Subnational Depopulation via Natural Decrease in the Countries of Europe and in the States of the United States in the Early 21st Century

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Introduction

This paper seeks to improve our understanding of the prevalence and dynamics of the demographic phenomenon of natural decrease, i.e., the excess of deaths over births, among the countries of Europe and the states of the United States in the first decade of the 21st century. We first introduce the topic of natural decrease, then review some of the relevant literature and discuss our data and methods. We next present descriptive data on natural decrease for Europe and for the U.S. Then we estimate multiple regression equations for the counties of Europe and for the counties of the U.S. modeling the rates of natural decrease. We end our paper with a discussion of the results and some of the implications of our research.

In Europe today there is virtually no population growth. According to recent data from the Population Reference Bureau, the crude birth and death rates in Europe are both 11/1,000, resulting in a percentage rate of natural increase (RNI) of 0.0. Only two of Europe's 45 countries[1] have RNIs of 1.0 or higher, Kosovo (1.2%) and Ireland (1.0%). Sixteen of Europe's countries have negative RNIs, the highest being Bulgaria, Serbia and Latvia, all at -0.5%, and Hungary, Romania and Ukraine, all at -0.4%. The three countries with the largest populations in Europe all have negative RNIs: Russia with a population of 143.2 million has an RNI of -0.1%; Germany at 81.8 million has an RNI of -0.2%; and Italy has a population of 60.9 million and an RNI or -0.1% (Population Reference Bureau, 2012).

A negative rate of natural increase occurs when there are more deaths than births in a population; that is, in a particular year or over several years the population has more people dying than being born. This phenomenon of excess mortality is known in demography as "natural decrease." A long-term continuation of natural decrease will result in the continual diminution of the population, and eventually lead to its disappearance, unless the excess of deaths over births is offset by population increase due to net migration.

To gain an appreciation of the implications of a negative rate of growth, demographers use the notion of "halving time," or the number of years it would take a population to become half as large if its negative RNI remains unchanged (Poston and Bouvier, 2010: 274-275). One divides the natural log of 2 by the RNI, and multiplies the result by 100. In the case of Bulgaria with an RNI of -0.5, if this RNI remains unchanged for the years into the future, its population of 7.2 million would drop to 3.6 million in 139 years. If its negative RNI continued indefinitely, in less than 1,000 years, there would no longer be a country of Bulgaria.

Although there were a few analyses of natural decrease published earlier, it was in 1969 that the classic and still very much cited article on natural decrease by Calvin Beale was published in the journal *Demography*, namely, "Natural Decrease of Population: The Current and Prospective Status of an Emergent American Phenomenon." Since the 1970s, natural decrease has emerged as an important demographic phenomenon among the counties and other subareas of the United States. In the past six decades, almost half of all U.S. counties have experienced at least one year of natural decrease, and this has mainly occurred since the 1970s (Johnson, 2011a).

Actually, natural decrease first appeared in the U.S. in the early 1930s. It only characterized a small number of U.S. counties, and "with the fertility increases which began (in many U.S. counties) in the late 1930s, incidences of natural decrease virtually disappeared within the next several years" (Poston, Bradshaw and DeAre, 1972).

By far most demographic analyses of natural decrease worldwide have been conducted among the counties and subareas of the United States, and we discuss some of that literature below. Very few analyses of natural decrease have been undertaken among the subareas of the countries of Europe. Yet it is in Europe where there is occurring a far greater amount of natural decrease than in the U.S. or elsewhere.

Indeed, in the circa 2000-10 time period for the European countries in our analysis (see the list of countries in Table 1), 774 (or 59%) of their total of 1,315 counties experienced natural decrease. If we restrict the comparison to only those European countries with at least 7 natural decrease counties, then 763 (or 62%) of 1,222 counties experienced natural decrease. These European percentages of 59% and 62% are more than twice the magnitude of the percentage of all U.S. counties, 27%, experiencing natural decrease in the 2000-09 period.

