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Research Article

Spatial continuities and discontinuities in two successive demographic transitions: Spain and Belgium, 1880-2010

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Abstract

This is a study of how the synergisms between cultural and structural factors, which played a major role during the historical fertility and nuptiality transition (first demographic transition or FDT), have continued to condition demographic innovations connected to the "second demographic transition" (SDT). The continuity or discontinuity from the "first" to the "second" demographic transition is studied for spatial aggregates over more than a century in two national contexts, i.e. Belgium and Spain. Special attention is paid to the role of successive secularization waves in shaping the geographical patterns of both transitions. The study also shows that the maps of the two aspects of the SDT, i.e. the "postponement" and the "non-conformism" transitions respectively, are shaped by different determinants. Explanations are offered using the "Ready, Willing, and Able" paradigm, which allows us to uncover the different conditioning and limiting factors involved. The "non-conformist" transitions (control of marital fertility during the FDT and rise of cohabitation and non-conventional family formation during the SDT) more closely mirror the history of secularization and the "Willingness" condition, whereas the fertility postponement aspect of the SDT mainly reflects female education and employment, or the "Readiness" condition. This generalization holds in both countries. However, in Belgium spatial continuity from FDT to SDT is connected to stable patterns of secularization, whereas in Spain it is linked to long standing differences with respect to female literacy and education.

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1. Background

Several books and articles belonging to the so-called "Princeton Fertility Project" (especially: Livi-Bacci 1971, 1977, Lesthaeghe 1977, Lesthaeghe and Wilson 1986) are often cited as "cultural" corrections or complements to the classic economic and structural interpretations that dominate studies of historical fertility decline. One of the sources of inspiration (if not the main one) of the Princeton Fertility Project was without doubt William Leasure's doctoral dissertation (1962) on the Spanish fertility transition. In this thesis Leasure showed that the classic indicators of urbanization and industrialization largely failed to account for the regional diversity in Spain's fertility decline, and that regional and linguistic particularisms prevailed. This convinced A. J. Coale that it would be worthwhile to extend this Spanish investigation to the rest of Europe. The "Princeton Project" gradually emerged as a result, not as a cohesive project with preconceived objectives, but as a mere collection of empirical contributions from a variety of authors. Most of the research belonging to the Princeton project was performed during the late 1960s and through the 1970s, and several other and similar investigations were conducted during the following decades, including major further major studies on Spain and Prussia (e.g., Reher and Iriso-Napal 1989, Galloway et al. 1994, Galloway 2009).

Roughly 30 years after the completion of the Princeton studies, new demographic features have emerged with respect to household formation and fertility, and these are by now often collectively referred to as the "Second demographic transition" (SDT) (Lesthaeghe and van de Kaa 1986). The SDT has two main dimensions: (i) the "postponement transition", referring to the upward shifts in ages at marriage and at first and subsequent births, and (ii) the "non-conformism transition", pointing at the growth of unconventional forms of household formation (rise of cohabitation, of fertility among cohabitants, of single parent households, of same sex households, and of reconstituted families based on cohabitation).

The succession of two waves of demographic innovation, referred to here as the first and second demographic transitions (FDT and SDT), begs the question of long-term spatial continuity (e.g., Lesthaeghe and Neels 2002). More specifically, the question is addressed as to whether or not the leading regions during the FDT innovation would also be the leading ones at the onset of the SDT. Spatial continuity from FDT to SDT would be testimony as to the persistence of such long-term regional subcultures, whereas discontinuity would be pointing at new and recent developments in the structural and cultural determinants of the SDT[3].

[3] It should be stressed that at no point do we extrapolate the results of our correlation analysis from the aggregate to the individual level. Hence, the "automatic" label of "ecological fallacy", often mindlessly attached to all spatial analyses, would be misguided in this instance. Furthermore, a spatial analysis is, of

In order to study the nature of cultural-structural synergisms over time and space, use will be made of A. J. Coale's set (1973) of preconditions for innovation, otherwise known as the "Ready, Willing, and Able" trio (RWA). The empirical data will come from two countries: Belgium and Spain. Both countries are characterized by a high degree of both socio-economic and cultural (linguistic and political) heterogeneity, and hence they are ideal settings for studying regional (dis)continuities in demographic developments.

Furthermore, we shall pay special attention to a reconstruction of the spatial aspects of secularization in both countries, as these are intimately linked to the willingness condition in the RWA framework.

To sum up, the three objectives are:

(i) to contribute to studies of historical continuity of demographic patterns;

(ii) to obtain historical insights into the "genesis" of the SDT;

(iii) to use the Boolean nature of the RWA paradigm to explain both continuities in some features and discontinuities with respect to others.

2. The RWA model of innovation and diffusion of new behavioral forms

At the end of the Princeton European Fertility Project that studied the historical fertility and nuptiality transitions, A.J. Coale (1973) came up with a succinct and catchy formulation of the three preconditions for a demographic transition to occur. This clearly superseded the more detailed narratives offered by the Princeton project's various country studies, but caught the gist of their findings. Firstly, according to Coale, any new form of behavior must yield benefits that outweigh the costs or disadvantages. If there is no such economic advantage (= "Readiness" or R), then that new form of behavior will not be attractive and there will not be a breakthrough. Secondly, the new form must be "legitimate", i.e. it must be culturally and ethically acceptable. If the new form of behavior runs counter to prevailing beliefs or to religious or moral rules, then the condition of "Willingness" (=W) will not be met. Thirdly, there must be adequate means (e.g., of a technical or legal nature) to implement the new form. This is the

course, not the only way to look at historical change, but, in our opinion, still a salient one. Firstly, regions have long histories and traditions or subcultures that developed over centuries, and as such they transcend the life span of individuals. Secondly, if firms or institutions can be compared, so can other aggregates such as geographical ones, provided that the results are interpreted at that level. Thirdly, it is not because some theoretical paradigms, such as rational choice theory in sociology or neo-classic micro-economics, have shifted the attention to the individual-level decision making process, that all social science research should become "atomistic" too, and thereby lose out dramatically on historical richness.

"Ability" condition (=A). The three preconditions must be met jointly for a success S (i.e. a breakthrough of a new behavioral form) to occur:

$$\mathbf{S} = \mathbf{R}\ \textit{AND}\ \mathbf{W}\ \textit{AND}\ \mathbf{A} \text{ or } \mathbf{S=RWA}$$

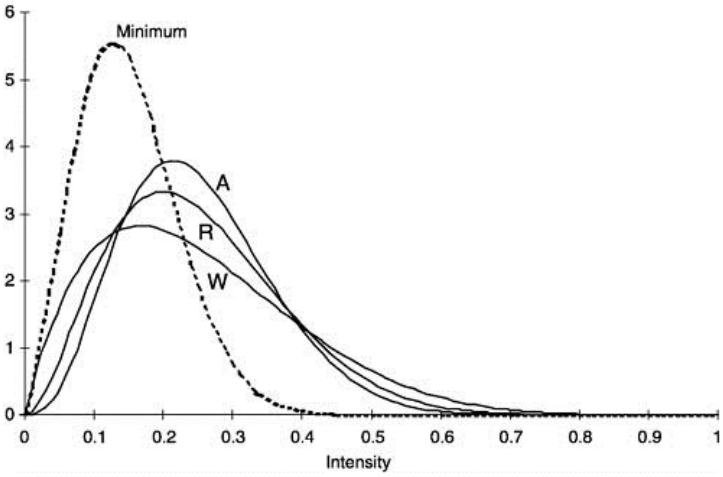
where *AND* is the logical "and" or conjunction. Any failure of satisfying merely one of the three conditions results in an overall failure, i.e., there will be no adoption or breakthrough or transition to that new behavioral form. In other words, there are three necessary conditions, but a single one is not sufficient. The model is not one with separate, additional effects, but a Boolean one focusing on synergistic combinations instead (cf. Ragin 1987). The RWA model can be specified at the micro level as well, and this will bring out a few extra features dealing with the dynamics of innovation processes in general and of demographic transitions in particular (Lesthaeghe and Vanderhoeft 1999). These will be explained now in greater detail.

We assume that any individual or household *i* would have its own set of three scores for, respectively, R*i*, W*i*, and A*i*. These scores range in intensity from zero to unity. Zero then means: no perceived advantage at all (R=0), not acceptable on moral, religious, or other cultural grounds (W=0), and no means of implementation (A=0). Unity corresponds to: numerous advantages completely outweigh any disadvantages (R=1), perfectly morally and culturally acceptable (W=1), and no technical or legal barriers (A=1). A score of 0.5 corresponds to a point of indecision. The condition for a success is satisfied when all three scores move beyond that mid-way point, and are hence larger than 0.5. Another way of stating this is that each individual or household has a minimum score MIN*i* which is the smallest of the three component scores R*i*, W*i*, or A*i*:

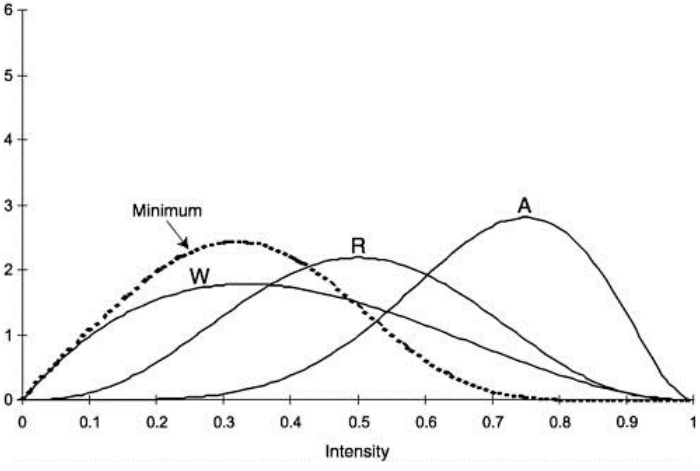
$$\text{MIN}i = \text{Minimum}(\text{R}i, \text{W}i, \text{A}i)$$

Hence, any actor will only adopt a new form of behavior if his MIN*i* > 0.5. The collection of individual scores obviously forms three distributions, respectively, for R, W, and A, but the collection of individual minima will add a fourth distribution. This MIN distribution will of course depend on the location and shapes of the R, W, and A distributions, but its mean will always be lower than that of the other three. The example in Figure 1 clarifies this point (cf. Lesthaeghe and Vanderhoeft 1999).

Figure 1: RWA model – examples of the location of the Ri, Wi, and Ai distributions together with that of the distribution of their minima (MINi)



Note: Location of W (left), R (middle), and A (right) at one point in time (second example) and location of the distribution of the minimum (R_i, W_i, A_i) (= dotted line).



Note: Location of W (left), R (middle), and A (right) at one point in time (third example) and location of the distribution of the minimum (R_i, W_i, A_i) (=dotted line).

In the first example, several cases have passed the 0.5 score on R or W or A, but nobody satisfies the RWA configuration where all three conditions are being met simultaneously. This can be seen from the distribution of minima, which does not have an upper tail that has moved beyond the 0.5 value. In the second example most actors know about proper ways of implementing the new form of behavior so that the distribution of A has already shifted to the right on the 0-1 intensity scale. With respect to readiness, the modal category is undecided (score 0.5) with half the population still not seeing a decisive advantage. But the majority in this example considers the new form of behavior as ethically or culturally unacceptable. The distribution of the scores that are the smallest of the previous three is located quite a bit further to the left than any of the other three distributions and only a small fraction has crossed the 0.5 point. Hence, few people have made a transition to a new form of behavior. In this example non-willingness obviously contributes disproportionately to the lower minima, and is therefore a dominant bottleneck factor or inhibitor.

During a process of change, all four frequency distributions move from the low end to the high end of the intensity scale on the horizontal axis, with the distribution of the minima always trailing behind. The R, W, and A distributions can follow their own pace, and as they shift their variances will also tend to expand. At the outset variances are low since the vast majority has low scores on all distributions, and at the end of the transition variances will again diminish as more and more persons end up with high scores for every precondition. Mid-way, variances are the highest, and the same holds for the distribution of minima. Moreover, it is likely that at that time the MIN distribution also comes close to adopting a bell-shaped curve. If this occurs, then our RWA model will produce a growth curve of adopters of new behavioral forms that closely resembles Verhulst's logistic curve (elongated S-curve). Many innovations and their diffusion, from gothic cathedrals to engines, from epidemics to rumors, follow such a logistic growth curve. Furthermore, the logistic curve for an older innovation tends to taper off and reach a saturation-level of no further expansion when new and better technologies or innovations start growing and replacing it. Also, the latest innovation can entirely wipe out the older pattern, and in this instance there is a new transition. And, if such transitions succeed each other, there is no problem with numbering them as a simple means of identification.

So far we have treated the shifts in the distributions of R, W, and A as independent. This is not likely to hold. Structural or materialist determinists, for instance, would commonly argue that R is the leading condition and that W and A are mere lagging derivatives. In this view, material conditions change first and people adjust their behavior to such new circumstances and opportunities. Subsequently both morality and technology will come under increasing pressure to adapt as well. There are, of course, numerous examples where other sequences hold. Breakthroughs in

contraceptive and reproductive technology, for instance, have opened up avenues for new interventions, and in this case A is the leading condition. Similarly, some cultures may have no objections to many forms of contraception and commonly accept abortion, and then the W-distribution will not be trailing behind the other two. To sum up, the sub-model with R being the leading condition and with cultural and/or technological lags may be frequently encountered, but it is by no means the only possibility.

For each of the three diffusion patterns with respect to R, W, and A, we should expect there to be at least one focus of initial innovation from which the diffusion occurs until it meets social barriers. These barriers can be social class distinctions, cultural obstacles (e.g., religious differences), or communication barriers (e.g., linguistic borders). From that point on, socio-economic, cultural, and spatial variables observable at the macro level (e.g., for spatial units) will emerge as determinants of the process of differential spatial diffusion (cf. Bocquet-Appel and Jakobi 1996).

To sum up: at present we have a model of innovation based on Coale's initial model of three preconditions and capable of producing a logistic growth curve for any new form of behavior. Each of the three preconditions can be "individualized" and translated back to the macro-level in the form of shifting distributions. Moreover, these shifts and especially differences in the pace of the shifts can be linked to mechanisms of social and spatial diffusion of the "contagion" type, in which network contacts are essential. Then social group and/or geographical patterns emerge in which innovating groups or regions lead the way, and in which others follow depending on the strength of various types of barriers. Such barriers can exist with respect to any of the three preconditions, but since the MIN-distribution in the RWA-model is the crucial one, it suffices for only one of the three preconditions to be obstructed for the diffusion of the new behavioral form to be stopped or delayed at such a social or spatial barrier. This has important consequences:

1. Those in the vanguard of a transition must score high on all three conditions and this will set them apart from the others, for whom at least one condition is not being met.
2. Conversely, if one of the three distributions substantially lags behind the others, then many MIN-scores will be determined by the bottleneck condition, and the best correlates of the outcome will be indicators of that barrier.

The final outcome of the use of the RWA model is that it expects both structural and cultural factors to emerge as correlates. The RWA specification leaves little room for disciplinary debates of the type "economics versus culture" (cf. Lesthaeghe 1998), or, by extension, for squabbles between economics, sociology, or political science.

Any one of these three can come up with strong "correlational" results, but the irony is that "victory" for a discipline can be claimed following the identification of a type of regressor (e.g., economic, structural, cultural…) with the largest and most significant coefficients, when in fact such statistical predictors could merely identify the slowest moving condition in an innovation and diffusion process[4]. The earlier types of analysis with "the buck stops at socio-economic structure" in sociology and social history and the subsequent "cultural turn" in the social sciences (see Sewell 2005, esp. chapters 1 and 2) just lead from one form of reductionist fallacy to another. The RWA model simply recognizes that processes of social change are the outcomes of (i) socio-economic structures with their specific configurations of opportunities and constraints AND (ii) of the adaptive capacity of cultural scripts of legitimation, AND (iii) of policies affecting the technical and legal environments. The AND is again the logical conjunction, and the factors that cause leads and lags over time can vary widely. Some configurations are remarkably recurrent ones, but others can indeed be totally "historically idiosyncratic".

