time period between 1987 and 1994 can be taken to present a unique opportunity to study the determinants of secession within the framework of a single state, relatively unconfounded by the distortions of large scale military repression.

4 Data and Variables

4.1 Dependent Variables: Separatism

I employ two different ways of quantifying the regional separatism of the late Soviet and early post-Soviet period described in the previous section. The first method focuses on popular demand for a new state, the second on official acts of autonomy. For the purposes of testing theories of secession, the first approach may be the more appropriate. As mentioned before, demonstrations are more likely to reflect an underlying popular demand for secession than official declarations. However, elite separatism may be decisive in practice, especially in largely autocratic polities.

[8] The central authorities' refusal to use concerted force on a large scale was not solely due to Gorbachev's personal dislike of military repression. There were material reasons as well. Gorbachev's political program as a reformist leader hinged on liberalization and the rule of law. When force was used, as in Tbilissi in 1989, it usually backfired in the face of subsequent public outrage (Beissinger, 2002). Senior military leaders were also wary of using the army for internal means. Morale was low among ordinary soldiers, and dodging the draft was common. In effect, the Soviet Army had neither the means nor the will to control the extent of the popular uprisings of the late 1980s (Fowkes, 1997). This may suggest that the costs of large scale repression had become to large for the government to bear (Harrison, 2002).

[9] It is important to note that the phenomenon of separatism within Russia in the early 1990s was not confined to those ethnically defined regions seeking independence. There was also the parallel movement towards regional autonomy and localism from the predominantly 'Russian' parts of Siberia, that felt neglected by Moscow economically (Hughes, 2001; Herrera, 2004).

4.1.1 Protests

I proxy for separatist demand using mass demonstrations, which were collected by Beissinger (2002). The data set by Beissinger (2002) covers 5,584 demonstrations that took place across the territory of the Soviet Union and its early successor states between December 1986 and December 1992. Demonstrations were recorded regardless of their demands, based solely on them receiving mention in the independent domestic or international press, underground *samizdat* publications, government archives or official police reports.[10]

For each demonstration, the location of the event, its starting date, the duration, the organizers, and the number of participants were recorded by Beissinger (2002). Where it was available, some information on the identity of the protesters, such as 'workers' or 'Kazakhs' was also recorded, as well as the number of those arrested, injured or killed during the event. If more than one source of data was available for a demonstration, averages were taken to arrive at an estimate for the number of participants or casualties. Most importantly, the database lists up to five demands for each protest. These cover a broad array of issues that people in the late Soviet Union were concerned about. Some demands are targeted at instances of official corruption or directed against particular politicians; others complain of rising prices or shortages, others seek economic liberalization or the correction of historical injustices, or the restoration of the Church. Some advocate a return to Stalinism, and some demands are overtly racist.

In coding these protests into an indicator of separatism, I first excluded all those protests that did not feature at least one demand explicitly calling for the creation of a new independent state or a fundamental change in the boundaries or responsibilities of a federal subunit. Vague demands that implied a general feeling of nationalism, or those that aired cultural or historical concerns remotely connected to statehood, were also excluded. The guiding principle used is that a demand should imply a clear change in the level of government providing public goods. In cases where this was difficult to determine, a judgment was made by looking at the identity of the protesters, the organizers' political program, and the historical and locational context of the protest. As a next step, irredentist calls for boundary changes, i.e. those calling for the unification of two territories, were excluded if they did not at the same time advocate secession from the USSR. Finally, calls for the exit of Russia as a whole from the Soviet Union were excluded. These are a priori difficult to frame in terms of the economic theory of secession, as a Russian exit would not change any Russian region's distance to the government. This selection decision affects only a very small number of cases.

This leaves 1,880 demonstrations for the analysis. These need to be divided further according to the combination of state size and heterogeneity that they advocate. Two criteria are used. The first is according to the territory whose secession is advocated (individual province, or Union republic). The second criterion divides the data into a narrow *secession category*, where nothing less than the complete exit of a territory is demanded, and a broader *autonomy category*. The autonomy category additionally includes demands such as that a territory be given economic or legal autonomy, that it be granted its own armed forces, currency etc.

[10]The exact definition of a demonstration employed by Beissinger (2002) is that of any voluntary gathering of individuals exceeding 100 persons, which is open to the public, and whose primary aim is to peacefully advance or advocate a political demand or opinion. This does include demonstrations that turned violent, for example because of police actions. It does not include gatherings whose primary aim was to inflict violence, such as lootings, pogroms, or armed uprisings, whose determinants are likely to be quite distinct from demonstrations.

This procedure yields three groups, which are partially overlapping due to the fact that one demonstration can enter several groups. Thus the variable SECREP describes only protests advocating the full secession of a Union Republic from the USSR, AUTREP calls for far-reaching autonomy or secession of a Union Republic from the Union. Finally AUTPROV is the broadest category, calling for the far-reaching autonomy or secession of any province in the Soviet Union, either by itself or in conjunction with others. The same procedure is carried out for protest participants.

Anti-secessionist protests are coded in the same manner, defined as gatherings opposing any of the demands described before. This adds another 361 demonstrations to the analysis. The variables and their descriptive statistics are displayed in Table B.1 and B.2.

All protests are aggregated to the level of the provinces, which constitute the fundamental unit of analysis in this paper. Even when demands for the secession of a Union Republic are analyzed, the variation in demand at the level of the republic's provinces can provide useful insights. Provinces are defined as they appear in the Soviet census of 1989 (Goskomstat SSSR, 1991) and correspond to the middle level in the federal hierarchy described in section 3.1 and figure 1. I add the 15 capital cities of Union republics (which are technically not provinces of their own) as separate units, given the fact that they are both in terms of their economic structure as well as in their ethno-linguistic composition often quite different from the surrounding countryside. Capitals may also be a particularly attractive and visible place to protest, and may therefore see more than their normal share of demonstrations. I also add the so-called 'republican districts ' which are districts immediately surrounding some capitals, as separate units. I control for the area surrounding the capitals and for the capitals itself in the empirical analysis with the dummies DISTRICT and CAPITAL.

In total, there are 184 'provinces' . Of these, 121 witness separatist protests, while 57 see anti-separatist protests. A total of 28 provinces do not see any protests at all. The distribution of protests across provinces is mapped in map A.3 and A.4. The pattern appears to corroborate the historiographical literature (Walker, 2003; Suny, 1993): Separatist protests are high in the Baltics, Ukraine and the Caucasus both in absolute numbers as well as in shares of the population. Within Ukraine, the western regions were proportionally more separatist. Demonstrations in Central Asia seem to be confined to the republican capitals and the regions surrounding the Fergana Valley. Within Russia, a 'protest belt' stretching from Tatarstan almost to Lake Baikal stands out. The relatively homogeneously Russian, but very remote, regions on the Pacific coast also experience some degree of popular separatism.

4.1.2 Elite separatism

Separatist policy can be measured by counting the number of separatist declarations and laws passed by regional authorities, as done by Treisman (1997) and Herrera (2004). An alternative is to exploit variation in the timing of the autonomy declarations as in Emizet and Hezli (1995) and Hale (2000). I employ both metrics.

DECLARATIONS is a categorical variable counting the number of separatist declarations made by provincial governments. It is a composite of two indices available in the literature. For the 32 Russian provinces with special administrative status, the index by Treisman (1997) sums the number of distinct policy areas in which local authorities unilaterally asserted their independence.[11] Herrera (2004) devises a

[11]There are 11 possible policy declarations: Declaration of national autonomy ('sovereignty'), declaration of full independence, unilaterally raising administrative status, adoption of own constitution, asserting legal supremacy, holding an unsanctioned referendum,

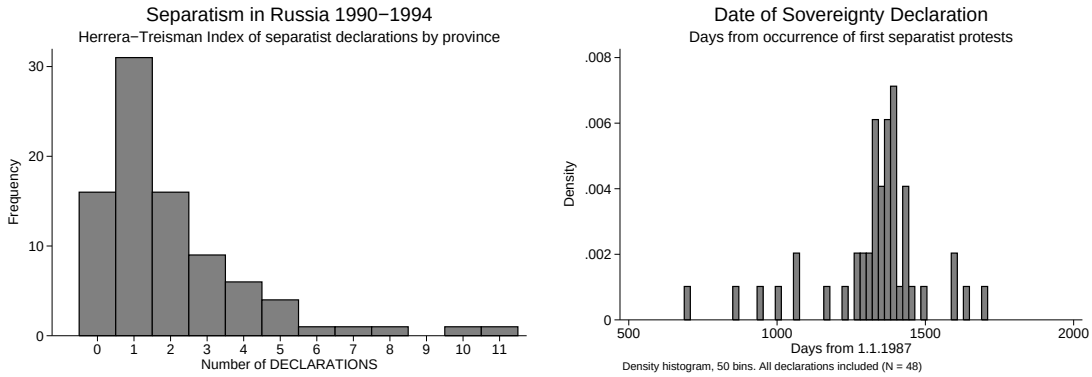

Figure 2: Indicators of separatist policy: Count of separatist declarations and timing of sovereignty declarations

similar index for the other 55 Russian provinces. Both indices are restricted to Russia and only count declarations up to 1994, the year when the Russian center began to gain back control over the provinces. I sum both (unweighted) indices to arrive at a final measure of local separatist policy.

A check on the robustness of this index is provided by exploiting the timing of autonomy ('sovereignty') declarations in the whole of the Soviet Union, using the exact date of these declarations. In the late Soviet context, sovereignty declarations were used by both provinces within Russia as well as by Union republics and individual provinces in the rest of the USSR to state their autonomy in legal matters from the center. They often preceded independence declarations. An early timing of this declaration is often taken by historians and political scientists as an indication of a high propensity to secede (Emizet and Hezli, 1995). This variable is different from all previous measures of separatism in that it (a) exhibits a time dimension and (b) mandates the combination of provincial and republican level data.

I collect the exact date of sovereignty declarations from every territory that issued one from a variety of secondary literature (Walker, 2003; Council of Europe, 2003; Hale, 2000; Treisman, 1997; van Selm, 1997; Lane, 1992). Where both a Union Republic and a subordinate province issued a declaration, both were recorded separately. Whenever sources disagreed about the exact timing or nature of a declaration, the majority of opinions was given prevalence. In total, this yields 48 SOVEREIGNTY declarations. These stem from all 15 Union Republics, from 29 units of special administrative status inside Russia, and from 4 other territories outside Russia.[12] The dependent variable is then calculated as the number of days elapsing since the 1.1.1988, which marks the start of the separatist protests, to the declaration.

Figure 2 displays the distribution of DECLARATIONS and SOVEREIGNTY. The Herrera-Treisman index of DECLARATIONS shows that there was considerable regional variation in separatist policy stance, and that the majority of Russian regions did engage in some extent of separatist policy. The SOVEREIGNTY measure, which only records those units with a positive degree of separatism, also displays some variation. However, most sovereignty declarations are clustered together in the year 1990.

boycotting federal elections, refusing to send military conscripts, engaging in independent foreign policy, claiming ownership over natural resources, and asserting right to own currency Treisman (1997).

[12]Territories with special administrative status are shown in Maps A.1 and A.2.

4.2 Independent variables

4.2.1 Size

The main explanatory variables of interest are size and heterogeneity. Size should be the size of the state people demand in their protests. For those regressions testing the demand for the secession of Union Republics, the republican population from the 1989 census, POPREP, is the natural choice. For the AUTPROV regression, where some provinces seek exit from the Union on their own, and some in combination with others, POPPOT accords the provincial population to any Russian province and any unit with special administrative status outside of Russia, and the republican population to the rest. This reflects the fact established in section 3.2 that mainly Russia saw separatist movements from individual provinces, whereas most individual provinces with separatist movements outside of Russia were provinces with special administrative status.[13]

4.2.2 Income

An additional complication is that treating population size as being synonymous with country size is dependent on the assumption of equal and exogenous incomes for all citizens in the basic model by Alesina and Spolaore (1997). The Soviet Union may have come closer to this assumption than most other polities in history, but income differences did exist within Socialism, too. Controlling for per capita income is therefore necessary. Unfortunately, income estimates are not available on a provincial level. Soviet income data are also not deemed to be very reliable, as accounting standards differed between republics, and wages were not a good indicator of actual income. A better indicator is per capita consumption, which takes income from unregistered sources into account (Mitra and Yemtsov, 2006).[14] It has the additional benefit that it is recorded on a provincial level.

