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Forenames and Surnames in Spain in 2004

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This paper quantifies the corpus of forenames and surnames in Spain in 2004 using the telephone directory. It describes their frequency patterns, major measurable characteristics, and gives some geographical distributions, international comparisons, and historical explanations. The research presented here is set in a context of a broader study of the quantitative properties of the corpus of personal names in several countries undertaken by Tucker. Amongst the most significant findings are a much more highly skewed distribution towards the most popular surnames than in other countries, the permanence of language regions since the Middle Ages, and important differences in top Hispanic names frequencies between five countries across the Atlantic. It is also suggested that the innovative techniques presented here, combining geographical and statistical analysis of names and their language of origin, opens up enormous possibilities for multidisciplinary work on onomastics.

Introduction

The aim of this paper is to quantify the corpus of forenames and surnames in Spain in 2004 using a broad population register such as the telephone directory. It describes their frequency patterns, major measurable characteristics, and gives some geographical distributions and historical explanations. The paper does not seek to provide a history of forename and surname development in Spain and readers may like to read Kremer's brief review (Kremer, 2003). However, in order to understand some of the processes presented here, we need to describe a few major distinctive features of the historic linguistic context and naming conventions in the Iberian Peninsula.

Surnames started to be used in Spain in the tenth century and were well established by the twelfth century (Kremer, 2003), mainly as patronyms that changed with each generation, although they gradually became inherited surnames between the thirteenth and the fifteenth centuries (Faure et al., 2001). Surnames were introduced as a consequence of the reduction in the number of forenames in the Middle Ages,

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and the need to identify people in legal documents. For example, in the tenth century a study found 1.3 people per forename, while a century later the same authors found 3 people per forename (Moll, 1982). This seemed to be due to the influence of religion, since most forenames were reduced to the most popular saints.

During these five centuries the Iberian Peninsula was settled by several population groups and languages, grouped into five more or less permanent kingdoms; four of them Christian and south-expanding: Galicia-Portugal, Castile-Leon, Basque Country-Navarre, and Aragon-Catalonia, and one Muslim and south-retreating: Al-Andalus. These groups spoke at least nine different languages (eight romance languages plus Basque Arabic) and, although only Castilian (Spanish), Catalan, Galician, Portuguese, and Basque survive today, all have left traces in the surnames found in the Iberian Peninsula. To these we can add surnames from non-Romance languages, Iberic and Germanic, previously spoken in the peninsula, Jewish surnames, and surnames brought from the native languages of former colonies in Latin America and the Philippines, for example: *Moztezuma* (Tibón, 2001).

With the growing expansion of Castile since the fourteenth and fifteenth centuries, and the political unification from the beginning of the sixteenth century of what now territorially constitutes Spain, the Castilian language, currently also known as Spanish, was imposed to all other kingdoms. Therefore, Castilianization of personal names over several centuries makes it difficult to ascribe all surnames to their original language and form (Kremer, 2003). Castilianization was combined with Christianization, enforced by the Spanish Inquisition since the sixteenth century, that forced many people change their Arab, Jewish, or 'foreign-sounding' surnames to a mainstream Castilian one to avoid persecution. Some of the new Castilian surnames were adopted so frequently by religious converts that they have been identified as typical 'convert surnames'; these are amongst the most frequent surnames found today, as it will be explained later.

History has left a rich and diverse cultural sediment present in today's place names and personal names in all of the twenty-one Spanish speaking countries. However, this paper is concerned only with the personal names of contemporary Spain. For simplicity we will use the overarching term of 'Spanish names' for these forenames and surnames.

The Spanish custom to use two surnames (father's and mother's surnames, see next section) seems to have started around the sixteenth century. According to Faure (2001) this was because the use of two surnames was associated with aristocratic families, and hence it became very fashionable amongst the popular classes or the upcoming bourgeois. In the sixteenth century those with a nobiliary title or their descendants did not have to pay taxes, and many people tried to claim they had aristocratic ancestors (the group of dispossessed 'nobles', known as 'hidalgos', was huge in the seventeenth century, and they were all registered due to tax exception reasons; '*Padrón de Hidalguía*'). Therefore, as Spain went into economic decline in the seventeenth century, it seems to have been important to keep both paternal and maternal surnames to identify individuals who might have some sort of 'nobiliary rights' or just to distinguish themselves from the most common surnames. This explanation is similar to that of using double-barrel names in the Anglo-Saxon naming system, of which there are also many examples with combination of Spanish most popular surnames.

Finally, in the nineteenth century this custom was institutionalized through a Civil Registration Act (1870) which made it mandatory to register births and always use two hereditary surnames, both father's and mother's surname. The act also forbade any change in the spelling of one's family name (Kremer, 2003). This made sure that paternity and maternity of a child was always clear, as well as to identify brothers and sisters of the same marriage. This had important implications in legal issues, for example in hereditary disputes. This was also the time when Spanish surnames were given to all the population of Philippines, then a Spanish colony, together with Cuba and Puerto Rico, before the 1898 war with the US. Today most people in Philippines carry Spanish names, although only 3,000 people speak Spanish in a country of 89 million people (CIA World Fact book).

The 1870 Act stopped the process of Castilianization of surnames, but that of forenames has continued, and was specially reinforced during the Franco dictatorship, when Castilian was the only official language. The restoration of democracy in 1975 has brought back into official records the Galician, Catalan, and Basque given name that many citizens were given at birth. The forty-year dictatorship had also a high impact on the surnames that migrated to Latin America from Spain as people emigrated to escape persecution. A high proportion of Catalan and Basque distinct surnames occur among these emigrants.

Finally, the return to democracy and the economic expansion in the last twenty years has seen Spain shift from a net emigrant country in the 1960s and 1970s to being now the country with the highest rate of immigration in Europe (in 2005 the population grew by 2.1%, due to immigration, and in the period 2001-2006 by 9%) (Instituto Nacional de Estadística, 2006). This process has brought surnames from all over the world to the Iberian Peninsula, especially to the major cities and the Mediterranean coast and the islands.