3. From the FDT to the SDT: The Belgian example revisited

There are several reasons for revisiting the issue of historical spatial continuity in Belgium. The first one is that we now possess many more SDT indicators than could be used in the 2002 Lesthaeghe and Neels article. We owe this to Neels' fertility reconstructions of 2006 for both cohorts and cross-sections on the basis of the 1990 census, and to the Gadeyne et al. reconstruction of cohabitation trends and differentials starting from a retrospective question in the 2001 census. The second reason is that Neels (2006) showed that the Belgian SDT has two components with different spatial patterns: marriage postponement and premarital cohabitation followed the older historical pattern of demographic innovation, but fertility postponement did not. Also, in the US there was a partial disconnection in the spatial incidence of the fertility postponement and the non-conformity dimensions of the SDT, respectively (Lesthaeghe and Neidert 2006). More specifically, the states in the lower half of the two distributions were the same, but those at the vanguard differed: the North Atlantic states were the leading ones with respect to fertility postponement, whereas several western and Pacific states were leaders with respect to cohabitation.

[4] An example will elucidate this point. Suppose that everyone satisfies the R condition, but many would not satisfy the W and/or A conditions. The correlates of the outcome would be connected to W and A and not to R, since this is a constant. The fact that the R condition is already satisfied is of paramount importance for the subsequent development of the process (necessary condition), but indicators of R will not be significant in any correlation analysis, and they are likely to be dismissed as "unimportant".

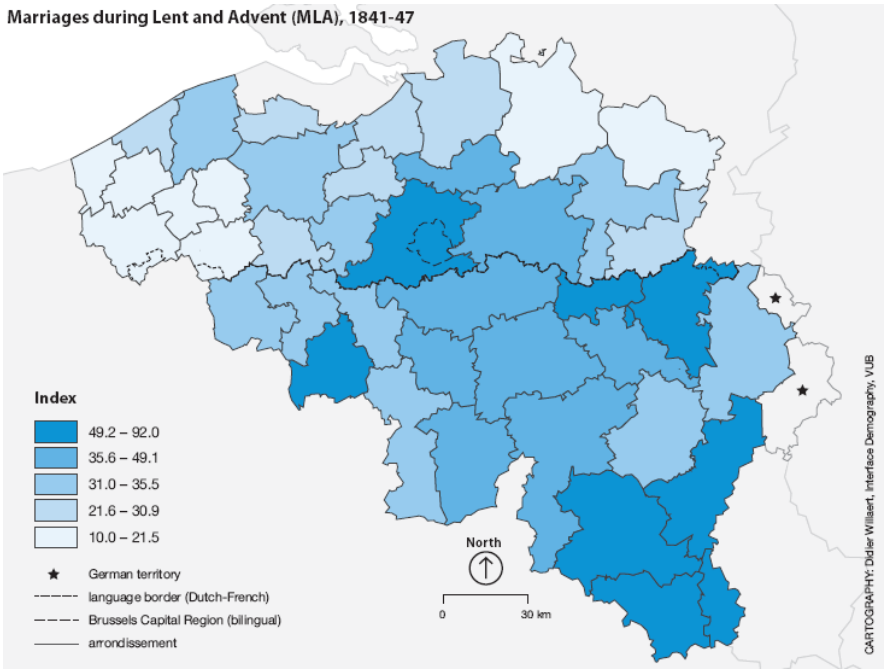
Before turning to statistical analyses of the Belgian data, a short digression is necessary to elucidate the secularization history of the country. This history contains a few features that are essential to the understanding of the role of the W-factor and its relation to socio-economic structural determinants.

3.1 The three secularization waves in Belgium: 1750-1970

As in much of Western Europe, the first signs of secular, rationalist thinking emerged with the Enlightenment during the second half of the 18th century. It was essentially an elite phenomenon (e.g., in Freemason lodges), but capable of being one of the driving forces of the Brabant Revolution of 1789, or the first attempt at establishing Belgian independence. This first wave of secularization gained much wider popular support during the French Revolution, and many urban parishes, especially in Liège, failed to observe the marriage ban during the so-called "closed periods" of Lent and Advent. Also, during the Napoleonic period and the period of reunification with the Netherlands (1815-1830), Catholicism remained under state control, but this did not imply that the secular ideas had penetrated in all regions of the country. As became very clear at the time of the Belgian independence in 1830 and with the concomitant Catholic restoration, numerous areas in the Dutch-speaking northern half of the country had remained staunchly loyal to Catholic clergy and doctrine.

The early map of this first secularization wave can be constructed on the basis of the degree of non-observance of the marriage ban during Lent and Advent, i.e. the period of 40 days before Easter and the similarly "closed" period prior to Christmas (see maps 1, 2, and 3 for quintiles). The Napoleonic Civil Code had made a civil marriage obligatory and a church marriage optional. This remained so after Belgian independence, and hence the Catholic marriage ban was no longer an impediment for freethinkers or for couples in need of a "shotgun" wedding. The index used here is simply the percentage of marriages in March (approximation for Lent) and December (idem for Advent) divided by 2/12, or the proportion that would be observed without marriage seasonality. Hence, this MLA index equals 100 if no marriage ban is being observed, and becomes a much smaller number if the Church rules are being respected. For instance, during the last decade of the Austrian occupation the MLA index often comprised between 5 and 15 in Flemish parishes and around 20 in Walloon ones, meaning that the number of marriages was less than one fifth of the expected number for two months in the absence of seasonality. After the French takeover these indices typically increase to 30 - 50, and even exceed 100 for a few years in Liège (Lesthaeghe 1991: 276-279).

Map 1: Marriages during Lent and Advent (MLA-index) in Belgian arrondissements, 1841-1847 (quintiles)

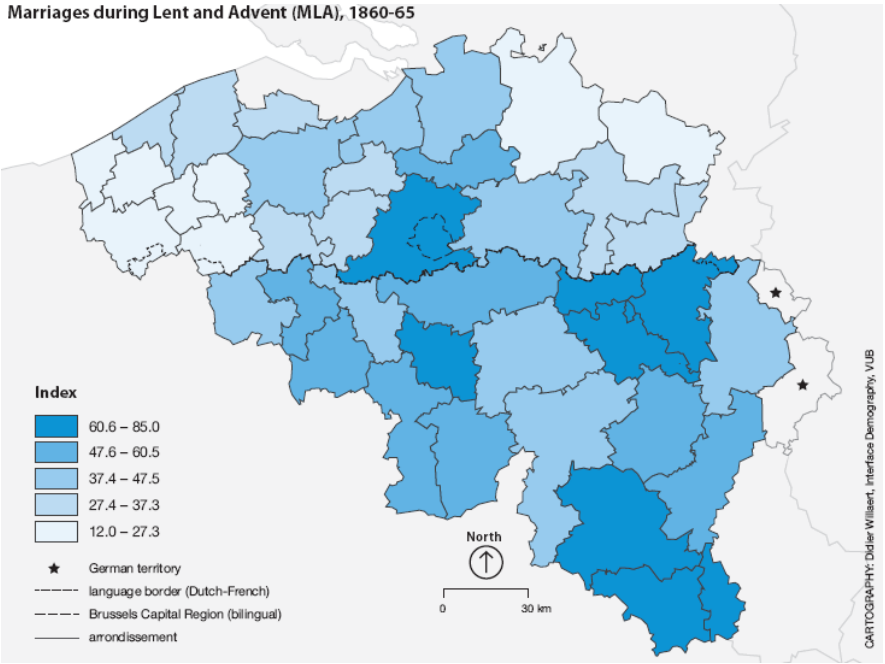


As the MLA map with quintiles shows for the period 1841-1846, the impact of the first secularization wave is markedly stronger for the Walloon or francophone arrondissements (see appendix, map A 1, for their identification) of the southern half of the country than for the Flemish ones to the north. Even more strikingly, the degree of non-observance of the ecclesiastic marriage ban is pronounced in many strictly rural Walloon arrondissements, with those of Arlon, Bastogne, Virton, and Neuchâteau having higher MLA values than the emerging industrial arrondissements of Charleroi and Mons. Similarly, other Walloon rural arrondissements match the Charleroi value, and these are Waremme, Nivelles, and Philippeville. A correlate of this rural secularization in Wallonia is the strong allegiance to the Liberal party, which did not only represent the freethinkers among the higher bourgeoisie, but also those among the wealthier artisans and farmers. By contrast there was no such strong rural Liberal support in Flanders, and only in the larger towns of Antwerp and Ghent was there a militant secular presence. A major point of dispute in the initial Belgian "two pillar"

system (Catholic versus Liberal) was the staunch competition between the Catholic schools and the secular state or municipal schools. Jesuit and episcopal colleges of secondary education and the Catholic University of Louvain (reopened in 1830) produced the elites for the Catholic pillar, whereas the State universities of Ghent and Liège and the small Free(thinker) university of Brussels remained secular strongholds.

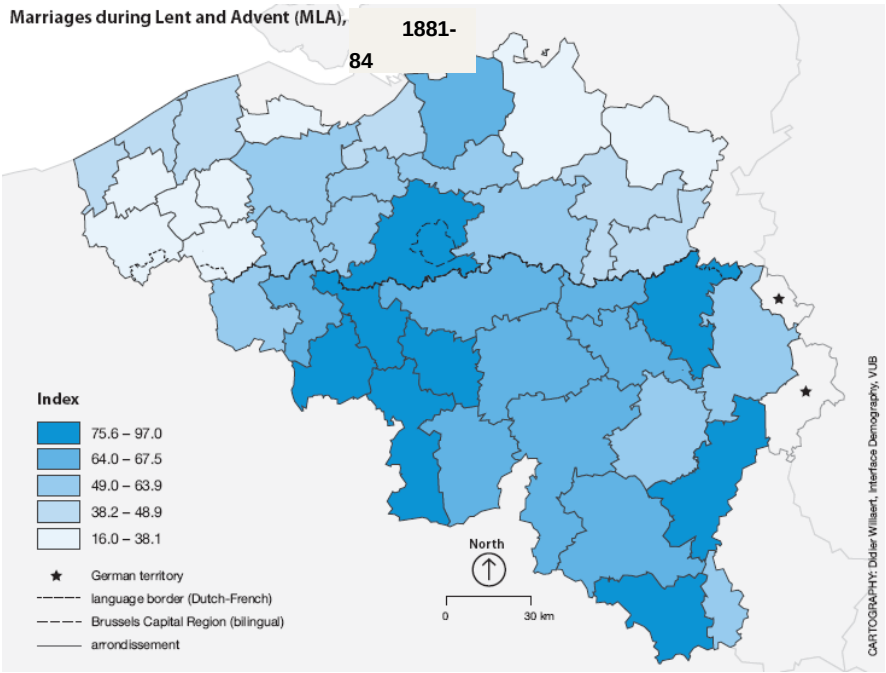
After 1860 a third "pillar" was added, corresponding to the rising importance of the Socialist Party. This generated a second secularization wave in all major industrial and urban areas as well. The MLA map for 1860-1865 clearly shows how the three major Walloon industrial arrondissements (Mons, Charleroi, Liège) and the arrondissement of Brussels have MLA values in excess of 60, which is already indicative of a major weakening of the ecclesiastic ban. By 1881-1884 only five Walloon arrondissements have values below 60, whereas there are only two Flemish ones with values above 60.

Map 2: Marriages during Lent and Advent (MLA index) in Belgian arrondissements, 1860-1865 (quintiles)



The double origin of secularization in Belgium before 1900 not only implies a leading position for Wallonia, but also that both rural and industrial or urban arrondissements are present in the upper half of the secularization distribution. In other words, there is only a modest positive correlation between secularization and industrialization/urbanization, which is a statistical bonus (low multicollinearity) when it comes to measuring the separate effects of secularization versus industrialization/urbanization upon, for instance, the speed of the marital fertility decline (Lesthaeghe 1977: 196-220; Lesthaeghe and Wilson 1986: 261-292).

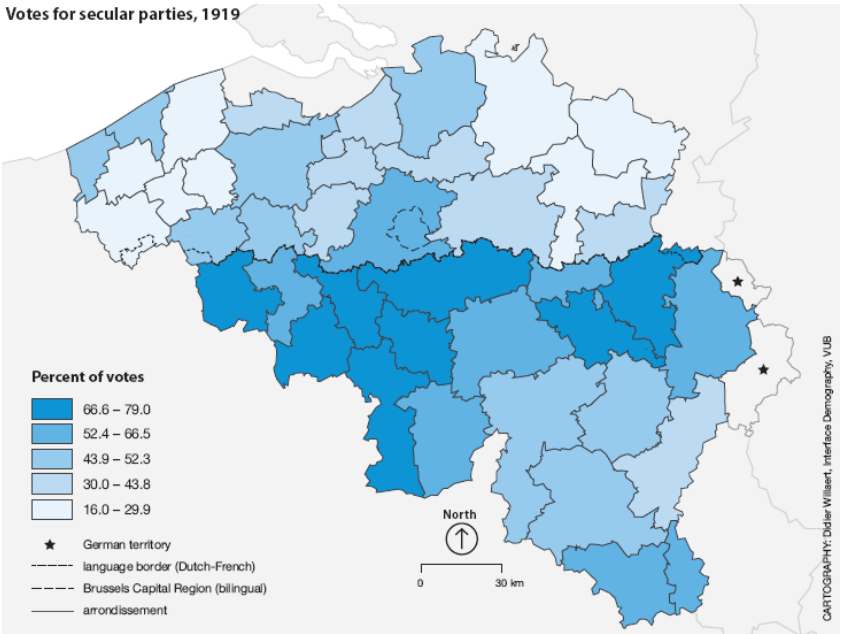
Map 3: Marriages during Lent and Advent (MLA index) in Belgian arrondissements, 1881-1884 (quintiles)



Until the 1960s the map of secularization remains very stable in Belgium, as can be gleaned from the correspondence between the MLA map for 1881-1884, the map of the secular vote (% Socialist + Communist + Liberal) in 1919 (first elections based on universal male suffrage), the map for the secular vote in 1958, i.e. at the time of the last

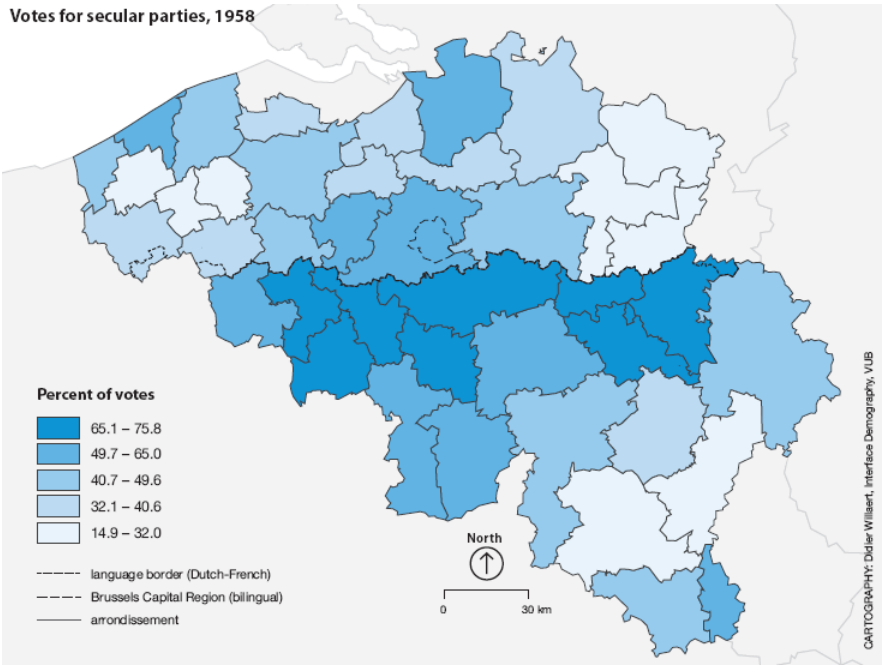
"school war"[5], and the 1964 map of percentages of adults absent during the annual Sunday Mass census (see maps 4, 5, and 6). Noteworthy in this series of secularization maps is that the least secularized arrondissements are all located in Flanders and form two clusters: a western one in the province of West Flanders (arrondissements of Ypres, Diksmuide, Tielt, Roeselare) and an eastern one comprising the whole of the province of Limburg (arrondissements of Hasselt, Maaseik, Tongeren) and the adjacent Campine area (arrondissement of Turnhout). Moreover, as can be seen in Map 2, these two persistently Catholic regions were already in evidence from the 1860s onward. Equally noteworthy, however, is that the eastern cluster of Flemish arrondissements remained strongly attached to the Catholic Church till the 1960s, despite its industrialization after World War I, i.e. along the Antwerp-Liège axis (Albert canal) and the Limburg coal fields.

