The Start of Yugoslavia's Disintegration: Where Borders Cut Commuting Spheres

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Abstract

Borders are often associated with low economic activity. A popular explanation for this phenomenon argues that borders cut market access. But as a growing amount of literature demonstrates that border effects persist after the removal of formal barriers, the forces behind low economic activity near borders remain unclear. This paper develops a new methodology to measure the market access of 16,596 settlements in the Socialist Federal Republic of Yugoslavia in 1965, right before the hardening of Yugoslavia's federal borders. Based on elevation, rivers, roads and the Dijkstra algorithm, this methodology identifies 4,682 settlements whose commuting spheres crossed Yugoslavia's federal borders. Using panel data for the 1948-1991 period, a difference-in-differences estimation identifies that the settlements that lost access to their nearest town due to hardened federal borders experienced strong decline in population growth following the reforms. Robustness checks demonstrate that depopulation occurred when settlements lost access to towns of significant size. This effect appears regardless of ethnicity and history. Instead, depopulation occurred in the absence of a nearby alternative town in the same federal unit.

Keywords: federal borders, market access, population growth, Yugoslavia

JEL Classification: H77 , N44

1 Introduction

Pinkovskiy (2017) documents the existence of sharp discontinuities in economic growth at country borders across the globe. Accordingly, these discontinuities are neither due to geography, climate or public goods provision, but rather due to differences in institutions between countries (Acemoglu, Johnson, & Robinson, 2002). But while this explanation may hold for long-existing borders, it *does not* apply to rather recently created borders, as in the Balkans (Pinkovskiy, 2017, p. 183).

An alternative explanation for border discontinuities may be found in the trade literature, where it is well established that formal barriers, such as tariffs and currencies, cause reductions in trade (Anderson & Van Wincoop, 2004; Frankel, Stein, & Wei, 1995; McCallum, 1995). However, such an explanation is not entirely convincing either since the persistence literature identifies discontinuities in economic activity long after the removal of formal barriers, too. For instance, the persistence of historic borders *within* contemporary countries has been documented for Europe (Becker, Boeckh, Hainz, & Woessmann, 2016; Grosfeld & Zhuravskaya, 2015) and the United States (Felbermayr & Gröschl, 2014; H.C. Wolf, 2000), while Michalopoulos and Papaioannou (2014) demonstrate that differences in economic activity persist across ethnic homelands in Africa today. Thus the causal direction between *borders* and *border effects* remains unclear.

To the best of my knowledge, Redding and Sturm (2008) is the only paper applying a difference-in-differences methodology to identify that the partition of Germany (1945-1989) caused the decline of towns *near* the iron curtain. Nitsch and Wolf (2013, p. 177) add that this effect persists today as local social and business networks did not yet (re-)integrate. Yet the contributions of N. Wolf (2009) and Becker, Mergele, and Woessmann (2020) cast doubts on this view since the German border effect existed already before World War II.

This paper tests, continues and modifies the empirical approach of Redding and Sturm (2008) in a number of ways. First, where Redding and Sturm (2008) use panel data for 120 towns in West Germany, I prepared a new panel data set of 16,596 settlements and 468 towns located in the former Yugoslavia. Second, where Redding and Sturm (2008) assume that border towns trade with each other prior to the creation of the border, I take one step back and identify geospatial markets for each town before and after the implementation of border regimes. To identify geospatial markets, I apply the algorithm of Dijkstra et al. (1959) to derive geospatial commuting spheres based on elevation, rivers and roads. This approach not only identifies areas where geography hinders integration, but it also highlights how two sides of the same border may be affected differently. On one side, settlements are *cut off* their nearest town if that town is on the other side of the border. On the other side, settlements are *not cut off* the same town and thus the hardening of the border does not affect daily activities, such as the commuting to the nearest market place.

Yet the key difference to previous literature is in the case of Yugoslavia. Focusing on the 1945-1991 period, this paper identifies the emergence of border effects *long before* the break-up of Yugoslavia. Whereas Yugoslavia was a de-facto unitary state under centralised communist rule after World War II (Frankel, 1955, p. 428), the country decentralised its entire administration, economy and political system in a series of reforms between 1966 and 1976 (Milanović, 1987, p. 2-7). Since Yugoslavia's federal borders were already drawn in 1945, this paper focuses on the institutionalisation of these borders due to the implementation of federalism. As most of Yugoslavia's federal borders turned into international borders after 1991, the 1945-1991 period provides a rare opportunity to assess whether border effects emerged long before the formal partition of the country and the wars of the 1990s.

While subnational borders may be less relevant in a unitary state, a more decentralised state organisation implies the creation of local clubs that can set independent policies (Buchanan, 1965; Casella & Frey, 1992). With the constitution of 1974, Yugoslavia's republican and provincial governments gained the competencies to regulate the sale of products on their territories (Lydall, 1989, p. 89-90; Bookman, 1990, p. 104). Enterprises were protected from competition of other federal units, while the flow of capital across republican and provincial borders effectively ceased (Milenkovitch, 1977, p. 56; Lydall, 1989, p. 81-82). Due to the few powers left to the federal government, Lampe (2000, p. 305) describes Yugoslavia after 1974 as a confederation of eight one-party regimes, while the federalisation reforms are widely seen as the start of Yugoslavia's disintegration (Jakir, 2005; Jović, 2009; Kežić, 2017; Ramet, 1992).

Based on the new economic geography literature (Alix-Garcia & Sellars, 2020; Davis & Weinstein, 2002; Krugman, 1991), I assume that the implementation of federalism created a negative shock to the market access of settlements that were cut off their nearest town by Yugoslavia's federal borders. As all citizens retained the rights to reside, work, and attend school and health institutions all across the country (Štiks, 2015), I attribute declines in population growth after 1965 to the out-migration of farmers who could no longer sell across republican and provincial borders (Burkett and Škegro, 1988, p. 143; Miller et al., 1989, p. 509; Cochrane, 1990, p. 10). This interpretation is in line with Tiebout (1956), who argues that individuals *vote with their feet.*

My empirical work builds on substantial data collection and digitisation, collected in libraries and from the authorities of Yugoslavia's successor states. Based on geospatial elevation and river data, and the road network of 1965, I use the algorithm of Dijkstra et al. (1959) to compute travel paths between all settlements and towns. From these paths I derive geospatial commuting spheres around each of Yugoslavia's towns in 1965. In line with the intuition that commuting spheres do not necessarily correspond to the geography of administrative borders, this methodology identifies settlements that were geographically integrated across Yugoslavia's republican and provincial borders *prior to* the federalisation reforms.

The key result of this paper is that the implementation of federalism negatively affected the population growth of settlements that *were cut off* their nearest town by Yugoslavia's republican and provincial borders. Heterogeneity in the estimates suggests that the loss of a town with at least 5,000 inhabitants (in 1961) is the key driver behind the decline. This result holds for Serbian settlements that were cut off Serbian towns, Croatian settlements that were cut off Croatian towns, and Croatian settlements that were cut off Slovenian towns. Moreover, the effect also appears on republican and provincial border sections *within* and *between* territories that were once part of the Ottoman Empire or Austria-Hungary, and cannot be explained by increased urbanisation of border towns. Instead, the evidence suggests that affected settlements declined in the absence of a nearby alternative town in the same federal unit.

The paper proceeds as follows. Section 2 presents the historical and anthropological background of the Socialist Federal Republic of Yugoslavia (1945-1991). Subsection 2.1 discusses the historical background of Yugoslavia's transition from a Stalinist central state to a socialist federation. Subsection 2.2 summarises the accounts of anthropological fieldwork on Yugoslavia's peasant economy, conducted by international scholars in Yugoslavia between 1956 and 1976. Section 3 describes the data sources and the methodology. Section 4 introduces the estimation framework, while Section 5 discusses the empirical results. Section 6 concludes the paper.

2 Historical and Anthropological Background

This section summarises Yugoslavia's history to address two key questions. First, is it reasonable to assume that local commuting across Yugoslavia's republican and provincial borders existed prior to 1965? Second, why did the regime of Josip Broz Tito implement reforms that empowered the republics and provinces at the cost of *his* federal centre? Subsection 2.2 discusses anthropological accounts of Yugoslavia's peasant economy, which is used to develop the methodological approach in Section 3 and Section 4. The settlements studied by anthropologists are part of the estimation sample.

2.1 From Stalinism to Worker's Self-Management

Acting as a multiethnic guerillia group, the communist "Partisans" of Josip Broz Tito liberated much of Yugoslavia before the arrival of the Soviet Red Army in late 1944 (Neal, 1958, p. 2). This achievement broadly united[1] the Yugoslav society behind Tito, who opposed Soviet influence (Rusinow, 1978, p. 10-13). Still, the Federal People's Republic of Yugoslavia, proclaimed in November 1945, initially resembled the Soviet model (Lapenna, 1972, p. 215).

[1] To be complete: Tito's regime ran concentration camps to align or execute its opponents, in particular those related to the fascist Ustasha, the German occupiers and the royal Chetniks (Dulić, 2004). Due to the common struggle against these forces during World War II, the Partisan movement was a strong integrating force across all of Yugoslavia's ethnic groups (Simić, 1973, p. 43 ; Lampe, 2000, p. 236-240).

Fig. 1: The Federal People's Republic of Yugoslavia in 1945.

The 1946 constitution defined the state as a federation of six republics, one autonomous province and one autonomous region (see Figure 1). In reality, however, power was concentrated on Tito in the federal capital Belgrade, leaving only cultural autonomy to these subordinate ADM1 units (Jović, 2009, p. 58). Throughout this paper the terms "republican and provincial borders" and "ADM1 borders" are used as synonyms.[2] The geography of ADM1 borders was determined by the regime without formal legal procedure or documentation (Radan, 1999, p. 142), but at least partially followed historical borders (Figure 2.1). In 1945, Tito explained that administrative boundaries were drawn to unite rather than separate the society (Radan, 1999, p. 145).

Between 1945 and 1965 the federal government acted as a strong integrating force to the Yugoslav economy (Hamilton, 1968, p. 116). Federal investment policy followed two major principles: First, investment was concentrated close to natural resources and where rentability was high (Hamilton, 1968, p. 241). Therefore large commuting areas developed along and across

[2]Only the Republic of Serbia was partitioned into "Central Serbia", the "Autonomous Province (AP) of Vojvodina", and the "Autonomous Region (AR) of Kosovo and Metohija" (Figure 1). Due to the federalisation reforms the competencies of Vojvodina and Kosovo and Metohija were elevated to those of the republics, while they were formally referred to as "Socialist Autonomous Province (SAP)".

Yugoslavia's largest rivers, such as the Sava and Drina, which separate Croatia, Bosnia-Herzegovina and Serbia (Hamilton, 1968, p. 134-137). Second, less developed regions received special funds to equalise socio-economic conditions (Hamilton, 1968, p. 137-146).

When Stalin expelled Yugoslavia from the communist bloc in 1948, the country faced the necessity to trade with Western market economies (Holt and Stapleton, 1971; Horvat, 1971, p. 120). Still driven by communist ideas, the regime set on a unique path to develop a system between capitalism and state socialism, known as "Worker's Self-Management". At its core, Yugoslav communists agreed with Engels (1894, p. 262) that the state was redundant and should "wither away" in a classless society (Neal, 1958, p. 18-20).[3]

Inefficiencies in central planning were answered by local self-management. In the new system workers controlled factories via workers councils (Ward, 1957, 1965), while enterprises could go bankrupt and formal unemployment became possible (Horvat, 1971, p. 78; Woodward, 1995).[4] Economic policy making was decentralised *from the federation to the communes*, which created communal competition and particularism (Fisher, 1966, p. 25; Ward, 1968, p. 572; Kežić, 2017, p. 54-64).[5] However, hit by economic crisis in the early 1960s (Lampe, 2000, p. 282-283), parts of the communal autonomy were transferred *to the republics and provinces*, but *not to the federation*.[6] This led to particularism and competition between republics and provinces, whose borders hardened after 1964 (Hamilton, 1968, p. 337).

Between 1966 and 1976, the federal government gradually lost competencies to the republics and provinces (Milenkovitch, 1977, p. 59; Bertsch, 1977, p. 92). Although the 1974 constitution[7] made the federation responsible to protect the unified market, intra-regional trade declined (Uvalić, 1983, p. 15). This was felt particularly in agriculture, where farmers required permits to sell outside their region (Cochrane, 1990, p. 10). To enforce protectionism, local governments used police powers against farmers, private buyers and official procurement agents (Burkett and Škegro, 1988, p. 143 ; Miller et al., 1989, p. 509).

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[3] A thorough historical discussion on Yugoslav communist ideology is provided by Jović (2009). The key critic of Stalinism was published by the dissident Milovan Djilas (1957), who describes that Stalinism created the contradiction of a new bureaucratic class, which produced new class differences.

[4] Tito formed foreign relations to develop tourism at the Adriatic, while guestworker programmes sent Yugoslavia's surplus workforce to Western Europe (Lampe, 2000, p. 294).

[5] Fisher (1966, p. 176) mentions a commune that banned cigarettes produced elsewhere.