Most striking is the surge of rare Spanish surnames noticed in many population registers of Spanish cities (Instituto de Estadística de la Comunidad de Madrid, 2006), some of which were previously extinct in the peninsula (e.g., Simbaña, Armijos). These are surnames brought back from Latin American countries in a return journey after five hundred years, having been preserved and disseminated across the Atlantic, closing a cycle of worldwide population migration and mixture. This is a fascinating journey that we are only starting to discover today by analyzing surname frequencies.

Main features of the Spanish naming system

Spanish surname structure

To an Anglophone, Spanish surnames look quite complicated, as most Spaniards, and people from Spanish-speaking countries, have two surnames. The nearest equivalent in the Anglophone world would be the hyphenated name such as Smith-Jones.

When a Spanish child is born it usually inherits as its first surname its father's first surname, and as its second surname its mother's first surname. For example, say the father's names, in the *Forename-1st Surname-2nd Surname* pattern is:

Esteban Martínez Muñoz

And his wife's name using the same pattern is

Pilar Ortiz Molina

Say they have a child and give her the forename *Ana*. Then her name using the same pattern would be

Ana Martínez Ortiz

If they had another child, and called him José, then his name would be:

José Martínez Ortiz

In this example the children have the same surnames, but the mother and father have surnames that differ from each other and those of their children. For married couples, the tradition is not to change any surname, so groom and bride keep their three-component birth name. Every child will inherit the father's first surname and the mother's first surname, usually in that order, although the order can be now changed.

Spanish surnames are thus patrilinearly inherited, as are the Anglo-Saxon ones, but it takes two generations to lose surnames in the matrilineal linage, rather than just one in the Anglo-Saxon system. The advantage of the Spanish system is that one can trace a person to both of his or her parents, which helps researchers in different applications, such as in historic record linkage, as well as pedigree reconstruction in genetic research (Rodríguez-Larralde et al., 2003).

For practical purposes, most people in Spanish-speaking countries just use their forename and first surname: for example, *Pablo Mateos*, and they only use the full name in official documents or formal situations. Therefore, the second surname is used to avoid potential confusions when the purpose of uniquely identifying a person is important (e.g., Pablo Mateos Rodríguez), just as the 'middle name' (usually the second forename) is used in the Anglo-Saxon system: for example, George William Bush vs. George Bush).

Other features of Spanish names

The most prominent feature of Spanish surnames is the presence of the ending '*-ez*', which dominates most surnames, with fourteen out of the top twenty most frequent surnames ending in '*-ez*' or its derivatives. This ending is the patronymic form in old Castilian, and it was attached to the forename of the father (e.g., *Fernández* was the son of *Fernando*). A variation of this ending in Galician and Portuguese is '*-es*', which commonly serves to distinguish the origin of names between languages. However, name corruptions between '-ez' and '-es' endings, in both directions, are frequent in Spanish-speaking Latin America and even more in the US (e.g., *Hernandes* instead of *Hernandez*, or *Valdez* or *Cortez* instead of *Valdes* or *Cortes*) since the letters 's' and 'z' are pronounced exactly the same in Latin America and the south of Spain. Hispanic surnames of this form in the US, other than a minority of Portuguese origin, are Anglicizations of the ending '-ez' into an '-es'.

Another important feature of Spanish names is the high frequent of toponyms, which Faure et al. (2001) quantify as 58% of the surnames in their dictionary. Of these, a high proportion of toponyms come from Basque and Catalan place names (28% and 17% of the total surnames respectively), and while the former group's

surnames are still located mostly in the Basque country, the latter's are present in parts of the south of Spain, explained by major repopulation settlements in the south during the Middle Ages (Faure et al., 2001).

Quantitative analysis of forename and surname frequencies

The data for this article was sourced from the Spanish 2004 telephone directory. The data represents 11.8 million telephone lines with up to two surname fields and one forename field; some entries had only one surname. Although the telephone directory contained 12.6 million residential telephone lines, 0.8 million opted out of the public version, which could introduce a small bias in this analysis. Assuming one person for every telephone line and given the Spanish population in 2004 to be 43.2 million (Instituto Nacional de Estadistica, 2006), the data represents about one entry for every 3.6 people, which is typical for telephone data, and represents a reasonable sample of over 27%.

The data was presented in either all upper-case, or in lower-case with upper-case initial letters, as in *MÁRIA DEL CARMEN* and *Mária Del Carmen*; all data was converted to the latter format.

The analysis follows the pattern established in Tucker (2001, 2002, and 2007) for other national distributions of surnames and forenames. The top hundred forenames and surnames are listed. Graphs of percentage of population against percentage of names and population against occupied frequency for both surnames and forenames are given.

Spanish forenames

There were no gender indicators in the forename data and the assigned indicators for only the top hundred forenames have been added here. Table 1 gives the list of the top hundred forenames by count, with count, rank, and gender (F/M). The top eight forenames are masculine, and overall 64% of the names and 75.3% of the telephone subscribers in the top hundred forenames are masculine, which is common for such tables drawn from telephone data.

Graph 1 shows the plot of percentage the population against percentage of forenames. This graph is typical for national distributions of forenames.

Graph 2 shows the population against occupied frequency for forenames. As there is no sex tag in the data supplied, the graphs are for males and females combined. The forename occupied frequency graph exhibits the same shape and distortion of the First Quasi-Line (from $x = 6$ to about $x = 160$) as seen in the UK Electoral Roll graphs (Tucker, 2007). The overall form, however, is exactly as expected and shows a clear Zipfian distribution following a power law (Zipf, 1949).

