Surnames and Migrations:
The Barcelona Area (1451-1900)[1]

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Abstract

Catalan onomastics, and specifically the evolution of surnames, has been conditioned by several demographic, political and social processes that have imparted singular characteristics over the course of centuries. The combination of these factors resulted in a significant number of homonymic surnames, making it impossible to correctly identify their geographical origin based solely on linguistic criteria. As a possible solution to this, this paper proposes the use of the cluster analysis method to introduce a further criterion for their identification and classification. Historical registers of Marriage License Books from the Diocese of Barcelona are the source selected to achieve this goal. These records, which collect information on more than two million surnames, were maintained between 1451 and 1905 in a set of 291 books (*Llibres d'Esposalles*) kept at the archives of the Barcelona Cathedral.

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Introduction

The study of historical migrations is one of the most difficult demographic phenomena to investigate due to the absence of specific records until recent times. Given this lack, it is necessary to rely on indirect sources and methods that have already shown great potential, such as the analysis of surnames.[2] However in the Catalan case – as well as in others – the evolution of onomastics, and specifically the evolution of surnames, has been conditioned by several demographic, political and social factors that have imparted singular characteristics over the course of centuries. The combination of these processes, as explained below, has made it necessary to propose the use of complementary methods to correctly identify the geographical origin of surnames and to complement existing linguistic criteria.

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[2] Some prominent recent examples are the papers of Mateos (2006: 83-102; 2010: 73-103), Busto *et al.* (2010: 287-296) or Berretta *et al.* (1993: 4), among others.

Catalonia experienced at least two great migratory waves between 1451 and 1900.[3] The first one took place from the late 15th century to the first half of the 17th century, and was led by migrants from the kingdom of France, mainly from the south. These migrants settled in Catalonia because of the higher salaries as compared to those in France, as well as the relative depopulation after the Crisis of the Late Middle Ages and the security offered in Catalonia in contrast to the French religious wars (1560-1598) (Moreu-Rey 1959: 7-9, Nadal and Giralt 1960: 121-122, Gual-i-Vilà 2005: 7-9). The second great immigration process in Catalonia has been the arrival of people from the rest of Spain, who brought the Castilian language with them. Although this migration has been constant over time (Moll 1959: 41, Moreu-Rey 1987: 2-5), it was not until the War of the Spanish Succession (1701-1715) and the Nueva Planta decrees that this migration intensified.[4] The first immigrants were traders, officers and soldiers from the rest of the Spanish Kingdoms (Ferrer-i-Bosch 1978: 105, Cerro 2007: 327-328, Alcoberro-i-Pericay 2009: 206-207) and then, from the second half of the 19th century, there was a continuous influx of Aragonese and Valencian workers attracted by the nascent industrialisation process in the Barcelona area (Arango 1982: 644, Nadal 1984: 227-228, Camps 1993: 30-36, Recaño 2000: 3-4, López-Gay: 2007: 178-179; 2014).[5]

All of these migration processes have not only led to the introduction of new surnames in Catalonia, but have also altered the distribution and frequency of already existing ones (Moll 1959: 39-42, Vall-Llobera 2010: 47, Jordà *et al.* 2013: 116). This is mainly due to the similarities between Catalan and Occitan onomastics (Vall-Llobera 2010: 47, Peytaví 2010: 122-127) and, to a lesser extent, between Catalan and Castilian onomastics (Moll 1959: 49, Faure *et al.* 2001), but also as a consequence of the process of diglossia favourable to the Castilian language that has occurred in Catalonia in modern times. Regarding this last point, while the influence of Castilian on Catalan surname forms has been constant since at least the political unification of the Castilian Kingdom and the Crown of Aragon under the Catholic Kings (1474-1516) (Moll 1959: 41), it was not until the aforementioned Spanish War of Succession that Catalan was gradually replaced in the administration and marginalised in public life (Castellano 1980 58-59, Congost 2002: 125-126). One of the main consequences of these processes was that some Catalan surnames were recorded in their Castilian forms or adapted to Castilian onomastics between the 18th and 20th centuries.[6] The whole process was exacerbated by the lack of Catalan grammar rules, which could have regularised the notation of surnames, until the 20th century.[7]