Map 4: Secular vote for liberal, socialist, and communist parties, 1919 (quintiles)



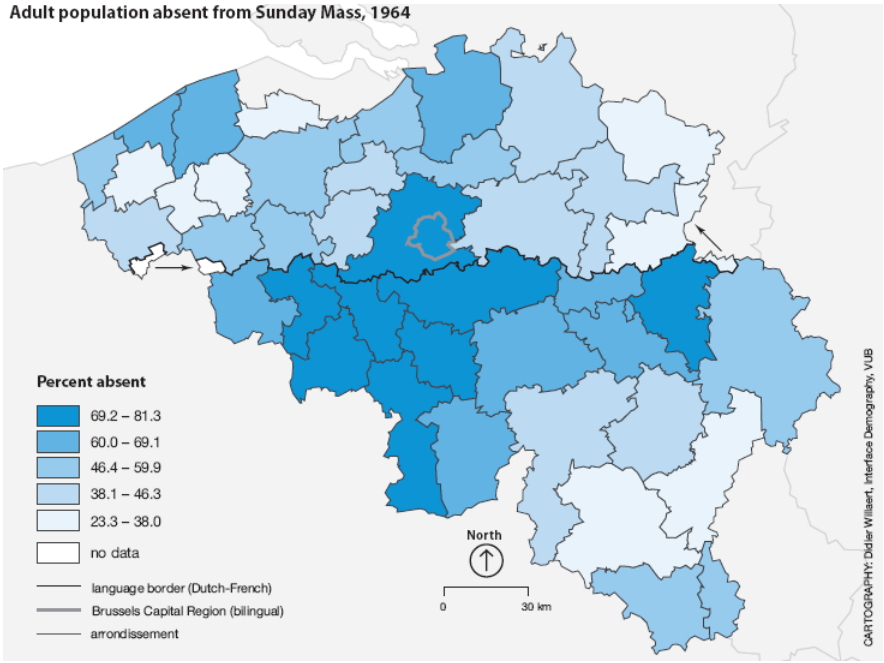
[5] The 1958 "school war" erupted as a result of the Liberal-Socialist government's attempt at restructuring the subsidy conditions of the Catholic school system. At that time many villages only had Catholic primary schools, and the government then also wanted to create secular counterparts.

Map 5: Secular vote for liberal, socialist, and communist parties, 1958 (quintiles)



The third secularization wave starts during the 1960s and corresponds to the disappearance of the hitherto Catholic strongholds in the northern half of the country. From then onwards Flanders catches up with Wallonia, and the marked contrast between these two regions, formerly coinciding with the linguistic border, becomes less pronounced. This is also the period of political "depillarization", with the growth of alternative parties such as the Greens and later on the regionalist and populist right also (e.g. Vlaams Blok, Front des Francophones). During the late 1960s and 1970s all sources of authority are being questioned, and this applies to political parties, the church, the university system, the army, and the judicial system alike. Not only does the period 1965-1975 correspond to a major breakthrough of the "post-materialist" and expressive values supportive of female emancipation and the sexual revolution, but this is equally the era of massive female educational progression to full secondary education and beyond.

Map 6: Sunday mass absenteeism among the adult population (15+), 1964 (quintiles)



After 1975 the spatial secularization differentials are largely played out, but two centuries of spatial contrast in this respect still lingered on with respect to everything with a moral or ethical dimension. In other words, a set of regional subcultures along a conservative - liberal dimension still continued to be operative, despite the fact that the more strictly religious dimension is no longer a major part of it. On the other hand, the rise of female higher education and of female labor force participation outside the domestic sphere created a new dimension, equally springing up from the 1960s onward. As we shall illustrate in the next section, these two aspects will also be of major relevance for the unfolding of the various demographic characteristics of the SDT.

3.2 Spatial continuity: Indicators and covariates for the Belgian example

To illustrate the spatial continuity over a period of almost a century and a half, we will resort to a series of both FDT and SDT indicators for the 41 (and later 43) Belgian arrondissements. The correlation matrix for these demographic indicators is subsequently analyzed via a classic Principal Component Analysis[6], which extracts three orthogonal factors (Varimax rotation) that jointly account for 80% of the total variance contributed by the entire pool of indicators. The next step consists of linking these demographic factors to a series of covariates of both a structural and a cultural nature in order to identify the best correlates.

The subset of demographic indicators related to the FDT contains all the Princeton indirectly standardized measures of marital fertility (Ig), of proportions married (Im), and of non-marital fertility (Ih) (Coale 1965: 207), computed for all the census dates between 1880 and 1970[7]. In addition, we also use the percentage of the total marital fertility decline that had already been completed by 1910 (delta Ig 1880-1910, Lesthaeghe 1977:109). Equally belonging to the FDT, but to its later years, are measures for the cohort of women born in 1931-1935, since the events of interest would typically have taken place in the late 1950s and the 1960s. For this cohort use is made of their mean age at first birth, their percentage of non-marital births, and their

[6] In all instances where Principal Component Analysis (PCA) is used, axis rotations are orthogonal, and the resulting factors are uncorrelated dimensions. All factors (= principal components in our case) with eigenvalues larger or equal to unity were retained. We use the terms "principal component", "factor" and "dimension" interchangeably. The term "factor" loading refers to the correlation coefficient between the factor and the indicator variable. Factors are composite measures or underlying dimensions of a set of indicators. Factors are constructed in such a way that they have means of zero and standard deviations of unity. Maps that present these factors use standard deviations as units of measurement, and divide the scale in quintiles.

[7] The Princeton indicators are all indirectly standardized measures, because of the absence of numbers of births broken down by age of the mother in most historical series of European countries. The Princeton indices all use Hutterite marital fertility schedules by age, h(a), to capture "natural fertility", i.e. very high fertility in the absence of contraception. The four indices are:

* Index of marital fertility *Ig = observed legitimate births / Sum M(a).h(a)* where M(a) is the number of married women by age, typically recorded in censuses. Age groups start at 15 and end at 49.

* Index of overall fertility *If = observed births (all)/ Sum W(a).h(a)*, where W(a) are all women by age.

* Index of illegitimate fertility *Ih = observed extra-marital births/ Sum U(a).h(a)*, where U(a) are unmarried women by age.

* Index of proportions married *Im = Sum M(a).h(a)/Sum W(a).h(a)*, or proportions married weighted by Hutterite fertility.

With these indices *If = Ig.Im + Ih(1-Im)* or in the instance of very low extra-marital fertility, *If = Ig.Im*. This allows for a simple decomposition of overall fertility If into a marital fertility and a nuptiality component respectively.

The "speed" of the fertility decline (Lesthaeghe 1977) is measured as the decline of Ig between the value Ig (t) at the onset and a value at a later date Ig(t+x), divided by Ig(t) -.300, where .300 is taken as the "end" value of the transition. The measure gives an idea of the proportion of the total marital fertility transition already covered between the onset of the process and a later date.

percentages of ever divorced. Finally, four more indices, all measured in 1960-1962, pick up relevant information for the end of the FDT: the total first marriage rate (TFMarR), the total fertility rate (TFR), the mean age at first birth, and the percentage of the TFR that was realized after age 30 (capturing mainly higher order parities and unplanned births during the pre-pill era).

The subset of SDT demographic indicators pertains to the rise of divorce, the postponement of marriage and fertility, and the rise of cohabitation and of non-marital births (mainly among cohabitants). For the periods 1969-1971, 1979-1981, and 1998-2000 use is made of the classic total fertility rates (TFR), the mean age at first birth, and the percentage of the TFR occurring after age 30. For the years 1970, 1981, 1991, and 1999 we possess the total first marriage rates TFMarR and the total first cohabitation rates TFCohabR. The latter could be computed from the 2000 census information on the year that first premarital cohabitation was initiated and the year of birth of the female respondents (see Gadeyne et al. forthcoming). Further information on cohabitation is available in the form of percentages cohabiting among women aged 20-24 and 25-29 measured in the 1990 census, and also as an indirectly age standardized index for 2000, along with similar indices for proportions married and divorced (Deboosere et al. 2009). Furthermore, information has been added pertaining to the cohort of women born in 1961-1965 and mainly occurring in the 1980s and 1990s: age at first birth, percent non-marital births, and proportions ever divorced (Neels 2006)

The socio-economic covariates essentially capture the processes of industrialization and urbanization, the degrees of literacy, and, for the second half of the 20th century, the rise of female secondary and higher education, along with their labor force participation. More specifically, for the periods 1880, 1890, 1900, and 1910 use is made of the percentages of the male labor force in agriculture (and for 1910 also in agriculture plus cottage industries), an index of urbanization and industrialization, and the literacy rate for the population aged 15-55 (Lesthaeghe 1977 160 ff.). This series continues with the urban percentages from 1920 to 1970. For the female cohorts born in 1931-1935 and in 1961-1961 we have the proportions ever worked. For the older cohort, educational achievement is measured as the percentage at least completing full secondary education, and for the younger as the percentage having a post-secondary degree (Neels 2006: 87-88, 188-189).

On the "cultural" side we have a series of measures of secularization and of linguistic homogeneity. The oldest series of secularization measures are the indices of marriages during Lent and Advent (MLA) for 1841-1847, 1860-1865, and 1881-1884 (Lesthaeghe 1991: 271). The next pair is the percentage votes for secular parties (Liberal, Socialist, Communist) in 1919 and 1958, and the last measure is the percentage absent from Sunday Mass in 1964. Linguistic homogeneity is measured as the percentage of the population over age 15 that only speaks the language or dialect of

the region (monolingual - Dutch or Flemish in the North, French or Walloon in the South). A low degree of language homogeneity captures the presence of linguistic minorities in a given region. These were either the original population (e.g., Flemings in Brussels, German speakers in the arrondissements of Bastogne and Verviers) or immigrants (e.g., Flemings in Wallonia). The use of languages was no longer recorded after World War II, as being too sensitive politically.

3.3 Statistical results for the Belgian example

The statistical analysis consists of two steps. First, the set of demographic indicators mentioned above is being reduced to a much smaller set of dimensions (PCA, Varimax, orthogonal factor rotation). Second, the best social and cultural correlates of each of the demographic dimensions are identified. This gives a succinct description of the underlying structure of the entire correlation matrix.

The three dimensions are clearly identifiable and tell the three basic stories.

Factor 1 is the long-term continuity dimension of demographic innovations. This dimension identifies the leading and lagging regions with respect to fertility control and contraception during the FDT. But it continues to reflect a subset of SDT indicators, and more particularly all those associated with the weakening of the marriage institution: the rise of divorce, postponement of marriage, increasing cohabitation, and parenthood within the cohabitation context.

Factor 2 reflects the historical rise and later decline of "traditional" non-marital fertility. This factor no longer has demographic indicators after the 1960s, which means that non-marital fertility from then onwards takes place in an entirely different context. This discontinuity essentially reflects the shift away from illegitimacy of non-marital births, not legalized by shotgun marriages and occurring to single women or adulterous married women, to extra-marital births mainly among cohabitants.

Factor 3 has no clear deeper historical roots, but is a novelty typical of the SDT: postponement of parenthood among all types of couples. As already shown by Neels (2006), the SDT in Belgium has two separate components, one related to divorce, marriage, and cohabitation, and one related to postponement of parenthood. These two components have different geographies. The former reflects the long-term innovation dimension (see Factor 1), but the latter has a geography of its own.

We shall now proceed with a more detailed investigation of each of these three dimensions.

3.3.1 Factor 1: Successive demographic innovations and long term spatial continuity

Table 1 presents the long-term continuity dimension of innovation. High scores on this dimension for arrondissements reflect the presence of a leading position throughout the whole period from the 1870s until 2000, whereas low scores identify the arrondissements that were slow in adopting the innovations of both FDT and SDT. The left side of the table contains the best indicators of dimension one with their factor loadings (or correlation coefficients) of 0.700 or better. The right hand panel lists all the structural and cultural correlates of dimension 1 with correlation coefficients of 0.600 or better.

The prime continuity dimension exhibited in Table 1 has factor loadings on an impressively long series of demographic indicators related to the FDT: all indicators related to the historical marital fertility control, the departure from the restrictive Malthusian marriage system, and even the continued higher fertility past age 30 in the pre-pill early 1960s. The series then continues with indicators pertaining to the SDT; the rise of divorce, but above all the postponement of marriage in favor of premarital cohabitation. And by the 1990s procreation among cohabitants has joined the set as well. Note, however, the absence of the measures of fertility postponement.

Aside from the 19th century indicators of proportions of the male labor force in agriculture and cottage industries, all the best correlates of the demographic spatial continuity dimension are indicators of progressing secularization, already starting with the MLA index of 1841-1846 and continuing uninterrupted until the 1960s with the percentages absent from Sunday Mass. Also note that indicators of urbanity or industrialization after 1920 are not in this set. Within the RWA framework this is strongly indicative of the fact that it was the W-condition that was the limiting one. In other words, essentially the moral and religious objections to two entirely new forms of behavior, i.e. controlling fertility through contraception and replacing marriage by cohabitation, were constituting the decisive limiting conditions that shaped the geography of these successive demographic innovations.