One drawback is that it does not take regionally varying savings rates into account. This could be an issue, given the fact that savings in the Soviet Union were largely forced, i.e. caused by a limited availability of goods, which might be region-specific. I therefore adjust the consumption data using the ratio of money incomes to retail sales collected from household budget surveys for the level of Union Republics by Kim and Shida (2014). The resulting variable INCOME confirms to what one would expect for the period: It is higher in the more industrial and urban areas of the Baltics, whereas it reaches its lowest values in the underdeveloped areas of the Northern Caucasus and Central Asia. It also reaches high values in those areas of Siberia heavily engaged in oil production that see the employment of a highly subsidized labor force.

This variable also allows a test of Bolton and Roland (1997) hypothesis that income differences matter for separatism. Similarly, the contention that differences in the income distribution DEVINCOME matter for the incentive to separate is tested by including a variable DEVGINI, which is the deviation of the Gini-

[13]The empirical results are similar if each province is accorded their respective republican population, except for those provinces that see more than 25% of protests advocating autonomy for that particular province.

[14]Consumption includes all goods sold though the state and private ('cooperative') retail sector. It also includes food distributed by the state, but excludes consumption of immobile goods, primarily housing and utilities. These can be taken to be constant in the Soviet context. Data sources are the republics' statistical yearbooks for the year 1989 (Goskomstat, various, 1990). In those cases where values were only available for 1988, the corresponding values for 1989 were imputed using the average consumption growth rate for the republic.

coefficient from the Union-wide mean using data from Alexeev and Gaddy (1993). Unfortunately, this variable is only available on the level of the Union republic.

4.2.3 Heterogeneity

Heterogeneity between the center and the periphery can have many components. The most straightforward measure, which is closest to the model by Alesina and Spolaore (1997), is geographical distance. I use the great circle distance between a provincial capital and Moscow in GEODIS. I also calculate the difference between the distance to Moscow and the distance to the Union republican capital for each province (GEO_DIF). This is set to capture the notion that people decide between two alternative 'bundles' of public goods provision.

Another dimension of heterogeneity alluded to in the literature is ethnic differentiation between a province and the seat of government Goyal and Staal (2004). Accordingly, I compare the composition of each province's population by nationality as recorded in the 1989 census to the composition of the Union center using a Finger and Kreinin (1979) similarity index (ETHDIS_FK).[15] An alternative 'matching' measure, ETHDIS_M, is also calculated based on the probability of two randomly drawn individuals from each province being of the same ethnicity.

Another aspect of heterogeneity is linguistic distance, which reflects the fact that some languages are more similar to others in terms of their grammatical structure, syntax and vocabulary. This can be seen as a rough proxy for the ease of interaction between speakers of different languages. I follow Fearon and van Houten (2002) in using a classification schemes from linguistics (Lewis, 2013), which categorizes languages into branches and sub branches based on their innate grammatical and lexicographic traits. Linguistic similarity is then defined as the position of the last common node of two languages in this language family tree. This is then converted into an opposite measure of linguistic distance, LANGDIS. I take the majority language spoken in a province as my point of reference. This may be relevant in the Soviet context, as the main language spoken does not always coincide with the ethnic group constituting the majority in a region. The difference in the main reflects the tendency of some non-Russian nationals, especially in Ukraine and Belarus, to speak Russian as their native language.

Although the Soviet Union was theoretically an atheist state, religion was practiced widely. Historically, the treatment especially of Muslim minorities had been a salient issue in Russian imperial history (Kappeler, 2001). Religion can therefore be seen as another important cleavage. I include a dummy variable MUSLIM if a region has a Muslim population of more than 30%, based on the 1979 census.

Finally, it may be that heterogeneity of preferences does not coincide with measurable indices of ethnolinguistic differentiation or geography, but rather reflects unobservable cultural norms that are specific to particular societies. The literature on secession has posited that the state can seek to homogenize these norms, for example through the education system or the bureaucracy, in what is sometimes called "nation building" (Alesina and Reich, 2014). If this is true, the longer a society is part of a particular state, the more

[15] The distance between populations i and j is calculated as $1 - ETHSIM$, where

$$ETHSIM_{ij} = \sum_k min\left[\left(\frac{(x_{i,k})}{(\sum_i N_i)}\right), \left(\frac{(x_{j,k})}{(\sum_j N_j)}\right)\right]$$

where $x_{i,k}$ is the population of ethnicity k in province i and N_i is the total population in that province. The ETHDIS index takes values between 0 and 1, where 0 denotes completely identical populations.

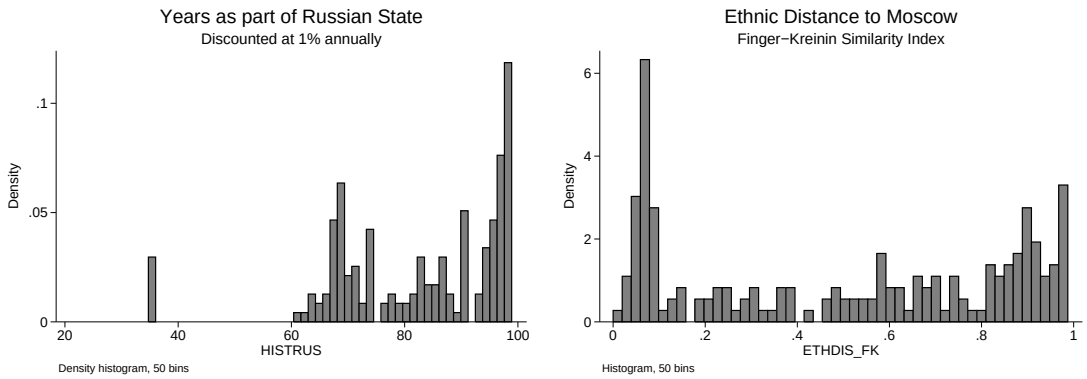

Figure 3: Heterogeneity between Moscow and the provinces: ethnicity and history

similar its preferences should become to those of the state's government. I take up this idea by constructing an index HISTRUS detailing the length of time a province has been part of the Soviet Union or one of its predecessor states, the Russian Empire or the Grand Duchy of Moscow.

To accomplish this, I record the first time a province came under the influence of a Moscow or St. Petersburg-based government using standard histories of Russian imperialism (Kappeler, 2001) and colonialism (Breyfogle et al., 2007) and the Great Soviet Encyclopedia (Paradise, 1978). I take the date that corresponds most closely to the point in history when physical Muscovite, Russian or Soviet presence began, either through direct conquest or through permanent settlement. In those cases where Russian presence was fragmentary due to enduring resistance by native peoples, such as in the North Caucasus or Bashkiria, I record the date at which the resistance was finally subdued. I remove any years in which the province was temporarily not part of the Russian or Soviet state, such as was the case for the Baltic states during the interwar period. The variable is discounted backwards from 1987 to give more weight to recent years, using a discount rate of 1% per year. This reflects both the notion that memories of distant statehood should fade in time, as well as the idea that modern states with developed institutions might be better at "nation building" than their early modern predecessors. I experiment with different discount rates, ranging from 0.1% to 10% per year, and different definitions of what constitutes firm Russian presence, but the empirical results are insensitive to these alterations.

Figure 3 displays the distribution of HISTRUS and the ethnic heterogeneity measure ETHDIS. Both variables exhibit a bimodal distribution: Although a large fraction of provinces was very close to Moscow, a substantial minority was far removed from the center on counts of ethnic or historical heterogeneity. HISTRUS also exhibits a few outliers, which are the Ukrainian provinces added to the USSR after World War II.

4.2.4 Transfers

The literature also emphasizes the role of transfers, which the center can employ to compensate regions for not seceding. As described earlier, there existed direct budgetary and indirect trade transfers in the USSR. Both are only available on a Union republican level in the published literature. I calculate DIRECTSUB as net transfers in rubles per head based on the data in Orlowski (1995). Indirect transfers can be approximated

on a provincial level. To accomplish this, I take the total output of a province's processed food and light industries (Goskomstat, various, 1990), whose products were the most overvalued in the Soviet internal trading system. I then calculate the implicit subsidy received in the production of these goods using the republic specific ratio of world prices to domestic prices for that industrial category from Orlowski (1993). The resulting measure INDIRECTSUB is imperfect, because information on the whole industrial structure of a province is not available. It is therefore not possible to gauge the extent to which a province might also have been producing underpriced goods, so that the variable cannot be interpreted as a measure of net subsidies. It does, however, have the advantage of having been calculated for the provincial level.

4.2.5 Trade

Trading opportunities may also be important in shaping incentives to secede, because they allow smaller countries to raise their welfare level in the absence of large internal markets. A part of the opportunity to trade is determined by geography and may therefore be exogenous to the policy decision of a country. One simple way to model this is to include a dummy ENCLAVE if a region is completely enclosed, without access to the sea, by another country in the event of secession. This would present a case of very high trade costs. I also calculate a provinces' potential access to markets outside of the Soviet Union (MARKETPOT). It consists of distance to the capitals of all independent countries of Europe, Asia and the North America, weighted by those countries' 1990 GDP. The variable accords high values to the Baltic regions and low values to Central Asian countries, thus capturing that the Baltics could be expected to have good trading opportunities with large Western European countries, whereas that option was geographically less readily available to the Central Asian republics.

Similarly, changes in the terms of trade can to some degree be viewed as exogenous from the perspective of the post-Soviet republics, at least in the short run. As they entered world markets, their import and export prices had to adjust to world market prices. The variable TRADECHANGE uses contemporary forecasts of the change in the terms of trade based on 1989 domestic and world prices from Tarr (1994). In addition, TRADECHANGE is adjusted by contemporary forecasts on trade reorientation based on gravity models as collected by van Selm (1997) to arrive at a comprehensive estimate of potential trade volume changes. This variable is only available on the level of the Union republics.

A problem with the forecasted price changes used above is that they do not properly adjust for the lower quality of Soviet goods. An easier way to capture the potential gains from trade is to only examine homogeneous goods with a high external value, such as raw materials. As contemporaries were well aware, Soviet oil, natural gas and precious metals could command high prices on world markets (Jensen et al., 1984). I take data on the location of Soviet oil fields from historical maps published by the US Central Intelligence Agency (1982). As the oil fields on the map cover very large geographical areas, I only code a province as having an OILFIELD if it also possesses the starting point of an oil or natural gas pipeline. This implicitly controls for the size or productivity of a field, as minor fields are unlikely to have major pipeline connections. In addition, provinces which lie at the nodes of the pipeline network, constitute transit points of international oil export lines, or posses a marine oil terminal or refineries, are coded in PIPELINES. This variable captures the notion that control over hydrocarbon infrastructure may be as important as control over the resource itself. The coding of both oil related variables is cross-checked with estimates from the contemporary literature (Jensen et al., 1984).

Two other natural resources are similarly coded. Major deposits of mineral resources (ferrous, non-ferrous, light metals, precious metals and non-metallic minerals) are depicted as points on the Central Intelligence Agency (1982) map. MINERALS is then simply the sum of all points within a province's territory. COAL is coded separately, with a dummy taking a value of 1 if a coal field lies inside a province's boundaries.

4.2.6 Repression

The total number arrested at *any* protest (ARREST), as well the number of protests where police violence took place (VIOLENCE), are taken from the Beissinger (2002) dataset and aggregated on a provincial level. There is substantial variation in ARREST that correponds to the assessment of the historical literature (Beissinger, 2002). In Central Asia, significantly more participants, both in absolute numbers and in proportion, are arrested at protests than in other parts of the USSR, indicating generally higher levels of repression. I also include three military variables to capture a possible threat of repression that may influence a population's propensity to protest. ARMY counts the number of bases of division strength of the Soviet Army's ground forces in a province in 1990, excluding non-mobilized or support troops. PARAMILITARY counts the number of bases (regiment and battalion strength) belonging to troops subject to the Soviet interior ministry.[16] Finally, it may be that repression was generally tighter in the vicinity of objects of paramount national security. I capture this possibility by controlling for the number of NUCLEAR weapons bases in a province. The military data comes from Lenskiy and Tsybin (2001) and Feskov et al. (2014). These works, in turn, are largely based on data published by the Soviet government under the terms of the Treaty on Conventional Armed Forces in Europe (CFE).

4.2.7 Temperature

Temperature data stems from the US National Climatic Data Center (2015). The data consists of monthly mean temperatures (in 0.1 °C) recorded from 1987 to 1992 at several weather stations in each Soviet province. The weather station in or closest to the provincial capital was selected. Figure 4 plots the monthly temperature values of TEMP against monthly protest counts for all provinces.

The literature on optimal weather instruments (Caceres and Malone, 2015) emphasizes that the relationship between weather and economic and political outcomes is often non-linear; the first part of Figure 4 confirms this for the present case. There is a clear hump-shaped relationship between temperature and protests. This may not be surprising, as both very low and very high temperatures can plausibly deter protests. I therefore calculate the absolute deviation of monthly temperatures (TEMPDEV) from 15 °C to take this non-linearity into account.[17] The result, plotted in the second part of Figure 4 suggests a strong relationship, with very few protests occurring at high or low outside temperatures.