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[3] Catalonia has experienced other less important migratory waves, such as the internal rural migrations to the Barcelona area (Arango 1982). However, in this paper it is accepted that these constant processes did not substantially affect the onomastic structure. Furthermore, it has been shown that the Basque, Italian and Portuguese languages, as well as the Germanic, Jewish and Muslim cultures also influenced Catalan surnames. Nevertheless, these influences after the end of the Middle Ages are so small as to be insignificant (Moll 1959 Marcó-i-Dach 1985, Lascortz 2000).

[4] Among other consequences of this war, Catalonia lost its self-government and a new public administration common to the rest of Spain was introduced, meaning the substitution of Castilian for Catalan as the administrative and cultural language (Castellano 1980 58-59, Congost 2002: 125-126).

[5] This first migration is not to be confused with the migratory wave that came to Catalonia in the 20s and 60s of the last century, mostly from southern Spain (Andalusia, Murcia).

[6] For more information see Moll (1959), Cabré (1999) and Peytaví (2010), among others.

[7] It was not until the Civil Registration Act of 1870 that all individuals were required to have two surnames, from the father and mother respectively. In addition, it was not until the 20th century that the first modern official Catalan grammar was established, based on the studies of Pompeu Fabra. This served as the foundation

Consequently, the combination of these factors resulted in a significant number of homonymic surnames, making it impossible to correctly identify their geographical origin based solely on linguistic criteria. As a possible solution to this, this paper proposes the use of the cluster analysis method to introduce a further measure for the identification and classification of the surnames present in a specific region and time, based on the evolution of their Growth Rates. This methodology is based on the premise that surnames are transmitted from fathers to their children in a stable form, as in the Catalan case since the 14th century (Roigé 1991: 38-39). Thus, as the transmission of surnames is stable, different family lines may be identified, allowing us to establish a direct relationship between the number of existing surnames and the demographic evolution of those who bear them. Therefore, the abnormal disappearance of surnames – in the absence of catastrophic causes such as wars or famines – is primarily due to emigration. Similarly, and most relevant to this study, the unusual appearance of new surnames and the increase in frequency of others already present in the population are mainly conditioned by immigration.[8]

Dataset

For this study it is necessary to use a source such as the Barcelona Historical Marriage Database (BHMD), which offers continuity over time and onomastic richness. This source provides us with the surnames of all individuals who married in the Barcelona area (250 parishes in 1900) between the 15th and 20th centuries (1451-1900), representing 2,248 different surnames and 453,911 unions (Figure 1).[9]
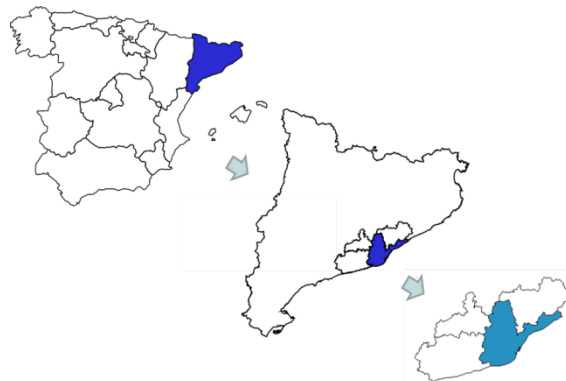

Fig. 17. Spain, Catalonia, the Diocese of Barcelona and the Main Deanship of Barcelona

The BHMD was created as part of the Advanced Grant Project Five Centuries of Marriages (5CofM) and is based on the data-mining of the marriages recorded in the so-called Marriage License Books (*Llibres d'Esposalles*) preserved in the Archives of the Barcelona Cathedral.[10]

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for Catalan onomastic standardisation, which has been built since then through the direction of the Catalan Language Academy (IEC), which was set up in 1907.