[6] Tito's close circle discussed alternatives (Jović, 2009, p. 62-68). Edvard Kardelj proposed further decentralisation of state institutions, while Aleksandar Ranković favoured a stronger federal centre. Ultimately, Tito supported Kardelj and removed Ranković from power in 1966 (Jović, 2009, p. 64-65).

[7] The 1974 constitution introduced a complex system of delegations and voters meetings (Jović, 2009, p. 74), which transformed all organs of state, economy and society into Basic Organisations of Associated Labour (BOAL). Each BOAL organised referendums and elected delegates to higher-level assemblies (Broekmeyer, 1977; Milenkovitch, 1977). Due to the strong republican and provincial governments, Lampe (2000, p. 305) describes the country after 1974 as a confederation of one-party regimes.

2.2 The Peasant Economy of Yugoslavia

Before World War II, Yugoslavia was an agricultural country with 77% of the population occupied by agriculture and 40% illiterate (Horvat, 1971, p. 71). The inheritance rule led farmers to divide their land by the number of sons, which gradually intensified the fragmentation of land (Lockwood, 1975, p. 93). Yugoslavia's agricultural landscape was therefore characterised by dwarf farms with an average per capita size of less than 1 hectare (Neal, 1958, p. 187).

The communist takeover did not improve the prospects of peasant agriculture. In 1945, the regime expropriated 1.57 million hectare of agricultural land, which was partially assigned to landless families and otherwise collectivised into state farms (Hamilton, 1968, p. 172). Although forced collectivisation ended already in 1953, the government restricted cultivated land to 10 hectares per private farm (Hamilton, 1968, p. 173). Until 1955, access to machinery, fertilizer and credits remained prohibited to private farms (Neal, 1958, p. 199).[8] While these constraints generally pushed peasants out of agriculture, communist economic policy created alternative opportunities through investment in heavy industries and urban infrastructure. In this light the number of workers in mining and industry increased from 238,115 to 1,362,000 between 1938 and 1964 (Hamilton, 1968, p. 219).

The consequence of this development was a process of rural-to-urban migration and an expansion of urban commuting spheres.[9] Between 1948 and 1961, the number of people living in a city with at least 20,000 inhabitants increased from 12.5% to 19.5% (Simić, 1973, p. 216). The number of cities with at least 100,000 inhabitants increased from two in 1948 (Belgrade, Zagreb) to seven in 1961. Nonetheless, urban infrastructure did not grow at the same speed. This was one reason why 1.4 million peasant-workers[10] still lived on their farm and commuted to work in factories by 1970 (Halpern, 1975, p. 87).[11]

By 1969, half of Yugoslavia's 12 million rural inhabitants lived in a household with at least one peasant-worker employed in full time outside of agriculture (Lockwood, 1973, p. 284-285). This worker-peasantry consisted of daily commuters and those who commuted weekly, monthly or seasonally to work places all across Yugoslavia and Western Europe (Lockwood, 1973, p. 286). The means of transportation were: walking by foot, horseback, bicycles, busses and trains (Lockwood, 1973, p. 287; Halpern, 1975, p. 87). As for daily commuters, Halpern (1963, p. 164) notes that one-way travel distances could easily reach 15 miles (24.14km). If a bus service was available, then it was not uncommon to walk one or two hours to reach the bus stop. On another occassion, Halpern (1975, p. 88) cites a Croatian peasant-worker who leaves his village at 6:30am, works in a factory in Zagreb during the day, and returns to work in his fields at 3pm. Lockwood (1973, p. 287) resided in a settlement

[8] Credits became available to private agriculture in 1955, but were barely used in the absense of specified banking institutions (Neal, 1958, p. 201-206).

[9] Detailed anthropological accounts of this process are available thanks to the field works of Halpern (1956, 1965, 1975), Simić (1973, 1974) and Lockwood (1973, 1975).

[10] Peasant-workers retained farming while working in industry (Lockwood, 1973, p. 281).

[11] Moreover, land provided a security against economic crises (Lockwood, 1973, p. 285).

of 250 inhabitants in Bosnia-Herzegovina, who travelled 3-4 hours by foot or horseback to their nearest market town.[12] From this settlement, 9 full-time lumberjacks commuted weekly to their work site, where they could reside in barracks.

Detailed descriptions of the market place in the town of Bugojno (Bosnia-Herzegovina) are available thanks to the field work conducted between 1966 and 1968 by Lockwood (1973, 1975). In January 1967, the formal regulation of the market place was in the hands of Bugojno's farmer's cooperative (Lockwood, 1975, p. 138-139). Local market regulators controlled the compliance with market rules and collected taxes for the trade of different products. For instance, farmers required a certificate of ownership for the livestock that they wished to sell outside their commune of origin. Importantly, the tax rates of vendors depended on their origin: Inhabitants from the neighbouring communes of Donji Vakuf and Gornji Vakuf had to pay the same tax rates as Bugojno's inhabitants, while outsiders from more distant places had to pay higher tax rates (Lockwood, 1975, p. 140). Hence, at least in Bugojno during 1967, communal borders did not prevent peasants to sell in neighbouring market towns within Bosnia-Herzegovina (Lockwood, 1975, p. 142).

At the market place, Lockwood (1975, p. 141-185) noted five different types of market participants: local peasants and farmers, outside farmers, buyers of the communal purchasing agency[13], and *smugglers*[14]. The most numerous group were local peasants, who originated from settlements *neither too close nor too distant from the town*. Lockwood (1975, p. 142) explains this by the fact that inhabitants of settlements just outside the town were rather involved in full time industrial work, while more distant villages lacked the means of transportation to regularly visit the market place.

3 Data

3.1 Population Data and Settlement Boundaries

All data used in this paper were collected in visits to Yugoslavia's successor states. As a first step, geospatial files of the contemporary administrative divisions, including settlement boundaries, were obtained from the Agency for Statistics of Bosnia and Herzegovina[15], the State Geodetic Office of the Republic of Croatia, the Statistical Office of the Republic of Slovenia and the State Geodetic Office of the Republic of Serbia[16]. Eurostat provided lower level

[12] Lockwood (1975) studied a settlement named Planinica (Bosnia-Herzegovina).

[13] Communal purchasing agencies were tasked to buy at the request of local institutions, such as hospitals. Joint purchasing was to prevent that local institutions bought products from professional traders (Lockwood, 1975, p.184-185); see smugglers.

[14] Professional trading was illegal in socialist Yugoslavia (Lockwood, 1975, p. 140). Buying in one commune to sell in another was considered smuggling, which was legally prosecuted.

[15] Since the Dayton Agreement there are three statistical offices in Bosnia-Herzegovina. Statistics for the Federation of Bosnia and Herzegovina are provided by the Statistical Office of the Federation of Bosnia and Herzegovina. Statistics for the Republika Srpska are provided by the Statistical Office of the Republika Srpska. In addition, there is the Agency for Statistics of Bosnia and Herzegovina, which provides few statistics for the entire Republic of Bosnia and Herzegovina.

[16] For Kosovo there are only cadastral municipalities are available.

boundaries (LAU2) for Northern Macedonia. Only the settlement borders of Montenegro are missing.

Historic census books (1948-1991) were collected from the Statistical Office of the Republic of Serbia. Each census contains harmonised population counts of all previous censuses, which allows comparison of settlement-level population counts over time. Unfortunately, there is no joint publication of the 1991 census. Thus the harmonised population counts of 1948-1991 were requested from each of Yugoslavia's successors, but were only received for Bosnia-Herzegovina, Croatia and Serbia (without Kosovo). These entities constituted Yugoslavia's geographic core, which is most relevant to this paper.

For Croatia and Serbia the obtained population data contain all settlements in all censuses, harmonised to contemporary settlement boundaries. In contrast, substantial effort was required to reconstruct and harmonise the data for Bosnia-Herzegovina.[17] The final population data set contains harmonised settlement level population counts of all censuses between 1948 and 1991 for all settlements in Bosnia-Herzegovina, Croatia and Serbia (without Kosovo). Altogether these are 16,592 settlements out of the total 26,149 settlements.[18] In addition the data set contains ethnicity counts of 1981 for all settlements in Serbia (excluding Kosovo) and for a large number of settlements in Croatia[19]. For Bosnia-Herzegovina, the ethnicity counts come from the 1991 census. In addition, I have added the ethnicity data of the 1961 census for all 468 towns.

3.2 Topography, Roads and Commuting Spheres

Historic road and communal maps were collected from the National Library of Serbia and from the State Geodetic Office of the Federation of Bosnia and Herzegovina. From this collection, a 1:800,000 resolution road map published in 1965 by the Auto-Moto-Union in Ljubljana was digitised into a geospatial vector format. The map captures all local, regional and main roads existing in Yugoslavia in 1965. The EU's Environmental Agency provided a digital elevation model and geodata of all European river segments. Based on elevation, river and road data, the algorithm of Dijkstra et al. (1959) can compute travel paths that account for underlying topography and infrastructure.[20] For this purpose, Yugoslavia was categorised into 1x1 km^2 cells. Then, a transition

[17] The inter-entity border, created during the Bosnian war (1992-1995) and institutionalised by the Dayton Agreement, partitions a substantial number of settlements in Bosnia-Herzegovina. Since the 1991 and 2013 censuses were published both for the settlement boundaries of 1991 and 2013, the available contemporary settlement borders could be used to reconstruct the settlement borders of 1991 through comparison of population counts in both administrative divisions. The census data obtained for Bosnia-Herzegovina lists the population counts of each census (1948-1991) in its respective administrative division, but with additional information of splits and mergers between settlements prior to 1991. This allowed to aggregate the data to the smallest unit that did not change over time.

[18] The difference is due to missing population data for Slovenia, Macedonia and Kosovo.

[19] Missing data of Croatia's settlement reforms after 1991 complicate the match with pre-1991 censuses.

[20] Ferries and railways are excluded due to the lack of available data. When rivers separate towns and settlements, a nearby road connection (bridge) is required to consider the town to be the nearest town.

matrix was created to define the speed with which an individual can travel between adjacent cells.[21]

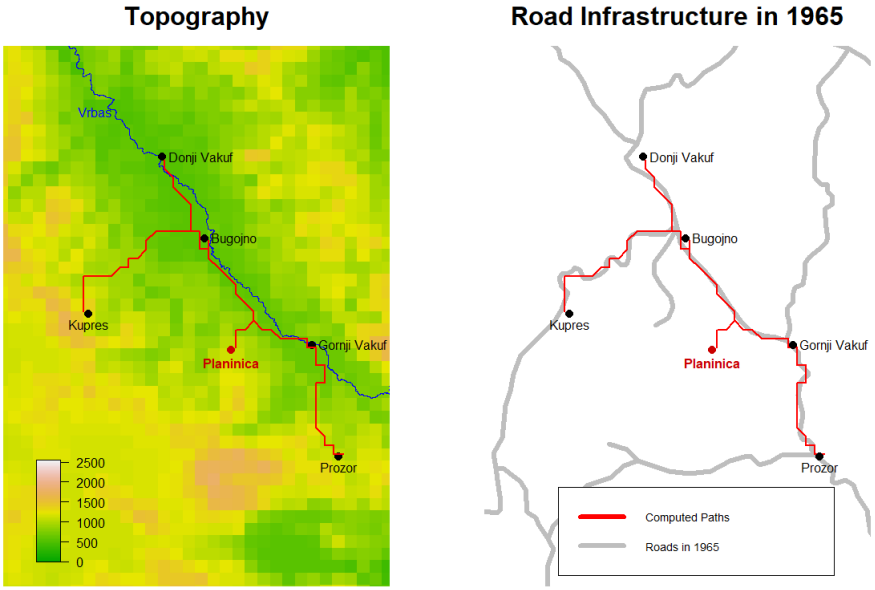


Fig. 2: Shortest travel paths to towns from Planinica (Bosnia-Herzegovina).

The resulting travel paths are best understood at an example. As the anthropologist William G. Lockwood resided between 1966 and 1968 in a settlement named Planinica (Bosnia-Herzegovina), I test the algorithm for this settlement. Both the left and right image of Figure 2 illustrate the computed shortest travel paths (red) from Planinica to the towns of Kupres, Bugojno, Donji Vakuf, Gornji Vakuf and Prozor. Each of these towns functioned as communal administrative centres (ADM2) throughout 1945-1991. The left image of Figure 2 plots the travel paths on top of the digital elevation model and the only river (Vrbas) in this region. The right image of Figure 2 plots the same travel paths on top of the road map of 1965. By comparison of both images it is evident that the algorithm searches the shortest downhill path from Planinica to the nearest road (here: Bugojno-Gornji Vakuf), from which the journey continues on the road network.[22] Strikingly, this pattern fits the descriptions of Lockwood (1975, p. 41-42).

[21] For the elevation model, the hiking function of Tobler (1993) is used to approximate the speed value. The hiking function assumes that individuals prefer to walk downhill or on flat terrain. For rivers, the transition matrix is set so that it is 100 times faster to cross through non-river cells. For the road network, the transition matrix obtains a speed value of 60km/h. Finally, the individual transition matrices are added up, resulting in a final transition matrix that accounts for elevation, rivers and roads. In a nutshell, the final transition matrix assumes that an individual will move downhill or on flat terrain, avoiding rivers, to find the nearest road, from where the journey continues on the road network.