Spanish surnames

In this paper the two surnames will be analyzed as individual surnames as with any other country but, additionally, the surnames in the *first surname* group will be compared with those of the *second surname* group to see what differences there are,

TABLE 1

TOP HUNDRED SPANISH FORENAMES BY RANK

Name	Count	Rank	F-M	Name	Count	Rank	F-M
Jose	444066	1	M	Pilar	51501	33	F
Antonio	388249	2	M	Andres	50179	34	M
Manuel	338917	3	M	Maria Dolores	47544	35	F
Francisco	306218	4	M	Santiago	46720	36	M
Juan	214048	5	M	Maria Teresa	46412	37	F
Pedro	129133	6	M	Emilio	46399	38	M
Jose Luis	128727	7	M	Javier	45559	39	M
Jesus	127249	8	M	Julian	44809	40	M
Maria	126576	9	F	Concepcion	44753	41	F
Carmen	118138	10	F	Juan Antonio	44339	42	M
Angel	114272	11	M	Julio	41148	43	M
Luis	112671	12	M	Ana Maria	40855	44	F
Miguel	109741	13	M	Ana	40782	45	F
Rafael	108028	14	M	Felix	40119	46	M
Jose Antonio	105790	15	M	Alfonso	40057	47	M
Jose Maria	100548	16	M	Juan Carlos	39600	48	M
Maria Del Carmen	90275	17	F	Salvador	39387	49	M
Fernando	86526	18	M	Maria Luisa	39121	50	F
Vicente	82888	19	M	Mercedes	39009	51	F
Josefa	79591	20	F	Tomas	38489	52	M
Jose Manuel	72161	21	M	Eduardo	36905	53	M
Ramon	70488	22	M	Agustin	36895	54	M
Carlos	69212	23	M	Manuela	35730	55	F
Isabel	65053	24	F	Mariano	34820	56	M
Francisco Javier	64296	25	M	Juana	34698	57	F
Joaquin	62078	26	M	Rosario	34685	58	F
Enrique	60917	27	M	Teresa	34443	59	F
Dolores	59775	28	F	Ricardo	34080	60	M
Francisca	57883	29	F	Pablo	32545	61	M
Antonia	55705	30	F	Alberto	32308	62	M
Miguel Angel	53394	31	M	Juan Manuel	31417	63	M
Juan Jose	52305	32	M	Domingo	31314	64	M

TABLE 1 (*Continued*)

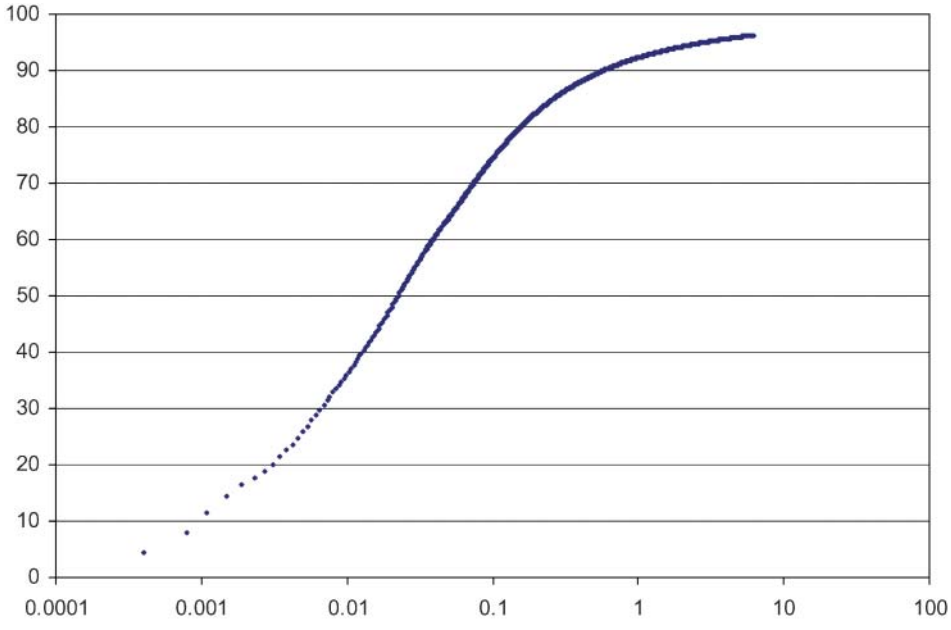
Name	Count	Rank	F-M	Name	Count	Rank	F-M
Jaime	31090	65	M	Maria Pilar	22275	83	F
Maria Jose	30201	66	F	Alfredo	22261	84	M
Rosa	30119	67	F	Julia	21908	85	F
Maria Isabel	29595	68	F	Maria Del Pilar	21270	86	F
Encarnacion	29090	69	F	Rosa Maria	21230	87	F
Ignacio	28080	70	M	Sebastian	20690	88	M
Diego	27950	71	M	Amparo	20478	89	F
Maria Jesus	26556	72	F	Eugenio	20342	90	M
Gregorio	26525	73	M	Gabriel	20104	91	M
Alejandro	26158	74	M	Lorenzo	19731	92	M
Felipe	25154	75	M	Roberto	19575	93	M
Daniel	24910	76	M	Maria Carmen	18530	94	F
David	24799	77	M	Elena	18013	95	F
Maria Angeles	24269	78	F	Consuelo	17992	96	F
Margarita	24039	79	F	Jose Miguel	17586	97	M
Jose Ramon	23840	80	M	Guillermo	17157	98	M
Jorge	22717	81	M	Victor	17064	99	M
Angeles	22427	82	F	Francisco Jose	17014	100	M

if any. For convenience we will call the first group of surnames *surname1* and the second group *surname2*.

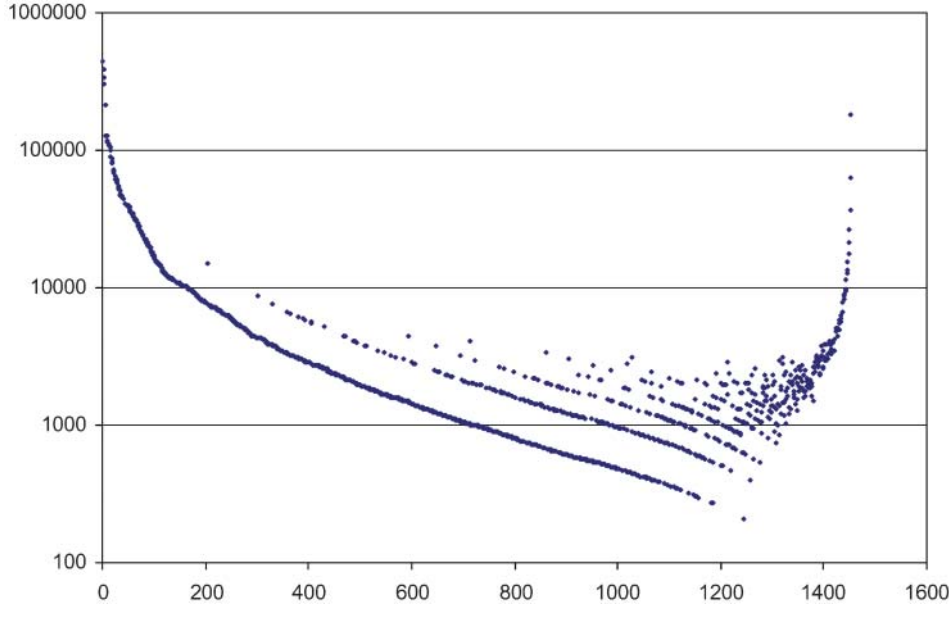
Table 2 lists the top hundred surnames in the *first surname* group, including count and rank, by ascending rank order. The equivalent table for the *second surname* group is virtually a carbon copy of the first and not much would be added by reproducing it here. Rather, the difference in rank of the *second surname* group is included in Table 2. The first eighteen entries are identical; *Romero* is ranked nineteenth in the first surname group; in the second surname group it is ranked nineteenth minus the difference which is $19-(-1) = 20$th. Likewise *Gutiérrez* is ranked in the second surname group $20-(+1) = 19$th.