[8] These assumptions are based on isonymy studies. For more information see Crow and Mange (1965), Lasker (1977) or Fuster (1986), among others.

[9] For comparative purposes the analysis focuses only on the period 1451-1900.

[10] The Marriage Licenses Books also contain other non-nominative variables (tax paid, marital status, occupations, etc.). Information regarding the origins of each bridal couple is particularly interesting when it is

The historical origin of this source dates back to the early 15th century, when in September 1409 Pope Benedict XIII (1328-1423) granted a tax privilege to the Barcelona Cathedral for its construction and subsequent maintenance. As a result, every union recognised by the diocese required, since then, a tax payment determined by the socioeconomic status of each couple.[11]

Methods

A cluster analysis is a multivariate statistical technique that facilitates the aggregation of cases –in this instance, surnames – in order to classify groups with high intragroup homogeneity and the highest intergroup difference. This classification is obtained without any prior assumption about what potential clusters might exist and what surnames could be a part of them.[12]

In order to create clusters large enough to mitigate possible overestimations as a result of the few cases reported annually of some surnames, the BHMD has been converted from a flow source (continuous record) – which collects all the marriages recorded daily in the diocese of Barcelona – to one that groups all the marriage licence records into periods of fifty years (Table 1). Furthermore only those surnames that appear in the Marriage License Books a minimum number of times, set at twenty-five, have been taken into consideration.[13]

Years	Marriages	Different Surnames
1451-1500	5.895	1.183
1501-1550	15.255	1.554
1551-1600	30.267	1.921
1601-1650	41.151	2.056
1651-1700	31.390	2.118
1701-1750	42.555	2.291
1751-1800	58.981	2.344
1801-1850	80.652	2.411
1851-1900	147.765	2.435

Table 1. Number of marriages by period

Finally in order to avoid other biases, such as the creation of clusters made up of the most common surnames, each surname's Growth Rate (GR) has been used as a reference variable

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registered (between 1573 and 1643), as it allows us to identify the birthplace of the individuals regardless of the name they bear.

[11] Because of the irregularity in the registration of some of the nominal variables, such as the surnames of women (82% of total cases) or the name of the parents of the brides (they are only registered in 18% of the cases) and to facilitate the comparability of data, this study only analyses the surnames of the groom (future husband), which is recorded in 99.6% of the marriage records.

[12] This paper takes the previous study of Francesc Calafell 'Els noms dels Catalans del segle XXI' (2013: 159-176) as a reference.

[13] Uncommon surnames introduce a high variability between each observation period. For example, a surname registered one time in an observation period, and two times in the following period, means a relative frequency increase of 100%, although this increase may be the result of chance or a registration problem at its source.

to create the cluster classification, rather than the total number or the relative frequency.[14] This measure allows us to observe the percentage increase or decrease of each surname in two observation periods.[15] Therefore for each surname nine GR were generated, one per period observed (1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900).

$$GR[x, x + n] = \frac{P\,x + n - P\,x}{P\,x}$$

Where Px + n is the number of surnames in the second period of observation and Px is the number of surnames in the first period of observation.

This cluster analysis was conducted by the method of minimum distance using the Pearson correlation as a measure.[16] This method is based on measuring the distances between cases, which in our analysis are the GRs of each surname, grouping those which are the most similar. These initial clusters are then linked to other surnames or surname groups, creating new groups. The process is repeated until the smallest possible number of clusters is found.[17] The result is a hierarchical aggregation of surnames in which they are grouped by the similarities in the intensity and time of their Growth Rates.

