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Research Article

A fish stinks from the head: Ethnic diversity, segregation, and the collapse of Yugoslavia

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A fish stinks from the head[1]: Ethnic diversity, segregation, and the collapse of Yugoslavia[i]

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Abstract

Demographic analysis clarifies political issues in the collapse of Yugoslavia. In most regions, 1961-1991, ethnic diversity (estimated by informational entropy) increased and segregation (estimated by Theil's H) decreased. In a few regions there was a reversal in 1991 as migration flows or presentations of self perhaps changed in anticipation of war. The analysis strengthens refutations of the view that long standing ethnic hatreds were the root cause of the Yugoslav collapse and supports analyses that attribute collapse to general economic crisis, economic competition between regions, and failures at the peak of government.

[i] Hammel was responsible for final preparation of the data sets for analysis. Mason, and secondarily Hammel, were responsible for the statistical analysis. Stevanović was responsible for initial preparation of the data sets and for contacts with demographers in Belgrade. Hammel and Mason wrote the paper.

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1. Introduction

We seek here to throw some demographic light on the collapse of Yugoslavia in the 1990s. We include data as late in time before the collapse as possible and thus incorporate information from the census of 1991, although its form and scope are less than ideal.[2] We extend the analysis as early as we can where the data are reasonably consistent in ethnic classification and territorial organization, namely to the census of 1961. We use data at the lowest level of aggregation in the census, namely the village or urban neighborhood, because we feel that ethnic diversity is most important socially and psychologically to individuals at that level.[3] However, we extend the analysis upward to higher levels as well. The paper makes use of work in sociology, history, ethnography, and political science as background to the demographic analysis.

What can demographic analysis tell us that other studies have not? This paper will show that, with some illuminating exceptions, ethnic diversity was increasing, and ethnic segregation decreasing at all census administrative levels 1961-91, but that there were even in these trends some prophetic local reversals between 1981 and 1991. These observations raise a series of interpretive questions that go beyond demographic analysis. Nevertheless, the demographic analysis is embedded in and motivated by them, so that they must be addressed. At the same time it is not our intention nor within our competence to offer a complete analysis from the viewpoints of sociology or political science. There already exist other analyses from those and other perspectives.[4] Our intent is to supplement them with a statistical analysis of ethnic distributions.

- Can the ethnic violence and collapse of Yugoslavia be attributed simply to long-standing and pervasive ethnic hatreds? This notion is the usual journalistic explanation.
- Can the violence be attributed to the processes of ethnic diversification and desegregation themselves? Could the inhabitants of Yugoslavia simply not endure the increasingly cosmopolitan character of their environment?
- Can the violence and separatism instead be attributed to a loss of control by the League of Communists of Yugoslavia, weakened by the economic crises of the 1980s and the rise of competition and dissatisfaction between constituent republics defined by dominant ethnicities? Did regional politicians seize on ethnicity as a device in quest of power?

In short, did Yugoslavia split from the bottom up or from the top down?

2. Historical background

Yugoslavia was cobbled together at the Paris Peace Conference in 1919 as part of an attempt to unite similar ethnic groups as a *cordon sanitaire* around a defeated German-Austrian alliance.[5] Like many regions of southeastern Europe, it held a congeries of ethnic groups, the jetsam of tribal and imperial waves that had swept across the Balkans for millennia. In the several centuries before World War I three major empires had held sway: the Venetian along the Adriatic, the Austro-Hungarian in the northwest, and the Ottoman in the southeast. Their boundaries did not coincide with divisions between ethnic groups. Many of these groups, especially pastoral ones, had been traditionally mobile. Many had scattered from southeast to northwest in flight from the Ottoman advance, and Serbs in particular fled or were invited into Habsburg territory to serve as frontier guards. Local relationships between these groups were often economically symbiotic, not always cordial, but not necessarily hostile unless poisoned by the influence of imperial masters. Figure 1 shows the geographical distribution of the principal ethnic groups *in majority* across the territory in 1991.[6] The map is a rough guide. It does not tell us much about areas in which no group had a majority but may have had a plurality, especially in Bosnia.[7] It does not tell us how diverse a region was ethnically, no matter which group was in majority. We seek here to draw a more detailed picture statistically if not cartographically.

This ethnic diversity is illustrated in some ways by the multiplicity of distinct languages natively spoken in the region, that is by groups with long historical depth.[8] One authoritative count lists 22.[9] Of the non-Slavic languages, only Albanian and Hungarian had large numbers of native speakers within Yugoslavia. Of the Slavic languages, Bulgarian and Slovak had few, leaving the major languages of the former Yugoslavia, from northwest to southeast: Slovenian, Croatian, Serbian, Macedonian. The disappearance of "Serbo-Croatian" and its replacement by Serbian, Croatian, and now Bosnian confirms the classic quip of linguists, "A language is a dialect with an army."

Language, or at least speech, however, are not perfect predictors of ethnicity in the political sense. It is often difficult to distinguish the ethnicity of Bosniaks (Muslim Slavs in Bosnia) from that of Bosnian Serbs or Croats residing in the same local area by listening to their speech. Indeed, it is often only their names that give a clue, showing those with names of Arabic-Turkish derivation to be Muslims, or those named after saints in the Orthodox or Roman churches to be, respectively, Serbs or Croats. Some other baptismal names and patronymics are also typically Serbian or Croatian. Persons might also be distinguished by vocabulary differences, with Muslims using more words of Turkish/Arabic origin, or phrases from the Koran, with Catholic Croats and Orthodox Serbs relying on their own sacred texts. Otherwise, dialect differences

throughout the former Yugoslavia are geographically rather than politically defined, even though the several standard languages are politically defined. Ethnicity can also be signaled by items of traditional costume.[10,11]

Figure 1: Majority ethnic distributions in Yugoslavia at the municipal level according to the 1991 census

Source: Created at the U.S. Central Intelligence Agency, 1992. Image currently maintained through the University of Texas Libraries, http://www.lib.utexas.edu/maps/europe/yugoslav.jpg. See http://commons.wikimedia.org/wiki/File:Yugoslavia_ethnic_map.jpg

3. The Yugoslav Censuses

Our analysis is based on the published tabulations contained on the CD issued by the Federal Statistical Office of Yugoslavia (Yugoslavia 1998). This source is unusual in that it is not only machine-readable but also provides preliminary tabulations on several demographic variables for the census of 1991 and also a series of tables of ethnic distributions in prior censuses back to 1921. For the later censuses, the tables provide data at the lowest level of aggregation (see below). While these data are essential for an historical overview of ethnic distributions, they have limitations that must be kept in mind. These stem from the nature of the census process itself.

1. The first step in the process is the interaction between the census taker and the respondent. Not until 1971 were the data on the question of ethnicity based entirely on the voluntary declaration of the respondent (including the declaration of the ethnicity of children under age 15 by their parents). Before that date, the census-taker played some role in offering examples, or in the earlier post-war censuses (1948, 1953), simply assigning ethnic membership.[12]

2. The second step is the reduction of a large number of ethnic groups to a smaller number of categories, including a residual "Other". It is important to note that "Other" is not the only residual category. A second residual category is "Yugoslav – unallocated", often tabulated simply as "Yugoslav", that is, persons of Yugoslav citizenship or heritage (*poreklo*) who did not declare or were not assigned to a specific ethnic group. The degree of residuality of "Yugoslav", however, differs in different censuses. In 1953 *Yugoslav* ethnic Muslims (thus not Muslim ethnic Turks, or Albanians, etc.), whether or not they practiced Islam, were allocated to the "Yugoslav" category.

3. The third step is the tabulation of the data into an even smaller number of categories for purposes of publication. As with most census data in all countries, the degree of specificity is greatest at the highest levels of aggregation and vice-versa. For example, the tables of ethnic membership for the historical censuses of Yugoslavia in the data source for this analysis provide much more detailed specifications of ethnic affiliation at the municipality level than they do for the lower, settlement, level.

4. A fourth limitation of the data is the loss of uniform formats across the different regions of Yugoslavia in the published data for the 1991 census. This regionalism

even affected the conduct of that census; some regions did not participate in the pre-test, some omitted questions, some apparently did not report the results at the lowest level of aggregation to the Federal Statistical Office (Mrdjen 2002). Indeed, insurgency had already begun in Serbian majority regions of Croatia when the census was taken on March 31, 1991, as a result of Croatia's declaration of independence and legislative changes that would have altered the historical status of Serbs in Croatia.[13]

3.1 Ethnicity in the Yugoslav Censuses

Ethnicity or its plausible indicators have been tabulated in the censuses of Yugoslavia since the first national count in 1921. In 1921 and 1931 mother tongue and religious affiliation were tabulated but unfortunately not cross-tabulated. Thus, the data from those years cannot be easily transformed into the ethnic categories used later because the fit between language, religion, and ethnicity is not clear cut. For example, Serbs and Croats were both listed as speakers of "Serbo-Croatian" and cannot be distinguished on linguistic grounds. All Orthodox in a region are not necessarily Serbs, nor are all Catholics necessarily Croats. Neither are all Muslims Muslim Slavs.[14] Although it would have been interesting to examine data on ethnicity beginning with the first postwar census (1948), the published data do not permit it. It is difficult to create a consistent data set from 1948 onward because the system of ethnic classification in the tabulations did not stabilize until the census of 1961. Indeed, it is consistent only 1961-1981 across all segments of the territory. In 1991 it continues in almost consistent form for Serbia and Montenegro (who jointly formed the rump Yugoslavia after the secessions), but the categorization employed in the published tables at the lowest level of aggregation is drastically simplified in Bosnia and Croatia. There are no useful data for Kosovo and two municipalities of Central Serbia in 1991, and there are no data in our source at the lowest level of aggregation for Slovenia and Macedonia in that year.[15]

3.2 Territorial organization in the Yugoslav Censuses

From 1961 onward the lowest level of aggregation in the census tables was the *naselje* (pl. *naselja*).[16,17] The next higher level was the *opština* (pl. *opštine*, approx. "municipality"). Opštine were typically named after the naselje that was their seat and also appear in the tabulations as naselja; thus they are listed twice, once as a naselje and once as the summary of their constituent naselja, but they are easily distinguished in the published tables. Opštine were not just census units but important administrative units.

The next higher level was the republic, although Serbia itself was divided at an intermediate level into Central Serbia and two other regions with a degree of autonomy that had varied over time – the Voyvodina in the north and Kosovo in the south. In this analysis we treat all of these entities above the opština as equivalent in level, i.e., the republics other than Serbia and the three sections of Serbia as described, and call them all *regions*.

Before 1961 data were not published at the naselje level, and the lowest level fluctuated in scope and name but was higher than the naselje. We do not use censuses before 1961 not only because they do not have data at the naselje level but also, as noted, because their classifications of ethnicity are not consistent with those 1961-1991. The geographical boundaries of census units above the naselje and below the region are also rather volatile over time, so that these units form a time series with changing content. Naselja are more consistent, but they, too, pose problems. Some naselja disappear from the census; these seem often to be small villages that were abandoned, but they may also be urban neighborhoods that were renamed. Some naselja appear in the middle of the census series; these appear to be genuinely new settlements, although they, too, may be old naselja renamed. While the renaming of naselja is not as frequent as the politically driven ubiquitous renaming of streets, it does occur.[18] More problematic than renaming is the varying spelling in the different censuses of the names of naselja that seem almost surely to be the same places. [19]

It is important to note, however, that the analysis presented here is not one of a time series of the naselja themselves but rather a time series of cross-sections of naselja. Each observation that we examine is a naselje at a point in time, located in its opština and its region at that point in time, and we do not rely, in our main analysis, on whether these points, even if identically named, are the same across the four censuses. Similarly, analysis of opštine over time is one of a time series of cross-sections. These caveats do not apply to regions, the borders of which appear to be quite stable over the time span 1961-1991.[20]

4. Ethnic classification in this analysis[21]

The underlying data on ethnicity consist of the census taker's judgment of a respondent's ethnicity or of a respondent's declaration of ethnic affiliation (*narodna pripadnost*) to the census taker. There was an evolution of these methods over time, described below, but they appear to have been relatively consistent in 1971-1991. By 1971 respondents could declare an ethnicity as such (e.g., "I am a Serb"), or they could claim an ethnicity on grounds of residence in a republic (e.g., "I am Serbian because I live in Serbia"), or they could decline to state an ethnicity. In the latter case, they would

presumably be classified as "Yugoslav – unallocated" if they were Yugoslav citizens or of Yugoslav heritage, or as "Other" if they were not.

