

Exogamy and Marital Propinquity in Nineteenth-Century Northeastern Italy

Alessio Fornasin and Anna Marzona

Historical-demographic research into territorial exogamy often tends to focus on single religious or administrative units, such as a parish or a municipality, rather than on more complex geographical entities consisting of a small number of territories. Indeed, the costs of collecting and organizing a sufficient amount of data to carry out multiple territory investigations, particularly those of an historical nature, can be prohibitive. For this reason, studies that make use of analysis criteria centred on geographical information systems (GIS) and/or quantitative geography are quite rare.

In this paper we analyze territorial exogamy and marital propinquity by observing a relatively large number of administrative units—a task made possible thanks to the availability of a vast quantity of data—using a GIS. Our aim is to observe marital mobility in the Friuli region of northeastern Italy in the first phase of demographic transition. We will focus specifically on the 127 municipalities of the administrative province of Friuli during the period 1872 to 1900.

The paper begins by providing a brief review of the literature on the theme, which is followed by a description of the specific characteristics of the Friuli region. Next are a short description of the data sources and an explanation of the criteria adopted for the construction of the source database. We then discuss the main problems encountered in the analysis of the data and the solutions adopted. Finally we focus on marriage in Friuli at the municipal level, through an investigation of the general characteristics of territorial exogamy and marital propinquity.

Demographic variables and distance: a happy exogamous marriage

The most common association between demography and geography occurs in studies on emigration. In fact, it was precisely in the context of emigration that the concept of distance was first employed to explain demographic phenomena. Edward G. Ravenstein, in the late nineteenth century, stated in a critically acclaimed paper that a place attracts migrant workers from other places in proportion to population and distance values.¹

Studies on emigration and marital exogamy are closely related. However, it was almost fifty years before James Bossard produced his sem-

Alessio Fornasin and Anna Marzona are at the University of Udine. *Historical Geography* Volume 37 (2009): 138-158. ©2009, Historical Geography Specialty Group, Association of American Geographers.

inal paper on the subject. Published in 1932, Bossard's work had a major influence on subsequent research into the relationship between geographic distance and marital choice.² Bossard analyzed 5,000 marriage certificates registered in the city of Philadelphia and calculated the residential propinquity of each pair of spouses. The results showed clearly that as distance increased, the number of marriages decreased. Bossard's conclusion was that "residential propinquity, *per se*, is an important part of the story of marriage selection."³ Numerous studies carried out subsequently confirmed this finding.⁴

Following the pioneering work of these researchers, other scholars approached the subject of marital propinquity from a variety of different perspectives. Samuel A. Stouffer, for instance, observed: "migration between two areas is directly proportional to the number of opportunities available in the area of destination and inversely proportional to the number of intervening opportunities and competing migrants between the origin and destination."⁵ Stouffer believed that the principle of "Intervening opportunities" could be applied to other social phenomena, in particular the choice of spouse,⁶ even if not to all types of mobility.

A few years later, George Kingsley Zipf published the most influential of all studies on the subject. In contrast to Stouffer, Zipf defined the "law" regulating social relationships on the basis of geographical distance.⁷ The basic premise of his theory is that the populations of, and distance between, two cities are directly related to existing communication indicators,⁸ such as the number of people using public transportation (bus, train or air) to travel from one city to the other, or the number of telephone calls between their inhabitants. Zipf's contribution was shortly followed by a study by John Q. Stewart. Using the same population-distance relationship devised by Zipf, Stewart applied the principles of Newtonian gravitation to the study of demographic behavior, albeit not marriage *per se*.⁹

Subsequent studies, generally within the field of sociology, adopted either Stouffer's or Zipf's perspective. Some scholars applied the theory of intervening opportunities within the framework formulated by Bossard;¹⁰ others observed that exogamy rates seem to decline and conform more closely to a distance function than a criterion *à la* Stouffer.¹¹

As concerns demographic analysis proper, where distance acquires an explanatory value, studies on exogamy have mainly focused on a single or, at most, on a small number of territorial units with distance usually treated as a secondary, albeit inevitable feature. There have been many studies of this kind to mention here. Limiting ourselves to research carried out in Friuli, we find that investigations focus mainly on the mountainous areas of the region, whose high levels of endogamy are always highlighted.¹² Other research revealed the existence of particular marital "strategies" which tend to favor the choice of spouse, if not from within the same village, at least from the same valley.¹³ Rarer studies on the Friulian plains also emphasize the high levels of endogamy of Friulian communities.¹⁴

Demographic studies of a larger number of communities which implicitly or explicitly evaluate distance parameters are uncommon.

Whereas most adopt the "gravitational model" as a starting point, they end in different perspectives. Kasakoff and Adams, for instance, focused on the island of Tikopia showing how geography strongly influences the marital preferences of the population.¹⁵ Relethford and Mielke, on the other hand, chronologically traced the exogamy levels of the communities of the Åland islands over the course of a number of centuries highlighting the crucial role of transportation technology to explain their growth.¹⁶ In another study, which abandoned the usual city-country dichotomy, Lemercier and Rosental analyzed nineteenth-century marriage records from the Lilla region of France to trace prenuptial migration patterns.¹⁷

From a strictly geographical point of view, the creation of more sophisticated territorial statistical methodologies, coupled with the development of specific software packages to analyze georeferenced data, has led to new approaches in demographic research and brought opportunities for far broader studies than were previously possible using the theoretical assumptions formulated during the forties. While with older methods spatial association was limited to a small number of geographic areas, recent approaches study spatial autocorrelation even within highly fragmented territories and are able to identify areas with homogeneous characteristics.¹⁸ The application of these new methods to demographic inquiry is still in its early stages. Recent examples include two studies on nuptial habits in the Netherlands.¹⁹ Thanks to the availability of an enormous quantity of digital information, Dutch researchers were not only able to study territorial exogamy with reference to a considerable number of geographical, economic and cultural variables, but also the complex interactions between them. Our work follows the path taken by these researchers, although we have had to limit the scope of our enquiry for the time being in order to adapt to the information available in our data sources.

In summary, research studies thus far highlight a number of different relations between exogamy and territory, not all of which reach the same conclusions. These can be briefly summarized thus: exogamy rates decrease as distance increases;²⁰ the more isolated a community is, the less frequent exogamic marriages are;²¹ conversely, the greater the number and density of the population, the more frequent endogamous marriages are – therefore the higher the number of inhabitants in a community, the lower the percentage of exogamic marriages.²²

The list is by no means complete and, as we explained earlier, the assumptions should not be considered conclusive. Indeed, some of these conclusions often lose their validity in urban contexts where rapid and extensive social change may occur.²³ In this paper we assess whether any of the relationships cited above can be applied to northeastern Italy.