Homonymic Surnames in the Catalan Anthroponymy

Surnames with the same pronunciation or written in the same way, but with different origins and original meanings are a constant phenomenon over time in Catalonia, which may introduce a bias in anthroponymic studies. Thus, originally different surnames were registered in the BHMD in the same manner, becoming the same surnames for all intents and purposes. Roughly 50-70% of the surnames are likely to have been affected by these coincidences (Jordà *et al*. 2012, 2014). These similarities occurred largely as a result of the linguistic similitudes between Catalan, French and Occitan (Vall-Llobera 2010: 47, Peytaví 2010: 122-127) (Table 2).[18]

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[14] If the relative frequency or the total number of cases observed is used in this study, the increase or decrease estimates are affected by the weight of each surname in the total population. These differences could introduce a bias. The GR allows us to avoid this by analysing, in relative terms, the increase or decrease in each surname regardless of the total number of observed cases.

[15] The 'GR' is similar to the 'PGR' (Population Growth Rate). This is the rate at which the number of individuals in a population increases in a given time period as a fraction of the initial population. A positive growth rate indicates that the population is increasing, while a negative growth ratio indicates that it is decreasing.

[16] The Pearson correlation coefficient, designed for quantitative variables (minimum interval scale) is an index that measures the degree of correlation between variables linearly related. The Pearson correlation coefficient is a measure of easy implementation and equally easy to interpret, and it has been selected because it is the most common measure when quantitative data and the method of minimum distance are used.

[17] To explore this method more profoundly see Kaufman and Rousseeuw (2009).

[18] This estimate is based on the comparison between the origins of each French bridal couple in the Marriage Licenses Books, and it has been linked to previous linguistic studies (Moll 1959, Alcover and Moll (1963), Bas-i-Vidal 1988, Moreu-Rey 1991, Coromines 1995, Albaigès 2005). In this paper 'French' is used for all the surnames introduced by immigrants from the Kingdom of France regardless of whether they came from Occitan

CATALAN	FRENCH	OCCITAN	ENGLISH TRANSLATION
Ferrer	*Forgeron*	*Ferrièr*	'Smith'
Font	*Fontaine*	*Font*	'Fontaine'
Serra	*Sierra*	*Sèrra*	'Mountain chain'
Prats	*Pré*	*Prats*	'Field'
Bosch	*Bois*	*Bòsc*	'Forest'
Valls	*Vallee*	*Vals*	'Valley'

Table 2. Similarities between Catalan, French and Occitan surnames: some examples

Furthermore according to several authors, in the absence of a standardised onomastics a Catalan scribe could choose one of three options at the time of registering a surname that was foreign to him: he could preserve the original spelling, if he knew how to write it; he could adapt it to the forms of the host language, which was the most common solution; or he could translate the surname from the original language into Catalan (Peytaví: 2010: 353-354). In contrast, surnames introduced in the Barcelona area by immigration from the Castilian language domain (primarily the Crown of Castile and the Kingdom of Aragon), did not present the same confusion. Surnames of Castilian, Aragonese, Murcian and Andalusian origin are for the most part easily identifiable from other surnames by the terminal '-ez': *Pérez*, *Rodríguez*, *Gómez* or *González* (sometimes Catalanised with the ending '-is', as in *Pérez / Peris* or *Gómez / Gomis*) (Moll 1959: 41).[19] However, there are also several cases in which surnames in Catalan and Castilian show certain graphemic or phonetic similarities. In the Marriage License Books approximately 8% of the surnames that are considered Catalan, but may originally have been Castilian have been identified (Table 3).[20]

CATALAN	CASTILIAN	ENGLISH TRANSLATION
Torre(s)	*Torre(s)*	'Tower'
Cas(a)/Cas(es)	*Casa(s)*	'House(s)'
Sal(a)/Sal(es)	*Sal(a)/(as)*	'Room/House'
Martí	*Martín*	'Martin'
Roca	*Roca*	'Stone'
Roja	*Roja*	'Red'

Table 3. Similarities between Catalan, and Castilian surnames: some examples

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or the French linguistic domain. Similarly all the surnames introduced by immigration from the Castilian language region are called 'Spanish' or 'Castilian'.

[19] Termination '-ez' is also present in Basque language in the form '-itz'. Other singular Castilian surnames with non '-ez' are *Hidalgo*, *Cortés* and *Herrero*, among others.