Yugoslav political philosophy was very sensitive to issues of ethnicity, especially to the history of conflict between the major ethnic groups. Under the Yugoslav constitution(s) after 1945 there were five "constitutive ethnicities", called *narodi*[22], each associated with one of the republics, which was its historical homeland, if not the residence, of all its members: Croatian, Macedonian, Montenegrin, Serbian, and Slovenian. Serbs, for example, also formed large minorities in Croatia and Bosnia and decreasingly so over time in Kosovo. Serbs resident in Croatia were also a constitutive ethnicity in Croatia, since they had formed a large portion of the population of Croatia since the 16th century. There were, in addition, a number of other recognized ethnic groups, called *narodnosti*[23], living in Yugoslavia but having a recognized homeland outside Yugoslavia (or no recognized or uncontested homeland, such as Roma, Cincari, Bunjevci, Vlachs, and others) and thus not having a republic that was ethnically, historically, and constitutionally their own. The largest of these groups were the Albanians, mostly concentrated in Kosovo, and Hungarians, mostly concentrated in Voyvodina. Although a republic, Bosnia did not have a constitutive ethnicity.[24] The central problems of Yugoslav ethnic politics are that some narodi had a large presence in a region not their own, and some very numerous narodnosti had no constitutional home.[25]

Two other "ethnicities" are of particular interest, and they are interrelated. One is that of "unallocated Muslims" (*neopredeljeni Muslimani*). These are persons who identify themselves as Muslim *in the ethnic sense*, but who are not necessarily observant Muslims.[26] These would include Muslims of Yugoslav origin[27], such as those in Bosnia or the Sandžak (the territory between Kosovo, Montenegro, and Hercegovina). In theory, persons of Muslim faith who were not of Yugoslav origin could not claim to be Muslims in the ethnic sense. Persons of Muslim faith who had declared another ethnicity, such as Albanian, would not be included in this "unallocated Muslim" category. The other category of interest is "Yugoslav", or more precisely "unallocated Yugoslav." It can be construed as a residual category of Yugoslav citizens who did not declare any ethnic tie, or who declared an ethnicity that was not separately tabulated, or of those who chose "Yugoslav" because it superceded previous ethnic divisions.

There are some subtle shifts in the counting of (ethnic) Muslims. Muslims of Yugoslav heritage were politically recognized as a separate nationality in first postwar census (1948) but not tallied as such. In that census the census taker was given a list of example categories, and instructed to tally Muslims who had declared no other ethnicity (e.g., Albanian), as Serb-Muslims, Croat-Muslims, or "unallocated Muslims". In 1953 the census-taker was again given a list of example categories and directed to write down

the ethnicity of the respondent, but there was no "unallocated Muslim" category published in the tables. The census taker was also instructed to write "Yugoslav-unallocated" for respondents "of Yugoslav origin … who had not been ethnically more closely allocated." In 1961 the designation, "Muslim", was defined as "in the ethnic sense" and applied only to persons of Yugoslav origin, i.e., not to Albanians, Turks, etc. and further not to ethnic Serbs, Croats, and others who were of Islamic faith. These allocations, according to the instructions, were apparently determined by the census taker, presumably after querying the respondent.

In 1971, there was a marked change in the instructions, namely that the respondent was to be recorded according to his or her own declaration, with the ethnicity of children under age 15 declared by their parents. The instructions explicitly state that respondents who do not wish to declare their ethnicity need not do so. Throughout the series of censuses, various terms, such as "ethnic membership", "ethnic minority", "nationality", etc., were used interchangeably and without definition. The term, "minority", was eventually dropped because it might be thought derogatory.

The second category of special interest is "Yugoslav". In the earlier censuses before 1961 it appears to have been a residual category for persons of Yugoslav origin or citizenship for whom the census taker could not determine an ethnic category, or those respondents who did not respond with an ethnic category. The number of persons in Yugoslavia listing Yugoslav as their ethnicity (or having it determined for them) is never large, except in Bosnia, although its proportional fluctuations may be. There may be a categorical equivalent of "Muslim" and "Yugoslav" in some censuses (see below). Otherwise, "Yugoslav" appears to have been a response of members of the League of Communists, of military officers, or of dedicated supporters of the national unity of Yugoslavia even if they were not members of the League, or, as suggested above, especially of Muslims or others who did not wish to identify themselves in traditional ethnic terms.[28] It may also have provided an opportunity for the children of ethnically mixed marriages or spouses in such marriages to choose a neutral ethnic alternative.[29] This declaration ("Yugoslav") is of special interest because it is unambiguously a political statement. However, it is important to note that all declarations of ethnicity in Yugoslavia (and perhaps universally) are in some sense political statements.[30] (See also Urdal 2001.)

Using the published tables on which our analysis is based, we observe that in 1961 eighty-seven percent or 842,000 of the 973,000 tabulated (ethnic) Muslims in Yugoslavia resided in Bosnia. Eighty-seven percent or 276,000 of the 317,000 tabulated "unallocated Yugoslavs" in Yugoslavia were also resident in Bosnia. If the persons tabulated as "Yugoslav" had all really been Muslims, there would have been 1.1 million of the latter. In the next census (1971) 86 percent or 1.5 million of the 1.7 million Muslims in Yugoslavia resided in Bosnia, but only 16 percent or 44,000 of the 273,000

"unallocated Yugoslavs" did. Muslims in Bosnia increased by 640,000 or 76 percent; "Yugoslavs" decreased by 232,000 or 84 percent. Even if all of the increase in Muslims was simply an "ethnic migration" of "Yugoslavs" into "Muslims", there are still about 400,000 people unaccounted for. Assuming (and not unreasonably) that crude death rates were about the same for Muslims and non-Muslims, and also that Muslim crude fertility rates were as much as double those of non-Muslims (also not unreasonable), the numbers still do not balance. There may have been other trading partners in this network. Serbs and Croats, the other two major ethnic groups in Bosnia, show almost no change in number between 1961 and 1971. It is possible that they actually experienced some population growth but that some proportion of their population, having reported as non-Muslim in 1961, elected to report as Muslim in 1971. It is also possible that some non-Yugoslav Muslims (ethnic Albanians, ethnic Turks, etc.) may have claimed Yugoslav Muslim ethnicity.[31]

The usual "balance equation" for demographic analysis contains three terms: births, deaths, and net migration. The balance equation for ethnic groups in Yugoslavia (and doubtless elsewhere) contains four: births, deaths, net geographical migration, and net ethnic redefinition. Even if good data were available for births and deaths by ethnicity by fairly small regions, we would still need accurate data on geographical migration to net out the "migration" by ethnic redefinition. We do not have the necessary data to solve this puzzle.

We should also note that ethnic redefinition is not a new phenomenon, historically, either for individuals or for populations. For example, some tribes of old Montenegro, such as the Klimenti, are reputed to be of "Albanian" (Gheg) origin. Thus at some historical point, perhaps about the same time as the introduction of Orthodox Christianity or later during the hegemony of the Serbian Empire, they and some other Ghegs adopted Orthodox Christianity and the Klimenti were Slavicized. One may speculate that they had already been bilingual.[32] Other, small but distinct ethnic groups such as the Bunjevci, Šokci, Torlakians, Vlachs, and others, fragments of the migrations triggered by the Ottoman advance and the Habsburg counteradvance, or simply those of ancient transhumance, often struggle politically and culturally to maintain their identity.

Our point here is that ethnicity is not absolute. It is subject to more mutability than biological race and its DNA. Ethnicity can change by acculturation, by individual inclination, and transactionally and inconsistently by individuals. Just as individuals may present themselves in alternative ways (for example, classically, by linguistic code-switching), groups can negotiate their social boundaries, for example by religious conversion. It is not identity but a statement about membership. (See for example the classic presentation of this issue by Barth (1969) and recent work on bilingualism in Wei (2000).) However, with no apology for this recitation of issues from the softer social sciences like sociolinguistics or transactional analysis, we press ahead,

cautiously, to see what demography can contribute. In sum, we may say that the demographic picture obtainable from these censuses is like that from many other excellent censuses. It shows a population responding to rates of birth and death, people moving across landscapes, and people oozing in and out of social categories. We accept those ambiguities, for what interests us is how people viewed themselves and how they might think their neighbors viewed them.

Ambiguity does not end with this recitation. Although shifts in the count of persons by ethnicity can occur by self-definition, changes in self-definition can reflect either confidence or fear, acceptance of diversity, or the rise of defensive nationalism. Further, the census counts of persons by ethnicity may suffer from nonrandom error. (We address random error in a later section.) Such errors are commonplace in the censuses of other countries, where they have been detected by post-enumeration surveys. Different segments of the population are counted with differing degrees of accuracy; minorities and the poor are often undercounted, the rich may be counted more than once if the census is residence-based. We are not aware of accessible post-enumeration survey data that would allow us to take undercounts and overcounts into consideration for the censuses that we analyze here.[33] In fact, such errors make our interpretations conservative. Correction of undercounts of minority populations would *increase* our measure of diversity.[34] Note also that the enumerations of persons by ethnicity include the population of Yugoslav citizens living abroad. The ethnic distribution of Yugoslavs living abroad differs by region, by ethnicity, and by point in time. If the enumeration of such persons is subject to nonrandom error, the reported ethnic proportions will be biased in some unknown direction and degree. The issue is complicated not only by errors in the reporting of departures and returns, but also by the reporting of births and deaths in the population living abroad. We have no way to estimate these errors. If a population living abroad is undercounted and also the majority population in its home area, correction of the error will decrease our measure of diversity; if that undercounted population is not the majority population in its home area, correction of the error will increase our measure of diversity.

The censuses are all we have. We must interpret them with caution. In the end, we can only fall back on philosophical statements, for example, that "statistics is the blind man's cane", or quote 1 Corinthians 13 to remark that "for now we see through a glass, darkly".

Table 1 shows the ethnic classifications published for the censuses of Yugoslavia 1961-81 at the naselje level and in those of the reporting successor states in 1991.[35] We discuss how to accommodate the diversity of these classifications in a later section.

Table 1: Ethnic categorization at the naselje level 1961-1991 (in English alphabetical order)

	1961	1971	1981	1991SMV	1991BOS	1991CRO
1	Albanian	Albanian	Albanian	Albanian		
2	Croat	Croat	Croat	Croat	Croat	Croat
3	Hungarian	Hungarian	Hungarian	Hungarian		
4	Macedonian	Macedonian	Macedonian			
5	Montenegrin	Montenegrin	Montenegrin	Montenegrin		
6	Muslim	Muslim	Muslim	Muslim	Muslim	Muslim
7	(Other)	(Other)	(Other)	Other	Other	Other
8	Roma	Roma	Roma	Roma		
9				Romanian		
10	Serb	Serb	Serb	Serb	Serb	Serb
11				Slovak		
12	Slovene	Slovene	Slovene			
13	Yugoslav	Yugoslav	Yugoslav	Yugoslav	Yugoslav	Yugoslav

Note: SMV = Central Serbia, Montenegro, Voyvodina
"(Other)" is implicit, calculated by subtraction of all other categories from the total population. "Other" is explicitly given in the census. The order of the categories in this table is not the same as their order in the published data or in Mrdjen's summary (2002) but is uniformly alphabetical (in English); the ordering in the source tables, where alphabetic, is sometimes in the Cyrillic rather than the Latin alphabet. The historical ordering of ethnic categories in the published tables is both complex and political. In 1948-1961 the tables list "Narodnost" ("Nationality"). In 1971 they list "Narodnost ili Etnička Pripadnost" ("Nationality or Ethnic Membership"). In 1981 they list "Narod, Narodnost ili Etnička Pripadnost" ("Nation, Nationality or Ethnic Membership)" (Mrdjen 2002). In 1948 all groups were listed in order of numerical preponderance. Subsequently, groups of Yugoslav origin were in a first sublist, all others in a second sublist. The Yugoslav groups in 1953 and 1961 were ordered by numerical preponderance except that "unallocated Yugoslavs" were placed last in the sublist; all non-Yugoslav groups were unordered in the second sublist. In 1971 there were three sublists. The first was of narodi (the constitutive nations). The second was of narodnosti (the non-constitutive nationalities), and the third was of all other reported groups. In all censuses except 1953, Muslims (in the ethnic sense) are listed specifically; in 1953 they were part of the "(unallocated) Yugoslav" category. In 1948 Jews are not listed separately. In 1953 they are listed as *Židovi*. Subsequently they are listed as *Jevreji* ("Hebrews") in the "foreign" sublist, and in 1971 in the third or "most foreign" sublist, despite the fact that Romaniote Jews had been resident in the Yugoslav lands probably at least since the destruction of the Second Temple, and other Jews certainly since the expulsion of the Sephardim from Spain in the 15th Century. Like Mrdjen, we see a lot of political nuance in these details, in a struggle to accommodate diversity and unity at the same time.