All other variables are based on the 1989 census (Goskomstat SSSR, 1991). These include the share of the population with a university degree, EDU, the share of workers, WORK, and the share of the population

[16] It was these troops, rather than regular Army units, who were responsible for most incidences of violent repression (Fowkes, 1997).

[17] 15 °C is chosen as it seems to be value that maximized protest turnout. As the main objective here is to maximize the strength of the instrument, rather than to test the relationship between weather and protests, imposing this structure on the data is probably permissible.

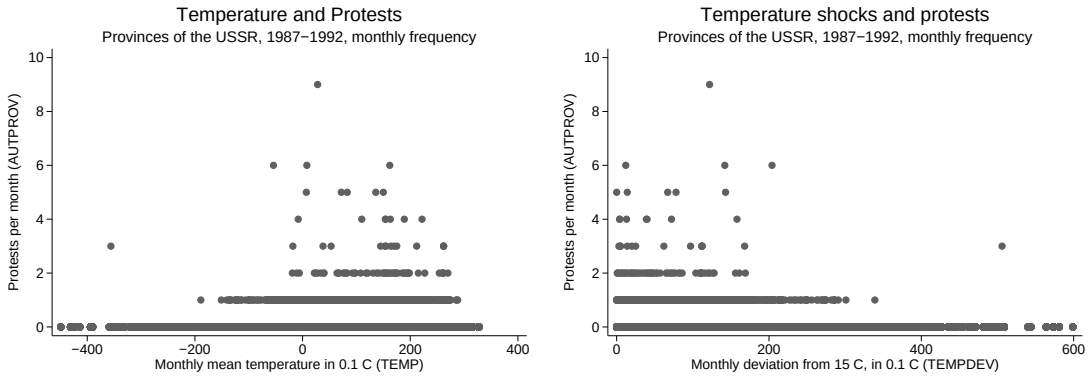

Figure 4: Protests, absolute temperatures, and deviation from 15 °C at monthly frequency for all 184 provinces from 1987 to 1991.

of working age, AGE. Finally, the population density of a province (DENS) is taken from Goskomstat SSSR (1990).

5 Method

5.1 Protest Specifications

The main dependent variables of interest are the number of protests, or the number of participants in protests. Given that the dependent variable is an integer restricted to non-negative values, estimation by Ordinary Least Squares is not suitable and count data methods are to be preferred. These should be based on a probability distribution that reflects the underlying process generating the counts (Winkelmann, 2008). In the present application, this excludes the benchmark model often used in counts, the Poisson distribution. The Poisson distribution is a single parameter model based on the assumption of equidispersion, i.e. mean and variance equivalence. The protest data, on the other hand, exhibits counts with variances that exceed the mean substantially and that are therefore overdispersed. Models based on the Negative Binomial distribution are an alternative. These allow for a dispersion parameter α that is not constrained to 0.[18] Additionally, the Negative Binomial allows for the modeling of individual heterogeneity and certain types of occurrence dependence. This may be particularly appropriate in the present setting, where the occurrence of protests at a given time may partly depend on their occurrence in previous periods, for example because of contagion effects (Cameron and Trivedi, 2013).

An additional issue is the relatively large number of zero realizations in the data. For example, AUTPROV, which records protests demanding far-reaching autonomy for a province from the Union, shows 35% of of provinces without this type of protest. In these cases, hurdle models or zero-inflated models can be

[18] Specifically, I model this dispersion using a Negbin 2 model (Cameron and Trivedi, 2013) which models the conditional variance ω as a function of the estimated dispersion parameter α and the quadratic mean μ, so that: $\omega_i = \mu_i + \alpha\mu_i^2$. If $\alpha = 0$, the model reduces to the Poisson. The empirical results consistently show that $\alpha > 0$ at the 1% level, indicating overdispersion and thus supporting the choice of a Negative Binomial model.

used. Hurdle models treat the occurrence of zeros as a fundamentally different process from the realization of the non-zeros, while zero-inflated models do not have that restriction (Winkelmann, 2008). In the context of protest data, it seems plausible to allow for zero realizations to be both an indicator of a very low propensity to secede, as well the outcome of an altogether different process.

A plausible different process generating the zeros could be the threat of repression in a particular province. This could preclude any protests from taking place. I therefore use a zero-inflated model to take account of this possibility. The occurrence of zeros, i.e. protests at the extensive margin, are modeled with a logit. The variables ARREST and VIOLENCE in the logit model the absence of protests as the result of repression by authorities in a particular province. This uses information from all protests, including those unrelated to separatism. In addition, I include military variables, such as local troop strength, on a case by case basis. This allows me to gauge whether a credible threat of repression existed in a particular province that may have prevented any separatist protests from taking place. Finally, I include the population size in the logit, and sometimes measures of heterogeneity. These allow for zeros to be an indicator of very low demand for secession.[19]

On the other hand, protests at the intensive margin are modeled using the negative binomial described above. In each specification, I include one measure of population size and one measure of population heterogeneity, as well as per capita income, to model the basic trade-off between size and heterogeneity described in the literature. Additional variables emphasized in the secession literature and control variables are included on a case by case basis.

Before estimation can proceed, the protest counts need to be adjusted for protest turnout (exposure) (Winkelmann, 2008). Most importantly, a larger number of protests is to be expected mechanically in large populations. I therefore express all protests as a share of the provincial population.[20] The additional inclusion of population as a variable in the regression then permits a test of proportionality. If the coefficient on population is significantly different from 0, this implies protests increase in population size above what would be expected due to exposure. This would then be a vindication of the theory on the benefits of state size. In addition, I run specifications where separatist protests are expressed as a share of all protests. This implicitly controls for factors influencing general protest turnout, including population size.

Controlling for other elements of exposure is more intricate. Because the regions in the sample are at different stages in their demographic transition, there are discernible differences in the age structure between provinces. The Provinces in Central Asia have a high proportion of the population under the age of 15, while central Russian provinces exhibit a high share of population above the age of 60. Because children and the elderly are less likely to engage in street protests, I include a variable measuring the share of the population aged 15-60 as a robustness check. I do not include this in the baseline specification, however, as the size of the working age population is to some degree collinear with indicators of total output.

I also control for other factors that might influence protest turnout. These include population density DENS, which could affect the economic cost of attending protests (Cicchetti et al., 1971). The share of the population with a tertiary degree, EDU, controls for the possibility that well educated populations might be

[19]The choice of the zero-inflated binomial with this specification over the regular binomial is supported by a Vuong test, which accords a superior fit to the zero-inflated model at the 1% level.

[20]Protests are expressed per 10 million population, participants per 1 million of the local population.

better informed about political events and therefore more likely to attend political protests (Schussmann and Soule, 2005).[21]

Lastly, I control for the administrative status of a province with a dummy ADMIN, which takes a value of 1 for territories with a 'special' administrative status such as ASSRs or AOs. This reflects Walker's (2003) contention that the legal status of a region mattered in the late Soviet Union in bestowing political legitimacy onto a separatist movement. This variable is also included in some logit regressions to capture the effect that an absence of protests could reflect the low administrative status of the province. However, as special administrative status was generally allocated to territories with a large non-Russian ethnic group, this variable also reflects some degree of population heterogeneity.

A final point to note is the possibility of spatial error dependence. This can be a problem if unobserved shocks or heterogeneity influence geographically close units in a similar manner. I therefore cluster all standard errors around 31 roughly homogenous regions, each comprising several provinces. The definition of these regions largely follows the Soviet division of the Union into economic planning regions described in section 3.1 and therefore seems most appropriate.[22] I also include fixed effects on the level of four macro-regions (Central Asia, Caucasus, Baltics and Moldova, as well as the three Slavic republics). These capture the general tendency of protests to be higher in the Baltics and the Caucasus, which may be due to cultural or institutional factors unrelated to the theory of secession.

5.2 Modeling Separatism by Elites

The count of separatist DECLARATIONS depicted in figure 2 conforms to a Poisson distribution without excess zeros and therefore poses no special empirical problems. The timing of SOVEREIGTNY declarations, however, is not a count, but a variable depicting a duration over time. It should therefore be modeled with a duration model. This models the likelihood of an event (such as a sovereignty declaration) taking place at any one point in time, conditional on covariates.

One of the most salient issues in the choice of duration models is how to depict the underlying probability of an event taking place, the so-called baseline hazard rate (Box-Steffensmeier and Jones, 2004). The baseline hazard can be modeled explicitly, but in the absence of theoretical guidance on how the probability of a sovereignty declaration should evolve over time, this may be imposing to much structure on the data. Instead, I use a semi-parametric approach, the Cox model, as this does not specify the hazard distribution *a priori* (Box-Steffensmeier and Jones, 2004).[23]

[21] In addition, the theory on the relationship between openness to trade and the incentive to secede is sometimes formulated conditional on the level of human capital, as in the Alesina and Spolaore (1997) model. Other variables mentioned in the protest literature as affecting individual participation in protests, such as marital status or unemployment (Schussmann and Soule, 2005), can assumed to be invariant across provinces in this (Soviet) setting. It may also be worth stating that although I include variables such as education or the share of workers as controls, my interest is not in inferring individual behavior based on these aggregate variables, which could constitute an ecological fallacy.

[22] I deviate from this division in allowing each Baltic and Central Asian Union republic to form their own separate region, thus reflecting the increasing importance of republican boundaries during the period under study (Suesse, 2014). I also separate the more industrialized and russified parts of Ukraine and Kazakhstan from the rest of the republic. In addition, the Fergana valley provinces are separated from Uzbekistan. However, the results do not change if all Baltic or Central Asian provinces are clustered in a single region.

[23] The Cox model exploits the ordering of the dependent variables, which means that tied dates can provide a complication. As I am, however, using the precise day of sovereignty declaration the problem is limited to only three ties. These are resolved using Efron's

As SOVEREIGNTY only records the provinces with a positive measure of separatism, a choice needs to be made regarding the composition of the control group, that is those units that never declare. I construct two versions. An extended secession sample takes on board all Russian provinces, units with special administrative status, and Union Republics. This yields 108 units, with 48 of them declaring. Alternatively, a restricted secession sample only looks at units with special administrative status and Union Republics, yielding 52 units with 46 declarations.

In both samples, the model treats those units never declaring as being right-censored at the end-point of the observation time. This end-point is chosen to be the final dissolution of the Soviet Union on 26. December 1991. The starting point of observation time is the start of the first protests in January 1987, but the results are insensitive to the choice of that date.

The above set-up is slightly modified once time-varying covariates, that is temperature or protests, are used as 'independent' variables. This is empirically important, as protest dynamics over time may matter for the decision to declare sovereignty at a specific point in time. However, neither variable can be expected to have a contemporaneous influence on secession. Time varying independent variables in event studies are therefore usually cumulated, or lagged (Box-Steffensmeier and Jones, 2004). I do both.

For any given day, I sum daily protests, or the deviations of temperatures, over all past months in a moving cumulative total. This provides a dynamic measure of total protest pressure. The temperature cumulatives TEMPDEV_C are then standardized by the rolling number of past days to avoid the variable exhibiting explosive behavior over time. TEMPDEV_L, on the other hand, calculates a rolling total of all daily protests or monthly temperature deviations over the past 180 days. Both dynamic temperature variables thus take historical weather variations into account, expressing the idea that decisions on secession may be influenced by the history of protest pressure, which in turn are partly influenced by the history of weather shocks in a territory.

5.3 Instrumental Variable Estimation

I am interested in finding out whether popular protests influence decisions by regional leaders to engage in separatist policy. Yet naively regressing separatist declarations on separatist protests is naturally marred by endogeneity problems. The factors analyzed in this paper, such as population size and heterogeneity to the center, could plausibly influence both protests and elite separatism. A completely different possibility is that causality could run from regional leaders to protests. For example, regional leaders in Russia or the Soviet Union did sometimes attempt to whip up popular support for separatism by running open or subverted media campaigns (Herrera, 2004). Alternatively, regional leaders could influence protest turnout by adjusting the tools of repression at their disposal.

Estimating a causal effect of protests on elite separatism depends on finding an instrument that is correlated with protest turnout, but not directly with political outcomes. Weather and climate-related variables are often held to fulfill this criterion (Caceres and Malone, 2015; Madestam et al., 2013). I therefore use temperature deviations as an instrument for protests. Two criteria need to be fulfilled for this to be a viable strategy. First, the relationship between temperature deviations and protests needs to be statistically strong.

method. Another issue is the assumed proportionality of the hazard function. This is vindicated using a proportionality test based on the model's Schoenfeld residuals.