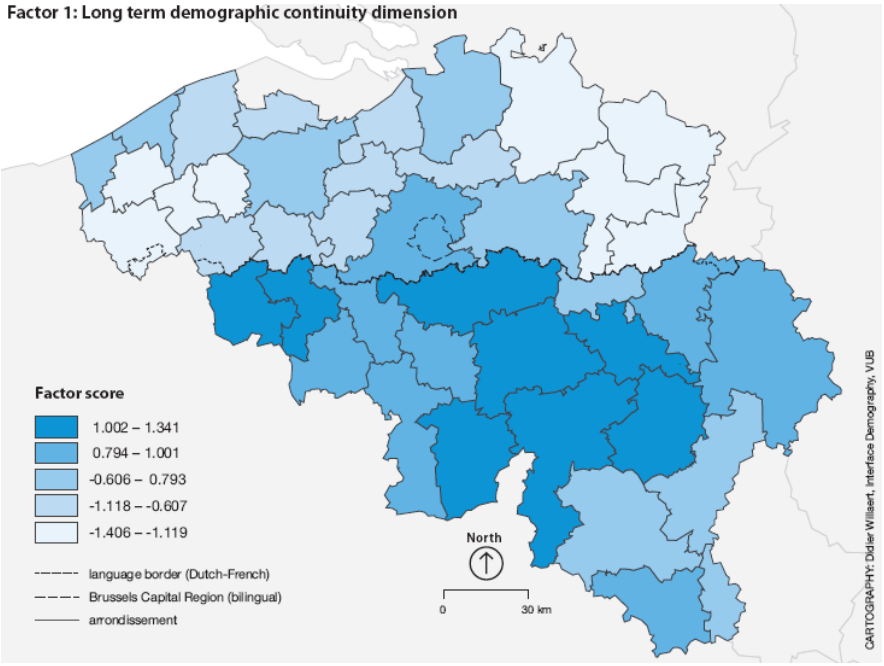
The map of the factor scores (expressed in standard deviations) of the arrondissements on the demographic continuity dimension is presented below (map 7). High scores are indicative of a leading position. Map 7 clearly shows that Walloon arrondissements, along with Brussels, were systematically at the vanguard with respect to all innovations captured by Factor 1. The language border is a well-demarcated barrier (see also Lesthaeghe 1977: 111-114). Moreover, many Walloon rural arrondissements are in the first quintile (cf. Philippeville, Dinant, Marche, Huy, Nivelles, Tournai, Ath), whereas the major Walloon industrial poles (Charleroi, Mons, Liège) are not.

Table 1: Long term continuity with respect to demographic innovations in Belgian arrondissements, 1841 – 2000 (principal component analysis results -- Factor 1)

Demographic Indicators with Factor Loadings GE .700			**Best Social Correlates of Factor 1 with Corr. Coeff. GE .600**		
1880	Index of Marital Fertility Ig	-0.881	1841-46	Marriages in Lent & Advent MLA	0.645
1890	Ig	-0.898	1860-65	MLA	0.780
1900	Ig	-0.944	1881-84	MLA	0.821
1910	Ig	-0.938	1890	% in Agriculture	-0.768
1880-1910	Speed of marital fertility decline	0.849	1900	% in Agriculture	-0.625
1920	Ig	-0.879	1910	% in Agric. + Cottage Ind.	-0.652
1920	Index of prop. Married Im	0.709	1919	% Secular Vote (Soc + Com + Lib)	0.897
1930	Ig	-0.784	1958	% Secular Vote (Soc + Com + Lib)	0.772
1947	Ig	-0.710	1964	% Non-attendance Church	0.698
1960-62	% TFR realized after age 30	-0.842	1980s	% Women ever-worked in cohorts 1961-65	0.672
1960-62	Total 1st Marriage Rate	-0.706			
1961	Index of Non-marital fert. Ih	0.716			
1961	Total 1st Cohabitation Rate	0.850			
1960s	% Women ever Divorced in cohorts 1931-35	0.705			
1960s	% Non-marital 1st births in cohorts 1931-35	0.732			
1967-70	Total Divorce Rate	0.764			
1969-71	Total 1st Marriage Rate	-0.790			
1971	Total 1st Cohabitation Rate	0.907			
1981	Total 1st Cohabitation Rate	0.947			
1989-91	Total 1st Marriage Rate	-0.738			
1990	% women 20-24 in Cohabitation	0.764			
1990	% women 25-29 in Cohabitation	0.840			
1991	Total 1st Cohabitation Rate	0.898			
2000	Index Cohabitation	0.803			
2000	Index 1st Marriages	-0.902			
2000	Index Divorce	0.750			

Finally, the map also clearly shows the two Flemish regions that were systematically at the tail end of the innovation distribution. These correspond entirely with the zones that had the longest resistance to the first two secularization waves, i.e. the West Flemish zone with Ieper, Diksmuide, Tielt, and Roeselare, and the Limburg-Campine zone with Hasselt, Maaseik, Tongeren, and Turnhout (see maps 1 through 6).

Map 7: Factor 1 (quintiles): Long-term continuity dimension in FDT and SDT innovation in Belgian arrondissements, 1880-2000



3.3.2 Factor 2: Historical illegitimacy in fertility and the urban-industrial connection

The second dimension emerging from the Principal Component Analysis mainly captures the remarkably stable spatial pattern of out-of-wedlock fertility in the period 1880-1930 (see Princeton Ih index), and later on the presence of higher proportions

married (Im) but lower fertility (see Table 2). Also noteworthy is the fact that there are no demographic indicators measured after 1980 loading on this factor. Hence it is fair to state that this dimension is more a historical one and unrelated to the SDT. Equally remarkable is that, also on the side of its correlates, only indicators of urbanity are identified up until 1970. Finally, note that the negative correlation with adult literacy in 1880 stems from the fact that the Belgian industrial poles of the 19th century, but to some degree also the larger urban ones, were attracting illiterate immigrant populations. But after World War II this negative relationship between literacy and urbanity was being reversed in tandem with the growth of the tertiary sector in the economy.

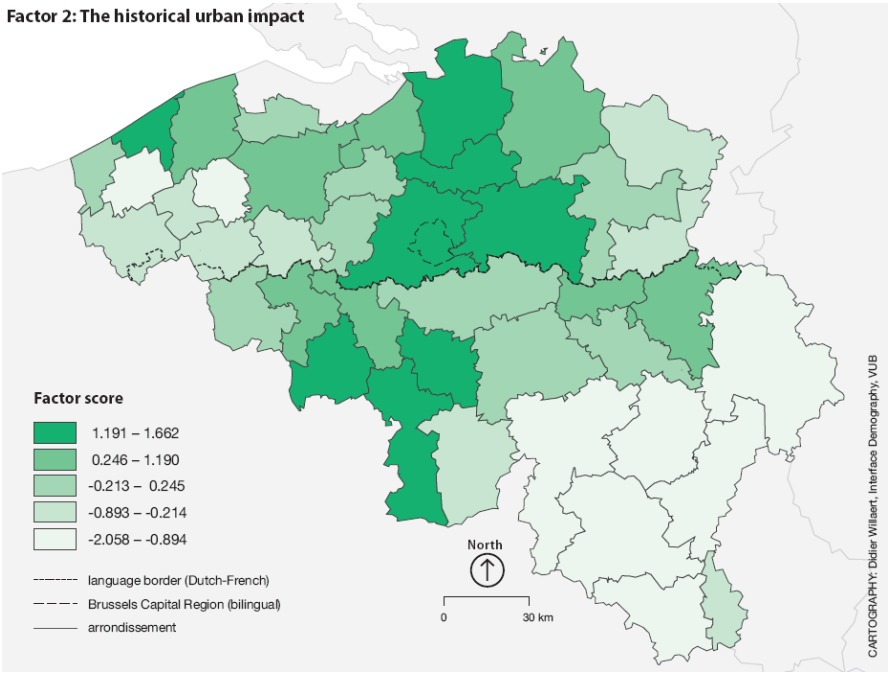
Table 2: The historical dimension of non-marital fertility in Belgian arrondissements, 1841-2000 (principal component analysis results - Factor 2)

Demographic Indicators with Factor Loadings GE .700			Best Social Correlates of Factor 2 with Corr. Coeff. GE .600		
1880	Index non-marital fertility Ih	0.837	1880	% literate	-0.621
1890	Ih	0.891	1890	% urban	0.711
1900	Ih	0.923	1900	% urban	0.756
1910	Ih	0.901	1910	% urban	0.790
1920	Ih	0.931	1910	% literate	-0.633
1930	Ih	0.838	1920	% urban	0.720
1947	Index of non-marriage Im	0.713	1930	% urban	0.726
1970	Im	0.785	1947	% urban	0.694
1970	Index of marital fertility Ig	-0.796	1950s	cohort 1931-35 with higher sec educ	0.628
1969-71	TFR	-0.773	1970	% urban	0.685
1979-81	TFR	-0.734			

Map 8 shows the geography of this second dimension. It strongly reflects the degree of urbanization and industrialization with high values for the Brussels – Antwerp axis in Flanders, and for the Hainaut industrial belt in Wallonia (Mons, Charleroi). But two other less industrialized arrondissements are also in the top quintile: Ostend on the Flemish coast and Thuin adjacent to the Hainaut industrial belt. By contrast, all the highly rural Walloon arrondissements of the Ardennes and several in the West Flemish rural belt are typically gathered in the lowest quintile. These were also arrondissements

with historically negative migration rates, a feature that contributed to the strengthening of their rural character. Finally, it is impossible not to notice that the language border plays no role here whatsoever.

Map 8: Factor 2 (quintiles): Pre - World War II "illegitimate" fertility in Belgian arrondissements and its historical urban-industrial connection



3.3.3 Factor 3: SDT fertility postponement

The third factor identified in the Principal Component Analysis pertains exclusively to a feature that belongs to the SDT: fertility postponement and differential catching up of fertility after age 30 (see Table 3). This is being indicated by the positive correlations with the mean ages at first birth from 1970 onward, and the percentage of the total fertility rate (TFR) realized after age 30 from roughly 1980 onward. Areas with high scores on this third dimension are then typically those with stronger fertility

postponement and subsequent fertility recuperation at later ages. Not surprisingly, these areas are also identified by two structural features: high post-secondary female education and high female employment rates for the cohorts born in the 1960s.

Table 3: SDT fertility postponement dimension in Belgian arrondissements 1950-2000 (principal components analysis results - Factor 3)

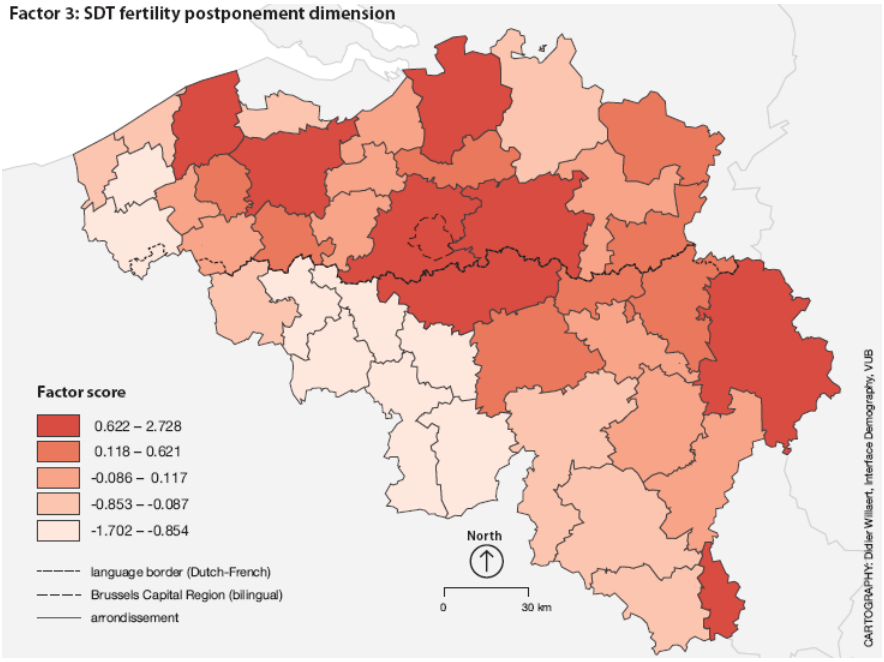
Demographic Indicators with Factor Loadings GE .700			Best Social Correlates of Factor 3 with Corr. Coeff. GE .600		
1950s	% of 1st births prior to age 25, cohort of 1931-35	-0.773	1980s	% women with higher education, cohort 1961-1965	0.807
1969-71	Mean age at 1st birth	0.701	1980s	% women ever in labor force, cohort 1961-1965	0.601
1979-81	Mean age at 1st birth	0.928			
1979-81	% of TFR after age 30	0.844			
1989-91	% of TFR after age 30	0.740			
1989-91	Mean age at 1st birth	0.881			
1998-00	% of TFR after age 30	0.809			
1998-00	Mean age at 1st birth	0.824			

Map 9 below shows the geography of the fertility postponement dimension. Along with the capital Brussels, all major Flemish urban areas and economic growth poles are represented in the top quintile (Halle-Vilvoorde, Leuven, Antwerp, Ghent, Bruges), in tandem with the better performers in Wallonia (Nivelles adjacent to Brussels, Verviers, and Arlon with its large population employed across the border in the Grand Duchy of Luxemburg). Much earlier fertility is still maintained in the whole of southern Wallonia along the French border, but particularly in the Hainaut old industrial belt. The same also continues across the language border in the southern part of West Flanders. However, the Flemish area of less fertility postponement has fewer cohabitants and much lower fertility rates among such cohabiting couples than its Walloon counterpart, as the stark differentiation in Factor 1 had already indicated.

3.4 The Belgian experience in a nutshell

The FDT in Belgium has two main components: (i) control over the level of marital fertility and (ii) the historical bulge and subsequent decline in "illegitimate" fertility.

Map 9: Factor 3 (quintiles) -- the fertility postponement aspect of the SDT in Belgian arrondissements



The best spatial correlate of the former was the degree of secularization, pointing at the fact that the bottleneck condition in the RWA trio must have been the W-condition or the religious and moral acceptability of contraception. The Belgian experience is furthermore one of considerable continuity, since the secularization dimension maintains a stable spatial pattern until at least the end of the 20th century, and continues to condition the spread of the "non-conformist" aspects of the SDT (i.e. cohabitation, parenthood among cohabiters) as well. This implies again that the moral acceptability or the W-condition continued to be the limiting condition for this "innovative" aspect of the SDT as well. This is not surprising, given the fact that both contraception (FDT) and

cohabitation (SDT) were in the respective time periods viewed as "unconventional" or even "immoral".

The contrast is provided by the other aspect of the SDT; i.e. the fertility postponement component. This feature exhibits a totally different geographical pattern, with female advanced education and concomitant employment emerging as the best spatial correlates. Hence there is no trace here of the operation of the W-condition, and this is quite logical since postponing parenthood is not behavior that directly violates moral or religious prescripts. As a consequence, the geography of fertility postponement mirrors the R-condition, since better educated and employed women were typically in the vanguard of the postponement transition (cf. Neels 2006, for individual level data).

4. From FDT to SDT: The Spanish experience

The comparison of Belgium and Spain allows for a more revealing study of cultural and linguistic factors involved in the FDT and SDT. Both countries share a Catholic tradition and have similar roots of secularization (Enlightenment, Marxism), and both are linguistically heterogeneous. Yet in a host of other characteristics they are quite different. To start with, Belgium was the first continental country to move through the Industrial Revolution, whereas Spain was near the tail end of the distribution in this respect. In fact only two Spanish areas had an earlier 19th century industrial development, Catalonia with textiles and the Basque country with metal industries. Secondly, Spanish landholding systems were characterized by the juxtaposition of "minifundios" of less than one hectare and permitting subsistence farming only, and "latifundios" or large agricultural enterprises operated by day laborers. Despite agricultural reforms, this duality survived well into the 20th century, and it is one of the causes of another major distinction, i.e. political polarization. Indeed, despite a grounding of politics in similar religious and ideological divisions, political history is far more turbulent in Spain than in Belgium. Starting with the guerilla war against Napoleon there was a steady growth of polarization between Catholic and secular factions, culminating in the Spanish Civil War. Thereafter both cultural and technical developments were slow for most of the Franco era (1939-1975), i.e. until at least 1965, whereas the rest of Western Europe was building new industrial and infrastructural capacities on the ruins of World War II. In fact it is not until the end of the Franco era, the constitution of 1978, and EU membership that Spain is propelled at high speed into late 20th century economic, technical, and cultural modernity.

A number of these points need further elaboration, since they will be of major relevance to understanding the spatial patterns of the FDT and SDT in Spain.