It is not surprising that the distributions for the first surname group and second surname group are very similar as both are drawn from the same population group. There are some differences between the two groups as 347,895 (2.9%) people in the telephone directory do not have two surnames, but just one, which is usually surname1. This occurs with foreign persons of non-Spanish-speaking countries, due to privacy protection attitudes of certain subscribers, or just because of errors in the data collection process.

Table 3 lists the top hundred surnames, counted by rank regardless whether the surname was used in the first or second surname position. The first twenty-five are



GRAPH 1 Percentage population against percentage of forenames (logarithmic scale)



GRAPH 2 Population against occupied frequency for forenames

TABLE 2

THE TOP HUNDRED SURNAMES IN THE FIRST POSITION

Surname	Count	Rank	Difference	Surname	Count	Rank	Difference
Garcia	404150	1	0.0	Molina	30201	33	–8.0
Fernandez	249983	2	0.0	Ramirez	29846	34	–3.0
Gonzalez	248769	3	0.0	Rubio	29748	35	–1.0
Rodriguez	241057	4	0.0	Morales	29581	36	–2.0
Lopez	233814	5	0.0	Delgado	29502	37	2.0
Martinez	224887	6	0.0	Ortiz	26249	38	–7.0
Sanchez	216267	7	0.0	Marin	25496	39	–9.0
Perez	209572	8	0.0	Iglesias	24271	40	–7.0
Martin	139762	9	0.0	Santos	22824	41	–9.0
Gomez	130565	10	0.0	Garrido	22436	42	–7.0
Ruiz	96419	11	0.0	Castillo	22243	43	–15.0
Hernandez	91153	12	0.0	Núñez	22134	44	–7.0
Jimenez	91148	13	0.0	Calvo	21295	45	–7.0
Diaz	88011	14	0.0	Prieto	21069	46	–8.0
Alvarez	80681	15	0.0	Lozano	20925	47	–8.0
Moreno	79530	16	0.0	Cruz	20415	48	–20.0
Muñoz	73569	17	0.0	Medina	20309	49	–7.0
Alonso	59837	18	0.0	Vidal	20285	50	–11.0
Romero	52728	19	–1.0	Diez	20095	51	–2.0
Gutierrez	51601	20	1.0	Cano	19843	52	–5.0
Navarro	46638	21	–1.0	Gallego	19347	53	–6.0
Torres	41576	22	–3.0	Pascual	18916	54	–12.0
Dominguez	40779	23	0.0	Peña	18859	55	–7.0
Gil	40038	24	–2.0	Guerrero	18715	56	–4.0
Vazquez	38892	25	1.0	Vega	18067	57	–8.0
Ramos	37091	26	–1.0	Herrero	17875	58	–6.0
Serrano	36863	27	–1.0	Mendez	17842	59	–4.0
Blanco	35318	28	–1.0	Leon	17742	60	–7.0
Sanz	31671	29	–4.0	Ferrer	17595	61	–22.0
Suarez	31040	30	–1.0	Nieto	16628	62	–7.0
Ortega	31038	31	–3.0	Fuentes	16475	63	–7.0
Castro	30290	32	–7.0	Marquez	16281	64	–15.0

TABLE 2 (*Continued*)

Surname	Count	Rank	Difference	Surname	Count	Rank	Difference
Cortes	16172	65	–12.0	Flores	13633	83	–11.0
Ibañez	16080	66	–15.0	Saez	13498	84	–5.0
Campos	16032	67	–9.0	Mora	13430	85	–13.0
Vicente	15941	68	–10.0	Arias	13216	86	–5.0
Carrasco	15885	69	–11.0	Velasco	13029	87	–5.0
Herrera	15849	70	–1.0	Santana	12585	88	4.0
Caballero	15787	71	–4.0	Andres	12498	89	–16.0
Cabrera	15575	72	–2.0	Marti	12325	90	–55.0
Montero	15213	73	–9.0	Reyes	12294	91	–13.0
Lorenzo	15053	74	1.0	Merino	12289	92	–7.0
Esteban	14486	75	–10.0	Moya	12202	93	–16.0
Aguilar	14481	76	–17.0	Izquierdo	12138	94	–8.0
Gimenez	14369	77	–23.0	Carmona	11998	95	–16.0
Crespo	14180	78	–10.0	Bravo	11986	96	–1.0
Soler	14179	79	–43.0	Casado	11900	97	–18.0
Hidalgo	14153	80	–7.0	Pardo	11703	98	–10.0
Pastor	14082	81	–9.0	Soto	11700	99	–15.0
Duran	13847	82	–14.0	Miguel	11614	100	–32.0

identical to Table 1 and as expected there is very little difference between the two tables, and all one hundred are Spanish surnames. *Garcia* is the most popular surname by far (6.8% of the population bear it as either surname1 or surname2). Its etymological origin comes from the patronym *Garcia*, which has not been used as a forename since the sixteenth century, but it must have been a very popular forename in Spain during the Middle Ages (Faure et al., 2001)

Graph 3 shows the plot of percentage of the population against the logarithm of percentage of surnames in either position. The graphs, not shown, for the first position surnames and that of the second position surnames are virtually identical and closely mirror that of Graph 3. They run slightly below that of Graph 3: at 0.1% of the surnames in the first position the plot is about 50% of the population, whereas we will see that the combined plot is at 55%. Of course all graphs axiomatically reach the 100,100 point.