This is easily tested, and can be verified in figure 4. Secondly, the exclusion restriction needs to hold. Formally, the exclusion restriction in this case is that temperatures affect the propensity of local leaders to issue separatist declarations *only* through temperature's effect on protests. It is obvious that there is no effect of elite separatism on weather, and it seems plausible that there is indeed no direct effect of temperatures on secession decisions.

The instrument devised above cannot be estimated using standard 2-Stage Least Squares, as 2SLS is a linear estimation method. In this application, the potential first stage is a count, and the second stage is a count (for DECLARATIONS) or a duration model (for SOVEREIGNTY). Both count and duration distributions are non-linear. If 2SLS is used on these distributions, linearity is imposed on relationships which are known to be non-linear, resulting in misspecification (Cameron and Trivedi, 2013; Box-Steffensmeier and Jones, 2004). The extent of this misspecification will depend on the degree of non-linearity. On the other hand, replicating a non-linear 2SLS by estimating the first stage as a count and using the predicted values in a second stage count or duration model leads to the predicted values of the first stage being correlated with the covariates (Angrist and Pischke, 2004).[24] I pursue three solutions to this conundrum.

- One is a three step procedure proposed by Angrist (2001). In a univariate preliminary stage, only temperatures predict protests using a non-linear method, such as a negative binomial. The predicted values can than be used in a regular 2SLS procedure. This has the advantage of accounting for non-linearity in the first stage, but does not resolve the second stage. This may not matter too much for DECLARATIONS, which is a categorical variable, but is unlikely to do justice to the duration variable SOVEREIGNTY.

- The model can get closer to mirroring the underlying distribution of the DECLARATIONS data if the values from the preliminary stage above are plugged into an instrumental variable Poisson model, which can estimating using the General Method of Moments (Mullahy, 1997).

- For duration data, few suitable methods to account for endogeneity are available (Box-Steffensmeier and Jones, 2004). I therefore follow Madestam et al. (2013) in displaying a reduced form estimate. In that case, the non-linear Cox model estimates the reduced form impact of temperature on secession, unscaled by protests. A negative binomial 'first stage' is shown for comparison. If the instrument is strong and the exclusion restriction holds, the statistical significance of the reduced form should be telling, even if size of coefficient itself may not be informative.

6 Results

6.1 Determinants of Separatist Protests

Tables 1, as well as C.1 and C.2, show the results of regressing all protests advocating far-reaching autonomy or secession of a province from the Union, either by itself or in conjunction with other provinces (AUTPROV). Tables C.3 and C.4 show the results for explaining protests advocating the complete secession of a Union Republic from the Soviet Union (SECREP).

[24] Instruments estimated by a linear first stage yield predicted values that are unrelated to other covariates or the residuals, which is why non-linear least squares is sometimes referred to as the 'forbidden regression' (Angrist and Pischke, 2004)

The results show a clear trade-off between state size and heterogeneity in shaping incentives to separate, thus confirming the key prediction of the theory on state size by Alesina and Spolaore (1997). The effect persists regardless of whether the separatist subject is a province or a Union Republic. Similarly, the conclusions are unchanged regardless of whether a broad-based autonomy category is used, or a more restrictive secession definition.

The population of the potential state whose secession or autonomy is advocated, POPPOT, is continuously statistically significant across specifications. The sign shows that population size increases the number of protests at the intensive margin. This scale effect is present despite the protest count already being adjusted for population size. Population size is also significant in decreasing the likelihood of a zero-occurrence in the logit equation, that is the extensive margin. On average, adding 1 million to a potential state's population increases the odds of the province engaging in any kind of separatism by 3.7% ($exp(0.0365) \approx 1.037$). The magnitude of the coefficient on population on the intensive margin is roughly similar. For example, based on the coefficient on the number of participants in regression (1) in table C.2, adding another million to the population of the potential seceding state increases the expected number of protest participants *per capita* by 3.5%.

Of the variables proxying population heterogeneity, LANGDIS and HISTRUS are significant across all specifications. Apparently, language or historical affiliation with a state are a more salient marker of heterogeneity than geographical distance (GEODIS) or ethnicity (ETHDIS). Geographical and ethnic distance only seem to matter for pro-secession, rather than pro-autonomy protests.[25] These conclusions hold irrespective of how HISTRUS or ETHDIS are defined.

The respective magnitudes of LANGDIS and HISTRUS also indicate that ethno-linguistic heterogeneity was less important than state history. For example, a province with a Ukrainian-speaking majority, such as Lviv, would statistically only expect 28% more separatist protests compared to a Russian-speaking region in Ukraine such as Donetsk, conditional on all other covariates being constant. The effect of historically being part of the Russian state is much larger in affecting separatism. For example, Donetsk, which became part of the Russian Empire in the mid-18th Century, can expect 320% fewer separatist protests compared to Lviv, which became part of the Soviet Union after World War II. Apparently, historical path dependency, rather than ethno-linguistic fragmentation *per se*, decisively contributed to separatist pressure and demand for the Soviet Union's dissolution.

The existence of a trade-off between size and heterogeneity is further supported by examining participants in anti-secessionist protests (P_ANTI_SEC) in model (3) in table C.4. In that case, the signs of the coefficients on both population and heterogeneity switch: the smaller the size of a potential state, the more people were protesting against the creation of such a state. Similarly, the closer a province was to Moscow in terms of historical heterogeneity, the more people were unwilling to leave the Soviet state. Looking at map A.4, which maps those anti-separatist protests, suggests that these protests mainly stem from the central Russian regions, but also from the Baltics, Moldova, Eastern Ukraine and Crimea. This last group may reflect the activity of Russian-speaking populations in these areas.

[25] The effect of ethnic heterogeneity generally becomes significant once the ADMIN control is dropped. As explained before, special administrative status in the Soviet Union was generally only given to regions with a resident ethnic group. It should be noted, however, that this does not seem to affect the significance of the other heterogeneity markers.

Table 1: Determinants of pro-autonomy protests, provincial level, USSR: Baseline

Variable	(1) Controlling for subsidies		(2) Controlling for trade potential		(3) Controlling for repression	
	Equation 2 (Neg. Binomial): Number of Protests (AUTPROV) per capita					
POPPOT	0.0203***	(0.00584)	0.0145**	(0.00628)	0.0200***	(0.00436)
HISTRUS	-0.0196***	(0.00516)	-0.0220***	(0.00453)	-0.0195***	(0.00515)
INCOME	0.0442	(0.0402)	0.0440	(0.0441)	0.0518	(0.0433)
INDIRECTSUB	-0.352	(0.263)				
DIRECTSUB	0.411	(0.805)				
DEVGINI	-1.818	(9.078)				
MARKETPOT			0.209	(0.600)		
ENCLAVE			-0.116	(0.348)		
L_INDUSTRY			-0.0001	(0.0001)		
OILFIELDS			0.223***	(0.0561)		
PIPELINES			-0.123***	(0.0393)		
COAL			-0.133	(0.208)		
MINERALS			0.0084	(0.0598)		
DENSITY	0.0103	(0.129)	0.0941	(0.0876)	0.0011	(0.106)
EDUCATION	13.18**	(5.565)	14.41***	(4.535)	11.96**	(5.015)
ADMIN	1.358***	(0.355)	1.072***	(0.343)	1.410***	(0.338)
CAPITAL	0.199	(0.704)	-0.258	(0.600)	0.216	(0.626)
DISTRICT	0.571	(0.785)	1.015	(0.670)	0.238	(0.861)
	Equation 1 (Logit): Predicting 0-occurrences					
POPPOT	-0.0365**	(0.0164)	-0.0369**	(0.0162)	-0.0508***	(0.0178)
ARREST	0.0019***	(0.0006)	0.0019***	(0.0006)	0.0018**	(0.0008)
VIOLENCE	-0.567***	(0.126)	-0.564***	(0.128)	-0.593***	(0.154)
ADMIN	-0.152	(0.507)	-0.162	(0.505)	-0.568	(0.602)
ARMY					-0.210	(0.151)
PARAMILITARY					-0.429***	(0.160)
NUCLEAR					0.438	(0.494)
Region F.E.	✓		✓		✓	
N (provinces)	183		183		183	
0-occurrences	63		63		63	
Log-likelihood	-663.97		-651.46		-661.01	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of the Soviet Union, 1987-1992. Zero-inflated Negative Binomial model with standard errors clustered by economic districts (31 clusters). Fixed Effects on level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia). Both logit and main equations include constants. All regressions exclude Moscow. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

A further robustness check on the trade-off between population size and heterogeneity is provided by examining all protests that are not directly related to separatism (NON_SEP) in model (3) of table C.2. Here the coefficient on population size is not statistically different from 0, both at the intensive and the extensive margin. This suggests that the scale effect of state size is unique to those protests related to separatism and the creation of new states.[26] Finally, the trade-off between size an heterogeneity is unchanged if regional fixed effects are removed and the dependent variable is expressed as a share of total protests, rather than as a share of the population in model (2) of table C.2. This is an attractive formulation, as it implicitly controls for all factors influencing general protest turnout.

The impact of income per capita INCOME on secessions is generally positive, as the theory would predict, but it is not statistically significant in most specifications. This is unchanged if the deviations of income from its Union-wide mean are examined. Tables C.3 and C.4 show that there is some evidence of deviations of the Gini from its Union-wide mean to be significant in explaining separatism. This is in line with the model by Bolton and Roland (1997). The model predicts that regions with very high or low inequality should be more separatist as they can come closer to their preferences for redistributing income in a separate state. The sign of the Gini-coefficient switches once anti-separatist protests are examined, strengthening this interpretation.

Directly examining received subsidies reveals a more mixed picture. Both direct and indirect subsidies are not significant when examining pro-autonomy protests (AUTPROV or AUTREP), but they do seem to matter for protests calling for a complete secession (SECREP). The coefficient on direct subsidies indicates that receiving subsidies lowers secessionist protests. The sign on the indirect subsidies, however, is positive, which is not in accordance with theory. Moreover, both types of subsidies maintain their signs even if anti-separatist protests are examined.[27] This may suggest that these variables influence general protest turnout, rather than being specifically related to secession. As indirect subsidies reflect industrial structure to some degree, especially a concentration on light industries, it could be that protest turnout is driven by the economic structure of a region. However, the results are robust to controlling for the share of light industry, or the share of manufacturing workers in the population.

Another explanation could be that the non-transparent nature of the Soviet subsidy system made cost-and-benefit calculations based on these figures beyond the reach of the average member of the population. This interpretation is supported by the fieldwork of Herrera (2004) which has shown that even local policy makers in Russian regions were often unable to ascertain whether their region was a net beneficiary.[28]

A similar explanation could be advanced to explain the insignificance of most trade related variables in Table 1. Outside market potential does not seem to affect popular demand. Neither does the status as an enclave, which presumably would entail very high trade costs in the event of secession. Similarly, taking

[26] This category of protests is a residual category after all separatist protests have been removed. It still includes a large fraction of protests related to 'nationalism' in a broad sense, such as the use of national languages in schools, issues related to interethnic hatred, or national historical grievances. This explains why historical distance to Moscow still helps to explain these protests. As mentioned in section 4.1.1, only protests explicitly calling for autonomy or secession of a territory were coded as separatist.

[27] This casts some doubt on earlier results by Austin (1996), who found that indirect subsidies did increase votes in favor of maintaining the USSR as a federal state at the Union-wide referendum of 17. March 1991. However, full vote results are only available at the level of 9 Union Republics, therefore this referendum has not been included in the analysis of this paper.

[28] Although this phenomenon was probably more salient in the Soviet Union, it probably is not an exclusively Soviet phenomenon given the complexity of transfers in modern federal systems. It may serve as a general note of caution against theoretical models seeking to elucidate the role of highly complex fiscal rules on secessions.

projected trade flows into account in Table C.4 produces little result, and neither do the inclusion of coal and mineral resources.[29]

The oil-related variables are strongly significant, showing that the presence of oil and natural gas fields does increase the demand for a separate state. This is robust across specifications. Moreover, examining anti-secessionist protests reveals that their occurrence is more likely in provinces without oil. Control over the infrastructure for the transport of hydrocarbons, on the other hand, seems to have the opposite effect from the presence of oilfields.[30]

The existing administrative status ADMIN seems to have been very important in affecting separatism. The higher a province's administrative status, the higher the demand for even more autonomy. This holds after controlling for a range of heterogeneity variables.

