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Abstract

The breakup of the Soviet Union provides evidence for the detrimental effects of secessionist conflict on domestic integration and economic growth. This paper shows that the increased likelihood of secessions by the Union's member republics in the late 1980s strongly reduced internal Union trade. Economic disintegration thus proceeded along internal borders and preceded the Soviet Union's official dissolution. This helps to explain the severity of the output fall in the late Soviet period. Methodologically, these results stem from an empirical gravity framework, which is derived from first principles by a game-theoretic modeling of Soviet internal trade. Exogenous variation in nationalist agendas, namely the desire to preserve national languages, is used to preclude endogeneity running from trade patterns to secession.

JEL classification: F52, N14, P20

Keywords: Nationalism; secession; economic disintegration; output fall; Soviet Union; transition economies

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1. Introduction

Conflict has well established negative effects on international economic integration. However, little evidence exists on the effect of conflict on trade or factor flows within the same state. This may be unsatisfactory, as political tensions within states are often centered on territorial sub-units, especially if these units are congruent with the settlement area of "distinct" ethno-linguistic groups (Roeder 2009; Hale 2004). There may be reason to expect such conflicts to be trade diverting, even in the absence of violent conflict. For example, Schulze and Wolf (2009) demonstrate how the emergence of economic nationalism in the Austro-Hungarian Empire led to increasing disintegration between its ethnically diverse territories decades before the dissolution of the Habsburg Empire. Berkowitz and DeJong (2001) similarly show how contemporary Russia remains economically fragmented along administrative boundaries.

The present paper goes beyond this existing literature in two ways. First, it asks in what ways the disintegrative effects of internal boundaries are magnified if regions are actively attempting to secede. In particular, I demonstrate how increasing secessionist tendencies in the Soviet Union, measured by declarations of autonomy issued by local republics in the late 1980s, inhibited the flow of goods within the Union. The effects are economically significant and statistically robust in an adapted version of a standard gravity model, and are strengthened when exogenous variations in nationalism are used to account for different propensities to secede

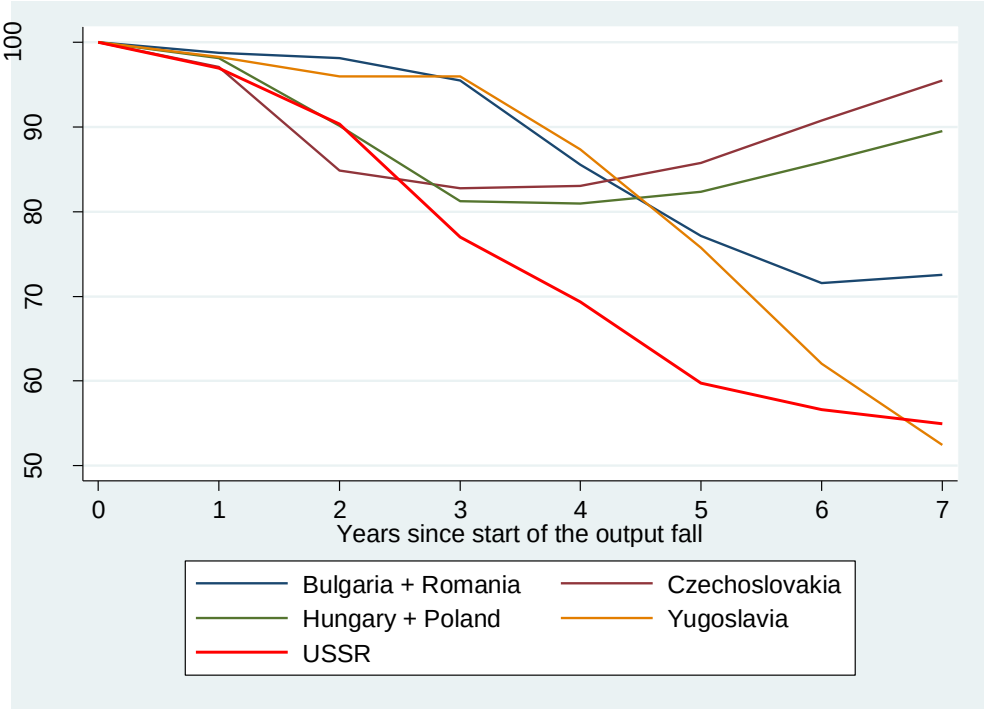
Secondly, I determine the effects of domestic disintegration on output. For the historical case of the Soviet Union, I show that one standard deviation less trade due to secessionist threats cut Soviet republics' growth rates by more than 7 percentage points per year between 1989 and 1992. These results help to explain an important historical event: the spectacular economic collapse of Soviet economy after it had seen slow, but stable, growth in the preceding decades. Most explanations suggest that the Soviet output collapse may have been the unintended result of reform policies (Murphy, Shleifer and Vishny 1992), or point to the increasing costs of maintaining economic control (Harrison 2002). Although these theories have provided substantial insights into the crisis of the Soviet command economy, their predictions are hard to test empirically. This paper suggests a complementary explanation that has a testable cross-sectional dimension: economic disintegration played a decisive role in the Soviet output collapse. As Figure 1 shows, the output collapse in the (Former) Soviet Union was indeed deeper than in other transition economies, save for Yugoslavia.

The link between nationalism, disintegration and the Soviet output fall put forward here is in accordance with a large qualitative literature stemming from other social sciences (Brubaker 1994; Suny 1993; Laitin 1991), which stresses the decisive role of nationalism in the Soviet Union's disintegration. The argument is further supported by the assessment of contemporary observers, who emphasized the high degree of economic interdependence between the Soviet republics (Granberg 1993). It also ties in with recent work demonstrating how the decline in Soviet external trade triggered output falls even beyond the Soviet Union itself (Gorodnichenko et al 2012). Finally, the findings of this paper lend credence to the propositions of a theoretical literature (Blanchard and Kremer 1997, Roland and Verdier 1999) that explains the extraordinary length and depth of the transitional recessions of the 1990's with lasting supply chain disruptions.

Methodologically, this paper employs the gravity framework (Anderson & Wincoop 2003) used in much of the recent trade literature. The standard gravity framework is adapted to the Soviet context by deriving gravity-type implications from a game-theoretical model of domestic trade in a command economy. This game-theoretical model features the possibility of centrally planned trade being diverted by local republican elites. In particular, a noisy signal of secession emitted by other republics motivates elites to use their limited discretion to institute informal trade barriers. Although the imposition of these trade barriers is demonstrated to be economically rational from the perspective, of individual republics, it leads to lower trade and a welfare loss in aggregate. I empirically use an

instrumental variable procedure to isolate the exogenous influence of political nationalism on the initial signal of secession. This controls for the possibility of secessions being endogenous to the economics of the trade regime. As a next step, I include the trade that is estimated to have been withheld due to the imposition of internal trade barriers in a regression of Soviet republics' growth rates. The panel nature of this "trade and growth" estimation allows for the inclusion of time and republic fixed effects, thereby controlling for a range of confounding factors that might have affected Soviet growth rates.

Figure 1 Output during the 1990's, selected countries in Central and Eastern Europe (maximum output = 100)



Output per capita, 1990 International Geary-Khamis $. Source: Bolt and van Zanden (2013). Calculation: Author.

The Soviet Union provides a meaningful showcase for the economic effects of political conflict within states for a number of reasons. Held together for 70 years as a tightly integrated economic space populated by a diverse set of nationalities, it offers an especially good testing ground for the effects of nationalism on domestic integration and growth. Secondly, whereas domestic trade flows are often not recorded in market economies, the extent of economic monitoring in the Soviet Union provides suitable amounts of data on domestic trade. Because this paper relies to a large extent on bilateral trade data, for which both export and importer declarations are available, data reliability is not a major obstacle in this study of the Soviet breakup. Thirdly, the generality of my theoretical model and my empirical approach suggest that this paper's results can, with the necessary degree of caution, be extended to contexts beyond central planning.

The remainder of this paper is as follows. Section 2 briefly outlines the most salient historical features of internal trade and political territorial organization in the Soviet Union, showing how discretion by local elites was a recurrent characteristic of Soviet economic life. These elements are then incorporated into a formal theoretical model of interrepublican trade under a command economy in section 3. Section 4 shows how the implications of that model can be integrated into an empirical gravity model, and how that model can sensibly be employed to Soviet data. Section 5 isolates the exogenous variation in political nationalism that can be employed in an instrumental variable approach. Section 6 displays and analyses the results concerning the degree of Soviet disintegration, whereas section 7 links trade disintegration to economic growth, or the lack thereof. The final section concludes and offers an assessment of the implications of the paper.

2. Historical Background: Internal Trade and Institutions in the Soviet Union

The Soviet Union was officially formed as a federation, which in the last decades of its existence consisted of fifteen constituent republics. Table 1 gives an overview of the fifteen Union republics and the degree to which they were integrated into the Union-wide economy. In terms of openness to trade, Soviet republics comfortably withstood comparison to the EU-member states of the time (Eichengreen 1993). [1]

This was largely the outcome of policy design. Soviet planning strove to construct vertically integrated industries whose supply chains spanned republican boundaries. Policy often aimed to reduce local institutions to transmission belts for decisions taken in Moscow. And although republican authorities were involved in planning decisions, the interests of the center ruled paramount in many cases. Moreover, long term decisions of economic policy, especially on industry location, were reserved to central bodies, as were decisions pertaining to strategic industries and foreign trade (Gregory & Stuart 1994, p. 350-351). Similarly, nationality policy accorded a strong role to Russians in running the Union. Ethnic Russians were given preference in recruitment to high positions within the Party or the central bureaucracy, and highly mobile Russian managers and skilled workers operated as an economic elite in many republican economies (Szporluk 1989).

Table 1 Internal trade in the Soviet Union in 1989

Republic	Intra-Union trade (Billion Rubles)	Intra-Union trade as % of republican output
Armenia	7.7	53.2
Azerbaijan	10.7	40.9
Belarus	32.4	43.9
Estonia	5.7	45.6
Georgia	10.7	47.2
Kazakhstan	22.0	29.0
Kyrgyzstan	5.5	40.8
Latvia	9.1	44.6
Lithuania	11.7	43.1
Moldova	9.8	48.4
Russia	138.2	16.2
Tajikistan	5.0	43.1
Turkmenistan	4.9	41.5
Ukraine	76.5	26.1
Uzbekistan	19.6	37.3
USSR total	*369.5*	*24.0*

Source: Author, calculated from Goskomstat (1990)

Yet the republics locked into the Union differed greatly in terms of their levels of development, as well as being ethnically highly heterogeneous. This placed a limit on the extent to which the center could impose its will on the individual republics in a number of important ways.