It is also important to note that in the end the published data are tabulated in a fixed form reflecting the political importance of the major ethnic groups. This political sensitivity is clearly apparent in Table 1, where the available tables in 1991 at the naselje level for Croatia and Bosnia are limited to the locally most important groups, and the collective of Central Serbia, Voyvodina, and Montenegro dropped Macedonian and Slovenian and added Slovak and Romanian. There are few Macedonians or

Slovenians in the three-member collective but substantial numbers of Slovaks and Romanians in the Voyvodina. Montenegro conformed in this, as a member of the rump Yugoslavia at the time of census publication. Our task would have been simpler and the results more useful if the available machine-readable data were consistently structured in 1991, as they were in the previous three censuses. It is important to stress again that our analysis is based on the published tabulations at the naselje level (Yugoslavia 1998). More detailed specification of ethnic distributions is available in that source for 1991, but only at the opština level and above, and not for all regions. The tables at the opština level for Bosnia in 1991 show only five categories, Croatia 29, Montenegro nine, Macedonia six, Slovenia 29, and all three regions of Serbia 22. A separate analysis of diversity and segregation at the opština level and above would still be limited by the five-category structure reported for Bosnia.

5. Methods

Following the lead of Fischer et al. (2004) and predecessors (e.g., Theil 1967) we examine two measures, one of *diversity*, the other of *segregation*.[36]

5.1 Diversity

The diversity measure, applied to all levels of census aggregation from the naselje to the region, is one of informational entropy, first proposed by Shannon in 1949 (Shannon and Weaver 1949). In this application it expresses the uncertainty (H_S) about the ethnic identity of a person chosen at random. Imagine, for example, an individual, blindfolded, in a room full of other persons. Suppose that one of these other persons is brought before the blindfolded one, and the latter is asked to guess the ethnicity of the former. The blindfolded person only knows the number of ethnic groups in the room and their proportional representation. If the blindfolded person knows there is only one ethnic group in the room, her uncertainty about the identity of the person before her is zero. The larger is the number of ethnic groups in the room, the greater is her uncertainty about the identity of the person before her. Further, the more equal is the proportional representation of the ethnic groups, the greater is her uncertainty. Thus for example, if there are two ethnic groups, and their proportional representation is 99:1, her uncertainty is lower than if their proportional representation were 50:50. If there are three groups, and they are distributed 1/3:1/3:1/3, her uncertainty is higher yet, and so on. The following formula expresses these relationships:

$$H_S = -\sum_{i=1}^{n} p_i \ln(p_i) \quad (1)$$

where H_s is Shannon's entropy, p_i is the proportion of the population in category *i* and ln is the natural logarithm.[37] We use H_s to distinguish Shannon's entropy from the Theil measure described below.

Where *p=0*, the value of *p*ln(p)* is assumed to be zero. Thus an empty category contributes nothing to the sum. If one category contains all of the observations so that all other categories are empty, the value of H_s is 0, and there is no uncertainty about the identity of an observation. While H_s always has a lower bound of zero, its upper bound is a function of the number of non-empty categories. H_s is maximized for any number of categories when the distribution across them is equal. The circular points (o) in Figure 2 show how H_s increases with the number of categories under conditions of perfect equality between the categories. The dashed points (-) show a very simple scenario of variable inequality for a two-category system. In this, the first category has, successively, shares of 0.1, 0.2, 0.3, 0.4, 0.5, and the second category has the residual, thus 0.9, 0.8, 0.7, 0.6, 0.5. Entropy increases with equality of sharing and is thus maximal with perfect equality. The topmost dashed point has the same value as the circular point for a two-category system with equal shares. The plus marks (+) show the result of a distribution in which only one of the census ethnic categories has any members in a given community, regardless of the number of categories in the census; entropy, i.e. diversity, in such circumstances is zero, since ln(0) is by definition zero. Thus, although entropy has a lower bound of zero, it has no fixed upper bound, since it depends on the number of groups as well as on their proportional distribution.

5.2 Segregation

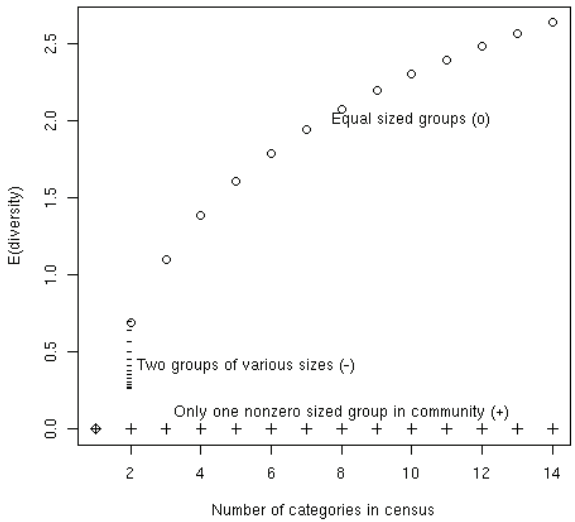
The segregation measure (H_T, Theil 1967) is applied to any superordinate level of census aggregation, that is, from the opština to the region. It expresses the degree to which units of the immediately subordinate level differ in their entropy (H_s) one from another, analogous to a measure of the variance between subsamples. The lower and upper bounds of H_T are [0,1]. (Our notation attempts to keep the relationship between formulae (1) and (2) transparent.) Note especially that H_T cannot be calculated for the lowest level of aggregation; thus here it cannot be calculated for naselja. That restriction is unfortunate, because some naselja in some censuses are relatively large and are almost surely ethnically diverse, divided into traditional subunits, such as the *mahala* (ward) or *komšiluk* (neighborhood), and with some degree of segregation.

Segregation is defined as follows:

$$H_T = \sum_{k=1}^{m} \frac{N_k}{N} \left(\frac{\hat{H}_S - H_{S_k}}{\hat{H}_S} \right) \tag{2}$$

where m is the number of subordinate units (for example naselja in an opština), N is the total population of the superordinate unit (for example the opština), N_k is the total population of subordinate unit k (for example each constituent naselje), $\hat{H}_s$ is the overall entropy of the superordinate unit, and H_{Sk} is the entropy of each subordinate unit. H_T is thus a weighted average of the relative differences of the diversity (entropy) of naselja from the diversity of their opština.

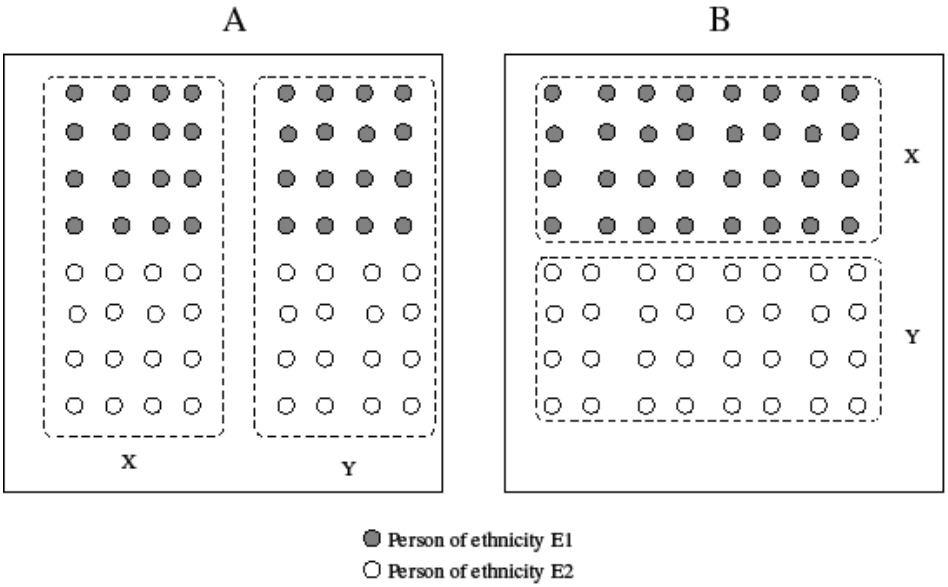
Figure 2: Entropy as a function of number of categories and equality of distribution



A simple hypothetical example will suffice to illustrate the difference between H_S and H_T. Suppose two opštine, A and B, each with two naselja, X and Y. AX, AY, BX, and BY are of equal size. The population of AX is half of ethnicity E1 and half of E2. That of AY is half E1 and half E2. The population of BX is entirely of E1, and that of BY is entirely of E2. Both opštine are half E1 and half E2, but in very different ways. A is minimally segregated, while B is maximally segregated. Figure 3 illustrates these differences. While the mean naselje level entropy of A is higher than that of B,

calculation of H_T is more revealing than simple comparison of means and is conveniently bounded on [0,1]. H_T is also additive across aggregation levels.[38]

Figure 3: Diversity vs. segregation



Note: Note that E1 and E2 are equally represented in AX and AY. The value of H_S in AX and AY is 0.69 in both, as calculated from the formula given for H_S. It can be simply represented in this case as -1*([0.5*ln(0.5)]+ [0.5*ln(0.5)]). (See also the value shown for two groups equally represented, in Figure 2.) This is the maximum attainable value for two ethnic groups. Since AX and AY have the same distribution of ethnic groups, the value of H_T is at its minimum, namely zero. On the other hand, each ethnic group is represented in only one village in the set consisting of BX and BY. Since there is only one group in each of BX and BY the value of H_S in each of them is zero (since ln(0) is here by definition zero), and in consequence the value of H_T is at its maximum, namely 1.

To give a quick sense of ethnic distributions in Yugoslavia, Table 2 shows that despite the great diversity of ethnicities, monoethnicity, i.e., *all* inhabitants of a naselje reported to have the same ethnicity, was sometimes the mode, usually the second most frequent pattern, and that having only two ethnic groups in a naselje was usually the mode. Only the Voyvodina diverges from this predominance at the lower numbers of ethnicities present.[39] Indeed, monoethnicity is the historical norm at the level of the village or of the mahala or komšiluk. This tendency to monoethnicity is in part an outcome of the traditional cycle of household formation. Household formation among most ethnic groups in the Balkans was typically patrilocal; on marriage, a bride and

groom resided in the household of the groom's father. Other brothers (if any) would coreside, so that on the death of their father a patrilineally extended household with more than one married son would become a fraternal joint one. As the sons (if any) of this joint household matured, they would marry (almost always endogamously in respect of ethnicity), bringing in their wives, and the adult sons of these brothers would be co-resident cousins. Eventually such a household might divide, but its constituent sections might continue to live in close proximity. Thus, with any degree of demographic growth, the village or mahala would become populated with patrilineally related kin, thus of the same ethnic group. Longer range migration might involve such complex family units, which would re-establish a monoethnic residential microregion. Households of different origin would on migration tend to seek out co-ethnics as neighbors even if only on grounds of common religion, a lower potential for interhousehold violence, and facilitation of the ethnic marriage market.[40] Table 2 presages what we will learn in more detailed analysis later: the decline in monoethnicity, sometimes ragged, the increase in just a few areas, and the increase in 1991 in a few of those in which it had previously declined, as the clouds of war began to gather. The decline in monoethnicity was driven especially by internal migration from diverse monoethnic locations to urban centers, and by the disappearance of small villages as the young migrated to cities and the older generation died. To some extent this trend was offset at the higher level geographical units, since migrants to the cities tended to stay within territories dominated by their own ethnicity – Serbs in Serbia tended to relocate within Serbia, and so on (Hoffman 1973, Sharp 1975, Thomas 1979).