Clearly, it is among the subareas of most European countries where there is the greatest amount of natural decrease in the world. Yet, demographers know little about natural decrease among the subareas of the European countries.

In this paper we endeavor to address this void. Using data from EUROSTAT (2011) for the subareas of the countries of Europe for the circa 2000-10 time period, we ascertain, country by country, the degree of natural decrease in their respective county-level areas; we look also at the extent to which some of these subareas have offset their excess mortality with gains via net migration. For comparisons, we also consider natural decrease among the counties of the states of the U.S. We turn next to a review of the major literature on this topic, and then to a presentation of our data.

Review of Literature

A paper by Harold Dorn published in 1939 was most likely the first article ever published on excess mortality through natural decrease. Dorn (1939) noted that between 1935 and 1936 approximately 145 counties in the United States experienced natural decrease. These early experiences of natural decrease were due to the low fertility rates during the depression and were all but erased following the "baby boom" that began at the end of World War II. By 1950 only two counties in the United States were reporting more deaths than births (Beale, 1969). Later research showed a growth in the number of U.S. counties reporting natural decrease. By 1966 over 300 U.S. counties had more deaths than births (Beale, 1969). Beale recognized this rapid increase in natural decrease among the U.S. counties and noted that the cause was not necessarily declining fertility rates but rather a response to "age-selective net outmigration" from rural to urban areas (1969:93).

Beale's (1969) original conclusions have been substantiated by multiple researchers for nearly fifty years. Indeed, the pace of natural decrease has continued in the U.S. during the 1970's and the 1980's even in the face of overall natural increase in the U.S. population as a whole (Johnson, 2011a). We noted earlier that as of 2005, nearly half of all counties in the United States had experienced at least one year of natural decrease (Johnson, 2011a).

However, natural decrease does not necessarily mean overall population loss. It only means that there are more deaths in the population than births. Indeed, counties can simultaneously experience natural decrease and population growth. For example, we show later that of the 854 counties of the U.S. experiencing natural decrease between 2000-09, 318 of them (or almost 10% of all U.S. counties) actually increased in overall population size during the 9-year time period.

Morrill (1995) has also shown that counties with high and positive rates of net in-migration may increase their populations while at the same time report more deaths than births. Yet, in order for these "favored areas" to grow, other communities will necessarily encounter population loss along with natural decrease as a consequence (Morrill, 1995). Other researchers over the decades have conducted state-specific studies and found similar patterns of positive growth rates of the populations of counties experiencing natural decrease (Adamchak, 1981; Chang, 1974; Poston et al, 1972).

Johnson (1993, 2006, 2011a, 2011b) has published some of the best current research on natural decrease. He has documented the prevalence of natural decrease counties in the U.S. focusing especially on the complex relationships between fertility, migration, age structure, and mortality (see also Johnson and Lichter, 2008). The future of many areas of the country experiencing natural decrease is far from certain. Thanks to new patterns of migration, some areas prone to natural decrease are receiving an influx of international migrants (Johnson, 2011b). The majority of these immigrants are Hispanic, thus having the twofold benefit of offsetting natural decrease through migration and increasing the overall fertility rate (Johnson and Lichter, 2008; Lichter and Johnson, 2006). Unfortunately, the future is not so bright for natural decrease counties in other developed countries, particularly in Europe.

Most of the research on excess mortality via natural decrease in the European countries has been conducted at the national level rather than at the county level as in the United States (Heilig, Buttner and Lutz, 1990; Van De Kaa, 1987). We noted above that as of 2012, 16 of Europe’s 45 countries, including its three largest countries, i.e., Russia, Germany and Italy, were all experiencing natural decrease at the national level. Overall population loss among European countries with very low fertility rates is heavily dependent on net migration (Coleman and Rowthorn, 2011). But at the county level in Europe, as is the situation among the counties of the U.S., not all counties experiencing natural decrease are encountering population decline.