The area under investigation

The area investigated in this work covers a vast portion of Friuli, a region situated in northeastern Italy. The study comprises virtually all the municipalities within the present province of Udine, historically the

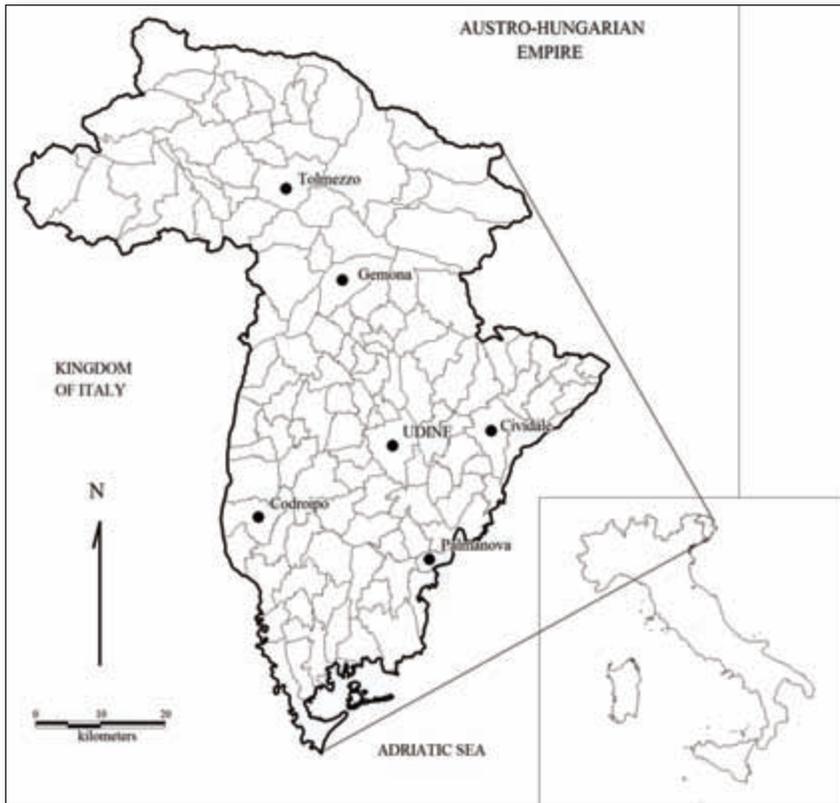


Figure 1. The Province of Friuli (1881).

only urban center in the whole area. The territory was not selected according to geographic or administrative criteria, but rather on the basis of archival data. The data are based on marriage records held by the State Archives Office in Udine. It refers to the municipalities within the present day province of Udine that were part of the Kingdom of Italy until 1918 (Figure 1).

From a geographical point of view, however, the examined area does have a certain unity. Its borders run along so called “natural” lines, which, in the western part of the region, toward the Kingdom of Italy, correspond with the mountain ridges that act as a watershed between the basin of the Tagliamento river and its main tributaries to the right. On the side of the plains, the boundary line is marked by the river itself; in the northern and eastern parts of the region, the lines correspond with the political borders between the Kingdom of Italy and the Habsburg Empire and run, with a few limited exceptions, along mountain ridges or important water flows.

Friuli is characterized by a vast range of environments and encompasses the wet plains of the south, the dry plains of the central area, followed by the hills and finally the mountains of the north. During the

nineteenth century, agriculture was the principal economic activity in the plains. It diminished in importance as altitude increased. The secondary sector of the economy, which was represented almost exclusively by hand-craft production, was particularly strong in the main towns, most notably Udine.

The agricultural regions of Friuli were characterized not only by agricultural employment, but also by what was produced. The plains were characterized by mixed agricultural production which was partially oriented to the market and based partly on cereal farming and partly on viticulture. In the mountain areas, where grain production was minimal and only sufficient to cover demand for two to three months of the year, cattle breeding was prevalent.²⁴ A second distinctive feature of the Friulian economy was provided by significant seasonal migration, predominantly among the male population, toward Central and Eastern Europe. Generally speaking, the jobs undertaken by these emigrants were the same throughout the territory and consisted principally of building and construction work. In the mountain areas of the north, the number of emigrants was usually greater than in the south. This was partly due to the fact that migratory traditions varied according to territorial context. In the mountains, seasonal emigration was a reality consolidated over the centuries, albeit one that continued to be based on handicrafts or commerce until the first half of the nineteenth century;²⁵ in the plains, however, emigration, while not unknown, only became a significantly important social and economic phenomenon during the nineteenth century.²⁶ Emigration was not a phenomenon that affected the whole of Friuli and was particularly rare in the eastern mountain area, probably the poorest part of the whole province.

The census population of the territory was 334,928 inhabitants in 1871; 352,419 in 1881; and 408,765 in 1901.²⁷ The growth rates per 1,000 persons between these years intervals were 5.1 and 7.8 respectively, and population growth was uniformly distributed across the territory. Therefore we can conclude that during the 29 years covered by this work there were no significant changes or facts that could have influenced the results of the analysis. In 1881, population density was 84.2 inhabitants per square kilometer, although territorial differences were remarkable (Figure 2).

After Udine, the most densely populated zone was the area of hills to the north of the main town. Slightly less populated was the area of the high plains to the south of Udine. Population density throughout the rest of the territory remained consistently under 100 inhabitants per square kilometer. The northern mountain area, with the exception of a group of municipalities along the higher Tagliamento river valley, was the least populated, with fewer than 50 inhabitants per square kilometer. In the period that spans the two censuses, birth, death and marriage rates per 1,000 persons were estimated at 35 and 34, 27 and 22, and 8 and 7 respectively.²⁸ The falling mortality rate is particularly evident in the last few decades of the nineteenth century, the period that forms the focus of our analysis and marks the beginning of the demographic transition of Friuli.²⁹

Sources, data, database, and methods

This research is mainly based on 80,000 marriage certificates issued by the Italian Registry Office during the period 1872-1900 and now held in the Udine State Archives Office. A more detailed description of the database in which these are stored is given in a separate paper.³⁰ Here we describe only those characteristics most closely related to the current inquiry.

Marriage certificates provide useful data on spouses, irrespective of where the marriage took place.³¹ In addition to recording the name and surname of the spouse, their age, often their profession and their previous marital status, they also contain information on the spouses' parents, usually limited to the name of the father and name and surname of the mother. Marriage certificates are also rich in territorial information. A single record can specify up to nine different geographical indications: the municipality

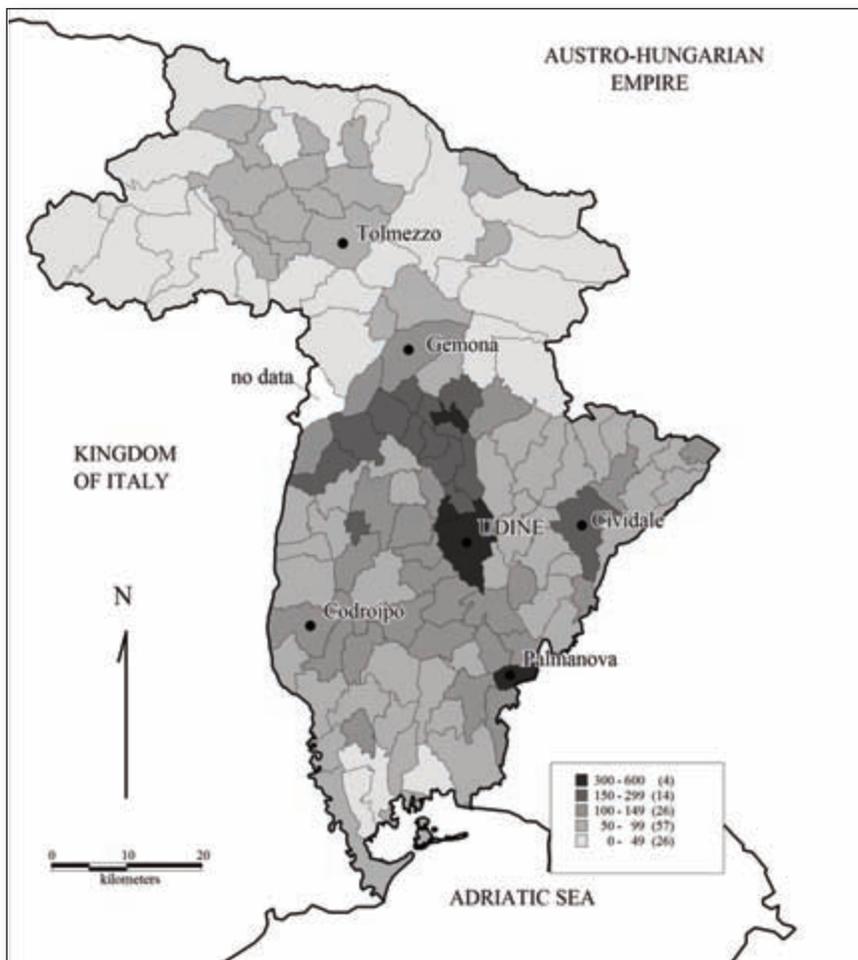


Figure 2. Inhabitants per square kilometer. Province of Friuli (1881).