This graph is not quite typical for national distributions of surnames; particularly the bulge between 0.001% and 0.01% of surnames. The 1997 UK Electoral Roll (Tucker, 2003) has a more typical 'S' curve also observed for the US, Canadian, and UK surnames distributions. Table 4 shows a rough comparison between the UK plot and that of the Spanish Data.

TABLE 3

THE TOP HUNDRED SURNAMES IN EITHER POSITION

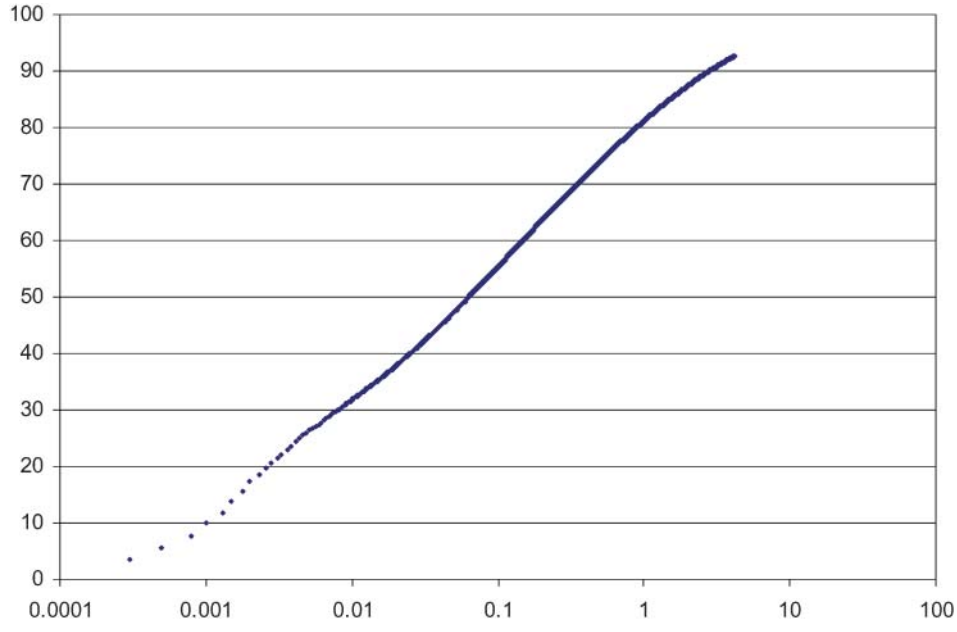
Surname	Count	Rank	Surname	Count	Rank
Garcia	813257	1	Rubio	59458	33
Fernandez	503142	2	Ramirez	59370	34
Gonzalez	499596	3	Delgado	59145	35
Rodriguez	482448	4	Morales	59034	36
Lopez	467681	5	Castro	58945	37
Martinez	449954	6	Ortiz	52792	38
Sanchez	433030	7	Marin	50412	39
Perez	421997	8	Iglesias	48321	40
Martin	278261	9	Garrido	45025	41
Gomez	261776	10	Santos	44190	42
Ruiz	193130	11	Nuñez	43931	43
Hernandez	182808	12	Calvo	42705	44
Jimenez	181206	13	Lozano	42088	45
Diaz	176485	14	Castillo	41944	46
Alvarez	161674	15	Prieto	41709	47
Moreno	158435	16	Diez	40607	48
Muñoz	145791	17	Medina	40575	49
Alonso	119004	18	Vidal	40211	50
Romero	105603	19	Cano	39535	51
Gutierrez	103776	20	Gallego	38130	52
Navarro	92302	21	Guerrero	37290	53
Torres	82578	22	Pascual	36976	54
Dominguez	81473	23	Cruz	36776	55
Gil	79895	24	Peña	36538	56
Vazquez	77755	25	Mendez	35490	57
Serrano	73552	26	Herrero	35020	58
Ramos	73544	27	Vega	34825	59
Blanco	69810	28	Ferrer	34815	60
Suarez	63257	29	Leon	34138	61
Sanz	62803	30	Nieto	32752	62
Ortega	61904	31	Fuentes	32670	63
Molina	60172	32	Cortes	32434	64

TABLE 3 (*Continued*)

Surname	Count	Rank	Surname	Count	Rank
Marquez	31973	65	Flores	27414	83
Campos	31882	66	Saez	27288	84
Caballero	31863	67	Arias	26803	85
Ibañez	31793	68	Mora	26267	86
Herrera	31534	69	Velasco	26172	87
Carrasco	31284	70	Santana	25689	88
Vicente	31163	71	Merino	24401	89
Cabrera	30876	72	Izquierdo	24329	90
Lorenzo	30112	73	Moya	24287	91
Montero	30085	74	Bravo	24234	92
Gimenez	29429	75	Reyes	24067	93
Esteban	28648	76	Carmona	24050	94
Hidalgo	28460	77	Marti	23914	95
Aguilar	28386	78	Andres	23895	96
Pastor	27921	79	Redondo	23542	97
Soler	27776	80	Pardo	23209	98
Crespo	27638	81	Vila	23162	99
Duran	27575	82	Casado	23062	100

The Spanish surname distribution is thus even more weighted to the popular surnames than that of the UK. Spanish society thus seeks comparatively more use of the popular surnames. This exception has been also found in a comparative study by Scapoli et al. (2007) who analyzed the surname frequency distributions of eight major European countries Austria, Belgium, France, Germany, Italy, Netherlands, Spain and Switzerland.