The logit equation depicts the influence of repression on the likelihood of no protest occurring at all. It accords a strong role to the ARREST variable in the regressions explaining pro-autonomy protests. This indicates that a certain proportion of the zero observations were not due to a low propensity to secede, but rather due to repression by local authorities. However, the exercise of VIOLENCE by authorities seems to have had the opposite effect, that of increasing the likelihood of a secessionist protest taking place. This is in accordance with the literature, which emphasizes the role of the public backlash against Soviet rule after incidents in which violence was used in an attempt to quell protests (Beissinger, 2002). Similarly, the presence of pro-Soviet PARAMILITARY forces, increases rather than decreases the likelihood of protests. The presence of ARMY units has a similar, though not statistically significant, effect.[31] In any case, the inclusion of repression variables does not change the results regarding the trade-off between state size and population heterogeneity.

6.2 Determinants of Separatist Policy

The Soviet experiment also allows a comparison between the extent of popular separatism in a region and the extent to which local leaders actually pursue a separatist policy. This comparison may be of interest for a number of reasons. First of all, the literature posits that democracies and autocracies should behave differently when determining the size of states. Under this perspective, we can interpret the protest data as showing the theoretical outcome under democracy, while actual separatist policy shows the outcome under autocratic regimes.[32]

Secondly, if state size matters economically or politically, we might be more interested in the determinants of actual attempts to secede, rather than the determinants of popular demand for secession. There are

[29] MARKETPOT becomes positively significant and ENCLAVE negatively significant at the 5%-level once regional fixed effects are abandoned, but this effect is not robust across specifications. Splitting up MINERALS by the type of resource reveals a slightly significant positive effect of precious metals on secessionist demand, possibly mirroring the high prices that could be achieved for these goods on world markets.

[30] This effect could well be spurious. Unlike oil fields, the presence of infrastructure is the outcome of a policy decision. Soviet policy makers may well have placed vital infrastructure in areas considered to be more loyal to Moscow.

[31] It may be that the presence of these central government armed forces spurred demands for separatism. It may, however, be more likely that Soviet authorities stationed armed forces in territories that were more prone to unrest, or simply close to the border.

[32] This assumes that regional leaders were autocrats. In practice, not all provinces under study here were full autocracies. Still, even in the earliest democratizer, Estonia, elections did not get underway until February 1990, while other Baltic and Western republics joined the democratic process much later. In effect, most regions were ruled by unelected officials, many of whom were (previous) members of the regional Communist Parties (Roeder, 1991).

many reasons why popular demand and policy decisions need not be synonymous, even in democracies. Politicians or ruling elites may be maximizing different utility functions, or operating under different constraints, than their constituents. They may also have different sources or quality of information about the benefits or costs of separatism.

Table 2: Determinants of secessionist declarations, provincial level, Russia

Variable	(1) Controlling for subsidies		(2) Controlling for trade potential		(3) Controlling for repression	
	Dep. Var.: Secessionist Declarations					
POPPROV	0.246***	(0.0601)	0.247***	(0.0626)	0.220***	(0.0646)
ETHDIS_M	1.424**	(0.649)				
LANGDIS			0.106*	(0.0620)		
MUSLIM					0.455*	(0.270)
INCOME	0.0110	(0.0390)	-0.0078	(0.0288)	0.0023	(0.0285)
INDIRECTSUB	-0.295	(0.344)				
WORKERS	3.016**	(1.537)				
EDUCATION	-0.702	(5.850)				
MARKETPOT			-0.187	(0.651)		
ENCLAVE			-0.404**	(0.171)		
OILFIELDS			0.0314	(0.0524)		
PIPELINES			0.0114	(0.0478)		
COAL			-0.0519	(0.208)		
MINERALS			0.0800	(0.0627)		
PARAMILITARY					-0.0164	(0.0192)
ARMY					0.0621	(0.0384)
NUCLEAR					0.346**	(0.173)
ADMIN	0.719**	(0.309)	1.084***	(0.226)	1.316***	(0.246)
Region F.E.	-		-		-	
N (provinces)	87		87		87	
0-occurrences	16		16		16	
Pseudo R2	0.206		0.210		0.211	
Log-likelihood	-139.49		-138.86		-138.72	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of Russia, 1990-1994. Dependent variable: Herrera-Treisman Index (0-11) of secessionist declarations by local elites All models Poisson regressions Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The results for DECLARATIONS, which depict the number of separatist declarations made by Russian regional leaders, are shown in table 2. The results for SOVEREIGNTY, which express the likelihood of a sovereignty declaration occurring for any of the Soviet provinces, are shown in model (1) of table 2. Both sets of results show that the trade-off between size and heterogeneity persists even in determining separatist policy. Leaders seem to be more separatist when the size of their future state is large, and their populations differ from the center on some measure of heterogeneity. Similar to the protest regressions, the

administrative status of a province is a strong determinant of separatist activity. This may suggest that local leaders are constrained somewhat by the amount of resources, or legitimacy, granted to them by the federal system.

However, there are important differences between these results and those obtained earlier using the protest data. Firstly, size is always very strongly significant in explaining separatist political outcomes, while the significance of heterogeneity variables is weaker. For example, historical distance, which was the strongest determinant of protests, does not seem to shape separatist policy. Secondly, variables which were important in explaining protests, such as the presence of oil, subsidies, or inequality, do not seem to matter for elites. Conversely, the status as an ENCLAVE does seem to deter regional leaders. Model (1) of table C.5 also offers some evidence that the presence of armed forces may have such an effect, although once again it cannot be ruled out that this relationship is spurious.

There are several ways in which one could interpret these results. They can be taken to support the theoretical literature claiming that the result of decisions on border changes differ under autocratic and democratic rules. The observation that heterogeneity seems to matter less to rulers than the size of 'their' state (i.e. a Leviathan's future tax base) can be squared with that strand of thought. Additionally, the results suggest that some level of ethnic heterogeneity with regard to the center does still influence leaders in engaging in separatist policy. It may be that leaders appealing to the rights of ethnic self-determination find it easier to shore up a modicum of domestic support for autonomy, or that appealing to such rights adds to their bargaining position.

The reason why enclave status only matters for decision making by elites can also be answered from different perspectives. It would be consistent with supposing that leaders are better informed about the costs of a secession resulting in an enclave status than the populace. A less benevolent explanation could center on revenue-maximizing politicians-turned-entrepreneurs accumulating rents from internal trade. These elites may be hesitant to move to a scenario that would starkly reduce trade. There is indeed evidence that special interest groups with linkages across regional borders captured local governments to assure the free movement of goods across regions in post-Soviet Russia (Guriev et al., 2010).

What is unclear, however, is whether the results on elite separatism are driven directly by the observed covariates, or whether these covariates affect separatist policy through protests. This question is important. Not only does the answer inform us regarding the drivers of secession, but it may show more generally to what extent elites in autocracies may be responsive to pressure from the populace. Table C.5 runs three 'naive' regressions of elite separatism on separatist protests. The relationship is positive and strong both in a cross section and in a panel setting. Yet the causality is not determined.

6.3 Instrumenting for Protests

As discussed in section 4.2.7, I use temperature deviations from a value of 15 °C as an instrument for the occurrence or size of protests. Table C.6 estimates the relationship between TEMPDEV and different protest measures, and finds it to be very strong. Model (1) shows the basic univariate relationship for the full sample, while model (2) does the same for those provinces (Union republics, special administrative regions, and provinces within Russia) used in the regressions on elite separatism. The results hold for both protest counts and participants. The Wald χ^2 on both univariate relationships is very high, suggesting that the instrument is strong.

Model (3) estimates the same zero-inflated negative binomial with controls and regional fixed effects as used in the protest regressions in section 6.1. The results show that while temperature deviations are a strong determinant of protests, they do not seem to affect the other variables. Model (4) runs a panel of temperatures on daily protests with fixed effects at the province level, thus shutting down all cross-sectional variation and only exploiting seasonal weather changes within a province. The results are similar, suggesting that protests do tend to occur in more moderate temperatures.

Do separatist protests influence secessions, once this exogenous variation is taken into account? Tables 3 and C.7 suggest that they don't. In both tables, model (1) shows the 'preliminary' non-linear first stage, depicting the strong negative relationship between temperature deviations and protest participation. Model (2) is the classical linear first stage where protest participation is regressed on the fitted values of (1) and optional covariates. This too shows a strong fit.

Finally, the effect of exogenous protests on the count of separatist declarations in Russian provinces is shown in the classical linear second stage in (3). The results are negative, and statistically not significant by a wide margin. This is confirmed in model (4), which is a non-linear Poisson instrumental variables approach based on the residuals from (1). This estimator shows the same sign, and the same level of insignificance, even though the magnitude of the coefficients differ slightly.

A reduced form estimation provides another way of cross-checking these results. This is done in table 4. Model (1) provides a non-linear first stage regression of protests on temperature deviations. Once again, temperature deviations strongly reduce protest participation. The reduced form impact of TEMPDEV on the separatist DECLARATIONS in (2), on the other hand, is insignificant with standard errors of an order of magnitude larger than the coefficient. This confirms the conclusion reach from the full IV procedure: that separatist protests had no impact on political outcomes.

Table C.8 follows the same reduced form strategy for the timing of the sovereignty declarations in the whole Soviet Union. The first stage is always strongly significant, whereas the reduced form negates any impact of protests on separatist policy. Including different control variables does not change the picture. In all regressions, the control variables themselves confirm the conclusions drawn in the previous sections: population size and heterogeneity both strongly determine protests (in the first stage), whereas the role for heterogeneity in explaining elite separatism (in the reduced form) is much lower.

The tests so far have all looked at a cross section of aggregate protests and mean temperature deviations. How do the conclusions change once the time-varying nature of temperatures, protests, and timed sovereignty declarations are taken into account? Table C.9 examines the role of the history of temperature deviations over all past periods since the start of 1987 at any given day in models (1) and (2). Although cumulative temperature deviations seem to explain the occurrence of past protests well, this too fails to uncover an effect of past protests on the timing of the sovereignty declarations. Finally, (3) and (4) look at the influence of temperature deviations over the last 180 days. Once again, recent exposure to separatist protests did not move local leaders to seek independence.

If local leaders did not react to popular pressure, what then explains the strong correlation between protests and elite separatism found in table C.5? Third variables affecting both forms of separatism may offer a plausible explanation. The previous sections have shown empirical evidence that potential state size, administrative status, and to some extent heterogeneity, are common correlates to both popular protests and

Table 3: Temperature deviations, protests and secessionist declarations: Instrumental Variables

Variable	(1) Instrument, non-linear	(2) First stage, linear	(3) Instrumented protests, linear	(4) Instrumented protests, Poisson
	Dep. Var.: Protests		Dep. Var.: Declarations	
TEMPDEV	-0.0247***			
	(0.0050)			
$\widehat{Protests}1$		2.8349***		
		(0.8616)		
$\widehat{Protests}2$			3.32e-06	4.70e-07
			6.06e-06	(1.04e-06)
Constant	11.688***	-16182	1.964***	0.6783***
	(.6506)	(14894)	(.2398)	(0.1179)
Regional F.E.	-	-	-	-
N (total)	87	87	87	87
R2	0.012	0.113	0.119	-
Log-Likelihood	-610.90	-	-	-
F	-	10.83	0.30	-
Wald χ^2	14.95	-	-	-
$p > \chi^2; F$	0.000	0.001	0.586	-

Sample: Russia, 1990-1994, cross section of provinces. Dependent variable for model (1): Participants in secessionist protests (P_AUTPROV) per capita, negative binomial model. Dep. Var. model (2): Participants in secessionist protests (P_AUTPROV) per capita, instrumented with predicted values from (1), first stage linear 2SLS. Dep. Var. model (3): Secessionist declarations (DECLARATIONS), instrumented with predicted values from (2), second stage linear 2SLS.Dep. Var. model (4): Secessionist declarations (DECLARATIONS), Poisson instrumental variable model using GMM and predicted values from (1) as excluded instrument. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Temperature deviations, protests and secessionist declarations: reduced form

Variable	(1) First Stage baseline	(2) Reduced form, baseline	(3) First stage, robustness	(4) Reduced form robustness
	Dep. Var.: Protests and Secessionist declarations			
TEMPDEV	-0.0372***	0.000356	-0.0298***	-0.00161
	(0.0112)	(0.00232)	(0.00776)	(0.00192)
POPPROV	0.623**	0.241***	0.525**	0.260***
	(0.265)	(0.0565)	(0.247)	(0.0699)
GEODIS	0.000645**	1.99e-06	0.000474**	4.55e-05
	(0.000258)	(6.11e-05)	(0.000210)	(5.86e-05)
INCOME	3.07e-05	-2.54e-05		
	(0.000150)	(3.07e-05)		
ADMIN	1.877***	1.393***	1.979***	1.335***
	(0.679)	(0.188)	(0.606)	(0.263)
ARMY	-0.400**	0.0766*		
	(0.158)	(0.0452)		
DENSITY			0.229	-0.150
			(0.516)	(0.151)
Constant	9.380***	-0.208	9.093***	-0.285
	(1.366)	(0.333)	(0.813)	(0.262)
Regional F.E.	-	-	-	-
N (total)	87	87	87	87
Log-Likelihood	-602.52	-143.34	-604.57	-144.84
Wald χ^2	31.71	64.81	300.56	407.30
$p > \chi^2$	0.000	0.000	0.000	0.000

Sample: Russia, 1990-1994, cross section of provinces. Dependent variable for model (1) and (3): Participants in secessionist protests (P_AUTPROV) per capita, model (2) and (4): Secessionist declarations by local elites (DECLARATIONS). Estimation model (1) and (3): Negative Binomial, model (2) and (4): Poisson. Model (3) and (4): Standard errors clustered at economic region (11 clusters). Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

decisions by local leaders. This suggests that both sets of variables matter for different contexts, and that theoretical modeling may want to take this into account.