[20] This estimate is obtained through the comparison of the information contained in the Marriage License Books with the *Diccionario de Apellidos Españoles* (Faure 2001).

Almost all other surnames that are registered in the BHMD are identified as Catalan with no homonyms found in French, Occitan or Castilian, according to several onomastic dictionaries (Moll 1959, Bas-i-Vidal 1988, Moreu-Rey 1991, Coromines 1995, Albaigès 2005). This is the case with surnames such as *Vendrell, Manresa, Figueres, Mataró, Martorell, Girona, Vilaplana* and *Perelló.*

Catalan Surname Classification Through Cluster Analysis

The large number of homonymic surnames, as already presented above, makes it necessary to formulate complementary and independent classifications of the linguistic origin of surnames in order to understand completely the evolution of Catalan onomastics. Thus, cluster analysis has provided the opportunity to configure a categorisation of surnames that can be classified hierarchically according to the degree of uniqueness of each one. This division into subgroups can go from the individual or the surname (2,248 cases) level up to two groups. However, in this paper, after several tests,[21] only a three-group cluster classification is presented. This hierarchisation is selected for its explicative capacity and its simple organisation.[22]

The first of the three major clusters mentioned, which has been designed Group A, consists of 724 different surnames (29.6% of the cases), which represent 155,455 individuals (34.2%) in total. Some of the surnames that form this group are: *Ferrer, Serra, Puig, Soler, Sala, Riera, Bosch, Duran, Roig, Garau, Coll, Plana, Torrent, Oliver, Gener, Pasqual, Colomer, Ros, Bertran, Figuera, Rossell, Oller, Sabater, Llobet, Mateu, Gil, Vilar, Ferran, Miquel, Miró, Bonet, Vendrell, Lledó, Llorenç, Trilla, Borrell, Roure, Raimon, Nadal, Mallol, Torrella, Mir, Dalmau, Bofill, Palau, Joan, Gelabert, Pujada, March, Cerdà, Oliva, Fuster, Marquès, Cardona, Navarro, Arnal, Moragues, Ribera, Nicolau, Galceran, Gual, Rei, Verdaguer, Alemany, Bassa, Guardiola, Canyelles, Salvador,Vilanova, Segarra, Balaguer, Benet, Pedrós, Català, Martorell, Piquer, Huguet, Ferrera, Quintana, Major, Pont, Perellada, Vilardell, Messaguer, Vicenç, Rabassa, Roure, Castelló, Jordà, Montmany, Terrer, Campderrós, Morell, Febrer, Ametller, Sastre, Agustí, Colom, Aguilar, Pellisser, Castellar* and *David*.

The second, Group B, is formed of surnames such as: *Font, Vidal, Ponç, Carrera, Batlle, Abadia, Camp, Amat, Esteve, Garriga, Busquets, Vinyals, Anglada, Bruguer, Andreu, Verger, Calbet, Gibert, Romeu, Guitard, Teixidor, Noguera, Porta, Morera, Oms, Maure, Ricard, Bover, Burnet, Masó, Cassany, Gallard, Barceló, Fontanet, Bartra, Lleonard, Rigal, Mongells, Arús, Brú, Galí, Gurí, Jofre, Forcada, Subirachs, Blanchart, Borruell, Guinard, Bonanat, Giol, Reinalt, Fages, Oriach, Gorgui, Constans, Mallola, Turó, Gai, Forest, Reiner, Francí, Sangés, Fontanilles, Darder, Bolart, Massacs, Albanell, Riambau, Domenjo, Guimerà, Bigorra, Borgunyó, Fontana, Viura, Pereta, Albi, Bastida, Brell, Condal, Prous, Bruna, Jolís, Catlla, Grimalt, Comba, Verdú, Montclús, Colet, Llemosí, Sauleda, Dunyó, Gastó, Maurici, Crusat, Jaumira, Llauder, Avellaneda, Salvanya* and *Arbona*. This group comprises 369 different surnames (15.1%) and 71,790 individuals (15.9%).