These authors found that the top eight most popular 'European surnames' are all Spanish, and there are thirty-nine Spanish surnames in the top hundred surnames of the countries studied, when its population only represents 13% of the study. This fact can be attributed to three major causes. The first one is the pattern of Christian repopulation of Spain since the early Middle Ages, from relatively small Christian communities in the north to a territorial expansion throughout the Iberian Peninsula and to America, thus expanding an originally small pool of local surnames. The second is the pressure of the Spanish Inquisition which forced Muslim and Jewish converts to adopt popular Castilian surnames (Faure et al., 2001), as well as the afore-mentioned Castilianization of other surnames. The third is a phenomenon of 'surname drift' (propagation of the same local popular surnames) that has not been counteracted by enough internal migration, and therefore a symptom of surname



GRAPH 3 Percentage population against percentage of surnames in either position

TABLE 4

PARTIAL COMPARISON OF THE SPANISH AND UK SURNAME PLOTS IN PERCENTAGES

Surnames	Population	
	Spain	UK
0.001	10	5
0.01	32	20
0.1	55	47
1.0	80	80

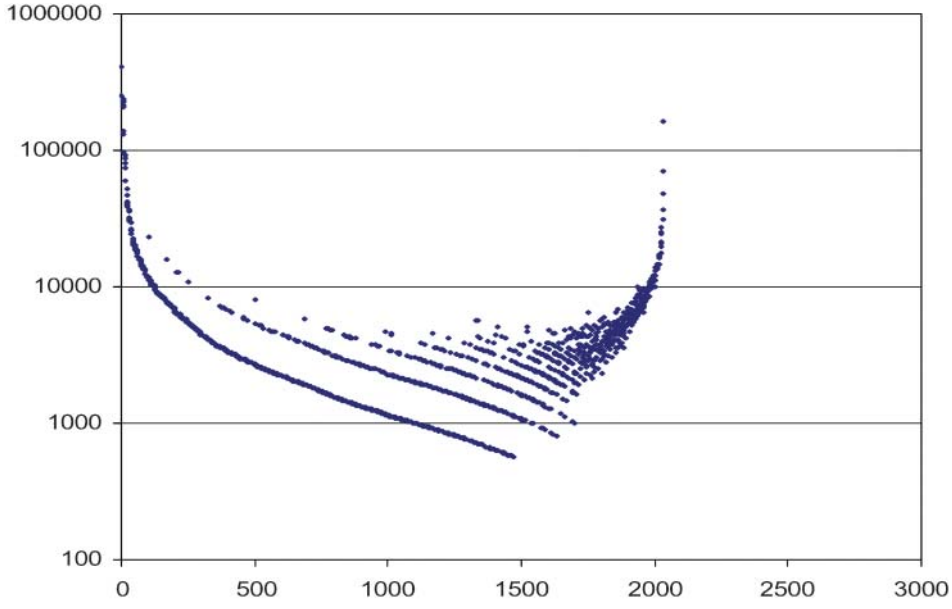
inbreeding in many areas (that is, a high frequency of marriages between the same surnames, also known as isonymy) (Scapoli et al., 2007).

Graph 4 shows the Population by Occupied Frequency of the Surname1; again, the same style graph for Surname2 is virtually identical and is not shown. Graph 5 shows the population by occupied frequency of the combined surnames.

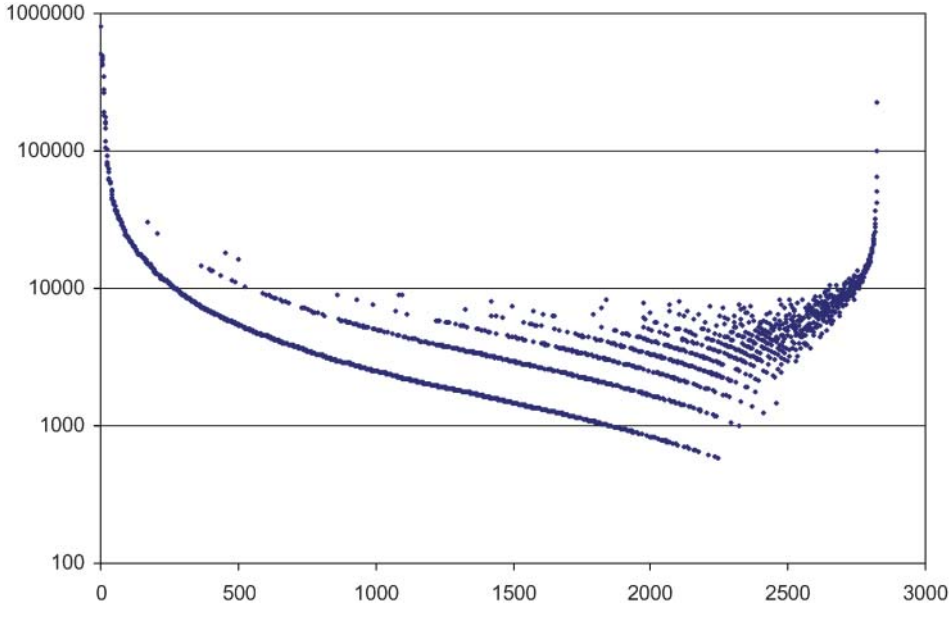
Both Graphs 4 and 5 are typical for national surname distributions and are clearly Zipfian.

The geographical distribution of surnames

The maps shown in Figure 1 show the geographical distribution of surnames in Spain according to their language region of origin; Basque, Catalan and Valencian,



GRAPH 4 Population against occupied frequency for surname1



GRAPH 5 Population against occupied frequency for the combined surnames

Galician, Castilian, and 'Other Spanish' which includes Spanish surnames with no particular regional or linguistic origin. The method to identify the language of origin for each Spanish surname is explained in Mateos (2006).The power of these five maps is that they summarize the history of the Middle Ages in Spain up to the sixteenth century, and how slowly those population patterns have evolved since then. The striking fact that one needs to remember is that these maps do not come from a historical atlas, but they have been built from the surnames frequencies of the Spanish 2004 telephone directory. The maps show the five quintiles of the frequencies of each of the surname categories by postal area, from 1 (lower quintile) to 5 (highest quintile).