7 Conclusion and Implications

This paper has found empirical evidence for the existence of a trade-off between size and population heterogeneity in the formation of states. This evidence stems from examining separatist protests across the 184 provinces of the Soviet Union. Additionally, some evidence has been found that supports the role of differences in income inequality in shaping incentives to secede. On the other hand, the influence of trade potential and subsidies is muted.

Three additional insights, which could be relevant for future theoretical work in this area, emerge from the results.

Firstly, the results on the determinants of separatist protests demonstrate that ethno-linguistic heterogeneity by itself does not exert a decisive influence on separatism. Rather it is the historical legacy of belonging to a state for a certain period of time that shapes attitudes towards that state. Historical path dependency, rather than primordial ethnicity, matters.

Secondly, this paper has shown that the determinants of the demand for secession differ at the intensive and the extensive margin. Repression matters in determining the occurrence of separatism, while heterogeneity and size shape the intensity of separatist demand. Theoretical work could take up this insight, for example by allowing separatist behavior to be costly, so that individuals decide how many resources to devote to such an activity. In that case, predictions could differ from the current class of models that tends to see decisions on secession as binary choices.

Thirdly, the empirical evidence suggests that popular demand for secession and secessionist policy are determined by a different set of factors, although the trade-off between size and heterogeneity persists to some degree. It has also been shown that local leaders did not respond to separatist pressure. Our understanding of state stability and breakup may therefore benefit from a set of models that are able to incorporate both the causes of demand for separatism as well as the conditions under which these demands are transmitted into actual policy. Such an approach could combine both self-interested citizens and self-interested local elites into a framework that could shed more light on the political economy of secessions.

A Maps

Note: Legend with territories' names provided on next page

Figure A.1: Union Republics and special administrative regions (ASSR, AO, AOk) in the Soviet Caucasus according to 1989 census

Note: Legend with territories' names provided on next page

Figure A.2: Union Republics and special administrative regions (ASSR, AO, AOk) of the USSR according to 1989 census

Legend to maps A.2 and A.1

Map abbreviation	Union Republic	Map abbreviation	Special Administrative Region
A	Russia (RSFSR)	1	Bashkir ASSR
		2	Chuvash ASSR
		3	Dagestan ASSR
		4	Kabardino-Balkar ASSR
		5	Kalmyk ASSR
		6	Karachai-Cherkess AO
		7	Komi ASSR
		8	Mari ASSR
		9	Mordvinian ASSR
		12	Komi-Permyak AOk
		13	Northern Ossetian ASSR
		14	Tatar ASSR
		15	Udmurt ASSR
		16	Karelian ASSR
		19	Nenets AOk
		20	Adygea AO
		22	Chechen-Ingush ASSR
		23	Taymyr AOk
		24	Yakut ASSR
		25	Yamalo-Nenetsk AOk
		26	Khanti-Mansi AOk
		27	Gorno-Altaisk AO
		28	Khakas AO
		31	Tuva ASSR
		32	Evenk AOk
		33	Buriat ASSR
		34	Ust-Orda Buriat AOk
		35	Agin Buriat AOk
		36	Chukotski AOk
		37	Koryak AOk
		38	Jewish AO
B	Ukrainian SSR		
C	Bylorussian SSR		
D	Moldovan SSR		
E	Lithuanian SSR		
F	Latvian SSR		
G	Estonian SSR		
H	Georgian SSR	17	Abkhaz ASSR
		18	Southern Ossetian AO
		21	Adzhar ASSR
I	Azerbaijani SSR	10	Nagorno-Karabagh AO
		11	Nakhichevan ASSR
J	Armenian SSR		
L	Kazakh SSR		
M	Uzbek SSR	30	Karakalpak ASSR
N	Turkmen SSR		
O	Tajik SSR	29	Gorno-Badakhshan AO
P	Kyrgyz SSR		

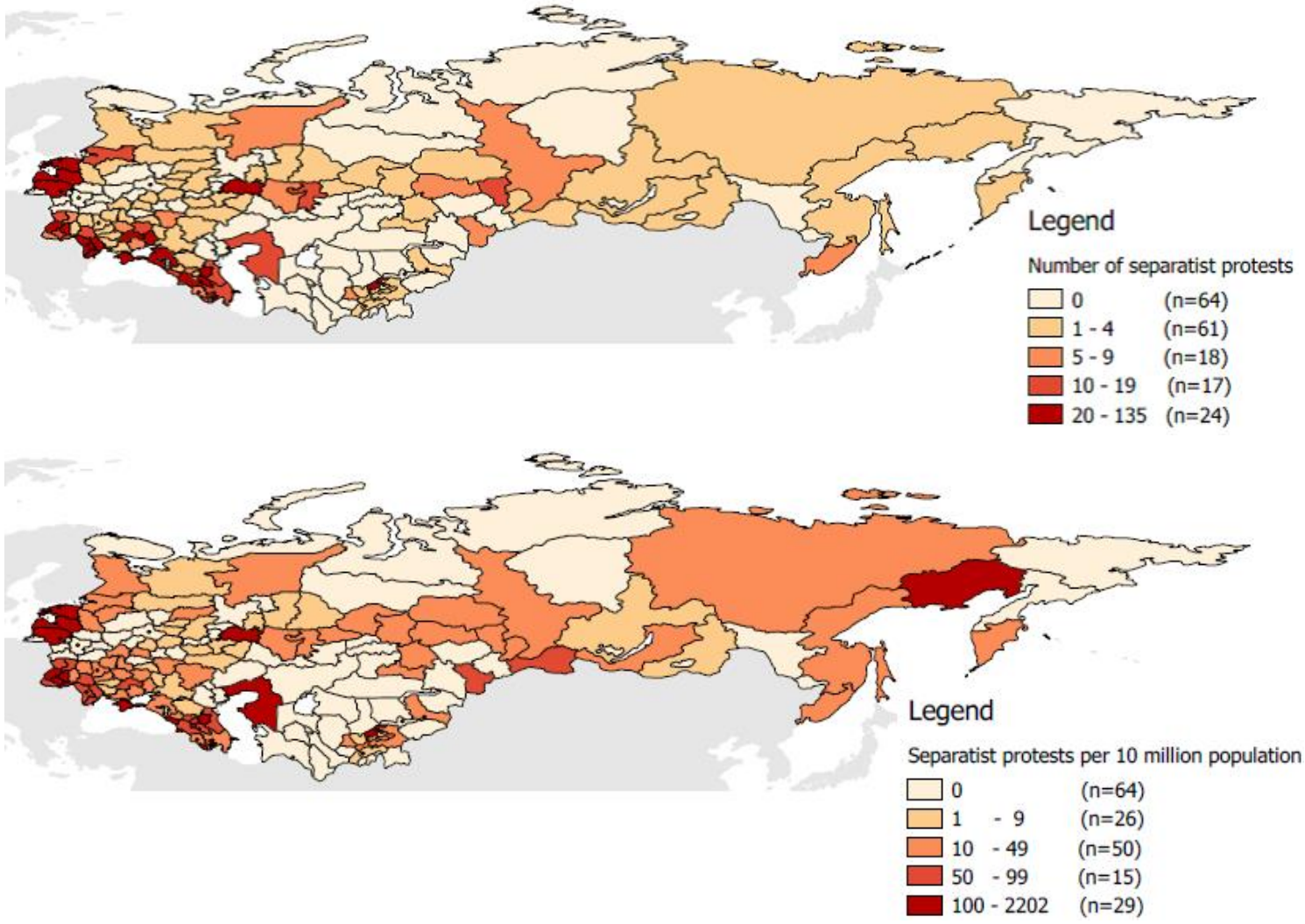

Figure A.3: Pro-autonomy protests (AUTPROV), 184 provinces, Soviet Union, 1987-1992

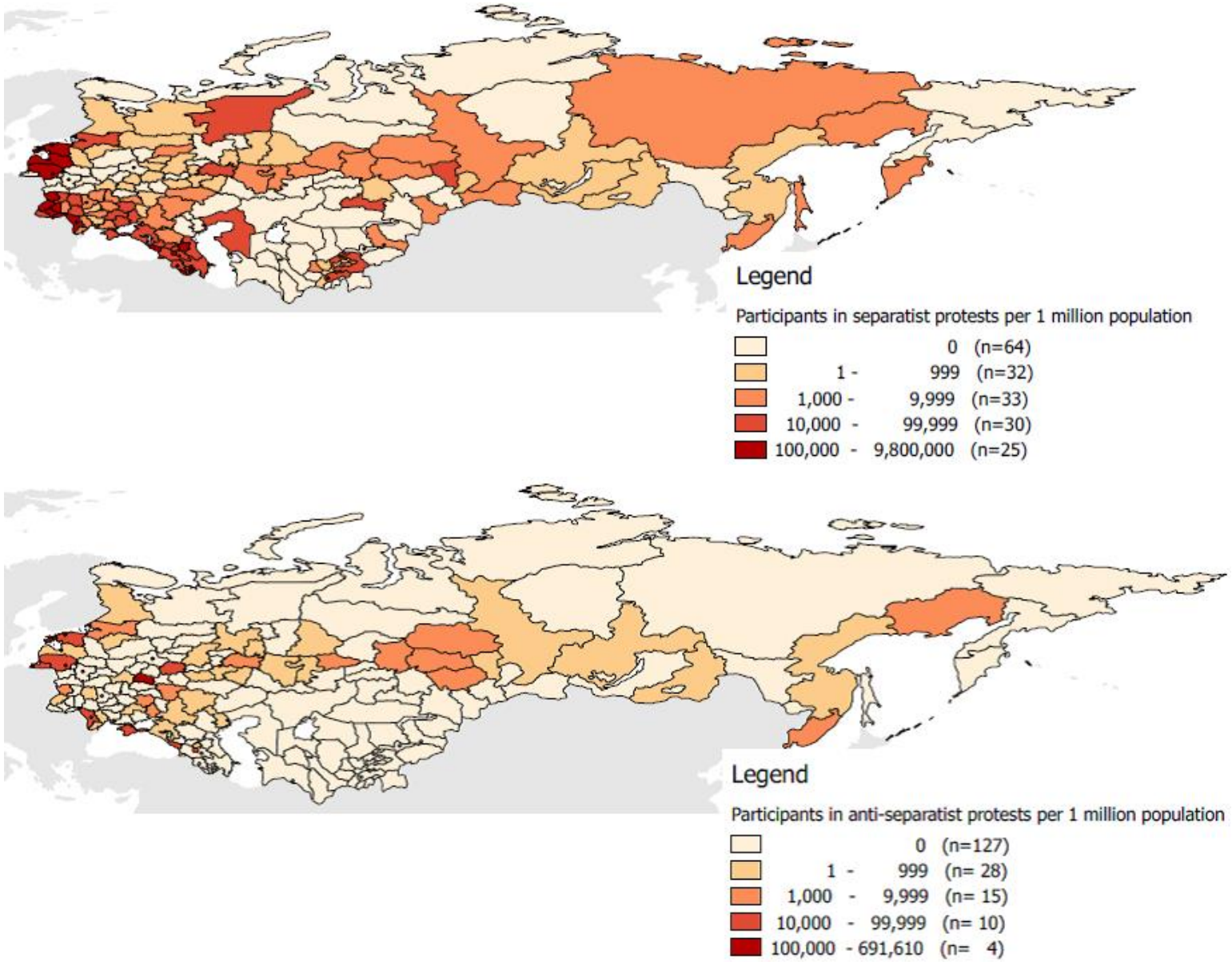

Figure A.4: Participants in pro-separatist (P_AUTPROV) and anti-separatist (P_ANTI_SEC) protests