[22] Deviations, as between Bugojno and Kupres, are due to the 1x1 km^2 resolution.

The shortest travel paths are computed for each of the 26,149 settlements, and for several sets of target towns in the entire Yugoslavia.[23] First, the administrative divisions of Yugoslavia are examined to identify all settlements that were the seat of a communal administration (*opština*) in all years between 1945 and 1991, resulting in a sample of 468 administrative towns (ADM2). Besides the provision of basic administrative services, each of these towns permanently operated at least one open air peasant market. Second, the sample of administrative towns is split into subsamples of towns that had at least 5,000, at least 10,000, at least 20,000 and at least 50,000 urban inhabitants in the 1961 census. Table 1 provides summary statistics for these samples.

Table 1: Summary Statistics of Yugoslavia's Towns in 1961.

	Census 1961				
Town Samples	**Number**	**Mean Pop**	**Median Pop**	**Min Pop**	**Max Pop**
ADM2-Towns (1945-1991)	468	11,610	3,792	216	585,234
5,000 Urban Inhabitants	194	24,704	11,754	5,003	585,234
10,000 Urban Inhabitants	107	39,380	20,778	10,132	585,234
20,000 Urban Inhabitants	59	59,755	30,352	20,060	585,234
50,000 Urban Inhabitants	14	158,873	103,560	50,650	585,234

All towns functioned as the administrative centre of a commune (*opština*) at least since 1945. Population data refer to the corresponding urban settlements in the 1961 census.

For each dimension, the nearest town of a settlement is obtained by choosing the town with the shortest travel path distance out of the five nearest towns (by aerial distance). This procedure also records the shortest travel path distance to the 2nd, 3rd, 4th and 5th nearest town. In Section 5.3 these paths are used to identify settlements with and without nearby alternative towns in the same federal unit.

Figure 3 visualises the resulting spheres of administrative towns (left image) and towns with at least 20,000 inhabitants (right image) at the example region around Planinica. Visual inspection shows that commuting spheres are neither constrained by ADM2 nor by ADM1 borders. Instead the commuting spheres follow the intuition that people do not commute according to administrative borders, but according to economic needs. Consequently, there are areas that are integrated across ADM2 and ADM1 borders.[24] In the right image of Figure 3 this is well visible for the town of Mostar (Bosnia-Herzegovina), where the commuting sphere overlaps in the south into neighbouring Croatia. Figure 10 and Figure 11 confirm that the travel pattern observed around Planinica are typical for all of Yugoslavia.

[23] Although panel data for Slovenia, Montenegro, Kosovo and Macedonia are missing, I have manually searched and added the population data of 1961 for the towns in these territories. This step is important to identify settlements in Croatia, Bosnia-Herzegovina and Serbia that are cut off towns in Slovenia, Montenegro, Kosovo and Montenegro, respectively.

[24] Administratively, Planinica belongs to the commune of Bugojno, but geographically it is closer to Gornji Vakuf, while the nearest town with at least 20,000 inhabitants is Zenica.

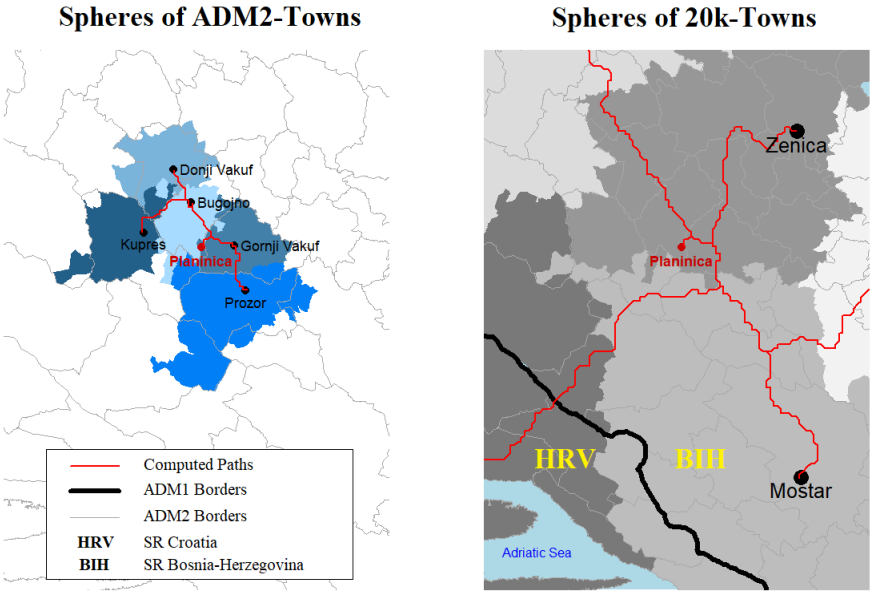


Fig. 3: Travel paths of Planinica (Bosnia-Herzegovina).

4 Empirical Strategy

Cochrane (1990, p. 10) explains that farmers required permits to sell across Yugoslavia's ADM1 borders, while Burkett and Škegro (1988, p. 143) and Miller et al. (1989, p. 509) describe that local governments used police powers to protect their markets from vendors and buyers of other federal units. As Yugoslavia's ADM1 governments only received the competencies to implement such policies after 1965, I interpret the federalisation reforms of 1966-1976 as a persistent shock to the market access of farmers that were previously attending markets in other federal units.

To test this hypothesis I study the dynamics in annual population growth, where the difference-in-differences framework of Redding and Sturm (2008, p. 1774) provides a natural starting point. Importantly, the framework assumes that borders have a stronger impact on border areas compared to more distant areas. Applying this methodology to the case of Yugoslavia, I define settlements less than 20km from Yugoslavia's ADM1 borders as treated, and settlements within 20-40km as the control group.[25]

To identify a causal relationship between the hardening of Yugoslavia's ADM1 borders and the population growth of border settlements two assumptions need to hold. First, to ensure that the treatment was assigned as good

[25] Redding and Sturm (2008) calculate a population weighted distance matrix for Germany before and after the partition, suggesting a 75km threshold for the treatment group. In the absence of population data for all of Yugoslavia it is not possible to replicate this approach. Applied to Yugoslavia, the 75km threshold includes some federal units are almost entirely. The 20km vs 20-40km definition is supported by balancing tests (Table 10). Alternating the thresholds does not change the results.

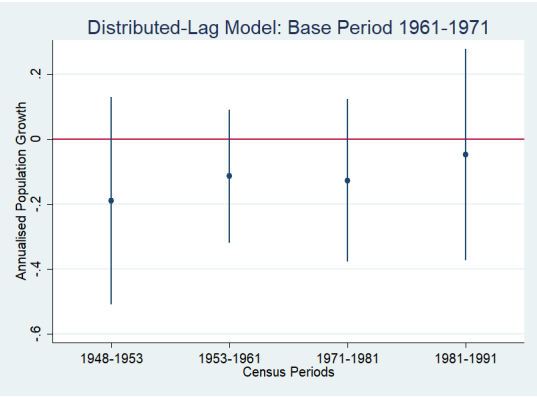


Fig. 4: Test for parallel trends based on Redding and Sturm (2008).

as randomly, there must be no significant difference between treatment and control group prior to the reforms. Second, to associate any treatment effect with the reforms, I require parallel trends prior to 1965. The balancing test in Table 10 shows no significant difference between treatment and control group prior to the reforms. To test the parallel trends assumption, I follow Schmidheiny and Siegloch (2019) and estimate a distributed-lag model, which tests whether treatment and control group are statistically different relative to a base period. The result in Figure 4 supports the parallel trends assumption. However, as it does not indicate a change after 1961-1971, Figure 4 casts the following doubt on this empirical strategy:

The empirical strategy of Redding and Sturm (2008) presumes the integration of markets across Yugoslavia's ADM1 borders prior to the reforms. However, instead of presuming integration, one should empirically identify the existence of these markets to define the treatment group.

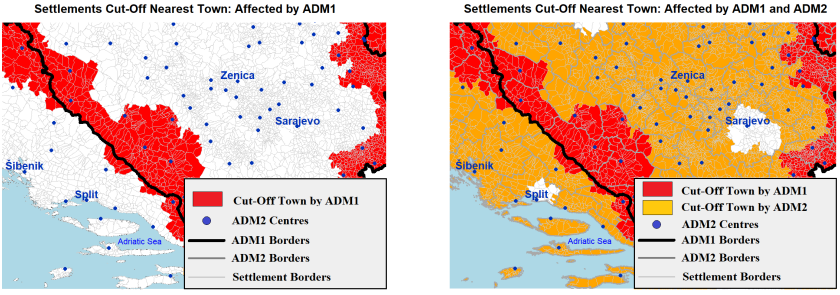
To improve the identification of the treatment group, I turn to the commuting spheres of Section 3.2. Equation 1 formalises this estimation strategy.

$$PopGrowth_{it} = \alpha + \beta AffectedBorder_i \times Federalism_t + \omega_i + \delta_t + \epsilon_{it} \qquad (1)$$

$PopGrowth_{it}$ is the annualised population growth rate of settlement i for the inter-census periods t.[26] The periods are: *1948-1953*, *1953-1961*, *1961-1971*, *1971-1981* and *1981-1991*. $AffectedBorder_i$ is a dummy that indicates if settlement i was cut off its nearest town by an ADM1 border. In the baseline

[26] Annualised population growth rates are calculated with the logarithmic growth formula: $PopGrowth = \frac{1}{censusperiod} \times ln(\frac{Pop_1}{Pop_0}) \times 100$, where $censusperiod$ is the number of years between two censuses.

this includes any settlement that is cut off its nearest town on at least one dimension. The dimensions are: towns with administrative status (ADM2) and subsets of towns with at least 5,000, 10,000, 20,000 or 50,000 inhabitants in 1961. $Federalism_t$ is a dummy that switches to *1* beginning in *1961-1971*, when Yugoslavia's ADM1 borders *hardened* (Hamilton, 1968, p. 337). Location-specific effects, such as altitude, are absorbed by settlement fixed effects ω_i. Time specific effects are absorbed by period fixed effects δ_t.



(a) Full Sample (b) Reduced Control

Fig. 5: The estimation framework illustrated at the border between Croatia and Bosnia-Herzegovina.

Panel A of Figure 5 visualises Equation 1 at the border between Croatia and Bosnia-Herzegovina, where all settlements that are *affected* by an ADM1 border are coloured in red. Moreover, the distributed lag regression (Panel A of Figure 6) confirms that the parallel trends assumption holds. Yet different to the specification of Redding and Sturm (2008), Equation 1 identifies that *affected* settlements experienced strong decline after *1961-1971*. However, if this decline is due to out-migration, then there is concern that migration to the control group could overestimate the treatment effect. The following considerations address this concern.

First, based on the anthropological accounts of Section 2.2, it appears that towns were the primary destination for internal migrants. Therefore all towns are excluded from the sample.[27] Second, just as in other countries, Yugoslavia's communal borders (ADM2) were delineated in line with republican and provincial (ADM1) borders, implying that ADM1 borders were at the same time also ADM2 borders. Consequently, by restricting the control group sample to settlements that were on at least one dimension cut off their nearest town by an ADM2 border (see Panel B of Figure 5), one can control for changes in cross-communal commuting.

This preferred estimation strategy compares 4,682 treated to 10,894 control settlements, and is supported by parallel pre-trends (Panel B of Figure 6) and balancing tests (Table C of Table 2). If the federalisation reforms of 1966-1976

[27] Moreover, islands are dropped in the absence of information on ferry routes.

(a) Full Sample (b) Reduced Control

Fig. 6: Test for parallel trends of Equation 1.

Table 2: Results of two-sample t-tests with equal variance for Equation 1.

Panel A:		**Full Sample**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	16,596	11,911	4,685	
Population (1961)	**Mean**	847	939	612	327***
	(Std. Error)	(36)	(48)	(34)	(79)
Ann. PopGrowth (1948-1961)	**Mean**	0.39%	0.40%	0.38%	0.02%
	(Std. Error)	(0.02)	(0.02)	(0.03)	(0.04)

Panel B:		**Towns and islands dropped**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	16,055	11,373	4,682	
Population (1961)	**Mean**	644	657	612	46
	(Std. Error)	(14)	(14)	(34)	(31)
Ann. PopGrowth (1948-1961)	**Mean**	0.37%	0.36%	0.38%	-0.01%
	(Std. Error)	(0.02)	(0.02)	(0.03)	(0.04)

Panel C:		**Towns, islands and settlements not cut by ADM2 dropped**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	15,576	10,894	4,682	
Population (1961)	**Mean**	610	610	612	-2
	(Std. Error)	(11)	(7)	(34)	(25)
Ann. PopGrowth (1948-1961)	**Mean**	0.35%	0.34%	0.38%	-0.04%
	(Std. Error)	(0.02)	(0.02)	(0.03)	(0.04)

* p<0.10, ** p<0.05, *** p<0.01

affected the population growth of border areas, then the causal effect should be captured by comparison of these groups before and after 1965.