The first restraint was a legal one. On a constitutional level, the Soviet Union was, as proclaimed in its anthem an "unbreakable Union of free republics". In fact, each republic also had a constitutionally secured right to secede from the Union. Each Union republic was allocated to one "titular nationality", whose national language and national state symbols were usually granted constitutional

[1] As is well known, Soviet national accounting practices significantly diverged from those carried out elsewhere (OECD and CIS 1993), and comparisons between market and command economies should be taken with a grain of salt. But they may serve to illustrate the general point of relatively high trade integration in the Union.

status and whose members were accorded a legally privileged position within the republic.[2] In terms of political institutions, each Union republic possessed its own Communist Party, separate parliaments, police forces, educational institutions as well as an extensive government bureaucracy. Among the most influential sectors of the republican bureaucracy were the local economic planning agencies, as well as republican industrial ministries. Their main responsibility revolved around governing those enterprises which were of predominantly local importance, as well as cooperating with central economic authorities in the governance of enterprises which were deemed to be of national importance (Gregory & Stuart 1993, p. 150-151). Even though these institutions were often subordinate to the center's directives, and were powerless during the most repressive phases of Soviet rule, their very existence provided the republics with some leverage in the bureaucratic politics that characterized the late Soviet Union (Nove 1980, p. 74).[3]

The greatest barrier to the full implementation of central control therefore lay in the operation of the bureaucratic apparatus itself. The sheer complexity of the planning and production process required some planning authority to be delegated to lower echelons. Most importantly, the task of carrying out the plan had to fall on local bureaucrats and enterprise managers (Hanson 2003, p.18). As plans could not be drafted contingent on each eventuality, local economic agents had to be given some *de facto* freedom of action, the extent of which increased after the death of Stalin (Hanson 2003 p.252). Local Party cells played a strong role in the day-to-day regulation of local enterprises, as well as in lobbying central ministries to increase allocations for their regions (Rutland 1993, p.63). Similarly, enterprise managers frequently had to use their own initiative in resorting to parallel networks to fend off supply shortages.

Although monitoring of lower bureaucratic echelons was extensive, the evaluation of performance remained incomplete in practice (Nove 1980, p.73). Imperfect oversight coupled with executive discretion opened up the possibility of transgressions for local officials and enterprise managers. This possibility was enhanced by the fact that even when transgressions were noticed, plan compliance was not always enforced. Crucially in the present context, the fulfillment for delivery plans by supplying enterprises often remained unenforced, because fulfillment of production plans rather than delivery plans were considered crucial by the authorities (Nove 1980, p.122). This is one of the reasons why producers were generally hesitant to supply ordered goods, even if they were produced. This phenomenon of export restriction has been one of the chronic features of the Soviet system (Schroeder 1972) and will play a key role in my model.

Generally speaking, the severity and frequencies with which plans were enforced declined as the Soviet era wore on and reached its lowest point towards the end of the Brezhnev era.[4] By the end of Brezhnev's long rule, turnover among republican elites, both at the top as well as at the bottom, had virtually come to a standstill (Rutland 1993 p.192-193). As a result of long tenures of officials, informal networks, often running along ethnic or clan affiliations, solidified in the Union republics (Suny 1993). Although Brezhnev's successors Andropov and Gorbachev attempted to increase turnover rates at the top of the Party and State hierarchies, even their most determined anti-corruption campaigns could not cut through the by now entrenched interests which had developed over the course of the prior two decades (Fowkes 1997, p.122). "Most frustrating for the central

[2] This included preferential treatment of members of the titular nationality in appointments to Party and bureaucratic posts within the republic (Roeder 1991, p.204).

[3] Bureaucracy in the USSR coincided with the inflated use of acronyms and cumbersome terminology. For the sake of convenience I will ignore these particularities and refer to, for example, Russia, rather than to the Russian Soviet Federative Socialist Republic. I will also refer to "internal Soviet trade" without necessarily implying voluntary transactions.

[4] One explanation for the decline in punishments would be that authorities often deemed the collateral costs of punishments, which typically involved the relocation of those deemed responsible for mismanagement, as being too high. See Harrison (2002) for an analysis of the rationale for Soviet authorities to use or abstain from using punishments.

government," writes Suny (1993, p. 115), "was the close connection between culture, kinship and the second economy, the illegal wheeling and dealing protected by favors and bribes, family loyalties and codes of silence." Ethnic networks had thus become a powerful competitor to the state in the allocation and distribution of resources.

To a large extent, the state itself had been taken over by local ethnic interests. Suny continues to note: "Once Stalinist terror was reduced (…) the republics were essentially ruled by national 'mafias', centered within the Communist Parties and state apparatuses whose reach extended throughout society." Georgia became noted as a particular hotspot for bureaucratic corruption and kinship networks (Clark 1993). In Uzbekistan, a cartel of republican leaders successfully manipulated the cotton trade for decades to the damage of the central authorities in Moscow. Such behavior was not limited to the "eastern" republics. As Gregory Grossman (1977, p.34) observed: "Leningrad, Riga and Odessa are obviously major funnels that feed the second economy. The Odessa black market enjoys high renown."

There is qualitative evidence abound of these disintegrative effects increasing during the last decade of the Union's existence. Republican nationalist movements became more vocal in voicing separatist positions as the Gorbachev years wore on and popular demands became more ethnocentric in focus, occasionally spilling over into ethnic violence (Beissinger 2002). Republican leaders also became more assertive in political conflicts with central authorities and started to reclaim political authority from the center. This is illustrated by the unilateral declarations of sovereignty by the republics (see table 2, section 4). Even Russia moved towards more autonomy from the Union (Szporluk 1989).

There is also qualitative evidence of this political fragmentation having economic effects. To a certain degree, this was nothing new. "Economic patriotism", especially by republican wholesale trade enterprises, had always presented some "barrier to the normal flow of goods between republics" (Orlov & Shimanskij 1970, p.96). Even during reforms in the early 1960's, Soviet policy makers had complained about excessive "localism" by regional leaders (Markevich & Zhuravskaya 2011). But in the atmosphere of the Gorbachev years, marked by interethnic conflicts and rapidly receding central control, the extent of such informal trade barriers was magnified (Strayer 1998, p.151). Part of the reason was ideological. Nationalist movements started to advocate economic self-sufficiency, or as the Lithuanian mass movement Sajudis put it, the ideal of the national economy as "a unified, self-contained system" (Fowkes 1997, p.156). But republics also used boycotts of interrepublican shipments as a bargaining tool. After such boycotts, falls in production were routinely observed in factories in those republics dependent on the boycotted inputs (Snyder 1993 p.194). Contemporary Soviet economists accordingly emphasized the costs disintegration would have (Granberg 1993). Similarly, observers from international economic organizations frequently complained about political conflicts increasingly hindering interregional deliveries (IMF et al 1991, p. 195; Christensen 1994).

Although the historical account offered this far paints a clear picture of the fact that discretion by local elites was extensive, and that it was increasingly used, the motivation behind the intensifying imposition of trade barriers is obscure. Why and how would republics, or their elites, gain by withholding trade? The next section proposes a formal model of Soviet interrepublican trade which derives testable conditions for the exercise of opportunistic behavior by republican elites.

3. Trade and discretion in a command economy: a game theoretical perspective

Consider republics i, j and a central planner who decides on the output O of a certain good k, O_k, to be produced in each republic. The planner faces product-specific per unit costs of production $0 < \{c_i, c_j\} \leq 1$ that are deducted from the final output. Production costs may differ between republics, for example due to differences in productivity. The planner faces no input constraint and

can freely allocate production between republics, as long as he satisfies a minimal level of demand D_i, D_j, in each republic. This may be thought of as the minimum level of consumption that ensures the consent of the population, or the minimum level of demand from local non-tradable goods producers that needs to be fulfilled. Anything that is produced in excess of the level of minimum demand accrues as surplus to the planner. In that case, the planner would clearly only produce in the more expensive location to fulfill the minimum level of demand and all other production will take place in the location with the lower per unit cost

Now suppose the planner has the option of transferring some of the final good *k* from one republic to the second republic. The planner may thus assign a bilateral trade flow q, so that q_{ijk} denotes a flow of good k from i to j and q_{jik} a reversely directed trade flow. In moving goods, the planner needs to pay (symmetric) per unit transport costs, so that goods actually traded q_{ijk} are only a fraction of the goods being given up by i (q_{ik}):

$$q_{ijk} = q_{ik}\,(1 - \tau_{ij}) \quad (1)$$

For the case of i being the low cost producer for good *k*, the planner's maximization problem can be stated as choosing the values of O_{ik}, O_{jk}, q_{ik} that maximize:

$$\max\{\, O_{ik} + O_{jk}\}$$

subject to constraints:

$$O_{ik}(1 - c_{ik}) - D_{ik} \geq q_{ik}$$

$$O_{jk}(1 - c_{jk}) - D_{jk} \geq -q_{ik}(1 - \tau)$$

$$q_{ik} \geq 0$$

As before, the planner will only supply the high costs region *j* with goods to fulfill its minimum consumption requirement, so that the second constraint is always fulfilled with equality. From the first order conditions, the planner will choose positive values for q_{ik} if trade costs are low compared to the cost of producing in the high cost location:

$$\frac{1 - c_{jk}}{1 - c_{ik}} \leq (1 - \tau_{ij}) \qquad (2)$$

Equation (2) thus defines the extensive margin of trade. The size of trade q_{ijk} (the intensive margin), will then be equal to the minimum consumption requirement in the high cost location: $D_{jk} = q_{ijk}$. Summing over all goods to arrive at the determination of aggregate good flows yields an expression determining the planned aggregate bilateral trade flows, which resembles an implicit formulation of a gravity equation:

$$q_{ij} = f(c_j, c_i, D_i, D_j, \tau_{ij}) \qquad (3)$$

As in a Ricardian market economy (Eaton and Kortum 2002), trade in the model command economy is driven by differences in productivity, by the size of demand of trade partners, and is decreasing in trade costs. In essence, a planner will attempt to concentrate as much production in one location as transport costs will allow him to, and use trade flows to exploit cost advantages for different products in different locations. Indeed, Soviet planners' persistent desire to exploit economies of scale in single locations is well known (Pallot & Shaw 1981). The high degree of interrepublican trade noted in section 2 is a clear result of this tendency.