Of course, several demographic processes may play a role in effecting changes in diversity and segregation. Migration was probably the most important force just after World War II, especially in the deliberate policy to encourage population transfers from some so-called "passive" rural areas (notably Hercegovnina) to others, notably to the Voyvodina after the expulsion of ethnic Germans. Deliberate restrictions on reverse migration limited diversity in Kosovo when Serbs who had left the region during the war were for some period not permitted to resettle. It was also important in the 1990s as refugee flows changed the ethnic landscape. Differential rates of natural increase also have an effect, but the data are difficult to incorporate in analysis. Ethno-specific rates of fertility and mortality are not available at the low levels of aggregation at which we wish to analyze the data, and they are not easily acquired in machine-readable form for censuses before 1991. Nevertheless, it is probably reasonable to assume that the rate of natural increase is higher in rural than in urban locations, higher for Albanians, Roma, and Muslims-in-the-ethnic-sense, and for other ethnic groups such as Turks that are predominantly observant Muslim. Changes in ethnic self-definition may have been important. These same processes play a role in more complex measures, such as segregation.

Table 2: Proportion of naselja with n ethnic groups, by region and census year

Region:	N Ethnic Groups											
Date	1	2	3	4	5	6	7	8	9	10	11	N Naselja
BOS:61	0.213	*0.236*	0.216	0.159	0.086	0.036	0.021	0.013	0.008	0.011	0.001	6078
BOS:71	0.208	*0.264*	0.218	0.146	0.083	0.039	0.016	0.010	0.004	0.009	0.003	5873
BOS:81	0.169	*0.223*	0.202	0.169	0.116	0.065	0.024	0.012	0.008	0.006	0.006	5851
BOS:91	*0.282*	0.229	0.165	0.152	0.171	*						5488
CRO:61	0.248	*0.281*	0.203	0.123	0.058	0.033	0.022	0.013	0.008	0.010	0.001	6756
CRO:71	0.219	*0.255*	0.188	0.145	0.075	0.046	0.025	0.017	0.012	0.012	0.005	6675
CRO:81	0.113	0.181	0.210	*0.216*	0.124	0.065	0.037	0.020	0.013	0.013	0.008	6623
CRO:91	0.1330	*0.289*	0.214	0.227	0.137	*						6293
KOS:61	0.168	*0.227*	0.236	0.177	0.097	0.054	0.015	0.007	0.007	0.005	0.007	1437
KOS:71	0.273	*0.278*	0.193	0.134	0.061	0.020	0.009	0.007	0.007	0.008	0.009	1435
KOS:81	*0.334*	0.233	0.168	0.110	0.064	0.034	0.021	0.009	0.008	0.008	0.009	1444
KOS:91	*											
MAC:61	0.279	*0.332*	0.186	0.104	0.039	0.027	0.012	0.009	0.002	0.009	0.000	1696
MAC:71	*0.340*	0.330	0.164	0.083	0.041	0.018	0.007	0.004	0.003	0.010	0.000	1643
MAC:81	*0.344*	0.263	0.177	0.090	0.050	0.029	0.021	0.007	0.005	0.013	0.000	1629
MAC:91	*											
MNT:61	*0.388*	0.275	0.142	0.092	0.044	0.016	0.016	0.008	0.010	0.007	0.002	1259
MNT:71	0.175	*0.261*	0.226	0.156	0.072	0.044	0.019	0.015	0.014	0.014	0.003	1259
MNT:81	0.206	*0.222*	0.205	0.147	0.095	0.054	0.023	0.015	0.015	0.011	0.006	1231
MNT:91	0.149	*0.236*	0.233	0.160	0.108	0.048	0.030	0.015	0.007	0.006	0.007	1172
SLV:61	*0.564*	0.271	0.104	0.032	0.013	0.005	0.004	0.003	0.003	0.000	0.000	6034
SLV:71	*0.548*	0.269	0.099	0.040	0.017	0.010	0.006	0.004	0.006	0.001	0.000	6004
SLV:81	*0.463*	0.259	0.121	0.069	0.038	0.020	0.010	0.008	0.009	0.003	0.000	5933
SLV:91	*											
SRB:61	*0.419*	0.280	0.120	0.070	0.035	0.021	0.014	0.010	0.012	0.010	0.009	4101
SRB:71	0.158	*0.302*	0.219	0.129	0.062	0.037	0.022	0.017	0.018	0.014	0.022	4101
SRB:81	0.119	0.219	*0.235*	0.149	0.103	0.061	0.034	0.025	0.014	0.017	0.024	4154
SRB:91	0.134	0.196	*0.229*	0.182	0.111	0.059	0.032	0.017	0.013	0.011	0.015	4122
VOY:61	0.000	0.022	0.033	0.086	0.109	0.140	0.135	0.140	*0.151*	0.118	0.067	451
VOY:71	0.002	0.018	0.018	0.035	0.060	0.089	0.135	0.122	0.160	0.153	*0.208*	451
VOY:81	0.004	0.009	0.017	0.030	0.045	0.130	0.098	0.105	0.145	0.158	*0.259*	468
VOY:91	0.002	0.006	0.004	0.030	0.065	0.112	0.110	0.125	0.134	0.209	*0.203*	464
N Naselja	*26481*	24908	18048	13170	7946	3425	1926	1280	1057	1050	834	100125

Note: BOS=Bosnia, CRO=Croatia, KOS=Kosovo, MAC=Macedonia, MNT=Montenegro, SLV=Slovenia, SRB=Central Serbia, VOY=Voyvodina

* Modal values are italicized. BOS and CRO reported a maximum of five groups in 1991. Macedonia and Slovenia did not report at the naselje level in 1991. Data for Kosovo were unusable in 1991.

6. Caveats

A caveat on this and later interpretations of the data, is our inability to assess the separate effects of fertility, mortality, migration, and ethnic self-definition on ethnic balances. We have no ethnospecific data on fertility and mortality at the lower levels of census aggregation, let alone such information that indicates urban versus rural settlement. Thus, although we know in general at the national level that Albanian fertility rates are higher than Serbian rates, we do not know how great these discrepancies are within urban and rural contexts, or within lower level census units. Nevertheless, historical observations suggest that although fertility decline in some ethnic groups may shift the ethnic balance in some regions (for example, perhaps among Serbs in Kosovo), a major driving force in these balances has been migration, especially at lower levels of aggregation where occupational diversity is less and social conditions more similar among inhabitants (Allcock, *op.cit.,* Ch. 6).[41]

Because of the minor changes in ethnic tabulation in Serbia and Montenegro in the 1991 census and the drastic changes in Bosnia and Croatia in that year, and since we wish to include what we can of data from 1991, we are obliged to modify the system of ethnic classification for analysis. There is no perfectly satisfactory way to do that. Table 1 shows that the standard 11-category system employed 1961-81 was altered in Serbia-Montenegro in 1991 to add Romanians and Slovaks but transferred to Yugoslav the Slovenes and Macedonians.[42] In Bosnia and Croatia in 1991 there were only five categories published at the naselje level, and these transferred to Yugoslav or Other some groups numerically preponderant in other regions but minor in Croatia and Bosnia, such as Albanians and Montenegrins. Thus it is impossible to compare diversity or segregation across all census years and regions based on particular ethnic groups, since they are not consistently listed. Our solution was to reduce all of the 11-category systems to five categories, taking the *four most numerous* named categories in each region separately, and putting all other persons in a *fifth* category, Other. Note that selection of the four most populous categories in each region means that the ethnicities so chosen are *not* the same across the regions.[43] The different nominal identity of the five categories has no effect on the *calculation* of the two indices (H_S, H_T), although it may affect their interpretation. Of the 100,125 observations of naselja across the four censuses, 26,481 or 26 percent were monoethnic. Of the remainder, 64,072 or 64 percent contained from 2 to 5 ethnic groups. Thus for 90 percent of the naselja, the reduction to a 5-category system has no effect.[44] Only the remaining 9,572 or 10 percent contained more than 5 groups.[45] Sixteen percent of these were in the Voyvodina and constitute 85 percent of the naselja in that region. The Voyvodina is an outlier. In all other regions an average of 9 percent of naselja report more than five groups in any census year.

7. Results

7.1 Diversity (H_S)

Figure 4 is a series of boxplots showing the levels of ethnic diversity (entropy) at the levels of naselje, opština, and region, for each region, by census year. [46] "Serbia" in this analysis means Central Serbia (sometimes called in the literature "Serbia Proper"), but here not including in any year the opštine of Bujanovac and Preševo because of the data deficiencies already noted.[47] Each segment of the series can have up to four boxes, one for each census. There is no fourth box for Slovenia, Macedonia, or Kosovo because of the absence of useful data.

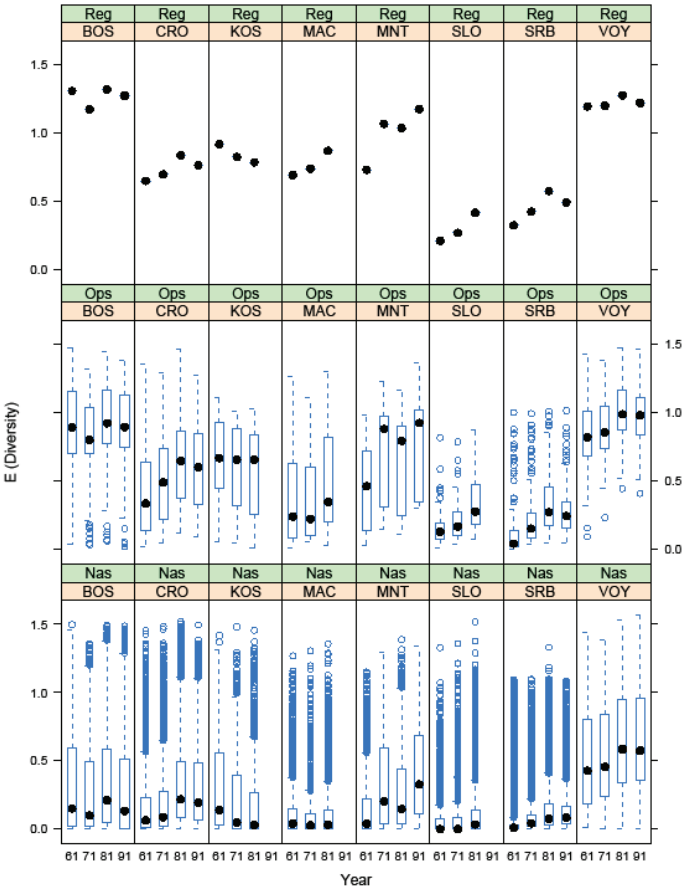
Note that each location at the regional level has only one observation, and the plot contains only the dot for the median. The variability and skewness of the distributions below the region vary inversely with administrative level, greatest for naselja and less for opštine. Although the diversity within regions changes over time, roughly speaking Voyvodina has the greatest diversity[48], followed closely by Bosnia, then Montenegro, then the roughly equivalent Croatia, Kosovo, and Macedonia, then Serbia, then the least diverse, Slovenia. It is worth noting that the major element of diversity in Voyvodina is the number of ethnic groups reported, while the major element of diversity in Bosnia is the near-equal balance between the major groups.

At the regional level, diversity in Bosnia fell between 1961 and 1971, rebounded in 1981, then declined slightly in 1991. The drop in 1971 may be related to the change in census protocol, with self-declaration becoming the norm. In Croatia, diversity rose steadily 1961-81, then fell slightly in 1991. In Kosovo, diversity fell steadily 1961-81. In Macedonia, it did just the reverse. In Montenegro, diversity increased substantially 1961-91, with a slight dip in 1981. In Slovenia, diversity increased steadily 1961-81. In Serbia, it increased 1961-81 with a slight decline in 1991. In Voyvodina, it was steady 1961-71, increased slightly in 1981, then fell slightly in 1991. Overall, there was discernible although irregular increase in six of the regions, no clear change in one, and a decline in one.

At the opština level, the patterns of the medians in most regions are almost identical to those at the regional level. However, in Kosovo, there is little change in the medians, and the the distributions are more skewed downward over time, with more obvious outliers where lessening of diversity was stronger.