Furthermore, of the European countries with excess mortality, the extremely low fertility rates characterizing much of Europe have “exhausted positive demographic momentum” leading to populations with intermittent growth and overall decline (Coleman and Rowthorn, 2011).

Data and Methods

In our analyses for the European countries, we use data from the *EUROSTAT Yearbook, 2011* (EUROSTAT, 2011) and examine the numbers of deaths and births in the county-level units of every country of Europe with at least eight counties. The periods of time covered vary somewhat for each country, ranging from 2000-09 to 2003-10. To be included in our analysis, we required that a country have at least eight counties and have birth and death data available for the counties for at least 8 consecutive years in the 2000-2010 time period. If a country had fewer than eight counties, or had data for its counties for less than eight consecutive years, it was excluded. Turkey is a good example. Turkey has 84 counties, but only provided birth and death data in the *EUROSTAT Yearbook* for the four consecutive years of 2007-2010. So we did not include Turkey. We excluded Finland, Denmark, and Slovakia for a similar reason. All our included countries provided the required demographic data in the *EUROSTAT Yearbook* for at least eight consecutive years in the 2000-2010 period. The European countries included in our paper and their respective time periods are listed in Table 1.

In the comparative analysis we undertake for the U.S. and its counties, we relied almost entirely on the electronic version of the *Atlas of Rural and Small Town America* (Economic Research Service, U.S. Department of Agriculture, 2013). This is a dataset published electronically by the Economic Research Service of the U.S. Department of Agriculture. It contains demographic, economic, environmental and social data for all the counties of the U.S., mainly for the 2000-2010 period. According to documentation on its webpage, the *Atlas* is intended to promote "the well-being of rural America through research and analysis to better understand the economic, demographic, environmental, and social forces affecting rural regions and communities" (Economic Research Servicel, U.S. Department of Agriculture, 2013).

What is a "county" in a European country? How is a European county defined spatially and demographically? Sub-national regions, i.e., counties, in each European country vary from one country to the next. However, "Regulation (EC) No 1059/2003 of the European Parliament and of the Council adopted in May 2003" uses the Nomenclature of Territorial Units for Statistics (NUTS), a classification system we also use here. (See Council of the European Communities [2003] and EUROSTAT [2007] for more detail.)

The purpose of NUTS is to create geographical divisions in each country that enable meaningful comparisons over time and from one country to the next (Council of the European Communities, 2003). Each country is divided into three levels (NUTS 1, NUTS 2, and NUTS 3); the third level most closely resembles counties in the United States, although the median geographic size of the NUTS 3 regions is slightly smaller than that of counties in the U.S. (Ciccone, 2002).

There are a total of 1,303 NUTS 3 regions in Europe, each consisting of a population ranging in size from 150,000 to 800,000. The NUTS designation takes into account existing geographic and political divisions in each country but provides a standard that allows for cross national comparisons. The NUTS 3 geographic subregion refers to *Départements* in France, to *Kreise* in Germany, to *Provincie* in Italy, to *Provincias* in Spain, and to *Counties* in the United Kingdom. In our paper we refer to the NUTS 3 regions in all the European countries as "counties."

For comparative purposes, we also examine the numbers of deaths and births in the counties of each of the states of the U.S. during the 2000-09 period. Listed in Table 2 are the fifty states, the District of Columbia, and Puerto Rico, and their respective number of counties. According to the U.S. Census Bureau, the "primary legal divisions of most states are termed counties. In Louisiana, these divisions are known as parishes. In Alaska, which has no counties, the equivalent entities are the organized boroughs, city and boroughs, municipalities, and census areas"; and in Puerto Rico these divisions are known as municipios (U.S. Census Bureau, 2011). As with our analysis of the European countries, we use the term "county" to refer to these primary legal divisions in all the states, the District and Puerto Rico.