We now turn to the strategy options available to the republics. In Soviet practice, planning decisions of Union-wide importance were made by central Gosplan authorities, so that the central planner's preferences in assigning interrepublican trade flows can be viewed as exogenous to the strategy choices of the individual republics. Furthermore, the planner did typically bear the costs of production and transport, and republics could not engage in intra or extra-Union trade on their own account (Gregory and Stuart 1991). q_{ij} is therefore exogenous to the strategy set of the republics.

In the Soviet Union, managers received material rewards for the output they produced, and to produce output, they needed imports (Nove 1980). I therefore assume a trade flow q_{ij} delivers utility $v_j(q_{ij})$ to the elites of the importing republic j:

$$v_j(q_{ij}) \quad = \pi_{ij} q_{ij} \qquad \text{where} \quad 0 < \pi_{ij} \leq 1 \ \forall\, i \neq j \qquad (4)$$

π_{ij} is a valuation parameter that translates a unit of imports into utility for the domestic elites. It is assumed to be pair specific, because it may depend on the composition of the particular trade flow.

Under a command economy system, however, q_{ij} does not automatically trigger a reverse flow of real resources. Trade flows are therefore not mirrored by the build-up of debit or credit positions by the trading parties (van Selm 1997, p. 47). Furthermore, managers are rewarded for output, rather than for the delivery of output. I therefore assume for the exporter's utility: $v_i(q_{ij}) \quad = 0$ [5]

This setting provides an economic explanation for the tendency noted in section 2 of producers in a command economy -enterprises or republics- to restrict deliveries. A utility maximizing republic would want to behave like a mercantilist in reverse by maximizing its imports, thus generating inputs free-of-charge, and restricting its exports, for which it would receive little of value in return. One could thus say that some centrifugal tendencies are built into a system of socialist federalism.

Naturally in a command economy, the republics' freedom of action is constrained by the planner's means of coercion, which determine the extent to which these centrifugal tendencies can manifest themselves. As the discussion in section 2 has illustrated, enforcement was often fragmentary. I model this by allowing the delivery of a certain fraction of trade to be unenforced by the planner[6], thus giving republics the discretion to withhold some scheduled exports, if they wish to do so:

$$l_i q_{ij} \quad \text{where} \quad 0 < l_i \leq 1 \qquad (5)$$

The fraction l_i may conceivably be influenced by a variety of factors, including the monitoring regime in place, the enforcement mechanisms available to central authorities, as well as the strength of local parallel networks. It is therefore allowed to vary between exporting republics. There is indeed direct evidence of l_i existing in Soviet internal trade. As a regional Party leader recalls: "So we asked the

[5] This is probably a slight overstatement even in the context of a command economy (Gregory & Harrison 2005). A successful delivery of goods did trigger a reverse flow of rubles corresponding to the predetermined "value" of the goods. As with most enterprise transactions, however, this money was "earmarked" in the sense that it was "trade fund money" and could not easily be used to pay wages, finance investment or procure goods from other enterprises. In that sense it did not constitute an economic asset of equal value to the exported goods. The main results of the model would also carry through by more moderately assuming $v_j(q_{ij}) > v_i(q_{ij}) > 0$, but this would complicate the notation without yielding additional insights.

[6] As noticed before, meeting delivery plans had a lower priority than meeting output targets, which meant that monitoring of supplies was especially fragmentary. Although Soviet reformers experimented with the introduction of direct contracts between suppliers in order to increase delivery rates, these contracts remained unenforceable in practice, partly because the Soviet Union lacked either an applicable body of commercial contract law (IMF et al 1991, p. 247-255) or a state able to enforce such contracts (Roland 2000, p.148).

government to leave about 5% of the region's output at *our* disposal. Some share of that was left to the producers, so that they could barter for their own needs. The rest went to the region's needs." (Ellman and Kontorovich 1998, p. 204).

Any potential exports that are withheld and allocated "to the region's needs" can be used as inputs into the domestic republican economy. I assume these goods to exhibit a lower utility than those goods imported into the republic's economy. This implies that trade, under a planned system is economically more efficient than autarky under the same planned system. This will be the case if the withheld goods are only imperfect substitutes for the goods that could have been imported:[7]

$$0 < \pi_{ii,}\pi_{jj} < \pi_{ij},\ \pi_{ji} \qquad (6)$$

Figure 1 below summarizes the payoffs republics i, j can expect from their binary strategy options of either complying fully with the plan or of utilizing discretion. The game is one of complete information and simultaneous moves.

Figure 2 Strategy choices and payoffs under centrally planned trade with republican discretion

		Republic j	
		Comply	**Discretion**
Republic i	**Comply**	$\pi_{ji}\mathrm{q}_{ji}$, $\pi_{ij}q_{ij}$	$(1-l_j)\pi_{ji}\mathrm{q}_{ji}$, $\pi_{ij}q_{ij} + l_j\pi_{jj}q_{ji}$
	Discretion	$\pi_{ji}\mathrm{q}_{ji} + l_i\pi_{ii}\mathrm{q}_{ij}$, $(1-l_i)\pi_{ij}q_{ij}$	$(1-l_j)\pi_{ji}\mathrm{q}_{ji} + l_i\pi_{ii}\mathrm{q}_{ij}$, $(1-l_i)\pi_{ij}q_{ij} + l_j\pi_{jj}q_{ji}$

Note: Top line indicates payoff for republic i

Allowing these republics to play a one shot game yields a familiar result under non-cooperative game theory and resembles a Prisoner's Dilemma. Republic *i* will prefer the outcome *{discretion; comply}* to *{comply; comply}*. This is not an equilibrium, as similar considerations are applied by *j*. The Nash equilibrium is *{discretion; discretion}*, which is an equilibrium associated with lower trade flows, and lower aggregate welfare, than the equilibrium that would be attained under perfect plan attainment. Yet the result differs from a classic Prisoner's Dilemma through its asymmetry. As long as trade is unbalanced ($q_{ij} \neq q_{ji}$) and opportunities for discretion unequally distributed ($l_i \neq l_j$), payoffs in the *{discretion; discretion}* state are not equally distributed between republics. For an individual republic it may even exceed the payoff of the plan compliance equilibrium.[8]

Conceptually, the problem bears some similarity to a Fundamental Problem of Exchange (Greif 2000) with simultaneous moves. In the absence of mutual commitment or a superior enforcement mechanism, a trade that would be welfare achieving on aggregate cannot be achieved.

[7] This is of course not the same as assuming that the particular set of planned trade flows is more efficient than an alternative set of trade flows generated by market forces. It just requires that planned trade is preferable to autarky *given* the choices on the location of production already made by the planner. In the Soviet context modelled in equations (1)-(3), where imports are by definition "deficit" goods, i.e. goods that the local economy was not budgeted to produce ($O_{jk}(1-c_{jk}) < D_{jk}$), this is probably a reasonable assumption.

[8] A move from the low trade equilibrium to the equilibrium with high trade flows is therefore not necessarily a Pareto improvement for all agents, which offers an explanation for the perennial resistance against supply reform in the Soviet Union (Schroeder 1972)

A possible way out for the planner would be to lock the republics into the trading regime for an infinite number of rounds without any access to outside trading options. This is what the Soviet Union, functioning as a "perpetually" closed customs union, tries to accomplish. With a discount factor $0 < \delta_i,\ \delta_j \leq 1$ we have full plan compliance under the USSR regime if for republic *i* the gains from continual trade exceed the one-off gain from partial autarky:

$$\left(\frac{1}{1-\delta_i} - 1\right)\pi_{ji}q_{ji} > l_i\pi_{ii}q_{ij} \qquad (7)$$

The reverse should hold for *j*. Given the appropriate parameter configuration, the existing trade configuration is stable and the republican elites are fully in compliance with the plan. Republics can follow a "tit for tat" strategy: employing their exports as a payment against which they receive further desirable imports in what is *de facto* a sort of dynamic barter trade. Such strategic considerations in Soviet internal trade are corroborated by anecdotal evidence. As a regional Party boss interviewed by Ellman and Kontorovich (1998) recounts the mechanics of interregional barter: "You scratch my back, and I will scratch yours." (p.205)

Consider now a scenario in which the planner's ability to maintain the existing trade arrangement becomes uncertain. Such a scenario corresponds most closely to the period of Soviet history under study here, which was marked by the liberalizing Gorbachev reforms. The Gorbachev regime allows for the possibility of secession i.e. exit by a trading partner out of the system. I model this by inserting a probability of transition to the next round of the game for each trading pair P_{ij}. This is defined inversely to the probability secession s_i, s_i , i.e. exit from the Union by one or both republics:

$$P_{ij} = \left(1 - s_{ij}\right) \quad \text{where} \quad s_{ij} = f(s_i, s_j) \qquad 0 < s_i, s_j \leq 1 \qquad (8)$$

The probability of secession will be treated as being exogenous for the moment. The underlying assumption, that republican secession is not determined by the economics of the trading system, may be a strong one, but it is one that will be relaxed in the empirical sections by using an instrumental variable strategy. For now, I treat the probability of secession as a noisy signal that is exogenously sent out by each republic and supplies some information on the likelihood of its exit to the trading partner. The implication is that republics can react to each other's commitment towards staying in the Union by adjusting their own strategy appropriately.