5 Results

5.1 Baseline Result

Table 3 reports the baseline regression results. Column 1-2 report the results for the specification based on Redding and Sturm (2008), whereby Column 1 uses the full sample and Column 2 includes sample restrictions. Column 3-8 report the results from the estimation of Equation 1. Column 3 uses the full sample, and Column 4-8 introduce the restrictions of Section 4.

The results are as follows. First, the DiD estimate based on the specification of Redding and Sturm (2008) does not lead to a statistically significant

Table 3: Baseline regression results.

	Annualised Population Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Border20km × Federalism	0.0888	0.0932						
	(0.141)	(0.162)						
AffectedBorder × Federalism			-0.308**	-0.259*	-0.391**	-0.306**	-0.255*	-0.385**
			(0.151)	(0.152)	(0.182)	(0.149)	(0.150)	(0.180)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}
Restriction1^{R1}	No	Yes	No	Yes	Yes	No	Yes	Yes
Restriction2^{R2}	No	No	No	No	No	Yes	Yes	Yes
Restriction3^{R3}	No	Yes	No	No	No	Yes	Yes	Yes
Census Period 1961-1971	Included	Included	Included	Included	Dropped	Included	Included	Dropped
Clusters	363	269	363	360	360	362	359	359
Settlements	16,596	10,600	16,596	16,055	16,055	16,107	15,576	15,576
Observations	82,980	53,000	82,980	80,275	64,220	80,535	77,880	62,304
R-Square	0.4183	0.3985	0.4188	0.4112	0.4369	0.4204	0.4128	0.4388

Standard errors in parentheses, clustered at the nearest ADM2-town sphere.
F: Includes all of Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements on at least one dimension off their nearest town.
R3: Control settlements are within 20-40km of Yugoslavia's ADM1 borders.
* p<0.10, ** p<0.05, *** p<0.01

estimate. Balancing tests (Table 10) and parallel pre-trends (Figure 4) support causal interpretation of Column 2. Hence, I conclude that Yugoslavia's federalisation reforms did *not* lead to genuine out-migration from settlements that are located within 20km of Yugoslavia's ADM1 borders. Still, the lesson learned from this specification is limited as it cannot verify the cross-border integration of settlements prior to the reforms.

The estimation of Equation 1 in Column 3-8 tests whether *affected* settlements experienced changes in their population growth. That is, *AffectedBorder* only includes settlements that were on at least one dimension cut off their nearest town by Yugoslavia's ADM1 borders. Column 3 suggests that Yugoslavia's federalisation reforms are at least correlated with a decline in the annual population growth of settlements that were (on at least one dimension) cut off their nearest town by an ADM1 border, relative to all other settlements. As expected, the estimate becomes smaller when likely migration destinations (i.e. towns) are excluded (-0.308% in Column 3 and -0.259% in Column 4). Moreover, the estimation is robust to Column 6 and Column 7, which include in the control group only settlements that were (on at least one dimension) cut off their nearest town by an ADM2 border. Furthermore, the estimation is robust to Column 5 and Column 8, both of which drop the 1961-1971 period that could be partially assigned to the pre-treatment period.

Supported by balancing tests (Figure 2) and parallel pre-trends (Figure 6), I conclude that the average reduction in annual population growth caused by the reforms is between 0.25% and 0.38% (Column 7, Column 8). Given an average annual population growth of 0.34% between 1948-1961 (Panel C in Table 2), this implies that annual population growth turned to 0 after 1961.

5.2 Does Size Matter?

If the result in Section 5.1 is indeed caused by the loss off access to nearby market towns, then the size of the these town should matter (Krugman, 1991). Based on the anthropological field work in Section 2.2 it seems reasonable to assume that farmers could travel up to 25km.[28] Given the median travel distances in Table 9, this implies that most farmers only visited the nearest administrative town (13.1km) and the nearest town with at least 5,000 inhabitants (23.8km). Table 4 therefore repeats the estimation separately for settlements that were cut off their nearest administrative (ADM2) town (Column 1-4), and settlements that were cut off their nearest town with at least 5,000 inhabitants (Column 5-8). First, the full sample is used for the estimation (Column 1, Column 5). Second, towns, islands and settlements that are not cut off their nearest town by an ADM2 border are dropped (Column 2, Column 6). Third, the sample is reduced to settlements within 20km of the nearest ADM1 border crossing road (Column 3, Column 7). Fourth, the sample is further reduced to settlements within 5km of the nearest ADM1 border crossing road (Column 4, Column 8).

Table 4: Regression results testing for town size.

	Annualised Population Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CutOffADM2Town × Federalism	-0.123	0.0167	-0.391	-0.201				
	(0.211)	(0.226)	(0.298)	(0.357)				
CutOff5kTown × Federalism					-0.506	-0.458	-0.818**	-1.156**
					(0.313)	(0.333)	(0.402)	(0.436)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}
Restriction1^{R1}	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Restriction2^{R2}	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Dist-To-ADM1 Border Road	175km^{M}	175km^{M}	20km	5km	175km^{M}	175km^{M}	20km	5km
Clusters	363	339	154	37	157	146	75	43
Settlements	16,596	4,513	1,756	399	16,596	9,521	3,702	642
Observations	82,980	22,565	8,870	1,995	82,980	47,605	18,510	3,210
R-Square	0.4183	0.4133	0.3804	0.3384	0.4189	0.4105	0.3832	0.3580

Standard errors in parentheses.
For Column 1-Column 4, standard errors are clustered at nearest ADM2-town sphere.
For Column 5-Column 8, standard errors are clustered at nearest 5k-town sphere.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements off their near. ADM2 town (Column 2-4) or near. 5k-town (Column 5-8).
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
* p<0.10, ** p<0.05, *** p<0.01

Interpretation of Table 4 leads to two conclusions. First, the loss of a purely administrative town does not lead to decline in annual population growth.

[28] Halpern (1963, p. 164) notes that one-way travel distances could easily reach 15 miles (24.14km). Planinica, the village studied by Lockwood (1973, 1975) is 15km travel distance from the nearest town with 5,000 inhabitants (Bugojno). According to Lockwood (1975, p. 142), the villagers of Planinica lacked the transportation technology to regularly sell their produce at the Bugojno market.

Causal interpretation is supported for the estimate in Column 2 by balancing tests (Table 11) and parallel pre-trends (Figure 12). Second, the loss of a town with at least 5,000 inhabitants leads to strong and statistically significant decline in annual population growth. Within 20km of the nearest ADM1 border crossing road, the annual population growth of affected settlements declined by 0.818% (Column 7). The estimate increases to -1.156% if I include only settlements within 5km of an ADM1 border crossing road (Column 8). Both for Column 7 and Column 8 causal interpretation is supported by balancing tests (Table 12) and parallel pre-trends (Figure 13).

Taken together, the border effect appears where ADM1 borders cut access to *towns of significant size* (here: at least 5,000 inhabitants in 1961). Table 13 shows that the loss of a town with at least 10,000 and at least 20,000 inhabitants is correlated with decline, while the estimate for settlements that are cut off their nearest town with at least 50,000 inhabitants is not statistically significant. Thus I conclude that the border effect appears due to the loss of nearby significant towns rather than the loss of more distant towns.

5.3 Alternative Towns

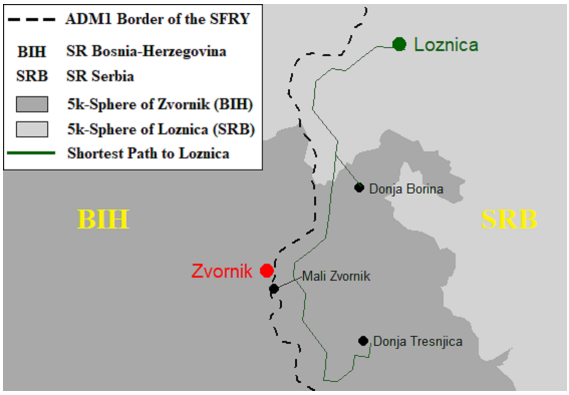


Fig. 7: The 5k-Spheres of Zvornik and Loznica.

The results of the previous section are best understood at an example. For this purpose Figure 7 zooms to an ADM1 border section between Bosnia-Herzegovina and Serbia, near the towns of Zvornik (Bosnia-Herzegovina), Mali Zvornik and Loznica (both Serbia). All of these towns functioned as communal administrative centres throughout the existence of socialist Yugoslavia and beyond. However, Loznica (10,411) and Zvornik (8,110) both counted more than 5,000 inhabitants in 1961, while Mali Zvornik only counted 1,303 inhabitants.

In Figure 7 the settlements of Donja Borina and Donja Trešnjica are illustrative examples as both were cut off their nearest town with at least 5,000

Table 5: Descriptive statistics for the 5k-sphere of Zvornik (BIH).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Zvornik-Sphere	**Zvornik-Commune in BIH**		**Zvornik-Sphere in SRB**		
	Total	**N.Town=Zvornik**	**N.Town=Bijeljina**	**N.Town=Zvornik**		
Settlements	294	39	3	30	Donja Borina	Donja Trešnjica
Dist. 1st 5k-Town	36km	15km	28km	32km	13km	16km
Dist. 2nd 5k-Town	55km	31km	30km	45km	16km	37km
Population (1948)	281	564	1,147	849	1,187	886
Population (1961)	375	742	1,351	901	1,395	1,044
Population (1991)	475	1,121	1,272	661	1,707	730
A. PopGrowth (48-61)	2.23%	2.10%	1.26%	0.46%	1.24%	1.26%
A. PopGrowth (61-91)	0.78%	1.38%	-0.20%	-1.03%	0.67%	-1.19%
Diff. (61-91 – 48-61)	*-1.44*	*-0.72*	*-1.46*	*-1.49*	*-0.57*	*-2.45*

Mean distance and population values of settlements with Zvornik (BIH) as the nearest town with at least 5,000 inhabitants. 294 settlements are in Zvornik's sphere (Column 1), out of which 39 are located in the Zvornik commune (Column 2). Column 4 adds the 3 settlements in the Zvornik commune that are closer to Bijeljina (BIH), but cut off Bijeljina by an ADM2 (communal) border. Annualised population growth rates (1948-1961, 1961-1991) are calculated using the logarithmic growth formula.

inhabitants (Zvornik). Column 6 and Column 7 of Table 5 show that both settlements were similar in size and population growth until 1961, and both experienced significant decline between 1961 and 1991.[29]

Nonetheless there is an important difference between Donja Borina and Donja Trešnjica. Both settlements are nearest to the *inaccessible* Zvornik, and for both the *nearest accessible alternative town* within Serbia is Loznica. Still, once we assume that farmers attend the nearest significant market, it becomes obvious that the hardening of the ADM1 border provided less of an obstacle to Donja Borina, where the additional travel distance to Loznica (16km) instead of Zvornik (13km) is just 3km. In contrast, Donja Trešnjica faced an additional 21km (Figure 7). In line with this interpretation, Donja Trešnjica (Column 7) experienced a much stronger decline than Donja Borina (Column 6) and the sphere average (Column 1).

Following the examples of Donja Borina and Donja Trešnjica, I expect that the estimates in Section 5.1 and Section 5.2 are driven by settlements that lacked a nearby alternative town in the same federal unit. To test this hypothesis, I split the variable *CutOff5kTown* into two groups. *CutOff5kTownDistAlt* is the subset where the nearest alternative town in the same federal unit is rather distant, and *CutOff5kTownNearAlt* is the subset where the nearest alternative town in the same federal unit is rather near. To identify whether the alternative town is distant or near, I examine for each settlement the *additional travel distance* incurred due to travelling to the nearest alternative town *within the same federal unit*. Then, comparison to the median (19.9km) identifies whether the alternative town is rather distant or rather near.

[29] The entire Zvornik sphere declined between 1961 and 1991 (Column 1). Donja Borina and Donja Trešnjica are two out of the 30 treated settlements averaged in Column 5. When the average annualised population growth rates of all treated settlements (Column 5) are compared to settlements within the Zvornik commune that are nearest to Zvornik (Column 3), then the difference is much larger as when compared to settlements within the Zvornik commune that are cut by an ADM2 border (Column 4). This supports the preferred estimation strategy, which compares Column 5-7 to Column 4.

Table 6: Regression results testing for the role of alternative towns.