where the marriage took place, the birthplace and residence of each spouse, the residence of their parents. Information regarding the relevant municipality is always provided but at times even the individual hamlet is specified.

Although predominantly based on marriage certificate data, the research also uses other demographic and geographical sources from the National Institute of Statistics (ISTAT). Data provided by the censuses of 1871, 1881 and 1901 on the number of residents in each municipality were used to calculate the total number of inhabitants in the area under study. The very detailed data provided by the 1881 census, which included population records for each individual hamlet, allowed us to estimate the number of inhabitants in those municipalities whose boundaries had changed over time and, in addition, to calculate the demographic barycenter of each municipality.

For a GIS database, we used georeferenced polygon and point maps of the historical boundaries of Friuli's municipalities produced by the Department of Statistics of the University of Udine (Figure 3). A more detailed description of the criteria used to create the maps is provided in several other papers.³² The polygon map represents the boundaries of 127 municipalities. Since some administrative boundaries changed during the

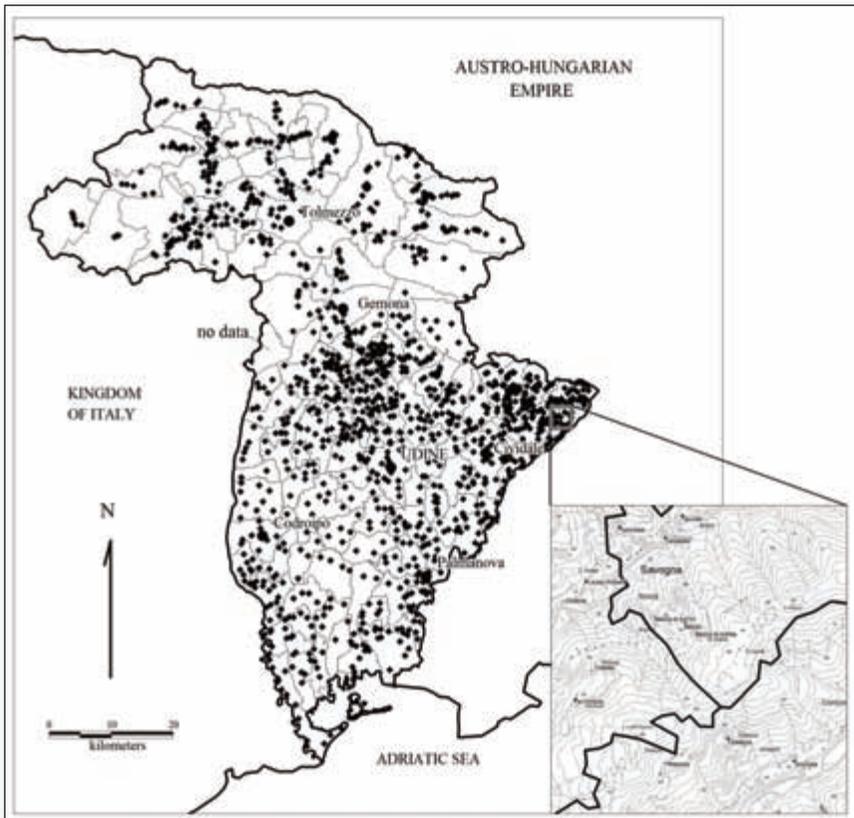


Figure 3. Polygon and point maps of the Province of Friuli (1881).

study period, the map we chose as our framework of reference represents the boundaries of December 31, 1881. The point map represents the position of all 656 localities listed in the 1881 census together with the 1,278 localities cited in the marriage certificates.

Problems with measuring territorial exogamy

A marriage is exogamous when a person who lives in a given place marries another person who lives in a different place. The choice of the word “place” is explicitly generic and is just one example of the many ambiguous terms commonly used in studies on exogamy.

The simplest way to measure territorial exogamy, for instance the exogamy of a parish, is to calculate the ratio between the number of marriages in which one of the spouses is not native to the parish and the total number of marriages celebrated within that parish. The complementary measure indicates the endogamy level of the parish. In this section we use this measure to give a first description of how exogamy levels were distributed across the territory: we calculated intra-provincial exogamy as the ratio between the number of marriages involving a resident and a non-resident in a given municipality and the total number of marriages in the same municipality.³³ The results of our analysis are shown in Figure 4.

Figure 4 below confirms some of the general findings already reported in previous studies. Almost the entire western mountain area, for example, demonstrates low to very low levels of exogamy. This is a well-known phenomenon and can be partially explained by land property systems and inheritance laws and customs.³⁴ The exceptions are municipalities whose territory has a limited extension. Our research confirms that the lowest exogamy levels are found in the northern German and Slovenian linguistic minority municipalities of Sauris and Resia.³⁵

However, if we look at the map more closely, we can note a number of new, unexpected phenomena. It is surprising, for instance, how Udine, the region’s main town, has fewer exogamous marriages than would be expected for its population size. However, it is also true that the most populated localities have a larger marriage pool and therefore endogamous marriages are more likely to occur. A second surprising result is that the highest levels of exogamy are found in the municipalities situated to the north and west of the main city, municipalities with a limited territorial extension and relatively high population density. At this point, we should stress once more that although the map reveals previously unexplored aspects of marriage habits in Friuli, it could present some distortions due to the geographical characteristics of the municipalities concerned. However, we do not analyze these distortions at this stage in our research. Indeed, this exogamy measure does not inform us as to the exact place of residence of the spouses; all we know is that in a given place a certain marriage took place but not whether the couple took up residence there.