At the naselje level, patterns again mimic those at the regional and opština levels, with some exceptions. There is discernible but sometimes irregular increase in five regions, no overall change in two, and decline in one. In Kosovo at the naselje level, diversity declined just as it did at the regional level. In Macedonia, there is little or no change at the naselje level, in contrast to the pattern of increase at higher levels.

Figure 4: Diversity by census level by census year



Note: REG = region, OPS = opština, NAS = naselje BOS = Bosnia, CRO = Croatia, KOS = Kosovo, MAC = Macedonia, MNT = Montenegro, SRB = Central Serbia, SLO = Slovenia, VOY = Voyvodina

The anomalous pattern at the opština level in Kosovo suggests that persons were moving out of naselja where they were in the minority to naselja where they were not, but still within the same opština.[49] From Table 2 it is evident that, uniquely among the regions of the former Yugoslavia, the percentage of monoethnic naselja in Kosovo rose steeply and continuously between 1961 and 1981. Diversity at the opština level would

not be changed by intra-opština migration. The downturns in 1991 in most of the remaining regions suggest that migration anticipating the wars may have already begun, and that inhabitants were leaving locations where they were in the minority. It is also possible that individuals were identifying themselves differently as tensions increased. Overall, in 17 of the 24 observational frames, the pattern is one of increase in diversity, even if slight. Change is negative in only two, and these are both in Kosovo. Five frames show effectively no overall change.

The terminal drop in Bosnia may only be part of a fluctuating pattern of diversity of varying cause. The underlying raw data show that the proportion reporting Muslim ethnicity was 0.26, 0.40, 0.40, 0.44 in the successive censuses. There appears to be no simple trade-off with the reporting of Yugoslav identity, which appears as 0.08, 0.01, 0.08, 0.05. Nevertheless, some shift in ethnic identification must have played a role (see Mrdjen 2002). The proportions reporting as Croat or Serb both show steady decline, while the proportions reporting as Other (which would include some persons declining to identify an ethnicity) show a steady but slight increase. We have no direct information on internal migration rates by ethnicity, but unknown changes in rates of natural increase in the different ethnic groups may play a role. Similarly, we have no direct information on the propensity to report alternative ethnicity.

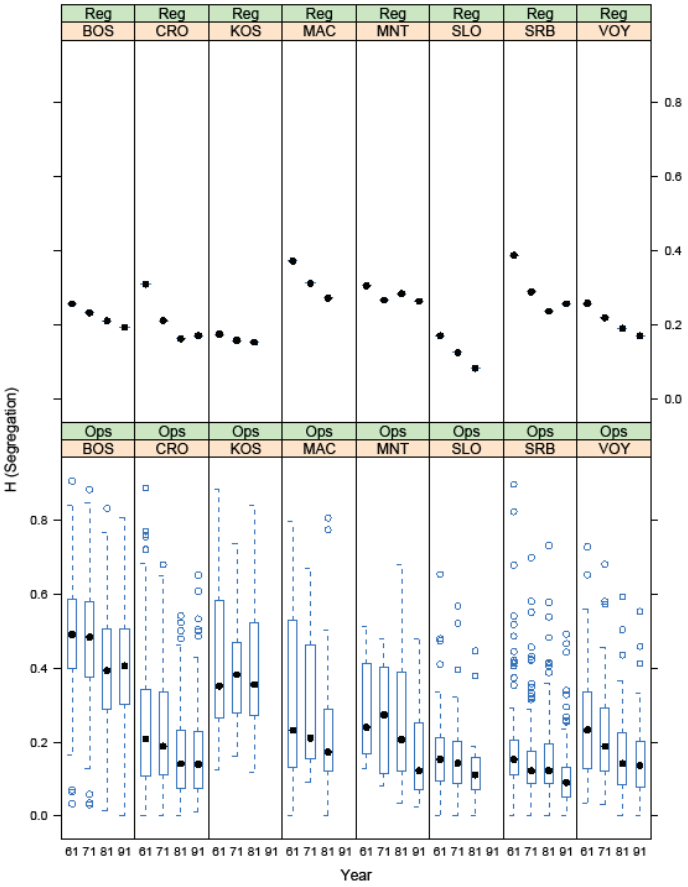
7.2 Segregation (H_T)

Figure 5 examines segregation patterns. Note that only two levels are examined – opština and region, since segregation cannot be calculated at the lowest (naselje) level. As before, there is only one observation per region and thus only the median dot is shown at that level.

Fischer et al. (2004)[50] suggest that changes in H_T as small as 0.02 are substantively important. Whether they are statistically significant we address in a later section. We focus on the period 1961-1981, with separate comments on any shifts 1981-1991, because of the lack of adequate data after 1981 for some regions (Kosovo, Slovenia, Macedonia). Figure 5 shows that segregation had a fairly consistent downward trend in 15 of the 16 observational frames (eight regions at the regional and opština levels), with the exception of Kosovo and Montenegro at the opština level. However Montenegro does show a stronger decrease 1971-1981 than does Kosovo. Of the 24 intercensal changes (3 intercensal periods in 8 regions), three, as noted, have no data in 1991. (See Table 3 where the observed median differences 1961-1981 are tabulated). Of the remaining 21 frames, all observed changes in the medians are negative, and they are negative by more than 0.02 except the small positive shift in 1981 at the opština level in Kosovo and Montenegro and the regional level in the latter. Both Croatia and Serbia

show small increases in segregation 1981-1991. These shifts in Croatia and Serbia may reflect changes (in residence or reporting habits) of members of the Serb minority in Croatia or of the Croatian minority in the Voyvodina county of Srem. Large numbers of Serbs were displaced from Croatia after 1991, but some anticipatory changes may have occurred and may have involved reciprocal property exchanges and relocations (see Čapo-Žmegač 2007 on such changes after 1991). Despite these sorts of irregularities, the overall trend toward decreased segregation is striking.

Figure 5: Segregation by census level by census year



8. Statistical significance

How significant are the patterns that we observe? Could they be the result of chance alone? The question is complex.

1. The data examined here are not a sample but the universe of data collected. We should not ask the question of significance in the usual framework of assessment of sampling error.

2. We can, however, rephrase the question as one about measurement error and try to approach it by bootstrapping (Efron and Tibshirani 1993). We decided to ask the simplest and most fundamental question: did the observed change in the median entropy (segregation) between 1961 and 1981 exceed a level that could reasonably be attributed to random variation? We did not include 1991 for two reasons: (1) the absence of useful data for three regions in 1991 and (2) the clear change in slope from 1981 to 1991 in some regions and the complexity that would be introduced by trying to test a nonmonotonic pattern. It is important to note that this test of change from 1961 to 1981 examines only those two time points and does not address any nonlinearity, such as can be seen in the more informative boxplots. Nevertheless, this limited test does address the issue of the reliability of our interpretations by focusing on a subset that reflects the general problem of the reliability of the census and the sensitivity of interpretations to random error. Our procedure is as follows:
   - The data set contains 100,125 observations of naselja in four census years. We draw 1,000 samples *with replacement* from this universe of observations. By drawing with replacement we create 1,000 "bootstrap samples" each of which has 100,125 observations. In each such bootstrap sample, some naselja in that region and that year will appear once, some will be repeated perhaps several times, others will be left out, because we sampled randomly and repeatedly with replacement. (Think of this sampling with replacement as fishing in a pond, catching a fish, throwing it back, and fishing some more. You are unlikely to catch every fish in the pond, but you are likely to catch the same one more than once.) We can use the standard deviation of the differences of the medians calculated from the bootstrap samples as an estimate of the true standard deviation.[51] For analysis of each census (region x year) we discard observations that are not in the region and the census year we are testing. In this way the structure of the bootstrap parallels that of the boxplots. Further, by making the tests region and time specific, we avoid the

introduction of irrelevant variance between regions and censuses at the different dates.

- We generate Z statistics for the difference between median naselje level entropy in each republic in 1961 and 1981 as well as differences in opština and regional level entropy and segregation over the same period. (Recall that segregation cannot be examined at the naselje level.)

3. Table 3 shows the results. We ask whether the observed difference is likely to have occurred by chance alone, and we judge that likelihood as described above. Because our interpretations are directional, we double the usual critical value of alpha (0.05) to 0.10, and we accordingly mark as "significant" (in italics) those p-values that are less than 0.10.

4. Naselje Diversity: The p-values for naselje diversity are all vanishingly close to zero. None of the observed differences between the median diversity of naselja in 1961 and 1981 in any region are likely to have occurred by chance alone. Note, however that Figure 4 is more informative. The overall pattern for Bosnia is one of fluctuation that is, on average, flat. Croatia, Serbia, and Voyvodina show a flattening or downturn in 1991. While the decline in Macedonia is unlikely to be the result of chance alone, it is quite small on average, and the overall pattern over time is flat.

5. Opština diversity: All but two results are unlikely to have occurred by chance alone. The two exceptions are Bosnia and Kosovo. In neither of these regions do the boxplots show any important change between the two census dates, hence the high p value, since what we see in the differences between medians is estimates of zero.

6. Opština segregation: In five of the regions the difference between the observed median difference and the bootstrapped median difference has a p-value close to zero. In Kosovo and Montenegro the pattern between 1961 and 1981 is irregular or flat, meaning effectively no change. The observed differences in medians are insufficiently different from zero to exclude chance alone as their cause, confirming our judgment. The situation for Macedonia is different. The boxplot shows segregation to have declined, but the bootstrapping shows that the observed median difference (which is negative) had a probability of 0.1006 of occurring by chance alone, thus implying that change in Macedonia may have been flat, if we strictly interpret the alpha level. On the other hand, if we were to bet money on our

interpretation of the graphical result, we would enjoy odds of 9:1; that is not a bet we would refuse.

7. Examining regional diversity we see that in all regions but Bosnia the p values are below 0.10. In Bosnia again, the pattern of fluctuation means that there was effectively no difference between 1961 and 1981, which is just what the bootstrap shows.

8. Examining now regional segregation, we see that all but two p values are less than alpha. The exceptions are Kosovo and Montenegro. Both of these slopes from 1961 to 1981 are very small. If the comparison in Montenegro had been 1961-1991 the difference, seen from the boxplots, would have been steeper. While we would have judged both cases to have shown decline, we must admit that at these modest declines, a small drop is not far from zero.

9. The upshot of this testing between 1961 and 1981 is that although we could not apply a general test across all four censuses in all eight regions, bootstrapping shows that where we could conduct a reasonable inferential test, our judgments were on the whole reliable. The doubtful cases are those in which a very slight decline cannot be easily distinguished from no decline, at the chosen alpha level. But in our view, art trumps probability theory. That our interpretations of the boxplots were clearly correct in almost all cases strengthens our view that in the marginal cases we were probably not far off target.