I also allow for the possibility of mutual (symmetric) social capital in interrepublican trade relations moderating the effect of the signal of secession. This takes account of the possibility that republics which are geographical neighbors, or share historical or cultural ties, will likely enter into an exchange again after Union breakup. They might therefore behave less opportunistically with respect to each other at present. I call these effects "Neighborhood effects":

$$0 < N_{ij} \leq 1$$

In total, these additions change the condition for a *{comply; comply}* equilibrium to be feasible, so that we now have for republic *i*:

$$R_{i,j} = \left(\frac{1}{1-\delta_i P_{ij} N_{ij}} - 1\right)\pi_{ji}q_{ji} > l_i\pi_{ii}q_{ij} = A_{i,j} \qquad (9)$$

This equation embodies the basic properties of Soviet internal trade. $R_{i,j}$ defines the present value of the reward to republic *i* from continued trade with *j*. On the other side, $A_{i,j}$ defines the one-off gain from a more autarkic policy towards *j*. Given that $P_{ij}N_{ij} < 1$ per definition, $R_{i,j}$ under the Gorbachev regime will be lower than under the USSR regime, so that we expect republics to trade less under a regime which allows the possibility of secession.

This provides a theoretical explanation for the imposition of trade barriers during the end years of the USSR: As long as republics were locked into the Union in perpetuity without recourse to outside trading options, the perspective of continuing trade interaction with other republics provided a limit to the extent to which discretion could profitably be applied. Only once the commitment of another republic to the Union became dubious, for example if it strove towards secession, did withholding exports to that republic make sense. In essence, secessionism opened up interrepublican trade to Greif's (2000) Fundamental Problem of Exchange.

In general, defining the strength of the incentive for the individual republic *i* to follow the plan with *j* :

$$\Pi_{i,j} = R_{i,j} - A_{i,j} \qquad (10)$$

yields an expression that is increasing with trade flows from *i* to *j*. Summing over all the incentives faced by all possible trade pairs n and subsequently dividing by n defines the incentive facing the *average* republic:

$$g(\pi_{ji}, \delta_i, N_{ij}s_j, \pi_{ii}, l_i) = \left(\frac{\sum_{i,j}^{n}(R_{i,j} - A_{i,j})}{n}\right) \qquad (11)$$

Function $g(.)$ describes the extent to which the plan will be fulfilled and trade will take place. It therefore governs the aggregate level of pairwise exports over which republics had discretion in the USSR. Expressed from the perspective of *i*:[9]

- $g(.)$ should be increasing in π_{ji}, δ_i, N_{ij},
- $g(.)$ should be decreasing in s_{ij}, π_{ii}, l_i

The conceptual basis for these effects is that in a game with barter trade, republics use their own exports as a bargaining chip against which they receive further desirable imports. The more a republic benefits from the existing trading arrangement, the more it will work towards maintaining the trading relationship by sending exports. If this is no longer the case, for example because the other republic is likely to secede (increase in s_{ij}), elites will opt for autarky and restrict their exports.

4. Empirical strategy and data

As shown in section 3, equation (11) leads to the formulation of a number of testable hypotheses concerning the determinants of discretionary exports of each Union republic and especially the role of the secession signal. However, $g(.)$ predicts the behavior of exports over which republics have discretion ($l_i q_{ij}$) whereas in practice only planned trade q_{ij} already adjusted by discretionary trade flows $l_i q_{ij}$ is observable in the data.

Using equations (3) and (11) we can therefore describe actually observed trade flows at one point in time y_{ijt} as planned trade flows q_{ijt} adjusted by discretionary flows as:

$$y_{ijt} = f(c_j, c_i, D_i, D_j, \tau_{ij}) + g(\pi_{ji}, \delta_i, N_{ij}, s_{ij}, \pi_i, l_i) \qquad (12)$$

Equation (12) does not specify a functional form that can be readily estimated, and some of the variables may be very hard to measure. I therefore prefer an agnostic approach. Instead of explicitly modeling all variables, I use time varying exporter and importer specific dummies γ_{it}, η_{jt} to capture the effect of any variable that is republic specific, such as republican productivity or demand. These dummies may also control for a whole range of factors that the modelling process has omitted.

[9] The comparative statics of $g(.)$ are the same as $\Pi_{i,j}$ except that $g(.)$ is not influenced by the term $(q_{ij} - q_{ji})$. As the aggregate internal trade balance sums to 0, it cannot influence the level of internal trade and therefore does not influence the incentives of the average republic.

Moreover, the use of time varying dummies allows the circumvention of the problem of multilateral resistance, which is the tendency of regions that are relatively remote relative to their trade partners to trade more with each other (Anderson & Wincoop 2003). It also avoids some thorny data problems, including inflation and the problem of aggregating values without market prices, that otherwise plague quantitative studies of centrally planned trade (see van Selm 1997; Gros and Dautrebande 1992).

I follow the convention in the literature to take natural logs of trade volumes and trade costs and to assume a linear specification. Equation (12) is then transformed into a testable equation:

$$ln\, y_{ijt} = \beta + \beta \ln\tau_{ij} + \beta s_{ij} + \beta ln\pi_{ji} + \beta N_{ij} + \gamma_{it} + \eta_{jt} + \varepsilon_{ijt} \qquad (13)$$

Equation (13) is of course an augmented form of the standard empirical gravity equation (Baldwin and Taglioni 2006; Anderson & Wincoop 2003).

How are the variables in (13) measured? Most importantly, data on internal trade y_{ijt} from 1987 to 1991 is taken from the input-output tables of each Soviet republic as compiled by the World Bank mission to the Commonwealth of Independent States (Belkindas and Ivanova 1995). This results in an annual matrix giving exports from each republic to each other republic in value terms, i.e. internal rubles. As the matrix records declarations on each unidirectional flow of goods from the importing side as well as from the exporting side, this theoretically yields two matching values for each trade flow. In practice however, these so called "mirror statistics" diverge in many cases, sometimes substantially.[10] I therefore take the arithmetic mean between both values to arrive at a consolidated value for y_{ijt}, as well as experimenting with different transformations of y_{ijt}. A concern might be that republics could have had a structural incentive to underreport on the level of desirable imports they have received or overstate the exports sent, for example to lobby for increased plan allotments. However, the distribution function of exporter and importer declarations are very similar: a t-test fails to reject the hypothesis of mean similarity at the 1% level. Empirically, the results reported in sections 6 are robust to the use of either distribution, or a linear combination of both.

Slightly more troubling is the phenomenon of missing data entries for some exporter-importer-year combinations, due to missing input-output tables. This is most acute for the years 1988 and 1989. I exclude those years, as well as running a genuinely balanced sample, as robustness checks in the empirical section. The results both for the link between secession and trade decline as well as for the connection between trade and growth are shown to be unaffected by this.

In order to measure the effect of withheld trade on growth, data on the change in GDP in constant prices from 1989 up to and including 1992 is taken from the European Bank for Reconstruction and Development's first Transition Report (EBRD 1994). Although this data has been checked for consistency by the EBRD, these data points remain to some extent the outcome of a Soviet data generating process. Unlike the trade data, there exists no second distribution to provide a consistent cross check. However, chronic misrepresentations that are republic-specific are alleviated by country fixed effects in the growth regression, as well as by the fact that I use growth rates, rather than levels. Research into Soviet accounting practices (Harrison 2011) suggests that misrepresentations were also a function of yearly plan tautness, in which case the problem can be dealt with by including year dummies.

[10] This phenomenon is well known in the trade literature (Guo 2009) and is not a Soviet-specific issue.

Measuring the utility of the goods composition of a given import vector (π_{ji}) presents another challenge, partly because no disaggregation of bilateral trade flows into goods categories is available. What is available, however, is the decomposition of total exports and imports for each republic into 15 goods categories for the year 1990 (Orlowski 1993). Based on that data, I calculate a similarity index between each pairwise combination of republican imports and exports. The methodology is a slightly altered version of the familiar Finger-Kreinin-Index (Finger & Kreinin 1979) which is often used to compare export distributions.[11] The result measures the degree to which a republic depends on a given other republic's exports to sustain its current structure of imports. A close similarity between a republic's import structure and another republic's export structure is thus used as an indicator for high complementarities. The hypothesis in Section 3 stated that a republic depending on crucial imports from another republic may be less willing to engage in opportunistic behavior.

Trade costs between republics are measured in a conventional way by using the great circle distance between republican capitals, which during the period of observation can generally be taken to have constituted the republics' economic centers. It is thus assumed that trade costs increase with distance.

Neighborhood effects N_{ij} describe the possibility of two trading partners meeting again after the common economic space has collapsed, which might influence their actions today. I decompose this effect into two categories: geographical proximity and ethno-linguistic proximity. Geographical proximity is measured by an adjacency dummy between republics, or by a regional dummy[12]. These effects are related, but different from the effect of distance on trade flows. For example, the estimate for the effect of distance on trade might be biased if no allowance is made for the possibility that neighboring republics can trade more with each other, notwithstanding the possibly very large geographical distance between their capitals. This can especially be a problem given the large territorial size of some republics in the sample.

Measuring the importance of ethno-linguistic proximity can be thought of as proxying cross-border social networks that may be trade enhancing. Some ethno-linguistic groups in the USSR were more closely related on several dimensions of ethno-linguistic dimensions than others (Beissinger 2002). For example, Turkmens and Azeris both speak semantically very similar Turkic languages (Suny 1993), even though both countries are not geographically adjacent. In measuring the degree of interethnic similarities, I follow Fearon and von Houten (2002) in using bilateral linguistic similarity as a proxy variable. The key concept is to use 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. For example, Russian and Belorussian are both east-slavic tongues and only part way at the third node. Georgian and Estonian, on the other hand, stem from completely unrelated language groups and are assigned a value of 0.

[11] Specifically, I calculate the export-import similarity index for a unidirectional good flow q_{ij} as:

$$\pi_{ji} = \sum_k \min\left[\left(\frac{X_{j,k}}{\sum_j q_{j,k}}\right), \left(\frac{M_{i,k}}{\sum_i q_{i,k}}\right)\right]$$

where $X_{j,k}$ are total exports of republic *j* of good *k*, and $M_{i,k}$the imports of *i* of the same good. The export-import index π_{ij} for the reverse goods flow q_{ji} is defined analogously. The difference to the original Finger-Kreinin index is twofold. Firstly, my index calculates a product's share of republican trade rather than its share of Union wide trade for that product. This is set to capture the importance of a particular import commodity to a republic's overall imports. Secondly, the index is non-symmetric ($\pi_{ij} \neq \pi_{ij}$) even for the same trade partners, because it compares export and import distributions, rather than two export distributions.