	Annualised Population Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CutOff5kTownDistAlt × Federalism (β_1)	-0.878***	-0.834***	-1.235***	-1.487***	-0.746**	-0.719*	-1.676***	-0.292
	(0.270)	(0.287)	(0.361)	(0.512)	(0.309)	(0.390)	(0.504)	(0.409)
CutOff5kTownNearAlt × Federalism (β_2)	-0.142	-0.0870	-0.366	-0.715*	-0.380	-0.246	-1.131	-0.777
	(0.352)	(0.372)	(0.426)	(0.407)	(0.452)	(0.395)	(0.795)	(1.126)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	BIH^{FB}	HRV^{FH}	SRB^{S}	VOJ^{FV}
Restriction1^{R1}	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Restriction2^{R2}	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dist-To-ADM1 Border Road	175km^{M}	175km^{M}	20km	5km	99km^{MB}	117km^{MC}	175km^{MS}	117km^{MV}
Clusters	157	146	75	43	45	51	48	30
Settlements	16,596	9,521	3,702	642	3,409	3,620	2,328	164
Observations	82,980	47,605	18,510	3,210	17,045	18,100	11,640	820
Wald Test ($\beta_1 = \beta_2$), p-value	0.0060	0.0053	0.0016	0.0654				
R-Square	0.4192	0.4111	0.3851	0.3600	0.4398	0.3399	0.5127	0.3840

Standard errors in parentheses, clustered at nearest 5k-town sphere.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
FB: Includes all settlements in Bosnia-Herzegovina.
FH: Includes all settlements in Croatia.
FS: Includes all settlements in Central Serbia.
FV: Includes all settlements in Vojvodina.
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
MB: In Bosnia-Herzegovina, the maximum distance to an ADM1 Border Crossing Road is 99km.
MC: In Croatia, the maximum distance to an ADM1 Border Crossing Road is 117km.
MS: In Central Serbia, the maximum distance to an ADM1 Border Crossing Road is 175km.
MV: In Vojvodina, the maximum distance to an ADM1 Border Crossing Road is 117km.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements off their nearest 5k-town.
* p<0.10, ** p<0.05, *** p<0.01

The definition of the variables is described in the text above. Figure 5 illustrates one settlement with a distant (Donja Trešnjica) and near alternative (Donja Borina).

Table 6 reports the regression results. Column 1 uses the full sample, restrictions are introduced in Column 2-4. The sample is further limited to Bosnia-Herzegovina in Column 5, Croatia in Column 6, Central Serbia in Column 7, and Vojvodina in Column 8.

Table 6 leads to only one conclusion. As expected, settlements with a relatively near alternative town in the same federal unit *do not* drive the border effect. Instead, it appears that settlements with a relatively distant alternative town *do* experience strong and statistically significant declines in their annual population growth following the federalisation reforms. The estimate in Column 4 suggests that affected settlements with a distant alternative experienced an average decline in their annualised population growth rate by 1.487%. Causal interpretation of this estimate is supported by balancing tests (Table 14) and parallel pre-trends (Figure 14). Moreover, the Wald test in Column 4 supports the conclusion that settlements experience decline when their inhabitants cannot reshuffle their economic activities to nearby alternative markets. This estimate is also confirmed when the sample is restricted to the individual federal units (Column 5-7). Only for the Vojvodina sample (Column 8) there is no statistically significant effect, which might be due to its small territory and the proximity to Belgrade.

5.4 Border Sections and Ethnicity

If the border effect is due to federalism, then it should appear on all subsections of Yugoslavia's ADM1 borders.[30] More specifically, two aspects are relevant.

First, declining population growth should appear both on border sections *within* and *between* former Ottoman and Austro-Hungarian territories (Figure 8). To address this hypothesis I turn to the border between Bosnia-Herzegovina and Serbia (both former Ottoman Empire), to the border between Croatia and Slovenia (both former Austria-Hungary) and to the border between Croatia and Bosnia-Herzegovina (former border between the Ottoman Empire and Austria-Hungary).

Second, the spatial distribution of Yugoslavia's ethnic groups allows to focus on border sections that separate the same and different ethnic groups (Figure 9). As multi-ethnic Bosnia-Herzegovina contains numerous settlements with an ethnic Serbian (Croatian) majority, I can test whether the population growth declined in Serbian (Croatian) settlements that were cut off Serbian (Croatian) majority towns in neighbouring Serbia[31] (Croatia[32]). To obtain the ethnic majority of towns I have digitised the ethnicity census of 1961. Yet for the more than 15,000 settlements I could only obtain the ethnicity censuses of 1981 and 1991. Thus I take the results in this section as mere correlations.[33]

Table 7 is organised as follows. Column 1 and Column 2 include only settlements within 20km of the border between Bosnia-Herzegovina and Serbia. Column 1 includes only settlements with at least 50% Serbs, and Column 2 includes only settlements with at least 95% Serbs. In both specifications *CutOff5kTown* only turns 1 if a settlement is cut off a town that had a Serbian majority in 1961. Focusing on Croats, Column 5-6 apply the same estimation principle to the border between Bosnia-Herzegovina and Croatia, and Column 3-4 focus on the border between Croatia and Slovenia. Each column is supported by parallel pre-trends (Figure 15, Figure 16, Figure 17).

Both Column 1 and Column 2 suggest that Serbian majority settlements cut off Serbian majority towns experienced declining population growth after the reforms. As Column 5 and Column 6 show similar estimates for Croatian

[30] With the available data I can study 9 out of the total 12 ADM1 border sections. The border sections are: Slovenia-Croatia, Croatia-Bosnia-Herzegovina, Croatia-Montenegro, Croatia-Vojvodina, Vojvodina-Central-Serbia, Central-Serbia-Bosnia-Herzegovina, Central-Serbia-Montenegro, Central-Serbia-Kosovo, Central-Serbia-Macedonia, Kosovo-Macedonia, Kosovo-Montenegro and Bosnia-Herzegovina-Montenegro. In the absence of population data for Kosovo, Macedonia and Montenegro I have to exclude the following border sections: Kosovo-Macedonia and Kosovo-Montenegro. Due to few border crossing roads in 1965 I have to exclude the borders between Central-Serbia and Macedonia and between Croatia and Montenegro. Table 15 reports correlations for all available border sections.

[31] The towns in Serbia are Bogatić, Loznica, Priboj, Titovo Užice, Valjevo and Šabac.

[32] The towns in Croatia are Dubrovnik, Gospić, Karlovac, Kutina, Nova Gradiška, Petrinja, Slavonska Požega, Slavonski Brod, Split, Đakovo and Županja.

[33] The available ethnicity data for settlements in Croatia and Serbia come from the 1981 census. The available ethnicity data for settlements in Bosnia-Herzegovina come from the 1991 census. Therefore, a settlement with +50% Serbs (Croats) could have had +50% of another ethnic group before the reforms (1961). As a robustness check I re-run the regression for samples with +95% Serbs (Croats). Nonetheless, in the absence of ethnicity data from 1961 I restrain myself from causal conclusions.

Table 7: Regression results for specific border sections and ethnic groups.

	Annualised Population Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
CutOff5kTown × Federalism	-0.939**	-0.992***	-0.765***	-0.469***	-1.133**	-0.920*
	(0.275)	(0.241)	(0.145)	(0.157)	(0.479)	(0.483)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}
Ethnicity Settlement^{ES}	+50% Serbs	+95% Serbs	+50% Croats	+95% Croats	+50% Croats	+95% Croats
Ethnicity Cut Off Town^{ET}	+50% Serbs	+50% Serbs	+50% Slovenes	+50% Slovenes	+50% Croats	+50% Croats
5k Town is in	SRB	SRB	SLO	SLO	HRV	HRV
Restriction1^{R1}	Yes	Yes	Yes	Yes	Yes	Yes
Restriction2^{R2}	Yes	Yes	Yes	Yes	Yes	Yes
20km-To-Border Section	SRB-BIH	SRB-BIH	HRV-SLO	HRV-SLO	HRV-BIH	HRV-BIH
Dist-To-ADM1 Border Road	20km	20km	20km	20km	20km	20km
Settlements	203	168	1,253	926	179	131
Observations	1,015	840	6,265	4,630	895	655
R-Square	0.3485	0.4895	0.3066	0.3011	0.4041	0.4116

Standard errors in parentheses, clustered at settlement level.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
ES: Ethnicity data for settlements come from 1981 (Croatia, Serbia) and 1991 (Bosnia-Herzegovina).
ET: Ethnicity data for all towns come from 1961.
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements off their nearest 5k-town.
* p<0.10, ** p<0.05, *** p<0.01

majority settlements cut off Croatian majority towns, I conclude that the border effect appeared where ADM1 borders separated the *same* ethnic group.

Column 3 and Column 4 turn to the border between Croatia and Slovenia. As all towns in Slovenia had a Slovenian majority in 1961, both Column 3 and Column 4 show that Croatian majority settlements cut off Slovenian majority towns experienced decline after the reforms. Thus I conclude that the border effect appeared also where ADM1 borders separated *different* ethnic groups.

As the effect appears on the border between Bosnia-Herzegovina and Serbia (Column 1-2), I conclude that it *cannot* be due to legacies of the Ottoman Empire. As the effect appears on the border between Croatia and Slovenia (Column 3-4), I conclude that it *cannot* be due to legacies of Austria-Hungary. Finally, as the effect also appears on the border between Bosnia-Herzegovina and Croatia (Column 5-6), I conclude that it *cannot* be due to the former partition between the Ottoman Empire and Austria-Hungary.

5.5 Towns and Urbanisation

As a final robustness check I turn to the sample of towns. In fact, an alternative explanation for the declining population growth rates of cut off border settlements could be in increased urbanisation of the corresponding towns.

In Column 1 of Table 8 I keep only the available 339 towns.[34] To identify *affected* towns, I calculate for each town with at least 5,000 inhabitants the share of settlements that is cut off by an ADM1 border. In Column 1, Column 3, Column 5 and Column 7 a town requires at least 1% of the settlements

[34] The total number of towns is 468. However, this number includes towns in Slovenia, Montenegro, Macedonia and Kosovo. The lack of available population data for all towns constrain the data set to all 339 towns that are located in Croatia, Bosnia-Herzegovina and Serbia (without Kosovo).

Table 8: Regression results for 5k-towns with parts of their sphere cut.

	Annualised Population Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5kTownLostSettlements × Federalism	0.391	0.258	0.574	0.359	-0.962	-0.0683	0.177	-0.149
	(0.251)	(0.458)	(0.959)	(1.198)	(0.618)	(0.862)	(0.450)	(0.576)
Town FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}
Share of 5k-Sphere Cut	+1%	+50%	+1%	+50%	+1%	+50%	+1%	+50%
Restriction1^{R1}	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dist-To-ADM1 Border Road	175km^{M}	40km	175km^{M}	40km	175km^{M}	40km	175km^{M}	40km
40km-To-Border-Section			SRB-BIH	SRB-BIH	HRV-SLO	HRV-SLO	HRV-BIH	HRV-BIH
Towns	339	121	40	30	28	14	84	60
Observations	1,695	605	200	150	140	70	420	300
R-Square	0.4352	0.3403	0.3151	0.2570	0.2184	0.1989	0.3767	0.3633

Standard errors in parentheses, clustered at the town level.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
R1: Islands dropped.
* p<0.10, ** p<0.05, *** p<0.01

within its sphere to be cut by an ADM1 border. In Column 2, Column 4, Column 6 and Column 8 a town requires at least 50% of the settlements within its sphere to be cut by an ADM1 border. Moreover, the sample is restricted to towns within 40km of an ADM1 border crossing road. Column 3-4 only use towns within 40km of the border between Serbia and Bosnia-Herzegovina, Column 5-6 only use towns within 40km of the border between Croatia and Slovenia, and Column 7-8 only use towns within 40km of the border between Bosnia-Herzegovina and Croatia.

Across all specifications in Table 8 I do not obtain statistically significant estimates. For Column 1 and Column 2 causal interpretation is supported by balancing tests (Table 16) and parallel pre-trends (Figure 18). Hence, I conclude that the declining population growth rates in cut off settlements *cannot* be driven be increased urbanisation of towns that had some of their sphere cut by an ADM1 border.

6 Conclusion

The case of the Socialist Federal Republic of Yugoslavia (1945-1991) provides evidence for negative externalities emerging from federalism. Whereas Yugoslavia was a de-facto unitary state under centralised communist rule after World War II (Frankel, 1955, p. 428), the country decentralised its entire administration, economy and political system in a series of reforms between 1966 and 1976 (Milanović, 1987, p. 2-7). Among historians, these reforms are widely seen as the start of Yugoslavia's disintegration (Jakir, 2005; Kežić, 2017; Ramet, 1992).

This paper demonstrates that the hardening of Yugoslavia's ADM1 borders after 1965 led to the decline of settlements that were previously integrated across these borders. The key methodological contribution of this paper is therefore in the identification of *affected* border areas. Different to previous

literature, the algorithm of Dijkstra et al. (1959) contributed in developing a novel approach to identify market access geographically through travel paths based on elevation, rivers and roads. The resulting commuting spheres demonstrate that two sides of the same border were affected differently by the federalisation. On the one side, there are settlements *cut off* their nearest town since that town is on the other side of the border. On the other side, there are settlements that are *not cut off* the same town and thus the hardening of the border does not necessarily affect daily activities, such as the commuting to the nearest market place. Strikingly, the pattern observed highlights that market access can differ at the micro-level due to administrative boundaries.

The empirical results show that borders cause reductions in market access. Precisely, the evidence leads to two important conclusions. First, whether a border settlement depopulates depends on whether its nearest *significant* town is on the same or on the other side of the border. For Yugoslavia in the 1960s, *significant* towns had at least 5,000 inhabitants. Importantly, mere geographic proximity to an ADM1 border is not sufficient to experience decline. In response to the persistence literature, the evidence of this paper demonstrates that there is no compelling reason to associate *border effects* with *borders* when there is no interaction feasible due to topography and infrastructure.

Second, the empirical evidence shows that the loss of access to the nearest town only leads to decline when the nearest alternative town on the same side of the border is rather distant. Therefore I conclude that individuals migrate away from borders when they cannot reshuffle their activities, which highlights the importance of market access. Concerning the unresolved status of the Serbia-Kosovo border, the evidence underlines that the *hardening* of the border harms locals on both sides of the border (Figure 19).