Finally, Group C is the most diverse and numerous of all. There are 1,355 different surnames (55.3%) representing 226,666 individuals (49.9%) composed of surnames like:

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[21] In order to identify which hierarchisation of surnames is the most explicative and easily understandable, several cluster classifications have been analysed (clusters of 15, 9, 7, 5, 3 and 2 groups respectively).

[22] For each observed period (1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900): Group A: Average 0.87, 0.78, 0.61, 0.52, 0.48, 0.44, 0.42, 0.42, 0.43; Standard Deviation 1.70, 1.52, 1.31, 1.18, 1.18, 1.08, 1.06, 1.02, 0.99; Group B: Average 0.31, 0.36, 0.59, 0.67, 0.52, 0.42, 0.40, 0.37, 0.35 Standard Deviation 0.81, 0.86, 1.14, 1.21, 1.11, 0.91, 0.89, 0.85, 0.76; Group C: Average 0.18, 0.21, 0.24, 0.27, 0.33, 0.38, 0.39, 0.41, 0.40; Standard Deviation 0.67, 0.70, 0.73, 0.77, 0.85, 0.86, 0.87, 0.87, 0.84.

Martí, Vila, Valls, Mas, Roca, Torres, Prats, Rovira, Pujol, Ribes, Cases, Costa, Casanoves, Comes, Carbonell, García, Pi, Pagès, Julià, Domènech, Solà, Canals, Rius, Alzina Moliner, Mates, Castell, Sanç, Ventura, Pla, Fàbrega, Martínez, Codina, Artiga, Pérez, Armengol, Fernández, Pou, Simó, Amigó, Perer, Rodríguez, González, Llobera, López, Cortés, Feliu, Olivera, Borràs, Capdevila, Tomas, Petit, Creu, Llopart, Domingo, Elias, Muntaner, Obac, Tort, Abril, Cabot, Eimerich, Berenguer, Gomez, Rodó, Comella, Jover, Torner, Montserrat, Llopis, Güell, Iglesias, Robert, Isern, Sánchez, Faura, Lluc, Margarit, Sunyol, Irla, Reventós, Rosselló, Ramoneda, Baró, Claramunt, Ximenes, Cirera, Marcet, Bellver, Escuder, Miralles, Munt, Saladrigas, Romagosa, Piera, Albereda, Enric, Subirana, Marçal and *Padró*.

Cluster Classification and Its Relation to Migration Processes

If the evolution of these three clusters of surnames is related to the time of arrival of the migratory waves from France and the rest of Spain, certain complementarities can be observed (Figures 2 and 3).
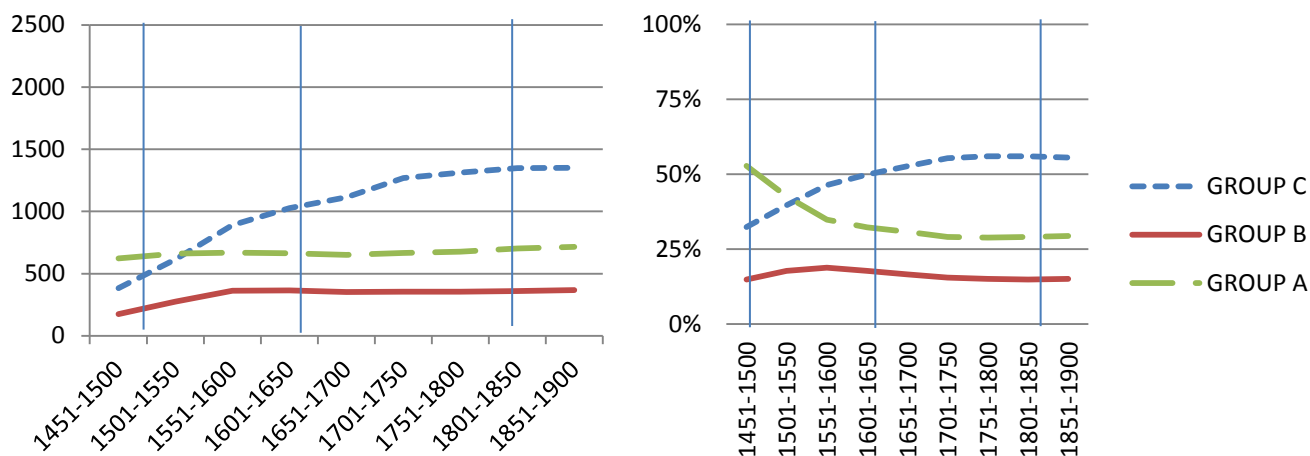