Table 3: Bootstrap results 1961 vs. 1981

Region	Observed Median Difference	Bootstrap Mean Difference	SD Bootstrap Mean Difference	Z	p
		Naselje Diversity			
BOS	0.0605	0.0601	0.0098	6.1586	*0.0000*
CRO	0.1543	0.1539	0.0040	38.5852	*0.0000*
KOS	-0.1101	-0.1105	0.0145	-7.5688	*0.0000*
MAC	-0.0080	-0.0079	0.0030	-2.6654	*0.0038*
MNT	0.1080	0.1083	0.0091	11.9290	*0.0000*
SLV	0.0344	0.0342	0.0023	15.1044	*0.0000*
SRB	0.0664	0.0661	0.0017	38.4875	*0.0000*
VOY	0.1588	0.1612	0.0499	3.1827	*0.0007*

Table 3: (Continued)

Region	Observed Median Difference	Bootstrap Mean Difference	SD Bootstrap Mean Difference	Z	p
Opština Diversity					
BOS	0.0291	0.0138	0.0290	1.0046	0.1575
CRO	0.3123	0.3091	0.0306	10.2135	*0.0000*
KOS	-0.0128	-0.0467	0.0691	-0.1850	0.4266
MAC	0.1075	0.1194	0.0449	2.3941	*0.0083*
MNT	0.3334	0.2928	0.0738	4.5179	*0.0000*
SLV	0.1469	0.1444	0.0172	8.5384	*0.0000*
SRB	0.2294	0.2133	0.0156	14.7072	*0.0000*
VOY	0.1677	0.1613	0.0379	4.4230	*0.0000*
Opština Segregation					
BOS	-0.0981	-0.0933	0.0227	-4.3287	*0.0000*
CRO	-0.0671	-0.0515	0.0123	-5.4656	*0.0000*
KOS	0.0039	0.0188	0.0557	0.0707	0.4718
MAC	-0.0590	-0.0384	0.0462	-1.2783	0.1006
MNT	-0.0331	-0.0584	0.0353	-0.9355	0.1748
SLV	-0.0420	-0.0384	0.0129	-3.2502	*0.0006*
SRB	-0.0302	-0.0219	0.0080	-3.7831	*0.0001*
VOY	-0.0911	-0.0567	0.0320	-2.8495	*0.0022*
Regional Diversity					
BOS	0.0108	0.0106	0.0216	0.4999	0.3086
CRO	0.1866	0.1881	0.0226	8.2515	*0.0000*
KOS	-0.1310	-0.1348	0.0496	2.6408	*0.0041*
MAC	0.1773	0.1764	0.0622	2.8483	*0.0022*
MNT	0.3054	0.3100	0.0726	4.2083	*0.0000*
SLV	0.2040	0.2027	0.0240	8.4897	*0.0000*
SRB	0.2516	0.2490	0.0429	5.8624	*0.0000*
VOY	0.0806	0.0793	0.0533	1.5123	*0.0652*
Regional Segregation					
BOS	-0.0458	-0.0462	0.0172	2.6592	*0.0039*
CRO	-0.1474	-0.1537	0.0184	8.0283	*0.0000*
KOS	-0.0218	-0.0167	0.0261	0.8353	0.2018
MAC	-0.1000	-0.0906	0.0418	2.3913	*0.0084*
MNT	-0.0212	-0.0193	0.0482	0.4387	0.3304
SLV	-0.0879	-0.0901	0.0251	3.4968	*0.0002*
SRB	-0.1513	-0.1551	0.0379	3.9873	*0.0000*
VOY	-0.0675	-0.0768	0.0284	2.3808	*0.0086*

Note: Observed Median Difference is the observed difference between the medians of this variable in 1961 and 1981 at this census level (see figures 4 and 5). Bootstrap Mean Difference is the mean of the differences of the medians in 1961 and 1981 in the 1000 bootstrap resamplings, and SD Bootstrap Mean Difference is the standard error of this mean. Z is the Z-score for the deviation of this mean from zero. p is the probability of that deviation by chance alone. Since our interpretation of the boxplots is specifically directional, by region, a p-value of < 0.10 might be interpreted as statistically significant (shown in italics).

9. Implications of opština boundary changes

As already noted, naselja that are almost surely the same places in different censuses are sometimes located in different opštine. The extent of these changes varies greatly across regions, and changes are most frequent in the first decade. Preliminary analysis shows that a common outcome of opština boundary shifts is to increase the measure of segregation. There are two plausible conjectures to explain the changes. The first is that they reflect ethnic gerrymandering, strongest in the earliest period but diminishing. The second is that they are an inevitable result of combining relatively monoethnic but ethnically different opštine side by side in a new opština, as improvements in communications allowed simplification of the administrative structure of government.[52] We defer exploration of this question, since it requires detailed geographical analysis.[53]

10. Some supplemental evidence

Botev (1994) offers a sophisticated analysis of ethnic endogamy and exogamy in Yugoslavia from about the beginning of our data up to a few years before its end. Marriage event data are not recorded in the censuses; only marital status is. Botev uses event data from annual statistical reports, at the regional level. He is skeptical about journalistic reports that focus on the disruption of interethnic marriages by interethnic conflict (as are we) and sees no consistent trend in the incidence of interethnic marriages. There is an apparent contradiction between his results and ours. Botev sees no consistent trend in the degree of exogamy by region. We do see trends in the ethnic diversity of regions. Indeed, our results on ethnic diversity at the regional level are in rough agreement with Botev's basic data on proportions of exogamic marriage in six of the eight regions. What we describe is the local residential population at various levels, approximately the structure of supply in the marriage market. Our results (on residence) are in rough concordance with Botev's raw data on marriage events; the simple conclusion from this concordance is that the structure of supply was changing but demand was relatively constant. In an interesting log-linear analysis, Botev identifies the structure of marital preferences. Given those preferences, marriage events are still conditioned by the supply of potential spouses, which we show to be moving toward greater local diversity. A caveat on this discussion, and on Botev's results, is that the marriage market in the former Yugoslavia was not strictly local and may have transcended regional boundaries. See also Mrdjen's discussion of interethnic marriages (Mrjden 1996).

Kuzmanović (1994) summarizes surveys of "social distance" between particular ethnic groups in Yugoslavia. The surveys asked respondents of ethnicity A whether

they would accept a person of ethnicities B…X in particular social relationships, ranging from coresidence in the same country to marriage with a close relative of the respondent. Surveys of this kind had been carried out in Yugoslavia between 1960 and 1990 (see Bogardus 1926 on the fundamental concepts of social distance). The surveys are not identical in the ethnic structure of their samples, the questions are not identical, and there are other formal differences between them, so that close comparison is not possible. One must also take the veracity of responses with a grain of salt; almost surely, given official government attitudes toward ethnic relations, respondents were likely to give politically safe answers. Nevertheless, the results are illuminating. According to Kuzmanović the earlier surveys manifest perceived distance between ethnic groups in Yugoslavia that is relatively low in comparison to that found in other, modern, multi-ethnic countries. Even in the time of economic and political crises in the 1980s, the level of ethnic intolerance (as expressed in the survey responses) was relatively low. By 1990, with the outbreak of violent rebellion in the Serb-dominated areas of Croatia, surveys show much higher perceived distance. Kuzmanović concludes that the political quarrels and economic rivalries between the republics led to an increase in expressed inter-ethnic antagonism that peaked especially after the outbreak of open hostilities between the Serbian-controlled JNA (Yugoslav National Army) and breakaway forces in Slovenia and Croatia. Prior to that, the data appear to show that interethnic antagonism was usually lower in the more diverse republics than in the more homogeneous ones. One might then expect that in the absence of armed conflict, the history of increasing diversity would have led to a diminution of interethnic social distance.

11. Summary, reflections, and conclusion

Using two commonly employed measures of ethnic diversity and segregation, we examined the censuses of Yugoslavia 1961-91. We did not attempt coverage before 1961 because the systems of administrative organization and the categorization of ethnicity varied too much from those employed 1961-91. Even inclusion of data from 1991 posed problems, requiring a simplification of ethnic classification.

Our interpretations of the data are subject to an important caveat about the meaning of data on ethnicity. These data can be regarded as information on the true ethnic origins of persons or as information on how persons wished to present themselves. The first alternative presupposes that persons know what their "true ethnic origins" are, a difficult task even for obsessive genealogists, given the history of intentional or fortuitous mixture of ethnic groups in the region. The second alternative presupposes that persons respond to questions about their ethnic identity in a way that

furthers their political interests, especially in a country in which census takers may be regarded as agents of the police. Under the first alternative, our data show that coresidential ethnic mixture was on the whole objectively increasing. Under the second, our data show that respondents felt increasingly at ease in representing themselves as members of other than the regionally dominant ethnic group. The political implications of the two alternatives are the same.

The extraordinary ethnic diversity of the territory of Yugoslavia was historically one of local mono-ethnicity, expanding to multi-ethnicity in ever larger geographical units. Imperial conquest, refugee flight, and more recently urbanization and the disappearance of small, usually monoethnic, rural settlements over time resulted in greater mixture of the population. Over the period 1961-91 diversity at all levels mostly increased, and segregation mostly decreased. Where exceptions appear, such as in Kosovo, there is a longer recent history of severe ethnic conflict, leading to separation, rather than integration, of rival ethnic groups. While we do not yet have detailed data at all local levels to support the assertion, it is apparent from general information that the refugee flows during, following, and to some extent before the wars of separation have reversed the trends toward integration seen in the census data 1961-91. Indeed, events in Kosovo even during that period suggest that political rivalry and separatist politics were instrumental in triggering ethnic separation.

There can be no question that ethnic hostility has a long history in the region, bred of conflicts between empires and their ethnic surrogates. There can be no question but that these conflicts have erupted with sufficient frequency over historical time so that every generation has been subject to atrocity or tales of it. Nevertheless, two factors seemed to dampen such resurgence. One was state policy, perhaps most draconian in Yugoslavia after 1945, in which even telling or collecting ethnic jokes was subject to penalty.[54] The other was the inexorable march of industrialization and urbanization that mixed together populations that had previously lived in isolation, sometimes achieving diversity by deliberate encouragement of internal migration, as in the replacement of expelled German-speaking (*Volksdeutsche*) populations of the Voyvodina by inhabitants from distant Yugoslav areas. General measures of social distance between ethnic groups appear also to have increased as hostilities intensified, but are inversely correlated with local diversity.[55]

Let us revisit the broader questions raised at the outset. How do we understand our puzzle: the eruption of violence in the 1990s that dismembered Yugoslavia along ethnic lines into its separate republics, that has split Kosovo from Serbia, and that may yet split Bosnia into three parts? Although our interest in this analysis is careful measurement of diversity and segregation, we cannot avoid this political question, even though it is not within our competence to answer it. The literature on ethnic relations, ethnic politics, and the organization of polities is vast, even if focused just on

Yugoslavia. We cannot attempt to review it but simply proceed to consider the obvious alternatives.

Perhaps the most discouraging interpretation of the flow of historical events is that increasing diversity itself led to interethnic antipathy. Although direct evidence from surveys of interethnic attitudes is not as strong as we might wish, that explanation seems unlikely. Antipathy as expressed in the surveys appears to decrease with increased diversity. Further, strong evidence of interethnic antipathy seems to have appeared only after the outbreak of open conflict.

An alternative explanation would be that ethnic dissension was held in check by an authoritarian government until the discipline of the League of Communists was undermined by economic and constitutional crises after Tito's death in 1980. This is the most plausible of the alternatives.[56] Economic rivalry between the republics, and resentment over large transfers from the wealthier regions (Slovenia, Croatia, and to some extent Serbia) to the poorer ones (Kosovo, Macedonia) grew during the 1980s. Since the 1970s the central government had pursued a path of decentralization and federalization, granting virtual autonomy even to the regions of Serbia that did not have the status of republics (Kosovo, Voyvodina). This course proved impossible to reverse and aroused secessionist tendencies simply on a regional basis but easily transformed into inter-ethnic resentment.[57] Playing the ethnic card may simply have been a convenient option for politicians seeking broad support.

Other actors, European and American, dithered until it was too late. It has been said that the alacrity of German recognition of Croatia and Slovenia after their secession, contrary to the position of the European Union, brought to mind the alignments of 1914 and 1941 (Crawford 1996). The United States and NATO were reluctant to protect the populations of Yugoslavia from nationalist frenzy until the military situation was hopeless. Why? By 1991 there were tectonic shifts in the power relationships of European states. Exhausted by the war in Afghanistan, plagued by economic difficulties, Party hegemony weakened by glasnost, the Soviet Union was collapsing. The Berlin Wall had come down in 1989. Yugoslavia was no longer important to the West as a client and entry point to the socialist and Third worlds, as an example of a socialist state independent of the USSR. Burdened by foreign debt, challenged by demands from the International Monetary Fund for repayment and recentralization of its banking system, suffering from hyperinflation and unemployment, unable to control its otherwise laudable efforts toward federalism, Yugoslavia would have needed firm support from the EU and NATO. Efforts to create a customs union or arrange entry into the European Union would have helped. That support was not forthcoming.[58]

Given the notion of constitutive ethnicities, Yugoslavia tore apart on lines established in its own charter. With the authority and solidarity of the League of

Communists diminished, with an ideology that denied class distinctions and thus an alternative scenario for alignment, and with a one-party system, ethnicity as a political mobilizer was the only convenient organizational alternative (Allcock op. cit., Lipset and Rokkan 1967).