B Summary Statistics

Table B.1: Summary statistics: Provinces of the Soviet Union, Part I

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
	Protests, cross section					
ALL	All Protests, count	184	30.342	62.664	0	492
P_ALL	All protests, participants	184	550520	3055347	0	3.80e+07
AUTPROV	Pro-Provincial autonomy protests[a]	184	78.5	229.1	0	2202
SECREP	Pro-Republican secession protests[a]	184	41.7	169.5	0	1855
AUTREP	Pro-Republican autonomy protests[a]	184	63.7	213.6	0	2133
NON_SEP	Non-separatist protests[a]	184	13.7	32.36	0	194
S_AUTPROV	Provincial autonomy, share of ALL	184	225.1	239.9	0	1000
P_AUTPROV	Provincial autonomy, participants[b]	184	194011	925761	0	9816020
P_SECREP	Republican secession, participants[b]	184	108508	516727	0	4480850
P_ANTI_SEC	Anti-secession, participants[b]	184	10550	63446	0	691610
	Elite Separatism, cross section					
DECLARATIONS	Number of separatist declarations	87	2.023	2.118	0	11
SOVEREIGNTY	Timing of sovereignty declaration, days	108	1607.4	273.2	687	1822
	Panel variables					
AUTPROV	Pro-Provincial autonomy protests, daily	335984	.005	.079	0	9
P_AUTPROV_C	AUTPROV, cumulative participants	173370	37054	313900	0	7680250
P_AUTPROV_L	AUTPROV, last 180 days	153930	.518	1.91	0	30
TEMP	Monthly mean temperature, 0.1 °C	321708	70.7	118.25	-449	328
TEMPDEV	Monthly deviation from 150 TEMP	321708	109.774	90.65	0	599
TEMPDEV_C	Cumulative deviations from 150 TEMP	173370	135.7	62.7	0	599
TEMPDEV_L	Deviations from 150 TEMP, last 180 days	153930	20071	12007.5	0	82018
SOVEREIGNTY	Timing of sovereignty declaration, days	108	1607.4	273.2	687	1822

[a] Per 10 million inhabitants

[b] Per 1 million inhabitants

Table B.2: Summary statistics: Provinces of the Soviet Union, Part II

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
	Population, cross section					
POPPROV	Provincial population, million	184	1.553	1.267	.025	8.876
POPREP	Republican population, million	184	80.9	64.3	1.6	147.0
POPPOT	Population of potential state, million	184	11.9	17.1	.025	51.5
	Heterogeneity, cross section					
GEODIS	Geographic distance to Moscow, km.	184	1845	1464	0	6781
GEO_DIF	Difference Moscow & republic distance	184	1652	1519	-1076	6781
LANGDIS	Linguistic distance to Moscow	184	1.4	1.7	0	4
ETHDIS_FK	Ethnic distance to Moscow, Finger-Kreinin	184	.504	.349	0	.987
ETHDIS_M	Ethnic distance to Moscow, matching	184	.57	.319	.107	.990
ETHDIS_DIF	Difference Moscow & republic ETHDIS_FK	184	.368	.261	-.243	.975
MUSLIM	Muslim population > 30%	184	.266	.443	0	1
HISTRUS	Length under Russian rule	184	82.4	15.3	34.7	98.9
	Economic covariates, cross section					
INCOME	Income per capita, '000 rubles	184	10.6	4.3	2.6	27.5
DEVINCOME	Demeaned income per capita, rubles	184	3072	3046	4	16891
GINI	Gini index of income inequality	184	.27	.028	.233	.345
DEVGINI	Demeaned Gini	184	.028	.012	.01	.064
INDIRECTSUB	Indirect subsidies per capita, '000 rubles	184	.461	.293	.022	2.335
DIRECTSUB	Direct subsidies per capita, '000 rubles	184	.042	.1	-.015	.677
L_INDUSTRY	Output of light industry, million rubles	184	549.2	795.4	0	6220
MARKETPOT	Market potential outside USSR	184	1	.258	.623	1.88
ENCLAVE	Enclave after secession	184	.223	.417	0	1
TRADEPOT	Projected trade volume & price change	184	7.71	9.51	-16.3	16.9
OILFIELDS	Number of major oil & gas fields	184	.462	1.418	0	11
PIPELINES	Number of oil & gas transport nodes	184	.636	1.29	0	10
COAL	Coal field dummy	184	.174	.38	0	1
MINERALS	Exploitable mineral resources	184	.815	1.16	0	5
	Controls, cross section					
DENSITY	Population density, '000 per km.	184	.322	1.05	0.000	6.15
EDUCATION	Population with tertiary degree, share	184	.075	.033	.025	.225
WORKERS	Manufacturing workers, share	184	.587	.073	.387	.716
AGE	Population aged 15-60, share	184	.597	.042	.473	.697
ADMIN	Administrative status as ASSR, AO, AOk	184	.207	.406	0	1
ADMIN_SSR	Union Republican admin. status	184	.489	.501	0	1
CAPITAL	Capital of Union Republic, dummy	184	.087	.283	0	1
DISTRICT	Territory surrounding capital, dummy	184	.027	.163	0	1
	Repression, cross section					
VIOLENCE	All protests with violent repression	184	7.37	19.3	0	178
ARREST	Participants arrested, all protests	184	61.1	262.3	0	2449
ARMY	Number of Soviet army division bases	184	1.08	1.79	0	12
PARAMILITARY	Number of internal troop (MVD) bases	184	2.07	3.77	0	38
NUCLEAR	Number of nuclear weapons bases	184	.207	.468	0	2
	Temperature, cross section					
TEMP	Mean monthly temperature, 0.1 °C	184	71.3	52.6	-99.3	178.3
TEMPDEV	Mean monthly deviation from 150 TEMP	184	80.7	49.5	.733	249.3

C Robustness Checks and Additional Results

Table C.1: Determinants of pro-autonomy protests, provincial level, Soviet Union: Heterogeneity Indicators

	(1)		(2)		(3)	
Variable	Linguistic distance		Ethnic difference		Geographic & religious differences	
	Equation 2 (Neg. Binomial): Number of Protests (AUTPROV) per capita					
POPPOT	0.0261***	(0.00728)	0.0256***	(0.00724)	0.0300***	(0.00759)
LANGDIS	0.246**	(0.114)				
ETHDIS_DIF			0.323	(0.579)		
GEO_DIF					2.06e-05	(7.26e-05)
MUSLIM					0.536	(0.441)
INCOME	0.0872*	(0.0461)	0.0307	(0.0476)	0.0443	(0.0617)
DENSITY	0.155	(0.130)	0.0456	(0.103)	0.0676	(0.114)
EDUCATION	7.637	(4.911)	12.48***	(3.673)	11.75***	(4.558)
ADMIN	1.120***	(0.363)	1.468***	(0.366)	1.301***	(0.351)
CAPITAL	0.255	(0.597)	0.0909	(0.555)	0.0338	(0.641)
DISTRICT	0.454	(0.889)	0.661	(0.770)	0.585	(0.842)
	Equation 1 (Logit): Predicting 0-occurrences					
POPPOT	-0.0363**	(0.0163)	-0.0364**	(0.0163)	-0.0363**	(0.0163)
ARREST	0.0019***	(0.0006)	0.0020***	(0.0006)	0.0020***	(0.0006)
VIOLENCE	-0.568***	(0.126)	-0.571***	(0.127)	-0.572***	(0.128)
ADMIN	-0.148	(0.508)	-0.142	(0.508)	-0.142	(0.507)
Region F.E.	✓		✓		✓	
N (provinces)	183		183		183	
0-occurrences	63		63		63	
Log-likelihood	-666.06		-670.25		-669.17	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of the Soviet Union, 1987-1992. Zero-inflated Negative Binomial model with standard errors clustered by economic districts (31 clusters). Fixed Effects on level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia). Both logit and main equations include constants. All regressions exclude Moscow. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Determinants of pro-autonomy protests, provincial level, USSR: Robustness

Variable	(1) Participants in protests		(2) Adjusted for total protests		(3) Non-separatist protests	
	Equation 2 (Neg. Binomial): Protests or participants per capita					
POPPOT	0.0340***	(0.0116)	0.00742***	(0.00263)	-0.00334	(0.00623)
HISTRUS	-0.0643***	(0.0136)			-0.0170***	(0.00476)
LANGDIS			0.154***	(0.0481)		
INCOME	-0.0325	(0.0926)	0.0376**	(0.0174)	3.9e-05	(4.8e-05)
MARKETPOT	-1.261	(1.314)				
ENCLAVE	-0.210	(0.622)				
L_INDUSTRY	7.2e-05	(0.0002)				
OILFIELDS	0.520***	(0.164)				
PIPELINES	-0.291***	(0.0864)				
COAL	0.189	(0.714)				
MINERALS	-0.0616	(0.144)				
DIRECTSUB			1.707	(1.925)		
INDIRECTSUB			-0.177	(0.266)		
DEVGINI			0.805	(6.921)	10.79	(9.930)
DENSITY	0.0419	(0.207)			0.215*	(0.122)
EDUCATION	-5.752	(10.41)			15.09***	(4.990)
ADMIN	1.145**	(0.552)	-0.0112	(0.199)	0.450	(0.296)
CAPITAL	3.671***	(1.395)			-0.315	(0.645)
DISTRICT	0.714	(0.808)			-1.039***	(0.307)
	Equation 1 (Logit): Predicting 0-occurrences					
POPPOT	-0.0378**	(0.0161)	-0.0378**	(0.0161)	-0.0369	(0.0540)
ARREST	0.0018***	(0.0006)	0.0018***	(0.0006)	-16.61***	(1.926)
VIOLENCE	-0.533***	(0.114)	-0.531***	(0.114)	-23.81***	(0.874)
ADMIN	-0.304	(0.496)	-0.189	(0.502)	2.012**	(0.944)
Region F.E.	✓		-		✓	
N (provinces)	183		183		183	
0-occurrences	63		64		33	
Log-likelihood	-1386.09		-862.17		-516.71	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of the Soviet Union, 1987-1992. Dependent variable for regression (1): Participants in secessionist protests (P_AUTPROV) per capita. Model (2): Number of secessionist protests as share of total protests (S_AUTPROV). Model (3): Number of protests unrelated to autonomy or secessionist demands (NON_SEP) per capita. All models are zero-inflated Negative Binomial model with standard errors clustered by economic districts (31 clusters). Fixed Effects on level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia) for regressions (1) and (3). Both logit and main equations include constants. All regressions exclude Moscow. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.3: Determinants of pro-secessionist protests, republican level, USSR: Baseline

Variable	(1) Republican secession baseline		(2) Controlling for trade potential		(3) Controlling for subsidies and inequality	
	Equation 2 (Neg. Binomial): Number of Protests (SECREP) per capita					
POPREP	0.0754***	(0.0286)	0.0767***	(0.0300)	0.0570***	(0.0189)
GEODIS	0.0018**	(0.0009)				
ETHDIS_DIF			1.853**	(0.885)		
HISTRUS					-0.0319***	(0.00590)
INCOME	0.0006	(0.0984)	-0.0274	(0.0916)		
DEVINCOME					-8.7e-05	(6.3e-05)
TRADEPOT			0.104	(0.110)		
DEVGINI					25.74**	(11.24)
INDIRECTSUB					3.082***	(0.885)
DIRECTSUB					-2.324**	(0.990)
L_INDUSTRY					-0.0002	(0.0004)
DENSITY	0.348	(0.496)	0.458	(0.503)	0.237	(0.367)
EDUCATION	12.53	(10.37)	13.93*	(7.387)	24.34**	(11.46)
CAPITAL	0.407	(1.869)	-0.0923	(1.600)	-1.028	(2.132)
DISTRICT	-1.957***	(0.328)	-2.444***	(0.444)	-1.350***	(0.255)
	Equation 1 (Logit): Predicting 0-occurrences					
POPREP	-0.126*	(0.0715)	-0.138**	(0.0705)	-0.112***	(0.0430)
ARREST	-1.623	(3.412)	0.219	(0.781)	-0.437	(0.721)
VIOLENCE	-16.37***	(2.819)	-39.75	(136.7)	-1.399	(0.910)
Region F.E.	✓		✓		✓	
N (provinces)	97		97		97	
0-occurrences	47		47		47	
Log-likelihood	-279.90		-281.22		-262.89	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of the Soviet Union, 1987-1992, excluding Russia. Dependent variable: protests advocating secession of a union republic (SECREP). Zero-inflated Negative Binomial model with standard errors clustered by economic districts (20 clusters). Fixed Effects on level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia). Both logit and main equations include constants. All regressions exclude Russia. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.4: Determinants of pro and anti-separatist protests, republican level, USSR: Baseline