4.1 The Spanish spatial secularization pattern

Just as in Belgium (then known as the Austrian Low Countries), the start of secularization in Spain is linked to the Enlightenment and to the "enlightened despotism" of the last two 18th century monarchs (Carlos III and IV). During their reign the Jesuits were expelled (1767), the church was forced to sell off land and loan the proceeds to the state, and the private organizations to stimulate economic, philosophical, and scientific development were officially sponsored. These organizations, called *Sociedades Economicas de Amigos del Pais*, received legal licenses to foster their activities both in Spain and the colonies. After the guerilla war with the Napoleonic forces, Spain adopted a liberal constitution in 1812.

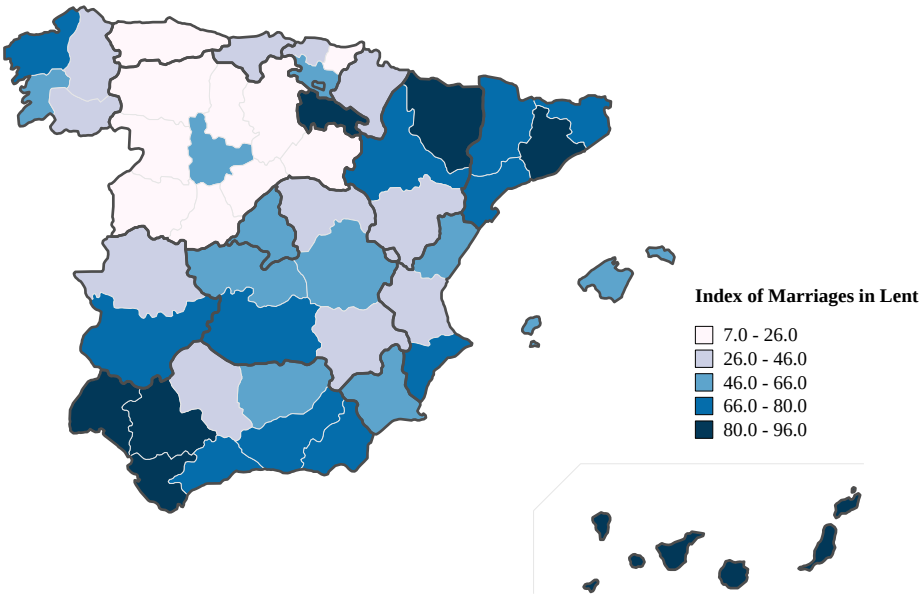
During the first half of the 19th century Spanish liberalism replaced the Ancien Régime through political struggles, revolutions, and civil wars. After the first Carlist war in 1840 and the traditionalists' defeat, the church's role in politics, economics, and social works was further reduced. By 1843 many episcopal sees were vacant, cathedral chapters were controlled by laymen, most male religious orders were banned, and more church property had been sold to service the public debt. Moreover, the tithes were abolished, priest became civil servants, and there was no curtailment of anticlerical urban riots.

Under the reign of Isabel II (1843-1868) and later under that of her son Alfonso XII (1874-1885) and during the dictatorship of Primo de Rivera (1921-1930) the church gradually recovered. During that period the main interruption was the First Republic of 1873-1874, but that only constituted a brief intermezzo. However, by the end of the 19th century there is a further polarization of the political spectrum. Not only were the Socialists present on the Left, but so also were more radical factions with anarchist philosophies. Similarly, fascists enlarged the extreme Right, hitherto mainly made up of the strongly Catholic Carlists. Hence, at the turn of the century the extremist forces were growing that led to the events of the 1930s, i.e. the Second Republic and the Civil War.

A first glimpse of the regional pattern of these divisions can be obtained from the index of marriages in Lent (ML-index) for 1900 and 1901. In contrast to Belgium, marriages during Advent were frequent in Spain, and only those in Lent were banned or discouraged. The ML index for Spain is then simply the percentage of marriages in March divided by 1/12 (assuming a flat distribution of marriages within the year), or simply multiplied by 12. The provincial values at that time span the complete spectrum, from virtually no such marriages (ML values below 25) to almost a complete non-adherence to the practice of not marrying during the ecclesiastic "closed period" (values above 80). The strongly Catholic areas of Asturias and the provinces of Castile and Leon clearly show up as white zones on the map of the ML-values for 1900-1901 (Map 10). Maps with other indicators, such as the number of inhabitants per clergyman in the

census of 1887 (Reher et al. 1993), or the number of inhabitants per seminarist in dioceses in 1963, show almost exactly the same areas as being Catholic strongholds. At the other end of the distribution there is a large north eastern zone of strong secularization, made up of Catalonia and adjacent Huesca and Zaragoza plus Rioja, and a large southern zone covering Andalusia (with the exception of Cordoba) and adjacent Badajoz, Ciudad Real, and Alicante. Also the western half of Galicia (A Coruña, Pontevedra) distinguishes itself by higher levels of non-adherence to the marriage ban than its Catholic hinterland. Finally, the Canary Islands equally fall in the top quintile of non-observance of the marriage ban.

Map 10: Index of marriages during Lent (ML) in Spanish provinces (quintiles), 1900-1901



Further into the 20th century other indicators of secularization were constructed. For the Second Republic use was made of the percentage in each province of the elected *diputados* for the Left in 1931 and 1936 and for the Right in 1933 and 1936. Centrist *diputados* were left out in setting up these indicators. For the post-Franco era the indices are the percentage vote for the Left in the 1977 election (including regional leftist parties) and the percentage of marriages that were only civil marriages in 2001 and 2009. Together with the ML-index for 1900-1901, these seven indicators were

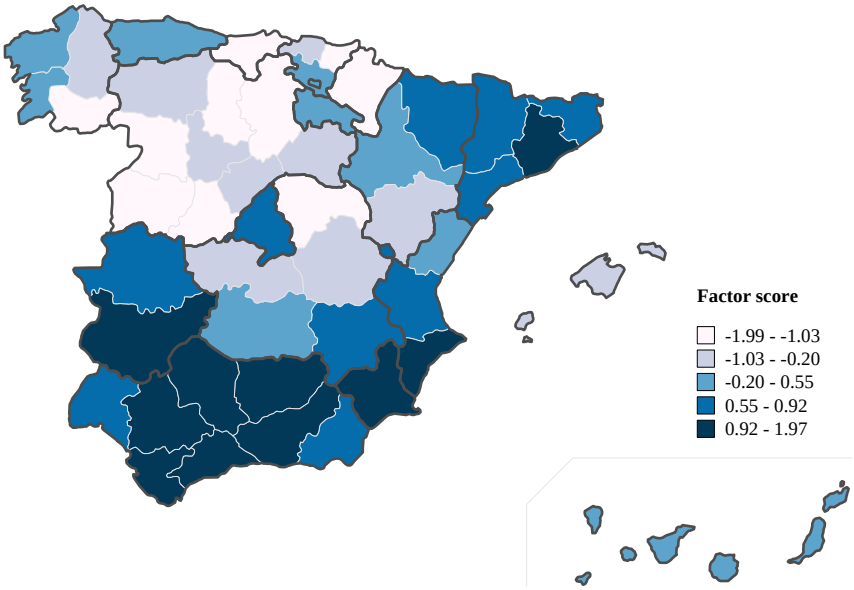
subjected to a Principal Component Analysis to extract the underlying orthogonal (i.e. uncorrelated) dimensions. It turns out that there is a clear distinction between a historical spatial dimension of "old secularization" and a newly emerging post-Franco "new secularization" with a different geography. The best indicators of the older pattern are, not surprisingly, the percentage of *diputados* for the Left in 1936 (factor loading or r = .853), for the Right in 1936 (-.757), percentage vote for the Left in 1977 (.704), the ML-index in 1900-01 (.671), the percentage of *diputados* for the Left in 1931 (.559), and for the Right in 1933 (-.505). The best indicators of the "new secularization" dimension are the percentages of civil marriages in 2009 (.947), in 2001 (.942), and the percentage of *diputados* for the right in 1933 (-.580). It can be noted that the 1977 election results were still correlated with the Second Republic political maps (see also Linz and Montero 1999), but that the 21st century indicators have become quite independent of the historical dimension.

The two factors of old and new secularization respectively are presented in Maps 11 and 12. Note that the scale of the principle components (factors) is expressed in standard deviations, and that the distribution has a mean of zero and a standard deviation of unity.

The comparison of Maps 10 and 11 show that the historical secularization dimension in Spain was quite stable until the 1970s. The core of the most Catholic area is made up of Castile and Leon and the provinces of Castile-La Mancha around Madrid together with Teruel. This large central zone spreads further out to include eastern Galicia (Lugo, Ourense), Cantabria (Santander), Navarra, and the northern Basque area (Bizkaia, Gipuzkoa). The most secular areas are again the whole of the South, the entire Mediterranean coast (but not the Baleares), inner Catalonia (Lleida), and northern Aragon (Huesca). Finally, there is a band of northern provinces that is situated in the central segment of the distribution of the historical secularization factor, and it is made up of western Galicia (A Coruña, Pontevedra), Asturias, Rioja, Alava, and Zaragoza.

Another striking feature for Spain is the strong connection between Catholicism and literacy. In 1887 the census figures for male analfabetism show a contiguous zone of percentages lower than 41% in the provinces of Castile and Leon and along a narrow Atlantic stretch from eastern Asturias, Santander to western Bizkaia. Intermediate figures form a circular band around this Catholic heartland to include Galicia and the northern part of Castile-La Mancha, and also emerge along the Catalan coast. But in much of the rest of Spain, and notably in the south and along the central and southern Mediterranean coast, male illiteracy was higher than 70% (Reher et al. 1993).

Map 11: The historical secularization dimension in Spanish provinces (quintiles of factor values)



The map of 1887 for female illiteracy shows a similar pattern with levels below two thirds in Castile and Leon, Navara, Rioja, the whole of the Basque region, Santander, and eastern Asturias. By contrast, levels in excess of 85% of female illiteracy prevailed in the whole of Galicia and in the entire south-eastern segment of the country, roughly from Castellon to Almeria and further inland to Ciudad Real. In contrast to Belgium, where illiteracy disappeared almost entirely after the First World War, the Spanish low literacy zone persisted much longer (Vilanova-Ribas and Moreno-Julia 1992). Moreover, the concordance between higher literacy and better education on the one hand and Catholicism on the other meant that the civil service in Madrid and the elite of the Franco era were disproportionally overrecruited from Castile and Leon, thereby fuelling more antagonism between the political rightist center of the country and the more secular periphery. However, things changed after 1975.

As stated before, Spain underwent a rapid and profound transformation during the post-Franco era in just about every single domain of life, from economic modernization and rising standards of living to much more centrist politics and the total disappearance of the extreme Left and Right alike (Linz and Montero 1999). Obviously Spain had no

more appetite for either the "*nacionalcatolicismo*" (Botti 1992) of Franco or for adventures with the far Left. On the other hand, just like in Belgium, regionalist parties and movements gained both ground and influence with marked degrees of devolution of economic power and with linguistic and cultural autonomy as a result.

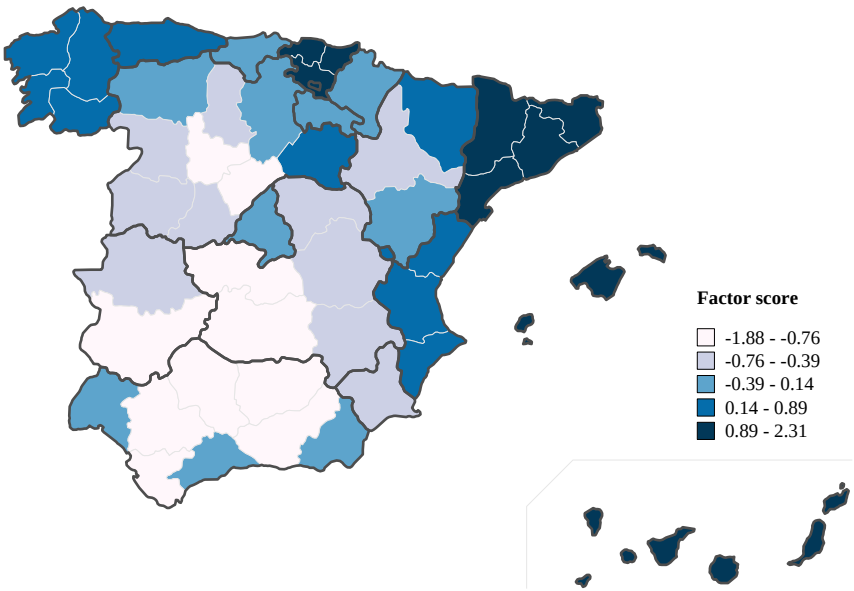
In tandem with the post-Franco modernization of its economic and social fabric, Spain also underwent a fast and profound new secularization wave. The proportion of practising Catholics (Mass at least a few times per month) drops from a plateau of no less than 90% during the 1950s and 1960s to just over 50% in only the five years between 1970 and 1975 (Requeña 2005). And from 1975 onward there is a further linear decline to less than 30% in 2002. The Spanish secularization is not only visible in the institutional spheres, but equally in profound changes with respect to individual ethics. For instance, to everybody's amazement in the rest of Europe, Spain joined the vanguard countries in recognizing same sex marriages. It comes therefore as no surprise to witness a steady rise of marriages that have the civil part only and do away with the religious ceremony. For instance, for Spain as a whole, in 1976 barely 0.3% of marriages were civil ones only, but by 2000 this had grown to a quarter (24.1%) (INE, 2005), and by 2009 to more than half (54.9%) (INE website). In some provinces this figure exceeds 60% (Baleares, Barcelona, Girona, Gipuzkoa, Lleida, Las Palmas, Santa Cruz de Tenerife, Tarragona, and Valencia). Hence, with the disappearance of the old politico-religious cleavage, a new spatial pattern emerges for the latest secularization wave. This pattern is caught by the second principal component in our analysis, and it is shown in Map 12.

The most striking difference between Maps 11 and 12 is that the whole south is no longer a component of this late 20th and early 21st century secularization wave. This is a major factor in Spanish spatial cultural discontinuity. But, on the other hand, the old Catholic zones of Castile and Leon and Castile-La Mancha remained at the lower end of the distribution as well, so that there is one large contiguous area of slower than average "new secularization", stretching from Burgos to Cadiz (north-south) and from Murcia to Caceres (east-west).

The other half of the distribution geographically forms an extended "peripheral arc", and contains both provinces that have always been at the vanguard of secularism and a number of newcomers. Obviously Catalonia remains in the former group, and so does the linguistically related Comunidad Valenciana. The Baleares complete the linguistically homogeneous part of this "new secularization arc". The northern band of provinces along the Atlantic Ocean and the Pyrenees is also well represented in the top half of the distribution. This includes "familiar" provinces in this respect such as Huesca, Alava, and western Galicia. A set of relative "newcomers" such as the northern Basque provinces, Soria, Asturias, and eastern Galicia complete the "arc". Finally, it should be noted that Madrid is not among the trendsetters in this latest secularization

wave, but just in the middle of the distribution, and that the Canary Islands continue to be highly secularized provinces.

Map 12: The new secularization dimension in Spanish provinces (quintiles of factor values)



To sum up, one of the major differences between Belgium and Spain in recent secularization history is that the former country displays a high degree of continuity in the spatial pattern of secularization, whereas the latter exhibits a clear cleavage between the old secularization pattern and a new one that has emerged since the 1970s. This distinction is obviously related to the fact that Belgium has been a typical "consociational democracy" (Lijphart 1968), i.e. governed by political "pillars" which had to form coalition governments from the very onset in 1830. The country has an intact track record of negotiated pacts, deals, and compromises between political elites, and therefore, unlike Spain, less polarization and no open and virulent conflicts along the secularization dimension.