There is nothing in the demographic record to suggest that ethnic separatism was inevitable, absent the emergence of economic and political rivalry at the highest levels of government. Although Yugoslav society had its share of ethnic intolerance, there is nothing in the population record to suggest that intolerance by itself would have led to mass separatism. Our contribution has only been to add to the evidence information on population distribution that has not been part of the debate. That information supports the arguments put forth by Allcock, Denitch, and Woodward, among others, that the collapse of Yugoslavia was from the top. As the Serbian proverb prophetically informs us, this fish did stink from the head.

12. Acknowledgements

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Notes

[1] Translation of the Serbian proverb, "*Riba smrdi od glave*". This proverb is widely known in other European languages and is often attributed to the philosopher Erasmus (c.1466-1538) as *Piscis primum a capite foetet*, although it may have an older Greek origin.

[2] Later censuses for some successor states exist but vary even more in coverage and format and are not all at the same date. A carefully controlled comparative examination of the data after 1991 is not feasible at this time. There is also a rich literature on the social, political, and humanitarian outcomes of the violent collapse of Yugoslavia, especially regarding Bosnia-Hercegovina, Kosovo, and the Serbian exodus from Croatia. These works are primarily from a political science or humanitarian perspective, and we do not discuss them here because they fall outside of our time range.

[3] Ethnic relations in the workplace are also important especially given the Yugoslav practice of workers' self management. However the census gives us no information on workplace ethnic distributions.

[4] The literature on this topic is enormous. Excellent overviews from sociology, political science, and anthropology are: Allcock (2000), Denitch (1994), Woodward (1995) and Halpern and Kideckel (2000). For an extensive view of similar issues in what have been called the wars of the communist succession, see Kaufman (2001). For problems in state formation in the Balkans, see Weiner (1971). For a general theory of geographical factors in ethnic violence, see Toft (2003). See also Goldstone (2002), Hammel (1993, 1997, 2000), Hayden (1996), Kertzer and Arel (2002), Slack and Doyon (2001), Urdal (2001), and Weiner and Teitelbaum (2001).

[5] This first "Yugoslavia" was initially named the Kingdom of Serbs, Croats and Slovenes. By virtue of its status as a large independent state rather than a part of any empire in 1914 (Croatia and Slovenia were part of Austria-Hungary, Macedonia part of the Ottoman Empire, Montenegro was small), and as an independent combatant against Austria-Hungary and the Ottomans, Serbia was given pride of place. Thus the seeds of dissension were sown.

[6] Presumably, these majority stakes were calculated at the level of the municipality in order to show differences within the superordinate level of the republic or autonomous region.

[7] For brevity we use the word, Bosnia, throughout to mean Bosnia-Hercegovina. Similarly, we use the word Kosovo throughout to mean Kosovo and Metohija.

[8] Indeed reliance on language as ethnic identifier was an important aspect of the decisions of the Paris Peace Conference, although ironically it stemmed from the German Romanticist trend initiated by Herder, Goethe, and the brothers Grimm.

[9] Some of these are spoken of course only by small populations. Some are related to one another at a more general level. Even at that higher level there is extraordinary diversity, with representation from Slavic (Serbian, Croatian, Bulgarian, Bosnian, Macedonian, Slovenian, Slovak), Romance (Italian, Venetian, Istriot, and various Romanian languages), Albanian, Indo-Aryan (several Romani languages), Caucasian (Circassian), Ugric (Hungarian), and Altaic (several Turkic languages). Most of those listed are Indo-European but sometimes distantly related, while others are not related to one another or to the Indo-European set. German is not included in this list. Before the end of World War II there were substantial populations of German speakers in the Voyvodina who had settled there when the region was under Austro-Hungarian control. Jews are not included; there were Sephardic populations of considerable depth in Bosnia and Serbia prior to World War II, speaking Ladino as well as the local Slavic language. Some Ashkenazim lived in Croatia and surrounds, speaking Yiddish as well as the local Slavic language. See www.ethnologue.com.

[10] For example, the *qeleshe*, a white felt skullcap worn by Albanian men, the *crnogorska kapa* worn by Montenegrin men, the *šajkača*, a military cap like the U.S. garrison cap or French *bonnet de police* worn by Serbian men, the *fez* worn by Muslim men. Muslim women in the countryside often wear *dimije* , "harem pants", but in urban contexts may simply wear a head covering. Ethnic differences of costume between non-Muslim women are more subtle and found mostly in the countryside .

[11] The complexity of interethnic relations and of the Yugoslav people to their imperial overlords can be illustrated anecdotally. In 1961, Ivo Andrić was awarded the Nobel Prize in Literature for a work entitled, in English, *A Bridge on the Drina*. The Drina River is the border between Bosnia and Serbia. In the book, the bridge is a metaphor for interethnic relations between Muslims, Christians, and Jews. Interestingly, Andrić does not use the usual Serbo-Croatian word for "bridge" (*most*) in his title, but the word *ćuprija*. Ćuprija is the Turkish word for bridge. The bridge is an historical one, at Višegrad, and still stands, having been blown up by the Austrians in World War I, by the Germans in World War II, and by paramilitaries in the war of the 1990s, but subsequently repaired each time. It was commissioned and financed by Mehmed Paša Sokolović in the 16th century. Mehmed Paša Sokolović was the Grand Vizier of the Ottoman Empire, who served three sultans, including Suleiman the Magnificent. One may wonder at his surname: he was also a Serb, who had been conscripted as a young boy into the Janissaries. It is this bridge, built by a Serb in Ottoman clothing, that Andrić celebrates as a metaphor of ethnic relations. As if this were not enough, we note that Andrić has often been identified as a Bosnian Serb. He was in fact born a Bosnian

Croat and was an observant Catholic. In his student days before World War I, he associated with radical Serbian organizations fighting against Habsburg rule, organizations that had among their members Gavrilo Princip, who assassinated Archduke Ferdinand in 1914. Andrić served some time in prison for his political activities. So much for simple views of ethnic nationalism.

[12] Yugoslavia exhibits a transition process from the "fixed ethnicity" notion typical of some European states to the more flexible and situational view now exemplified in the United States. See for example Simić (2007).

[13] It is not within the scope of this paper to chronicle the collapse of Yugoslavia, but we give some interesting details. The collapse may be said to have begun with the 14th Congress of the League of Communists of Yugslavia. At that Congress, the delegates of Croatia and Slovenia walked out on January 20, 1990, frustrated by the maneuvers of Slobodan Milošević, who had gained control of the votes of Serbia, Kosovo, Voyvodina, and Montenegro, thus 4 of 8. Separatist politicians in all regions began to advance their own agendas. Ultimately even Milošević adopted a Serbian nationalist position rather than the hegemonic Yugoslav one that he held originally. See especially Allcock (2000), Denitch (1994), and Woodward (1995).

[14] For example, while most Albanians are Muslim, some are Catholic and a few are Orthodox. Some Muslims are ethnic Turks. A few Serbs in Dubrovnik are Catholic.

[15] A large proportion of the Albanian population in Kosovo and the two municipalities of Bujanovac and Preševo in Central Serbia refused to participate in the census. We omit Kosovo in 1991 from the analysis, so that our results for that region describe only its characteristics 1961-1981. We omit Bujanovac and Preševo from the analysis 1961-1981 as well as in 1991, because to include them before 1991 would misrepresent comparisons for Central Serbia across the range 1961-1991. Similarly, we omit Slovenia and Macedonia from analysis in 1991 because the tabulations available are only at the opština level.

[16] From the verb *seliti*, "to settle", thus "settlement". Cf. *selo*, "village". We use the nominative case (singular or plural, as appropriate) of Serbo-Croatian nouns throughout. On pronunciation, render š as English sh in shoe, č as English ch in church, ć as the exaggerated palatalized ct in English picture, ž as the voiced form of š, approximately as *ge* in French *fromage*.

[17] That naselja were the smallest administrative units does not imply that they were always small demographic units. Many naselja are tiny villages. On the other hand, the naselje of Novi Sad, seat of the opština of Novi Sad in the Voyvodina, had almost 180,000 inhabitants in 1991.

[18] For example, by 1991 most or all of the locations named for Tito (e.g., Titograd, Titovo Užice, or heroes of the revolution, e.g., Ivangrad, had reverted to their earlier

denominations, e.g. Podgorica, Užice, Berane, respectively. It is not always easy, without local political knowledge, to know what the predecessor names were.

[19] The problems of consistent identification of a given geographical location over time could be easily solved if the censuses contained information on latitude and longitude or if they assigned a unique identifier to each naselje. No such list exists, at least not in public form, except a list with unique numerical identifiers for Serbia in 2001. There do exist gazetteers of geographical place names, including populated places, and giving latitude and longitude, but they are not easy to use (e.g., http://earth-info.nga.mil/gns/html/index.html). First, they are the result of the scanning of maps issued by different governments, in different languages, at different dates. Second, they do not indicate the opština to which a naselje belongs administratively. The first defect means that it would be very difficult to decide how to include information from maps in English, German, Hungarian, Italian and Albanian and whether the names listed in them were the equivalents of the Serbo-Croatian names in the censuses. The second defect means that it would be difficult to decide whether two identically spelled naselje names on the lists were the same place or two different places with the same name, because the opština names for the naselje are not given. Naselje names are apparently never duplicated within an opština but they are often duplicated across different opštine. Finally, the naselje names given on the maps may vary in spelling both among themselves or from those in the census, just as those names differ across censuses. GIS data (points and polygons) are now available for locations in the former Yugoslavia, but their use in our work demands prior careful articulation of the place name data with the census name data (which cover a longer time span than the geographical names data). That is an arduous task that we have not yet undertaken.

[20] We did attempt provisional assignment of unique identifiers for naselje names. These were catenations of the region name, the opština name, and the naselje name. We call this construction a *cname*. For example, the cname CRN:IVANGRAD:IVANGRAD depicts (reading right to left) the naselje of Ivangrad in the opština of IVANGRAD in CRNA GORA (Montenegro). We then compared the cnames within each region across censuses. Minor differences could be detected in many comparisons. For example, the abbreviation for "Saint" in a place name might differ. Where such minor differences were detected, we changed the cname in the earlier census to the form observed in the later census. Our confidence in these matches was high if the difference in names was minor and had an easy explanation, as in the example just noted, and especially so if the two naselje names were in the same opština in both censuses. These simple cases are the most common. Some instances were more difficult, for example if an opština seat itself was renamed, as was the case with CRN:IVANGRAD:IVANGRAD 1961-1981 and its transformation to CRN:BERANE:BERANE in 1991. There is no linguistic clue to the fact that these are

the same place on the ground. We did not use the renamed cnames as identifiers to create time series of places across the four censuses for our main analysis.

[21] See Mrdjen 2002 for a perceptive review of ethnic classification in the Yugoslav censuses.

[22] *narod*, "folk, a people, cf. German *Volk*", pl. *narodi*.

[23] *narodnost*, "ethnicity", pl. *narodnosti*. The difference between narod and narodnosti is approximately that in English between *nation* and *nationality*.

[24] Albanians have been the majority population in Kosovo in modern times and arguably for much of the later Ottoman period. Serbs displaced from Kosovo during World War II were initially forbidden to return after 1945 in order to placate the Albanian population. The lower Serbian birth rate and Serbian emigration out of Kosovo have intensified the Albanian majority. (See Hammel and Stevanović 2004 Petrović and Blagojević 1989,1992.) Serbs have a majority in the Voyvodina, but the Hungarian minority is large. The population of Bosnia was approximately 20 percent Croatian, 30 percent Serbian, and 40 percent Muslim in 1981. Thus, Muslims had only a plurality, and their designation as the constitutive ethnicity would have been difficult. As of this writing the official Bosnian position is that Croatian, Serbian, and Bosniak are now all constitutive ethnicities. However, Bosniak politicians appear to be resisting the reporting of ethnicity in any census (http://www.politika.rs/rubrike/Svet/Boshnjaci-politizuju-popis-stanovnishtva-u-BiH.sr.html, 27 August 2009.) (We are obliged to Prof. Andrei Simić for this reference.) It is also important to note that the revision of the Yugoslav constitution in 1974 paid special attention to issues of ethnic identity, partly by granting greater autonomy to Kosovo and the Voyvodina, where there were large non-Serbian populations. At the same time the particular ethnic consciousness of Bosnian Muslims was increasing, so that a particular Bosnian Muslim identity, "Bosniak", began to emerge out of the formerly residual category of "unallocated" Muslims. We are obliged to an anonymous reviewer for stressing this point. We speculate that any previous attempt to designate Muslim Slavs in Bosnia as a particular ethnic group might have met determined and potentially violent opposition from Bosnian Serbs and Bosnian Croats, who together amounted to between half and two-thirds of the Bosnian population. Indeed, that is just what happened after the League of Communists lost political control in 1990.