Given the richness and quantity of data at our disposal, we de-

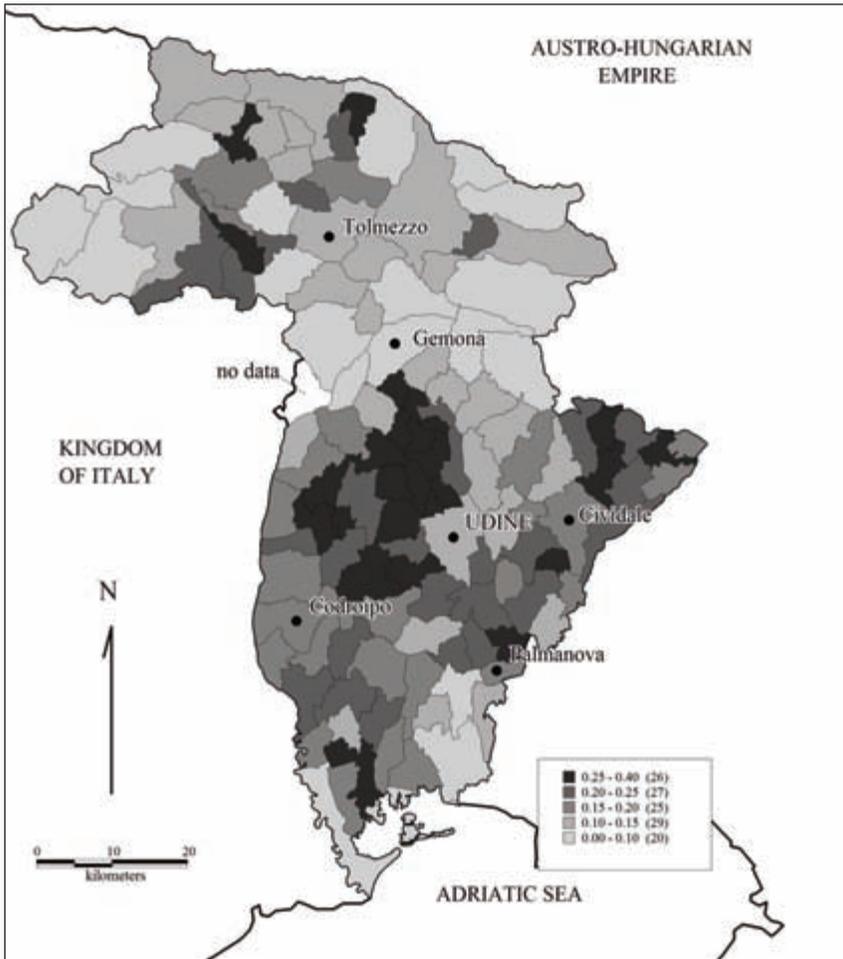


Figure 4. Exogamy Levels for the Province of Friuli (1872-1900).

cided to take a different approach to the problem. For each married couple who lived in the municipalities of Udine province, we calculated the distance in kilometers between the places of residence of the couple prior to marriage.³⁶ We then considered all marriages registering a non zero value for distance to be exogamous. All marriages between two persons for whom the distance between their respective places of residence prior to marriage is zero are therefore considered endogamous, irrespective of where the marriage took place. At the provincial level, this calculation method implies that the exogamy levels of males and females will be absolutely identical, even if these may be significantly different when evaluated at the individual municipal level.

The measurement of exogamy at the municipal level poses a number of geographic and demographic problems that derive from the shape and size of the territory as well as the number of inhabitants. A slightly more accurate way to calculate exogamy would therefore be to take these

additional aspects into consideration. This is something we will do in part—using a variety of different means in accordance with the different types of analysis—further on in this study.

In addition to exogamy levels, a second interesting item under examination is marital propinquity (the distance between the places of residence of the spouses), the results of which are presented in Figure 5. However, before commenting on these findings, we will give a brief explanation of the criteria used to construct the map.

As we stated previously, we define a marriage as “exogamous” if the distance between the spouses’ places of residence exceeds zero. We further affirmed that the distance is calculated on a municipality basis; we did not, however, specify how this is measured. There are numerous ways to measure distance and the choice can have a significant bearing on the results. It could, for example, be measured as the distance between the geographic barycenters of the municipalities (the so called “centroids”); alternatively, we could measure it as the distance between the largest hamlets, following, for optimal precision, road axes. To give this study both geographical and demographic validity, we choose to measure it as the distance between the demographic barycenters of the municipalities. We calculated the longitude and latitude of the demographic barycenter of each municipality using the 1881 census populations together with geographical coordinates obtained from the map.³⁷ The formula we used to calculate the longitude of the demographic barycenter \bar{x} of a municipality is

$$\bar{x} = \frac{\sum_i x_i \cdot p_i}{\sum_i p_i}$$

where x_i and p_i are the latitude and the number of inhabitants of hamlet i . A similar equation is adopted for the calculation of the latitude \bar{y} .

We measured the distance between each of the 12,265 spouses at municipality level.³⁸ The values used to construct the distance map were taken by weighting the distance with the mean distance between people living in a given municipality and all the other inhabitants of the province. By applying this method we were able to eliminate the distortion that arises from the geographical location of the municipalities.³⁹ The values plotted on the map, therefore, are not the mean distances between the spouses, but mean values that weight the distance between spouses with the distance between inhabitants generally. A value greater than one indicates that the mean distance between spouses is higher than the mean distance between people of that municipality and all the other people of the province; a value less than one indicates the opposite. The results are shown in Figure 5.

What clearly emerges from the map is that almost all the mountain municipalities in the western part of the territory demonstrate a tendency on the part of their inhabitants to find a marriage partner within a short distance from their place of residence. A similar situation is found in the central-eastern mountain communities, where few move particularly far within the province in search of a spouse. This feature is not common to the

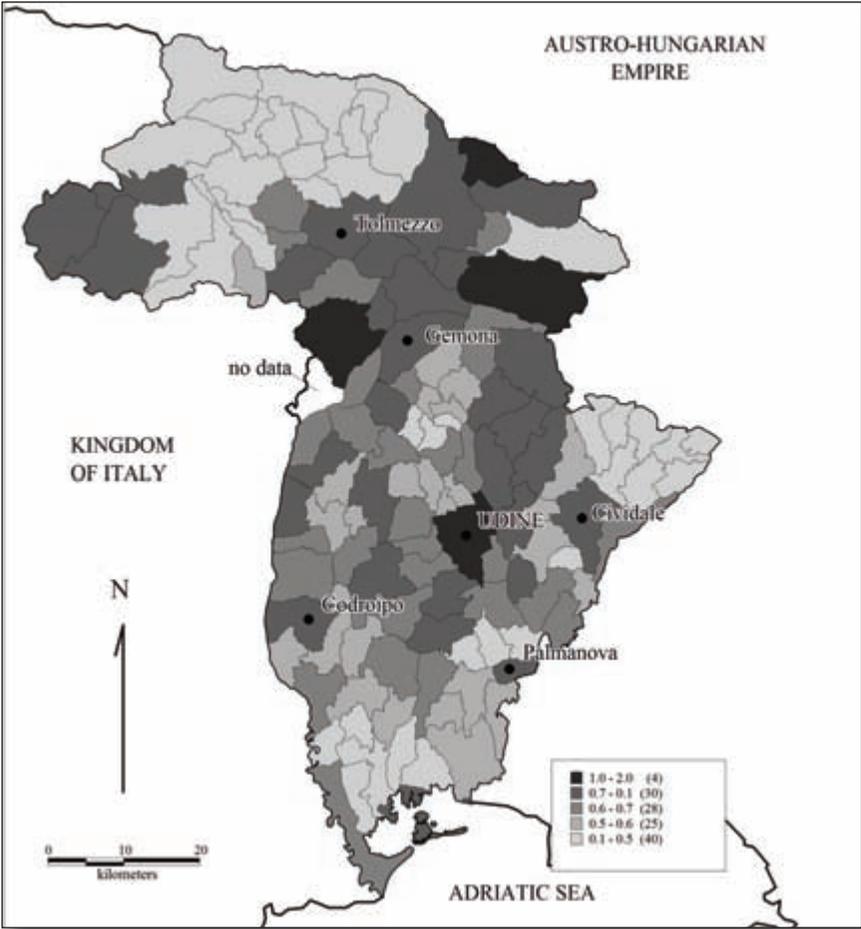


Figure 5. Marital propinquity index for the Province of Friuli (1872-1900).

entire mountain area. Indeed the northeastern mountain area demonstrates the largest cluster of municipalities whose inhabitants tend to find partners at a relatively long distance from their place of residence. It is difficult to ascertain the reasons for this. One hypothesis might be that this is a distortion resulting from the fact that the majority of the municipalities concerned are quite extensive. However, this geometrical explanation is not so convincing, given that the demographic barycenters of these communities are relatively close and, what is more, the measure used is weighted with the mean distance between all the other barycenters.