Natural Decrease in the Countries of Europe

In Table 1 we list for each of the 22 European countries included in our analysis its number of natural decrease counties and the percentage of all its counties that experienced natural decrease in the circa 2000-10 period. Of the 22 countries, Germany by far has the most counties, 429, with the United Kingdom and Italy following with 133 and 117 counties, respectively.

In eight of the 22 European countries, more than one-half of its counties experienced natural decrease in the time period being analyzed (recall that the time period in each European country for determining the existence of natural decrease in its counties varies slightly from country to country). All of Lithuania's 10 counties experienced natural decrease between 2000-2009, and almost 91 percent of Croatia's 21 counties experienced natural decrease between 2002-2010; these are followed by 82 percent of Germany's 429 counties in 2000-2009, and 81 percent of Romania's 42 counties in 2000-2009; other countries with more than half its counties experiencing natural decrease are Greece (71 % -- 2001-2010), Italy (64 % -- 2002-2010), Portugal (63 % -- 2000-2009), Sweden (62 % -- 2000-2009), and Slovenia (58 % -- 2003-2010). Almost 60 percent of all the counties in Europe experienced natural decrease in the circa 2000-10 period.

EUROSTAT includes in their recent *Yearbook* (EUROSTAT, 2011) a map showing the rates of natural change in 2008 for all the counties of all the European countries (not only the 22 included in our analysis). We present this map as Figure 1; it shows for each county its rate of natural change for the year of 2008, as calculated by:

$$(\text{Births}_{2008} - \text{Deaths}_{2008} / \text{Population}_{2008}) * 1{,}000 \qquad (1)$$

Negative rates of natural change, i.e., natural decrease, are shown in the map in various shades of blue, with the darker the blue the more negative the rates of natural decrease. Positive rates of natural change are shown in shades of yellow; the darker the yellow the greater the excess of births over deaths. The map clearly shows that Europe is much bluer than it is yellow.

Excess deaths over births in 2008 were widespread in Europe and characterized more than half of Europe's counties. However, there was natural increase in 2008 in all the counties of Ireland (but not all of Northern Ireland) and Turkey, and in the central counties of the United Kingdom, and in many counties of France, Belgium, the Netherlands, Luxembourg, Switzerland, Iceland, Liechtenstein, Denmark, and most of Norway (EUROSTAT, 2011: 20, 25).

But there was excess mortality resulting in natural decrease in 2008 in most all the counties of Germany, Hungary, Croatia, Romania and Bulgaria, and in the Baltic States in northern Europe, and in most of Greece and Italy in southern Europe. "One major reason for the slowdown in the natural growth of the (European) population is that the EU's inhabitants are having fewer children than they used to" (EUROSTAT, 2011: 25). The aggregate total fertility rate of the 27 countries that form the European Union dropped from 2.5 births per woman in the early 1960s to 1.6 for the 2006-08 period (EUROSTAT, 2011: 25).

Remember that the EUROSTAT data shown in the map in Figure 1 refer only to the single year of 2008. The natural decrease data we show in Table 1 and mentioned earlier in this section refer to natural decrease for at least eight consecutive years in the 2000-10 time period. So it is certainly the case that some of the European natural decrease counties shown in the map have not experienced natural decrease for eight or more consecutive years in the 2000-2010 time period. To illustrate, almost all of Germany's counties have rates of natural decrease in 2008, whereas a slightly smaller percentage (82 %) experienced natural decrease in the 2000-09 period (Table 1).

Are most of the natural decrease counties in Europe also net losers of total population in the time period? We show in the last two columns of Table 1 for each of the European countries the number and percentage of natural decrease counties that also lost population in the circa 2000-10 period. For example, 353 of Germany's 429 counties experienced excess deaths over births in the 2000-09 period. Of these 353 counties, 211 lost overall population during the period. So whereas 82 percent of all Germany's counties were natural decrease counties, only 49 percent of all the counties were both natural decrease and population loss counties.