4.2 The demographic dimensions of the FDT and the SDT in Spain

As in the Belgian analysis, use has again been made of a large set of demographic indicators for Spanish provinces, respectively measuring features of the first and second demographic transitions. The correlation matrix for the total of 24 demographic indicators was again analyzed by means of a Principal Component Analysis, and this set of indicators could be reduced to five basic dimensions, three of which capture the FDT and two the SDT. These 5 dimensions are described in Table 4.

Table 4: Indicators and dimensions of the first (FDT) and of the second demographic transition (SDT) in Spanish provinces

A. FDT – First demographic transition dimensions

Factor 1. Late and slow decline of marital fertility, resistance to fertility control, 1887-1960.		**Factor 2: Prevalence of earlier female marriage, as opposed to Malthusian pattern of late marriage and higher definitive celibacy, 1887-1930.**		**Factor 3: Historical pattern of fertility outside wedlock, 1887-1960.**	
Princeton index of marital fertility (Ig 1887)	0.78	Princeton index of proportions married (Im 1887)	0.94	Princeton index of illegitimate fertility (Ih 1887)	0.89
Ig 1900	0.84	Im 1900	0.92	Ih 1900	0.92
Ig 1930	0.85	Im 1930	0.85	Ih 1930	0.74
Ig 1950	0.90			Ih 1960	0.58
Ig 1960	0.74				
% total marital fertility transition completed by 1930	-0.60				

Table 4: (Continued)

B. SDT – Second demographic transition dimensions

Factor 4: The new postponement of marriage and parenthood, 1995-2001.		**Factor 5: SDT - Non-conformist family formation pattern, 2001-2002.**	
Women not yet in a union at age 25-29, 2001	0.82	Pct unions cohabiting, 2001	0.64
Fertility postponement index (fert 30+/ fert 20-29), 2001	0.93	pct births non-marital, 2001	0.78
Women childless 25-29, 2001	0.93	pct children <15 in one-parent household, 2001	0.45
Women childless 30-34, 2001	0.91	total fertility TFR, 2002	0.65
Total fertility rate TFR, 1995	0.72		

The dimensions described above in table 4 clearly show that we are essentially dealing with five different features. The resistance to fertility control, the pattern of early marriage, and the historical levels of extra-marital fertility are the three classic ingredients of the FDT, whereas the postponement of fertility and the rise of "non-conformist" family formation are the two SDT components.

4.3 Statistical results for the Spanish example

We shall now discuss the maps for each of the five demographic dimensions of the Spanish FDT and SDT, and make the link with a set of socio-economic and cultural spatial indicators.

4.3.1 The FDT marital fertility transition

Following up on the earlier studies of J. W. Leasure (1962) and M. Livi-Bacci (1968), a detailed analysis of the Spanish historical fertility transition has been offered by Reher and Iriso-Napal (1987, 1989). Much of what follows here on the FDT therefore largely echos their findings. However, when it comes to a multivariate analysis in section 5,

another strategy will be followed which will essentially eliminate the multicollinearity problem that affected the outcomes of earlier studies.[8]

Map 13 depicts the spatial pattern of the Spanish marital fertility transition. The factor captures the marital fertility levels as measured through the Princeton Ig measure, from 1887 through 1960, and the relative speed of the decline of marital fertility between 1887-1900 and 1930. For the last indicator, the Ig-levels at the onset were chosen to be either those for 1887 or for 1900, depending on which was highest. This choice was made in order to accommodate the fact that several provinces still had a fertility increase between 1887 and 1900. Furthermore, we take 1930 as a good approximation of the mid-transition point, since the 1920 Ig levels, as used by Reher and Iriso-Napal, are still very high. For instance, for the rural parts of provinces the mean Ig level was .66 in 1887, .68 in 1900, and still .62 in 1920. (Reher and Iriso-Napal 1989: 408). For Spain as a whole these values were respectively .65, .65, and .59. The value for 1930 is .54, which is still fairly high but about the halfway value between Ig = .65 in 1900 and .40 in 1960. (Coale and Treadway 1986: appendix table: 145).

Aside from Madrid, one major set of contiguous provinces stands out as the Spanish region with an early fertility decline. This zone comprises the entire Catalan-Valencian linguistic area, i.e. the three Catalan provinces, the three provinces of the Comunidad Valenciana, and the Baleares Islands. The three adjacent provinces of Aragon are also part of the faster fertility transition zone. In the top quintile we also find the two Canary Islands provinces. Spearheading the marital fertility decline were the provinces of Barcelona, Tarragona, and Castellon. Taking an Ig value of .30 (or 30 percent of Hutterite fertility) as the endpoint of the transition, these three provinces had already covered two thirds of the entire marital fertility transition by 1930.

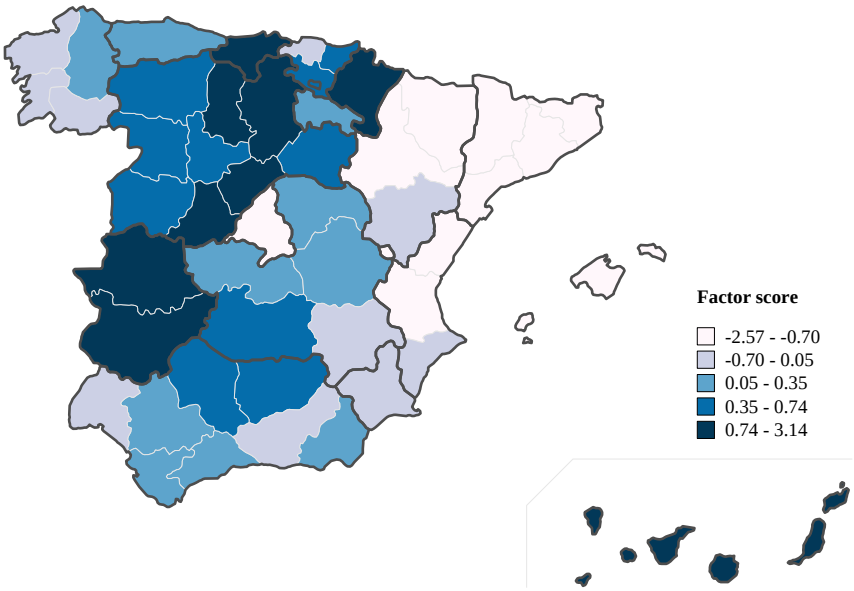
The areas belonging to the latest and slowest quintiles are all located along a north-south axis stretching from Santander (Cantabria) to Badajoz, and comprising all of Castile and Leon and Extremadura. Navarra is also part of this slower zone, and so are Ciudad Real, Jaen, and Cordoba in the south. The following provinces had not even completed 10% of the transition by 1930: Avila, Burgos, Cordoba, Cuenca, Granada, Navarra, Salamanca, Segovia, and Zamora.

The best correlates of a fast marital fertility transition (the opposite to what is shown in the map above) were the following: the percentage employed in industries in 1900 (r = .425), the urban percentage in 1900 (.309), the percentage of *diputados* for the left in 1936 (.316) and for the right at the same elections (-.359). As expected, these correlations are all very modest, and that perfectly echoes the findings of Leasure (1962) and of Reher and Iriso-Napal (1989). In the analysis of the latter authors other

[8] The articles by Reher and Iriso-Napal present both zero-order correlations (r) and standardized regression coefficients (beta). This is a very fortunate decision since the comparison of values of r and beta is very instructive in assessing the seriousness of the multicollinearity problem.

variables have also been added, such as infant and childhood mortality rates, the presence of day laborers, and a measure of net migration. In accounting for the Ig-values of rural parts of provinces in 1920, they find correlations for these three extra indicators of, respectively, .304, -.341 and -.511.

Map 13: FDT - late and slow decline of marital fertility, 1887-1960



The positive correlation between higher marital fertility and higher infant and childhood mortality can be explained, as done by the authors, by the impact of breastfeeding differentials. Shorter durations of breastfeeding lead to both less spacing of births and higher fertility and to higher mortality prior to age 5. A breastfeeding map for Spain could further elucidate this point.[9] The negative correlation with day laborers essentially captures the lower marital fertility in a number of southern provinces with agricultural structures dominated by latifundio. The negative correlation between net migration and marital fertility in rural areas points in the direction of selectivity, with traditionalism being reinforced by a loss of population. Reher and Iriso-Napal also find a negative correlation (-.503) between the leftist vote in 1936 and rural fertility levels,

[9] For a further analysis of the link with infant mortality, see F. Gil-Alonso 2010.

which is equally reflected in our findings for the marital fertility factor for provinces as a whole.

We also explored the effect of primogeniture as a characteristic of the inheritance system. The protection of property for the oldest son could indeed explain why Catalonia was so far ahead with its fertility decline. However, the map produced by Zapatero Molinero (1977: 19) shows that the primogeniture zone stretched westward to include Huesca, Navarra, and the Basque country as well. Furthermore an Asturian-Galician band also exists with a dominance of primogeniture or testamentary preference. Some of these regions (e.g., Huesca) were equally at the forefront of fertility control, but others were not at all (e.g., Navarra). Moreover, the three provinces with fast fertility decline in the Comunidad Valenciana all had equal division as the dominant inheritance principle.

The conclusion from this exploration is that there is a modest link of the Spanish marital fertility transition to industrialization, urbanization, and secularization, but that major regional particularities prevail, even if further controls are introduced for inheritance or land tenure systems.

4.3.2. The FDT nuptiality system

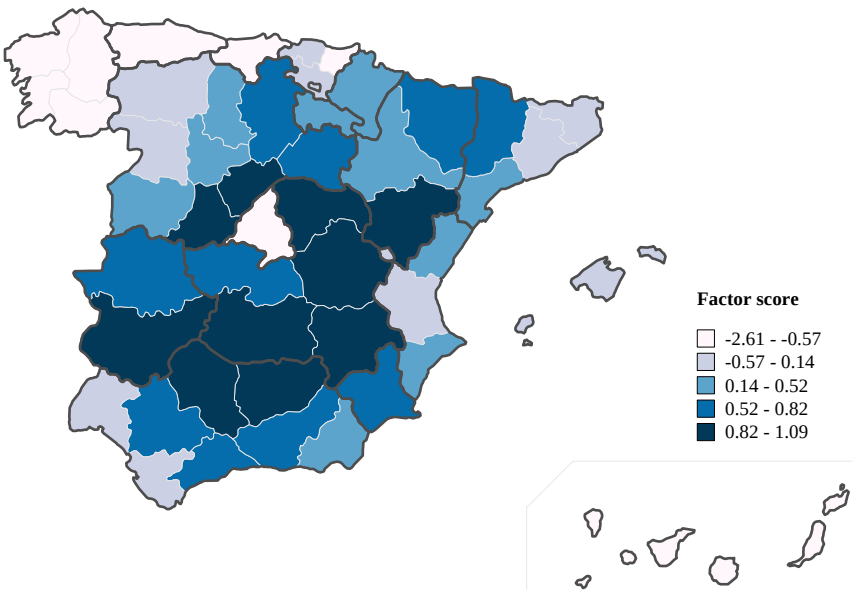
There are major differences between Belgium and Spain with respect to the historical patterns and changes in their respective nuptiality systems. Belgium fell entirely within the broader western European zone with the dominance of the Malthusian system of late and non-universal marriages during the 18th and 19th centuries. This was not the case for Spain, where the Malthusian system only prevailed in the Atlantic provinces (see Map 14 and Reher 1991). In these areas the Hutterite fertility weighted Princeton index Im of proportions of women married at ages 15 to 49 are in the range of .440 to .480 in 1887 (Reher et al. 1993: 227). At the other end of the spectrum, Im values in 1887 are as high as .680 in several Spanish provinces (e.g., Avila, Huesca, Segovia) (ibidem), which is indicative of much earlier marriage. By contrast, the Im levels for Belgian arrondissements in 1880 were systematically lower than those in Spain, and only in the .350 to .500 range, reflecting the impact of stronger Malthusian control.

A direct consequence of this distinction at the onset is that the proportion of married women rose during the FDT in Belgium as the Malthusian system gradually receded under the impact of the growth of wage labor in industrial sectors (Lesthaeghe 1977). By contrast, in Spain the proportions married experienced a modest decline. In terms of the Princeton index Im, there was a decrease from .575 in 1887 for Spain as a whole to .504 in 1930, and in terms of mean ages at first marriage for women there was

a small increase from 24.4 in 1900 to 24.7 in 1930 (Muñoz-Perez and Recaño-Valverde 2011).

The spatial nuptiality pattern is shown in Map 14 and captures the Im values for 1887, 1900, and 1930. The best correlates of this map deal with the land tenure system. The minifundio indicator, i.e. percent of plots of less than one hectare in 1962 (INE, 1964) and the latifundio indicator of plots of over 100 hectares have correlation coefficients of -.594 and .395, respectively. This reflects the correspondence between late marriage and small-scale subsistence farming in Galicia and Asturias, and much earlier marriage among the rural proletariat in central and southern regions with large-scale agricultural enterprises. The correlation is not stronger because other areas existed with small scale farming along the Mediterranean coast, but these did not necessarily have the late nuptiality pattern (e.g. Alicante, Murcia).

Map 14: FDT - earlier female age at marriage, high proportion of women married 15-49, 1887-1930



But the land tenure system does not tell the whole story. At least as important, but connected to population pressure in densely populated rural areas, is the imbalance in the sex ratios at marriageable ages, say 20-29. This ratio of men 20-29 to women 20-29

for all the Atlantic provinces, from Gipuzkoa to all of Galicia and also including Leon and Zamora, shows a large deficit of men, thereby reducing the marriage possibilities of women. Hence selective outmigration of men depressed the values of Im considerably. This feature, already described for 1887 (Reher et al. 1993), continued to exist well into the 20th century.

The Belgian values of Im in the arrondissements and towns show very similar effects of selective migration by gender and marital status (Lesthaeghe 1977: 80-87). Densely settled rural areas with cottage industries and small scale agriculture similarly lose young men and have the lowest Im values. The older urban areas, which offer employment opportunities for single women in textile industries, education, and domestic service, have higher overall female employment rates and a shortage of single men, which reduces the Im values as well. On the other hand, the new industrial towns with heavy industries and growing suburbs had ample male-oriented employment opportunities, a surplus of single men, and hence a favorable market for women, and much higher Im values as a result (often above .550) (Ibidem: 84-85).

To sum up, in Belgium the gradual abandonment of the late Malthusian marriage pattern was a major ingredient of the FDT and there is a steady drop in ages at marriage until the mid-1960s. In Spain, the situation is much more stable until the 1930s, and the decline in marital fertility is not really accompanied by a nuptiality transition as in northern or western Europe. Instead, nuptiality patterns partially continued to reflect the strong differences in land tenure systems, with later marriage in areas with peasant agriculture, and early marriage in areas with latifundio and a rural proletariat.