[12] Regions are defined as Baltic, Caucasus, Central Asia and West (including Moldova).

This leaves the threat of secession s_{ij} as the last variable to be defined. As mentioned in section 2, republics started to issue unilateral declarations of sovereignty during Gorbachev's rule. These were not declarations of independence (which were issued much later), but rather statements of autonomy. As such, they did not remove the republics from the existing state, but they did send a strong signal that a republic was moving towards more self-rule (Hale 2000). As detailed in table 2, there was considerable variation in the timing of these declarations. The Baltic republics steamed ahead, while most republics from Central Asia were more hesitant. I take an early issued sovereignty declaration as signaling a higher tendency to eventually secede from the Union, following Hale (2000) and Emizet and Hesli (1995).[13] There are three ways of employing this variable. One is to define a dummy taking the value of 1 if one republic in a trading pair has declared sovereignty: $s_{ijt} \in \{0, 1\}$. Alternatively, I calculate the total number of days until the eventual dissolution of the Union on the 26th of December 1991 to arrive at an indicator of secessionism. The pairwise secessionist value can then be defined as either as the product of the individual indicators: $(s_i \cdot s_j)$, or as the maximum value of either: $\max\{s_i, s_j\}$. The last two definitions lend themselves better to IV estimation and are therefore preferable, but I experiment with all three different definitions of s_{ij} as robustness checks.

Table 2 Sovereignty declarations and secessionism

Republic	Date of sovereignty	Days to Union dissolution (26.12.1991)
Armenia	23.08.1990	490
Azerbaijan	23.09.1989	824
Belarus	27.07.1990	517
Estonia	16.11.1988	1135
Georgia	20.06.1990	554
Kazakhstan	25.10.1990	427
Kyrgyzstan	27.10.1990	425
Lithuania	28.05.1989	942
Latvia	28.07.1989	881
Moldova	26.07.1990	518
Russia	12.06.1990	562
Tajikistan	24.08.1990	489
Turkmenistan	22.08.1990	491
Ukraine	16.07.1990	528
Uzbekistan	20.06.1990	554

Source: van Selm 1997

5. Results I: Nationalism and the propensity to secede

Until now, little has been said about the nature and determinants of the tendency to secede. The theoretical model developed earlier relied on secessions being exogenous to the strategic decisions on trade made by the republics. Similarly, the empirical specification of (13) implicitly assumes that the decision to secede is not endogenous to the trading regime. This is clearly too strong an assumption: republics that are less integrated into the Soviet economic system might have more to gain from leaving it. Is there an exogenous source of variation determining secessions?

[13] Incidentally, this signal turned out to more than just noise: the Spearman rank correlation shows a ρ of 0.82, significant at the 1%-level, between the sovereignty declarations and the actual independence declarations, which are clustered in the final months of the year 1991.

Much of the historiographical literature (Brubaker 1994; Suny 1993) suggests that political nationalism, that is the belief that distinct peoples exist and that they should be organized into distinct nation-states, was a driving force behind the decisions of the Soviet republics to opt for secession. For the purposes of this paper, a successful identifying strategy relies on the availability of a variable that captures this ideological essence of nationalism, without being disturbed by trade-related grievances that may be lead to republics desiring secession.

I therefore turn to a prominent feature of nationalism that has been expounded by many leading theoreticians of nationalism such as Ernest Gellner (1983) and Benedict Anderson (1991): linguistic identity. The key idea is that nationalists not only identify peoples by the languages they speak, but make language itself into an object of nationalist expression that goes far beyond the immediate necessity mandated by the needs of communication. This holds true especially for the Soviet Union, which saw national movements repeatedly pressing for the use of national languages in literature as well as in political and everyday life (Laitin, Peterson and Slocum 1992). As such, political nationalism focused on language is different from the use of linguistic networks that facilitate trade by lowering interaction costs. To make the point: Ukrainian nationalists wanted to repaint the street signs from Russian to Ukrainian (Suny 1993, p.105) not to lower communication costs, but because by doing so they were helping to constitute a separate political community.

The particular component of linguistic expression I use is the ratio of school text book copies in the national language in each republic relative to the number of Russian language school text book copies in that republic. The data is for the year 1970, and based on Pool (1978). There are several reasons, methodological as well as conceptual, for choosing this particular variable.

Primarily, being permitted to use the national language in local schools was a prominent and long-standing demand from nationalist circles in the USSR, articulated to different degrees in different republics.[14] It was also one that the Soviet authorities generally complied with, and as such differed markedly from their more cautious attitude towards permitting the use of local languages in the political and economic institutions of state. Even during the anti-nationalist excesses of the Stalin years, national language schooling was continued for most ethnicities (Anderson and Silver 1984).

Methodologically, expressing this variable relative to the number of Russian textbooks controls for many factors that might influence the general usage of books, such as the level of literacy. Because school text books are mandatory to use, the variable also captures the actual consumption of books rather than just their production. Additionally, the education system itself can be thought of as catalyst for nationalism (Gellner 1983), because it transmits values shaping future behavior in the sense of Tabellini (2008). The use of national language text books in 1970 can then be thought of as having raised a generation that is willing and able to articulate their demands for national sovereignty by the late 1980's. Lastly, employing the year 1970 to measure text book usage ensures that the exclusion restriction, which states that the trade regime of the late 1980's does not determine the use of text books at school, is likely to be met. Figure C1 in the Appendix plots the instrument against the sovereignty declarations, both calculated as the product of the importer and exporter values for each trading pair $(s_i \cdot s_j)$. The graph suggests a strong instrument.

[14] The extent to which local populations were able to formulate and press their demands for a revision of language policy in Soviet times is demonstrated most vividly in the Georgian crisis of 1978 where a proposed amendment to the republican constitution that would have changed the official status of the Georgian language provoked a public outcry and mass demonstrations. As a result, Soviet authorities backed down and Georgian remained the sole official language of the republic (Dunlop 1986)

6. Results II: Secessionism and trade disintegration

(i) OLS specifications

The results of running equation (13) with Ordinary Least Squares on Soviet internal trade data from 1987-1991 are provided in table 3, using the three alternative definitions of the secessionism variable. The results are encouraging. The R-square is characteristically high, as would be expected given the inclusion of the full range of exporter and importer time varying fixed effects. The classical gravity variables also present a familiar pattern. Distance is negatively related to trade volumes. Moreover, the control variables tend to confirm the hypotheses outlined in section 3. Bilateral trade volumes tend to increase with the similarity between a republic's import needs and another republic's export structure, although this control variable is not robust across specifications. The neighborhood control variables linguistic depicting similarity and adjacency have the expected sign, but are not significant in most specifications (not shown).

Most importantly, the threat of secession as measured by the issuance date of sovereignty declarations is highly significant. Republics that issued earlier sovereignty declarations saw the amount of imports they received from other republics reduced, which supports the prediction of the game theoretical model. As can be seen from comparing regressions (A), (B) and (C), the effect of secessionism exists independently of the precise definition of the variable that is used, although its statistical significance is weaker for the definition as a time varying pairwise secession signal (B). This is conceivably due to fact that trade data is only available on an annual basis, thus making it impossible to pick up the finer variations in timing between republics' sovereignty declarations, many of which fall into one year and are therefore coded the same. As this specification is also not so amenable to IV-estimation, I will concentrate on specifications (A) and (C) instead.

The results of both specifications are also robust in a perfectly balanced sample which excludes the years 1988 and 1989, as well as all missing data pairs from other years (Regression A.I, Appendix). Similarly, the results are unaffected if I only use exporters' declarations of trade values in A.II. This suggests that exporters did not systematically overreport the trade they sent. Redefining the secession variable yet again, for example by measuring the threat of secession by the ranked position of each republic in the race for sovereignty and then taking maximum or multiplied values also does not change the picture (not shown). Similarly, the OLS results, as well as the instrumental variable results that will be presented later, carry through if errors are clustered around trading pairs (A.VII) or the republic level (A.VIII and A.IX). Given that clustered errors are not compatible with the standardized beta coefficients used in this context, it was chosen to stick with the beta coefficients for the sake of interpretation. The results also survive dropping Russia, which is the largest trading country, from the sample (A.III).

Some checks on the economic significance of the results are useful. The beta coefficients in (C) suggest that a 1 standard deviation increase in the pairwise secession signal leads to a 0.15 standard deviation decrease in bilateral trade volumes. This implies that if one republic in the mean trading pair had declared its sovereignty 227 days earlier, the pair would have seen its trade volume cut by about 25%, which presents a sizeable and plausible cut in trade. As regression (D) does not use beta coefficients, we can also check the plausibility of the point estimate of the distance variable, which presents the elasticity of trade with respect to distance. The value of -0.42 is markedly lower than that commonly found for market economies. For example, a meta-survey of 1467 gravity models by Disdier and Head (2006) finds an average elasticity of trade to distance of -0.90. This may indicate that central planners did not take distance-related trade costs into account to the same degree as market agents would have done. This conjecture ties in with studies of the distance elasticity in centrally planned Soviet trade using older generation gravity models without fixed effects. These studies display elasticities of about the same magnitude as the one found here (see Gros and Dautrebande (1992), Van Selm (1997), Djankov and Freund 2002).