7 Declarations

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7.2 Competing interests

The author has no relevant financial or non-financial interests to disclose.

References

Acemoglu, D., Johnson, S., Robinson, J.A. (2002). Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. *The Quarterly Journal of Economics*, *117*(4), 1231–1294.

Alix-Garcia, J., & Sellars, E.A. (2020). Locational Fundamentals, Trade, and the Changing Urban Landscape of Mexico. *Journal of Urban Economics*, *116*, 103213.

Anderson, J.E., & Van Wincoop, E. (2004). Trade Costs. *Journal of Economic Literature*, *42*(3), 691–751.

Becker, S.O., Boeckh, K., Hainz, C., Woessmann, L. (2016). The Empire is Dead, Long Live the Empire! Long-Run Persistence of Trust and Corruption in the Bureaucracy. *The Economic Journal*, *126*(590), 40–74.

Becker, S.O., Mergele, L., Woessmann, L. (2020). The Separation and Reunification of Germany: Rethinking a Natural Experiment Interpretation of the Enduring Effects of Communism. *Journal of Economic Perspectives*, *34*(2), 143–171.

Bertsch, G.K. (1977). Ethnicity and Politics in Socialist Yugoslavia. *The Annals of the American Academy of Political and Social Science*, *433*(1), 88–99.

Bookman, M.Z. (1990). The Economic Basis of Regional Autarchy in Yugoslavia. *Soviet Studies*, *42*(1), 93–109.

Broekmeyer, M.J. (1977). Self-Management in Yugoslavia. *The Annals of the American Academy of Political and Social Science*, *431*(1), 133–140.

Buchanan, J.M. (1965). An Economic Theory of Clubs. *Economica*, *32*(125), 1–14.

Burkett, J., & Škegro, B. (1988). Are Economic Fractures Widening? D. Rusinow (Ed.), *Yugoslavia: Fractured federalism* (pp. 142–155). Washington,

DC: The Wilson Center.

Casella, A., & Frey, B. (1992). Federalism and Clubs: Towards an Economic Theory of Overlapping Political Jurisdictions. *European Economic Review*, *36*(2-3), 639–646.

Cochrane, N.J. (1990). *Trade Liberalization in Yugoslavia and Poland.* (Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture. Staff Report No. AGES 9058.)

Davis, D.R., & Weinstein, D.E. (2002). Bones, Bombs, and Break Points: The Geography of Economic Activity. *American Economic Review*, *92*(5), 1269–1289.

Dijkstra, E.W., et al. (1959). A Note on Two Problems in Connexion With Graphs. *Numerische Mathematik*, *1*(1), 269–271.

Djilas, M. (1957). *The New Class: An Analysis of the Communist System.* San Diego: Harcourt Brace Jovanovich.

Dulić, T. (2004). Tito's Slaughterhouse: A Critical Analysis of Rummel's Work on Democide. *Journal of Peace Research*, *41*(1), 85–102.

Engels, F. (1894). *Herrn Eugen Dühring's Umwältzung der Wissenschaft.* Stuttgart: Verlag von J.R.W. Dietz.

Felbermayr, G., & Gröschl, J. (2014). Within US Trade and the Long Shadow of the American Secession. *Economic Inquiry*, *52*(1), 382–404.

Fisher, J.C. (1966). *Yugoslavia - A Multinational State: Regional Difference and Administrative Response.* San Francisco: Chandler Pub. Co.

Frankel, J. (1955). Federalism in Yugoslavia. *American Political Science Review*, *49*(2), 416–430.

Frankel, J., Stein, E., Wei, S.-J. (1995). Trading Blocs and the Americas: The Natural, the Unnatural, and the Super-Natural. *Journal of Development Economics*, *47*(1), 61–95.

Grosfeld, I., & Zhuravskaya, E. (2015). Cultural vs. Economic Legacies of Empires: Evidence From the Partition of Poland. *Journal of Comparative Economics*, *43*(1), 55–75.

Halpern, J.M. (1956). *A Serbian village.* New York: Columbia University Press.

Halpern, J.M. (1963). Yugoslav Peasant Society in Transition-Stability in Change. *Anthropological Quarterly*, *36*(3), 156–182.

Halpern, J.M. (1965). Peasant Culture and Urbanization in Yugoslavia. *Human Organization*, *24*(2), 162–174.

Halpern, J.M. (1975). Some Perspectives on Balkan Migration Patterns (With Particular Reference to Yugoslavia. *Anthropology Department Faculty Publication Series*, *1*(1), 54.

Hamilton, F.E.I. (1968). *Yugoslavia, Patterns of Economic Activity.* New York, Washington: Frederick A. Praeger, Publishers.

Holt, S., & Stapleton, K. (1971). Yugoslavia and the European Community 1958-70. *Journal of Common Market Studies*, *10*, 47.

Horvat, B. (1971). Yugoslav Economic Policy in the Post-war Period: Problems, Ideas, Institutional Developments. *American Economic Review*, *61*(3), 71–169.

Jakir, A. (2005). Workers' Self-Management in Tito's Yugoslavia Revisited. *Moving the Social*, *33*, 137–155.

Jović, D. (2009). *Yugoslavia: A State That Withered Away.* West Lafayette: Purdue University Press.

Kežić, D. (2017). *Bauen für den Einheitsstaat: Die Eisenbahn Belgrad-Bar und die Desintegration des Wirtschaftssystems in Jugoslawien (1952–1976).* München: De Gruyter Oldenbourg.

Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, *99*(3), 483–499.

Lampe, J.R. (2000). *Yugoslavia as History: Twice There Was a Country, Second Edition*. Cambridge: Cambridge University Press.

Lapenna, I. (1972). Main Features of the Yugoslav Constitution 1946-1971. *International & Comparative Law Quarterly*, *21*, 209.

Lockwood, W.G. (1973). The Peasant-Worker in Yugoslavia. *Studies in European Society*, *1*(1), 91–110.

Lockwood, W.G. (1975). *European Moslems: Economy and Ethnicity in Western Bosnia*. New York, San Francisco, London: Academic Press.

Lydall, H. (1989). *Yugoslavia in Crisis*. New York: Oxford University Press.

McCallum, J. (1995). National Borders Matter: Canada-US Regional Trade Patterns. *American Economic Review*, *85*(3), 615–623.

Michalopoulos, S., & Papaioannou, E. (2014). National Institutions and Subnational Development in Africa. *The Quarterly Journal of Economics*, *129*(1), 151–213.

Milanović, B. (1987). Patterns of Regional Growth in Yugoslavia, 1952–83. *Journal of Development Economics*, *25*(1), 1–19.

Milenkovitch, D.D. (1977). The Case of Yugoslavia. *American Economic Review*, *67*(1), 55–60.

Miller, R.F., et al. (1989). Developments in Yugoslav Agriculture: Breaking the Ideological Barrier in a Period of General Economic and Political Crisis. *East European Politics and Societies*, *3*(3), 500–533.

Neal, F.W. (1958). *Titoism in Action*. Berkeley: University of California Press.

Nitsch, V., & Wolf, N. (2013). Tear Down This Wall: On the Persistence of Borders in Trade. *Canadian Journal of Economics/Revue canadienne d'économique*, *46*(1), 154–179.

Pinkovskiy, M.L. (2017). Growth Discontinuities at Borders. *Journal of Economic Growth*, *22*(2), 145–192.

Radan, P. (1999). Yugoslavia's Internal Borders as International Borders: A Question of Appropriateness. *East European Quarterly*, *33*(2), 137.

Ramet, S.P. (1992). *Nationalism and Federalism in Yugoslavia, 1962-1991.* Bloomington: Indiana University Press.

Redding, S.J., & Sturm, D.M. (2008). The Costs of Remoteness: Evidence From German Division and Reunification. *American Economic Review*, *98*(5), 1766–97.

Rusinow, D.I. (1978). *The Yugoslav Experiment 1948-1974.* Berkeley: University of California Press.

Schmidheiny, K., & Siegloch, S. (2019). *On Event Study Designs and Distributed-Lag Models: Equivalence, Generalization and Practical Implications.* (CESifo Working Paper)

Simić, A. (1973). *The Peasant Urbanites: A Study of Rural-Urban Mobility in Serbia.* New York and London: Seminar Press.

Simić, A. (1974). Urbanization and Cultural Process in Yugoslavia. *Anthropological Quarterly*, *1*(1), 211–227.

Štiks, I. (2015). *Nations and Citizens in Yugoslavia and the Post-Yugoslav States: One Hundred Years of Citizenship.* London: Bloomsbury Publishing.

Tiebout, C.M. (1956). A Pure Theory of Local Expenditures. *Journal of Political Economy*, *64*(5), 416–424.

Tobler, W. (1993). *Three Presentations on Geographical Analysis and Modeling.* (National Center for Geographic Information and Analysis, Technical Report 93-1, University of California)

Uvalić, M. (1983). Il Problema del Mercato Unitario Jugoslavo. *Est-Ovest*, *14*(4), 7–43.

Ward, B. (1957). Workers' Management in Yugoslavia. *Journal of Political Economy*, *65*(5), 373–386.

Ward, B. (1965). The Nationalized Firm in Yugoslavia. *American Economic Review*, *55*(1/2), 65–74.

Ward, B. (1968). Political Power and Economic Change in Yugoslavia. *American Economic Review*, *58*(2), 568–579.

Wolf, H.C. (2000). Intranational Home Bias in Trade. *Review of Economics and Statistics*, *82*(4), 555–563.

Wolf, N. (2009). Was Germany Ever United? Evidence from Intra-and International Trade, 1885-1933. *The Journal of Economic History*, *69*(3), 846–881.

Woodward, S.L. (1995). *Socialist Unemployment: The Political Economy of Yugoslavia, 1945-1990.* Princeton: Princeton University Press.

8 Appendix

8.1 Maps

Fig. 8: The Balkans before World War I, based on Hamilton (1968, p. 16).

Table 9: Median travel distances between 26,149 settlements and 468 towns.

	Distance to Nearest Town				
Nearest Rank	**ADM2 Towns**	**5k Towns**	**10k Towns**	**20k Towns**	**50k Towns**
First	13.1km	23.8km	34.7km	44.7km	74.4km
Second	24.2km	41.3km	59.8km	75.6km	141.9km
Third	32.4km	53.6km	77km	101.7km	190.5km
Fourth	39.7km	64.7km	92.6km	123.7km	235.5km
Fifth	49.9km	76.9km	110.1km	147km	293.9km

All towns had the status as a communal administrative centre (ADM2) between 1945 and 1991. This set of towns is broken down into towns with at least 5,000 inhabitants, towns with at least 10,000 inhabitants, towns with at least 20,000 inhabitants and towns with at least 50,000 inhabitants (all based on the 1961 census). For each layer the median travel distances are reported for the nearest, second nearest, third nearest, fourth nearest and fifth nearest town.

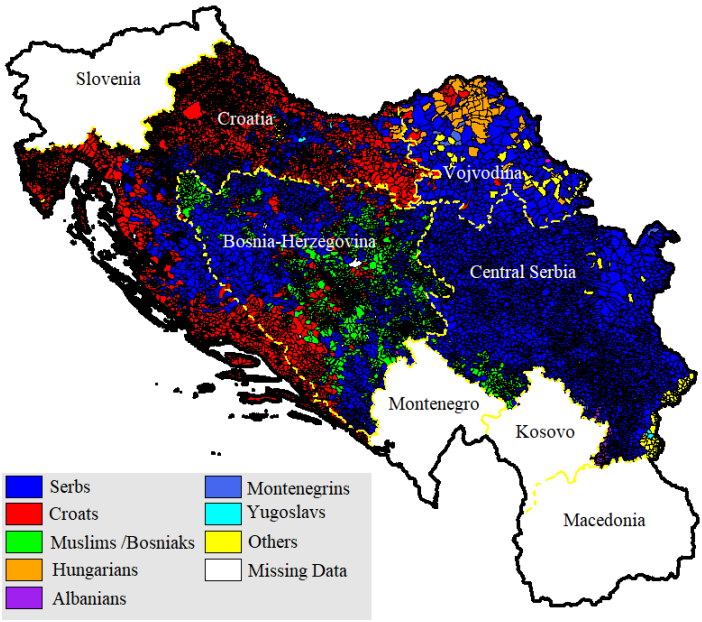


Fig. 9: Largest ethnic groups in Croatia, Central Serbia and Vojvodina (all Census 1981), and Bosnia-Herzegovina (Census 1991).