The natural decrease counties in some of the European countries were almost always population loss counties. In Bulgaria, almost 93 percent of its counties were both natural decrease and population loss counties. In Romania 76 percent of the counties were so classified, and in Croatia it was 67 percent, and it was 53 percent in Greece. Other countries had smaller percentages of all its counties experiencing both natural decrease and population loss. And none of Belgium's or Norway's natural decrease counties were also population loss counties. Only 7.5

percent of all the counties in the United Kingdom were both natural decrease and population loss; it was 10 percent in Spain, 7 percent in Italy, and 5 percent in France. Most of the natural decrease counties in these countries were apparently able to offset their excess mortality with net in-migration. We turn in the next section to a comparative analysis of the counties in the U.S.

Natural Decrease in the States of the United States

The United States has 3,221 counties distributed among the fifty states, the District of Columbia and Puerto Rico. We refer to all 52 of these areas as states. They are shown in Table 2 along with their respective numbers of counties. Texas has the largest number of counties, 254, followed by Georgia with 159 and Virginia with 134. Rhode Island has only 5 counties, and Delaware 3. The District of Columbia has only one county.

Figure 2 is a map showing the rates of natural change in the 2000-2010 time period for all the counties of all the states of the U.S., using this formula:

$$(\text{Births}_{2000\text{ to }2010} - \text{Deaths}_{2000\text{to }2010} / \text{Population}_{2000}) * 100 \qquad (2)$$

Negative percentage rates of natural change, i.e., natural decrease, are shown in the map in two shades of purple, with the darker purple reflecting rates of -12.6% to -2.5%, and the lighter purple rates of -2.4% to 0. Natural increase counties are shown in three shades of green, with the lightest green indicating rates of 0.1% to 2.5%, medium green rates of 2.6% to 8%, and the darkest green rates between 8.1% and 26.0%.

According to Johnson (2011a), since 1950 when natural decrease first appeared in U.S. counties, it was concentrated in certain regions, mainly in the “agricultural areas of the Great Plains, the Western and Southern Corn Belt, and East and Central Texas, as well as in the Ozark Ouachita Uplands.” It also occurred “in some mining and timber-dependent rural counties of the

Upper Great Lakes and in Florida counties that were among the first to receive retirement migrants. Later, natural decrease spread to other rural areas of the South, New York and Pennsylvania, the Upper Great Lakes, parts of the West in the 1990s, and eventually to Indiana and Ohio" (Johnson, 2011a:1-2). These regional concentrations are clearly seen on the map in Figure 2. The concentration of natural decrease counties is especially apparent in the North-South band from the Dakotas in the north through Nebraska, Kansas, and Oklahoma to central Texas in the south, and also in many retirement counties in Arizona, Texas and Florida.

Johnson has noted that "the heavy concentrations of natural decrease counties in the Great Plains and in the Corn Belt reflect the linkage between dependence on agriculture and persistent outmigration and low fertility. Farming counties are the most likely to suffer natural decrease" (Johnson, 2011a:2) with almost one-half of them experiencing it in the 2000-2010 time period.

Looking at our data in Table 2, over one-quarter (27%) of all 3,221 counties in the U.S. experienced natural decrease in the 2000-09 period. In West Virginia almost three-quarters of its counties had more deaths than births in the period. Also, although it is not shown in the table, in this time period (2000-2009), "more people in West Virginia died than were born" (Johnson, 2011a:3). And West Virginia does not stand alone. Some other states are perilously close to having more deaths than births. To illustrate, in 2010 "in Maine there were only 106 births for every 100 deaths. Overall, births exceeded deaths in Maine [in 2010] by just 789" (Johnson, 2011a:3).

Of the 52 states in the U.S. (remember we are referring to the District and to Puerto Rico also as states), four had more than half their counties showing natural decrease in the time period of 2000-2009: West Virginia (75 %), North Dakota (66 %), Montana (54 %), and Kansas (51 %).