Another factor worth highlighting concerns the inhabitants of the most populated centers: in the case of those marrying from outside the community, the spouse's place of residence tends to be quite distant. This behavior is evident, albeit with varying degrees of intensity, in all the main towns – particularly when compared to the surrounding area. The municipality displaying the greatest mean weighted distance (1.21), is Udine. Hence, while the region's principal town does not manifest particularly

high levels of exogamy in absolute terms, a considerable number of exogamous marriages are with spouses who originate from relatively distant places.

From a combined reading of Figures 4 and 5, we can conclude that contrary to what might be reasonably expected, higher exogamy levels do not imply greater distances between the spouses. Many places with a high level of exogamy reveal a tendency for inhabitants to find their spouses within a relatively short distance, whereas in those with lower levels the opposite may be the case. There are some exceptions, the northwestern mountain area being one example. The latter, however, has a traditional predisposition for extra-provincial exogamy. This effect could be generated by other spatial distortions not considered in this work: for example, the presence of direct roads and easy communication channels between adjacent municipalities, or the rate between population density and the length of municipal boundaries.

Territorial influences on exogamy and marital propinquity

We now verify the extent to which explanations for the “exogamy” and “marital propinquity” tendencies observed in this study can be attributed to their territorial location. In particular, we will be looking at whether the conditions of global (or spatial) dependence and local dependence (or spatial heterogeneity) exist in relation to these measurements.⁴⁰

Spatial dependency has been defined by authors who have explored these themes as “tied closely to the processual notions of diffusion and contagion.”⁴¹ What we intend to measure here, therefore, is the degree of diffusion of exogamy and marital propinquity in Friuli. The concept of heterogeneity, on the other hand, refers to the particular conditions that make a territory different from all the others. Our aim is to identify whether there are territories within the province – that is, clusters of municipalities – where people assume a similar behavior. In this analysis, global dependence is calculated using Moran’s index (I) and local dependence using the LISA index.⁴² To obtain these measurements we used GeoDa, a rich and powerful spatial data analysis software tool.⁴³

The calculation of both indexes requires not only the values of the variables under analysis, but also a series of territorial weights applied at municipality level. The choice of weights, which can have a considerable influence on the final results, represents a “hypothesis on the part of the researcher regarding the interdependence of the places where the phenomena is observed and the extent to which these interdependent relations influence the phenomena itself.”⁴⁴ We do not describe the technical details of these methods here.⁴⁵ Suffice to say that to obtain these calculations we must first establish the criteria for deciding when two territories are in close proximity to each other, or establish a proximity threshold. Once defined, these criteria should be applied to every territory in the analysis, in order to create a spatial weight matrix. We can, for example, build a contiguity

matrix, in which the weight is set to one if two municipalities share a border, and set to zero if they do not. Just as distance is an ambiguous concept, so too is contiguity. Borrowing from terminology adopted in the game of chess, we can talk of a contiguity matrix built using a “Rook” criterion—where two territories are considered adjacent if they share a common border—or of a contiguity matrix built with a “Queen” criterion, where territories are considered adjacent even if they only share a vertex. In both methods weight could be computed at different orders. First order weights are constructed considering only adjacent couples of territories. Second order weights are constructed considering couples separated by exactly one different territory, and so on for higher orders. An alternative method for building a matrix does not use the contiguity concept, but is based directly on the distance between each pair of territories; in this case the resulting matrix is non-binary. In the latter, the weight system can be built in inverse proportion to the distance taken as reference.

In this work we used a Rook contiguity matrix and a Queen contiguity matrix, both of the first order. In addition, we used two distance matrices, both with a threshold set at 9,500 meters (the mean distance between spouses). The first matrix was obtained by measuring the distances between the centroids of the municipal territories, the second by using demographic barycenters.

Having established the criteria for choosing the weights, we calculated the Moran’s I. The results are shown in Table 1.

The highest Moran’s I cannot be obtained using the same weight system in the two different cases.⁴⁶ For the marital propinquity index, the highest value (if only by a margin) results when weighted with the mean marriage distance from the demographic barycenter of the municipalities. The best result for the exogamy level results from a weight built using a first order Queen contiguity index. Theoretically, these results confirm that weights built upon the distances of demographic barycenters are more effective when applied to the distances of spouses and that contiguity weights provide the best results when used to measure characteristics, such as exogamy, where border contiguity plays an important role. Finally, as differences are minor in the different cases, we can also state that the results are considerably robust.

	Distance 9,500 m demog. baryc.	Distance 9,500 m centroids	Rook 1st ord.	Queen 1st ord.
Marital propinquity index	0.4758	0.4693	0.4715	0.463
Exogamy level	0.3736	0.3916	0.4609	0.4632

Table 1. The Moran I for marital propinquity and exogamy. (Note: significance level 0.01 for all results.)

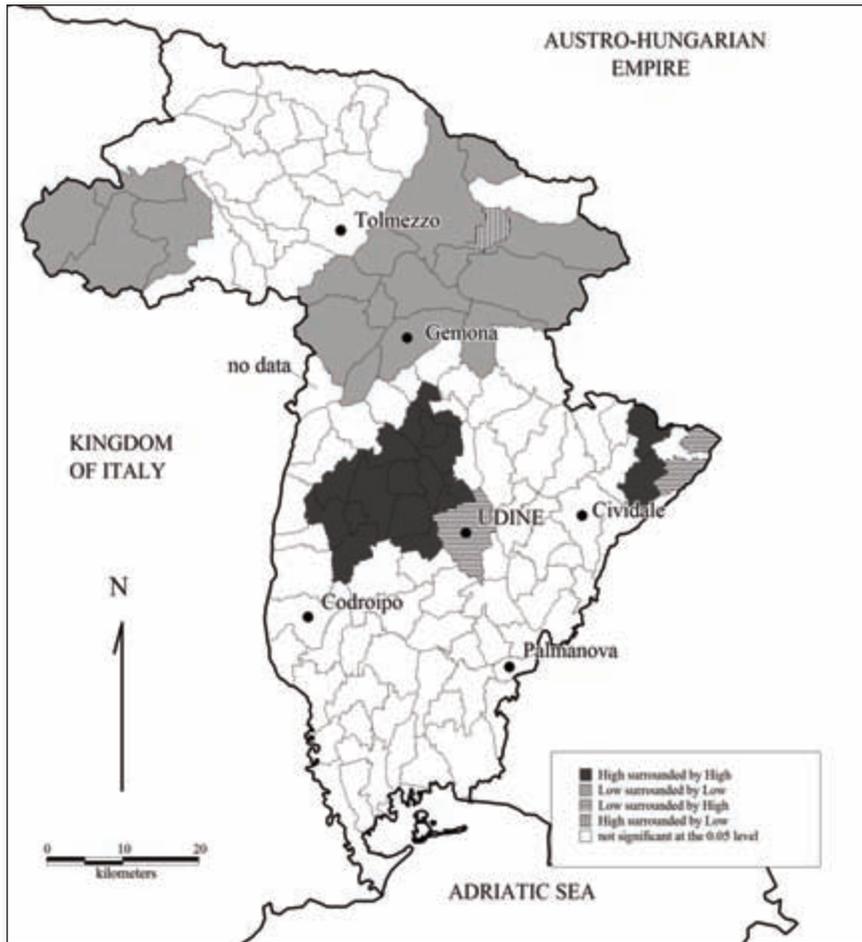


Figure 6. LISA Cluster map. Exogamy levels (Queen 1st order weighted).