The history of the four languages of Spain, their origins in the north third of the country and their southwards expansion are explained by these maps. The maps show the southwards expansion of Castilian from its core in the north-north-west, of Catalan from the north-east along the Mediterranean coast and islands (and south of Italy and Sardinia, should they also be on the map), the core of Galician language in the interior of Galicia (north-east) and onto Portugal (not seen on the map except for a few overspills along the border). They also show the uniqueness of Basque surnames and the relatively smaller interaction with their neighbors, a fact well studied in genetics (Cavalli-Sforza, 1997). Finally, a map of all other Spanish surnames reflects the inverse of the above maps, the repopulation of the southern half of Spain through the Middle Ages, the generation of new surnames, and the general spread of a much more mixed population that also went on to the Canary Islands (see map insets in Fig. 1), and beyond on to Latin America. The maps also show the areas where more population mix and interaction have occurred, especially during the twentieth century, eroding the 'bedrock' of local surnames established in Middle Ages. This is evident in the Catalonian coast and the province of Barcelona, leaving the highest incidence of Catalan surnames to the interior. A similar pattern is observed in the Balearic Islands, Valencia, and Galicia. This is the power of unveiling a sort of 'demographic geomorphology', deposited during nearly ten centuries, through the geography of contemporary surname frequencies.

International comparisons of Spanish names

Graph 6 shows a comparison of the frequencies of the top hundred surnames in five Spanish-speaking countries: Spain, Argentina, Mexico, Venezuela, and the US. The sources for these countries are as follows: *Spain*, the telephone directory featured in this paper; *Mexico*, a list of the top hundred surnames from the 2006 electoral roll, supplied to the authors by the Mexican Electoral Commission (Instituto Federal Electoral) under a Freedom of Information Act request; *Argentina*, hundred most frequent surnames from the 2001 electoral roll (Cámara Nacional Electoral) published in Dipierri (2005); *Venezuela*, a list of the forty most frequent surnames from the 1991 electoral roll (Consejo Supremo Electoral) published by Rodriguez-Larralde (2000); *US*, a list of surname frequency data from the 1990 Census published online (US Census, 2006).

There is a clear distinction between the slope of the frequency curves of Argentina and the US distributions, much less steep than those of the other three countries. This is explained by a much higher rate of surname immigration from different countries

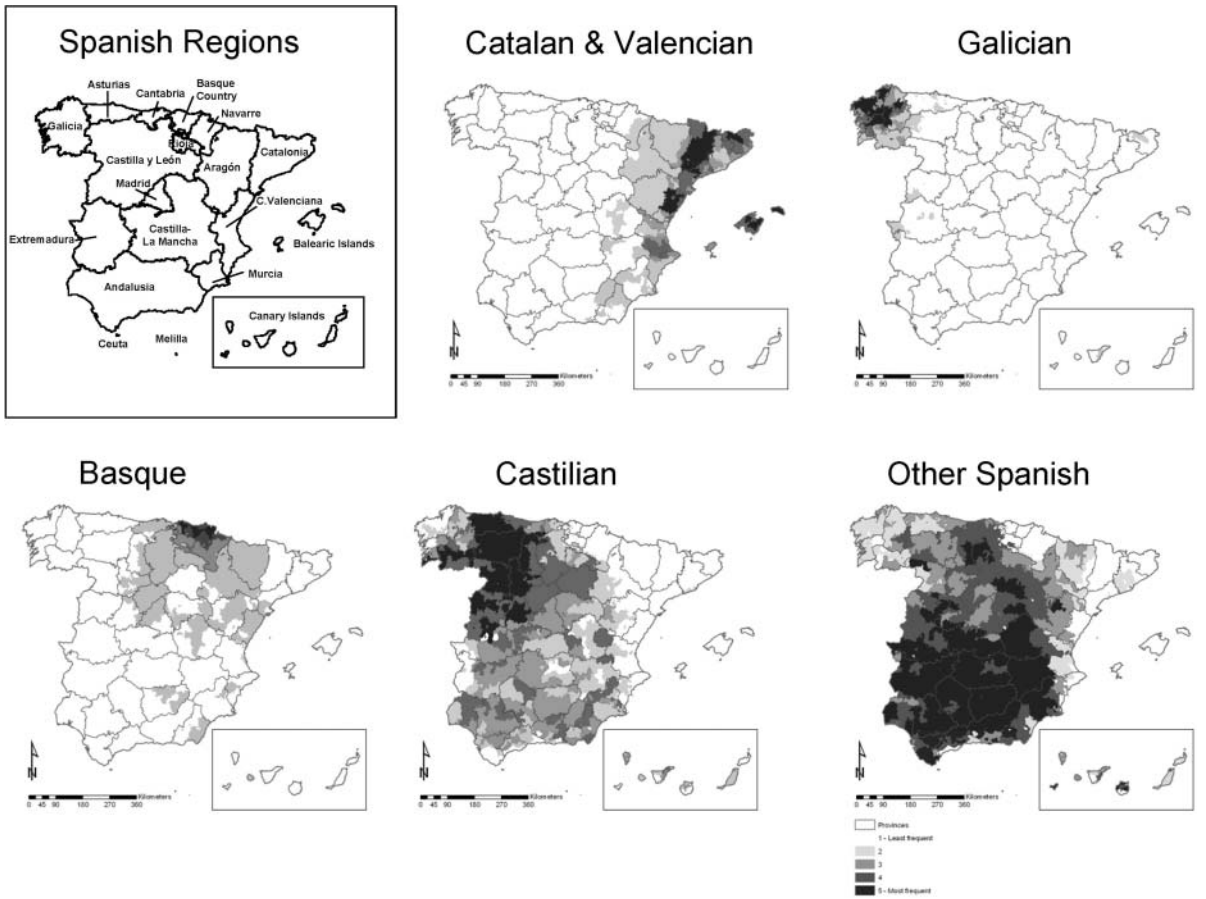
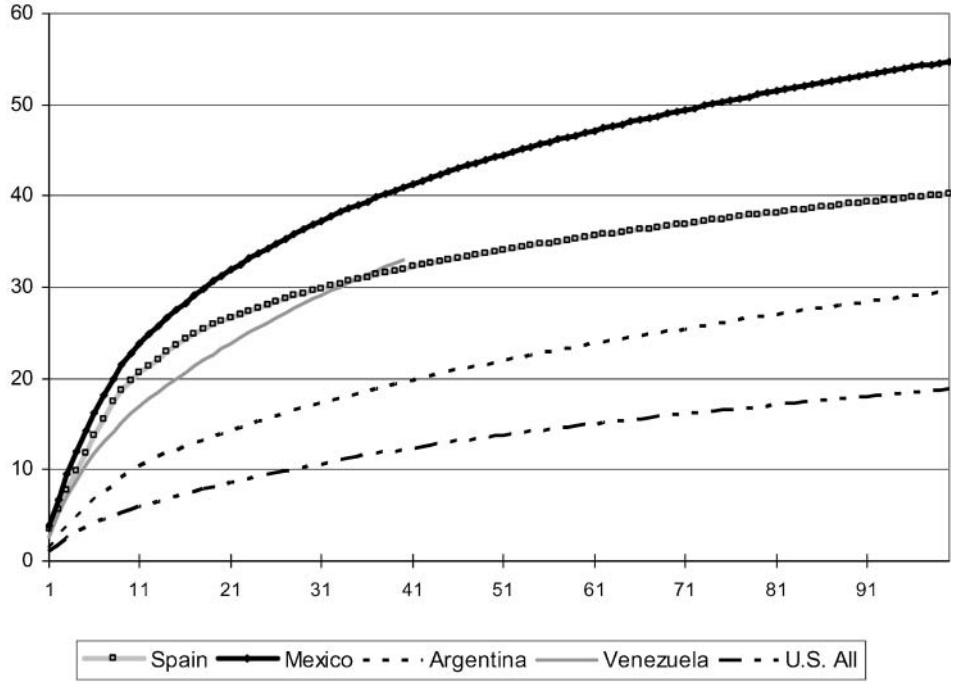