By comparison, in six states, none of their counties experienced natural decrease in this period (Arkansas, Connecticut, District of Columbia, Delaware, Puerto Rico, and Utah). In the 46 states with at least one natural decrease county, 21 had one-quarter or less of its counties experiencing natural decrease: Arizona (13 %), California (21 %), Connecticut (14 %), Georgia (6 %), Idaho (9 %), Indiana (5 %), Kentucky (18 %), Massachusetts (14 %), Maryland (21 %), Mississippi (2 %), North Carolina (25 %), New Hampshire (20 %), New Jersey (5 %), New Mexico (18 %), New York (15 %), Ohio (7 %), Rhode Island (20 %), South Carolina (4 %), Texas (24 %), Washington (23 %), and Wyoming (13 %). This description of natural decrease in the states of the U.S., compared with the earlier description of the phenomenon in the European countries, shows clearly that natural decrease is much more prevalent in Europe than in the U.S.

How many of the natural decrease counties in the U.S. are simultaneously population loss counties? Recall that in four of the European countries analyzed previously, over half their counties experienced both natural decrease and population loss: Bulgaria (93 %), Romania (76 %), Croatia (76 %), and Greece (53 %). Among the states of the U.S., only two of them had more than half their counties experiencing both natural decrease and population loss: North Dakota (66 %) and Kansas (50 %). In fact, among the states with at least one natural decrease county, two of them, Arizona and Maryland, had no natural decrease counties that were also population loss counties. For the most part, it is much more the situation among the U.S. states than among the European countries that counties experiencing natural decrease are able to offset the population losses due to excess deaths via positive net migration. We turn in the next section to factors influencing natural decrease in Europe and the U.S.

Factors Influencing the Extent of Natural Decrease in Europe and the U.S.

The best paper in the literature, in our opinion, on factors influencing rates of natural population change is Johnson's (2011b) multivariate analysis of U.S. counties in the last decade of the 20th century. His dependent variable was the "ratio of the number of births between 1990 and 2000 to the number of deaths multiplied by 1,000. Values of less than 1,000 would indicate an excess of deaths over births" (Johnson, 2011: 90-91). The independent variables he found to have statistically significant effects on natural change in his multivariate regression equation included median income, recreational activity of the county, percentage Hispanic, net migration of 15-34 year olds, net migration of 50+ year olds, fertility, and median age (Johnson, 2011b:92). Another variable shown in the literature to influence the rate of natural decrease is county population size (Poston et al., 1972).

The multivariate analyses we present below will differ from those in Johnson's (2011b) analysis in one very important way. Our dependent variable will not be the rate of natural population change as it was in Johnson's study, but rather, the rate of negative population change, i.e., the rate of natural decrease. Given the explicit focus in this paper on natural decrease in Europe and in the U.S., we are interested in modeling rates of negative natural population change, not rates of overall natural population change. Counties included in our equations will only be those experiencing natural decrease in a time period, which will be the 2000-2009 time period for the U.S. counties, and a time period of at least 8 consecutive years between 2000 and 2010 for the European counties. We are interested in understanding why there is variation among natural decrease counties in their degree of natural decrease. Why do some natural decrease counties only lose 1 percent or less of its population owing to the deficit of births compared to deaths in a given period of time? And why do other natural decrease counties lose up to 20 percent or more of its population in a given period of time because of having more deaths than births?

Our major intent here is to estimate similar models for the European counties and for the U.S. counties. But we are severely restricted by the limited availability of data in the *EUROSTAT Yearbook* (EUROSTAT, 2011). Unfortunately, data for the European countries and counties in the *EUROSTAT Yearbook* are nowhere near as rich and plentiful as they are for the U.S. states and counties in the *Atlas of Rural and Small Town America* (Economic Research Service, U.S. Department of Agriculture, 2013). Nevertheless we are able to undertake a limited comparative analysis of the European counties and the U.S. counties using several independent variables that are similar empirically and conceptually in the U.S. and the European contexts. After examining these comparative results for Europe and the U.S., we then undertake a more extensive analysis of the U.S. counties, relying on the rich array of data in the *Atlas of Rural and Small Town America*.