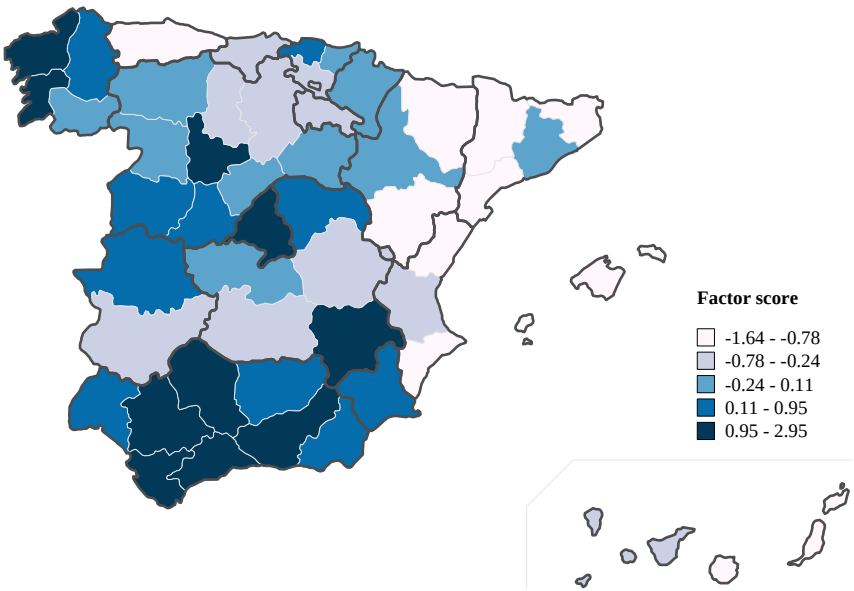
In both countries there were major additional "marriage market" effects caused by selective migration by gender and marital status. Whenever migration creates a surplus of young women, Im values are depressed, and the opposite holds when a surplus of young men is produced. There is a strong push for male outmigration in areas with small-scale peasant agriculture and high population densities, leading to low Im values, and hence the "land tenure – migration" link is of extra importance.

4.3.3 The "illegitimacy" dimension of the FDT

Out-of-wedlock fertility levels in Spain and Belgium were low to very low. For Spain as a whole the Princeton index of illegitimacy Ih amounted to .041 in 1887 and it declined to barely .038 in 1930 (Coale and Treadway 1986: 145). The zones with the highest levels of illegitimacy, i.e. with Ih values between .060 and .085, are all in the south. The other areas with higher illegitimacy (Ih values between .050 and.065) are located in Galicia. Finally there are also such values in Madrid, and more surprisingly in the province of Valladolid.

The major correlates of higher illegitimacy are the percentages urban in 1900 and 1950, with correlation coefficients of .468 and .412 respectively. This is essentially the same finding as in the case of Belgian illegitimacy. It is also possible that the higher illegitimacy in southern Spanish provinces reflects the remnants of unmarried cohabitation, but the overall correlation with, for instance, the presence of latifundio is not materializing because of other areas with similarly higher illegitimacy levels, reflecting other features such as urbanization.

Map 15: FDT - high out-of-wedlock fertility, 1887-1960



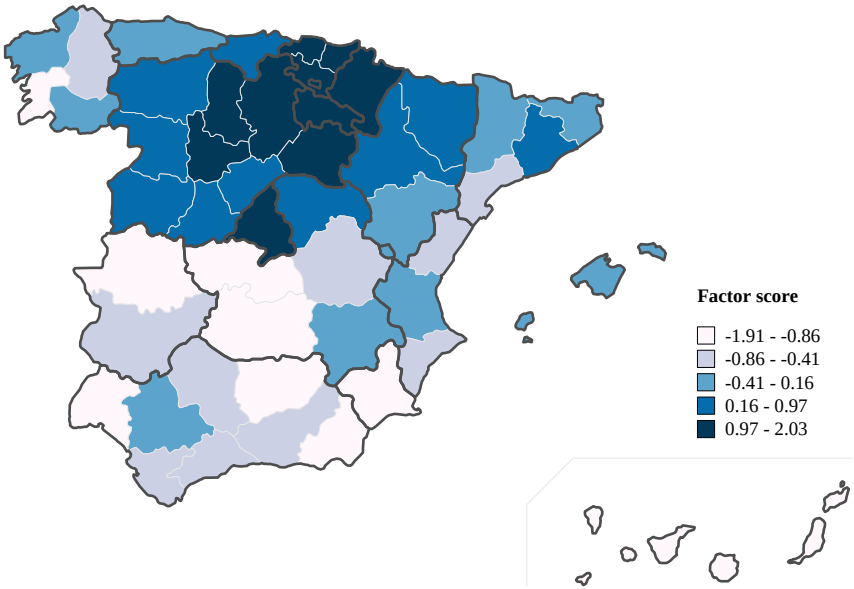
4.3.4 The postponement dimension of the SDT

As indicated in Table 4, the SDT postponement dimension is essentially capturing the proportions of women who are still not in a union at ages 25-29, the proportions of women still childless in the age groups 25-29 and 30-34, and the fertility postponement index, which is the ratio of the sum of the age-specific fertility rates above age 30 over that in the age bracket 20-29. All these indicators pertain to the year 2001. Another good correlate of this factor was lower total fertility as measured by the TFR in 1995.

The geography of the SDT postponement dimension is displayed in Map 16. The slowest transitions into marriage and especially to parenthood are found in a large contiguous set of provinces. The core of it is made up of Navarra, the Basque region, Rioja, Soria, Burgos, Palencia, Valladolid, and Madrid. Around this core is another circle of provinces with strong SDT postponement, so that the whole of Castile and Leon is covered, together with northern and central Aragon and the province of Guadalajara. The outlier here is Barcelona, which is the only province with stronger postponement outside that contiguous area.

The postponement is less pronounced in the rest of Spain, and least of all in Extremadura, the adjacent part of Castile & Leon, Andalusia (minus Seville), and Murcia. At the other end of the country Pontevedra in Galicia also falls within the lowest quintile of this postponement dimension.

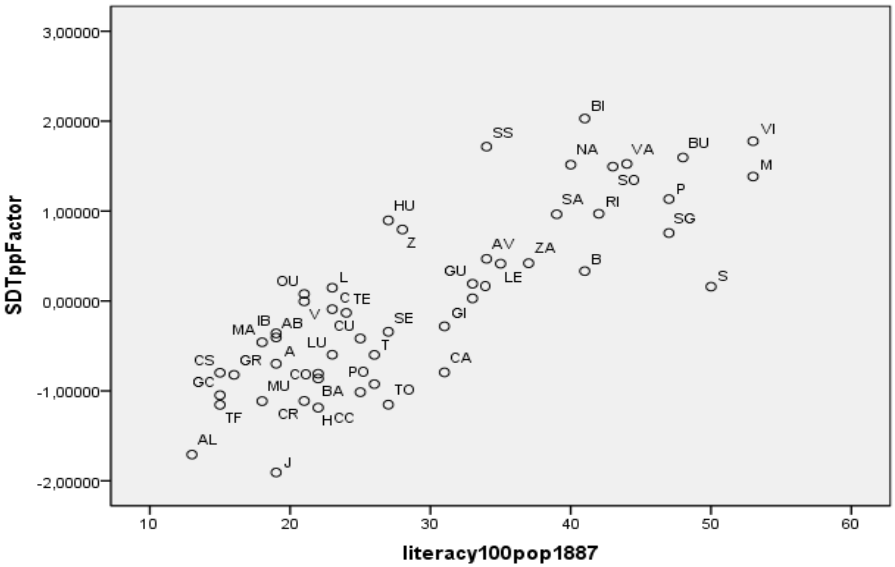
Map 16: SDT - postponement of marriage, parenthood, and overall fertility, 1995-2001 (quintiles)



The most striking correlates of the SDT postponement factor all deal with literacy and education: the total population literacy rate in 1887 (r = .814), the same rate for the population aged 10+ in 1910 (.798), the percentage of women 10+ still incapable of

reading and writing as late as 1986 (-.806), and the much more recent percentage of women 16+ in 2001 with more than complete secondary education (.797). Hence there is a striking continuity over time of the impact of the education factor from illiteracy in 1887 to tertiary education in 2001. In order to bring this out even more clearly, Figure 1 shows the scattergram illustrating the location of the provinces in this spatial correlation between the SDT dimension and population literacy measured as early as in the 1887 census.

Figure 2: Scattergram for the correlation (r = +0.814) between the SDT postponement dimension (1995-2001) and the percentage literate in the total population in 1887



The other major correlates of the SDT postponement dimension are equally correlates of the literacy/education variables, and, as outlined before, they will also reflect the connection between education and a stronger historical attachment to Catholicism. Hence, the SDT postponement factor also correlates with the number of persons per clergyman in 1887 (-.693) and with the index of marriages in Lent in 1900-1901 (-.415). Better education for women is also reflected in higher employment rates, and hence these rates for women 25-29 and 30-34 in 2001 are good predictors of SDT postponement (r = .685 and .672, respectively). Finally, the daily press circulation in

1995, another indicator of the population educational level, is also a fair correlate (.511) of starting marriage and parenthood later.

4.3.5 The "non-conformism" dimension of the SDT

The "non-conformism" dimension of the SDT is captured by four indicators for the period 1995-2002: the percentage of all births outside marriage, the percentage of cohabiting unions, the abortion rate for women 15-44, and the percentage of children living in single parent households (see table 4). Other strong demographic correlates of this dimension were higher divorce+separation rates for women 15-44 in 1991 and 2001 (r = .689 and .651, respectively).[10]

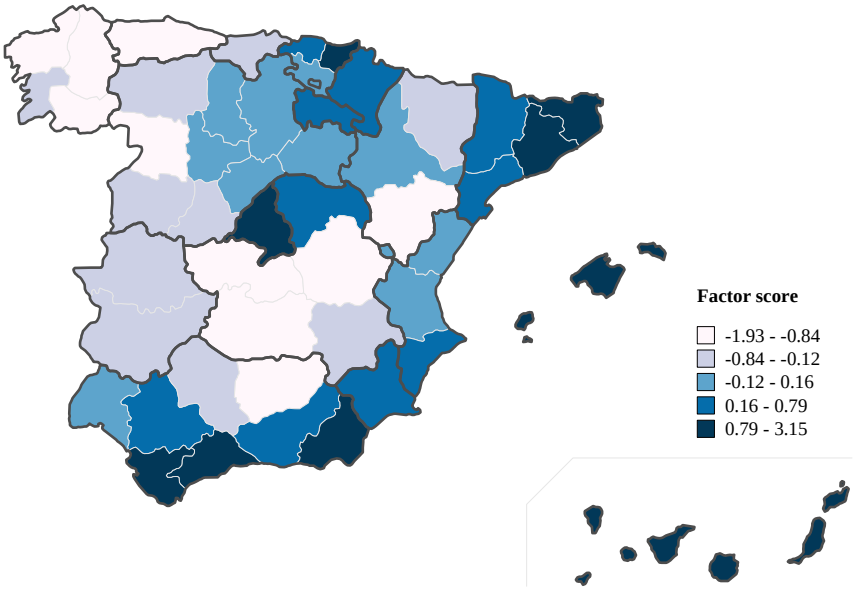
Non-conformism in current family formation is found in several zones, as shown in Map 17.

The first zone stretches along the entire Mediterranean coast, from the whole of Catalonia to Cadiz, and including the Baleares Islands. The second one comprises the Basque provinces, Navarra and Rioja. The third area is made up of Madrid and adjacent Guadalajara, and the fourth one of the Canary Islands.

The most significant correlates of this SDT non-conformity factor essentially capture the degree of urbanity and concomitant employment in the service sector, in tandem with the "new secularization" dimension. In more detail, the urbanity dimension shows up in correlations with the percentage employed in the service sector in 1995 (r = .755), in agriculture in 1995 (-.678), the percentage of women 16+ with secondary education in 2001 (.625) and their activity rate in 2002 (.608). The effect of the "new secularization arc" is reflected in the correlations between the SDT non-conformity factor and the percentages with only civil marriages in 2001 (r = .529) and 2009 (r = .519). But there are also echoes of the past. The urban percentages in 1900 and 1950 have a correlation with the SDT non-conformity factor of .463 and .458, and the index of marriages in Lent of 1900-01 a correlation of .437.

[10] See also Cabré-Pla and Menacho-Montes 2007.

Map 17: SDT – non-conformist family formation (cohabitation, out-of wedlock fertility, single parent household, abortion), 1995-2002



5. A common multivariate analysis strategy for both countries

So far we have only discussed patterns of zero order correlations between the various demographic dimensions and their predictors in Belgium and Spain, but a directly comparable multivariate analysis is needed to help us further. One of the problems of earlier detailed work presented by Reher and Iriso-Napal (1987, 1989) is the presence of strong multicollinearity. This emerges when predictors are fairly strongly correlated between themselves, and particularly so when such predictor intercorrelations are stronger than those with the dependent variable. Multicollinearity causes standardized beta-coefficients in multiple regressions to be substantially different from the zero-order correlations, and also causes them to have enlarged standard errors. In other words, estimates of net effects become unstable. In the instance of Spain this is a special worry, because the correlations between the presumed structural or cultural determinants and the FDT demographic dimensions are not very strong to start with. Another point is that

Reher and Iriso-Napal split their provincial data set into separate urban and rural subsets, so that no direct comparison with their findings can be made.

In this application we shall stick to a single data set for each of the countries and enter urbanization as a variable, rather than using it for splitting up the data. But, more importantly, we shall opt for a different analysis strategy altogether, with the aim of eliminating the multicollinearity problem in the estimation of the net effects of determinants.

In the analysis so far, a clearer picture of the FDT and SDT dimensions could be obtained by subjecting the various indicators to a Principal Components Analysis. By imposing an orthogonal design of factor extraction, uncorrelated dimensions could be obtained which prove to have very clear interpretations. Now, exactly the same strategy will be followed for the independent variables. The extracted factors or dimensions will also be uncorrelated between themselves, and the standardized regression coefficients (betas) of such uncorrelated predictors will be identical to the original zero order correlation coefficients. On the other hand, a factor may capture two strongly correlated features, such as industrialization and secularization or education and Catholicism. In such instances the effects of these two cannot be estimated separately. What we get is the effect of the synergy of the two together.[11]

5.1 The principal components of the independent variables sets in Belgium and Spain

In the Belgian example 22 indicators of structural, social, and cultural determinants of the FDT and SDT could be reduced to four main orthogonal dimensions while retaining 80% of the total variance of the indicators. In the Spanish example six orthogonal components were needed to capture 78% of the total variance contributed by 27 indicators. The factors and their main indicators are presented in Tables 5 and 6 for the two countries respectively. The values between parentheses are the factor loadings or the zero order correlation coefficient between the factor and the indicator concerned.

[11] There are generally very good historical reasons that explain such combinations of determinants, and these can be made explicit through a more detailed narrative rather than through purely statistical causal modeling.

Table 5: The four orthogonal dimensions of the socio-economic and cultural predictors in 42 Belgian arrondissements and the factor loadings of the indicators (r)

Factor 1. Urbanity .		Factor 2: Secularization and pre-World War I subsistence agriculture.		Factor 3: Literacy.		Factor 4: Advancement female education after World War II	
Percent population urban 1890 (%urb)	0.734	Vote for secular parties 1958	0.938	Literacy levels population 15+ (lit 15+)1880	0.947	Percent women in birth cohort 1931-35 with complete secondary or higher education	0.720
% urb 1900	0.786	Vote for secular parties 1919	0.965	Lit 15+ 1890	0.942	Percent women in birth cohort 1961-65 with tertiary education	0.940
% urb 1910	0.787	Non-attendance Sunday Mass 1964	0.895	Lit 15+ 1900	0.926	Ever worked women cohort 1931-35	0.472
% urb 1920	0.885	MLA-index 1881-1884	0.797	Lit 15+ 1910	0.933	Ever worked women cohort 1961-65	0.572
% urb 1930	0.880	Percent male active population in agriculture (% male agr.) 1890	-0.842				
% urb 1947	0.884	% male agr. 1900	-0.792				
% urb 1961	0.854	% male agr. 1910	-0.755				
% urb 1970	0.887	Percent male active population in agr. and cottage industries 1900	-0.822				
Percent male active population in agriculture and cottage industries, 1900	-0.585						
percent population rural 1970	-0.642						

Tables 7 and 8 show, for Belgium and Spain respectively, the results of OLS multiple regression. There is zero multicollinearity since the predictor dimensions are uncorrelated among themselves.