Having established which spatial weights provide the highest spatial autocorrelation values, we used the same weights to calculate the LISA index. The computed values are shown in figures 6 and 7. The shaded areas are locations where the LISA index has a significance of at least 0.05. Those in black represent spatially clustered areas with either high levels of exogamy or mean weighted distance (municipalities with high values surrounded by others with high values), whereas those shaded in grey are clustered on the basis of their low levels of exogamy or low weighted distance. The striped areas represent outlier municipalities: those surrounded by other municipalities that demonstrate an opposite tendency. The areas with vertical stripes represent municipalities with high values surrounded by those with low, while those marked with horizontal stripes denote those with low values surrounded by those with high.

The clusters that emerge with regard to inter-provincial exogamy levels are different from those concerning mean weighted distance. In figure 6 we observe three different groups of municipalities. Those with low

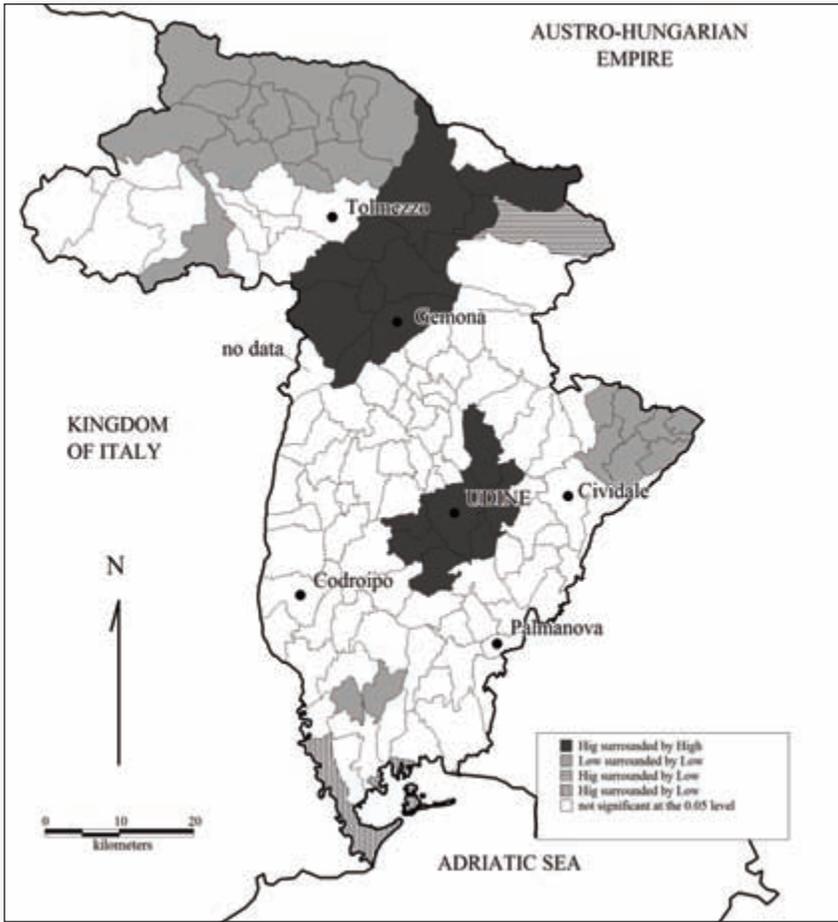


Figure 7. LISA Cluster map. Marital propinquity index (weighted distance 9,500 m).

levels of exogamy are concentrated in the western mountain area and in a group of municipalities in the northeast of the region. High exogamy levels are concentrated in the area to the northwest of the main town.

In Figure 7, we identify four clusters. Distance is on average higher in a group of municipalities located around Udine and in the central mountain area. It should be noted that the latter area represents a unique case in that it largely coincides with an area with low levels of exogamy shown in Figure 6. The regions registering the shortest marital distance are represented by a group of municipalities in the northwestern mountain region and the area to the far east of the province.

The results of our analyses reveal spatial clusters of communities with significantly similar exogamy and marital propinquity rates. This strongly suggests that territorial characteristics are an important contributory factor. Some of the results confirm what has already been established by previous studies. For example, in Figure 7, the two areas identified by

the LISA index as having the shortest distance between spouses correspond almost exactly with our previous findings on the migratory tendencies of the same territories. Migrant flows from Carnia, the area to the north of Tolmezzo, are toward central Europe, while those from the Natisone valley, the area close to Cividale, are toward Eastern Europe.⁴⁷ Furthermore, similar studies on Carnia have demonstrated the existence of high levels of “valley” exogamy which imply a short distance between spouses in exogamic marriages.⁴⁸ The Natisone valley, however, has traditionally been home to Friuli’s minority Slovenian population. These ethnic (and in this case also linguistic) minorities have high levels of homogamy and therefore low levels of marital propinquity.⁴⁹

In the same Figure 7, the two areas having the highest distance between spouses (a strip in the northern territory and the surroundings of Udine) represent the convergence points of important road axes. The northern territory was traversed by one of the most important routes between Austria and Italy – the so-called “Pontebbana” road. In the vicinity of the town of Gemona other roads from the south and west converge with that of “Pontebbana.”⁵⁰ It was relatively easy for the populations of the area close to Pontebbana to come into contact with people from the province’s more distant places. Moreover, Udine has been the main road convergence point of the province since the end of eighteenth century, and of railroads since the second half of nineteenth century.⁵¹ High distance values between spouses in exogamic marriages within Udine and its surroundings could be influenced by the central position of the city, which attracts people from distant municipalities, even if the centrality itself does not automatically imply high levels of exogamy.

Conclusion

In this research, we analysed territorial exogamy characteristics of the Friuli region during the late nineteenth century. The inquiry adopted a dual approach. The first, more classical approach, measured exogamy as the ratio between the number of marriages between spouses not previously resident in the same municipality and the total number of marriages in that same municipality. The second, more innovative approach, calculated exogamy rates on the basis of the distances (each appropriately weighted) between the spouses’ premarital places of residence.

Generally speaking, we found some clustering of municipalities with similar rates of exogamy and mean weighted distance. In some areas, such as the northwestern mountains, low exogamy levels coincide with short distance marriages while in others these measures appear to be inversely correlated, an example being the central-eastern mountains, where high exogamy rates coincide with short distance marriages. In the vast areas of the hills and mountains north of Udine, however, the opposite is true.

Although it is clear that location has a strong bearing on both exogamy and marital propinquity rates, we are not yet able to identify the influence of geographical, historical, cultural and social factors on the shared

behaviors of the different areas at this early stage in our research. We can point to a number of possible influences such as geographical isolation degree, different migration traditions, the relative importance of farming in the various local economies, education levels, and area variations in the social status ascribed to certain professions. Alternatively, we can make certain hypotheses on the basis of the demographic characteristics of the population, particularly with regard to the age of marrying couples and previous marital status.