[25] King Alexander I of the first Yugoslavia attempted to deal with the problems of regional ethnic predominance by re-establishing new administrative regions (*banovine*) that crosscut the traditional regions. He was assassinated for his pains in 1934 by a coalition of Macedonian and Croatian separatists (IMRO and Ustaše).

[26] The constitution and the census instructions are very explicit in their emphasis that Muslim is to be understood "in the ethnic sense" and not in the religious sense.

[27] The phrase, j*ugoslovensko poreklo* (Yugoslav origin) is not to be understood only in the territorial but also in the ethnic sense. It refers to southern Slavs of Yugoslavia, but not to persons of other ethnicity from that same territory, e.g., Albanians.

[28] It is interesting to observe that major urban cemeteries are often divided into separate sections by religion. There is a section for Catholics, one for Orthodox, one for Muslims, one for Jews. There is also a section for Communists, presumably so that they would not be obliged to declare a religious affiliation in order to be buried, or because their political affiliation was regarded as an alternative orthodoxy.

[29] We are obliged to an anonymous reviewer for suggesting that "Yugoslav" might provide a convenient alternative to specification of a single identity.

[30] We may reflect on what it would mean for a resident of the U.S. to respond to the race or ethnicity questions of the census with "American". See the careful treatment of the political meanings of ethnicity by Allcock (2000), especially Ch. 10, 11, 12, 14 *et passim*. Note also the specific manipulation of ethnic declaration, as for example in the claim that some Muslim Albanians reported that they were ethnic Turks, in order to enhance the possibility of their emigration/ "repatriation" to Turkey.

[31] In 1961 the Yugoslav category ranked in the top 5 ethnic categories (including Other) only in Bosnia, not in any of the other seven regions. Since the purported Yugoslav-Muslim tradeoff was probably important only or at least primarily in Bosnia, it is unlikely that the lack of this tradeoff played a role anywhere else in 1961.

In 1971 the Yugoslav category ranked in the top 5 in all but 3 regions (Kosovo, Macedonia, Slovenia), thus in 5 regions. Since the Yugoslav-Muslim tradeoff was primarily a Bosnian phenomenon, the emergence of the Yugoslav category in the remaining 4 regions (excluding Bosnia, Kosovo, Macedonia, and Slovenia) can only be explained by some other mechanism.

In 1981 the Yugoslav category ranked in the top 5 in all but Kosovo and Macedonia, thus in 6 regions. The same arguments apply in 1981 as in 1971, with Slovenia included.

In 1991 the Yugoslav category ranked in the top 5 of all 5 reporting regions. Probably if Slovenia, Kosovo, and Macedonia had reported the required data, the Yugoslav category would have ranked in the top 5 categories of 6 regions (adding Slovenia since Slovenia had that result in 1981). We may assume that Kosovo and Macedonia (both with large Albanian populations, and both with a history of separatist tendencies) would not have included the Yugoslav category in the top 5 even if they had reported data at the proper level in 1991.

What we see is an intensification of the popularity of the Yugoslav category in the time span in which ethnic definition was primarily by self-identification (1971-91). We cannot really evaluate the mechanisms by which these changes took place with the data

we have. Ideally we would like to have an adequate sample of the raw data at the individual level and be able to link those records across censuses, but such an undertaking is beyond our resources and perhaps those of the census facilities in the former Yugoslavia.

[32] See for example http://www.rastko.rs/rastko-al/zbornik1990/mbarjaktarevic-predanja_l.php and references therein.

[33] We are obliged to one of our reviewers for stressing this point.

[34] In theory, time trends in the rate of undercount could give the appearance of time trends in underlying ethnic distributions, net of any real changes in those distributions. An explanation of this phenomenon would require complex arguments about the changes in the undercount rate that might create the trends in ethnic distribution that we describe here. Our explanation is more parsimonious.

[35] Readers should note again our dependence on the electronic data employed in this analysis. These tables give us the detail we need for analysis at the settlement level, but they do not give us full detail on the ethnic identities subsequently published at higher levels. We have not had access to the full range of ethnicity data at the settlement level, and such tables may not exist, either in printed or electronic form.

[36] There is a plethora of measures to describe diversity and segregation. See http://www.census.gov/hhes/www/housing/housing_patterns/app_b.html. We select those used in this analysis because we find the diversity measure intuitively appealing, and because the segregation measure is based on it.

[37] In information theory the logarithm to base 2 is used; here we use the natural logarithm, which is more commonly employed in studies of diversity and segregation.

[38] As attractive as these measures are, they cannot tell us anything about populations that are not explicitly listed in the censuses. A striking example of this is in Bosnia, where the three dominant ethnicities are irregularly distributed across the landscape. Their distribution is "lumpy". However, the broad areas in which each is dominant are not formal categories in the census. They lie between the level of the opština and the republic. Thus the measure, H_T, cannot capture the segregation they demonstrate without remapping and creation of clusters of opštine that could be inserted into our analysis between the level of the formally recognized bounds of the republic and its opštine.

[39] Settlement patterns have a hidden and important effect on diversity and segregation. The Voyvodina offers an important lesson in interpretation. Even rural naselja in Voyvodina are often quite large, being rural towns rather than villages. One of the major cities in Voyvodina, Novi Sad, appears as a single naselje in one of the censuses. Voyvodina is historically diverse, partly because immigration of non-Slavs was encouraged under Austria-Hungary and partly because it was a refuge area for Slavic populations fleeing the Ottomans. Yet ethnic neighborhoods exist within these

naselja even if they are invisible in the census, because the naselje is the lowest level of census aggregation. Although exploration of the subject is beyond the scope of this paper, entropy and segregation both tend to increase with size of settlement. Changes in the size of very small settlements are mostly a function of natural increase or decrease and of in- and outmigration. Small settlements experience more outmigration than inmigration, and this outmigration consists mostly of persons in or below the childbearing ages. Small settlements tend to be monoethnic, but large settlements draw on an array of settlements of varying monoethnicities.

[40] Although not essential to our arguments in this paper, it is important to note that prohibitions on marriage with kin varied by religion and folk custom. Among Orthodox Serbs, intermarriage within the patriline, even at its most distant reach, was in theory prohibited. The restriction was less strong, perhaps, among Catholics. Among Muslims there was a preference for marriage between persons whose fathers were brothers, a traditional preference in the Near East, and not only among Muslims. Thus one would find that a rapidly expanding patriline in some ethnic groups, especially those of Orthodox faith, could within a few generations saturate its territory and exhaust the local marriage market, creating pressures for emigration and thus seeding an adjacent target area with the same ethnicity. See Hammel (1968) and citations therein.

[41] Some comparative information on fertility by ethnicity in 1991 is available in machine-readable form on the 1991 census CD (Yugoslavia 1998). It is a table of children ever born, by age of women over 15, by region, by ethnicity, by religion. The filename on the CD is POPIS/KNJ13.HTM. It opens as a text file. The most difficult part about using it is that you must format the column headers to make it intelligible. Since the column headers are uniform across the pages of the table, it is only necessary to format the first one and then delete all the others, then save the result to a different file in a different directory.

[42] We presume the transfer was to the "unallocated Yugoslav" category, based on the definitions of these categories in the census protocols. Similar tables are available in print for earlier censuses.

[43] It is interesting to note that the "Yugoslav" category appears in the first four in six of the eight regions -- all but Macedonia, where it is sixth, and Kosovo, where it is seventh. Both Macedonia and Kosovo have large Albanian populations.

[44] By "no effect" we mean that a location truly containing *only five* ethnic groups would yield the same measures of diversity and segregation whether the computations were done based on an 11 category system or on a 5 category system, since the five most populous groups would be the same, and the remaining six under an 11-category system would contribute zero to the calculations.

[45] The estimate for more than 5 groups is a lower bound, because in Bosnia and Croatia in 1991 only 5 groups were reported. Where a location contained more than five

groups, the effect of truncation to five lowers the diversity measure, but the inclusion of the omitted population in the category Other, increases it and to some extent offsets the reduction in number of categories.

[46] Each box of the boxplot contains observations in the central half of the distribution, i.e. the interquartile range, from the 25th to the 75th percentile. The dot within the box is the median. The dashed lines extend to 1.5 and 3 times the interquartile range. The circles denote extreme outliers. (See for example http://en.wikipedia.org/wiki/Box_plot).

[47] Since the data for Bujanovac and Preševo in 1991 were unreliable, their inclusion 1961-81 would have created a biased comparison across time for Central Serbia as a whole. Since Kosovo was an integral and separable census unit, it could simply be dropped in 1991 without affecting its comparison across 1961-81. Note that the published data for these locations or including them at higher levels in 1991 are estimates, not counts and are clearly marked as such in the source data.

[48] Voyvodina has been historically diverse because under the Habsburgs it was deliberately settled with peasants from other Habsburg lands, notably Hungarians, Slovaks and Germans. The Germans were expelled after 1945, and replaced by internal migrants from impoverished regions such as Hercegovina. The Serbian presence in Voyvodina is largely a consequence of refugee flows from the Ottoman advance.

[49] See Hammel and Stevanović 2004 for an analysis of ethnic migration at the opština level in Kosovo.

[50] See http://ucdata.berkeley.edu:7101/project_record.php?recid=28.

[51] For readers unfamiliar with the bootstrap or similar techniques, imagine that our data represent the true Yugoslavia but that census takers vary in their competence and diligence. We conduct 1,000 censuses of Yugoslavia at the two census dates. Some census takers in each census fail to visit an assigned naselje. Some lose their notes. Some visit the same place more than once, without realizing it. Some cannot spell. The results of these 1,000 imaginary censuses will differ randomly, and we use these differences to estimate the random variability in the underlying, actually reported census of Yugoslavia on the two census dates in this exercise.

[52] See Klemenčić (1996) for a history of boundary changes and comments that would refute an hypothesis of gerrymandering.

[53] An adequate combination of census and geographical data, necessary to determine the geographical boundaries of opštine, requires a list of populated places, each place with latitude and longitude. As of this writing, such lists have become available and include both central points and border polygons for the named locations. Difficulties in using such data still remain. First, the geographical (GIS) data are not firmly attached to calendrical dates, so that while central points may be reliable, border polygons may not be. Second, we do not know how dependent such data are on the

origin and date of the maps from which data were scanned. Third, we would need to reconcile disparities between maps of different date and different origins. Fourth, we would need to standardize the spelling of place names. Fifth, we would have to match the names of populated places in the geographical databases to the names of naselja in the census data. This is not a simple enterprise, since the geographical databases give no indication of the borders of administrative units above the level of the populated place and below the level of the former republic (now country). Where naselje names are duplicated across distinct populated places, we would have to pick the nearest populated place named as an opština to decide to which opštine the several naselja belonged. We have not yet embarked on this arduous analysis. Nevertheless we claim that its outcome, that might allow us to speculate more closely on political intent, is secondary to our findings in this paper.

[54] In all fairness we acknowledge that telling ethnic jokes or making disparaging remarks about ethnic groups in some other countries (such as the United States) can lead to accusations of political incorrectness, apologies, and even resignations.

[55] See Allcock's discussion of surveys of social distance (2000:198).

[56] See Allcock's careful dissection of these complex questions (2000:417-431).

[57] See for example Slack and Doyon (2001) on interethnic tension in Bosnia, centering on shifting demographic balances, political power, the allocation of jobs, and interethnic violence. Their focus was at the opština level, which at least in Bosnia, provided a microcosm of the national dilemma. For a detailed description of the economic crisis of the 1980s and its political consequences see Allcock (2000:89 ff.), and Woodward (1995:47 ff.).

[58] After almost two decades, over 300,000 deaths, and as many as five million displaced persons (Leonard 2005:33), the former republics appear to be establishing a regional trade network on their own (The Economist, August 22-28, 2009, pp. 45-46).

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