Variable	(1) Pro-independence, participants		(2) Pro-autonomy protests		(3) Anti-separatist participants	
	Equation 2 (Neg. Binomial): Protests or participants per capita					
POPREP	0.0861*	(0.0521)	0.0444**	(0.0229)	-0.0206***	(0.0059)
HISTRUS	-0.0501***	(0.0123)	-0.0226***	(0.00389)	0.0641***	(0.0206)
INCOME	-0.163	(0.111)	0.0806	(0.0783)	0.1025	(0.1775)
DEVGINI	45.56***	(11.96)	1.462	(10.42)	-127.8***	(27.46)
INDIRECTSUB	8.063***	(2.582)	-0.220	(0.966)	9.160***	(3.033)
DIRECTSUB	-6.305***	(1.577)	0.277	(0.859)	-38.66***	(6.76)
L_INDUSTRY	0.0002	(0.0007)				
OILFIELDS					-1.049***	(0.192)
DENSITY	0.995	(0.713)	-0.083	(0.213)	-1.937***	(0.5440)
EDUCATION	32.48*	(17.15)	9.805*	(5.844)	51.96***	(12.82)
CAPITAL	-2.270	(2.814)	0.564	(1.040)		
DISTRICT	-2.173***	(0.637)	-0.999**	(0.450)		
	Equation 1 (Logit): Predicting 0-occurrences					
POPREP	-0.121**	(0.0587)	-0.0750***	(0.0274)	-0.0110*	(0.0062)
ARREST	-0.340	(0.463)	0.0011	(0.0019)	-0.0005	(0.0029)
VIOLENCE	-1.521***	(0.366)	-0.626**	(0.303)	-0.5068***	(0.172)
ARMY	-1.355	(1.218)	-0.562	(0.349)		
PARAMILITARY	1.944*	(1.156)	-0.156	(0.358)		
Region F.E.	✓		✓		-	
N (provinces)	97		97		184	
0-occurrences	47		39		127	
Log-likelihood	-619.13		-345.66		-620.29	
$p > \chi^2$	0.000		0.000		0.000	

Sample: Provinces of the Soviet Union, 1987-1992. Models (1) and (2) exclude Russia. Dependent variable model (1): participants protesting in favour of independence for republic (P_SECREP). Model (2): number of protests in favour of autonomy for republic (AUTREP). Model (3): participants in protests against independence for republic (P_ANTI_SEC). Zero-inflated Negative Binomial model with standard errors clustered by economic districts (Model (1) and (2): 20 clusters, model (3): 31 clusters). Fixed Effects on level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia) for models (1) and (2). Both logit and main equations include constants. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.5: Secession decisions and protests

Variable	(1) Declaration of sovereignty Cox Model	(2) Sovereignty & Protests Cox Model	(3) Sovereignty & Protests Cox Model	(4) Declarations & Protests Poisson
Dep. Var.: Secessionism by local elites				
AUTPROV		0.0290***		0.0359***
		(0.00569)		(0.00475)
P_AUTPROV_C			7.59e-07***	
			(1.84e-07)	
POPPOT	0.1596**			
	(0.0789)			
HISTRUS	0.0112			
	(0.0155)			
INCOME	0.0340			
	(0.0618)			
DEVGINI	11.68			
	(13.85)			
MARKETPOT	1.379			
	(1.825)			
OILFIELDS	-0.0997			
	(0.0661)			
PIPELINES	0.0530			
	(0.0899)			
ARMY	-0.2522**			
	(0.1038)			
ADMIN_SSR	4.257***			
	(1.122)			
Regional F.E.	✓	✓	✓	-
N (total)	52	108	173,370	87
N (provinces)	52	108	108	87
Failure Events	46	48	48	-
Log-Likelihood	-128.44	-188.334	-188.25	-155.72
$p > \chi^2$	0.000	0.000	0.000	0.000

Sample model (1): Soviet Union, 1988-1991, provinces with special administrative status (restricted secession sample). Sample model (2): Soviet Union, 1988-1991, all provinces with likelihood of sovereignty declaration (extended secession sample). (1) and (2): Cox duration model with constant covariates. Sample model (3): Soviet Union, 1988-1991, Cox duration model with time varying covariates at daily frequency, full sample. Sample model (4): Russia, 1990-1994, cross section of provinces. Dependent variable for models (1), (2) and (3): timing of sovereignty declaration (SOVEREIGNTY). Efron method used for tied sovereignty dates. Dep. Var. model (4): Number of secessionist declarations (DECLARATIONS). Independent variable for models (2) and (4): secessionist protests per capita (AUTPROV). Model (3): participants in secessionist protests per capita (P_AUTPROV_C), time-dependent cumulative total. Models (1), (2) and (3) with fixed effects at level of 4 macro-regions (Baltics, Slavic Republics, Caucasus, Central Asia). Models (1) and (2) standard errors clustered at economic region (25 clusters), model (3) clusters at province level. Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.6: Temperature deviations and protests

Variable	(1) Full sample, participants	(2) Restricted secession sample, protests	(3) Controls, participants	(4) Fixed effects panel, protests
	Equation 2: Protests or participants per capita			
TEMPDEV	-0.0335***	-0.0185***	-0.0160***	-0.0025***
	(0.0051)	(0.0058)	(0.0054)	(0.0006)
POPPOT			0.0275**	
			(0.0107)	
HISTRUS			-0.0536***	
			(0.0078)	
DEVINCOME			0.0003***	
			(9.7e-05)	
DEVGINI			-33.74	
			(26.86)	
OILFIELDS			0.560**	
			(0.247)	
PIPELINES			-0.290***	
			(0.0892)	
ADMIN			0.391	
			(0.705)	
	Equation 1 (Logit): Predicting 0-occurrences			
POPPOT			-0.0336**	
			(0.0151)	
ARREST			0.0018***	
			(0.0006)	
VIOLENCE			-0.535***	
			(0.115)	
TEMPDEV		0.0137**		
		(0.0058)		
Regional F.E.	-	-	✓	-
Province F.E.	-	-	-	✓
N (total)	184	108	183	202,291
N (provinces)	184	108	183	113
Log-Likelihood	-1522.76	-470.56	-1410.27	-155.72
Wald χ^2	43.44	23.57	502.09	16.39
$p > \chi^2$	0.000	0.000	0.000	0.000

Sample model (1), (2) and (3): Soviet Union, 1987-1992, cross section of provinces. Sample model (4): Soviet Union, 1988-1991, panel at daily frequency. Dependent variable for models (1) and (3): P_AUTPROV. Dep. Var. model (2) and (4): AUTPROV. Models (1) and (2) and (3) Neg. Binomial with standard errors clustered at economic region (31 clusters), model (4) Poisson with robust sandwich errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table C.7: Temperature deviations, protests and secessionist declarations: Instrumental Variables with controls

Variable	(1) Instrument, non-linear	(2) First stage, linear	(3) Instrumented protests, linear	(4) Instrumented protests, Poisson
	Dep. Var.: Protests		Dep. Var.: Declarations	
TEMPDEV	-0.0247***			
	(0.0050)			
$\widehat{Protests}1$		2.727***		
		(1.002)		
$\widehat{Protests}2$			-3.32e-06	-8.71e-07
			(7.04e-06)	1.06e-06
POPPROV		8228	0.567***	0.2358***
		(8931)	(0.191)	(0.0773)
GEODIS		4.785	9.57e-06	4.23e-05
		(7.899)	(0.000151)	(6.85e-05)
INCOME		-1.749	-8.11e-05	-3.20e-05
		(4.654)	(9.43e-05)	(3.59e-05)
ADMIN		38798	2.991***	1.350***
		(26160)	(0.602)	(0.2099)
ARMY		-1171	0.118	0.0802
		(6166)	(0.118)	(0.0534)
Constant	11.69***	-29014	0.902	-0.078
	(0.651)	(57891)	(1.018)	(0.359)
Regional F.E.	-	-	-	-
N (total)	87	87	87	87
R2	0.012	0.146	0.217	-
Log-Likelihood	-610.90	-	-	-
F	-	2.28	5.95	-
Wald χ^2	14.95	-	-	-
$p > \chi^2; F$	0.000	0.044	0.000	-

Sample: Russia, 1990-1994, cross section of provinces. Dependent variable for model (1): Participants in secessionist protests (P_AUTPROV) per capita, negative binomial model. Dep. Var. model (2): Participants in secessionist protests (P_AUTPROV) per capita, instrumented with predicted values from (1) in first stage linear 2SLS. Dep. Var. model (3): Secessionist declarations (DECLARATIONS), instrumented with predicted values from (2) in second stage linear 2SLS. Dep. Var. model (4): Secessionist declarations (DECLARATIONS), Poisson instrumental variable model using GMM and predicted values from (1) as excluded instrument. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table C.8: Temperature deviations, protests and sovereignty declarations: reduced form (cross section)

Variable	(1) First Stage baseline	(2) Reduced form, baseline	(3) First stage, controls	(4) Reduced form controls
	Dep. Var.: Protests and Secessionist declarations			
TEMPDEV	-0.00581***	0.00169	-0.0105***	-0.00627
	(0.00218)	(0.00540)	(0.00387)	(0.00378)
POPPOT	0.0156***	0.0300**	0.0487***	0.0494***
	(0.00574)	(0.0146)	(0.0109)	(0.0183)
HISTRUS	-0.0126*	-0.0278***	-0.0274**	0.00393
	(0.00704)	(0.00941)	(0.0115)	(0.0115)
INCOME	0.0785***	-0.0570	0.140**	0.143**
	(0.0298)	(0.0810)	(0.0707)	(0.0701)
ADMIN			0.394	2.557***
			(0.492)	(0.665)
Constant	5.938***		5.282***	
	(0.616)		(1.086)	
Regional F.E.	-	-	✓	✓
N (total)	108	108	108	108
Failure events	-	48	-	48
Log-Likelihood	-607.52	-204.24	-452.79	-173.49
Wald χ^2	58.18	19.52	567.47	87.15
$p > \chi^2$	0.000	0.001	0.000	0.000

Sample: Soviet Union 1988-1991, cross section of provinces. Dependent variable for model (1) and (3): Secessionist protests (AUTPROV) per capita, model (2) and (4): Timing of sovereignty declarations by local elites (SOVEREIGNTY). Estimation model (1) and (3): Negative Binomial, model (2) and (4): Cox proportional hazard model. Standard errors clustered at economic region (27 clusters for model (1) and (2), 25 for model (3) and (4)). Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table C.9: Temperature deviations, protests and sovereignty declarations: Reduced form (panel

Variable	(1) First Stage, cumulative temperature shocks	(2) Reduced form, cumulative temperature shocks	(3) First Stage, past 180 days temperature shock	(4) Reduced form, past 180 days temperature shock
	Dep. Var.: Protests and Secessionist declarations			
TEMPDEV_C	-0.0575***	-5.73e-06		
	(0.0109)	(0.00450)		
TEMPDEV_L	-		-2.99e-05***	-2.06e-05
			(1.06e-05)	(2.57e-05)
POPPOT	2.66e-07***	5.71e-08***		
	(5.01e-08)	(1.50e-08)		
GEODIS	0.00102**	-6.45e-05		
	(0.000399)	(7.62e-05)		
INCOME	0.000368**	8.32e-05		
	(0.000145)	(7.54e-05)		
ADMIN	0.197	2.397***		
	(0.700)	(0.532)		
Constant	7.563***		-0.108	
	(1.265)		(0.330)	
Regional F.E.	✓	✓	-	-
N (total)	173,370	173,370	153,930	153,930
N (provinces)	108	108	108	108
Failure events	-	48	-	48
Log-Likelihood	-515112	-173.99	-114708	-211.95
Wald χ^2	208.24	83.92	7.87	0.64
$p > \chi^2$	0.000	0.000	0.005	0.422

Sample: Soviet Union 1988-1991, panel of provinces with daily frequency. Dependent variable for model (1): Cumulative participants in secessionist protests (P_AUTPROV_C). Model (3): Participants in secessionist protests (P_AUTPROV_L) over last 180 days. Model (2) and (4): Timing of sovereignty declaration (SOVEREIGNTY). Independent variable for (1) and (2): Mean past temperature deviation from 15 C. Model: (3) and (4): Mean temperature deviation from 15 C over last 180 days. Estimation model (1) and (3): Negative Binomial, model (2) and (4): Cox proportional hazard model. Standard errors clustered at province level (108 clusters). Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

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