At the current time, we are unable to investigate these factors in any appropriate depth. However, marriage certificates are an extremely rich source of information regarding individuals, and we plan to use this data in the next stages of our research.

Acknowledgements

This research was undertaken as part of "Friuli/*in prin*," a joint project between the Udine State Archives Office (Archivio di Stato di Udine) and the Department of Statistics of the University of Udine. We are grateful to Jean Pierre Zaccomer and Pamela Mason for their helpful comments.

Notes

1. Edward G. Ravenstein, "The laws of migration," *Journal of the Statistical Society of London* 48: 2 (1885): 167-235.
2. James H.S. Bossard, "Residential propinquity as a factor in marriage selection," *The American Journal of Sociology* 38: 2 (1932): 219-24.
3. Bossard, "Residential propinquity," 222.
4. See Maurice R. Davie and Ruby Jo Reeves, "Propinquity of residence before marriage," *The American Journal of Sociology* 44: 4 (1939): 510-517; Ray H. Abrams, "Residential propinquity as a factor in marriage selection: fifty year trends in Philadelphia," *American Sociological Review* 8: 3 (1943): 288-294; John S. Ellsworth, Jr., "The relationship of population density to residential propinquity as a factor in marriage selection," *American Sociological Review* 13: 4 (1948): 444-448; Gerald J. Schnepf and Louis A. Roberts, "Residential propinquity and mate selection on a parish basis," *The American Journal of Sociology* 58: 1 (1952): 45-50.
5. Samuel A. Stouffer, "Intervening opportunities: a theory relating mobility and distance," *American Sociological Review* 5: 6 (1940): 845-867; Samuel A. Stouffer, "Intervening opportunities and competing migrants," *Journal of Regional Sciences* 2: 1 (1960): 1-26; Robert H. Freymeyer and P. Neal Ritchey, "Spatial distribution of opportunities and magnitude of migration: an investigation of Stouffer's Theory," *Sociological Perspectives* 28: 4 (1985): 420.
6. Stouffer, "Intervening opportunities: a theory relating mobility and distance," 867.
7. George K. Zipf, "The $P_1 \cdot P_2 / D$ Hypothesis: on the intercity movement of persons," *American Sociological Review*, 11: 6 (1946): 677-686.
8. Following the formula $P_1 \cdot P_2 / D$, with P_1 and P_2 the population of the two cities and D their distance.
9. John Q. Stewart, "Demographic gravitation: evidence and application,"

- Sociometry* 11: 1/2 (1948): 31-58.
10. Alvin M. Katz and Reuben Hill, "Residential propinquity and marital selection: a review of theory, method, and fact," *Marriage and Family Living* 20: 1 (1958): 27-35.
 11. William R. Catton Jr. and R.J. Smircich, "A Comparison of mathematical models for the effect of residential propinquity on mate selection," *American Sociological Review* 29: 4 (1964): 528.
 12. Luciana Morassi and Giovanni Panjek, "Strategie familiari in Val di Resia (sec. XIX)," *Economia e Storia* 5: 4 (1984): 439-456; Elisabetta Navarra, "La comunità di Sauris tra Settecento e Ottocento: profilo demografico," in Donatella Cozzi, Domenico Isabella and Elisabetta Navarra, eds., *Sauris Zhare, una comunità delle Alpi Carniche* (Udine: Forum, 1998), 105-33; Laura Tosoni, "Le anime di San Martino," in Giorgio Ferigo and Lucio Zanier, eds., *Tumieç* (Udine: Società Filologica Friulana, 1998): 93-109; Matteo Manfredini and Francesca Morassi, "Matrimonio e comportamento nuziale in un villaggio carnico. Cercivento, 1867-1900," in Marco Breschi, ed., *Vivere in Friuli. Saggi di demografia storica (secc. XVI-XIX)* (Udine: Forum, 1999), 215-242.
 13. Giorgio Ferigo, "Le cifre, le anime. Un saggio di demografia storica," *Almanacco culturale della Carnia* 1 (1985): 31-73. Giorgio Ferigo, "Ancora di cifre e anime," in Manlio Michelutti, ed., *In Guart. Anime e contrade della Pieve di Gorto* (Udine: Società Filologica Friulana, 1994), 147-172; Claudio Lorenzini, "Note sul comportamento nuziale nella Pieve di Invillino (Carnia) tra la fine del Cinque e la prima metà dell'Ottocento," in Marco Breschi and Alessio Fornasin, eds., *Il matrimonio in situazioni estreme: isole e isolati demografici* (Udine: Forum, 2005), 111-126.
 14. Flaviana Zanolta, "Tra la nascita e la morte: Isola Morosini nel Settecento," in *Società, economia e popolazione nel Monfalconese (secoli XV-XIX)*, (Ronchi dei Legionari: Centro Culturale Pubblico Polivalente, 1981), 85-106.
 15. Alice Bee Kasakoff and John W. Adams, "Spatial location and social organisation: an analysis of Tikopian patterns," *Man* n.s. 12: 1 (1977): 48-64.
 16. John H. Relethford and James H. Mielke, "Marital exogamy in the Åland Islands, Finland, 1750-1949," *Annals of Human Biology* 21: 1 (1994): 13-21.
 17. Claire Lemerrier and Paul-André Rosental, "'Pays' ruraux et découpage de l'espace: les réseaux migratoires dans la région lilloise au milieu du XIX^e siècle," *Population* 55: 4/5 (2000): 691-725.
 18. Luc Anselin, "Local indicators of spatial association-LISA," *Geographical Analysis*, 27 (1995): 93-115.
 19. Karen Haandrikman and Carel Harmsen, "Spatial homogamy in the Netherlands. Distances between partners before cohabitation," paper presented at the EPC meeting, Liverpool, 2006. Karen Haandrikman, Leo van Wissen and Carel Harmsen, "Explaining spatial homogamy. Socio-economic, spatial and cultural aspects of spatial homogamy in the Netherlands," paper presented at the PAA meeting, New York, 2007.
 20. Bossard, "Residential propinquity"; David A. Coleman and John C. Haskey, "Marital distance and its geographical orientation in England and Wales, 1979," *Transactions of the Institute of British Geographers* n.s. 11: 3 (1986): 337-355.
 21. Relethford and Mielke, "Marital exogamy in the Åland Islands, Finland, 1750-1949."
 22. Ellsworth, Jr., "The relationship of population density to residential propinquity as a factor in marriage selection," Davide Pettener, "Consanguineous marriages in the upper Bologna Apennine (1565-1980). Microgeographic variations, pedigree structure and correlation of inbreeding secular trends with changes in population size," *Human Biology* 57: 2 (1985):