Table 3 Determinants of Internal Soviet trade 1987-1991: OLS Benchmark results

Dependent variable: log pairwise domestic trade	(A) Multiplied pairwise secession signal, standardized beta-coefficients		(B) Time varying pairwise secession signal, standardized beta-coefficients		(C) Maximum pairwise secession signal, standardized beta-coefficients	
Log distance	-0.149	*(-5.75)****	-0.209	*(-10.06)****	-0.194	*(-9.27)****
Log trade similarity	0.063	*(2.31)***	0.004	*(0.14)*	0.010	*(0.38)*
Secessionism $(s_i \cdot s_j)$	-0.317	*(-4.46)****				
Secessionism $s_{ijt} \in \{0,1\}$			-0.119	*(-2.03)***		
Secessionism $\max\{s_i, s_j\}$					-0.152	*(-3.42)****
Fixed effects	Yearly exporter & importer		Yearly Exporter & Importer		Yearly exporter & importer	
Neighborhood effects	Regional & ethno-linguistic		Adjacent & ethno-linguistic		Adjacent & ethno-linguistic	
R-squared	0.938		0.928		0.929	
Root-MSE	0.503		0.540		0.535	
Observations	670		670		670	

Source: author. Definitions: see text
All coefficients are standardized beta coefficients. t-statistics are in parentheses, robust standard errors for all regressions
** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table 4 Determinants of Internal Soviet trade 1987-1991: OLS Benchmark & 2SLS Benchmark

Dependent variable: log pairwise domestic trade	(D) OLS excluding Russia, no standardized beta-coefficients		(E) 1 stage 2SLS		(F) 2nd stage 2SLS: Instrumenting for maximum pairwise secession	
Log distance	-0.4247	*(-7.04)****	23.33	*(2.90)****	-0.3543	*(-6.49)****
Log trade similarity	0.4196	*(1.02)*	30.16	*(0.75)*	0.6456	*(1.74)**
Secessionism $\max\{s_i, s_j\}$	-0.0011	*(-3.04)****			-0.0030	*(-6.25)****
National language books			407.68	*(12.31)****		
Fixed effects	Yearly exporter & importer		Yearly Exporter & Importer		Yearly exporter & importer	
Neighborhood effects	Adjacent & ethno-linguistic		Adjacent & ethno-linguistic		Adjacent & ethno-linguistic	
R-squared	0.840		0.934		0.830	
Root-MSE	0.588		62.746		0.521	
Observations	540		540		540	

Source: author. Definitions: see text.
2SLS regression based on specification (D).Regressions exclude Russia (see A.VI for 2SLS specification including Russia).
Robust standard errors for all regressions. No standardized beta coefficients.
** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

(ii) Instrumental variable regressions

Regression (F) presents the benchmark Instrumental Variable regression using the maximum pairwise value of national language text books as an instrument for the maximum pairwise value of sovereignty declarations. The 1st stage regression suggests that the instrument is strong indeed. A higher use of national language text books in 1970 is associated with a significantly earlier expression of national sovereignty. The benchmark result from the 2nd stage regression (F) shows that the instrument works in the intended direction. Using the exogenous variation from political nationalism, the negative effects of the secession signal on trade are strengthened, economically as well as statistically, compared to the OLS regression (D). Apparently, nationalism added information to the secession signal that led trade partners to strongly cut their exports in response.

It should be noted that regression (D) is the appropriate OLS-counterpart to regression (F), because the definition of the instrument used makes it conceptually sensible for Russia be removed from the sample. Taking the usage of national languages compared to the usage of Russian as an expression of nationalism may not be meaningful in the case where Russian is the national language to start with. Nonetheless, while the baseline excludes Russia, regression A.VI in the Appendix shows that the main results carry through if Russia is included. It is worth stressing at this point that the secessionism effect is statistically robust to the exclusion of outliers, including the removal of any of the Baltic republics who appear as outliers in the race for sovereignty in table 2 (regression H).

I also experiment with multiplied secession scores, which amounts to an Instrumental Variable version of OLS specification (A). The outcome of this exercise is shown in (I) and suggests that little has changed. Moreover, although the definition of the instrument used is quite specific, changing that definition does not affect the results. For example, general national language book publications (instead of educational texts) from the official Soviet statistics (TsSU SSSR 1971) can be used instead. I also adjust by the percentage of residents in the republic who are nationals of the republic. This is to negate the possibility that differences in the ethnic composition might be driving the results. This does, however, not seem to be the case (not shown). Adjusting for the percentage of nationals who actually speak their "native" language is also quantitatively unimportant (not shown). The benchmark specification (F) is also robust to changes in the definition of the dependent variable. For example, even if only trade flows for which both the importer's and the exporter's declaration are available are counted in regression (A.V), the main results carry through, as they do in a perfectly balanced sample (A.IV).

Regression (G) uses a log specification of the secession variable and its instrument to ease the economic interpretation of the results. All other factors held constant, a 1% earlier issued declaration of sovereignty by the more secessionist republic had the effect of decreasing bilateral trade with a given trading partner by about 2.26%. This implies very large effects for some trading pairs. A hypothetical example illustrates this. We would ceteris paribus expect trade between Ukraine and Estonia to have been lower by a *factor* of 4.6 compared to trade between Ukraine and Uzbekistan because of Estonia's early declaration of sovereignty. In comparison, international borders between capitalist countries are only estimated to reduce trade by 20-50 % (Anderson & van Wincoop 2003). The internal border due to secessionism in this case is thus much higher than many international borders.

Table 5 Determinants of Internal Soviet trade 1987-1991: 2SLS Robustness

Dependent variable: log pairwise domestic trade	(G) Log specification of secessionism & instrument		(H) Excluding outlier (Estonia)		(I) Multiplied pairwise secession signal	
Log distance	-0.3407	*(-6.13)****	-0.4462	*(-5.81)****	-0.333	*(-3.04)****
Log trade similarity	0.6961	*(1.84)**	0.1078	*(0.24)*	0.610	*(1.48)*
Log Secessionism $\max\{s_i, s_j\}$	-2.2600	*(-6.13)****				
Secessionism $\max\{s_i, s_j\}$			-0.0059	*(-3.94)****		
Secessionism $(s_i \cdot s_j)$					-1.06†	*(-5.69)****
Fixed effects	Exporter & Importer time varying		Exporter & Importer time varying		Exporter & Importer time varying	
Neighborhood effects	Adjacent & ethno-linguistic		Adjacent & ethno-linguistic		Regional & ethno-linguistic	
R-squared	0.826		0.811		0.937	
Root-MSE	0.528		0.548		0.444	
Observations	540		432		670	

Source: author

Instrumenting for secessionism by national language textbooks in secondary education 1970. Reg. (I) includes Russia.

† Coefficient should be multiplied by 10^{-6}. z-statistics are in parentheses, robust standard errors

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table 6 Determinants of Internal Soviet trade 1987-1991: Controlling for neighborhood effects and networks: 2SLS

Dependent variable: log pairwise domestic trade	(J) Dropping neighborhood effects		(K) Controlling for share of Russians		(L) Controlling for network strength	
Log distance	-0.4516	*(-12.16)****	-0.3548	*(-6.43)****	-0.3181	*(-5.59)****
Log trade similarity	0.5147	*(1.46)*	0.6486	*(1.77)**	0.6931	*(1.88)**
Multiplied Russian share			-0.00001	*(-0.07)*	0.00002	*(0.13)*
Overrepresentation of national elites					-0.0004	*(-2.37)***
Secessionism $\max\{s_i, s_j\}$	-0.0031	*(-6.75)****	-0.0030	*(-6.25)****	-0.0038	*(-5.82)****
Fixed effects	Exporter & Importer time varying		Exporter & Importer time varying		Exporter & Importer time varying	
Neighborhood effects	-		Adjacent & ethno-linguistic		Adjacent & Ethno-linguistic	
R-squared	0.828		0.830		0.823	
Root-MSE	0.524		0.521		0.532	
Observations	540		540		540	

Source: author

Instrumenting for secessionism by national language textbooks in secondary education 1970

z-statistics in parentheses, robust standard errors. No standardized beta coefficients

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

The treatment so far has suggested that withholding exports was a response to secessionist signals due to nationalist state building. However, the historical overview in section 2 also suggested that ethnic networks might have existed independently of nationalist concerns. For example, "corrupt" actors may have used ethno-linguistic networks in an effort to decrease transaction costs in parallel markets where contract enforcement was minimal. This would echo explanations advanced by Greif (1993) and Rauch & Trindade (2002) for different historical contexts.

The benchmark regression partly controls for cross-border ethno-linguistic networks by including a proxy for linguistic similarity. However this variable is rarely significant, and dropping it together with the adjacency effect from regression (J) does not affect the secessionism variable. Similarly, regression (K) presents results for the only diaspora in the Soviet Union numerous enough to have a quantitatively discernible impact: the Russians.[15] If ethno-linguistic networks were very powerful, we might expect that the higher the percentage of Russians on either trading side would lead to a higher value of goods exchanged. This does, however not seem to be the case. [16] Either ethnic networks did not play a very potent role in allocating resources in the USSR, or networks did not generally extend beyond republican boundaries.

Regression (L) suggests that the latter possibility is more likely. In an attempt to control for the strength of the domestic networks of titular nationalities, regression (L) introduces the degree to which members from a titular nationality were overrepresented in the ranks of a republic's economic leadership as a variable.[17] The denser a certain nationality's network, the better a substitute it would be to state distribution channels and the easier it might be to withhold exports. The resulting coefficient is indeed statistically significant: the more key positions in a republic's economy were dominated by a single nationality, the more trade seems to have been held back. This suggests that ethnic networks might indeed have played a role in the allocation of resources within a closely circumscribed nationality, and that trade networks did not generally extend to closely related nationalities. Still, the secessionism variable is unaffected, suggesting the trade inhibiting effect of nationalist secession to be different from the use of ethno-linguistic networks as a substitute for state distribution channels.

Another different interpretation of the results could be that the center reacted to secessionism in the periphery by assigning lower trade volumes to punish the dissenting republics. This interpretation would be equally consistent with the notion of secessionism leading to disintegration and output collapse, but it would imply a different mechanism than the one outlined here. Such an alternative view would, however, be difficult to square with the historiographical literature referred to in section 2. That literature claims that trade was withheld by the republics, rather than by the center. There is also quantitative evidence making the punishment interpretation unlikely. Table 1 in Appendix B shows changes in the size of capital transfers allocated by central planning authorities to the republics over two time periods. Positive numbers indicate an increase in transfers to a republic. Republics are arranged by order of their sovereignty declarations. The first column shows that the center did not punish those republics choosing higher levels of national language education in 1970 by decreasing transfers subsequently. The second column shows that this action was not taken by central authorities in reaction to the actual declarations of sovereignty in the late 1980s either.[18]

[15] The variable used here is the product of the share of ethnic Russians in the importing and exporting republic. Data source is Van Selm (1997).