Fig. 18. Surname classification through cluster analysis: number of surnames
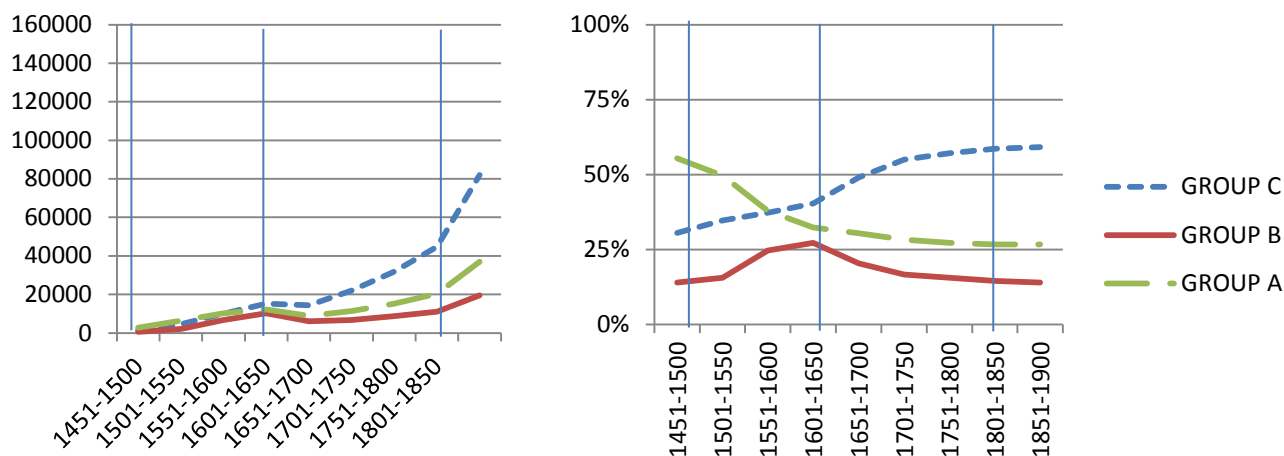
Fig. 19. Surname classification through cluster analysis: number of individuals.

Group A – which is distinguished by surnames already existing in the Barcelona area from the mid-15th century – is characterised by a continuous decline over time: in the period 1451-1500, this group represents over 50% of surnames and registered individuals. However, from 1851-1900, it represents only just over 25% (Figures 2 and 3). This pattern could suggest that it is formed of surnames which were little influenced by the migrations of the Modern and Contemporary eras.[23]

In contrast, the evolution of Group B is characterised by an irregular distribution of the number of individuals over time (Figures 3 and 4). This group represents around 25% of the couples recorded in the Marriage License Books throughout the 17th century, while in other periods they add up to only 15% (Figures 2 and 3). This calendar coincides with the period of the highest level of French immigration, suggesting that many of the French immigrants of the 16th and 17th centuries had carried surnames that belong to Group B.

Finally Group C is characterised by constant growth in the number of surnames and individuals registered between the 15th and 19th centuries, especially after 1850, coming to represent over 50% of surnames registered in the Marriage License Books from that time onwards (Figures 2 and 3). These results suggest that this group is composed of surnames introduced in the Barcelona area by continuous migration flows, and by immigrants who settled in Catalonia from the second half of the 19th century, like the Spanish migration wave.