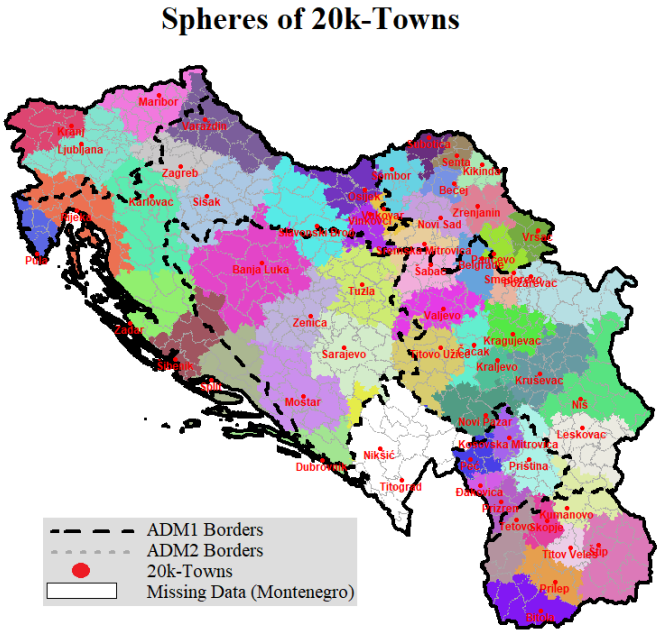


Fig. 10: Commuting spheres of towns with +20,000 inhabitants (in 1961).

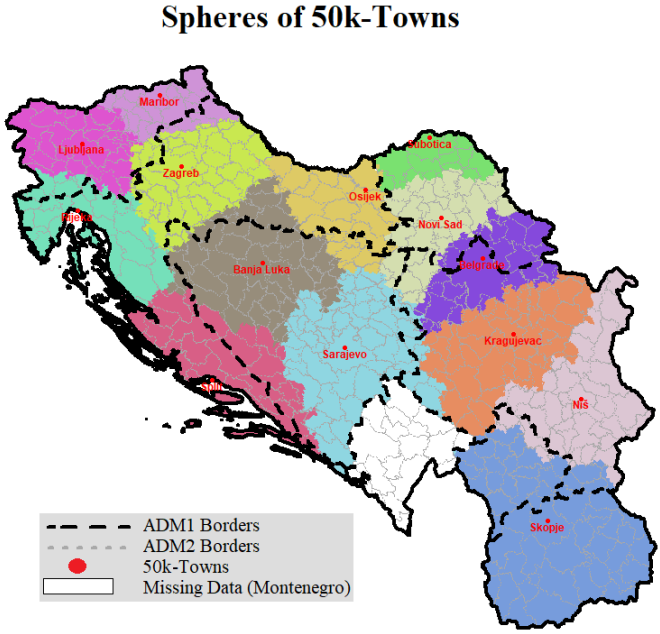


Fig. 11: Commuting spheres of towns with +50,000 inhabitants (in 1961).

8.2 Methodology of Redding and Sturm (2008) Applied

Table 10: Results of two-sample t-tests with equal variance for the estimation strategy of Redding and Sturm (2008).

Treatment = 0-20km to ADM1 Border; Control = All Other Settlements					
Panel A:		**Full Sample**			
		All	**Control**	**Treatment**	**Difference**
	Observations	16,596	9,821	6,775	
Population (1961)	**Mean**	846.74	833.08	866.55	-33.47
	(Std. Error)	(35.74)	(27.86)	(77.68)	(72.71)
Ann. PopGrowth (1948-1961)	**Mean**	0.39%	0.49%	0.26%	0.23%***
	(Std. Error)	(0.02)	(0.02)	(0.03)	(0.03)
Panel B:		**Towns and islands dropped**			
		All	**Control**	**Treatment**	**Difference**
	Observations	16,055	9,403	6,652	
Population (1961)	**Mean**	644.10	647.10	639.87	7.23
	(Std. Error)	(14.20)	(10.42)	(30.96)	(28.84)
Ann. PopGrowth (1948-1961)	**Mean**	0.37%	0.48%	0.21%	0.26%***
	(Std. Error)	(0.02)	(0.02)	(0.03)	(0.03)
Panel C:		**Panel B + Control restricted to 20-40km**			
		All	**Control**	**Treatment**	**Difference**
	Observations	10,600	3,948	6,652	
Population (1961)	**Mean**	635.69	628.66	639.87	-11.21
	(Std. Error)	(20.03)	(13.10)	(30.96)	(41.43)
Ann. PopGrowth (1948-1961)	**Mean**	0.23%	0.26%	0.21%	0.04%
	(Std. Error)	(0.02)	(0.03)	(0.03)	(0.04)

* p<0.10, ** p<0.05, *** p<0.01

The preferred sample for the estimation of causal effects is Panel C, used in Figure 4.

8.3 Does Size Matter?

Table 11: Results of two-sample t-tests with equal variance (ADM2-Towns).

Affected = Cut Off Nearest ADM2 Town; Unaffected = Not Cut Off Nearest ADM2 Town

Panel A:		**Full Sample**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	16,596	15,726	870	
Population (1961)	**Mean**	847	864	531	333**
	(Std. Error)	(36)	(37)	(82)	(160)
Ann. PopGrowth (1948-1961)	**Mean**	0.39%	0.41%	0.17%	0.24%***
	(Std. Error)	(0.02)	(0.02)	(0.06)	(0.08)

Panel B:		**Towns and islands dropped + NotCutByADM2 dropped**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	4,513	3,646	867	
Population (1961)	**Mean**	574	585	527	58
	(Std. Error)	(19)	(12)	(82)	(47)
Ann. PopGrowth (1948-1961)	**Mean**	0.20%	0.21%	0.16%	0.05%
	(Std. Error)	(0.03)	(0.03)	(0.06)	(0.07)

Panel C:		**Panel B + Only within 20km of an ADM1 Border Road**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	1,756	903	853	
Population (1961)	**Mean**	502	476	530	-53
	(Std. Error)	(42)	(23)	(83)	(84)
Ann. PopGrowth (1948-1961)	**Mean**	-0.10%	-0.34%	0.15%	-0.48%***
	(Std. Error)	(0.04)	(0.06)	(0.06)	(0.09)

Panel D:		**Panel B + Only within 5km of an ADM1 Border Road**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	399	83	316	
Population (1961)	**Mean**	405	354	418	-64
	(Std. Error)	(31)	(75)	(34)	(77)
Ann. PopGrowth (1948-1961)	**Mean**	-0.19%	-0.98%	0.02%	-1.00%***
	(Std. Error)	(0.10)	(0.22)	(0.10)	(0.23)

* p<0.10, ** p<0.05, *** p<0.01

These are the balancing tests for the subsample of settlements that are cut off their nearest administrative town (ADM2) by an ADM1 border. The preferred sample for the estimation of causal effects is Panel B.

(a) Full Sample (b) Reduced Control

Fig. 12: Test for parallel trends: CutOffADM2Town.

Table 12: Results of two-sample t-tests with equal variance (5k-Towns).

Affected = Cut Off Nearest 5k-Town; Unaffected = Not Cut Off Nearest 5k-Town

Panel A:		**Full Sample**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	16,596	15,014	1,582	
Population (1961)	**Mean**	847	891	428	463***
	(Std. Error)	(36)	(39)	(46)	(122)
Ann. PopGrowth (1948-1961)	**Mean**	0.39%	0.44%	-0.01%	0.45%***
	(Std. Error)	(0.02)	(0.02)	(0.06)	(0.02)

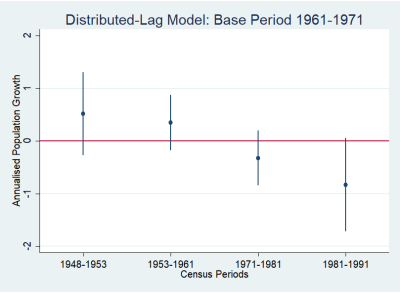
Panel B:		**Towns and islands dropped + NotCutByADM2 dropped**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	9,521	7,965	1,556	
Population (1961)	**Mean**	521	545	397	148***
	(Std. Error)	(10)	(7)	(46)	(26)
Ann. PopGrowth (1948-1961)	**Mean**	0.20%	0.25%	-0.06%	0.32%***
	(Std. Error)	(0.02)	(0.02)	(0.06)	(0.06)

Panel C:		**Panel B + Only within 20km of an ADM1 Border Road**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	3,702	2,254	1,448	
Population (1961)	**Mean**	434	458	398	60
	(Std. Error)	(20)	(11)	(49)	(42)
Ann. PopGrowth (1948-1961)	**Mean**	-0.11%	-0.11%	-0.09%	-0.02%
	(Std. Error)	(0.03)	(0.04)	(0.06)	(0.07)

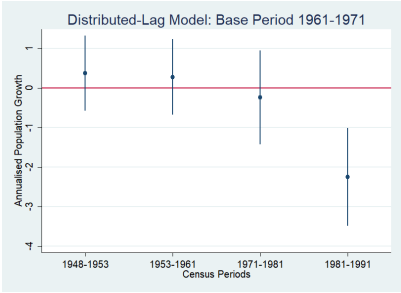
Panel D:		**Panel B + Only within 5km of an ADM1 Border Road**			
		All	**Unaffected**	**Affected**	**Difference**
	Observations	642	248	394	
Population (1961)	**Mean**	345	365	333	32
	(Std. Error)	(20)	(29)	(27)	(41)
Ann. PopGrowth (1948-1961)	**Mean**	-0.39%	-0.49%	-0.33%	-0.16%
	(Std. Error)	(0.09)	(0.15)	(0.10)	(0.18)

* p<0.10, ** p<0.05, *** p<0.01

These are the balancing tests for the subsample of settlements that are cut off their nearest town with at least 5,000 inhabitants by an ADM1 border. The preferred samples for the estimation of causal effects are Panel C and Panel D.



(a) Dist-to-ADM1-Border: 20km



(b) Dist-to-ADM1-Border: 5km

Fig. 13: Test for parallel trends: CutOff5kTown.

8.4 Spheres of Larger Towns

Table 13: Regression results for settlements that are cut off their nearest town with at least 10,000, 20,000 and 50,000 inhabitants.

	Annualised Population Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
CutOff10kTown × Federalism	-0.902***	-1.374***				
	(0.337)	(0.348)				
CutOff20kTown × Federalism			-0.651*	-0.896**		
			(0.342)	(0.348)		
CutOff50kTown × Federalism					0.319	0.497
					(0.280)	(0.376)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}	Full^{F}
Restriction1^{R1}	Yes	Yes	Yes	Yes	Yes	Yes
Restriction2	Yes^{R2}	Yes^{R2}	Yes^{R3}	Yes^{R3}	Yes^{R4}	Yes^{R4}
Dist-To-ADM1 Border Road	175km^{M}	20km	175km^{M}	20km	175km^{M}	20km
Clusters	86	48	49	36	14	13
Settlements	11,947	4,334	13,297	4,522	14,912	4,947
Observations	59,735	21,670	66,485	22,610	74,560	24,735
R-Square	0.4073	0.3834	0.4121	0.3792	0.4117	0.3754

Standard errors in parentheses.
For Column 1-Column 2, standard errors are clustered at nearest 10k-town sphere.
For Column 3-Column 4, standard errors are clustered at nearest 20k-town sphere.
For Column 5-Column 6, standard errors are clustered at nearest 50k-town sphere.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements off near. 10k-town (Column 1-2).
R3: ADM2 border cuts control settlements off near. 20k-town (Column 3-4).
R4: ADM2 border cuts control settlements off near. 50k-town (Column 5-6).
* p<0.10, ** p<0.05, *** p<0.01

8.5 Alternative Towns

Table 14: Results of two-sample t-tests with equal variance (Alternatives).

Affected = Cut Off Nearest 5k-Town; Control = Not Cut Off Nearest 5k-Town

Panel A:	Towns, islands and NotCutByADM2 dropped. Sample reduced to 5km to nearest ADM1 border road.				
		All	Control	Affected-DistAlt	Difference
	Observations	473	248	225	
Population (1961)	Mean	346	365	326	39
	(Std. Error)	(22)	(29)	(33)	(44)
Ann. PopGrowth (1948-1961)	Mean	-0.32%	-0.49%	-0.14%	-0.35%*
	(Std. Error)	(0.11)	(0.15)	(0.15)	(0.21)

Panel B:	Towns, islands and NotCutByADM2 dropped. Sample reduced to 5km to nearest ADM1 border road.				
		All	Control	Affected-NearAlt	Difference
	Observations	417	248	169	
Population (1961)	Mean	355	365	341	23
	(Std. Error)	(25)	(29)	(45)	(52)
Ann. PopGrowth (1948-1961)	Mean	-0.53%	-0.49%	-0.59%	0.10%
	(Std. Error)	(0.11)	(0.15)	(0.14)	(0.22)

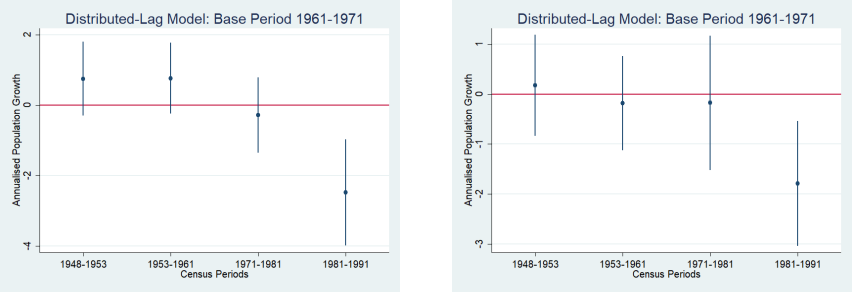
Affected = Cut Off Nearest 5k-Town; Control = Not Cut Off Nearest 5k-Town

Panel C:	Towns, islands and NotCutByADM2 dropped. Sample reduced to 4km to nearest ADM1 border road.				
		All	Control	Affected-DistAlt	Difference
	Observations	344	175	169	
Population (1961)	Mean	356	369	343	26
	(Std. Error)	(27)	(35)	(41)	(53)
Ann. PopGrowth (1948-1961)	Mean	-0.28%	-0.43%	-0.12%	-0.32%
	(Std. Error)	(0.18)	(0.18)	(0.13)	(0.26)

Panel D:	Towns, islands and NotCutByADM2 dropped. Sample reduced to 4km to nearest ADM1 border road.				
		All	Control	Affected-NearAlt	Difference
	Observations	304	175	129	
Population (1961)	Mean	354	369	333	36
	(Std. Error)	(31)	(35)	(57)	(63)
Ann. PopGrowth (1948-1961)	Mean	-0.47%	-0.43%	-0.53%	-0.1%
	(Std. Error)	(0.12)	(0.18)	(0.15)	(0.25)

* p<0.10, ** p<0.05, *** p<0.01

These are the balancing tests for the subsample of settlements that are cut off their nearest town with at least 5,000 inhabitants by an ADM1 border. The treatment variable is split into settlements with a near alternative 5k-town in the same federal unit, and with a distant alternative. Whether the alternative is distant or near is determined by comparison to the median of the additional distances to the nearest alternative town in the same federal unit. In Panel A only the 1948-1961 annualised population growth rates of affected towns with a distant alternative is biased at the 10% level. However, this bias is removed if the sample is further restricted to max 4km to the nearest ADM1 border crossing road (Panel C), which does also not affect the estimation results. As there is otherwise no bias, Table 14, together with Figure 14, supports causal interpretation.