[16] The role of ethnic Russians in allocating internal trade is unaffected by including Russia itself in the regression

[17] Specifically, the variable divides the share of enterprise directors of the titular nationality in a republic by that nationality's share in the republic's total population. Data on the nationality of directors is from Rybakovksi and Tarasova (1991)

[18] Incidentally, this evidence also strengthens the validity of nationalism as an exogenous instrument for secessionism: Those republics that were more nationalist and seceded first were not necessarily the most disadvantaged economically.

7. Results III: Trade disintegration and GDP decline

There are good reasons to expect the disintegrating effect of nationally induced secession explored in the previous section to have had a negative impact on GDP growth. As noted before, the Soviet Union was for some decades an integrated economic space dominated by production link spanning republican boundaries (Snyder 1993). Given that supply chains were disrupted, a drop in output might be expected if there was some friction or cost associated with finding a new supplier. Given that the disruptions of interrepublican supply chains predated the break-up of the Soviet Union, enterprises might not have had the possibility to establish new links quickly, given the lack of institutional and financial foundations in the Soviet Union for the bottom-up establishment of enforceable trade contracts. This would have led to a temporary dip in production. In the short run, an exogenous decrease in trade flows might also have led consumers to take a cut in consumption (in the model of section 3: q < D).

The results in the previous section demonstrate the average Union-wide effect of nationalism on trade. In order to gauge the effect of these trade cuts on republican GDP, I need to isolate the exogenous decrease in trade for each individual republic. This is done by running a counterfactual model which excludes the estimated effect of nationalism or secessionism. Specifically, I run the benchmark IV specification (F) to yield predicted values $\bar{y}_{ijt}$ for each year and each trading pair. The predicted effect of the secession signal for each pair is subtracted to yield $\tilde{\bar{y}}_{ijt} = \bar{y}_{ijt} - \bar{\beta}(max\{s_j, s_j\})$, where $\tilde{\bar{y}}_{ijt}$ is the counterfactual level of trade. Comparing this to the actually historically recorded trade levels y_{ijt} gives an estimate of trade that was withheld, x_{ijt}, where

$$x_{ijt} = \tilde{\bar{y}}_{ijt} - y_{ijt} \quad (14)$$

This estimate of withheld trade should be exogenous to the GDP of each republic at any given year, given that (F) includes a full range of exporter and importer year specific effects. The quantity of withheld trade is decreasing in actual trade volumes, reflecting the average negative impact of $\bar{\beta}(max\{s_j, s_j\})$ on trade estimated in regression (F). But the effect of the secession signal might have been different for different pairs at different times, thus providing additional variation to exploit.

This pairwise variable needs to be converted to a republic-level variable, which is the level at which GDP is recorded. I therefore sum the exponent of x_{ijt}across trade pairs for each importer and year to yield $x_{jt.}$[19] This is then weighted by each republic's initial level of GDP to yield x_{jt}as an estimate of the withheld import share that is comparable across republics. I introduce a one period lag to x_{jt} in affecting GDP growth, to allow for the time it might take for the effect of import stops to multiply through the supply chain of a republic. It also strengthens the argument that there is a causal, rather than a coincidental, effect of x_{jt}on output.

GDP growth $z_{jt}^{\cdot}$ in each Soviet republic is given by the EBRD (1994) as annual change in GDP in constant prices from the year 1989. Because x_{jt} is lagged by one period, this provides four years of GDP growth data (1989-1992). The empirical specification is then simply:

$$z_{jt}^{\cdot} = \beta + \beta x_{jt-1} + \varepsilon_{jt} \quad (15)$$

[19] Summing across importers rather than exporters employs the notion developed in the theoretical model in section 3 that, in an economy where exports do not trigger a reverse flow of real resources as payment, it is the importer that mainly gains from a trading relationship. It should therefore be the importer that suffers most from a sudden stop in trade. This is indeed borne out in the results.

The results are displayed in table 7 and show that the basic relationship between withheld trade and GDP growth is strong, and significantly negative. A one standard deviation increase in withheld trade due to nationalism leads to a 0.56 standard deviation decline in annual GDP growth. This amounts to an average reduction in GDP growth of 7.5 percentage points per year, which implies that a very significant output loss can be attributed to withheld trade. Judging by the R-squared of regression (M), withheld trade alone is enough to explain 32% of the variation in GDP growth among former Soviet republics.

Nevertheless, GDP growth during the period was influenced by a range of other factors. Reforms in the wake of the transition to a market economy might have led to dislocations in production. The loss of central control could have undermined the effort of agents in a planned economy that was dependent on enforcement from above to function (Harrison 2002). There might also have been a structural trend of increasing systemic inefficiency in the Soviet economy (Allen 2001). As long as these factors are unrelated to trade, they should not undermine the results. Regression (N) and (O) show that the results are broadly robust to the introduction of year and republic specific fixed effects that control for a generally decreasing growth trend during 1989 - 1992 as well as factors that are idiosyncratic to each republic.

If an exogenous decrease in imports was responsible for the large fall in GDP experienced by the former Soviet republics, this effect should be conditional on the composition of imports. The lower the substitutability between imported goods and domestically produced goods, the higher the negative effect should be of a sudden stop in imports.[20] Regression (R) provides some support for this hypothesis. It interacts x_{jt-1} with a dummy that takes the value of 1 if a republic was a net importer of oil and natural gas.[21] These fossil fuels are generally bottle-neck inputs into an importer's economy with a very low substitutability, especially in the short run. The results do indeed suggest that a significant part of the output slump can be explained by the import stop experienced by republics dependent on these crucial imports.

Regression (O) shows that the results are similar if the OLS regression (A) instead of the instrumental variable regression (F) is used to construct the counterfactual. Specification (Q) excludes those republics that appear to be outliers in graph C3 in the Appendix (Estonia & Armenia). These modifications reduce the statistical significance of the coefficient of interest, but only mildly so given the small sample size now employed. Excluding the years 1988 and 1989, for which some of the original trade data y_{ijt} is unavailable, actually strengthens the results (not shown). This suggests that the estimates of withheld trade x_{jt} for these years are biased downwards and that the true magnitude of withheld trade might be greater than assumed here. The results are also robust to using clustered errors to check for serial correlation (A.X) or to differencing each side of equation (15) one additional time to ensure complete stationarity of the data (A.XI).

One might also worry that if there were an omitted variable in the trade regression (F) that were correlated with income, this could leave the results affected. Given that the trade regression controlled for republic specific time varying effects, as well as for a range of bilateral variables, this possibility has already been minimized. An additional check is provided by running equation (15) with a placebo counterfactual consisting of just the residuals from specification (F), aggregated using the same method as the regular estimate of withheld trade. Full year and republic fixed effects are included. As table 9 shows, the placebo has no effect on growth. The coefficient of missing trade on income from the placebo counterfactual is not different from 0 with a t-statistic of 0.33.

[20] The model in section 3 accordingly assumed that domestic goods were imperfect substitutes for imported goods, so that imported goods exhibit a higher utility: $\pi_{ij} > \pi_{jj}$

[21] These are all republics except for Russia, Azerbaijan, Turkmenistan, Kazakhstan and Uzbekistan. The last two republics where not energy exporters during the period, but were approximately self-sufficient or had the capacity to be so quickly.

Table 7 Determinants of Soviet and Post-Soviet republican GDP 1989 -1992

Dependent variable: Republican GDP growth rates	(M) Baseline from 2SLS counterfactual		(N) Controlling for declining growth trend		(O) Controlling for declining growth trend & republic characteristics	
Withheld trade from reg (F)	-0.565	*(-6.85)****	-0.314	*(-4.20)****	-0.381	*(-4.84)****
Constant	-4.609	*(-3.12)****	3.021	*(2.02)***	3.495	*(0. 63)*
Fixed effects	-		Yearly		Republic & Yearly	
p > F	0.000		0.000		0.000	
R-square	0.319		0.707		0.841	
Root-MSE	11.08		7.48		6.37	
Observations	56		56		56	

Source: author. Definitions: see text
All coefficients, except the constant, are standardized beta coefficients. t-statistics are in parentheses, robust standard errors for all regressions. Regressions exclude Russia
** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table 8 Determinants of Soviet and Post-Soviet republican GDP 1989 -1992

Dependent variable: Republican GDP growth rates	(P) OLS counterfactual		(Q) Removing outlier republics		(R) Interaction with energy importer status	
Withheld trade from reg (A)	-0.385	*(-4.35)****	-0.312	*(-2.69)***		
Withheld trade from reg (A)*energy importer						
					0.219	*(1. 21)*
0						
1					-0.379	*(-4.29)****
Constant	3.200	*(0.57)*	4.190	*(1.04)*	3.964	*(0. 73)*
Fixed effects	Republic & Yearly		Republic & Yearly		Republic & Yearly	
p > F	0.000		0.000		0.000	
R-square	0.842		0.827		0.863	
Root-MSE	6.20		5.96		5.85	
Observations	60		52		60	

Source: author. Definitions: see text. Reg (Q) removes the republics Estonia and Armenia (see graph C.4).
Regression (P) and (R) include all republics (incl. Russia)
All coefficients, except the constant, are standardized beta coefficients. t-statistics are in parentheses, robust standard errors for all regressions
** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

8. Conclusions and implications of findings

This paper has explored domestic trade in a federation where the constituent units were signaling their desire to secede. The historical case of the Soviet Union shows the sizeable negative impact that such a setting may have on both internal trade as well as economic growth. It may be worth pointing to two extensions as well as a possible generalization of these results.

Although the federation studied here refers to the slightly specific setting of a command economy, the approach may be generalized to contexts beyond central planning. On a theoretical level, the results are based on an imperfect enforcement of interregional deliveries leading to a Fundamental Problem of Exchange. This could be applied to other settings where payments in response to deliveries do not occur instantaneously and the enforcement of commercial contracts is imperfect, so that business relies on continual interaction. The possibility of secession may then be enough to decrease the likelihood of continued interaction, thus hurting business prospects. In other contexts, a similar effect may occur if the return on long term investment is expected to depend in some way on the policy of the government in charge in a particular location, and uncertainty exists concerning the rules and regulations put in place by the new government after a possible secession. In both cases, the expectation of secession may be enough to deter trade or investment, even without secession actually taken place. This may have implications for the large literature on secessions (e.g. Alesina, Spolaore and Wacziarg 2000), which typically does not take such expectations into account.