Its Relation to the Origins of Surnames

Group trends are confirmed if the classification made by the cluster analysis is linked to a linguistic classification of the same surnames. Thus each group of surnames that emerged from the cluster analysis was studied to find how many of them can be classified as 'Catalan',

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[23] Population flows could have introduced surnames from outside Group A throughout time in the Barcelona area, causing a continuous decline in the relative weight of this group.

'French or Occitan' and 'Castilian' according to different onomastic dictionaries (Moll 1959, Bas-i-Vidal 1988, Moreu-Rey 1991, Coromines 1995, Albaigès 2005) (Table 4).[24]

GROUP	CATALAN	FRENCH/ OCCIT.	CASTILIAN		CATALAN	FRENCH/ OCCIT.	CASTILIAN
A	705	493	10		97.4%	68.1%	0.4%
B	333	286	27		90.6%	77.5%	1.1%
C	1120	633	181		82.7%	46.7%	7.4%

Table 4. Catalan surnames classified by cluster aggregation and linguistic origin

Although in all cases surnames considered to be Catalan are in the majority and all groups have a large number of surnames that could also be considered as originating from the Kingdom of France (Table 4), Group A is the one characterised by the highest percentage of surnames considered to be Catalan according to linguistic criteria (97.4%); in parallel Group B consists of a large number of surnames that might have been introduced by French immigration (77.5%); and Group C, in relative terms, has the highest percentage of Castilian surnames (7.4%) and the lowest number of French and Occitan surnames (46.7%). These results suggest that different immigration waves have made this last cluster. Therefore this group could be formed by surnames and individuals who have been influenced by the Spanish immigration of the 19th century as well as by Catalan surnames with little relation in relative terms to French immigration, which would suggest that they were immigrants from the rest of Catalonia who were not affected by the French migration wave of the 16th and 17th centuries (like the rural migration to the Barcelona area).

Discussion

This study has shown how the interrelations between Catalan, Occitan, French and Castilian have conditioned the evolution of surnames collected in the Marriage License Books during the Modern and Contemporary eras. Immigration from France, then from the rest of Spain has enriched Catalan onomastics by introducing new forms of surnames. This influence by migratory flows, together with the relatively high number of homonymic surnames and the absence of a standardised onomastics, make it necessary to develop new avenues of study. For this purpose, this research has presented a first approach to an alternative classification of surnames based on cluster analysis, seeking to complement onomastic studies.

Consequently the cluster analysis performed helps us to visualise certain trends that identify similarities between surnames independently from linguistic and historical origins. Thus from the classification generated it has been observed that surnames considered to be Catalan from linguistic criteria are the majority in all groups. Similarly, it has also been found that a significant number of them may have been introduced or (re)introduced by French immigration during the 16th and 17th centuries. If we analyse each group in detail, it can be seen that Group A has the highest number of Catalan surnames, Group B has the highest

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[24] The sum of percentages for each group does not necessarily add up to 100% because surnames could have two or more different linguistic origins.

percentage of surnames borne by foreigners, and Group C, the most heterogeneous of all, comprises the largest number of Castilian surnames and the smallest number, in relative terms, of surnames influenced by French immigration. These hypotheses are corroborated by the evolution over time of each group, which coincided with the major immigration periods. It should be noted that these results do not show that each cluster is formed solely by Catalan, French and Spanish surnames respectively, but rather finds three main frequency patterns where all surnames in the Barcelona area can be classified.

Cluster analysis has definitely proven to be a useful tool, providing substantial complementary information about the complex evolution of Catalan onomastics between the 15th and 20th centuries. However it remains for future research to deepen the classification of surnames from cluster analysis by introducing new variables to create them. In this study we used the GR between periods for the classification of surnames, but this could be complemented by other measures such as the relative frequency or the total number of surnames. Further study would allow us to corroborate and complement the proposed classification of Catalan surnames presented in this study.

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