FIGURE 1 The distribution of Basque, Catalan and Valencian, Galician, Castilian, and 'other Spanish' surnames in Spain by postal area



GRAPH 6 The percentage population represented by the top 100 surnames in Spain, Mexico, Venezuela, Argentina, and the US

and languages to both countries, whereas Spain, Mexico, and Venezuela have not been substantially exposed to non-Spanish surnames. Secondly, the Mexican population is highly concentrated in a few surnames, 50% of them sharing just 74 surnames, and the top three surnames covering 9.5% (Hernández, García and Martínez). This must be due to the combined fact that a few surnames have been imposed to the pre-Hispanic population by the Spanish colonial army and the church (Hernández means the son of Hernán, the forename of the conqueror of Mexico; Hernán Cortés), and that a low internal migration rate and low intermarriage between ethnic and socio-economic groups have produced high surname drift (propagation of the same popular surnames).

The top US Hispanic surnames are not included in Graph 6, but if they were the line would run very close to the Mexican line. These data were derived from the list of Hispanic surnames and the overall surname frequency data from the 1990 Census published online (US Census, 2006). The close similarity between the Mexican and the US Hispanic surname distributions point to a high proportion of the Hispanic surnames in the US having come from Mexico rather than the rest of Latin America, plus a reflection of the population settlements in the south-western states prior to the 1848 US-Mexican border.

Summary

The characteristics of the forenames and surnames in Spain discussed in this paper can be summarized into a set of common features. The forename frequency

distribution of the contemporary population of Spain follows a similar pattern as that of other countries studied by Tucker. The literature seems to indicate this was not the case in the Middle Ages, with most of the population sharing just a small pool of religiously prescribed forenames, so there has been a phenomena of rapid expansion in the forenaming practices. The surname frequency distribution presents a unique pattern, with a much higher concentration of the population in the most popular surnames than that found in other countries, an anomaly that other authors have also found (Scapoli et al., 2007). This peculiar surname frequency distribution could be explained by three combined processes. First, the pattern of Christian repopulation of the Iberian Peninsula and population expansion since the early Middle Ages from a small pool of patronyms in the north. Secondly, due to an imposed process of name change, on the one side because of the pressure of the Spanish Inquisition against non-Christians, and on the other due to a process of Castilianization of surnames. Thirdly, a phenomenon of 'surname inbreeding', that is, a high frequency of marriages between the same surnames (also known as isonymy) not counteracted by migration in many areas. Amongst other features of Spanish names, the unique naming system of two surnames does not produce any substantial difference between the frequency distribution of parental and maternal surnames (both of them coming from males two generations up the genealogical chain), even when it better reflects both sexes in the population.

The exploratory geographical analysis of name groups classified by language of origin that has been presented here does indicate the clear potential of using the quantitative analysis of names' geographical distributions to unveil historic population settlement and migration processes. In this case it reveals the original language regions of Spain in the Middle Ages and how these cultural regions are still structuring how populations mix today within still very confined interaction areas. Finally, a comparison of the frequency distribution the top surnames in five Spanish-speaking countries shows that surnames are a good indicator of how different populations have settled and have mixed between countries, as well as how the naming practices imposed upon former colonies have impoverished the naming heritage of their populations.

In this paper we hope to have unveiled some of the 'quantitative secrets' of Spanish names. Through the set of techniques presented here, we also aimed to introduce to the onomastic community a new field of spatio-temporal quantitative analysis of names to understand past and current population structures through 'name geomorphology'. We believe that linguists, historians, geographers, geneticists, statisticians and demographers should collaborate more closely to unveil a little bit more of how we came to be what we are today.

Appendix: data processing issues

Data hygiene: errors in the data

The errors in the data files are typical for large data files but indicative of the poor data hygiene in the gathering process. The errors could have been avoided by the simple expedient of only allowing symbols that appear in forenames and surnames to appear in the data. Errors included the following non-letter symbols (other than

hyphens) in names: '.', 'o' for 'O', '4', '%', ' '(space). There were also some triple characters in the names.

Diacritical marks

The data as supplied had very few diacritical marks. No attempt has been made to insert diacritical marks.

Format issues

The data sets were complicated by the fact that, although *Garcia* looked liked *Garcia*, they had been keyed in different forms such that *GARCIA*, 100 when added to *Garcia*, 99 did not always sum to *Garcia*, 199. The problem was that some of the data were in all capitals, and some were in initial capitals only, *and* that converting the 'all capitals' format to 'initial capitals only' did not resolve the issue. This data problem was resolved, and the consolidated tables give the totals. However, when comparing the first surnames with the second surnames the 'all capitals' data only has been used. In the case of Garcia, for example, this represents 91% of the total data, so it is believed that the results are valid.

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