(a) Distant Alternative (b) Near Alternative

Fig. 14: Test for parallel trends: CutOff5kTown and Alternative Towns

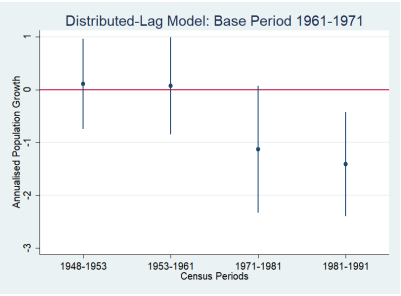
8.6 Border Sections and Ethnicity

Table 15: Regression results split into all available ADM1 border sections.

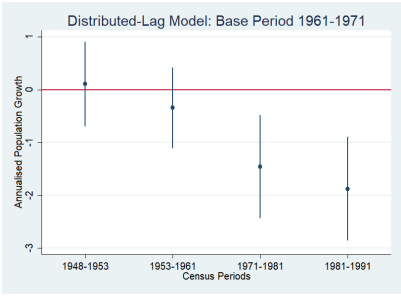
	Annualised Population Growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CutOff5kTownHRVSLO × Federalism	0.471	0.546	0.129	-0.552		-0.139		
	(0.503)	(0.513)	(0.557)	(0.544)		(0.552)		
CutOff5kTownHRVBIH × Federalism	-0.289	-0.271	-0.659**	-1.255***	-0.0219	-0.792***		
	(0.224)	(0.237)	(0.321)	(0.455)	(0.347)	(0.290)		
CutOff5kTownHRVVOJ × Federalism	-0.385	-0.335	-0.621*	-1.033**		-0.806**		-2.345
	(0.262)	(0.273)	(0.312)	(0.473)		(0.329)		(1.602)
CutOff5kTownSRBVOJ × Federalism	0.428	0.480	0.0868	0.0480			0.886	0.0845
	(0.415)	(0.423)	(0.480)	(0.707)			(1.189)	(0.296)
CutOff5kTownSRBBIH × Federalism	-1.268***	-1.216***	-1.497***	-1.724***	-0.825**		0.103	
	(0.382)	(0.420)	(0.472)	(0.432)	(0.404)		(0.156)	
CutOff5kTownSRBKOS × Federalism	-2.520***	-2.460***	-2.751***	-2.783**			-2.311***	
	(0.781)	(0.784)	(0.899)	(1.104)			(0.785)	
CutOff5kTownSRBMON × Federalism	-1.529***	-1.472***	-1.819***	-4.002***			-1.386***	
	(0.440)	(0.445)	(0.525)	(0.403)			(0.436)	
CutOff5kTownBIHMON × Federalism	-1.777***	-1.744***	-2.134***	-3.263***	-1.230***			
	(0.331)	(0.347)	(0.398)	(1.255)	(0.400)			
CutOff5kTownOTHER × Federalism	-0.523	-0.466	-0.613		-0.617	-0.357	-0.763	-0.700***
	(0.376)	(0.398)	(0.470)		(0.410)	(0.448)	(1.322)	(0.197)
Settlement FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Census-Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full^{F}	Full^{F}	Full^{F}	Full^{F}	BIH^{FB}	HRV^{FH}	SRB^{S}	VOJ^{FV}
Restriction1^{R1}	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Restriction2^{R2}		Yes	Yes	Yes		Yes	Yes	Yes
Dist-To-ADM1 Border Road	175km^{M}	175km^{M}	20km	5km	99km^{MB}	117km^{MC}	175km^{MS}	117km^{MV}
Clusters	156	145	75	43	45	51	47	30
Settlements	16,586	9,511	3,693	637	3,399	3,620	2,325	163
Observations	82,930	47,555	18,465	3,185	16,995	18,100	11,625	815
R-Square	0.4203	0.4131	0.3894	0.3679	0.4394	0.3401	0.5152	0.3846

CutOff5kTownHRVSLO = 1 if settlement within 10km of Croatia-Slovenia border.
CutOff5kTownHRVBIH = 1 if settlement within 10km of Croatia-Bosnia-Herzegovina border.
CutOff5kTownHRVVOJ = 1 if settlement within 10km of Croatia-Vojvodina border.
CutOff5kTownSRBVOJ = 1 if settlement within 10km of Central-Serbia-Vojvodina border.
CutOff5kTownSRBBIH = 1 if settlement within 10km of Central-Serbia-Bosnia-Herzegovina border.
CutOff5kTownSRBKOS = 1 if settlement within 10km of Central-Serbia-Kosovo border.
CutOff5kTownSRBMON = 1 if settlement within 10km of Central-Serbia-Montenegro border.
CutOff5kTownBIHMON = 1 if settlement within 10km of Bosnia-Herzegovina-Montenegro border.
CutOff5kTownOther = 1 if settlement is cut off 5k town but more than 10km from an ADM1 border.

Standard errors in parentheses, clustered at nearest 5k-town sphere.
F: Includes all settlements in Bosnia-Herzegovina, Croatia, Central Serbia and Vojvodina.
FB: Includes all settlements in Bosnia-Herzegovina.
FH: Includes all settlements in Croatia.
FS: Includes all settlements in Central Serbia.
FV: Includes all settlements in Vojvodina.
M: The maximum distance to an ADM1 Border Crossing Road is 175km.
MB: In Bosnia-Herzegovina, the maximum distance to an ADM1 Border Crossing Road is 99km.
MC: In Croatia, the maximum distance to an ADM1 Border Crossing Road is 117km.
MS: In Central Serbia, the maximum distance to an ADM1 Border Crossing Road is 175km.
MV: In Vojvodina, the maximum distance to an ADM1 Border Crossing Road is 117km.
R1: Towns and islands dropped.
R2: ADM2 border cuts control settlements off their nearest 5k-town.
* p<0.10, ** p<0.05, *** p<0.01

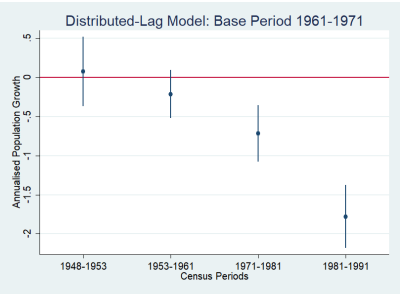


(a) +50% Serbs cut +50% Serbs

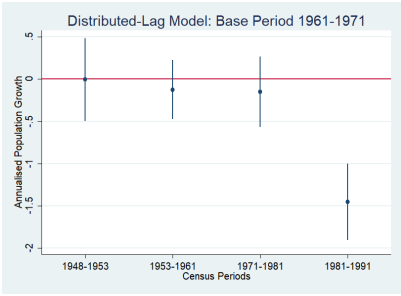


(b) +50% Serbs cut +95% Serbs

Fig. 15: Test for parallel trends: CutOff5kTown, Serbs cut off Serbs.

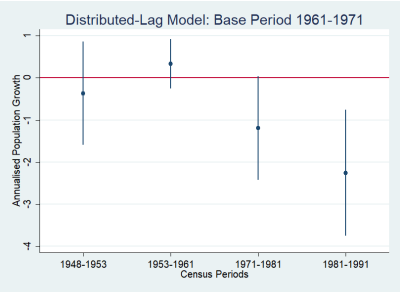


(a) +50% Slovenes cut +50% Croats

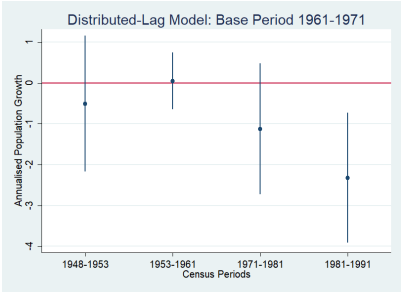


(b) +50% Slovenes cut +95% Croats

Fig. 16: Test for parallel trends: CutOff5kTown, Slovenes cut off Croats.



(a) +50% Croats cut off +50% Croats



(b) +50% Croats cut off +95% Croats

Fig. 17: Test for parallel trends: CutOff5kTown, Croats cut off Croats.

8.7 Towns

Table 16: Results of two-sample t-tests with equal variance for Equation 1.

Affected = 5k-town lost +1% of settlements within its sphere
Unaffected = All other towns

Panel A:		Full Sample			
		All	Unaffected	Affected	Difference
	Observations	339	207	132	
Population (1961)	Mean	10,698	11,341	9,689	1,652
	(Std. Error)	(1,524)	(1,183)	(3,453)	(3,129)
Ann. PopGrowth (1948-1961)	Mean	2.70%	2.63%	2.81%	-0.18%
	(Std. Error)	(0.11)	(0.14)	(0.19)	(0.23)

Affected = 5k-town lost +50% of settlements within its sphere
Unaffected = Towns within 40km of ADM1 border crossing road

Panel B:		Islands dropped			
		All	Unaffected	Affected	Difference
	Observations	121	39	82	
Population (1961)	Mean	7,203	8,466	6,602	1,864
	(Std. Error)	(1,270)	(2,555)	(1,433)	(2,723)
Ann. PopGrowth (1948-1961)	Mean	3.06%	3.02%	3.08%	-0.05%
	(Std. Error)	(0.19)	(0.32)	(0.24)	(0.41)

* p<0.10, ** p<0.05, *** p<0.01

Balancing tests for the subsample of towns that lost at least 1% (Panel A) and at least 50% (Panel B) of the settlements within their sphere due to an ADM1 border. Panel A uses the full sample without restrictions. Panel B drops islands and reduces the sample towns within 40km of an ADM1 border crossing road. Together with Figure 18, both Panel A and Panel B support causal interpretation.

(a) 1% Cut (b) 50% Cut

Fig. 18: Test for parallel trends: 5kTownsLostSettlements

8.8 Serbia-Kosovo border

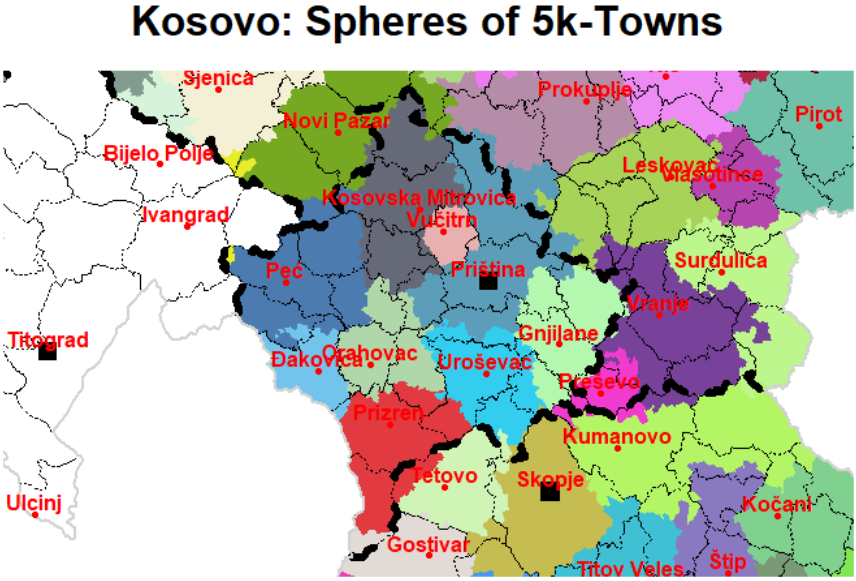


Fig. 19: 5k-Town Spheres around Kosovo.