More specifically, the findings of this paper could be extended in a cross-sectional dimension to include the lower level administrative units in the Soviet federal hierarchy, many of whom also experienced political separatism during the late Soviet and early transitional period (Hale 2000). Lack of suitable data on trade have prevented them from being included in this study. Given that these units were operating within the same framework as the 15 larger Union republics analyzed here, there may be reason to suspect a similar consequence of secessionism on trade and output. The disintegrative effects of secessionism on Soviet output may therefore have been even larger than the ones found in this paper.

The findings in this paper could also be extended in time to explain the extraordinary length and depth of the transitional recessions experienced by post-Soviet states after 1992. Orientation by post-Soviet enterprises towards new suppliers or customers on world markets may have been slow in the presence of numerous market imperfections even after the fall of communism, as proposed by Blanchard and Kremer (1997) or Roland and Verdier (1999). Most evidence indeed shows that the disintegration of old trade patterns in Eastern Europe continued for several years after the fall of Communism and that new trade patterns only established themselves slowly (Fidrmuc and Fidrmuc 2003, De Sousa and Lamotte 2007). If the fall in output associated with disintegration was as painful as the results of this paper suggest, the sluggish pace of readjustment to possibly welfare enhancing trade options in world markets would imply real costs of transition. These costs may have been prolonged by the numerous barriers, often of a political nature, that still inhibit trade between many post-Soviet states. This in turn implies that some of the reasons for the slow recovery of these states might be found by studying the dynamics of political nationalism in the post-Soviet world.

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A. Appendix: Robustness checks

Table A1 Determinants of Internal Soviet trade 1987-1991: Robustness (OLS)

Dependent variable: log pairwise domestic trade	(I) Balanced sample, standardized beta-coefficients		(II) Only exporter trade declarations counted, standardized beta-coefficients		(III) Excluding Russia, standardized beta-coefficients	
Log distance	-0.168	*(-6.53)****	-0.239	*(-10.76)****	-0.289	*(-7.04)****
Log trade similarity	-0.009	*(-0.32)*	0.029	*(0.98)*	0.058	*(1.02)*
Secessionism $\max\{s_i, s_j\}$	-0.131	*(-2.72)****	-0.146	*(-3.25)****	-0.208	*(-3.04)****
Fixed effects	Yearly exporter & importer		Yearly Exporter & Importer		Yearly exporter & importer	
Neighborhood effects	Adjacent & ethno-linguistic		Adjacent & ethno-linguistic		Adjacent & ethno-linguistic	
R-square	0.950		0.946		0.840	
Root-MSE	0.461		0.466		0.588	
Observations	384		479		540	

Source: author. Definitions: see text

All coefficients are standardized beta coefficients. t-statistics are in parentheses, robust standard errors for all regressions

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table A2 Determinants of Internal Soviet trade 1987-1991: Robustness (2SLS)

Dependent variable: log pairwise domestic trade	(IV) Balanced sample		(V) Only mirrored trade counted		(VI) Including Russia	
Log distance	-0.1574	*(-1.99)***	-0.4356	*(-6.98)****	-0.4000	*(-8.86)****
Log trade similarity	0.9546	*(2.23)***	-0.0499	*(-0.10)*	0.1540	*(0.70)*
Secessionism $\max\{s_i, s_j\}$	-0.0029	*(-6.12)****	-0.0015	*(-3.00)****	-0.0020	*(-2.77)****
Fixed effects	Exporter & Importer time varying		Exporter & Importer time varying		Exporter & Importer time varying	
Neighborhood effects	Adjacent & ethno-linguistic		Adjacent & ethno-linguistic		Adjacent & ethno-linguistic	
R-square	0.868		0.886		0.929	
Root-MSE	0.445		0.403		0.474	
Observations	306		237		670	

Source: author

Instrumenting for secessionism by national language textbooks in secondary education 1970. Regressions (IV) and (V) exclude Russia.

z-statistics in parentheses, robust standard errors. No standardized beta coefficients.

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table A3 Determinants of Internal Soviet trade 1987-1991: Clustered Standard Errors (2SLS)

Dependent variable: log pairwise domestic trade	(VII) Clustering around trading pairs		(VIII) Clustering around importer		(IX) Clustering around exporter	
Log distance	-0.3543	*(-4.64)****	-0.3543	*(-3.93)****	-0.3543	*(-5.13)****
Log trade similarity	0.6456	*(1.25)*	0.6456	*(1.69)**	0.6456	*(0.95)*
Secessionism $\max\{s_i, s_j\}$	-0.0030	*(-4.27)****	-0.0030	*(-3.40)****	-0.0030	*(-4.32)****
Fixed effects	Exporter & Importer time varying		Exporter & Importer time varying		Exporter & Importer time varying	
Neighborhood effects	Adjacent & ethno-linguistic		Adjacent & ethno-linguistic		Adjacent & ethno-linguistic	
R-square	0.830		0.830		0.830	
Root-MSE	0.521		0.521		0.521	
Observations	540		540		540	

Source: author

Instrumenting for secessionism by national language textbooks in secondary education 1970. Regressions exclude Russia. z-statistics in parentheses, clustered standard errors. No standardized beta coefficients.

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

Table A4 Determinants of Soviet and Post-Soviet republican GDP 1988-1992: Robustness

Dependent variable: Republican GDP growth rates	(X) Clustering around republic		(XI) 1st Differences, standardized beta coefficients		(XII) Placebo counterfactual, standardized beta coefficients	
Trade gap from reg (F)	-4.306	*(-5.25)****				
Δ Trade gap from reg (F)			-0.306	*(-2.26)***		
Placebo trade gap from reg (F)					0.067	*(0.33)*
Constant	3.494	*(1.56)*	-12.642	*(-1.52)*	-2.784	*(-0.66)*
Fixed effects	Republic & Yearly		Republic & Yearly		Republic & Yearly	
p>F	0.000		0.000		0.000	
R-square	0.841		0.618		0.771	
Root-MSE	6.37		7.70		7.63	
Observations	56		42		56	

Source: author. Definitions: see text

Dependent variable for regression (XI): Δ *Republican GDP growth rates.*

All coefficients, except the constants and regression (X), are standardized beta coefficients. t-statistics are in parentheses, robust standard errors for all regressions. Regressions exclude Russia.

** significant at the 10%-level, ** significant at the 5%-level, *** significant at the 1%-level*

B.Appendix: Capital transfers

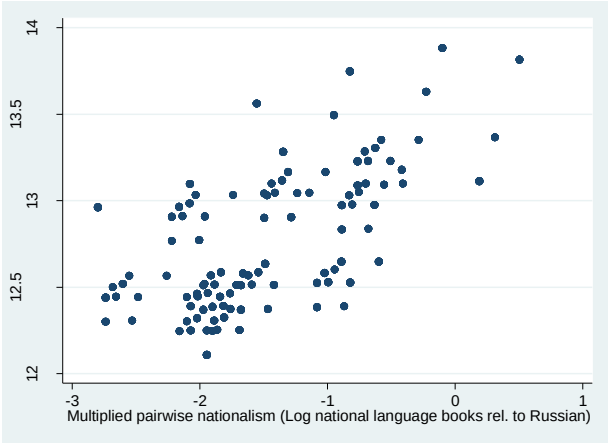
Table B1 Net Capital Transfers Received

Republic	Change in transfers 1970-1987 (% of GNP)	Change in transfers 1987-1991 (% of GNP)
Estonia	5.6	5.0
Lithuania	37.8	-3.2
Latvia	2.9	-1.3
Azerbaijan	-20.5	16.3
Russia	6.5	-2.6
Uzbekistan	-0.9	13.0
Georgia	-13.7	13.8
Ukraine	0.3	3.6
Moldova	8.0	-0.6
Belarus	-12.7	9.4
Turkmenistan	6.1	0.3
Armenia	-13.5	18.2
Tajikistan	4.3	-4.2
Kazakhstan	5.0	-1.8
Kyrgyzstan	6.9	3.3

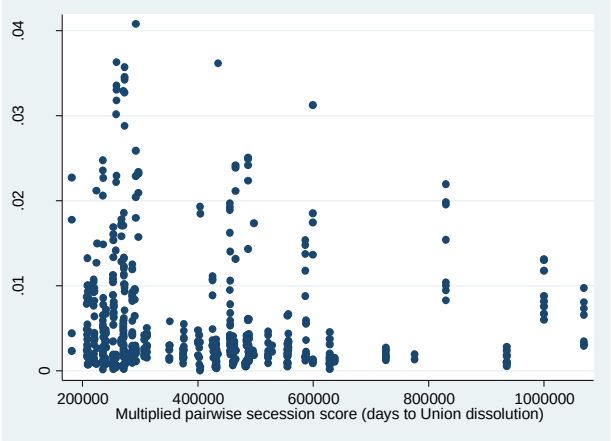
Calculations: Author. Source: van Selm (1997)

C. Appendix: The argument graphically

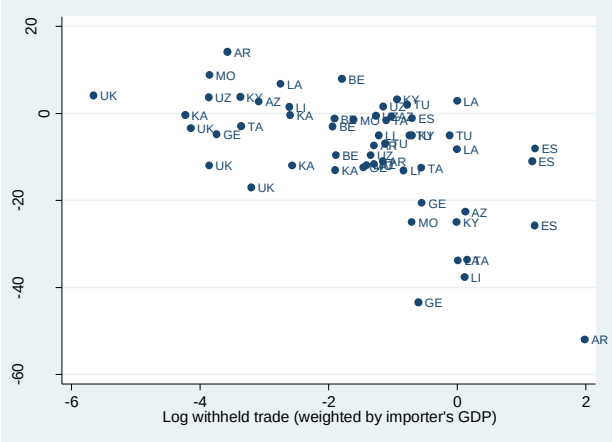
C1 Nationalism → secessionism



C2 Secessionism → internal trade



C3 Withheld internal trade → GDP



Note: unit of measurement for internal trade in C2 has been chosen for purpose of graphical representation and does not correspond to the units in the regression analysis, where data is automatically adjusted for inflation and GDP by fixed effects. C2 also excludes values for Russian trade, whose values are too large to be displayed in the same graph. C3 is based on an instrumental variable procedure that excludes Russia. See text for further definitions and robustness checks.

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