- 267-288. This latter relationship is not always linear; in fact some research studies have found that exogamic marriages are more frequent in small communities and cities and relatively less common in medium sized communities (Relethford and Mielke, "Marital exogamy in the Åland Islands, Finland, 1750-1949").
23. Luigi Lorenzetti and Reto Schumacher, "L'endogamie matrimoniale dans les villes suisses, 1880-1930. Effets structurels et préférences individuelles," *Histoire & Mesure* 20: 1/2 (2005): 29-58; Bart van de Putte, "Homogamy by geographical origin: segregation in nineteenth-century Flemish cities (Gent, Leuven, and Aalst)," *Journal of Family History* 28: 3 (2003): 364-90.
 24. Luciana Morassi, "Il Friuli, una provincia ai margini (1814-1914)," in Roberto Finzi, Claudio Magris, Giovanni Miccoli, eds., *Il Friuli-Venezia Giulia*, Vol. 1 (Torino: Einaudi, 2002): 5-148; Furio Bianco, *Le terre del Friuli* (Mantova: Astrea, Verona: Cierre, 1994).
 25. Alessio Fornasin, *Ambulanti, artigiani e mercanti. L'emigrazione dalla Carnia in età moderna* (Verona: Cierre, 1998).
 26. Gino di Caporiacco, *Storia e statistica dell'emigrazione dal Friuli e dalla Carnia* (Udine: Edizioni del Friuli Nuovo, 1967-69).
 27. The data refer to the last census date, namely the December 31 for the first two surveys and February 10 for the latter.
 28. Nicola Serio, "La popolazione del Friuli: permanenze e mutamenti (secc. XVIII-XIX)," in Lorenzo Del Panta, Lucia Pozzi, Rosella Rettaroli, Eugenio Sonnino, eds., *Dinamiche di popolazione, mobilità e territorio in Italia. Secoli XVII-XX* (Udine: Forum, 2002): 43-60. 47-49.
 29. Marco Breschi, Lucia Pozzi and Rosella Rettaroli, "Analogie e differenze nella crescita della popolazione italiana, 1750-1911," *Bollettino di Demografia Storica*, 20 (1994): 41-94. Demographic transition is the historical process of shifting from high birth and death rates to low birth and death rates.
 30. Anna Marzona and Alessio Fornasin, "L'anagrafe informatica delle famiglie friulane costruita sulla base delle fonti presenti presso l'Archivio di Stato di Udine," *Archivi & Computer* 17: 2/3 (2007): 172-198.
 31. Stefania Moretto, "Le statistiche italiane dello stato civile dal 1862 al 1930," *Bollettino di Demografia Storica*, 14 (1991): 51-71.
 32. Alessio Fornasin, "I sistemi informativi geografici per la storia del Friuli. Ricerche in corso," *Annales Series Historia et Sociologia*, 15: 1 (2005): 25-38; Alessio Fornasin and Anna Marzona "Esogamia territoriale nel Friuli post-unitario," in Carla Ge Rondi, Matteo Manfredini and Rosella Rettaroli, eds., *Transizioni di fecondità in Italia tra Ottocento e Novecento* (Udine: Forum, 2008): 167-189.
 33. To calculate the denominator we used the data published by MAIC, to overcome the lack of registry office documentation. As we mentioned earlier, for the year 1893 we based the calculation on marriage registers.
 34. Furio Bianco, *Carnia XVII-XIX. Organizzazione comunitaria e strutture economiche nel sistema alpino*, (Pordenone: Biblioteca dell'Immagine, 2000); Luigi Lorenzetti, "Economic opening and society endogamy: migratory and reproduction logic in the Insubric mountains (18th and 19th centuries)," *The History of the Family*, 8: 2 (2003): 297-316.
 35. Navarra, "La comunità di Sauris," 105-133; Morassi and Panjek, "Strategie familiari in Val di Resia," 439-456.
 36. This measure was taken on marriages of every order due to a lack of precise information on marital status.
 37. Obviously, the demographic barycenter of the single municipalities changed during the period under examination. The populations of hamlets change over

time and thus move the demographic barycenters of the municipality. Census data published by MAIC only allows these movements to be tracked at provincial level. To estimate the variation, we computed the demographic barycenter of the province in accordance with the 1881 boundaries using both demographic barycenters built at individual municipal level and the population rates of municipalities. What we can observe are merely minor provincial movements. The barycenter moves approximately 500 meters north between 1871 to 1881 and slightly more than 200 meters east from 1881 to 1901. In other words, Friuli's population distribution varied only very marginally during the two intervals; this leads us to assume that the population did not vary at individual municipal level sufficiently to radically alter the entire demographic structure of the province.

38. The mean distance of intra-provincial exogamic marriages is 9.5 km.
39. The standardization is necessary because the average distance between persons is larger for municipalities located at the borders of the region than for the ones located in the inner part. We adopted the same method employed in Haandrikman, van Wissen and Harmsen, *Explaining spatial homogamy*.
40. Paul R. Voss, Katherine J. Curtis White and Roger B. Hammer, "Explorations in Spatial Demography," in William A. Kandel and David L. Brown, eds, *Population Change and Rural Society* (Dordrecht: Springer, 2006): 407-429. See also Luc Anselin, *Spatial Data Analysis with GIS: An Introduction to Application in the Social Sciences*, NCGIA Technical Report (1992): 10-92. This paper is available at the web address http://www.ncgia.ucsb.edu/Publications/Tech_Reports/92/92-10.PDF
41. John O'Loughlin, Colin Flint and Luc Anselin, "The Geography of the Nazi Vote: Context, Confession, and Class in the Reichstag Election of 1930," *Annals of the Association of American Geographers*, 84: 3 (1994): 351-380, 358.
42. Andrew D. Cliff and John K. Ord, *Spatial Autocorrelation* (London: Pion, 1973); Graham J.G. Upton and Bernard Fingleton, *Spatial data Analysis by Example* (New York: Wiley, 1985); Luc Anselin, "Local indicators of spatial association-LISA," *Geographical Analysis*, 27 (1995): 93-115.
43. Luc Anselin, Ibnu Syabri and Youngihn Kho, "GeoDa: An Introduction to Spatial Data Analysis," *Geographical Analysis*, 38 (2006): 5-22.
44. Mario Badaloni and Elena Vinci, "Contributi all'analisi dell'autocorrelazione spaziale," *Metron*, 46 (1988): 119-140.
45. An overview of the different methods used to build a spatial weight matrix is given in Gian Pietro Zaccomer and Pamela Mason, "Progettazione e sviluppo di un software a supporto dell'analisi shift-share con struttura spaziale", Nota di ricerca 8 (Udine: Dipartimento di Scienze Statistiche dell'Università di Udine, 2007). For a more in-depth description of GeoDa see Luc Anselin, *Exploring Spatial Data with GeoDa: A Workbook*. This paper is available at the web address <https://www.geoda.uiuc.edu/pdf/geodaworkbook.pdf>.
46. The autocorrelation is positive when $I > -1/(n-1)$. In our analysis n is 127, the number of the municipalities. Therefore the limit between positive and negative autocorrelation is $I = -0.008$. As the values for I calculated on marital propinquity indexes and exogamy levels are always greater than zero, the autocorrelation is always positive.
47. Giorgio Ferigo and Alessio Fornasin, "Le stagioni dei migranti. La demografia delle valli carniche nei secoli XVII-XVIII," in Giorgio Ferigo and Alessio Fornasin, eds., *Cramars. Emigrazione, mobilità, mestieri ambulanti dalla Carnia in Età Moderna* (Udine: Arti Grafiche Friulane, 1997): 99-131; Alessio Fornasin, "Emigrazioni e mestieri in Carnia: la cesura del XIX secolo," *In Alto*, 80 (1988): 19-40.

48. Lorenzini, "Note sul comportamento nuziale nella Pieve di Invillino," 114-116.
49. Morassi and Panjek, "Strategie familiari in Val di Resia," 439-456.
50. Antonio De Cillia, *Friuli regione di passaggio. Dagli scambi neolitici all'attuale 'economia mondo'*, (Udine: Forum, 2002).
51. Alessio Fornasin, "Tra Vienna e Venezia. La viabilità della Patria del Friuli in età moderna," *Studi veneziani*, 38 (1999): 15-36; De Cillia, *Friuli regione di passaggio*.