Table 6: The six orthogonal dimensions of the socio-economic and cultural predictors in 50 Spanish provinces and the factor loadings of the indicators (r)

Factor 1. Early industrialization.		**Factor 2: Urbanity and service sector.**		**Factor 3: Land tenure – Minifundio vs Latifundio**	
Percent male employment in industry (% male ind.) 1900	0.643	Percent population urban (% urb) 1900	0.852	Percent agricultural enterprises less than 1ha 1986	0.859
% male ind. 1950	0. 585	% urb 1950	0.877	Promille agricultural enterprises 100+ ha 1986	-0.679
Percent males in agriculture (% male agr.) 1887	-0.412	Percent employment in industry (% ind.) 1900	0.587	Average size agricultural enterprises 1962	-0.659
Percent *diputados* right parties elections 1933	-0.520	% ind. 1950	0.528		
		Net migration rate 1887	0.443		
		Percent employment in service sector 1995	0.712		
		Percent employment in agriculture 1995	-0.793		
		Percent vote left 1977	0.724		

Factor 4. Historical literacy and Catholicism.		**Factor 5: Traditional left**		**Factor 6: "New secularization" and contemporary female employment**	
Percent population literate (% lit.) 1887	0.829	Percent *diputados* left parties 1936	0.804	Percent civil marriages (% civil marr.) 2001	0.900
% lit. 1900	0.753	Percent *diputados* right parties 1931	-0.705	% civil marr. 2009	0.895
Percent women 15 still illiterate 1986	-0.666	Percent *diputados* left parties 1931	0.603	Female employment rate 30-34 in 2001	0.903
Percent women 16+ with tertiary education 2001	0.617	Percent vote left 1977	0.377	Female employment rate 25-29 in 2001	0.750
Number of persons per clergyman 1887	-0.634			Percent women16+ with secondary educ. 2001	0.691
Percent *diputados* right parties elections 1933	0.632			Daily press circulation index 1995	0.756
Index marriages Lent, 1900-01	-0.574			PNB per capita 1960	0.643
Ratio patronos/non-patronos in agriculture 1920	0.535			Percent women 10+ still illiterate 1986	-0.607

Table 7: The prediction of the three demographic dimensions in Belgian arrondissements on the basis of the four independent variable factors. Results from multiple regression: beta coefficients and adjusted R squared values

N=42	FDT+SDT continuity: Fertility control + non-conformism family formation	FDT: Historical illegitimate fertility (Ih)	SDT: postponement fertility.
Urbanity	**.181***	**.578*****	**.188***
Secularization and pre-WWI subsist. agriculture	**.840*****	**.413*****	-.121
Literacy	**.377*****	**-.437*****	.167
Advancement postwar female education	.090	.167	**.801*****
Adj. R squared	.873	.687	.691
(R)	*(.941)*	*(.847)*	*(.849)*

Note: *** p<.001 , **p<.01, *p<.05.

Table 8: The prediction of the five demographic dimensions in Spanish provinces on the basis of the six independent variables factors. Results from multiple regression: beta coefficients and adjusted R squared values

N=50	FDT: high marital fertility Ig	FDT : earlier marriage Im	FDT: higher non-marital fertility Ih	SDT: postponement of unions & fertility	SDT: "non-conformism" family formation
Early industrialization	**-.313***	-.097	-.235	-.023	-.177
Urbanity	-.096	.154	**.412*****	.005	**.571*****
Minifundio (vs latifundio)	.071	**-.585*****	.096	**-.312*****	-.009
High historical literacy + Catholicism.	.077	-.058	.222	**.694*****	-.302***
Traditional Left	**-.439*****	.007	**.264***	-.195**	-.091
"New secular." + high contem. female emplmt	na	na	na	**.452*****	**.525*****
Adj. R squared	***.233***	***.309***	***.279***	***.797***	***.695***
(R)	*(.558)*	*(.615)*	*(.594)*	*(.907)*	*(.856)*

Note: *** p<.001 , **p<.01, *p<.05. na = not applicable (not a historical covariate).

The first major contrast between the countries is that the adjusted multiple correlation coefficients squared (or the proportions of the variance of the dependent dimension explained) are much higher for the spatial patterning of the FDT in Belgium than in Spain. For the SDT, however, there is no major distinction anymore in this respect, since the adjusted R-squared values for Spain have become much higher. In other words, the spatial patterns of the SDT dimensions in Spain are much better accounted for than those of the FDT.

In both countries industrialization and urbanization have, not surprisingly, contributed to a faster historical marital fertility decline, to a more pronounced bulge in illegitimacy during the FDT, and to the stronger emergence of the "non-conformism" dimension of the SDT. Note, however, that the impact of the urbanity dimension on the Belgian first factor is not large. This is mainly due to the fact that the control of marital fertility started in several Walloon rural areas even before spreading to the industrial and urban areas.

Just as important as these structural aspects was the dimension of secularization. In Belgium this was by far the strongest predictor of both behavioral "innovations", i.e. adoption of deliberate fertility control (FDT) and adoption of non-conventional family formation patterns (SDT). In Spain, the old secularization pattern associated with the political Left was equally instrumental in speeding up the fertility transition, whereas the "new secularization" pattern accounts more strongly for the "non-conformity" part of the SDT. In both countries historical illegitimate fertility levels were also higher in more secularized areas.

The impact of historical literacy levels in Belgium is noticeable when it comes to speeding up fertility control and reducing illegitimacy during the FDT, but it vanishes for the SDT postponement dimension. By contrast, the Spanish concordance of Catholicism with better education is a very strong one throughout the 20th century, and it currently accounts for higher proportions of women with post-secondary education. Through this long historical chain, this factor has become the best predictor of the fertility postponement dimension of the SDT. In Belgium there was no such clear connection between religion and more advanced education, and the postponement dimension of the SDT is mainly explained by just female higher education and higher employment rates.

Finally, a specific Spanish feature is that the spatial differences in nuptiality are partially accounted for by the minifundio-latifundio contrast. Regions with high rural population densities and a preponderance of small-scale agriculture had higher proportions of single women. This was further reinforced by high male outmigration, a sex imbalance, and concomitant unfavorable marriage markets for women. In Belgium the gradual weakening of the Malthusian late marriage pattern was mainly associated with the growth of urban and industrial wage sectors, but sex imbalances played a

similar role as in Spain, i.e. more unfavorable marriage conditions for the overrepresented gender.

5.2 Conclusions: Back to the RWA paradigm

The RWA-model of demographic change essentially implies that new forms of behavior will mainly develop spatial patterns that will mirror the "Willingness" condition if such forms of behavior run counter to pre-existing moral or ethical codes of conduct. The practice of deliberate contraception (FDT), and then much later also the replacement of legal marriage by cohabitation and concomitant parenthood within such cohabiting unions (SDT), were two such demographic innovations that challenged moral conventions and religious doctrine. Hence the normal outcome should be that these two features of FDT and SDT respectively should mirror the map of secularization. And since the latter had clearly crystallized by 1880 in both Spain and Belgium, then it is perfectly logical that the maps of the onset of fertility control (FDT) and of the rise of cohabitation (SDT) in these countries should be affected by the subsequent evolution of secularization. The empirical investigation presented here for the two countries indicates that this has indeed been the case, and quite strongly so. But there is still a difference between the two countries. In Belgium the regional pattern of secularization has remained very stable ever since the end of the 19th century, and as a result the "non-conformist" part of the SDT follows in the footsteps of the historical marital fertility transition. In Spain the secularization map changed after the Franco period with the growth of the "peripheral arc" as a continuous zone of high secularization and the disappearance from it of Andalusia. Consequently, the old secularization map predicts the historical marital fertility decline, whereas the new secularization map predicts the "non-conformist" dimension of the SDT. To sum up, in both countries the correlation with secularization remains through time, but in Belgium this occurs within the context of stable differentials and in Spain within the context of changing spatial patterns of secularization.

The fertility postponement ingredient of the SDT provides an illustration of a very different outcome. Waiting to have children till later, i.e. until education is completed or until a sustainable standard of living is reached, does not run counter to any moral or ethical prescripts. In fact quite the opposite is true (and has been true in the West even before Malthus defined his "prudent" marriage rules). Hence the limiting condition for this aspect of the SDT should not be related to the "Willingness" factor (moral code) in the RWA model. Rather, postponement of parenthood should reflect socio-economic conditions, and hence be influenced mainly by structural economic constraints, captured by the "Readiness" condition. This seems to be exactly the case with the spatial pattern

of the SDT fertility postponement in both countries, as shown by the strong spatial correlation between parenthood postponement and female higher education and labor force participation. In other words, the outcome is no longer reflecting the leads and lags with respect to a moral and religious dimension, but much more reproducing the map of structural socio-economic conditions. The outcome is that fertility postponement is a newer feature, not dependent on moral legitimation, and therefore spatially uncorrelated with the spread of cohabitation in both countries examined here. The long-term effect of female literacy, and later on of female higher education, on fertility postponement during the SDT is a specific additional Spanish feature.

The "Ability" condition has not been considered in the present analysis. But this does not mean that it is unimportant or unrelated to the dimensions studied here. For one, the availability of contraceptive methods, access to safe abortion, or the possibility of making contracts between cohabiting partners are three issues that are all ultimately settled at the political level. In both Belgium and Spain Catholic conservatism hindered the sale of contraceptives for decades and dramatically opposed abortion. By contrast, secular parties opened the way for free access to these methods and furthermore made legal provisions to accommodate cohabitation and even same sex marriage. Hence, the secularization dimension pops up in the "Ability" condition as well, and very forcefully so in the two countries considered here.

Finally, Spain and Belgium share another striking feature: language borders are capable of demarcating separate areas of diffusion of new forms of behavior. For Belgium this is a bipolar division, and for Spain a multipolar one. Moreover, these demarcations are best visible with regard to both the fertility decline of the FDT and the "non-conformity" dimension of the SDT. Very often the same divisions emerge with respect to secularization as well. This configuration is very visible in Belgium with the Walloon-Flemish language border showing up each time these dimensions are considered. Wallonia is simply systematically ahead with respect to fertility control (FDT), rise of cohabitation, and parenthood among cohabitants (SDT), and this corresponds to a long history of earlier and stronger secularization. In Spain a similar role is played by the Catalan-Valencian linguistic zone. All the provinces in this area (Catalonia, Comunidad Valenciana, Baleares Islands) tend to move together as an "avant-garde" with respect to marital fertility decline and the SDT dimension of non-conformist family formation. The entire zone is equally always present in both the old secularization and new secularization maps. The Andalusian, Galician, and Basque areas equally have their particularisms that set them apart from the Spanish core, made up of the two Castiles and Extremadura, but the division along the demographic dimensions is not as systematic as in the case of the Catalan-Valencian area. Nevertheless, it comes as no surprise that, back in 1961, William Leasure's professor of

Spanish in Princeton thought that Leasure had drawn up a map of Spanish languages, when in fact he was presenting a map of the Spanish fertility transition.

In a nutshell, the main conclusions are:

(i) Regional differences with respect to the manifest control of fertility within marriage (FDT) and "non-conformist" patterns of household formation (SDT) tend to mirror the maps of secularization, and are hence especially conditioned by the "Willingness" factor (W). By contrast the fertility postponement aspect of the SDT reflects spatial patterns of female education and employment, and is consequently essentially conditioned by the "Readiness" factor (R). These generalizations hold in both countries.

(ii) However, in Belgium spatial continuity from FDT to SDT is linked to the country's stable pattern of secularization, whereas in Spain the conditioning element of long-term continuity has been first female literacy and subsequently the growth of female education.

(iii) The two sub-dimensions of the SDT, i.e. "non-conformist" family formation and fertility postponement, are not nearly as interconnected as originally assumed by the SDT theory. This not only emerges in Belgium and Spain but was also clearly in evidence for the counties of the USA (Lesthaeghe and Neidert 2006) and shows up again in the regions of Latin America (Esteve et al. 2012). The reason for this seems to be the connection of the two demographic sub-dimensions to the different conditioning factors mentioned above (W versus R).

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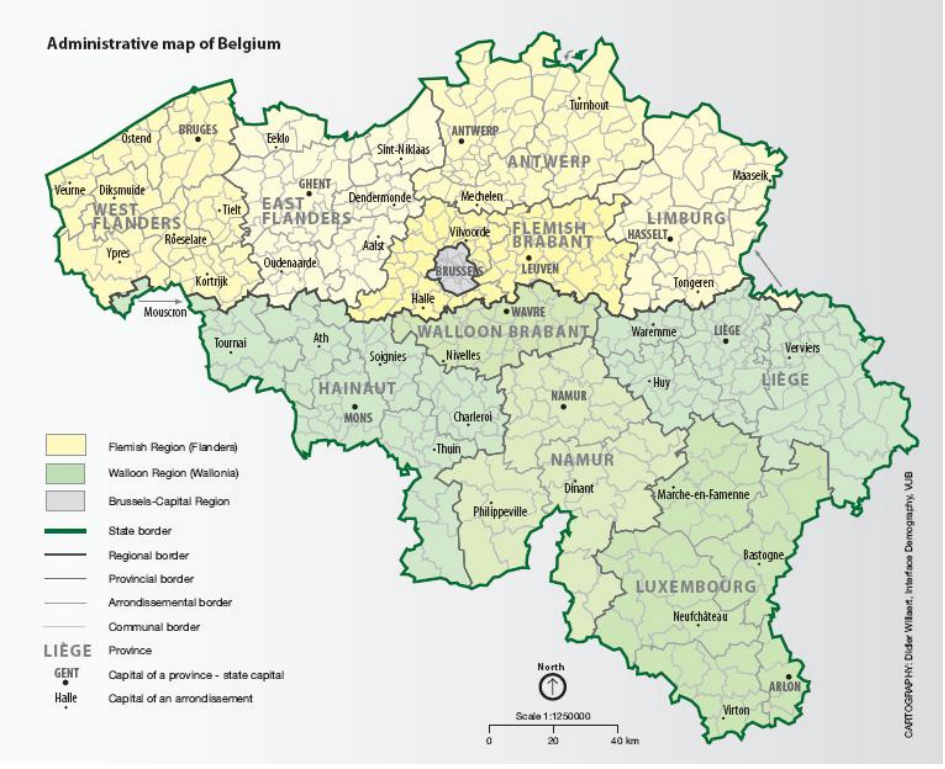
Appendices

Map A1: Linguistic and administrative map of Belgium (provinces, arrondissements)



Map A2: Linguistic map of Spain

Source: García Mouton, P. 1994 : Lenguas y dialectos en España. Editorial Arco Libros, Madrid.

Map A3: Administrative map of Spain (Comunidades Autónomas and provinces)

Notes: **(1) Andalucía:** Almería; Cádiz; Córdoba; Granada; Huelva; Jaén; Málaga; Sevilla. **(2) Aragón:** Huesca; Teruel; Zaragoza. **(3) Asturias, Principado de. (4) Balears, Illes. (5) Canarias:** Las Palmas; Santa Cruz de Tenerife. **(6) Cantabria.(7) Castilla y León:** Ávila; Burgos; León; Palencia; Salamanca; Segovia; Soria; Valladolid; Zamora. **(8) Castilla- La Mancha:** Albacete; Ciudad Real; Cuenca; Guadalajara; Toledo. **(9) Cataluña:** Barcelona; Girona; Lleida; Tarragona. **(10) Comunitat Valenciana:** Alicante/Alacant; Castellón/Castelló; Valencia/València. **(11) Extremadura:** Badajoz; Cáceres. **(12) Galicia:** A Coruña; Lugo; Ourense; Pontevedra. **(13) Madrid, Comunidad de. (14) Murcia, Región de. (15) Navarra, Comunidad Foral de. (16) País Vasco:** Araba/Álava; Bizkaia; Gipuzkoa. **(17) Rioja, La.ga.**