We first estimate a single equation for all natural decrease counties in the European countries (shown in Table 1), followed by country-specific equations for those five European countries with at least 30 natural decrease counties, namely, Germany (353 natural decrease counties), Greece (36), Italy (69), Romania (34) and the United Kingdom (43). Next we estimate a similar single multivariate equation for all the natural decrease counties in the U.S., and then state-specific equations for those six states with at least 40 natural decrease counties, namely, Iowa (42 natural decrease counties), Kansas (54), Nebraska (41), Texas (61), Virginia (54), and West Virginia (41). Finally, as just noted, because we have a more extensive dataset available for the U.S. counties, we undertake a more thorough multivariate analysis of natural decrease in the U.S. counties.

For the first multivariate analyses, we have selected four independent variables. One is population size. We expect that the larger the county's population at the beginning of the time period, the lower its rate of natural decrease during the time period. This reasoning is grounded in human ecological theory positing a relationship between overall population size and economic opportunities. The larger the population of the area, the greater its economic activities, and the more likely it will experience net in-migration than net out-migration, thus minimizing the likelihood of having more deaths than births in the period under investigation (Poston and Frisbie, 1998, 2005). Our second independent variable is population density, i.e., population per square mile/kilometer. Here we hypothesize that the more densely settled the county, the lower its rate of natural decrease. Our expectation here is also grounded in sociological human ecology about the high positive relationship between the density of a population and its level of urbanization. A highly urban county will less likely have an age structure with a deficit of young people to old people making it less conducive to a large deficit of births compared to deaths. Thus if a densely settled county does experience natural decrease the imbalance of deaths over births should be less than in a county not densely settled (Hawley, 1950; Poston and Frisbie, 2005).

The third independent variable is the extent to which the county depends on recreation as a sustenance activity. The more inclined toward recreational pursuits as a key function of a natural decrease county, the less will be its imbalance of deaths over births (Beale and Johnson, 1998; Johnson and Beale, 2002). And finally, the last independent variable is the percentage of the population of age 65 or more. The effect of this variable on the degree of natural decrease is very straightforward; the greater the percentage of persons age 65+ in a natural decrease county, the greater the imbalance of deaths over births in the county (Poston, 2005). Or as Johnson

(2011a:3) has written, the most important predictor of natural decrease "is a local age structure that has few young adults of child-bearing age and a large surplus of older adults at high risk of mortality."

We are using the three independent variables of population size, population density and percentage age 65+ realizing full well that there will be collinearity between and among these three variables owing to the fact that population size is the numerator of the density variable and the denominator of the age 65+ variable. But human ecological theory argues for their theoretical importance in predicting population change (Frisbie and Poston, 1978; Hawley, 1950; Poston and Frisbie, 2005), so we have retained them in the equations.

Population size and density are measured for each county at the beginning of the time period, which is usually circa-2000. Recreation dependency for the U.S. counties is a dummy variable scored 1 if the county has high recreational activity. This variable was developed by the USDA for all nonmetro counties using a multistep selection approach examining data for each county on several relevant empirical measures of recreational activity; counties with high values on these combined data are deemed to have recreational activity as one of their major sustenance functions. For more specifics, see Beale and Johnson (1998) and Johnson and Beale (2002). The recreation variable for the European counties is an interval variable representing the per capita number of collective tourist accommodation establishments in the county in circa-2000.

The last independent variable is percentage of the county population of age 65 or more. Ideally we would have preferred to have the age data for this variable referring to the beginning of the time period for which natural decrease is being measured. However, for many of the European counties the date of reference for this variable is 2006 or 2007, and for all the U.S. counties the date of reference is 2010. The use of an X variable in a regression variable with a time reference after the start of the time interval for the dependent variable is problematic empirically and conceptually owing to simultaneity bias (Greenwood, 1975). We are nevertheless using these imperfect age data owing to the fact that although the values for the counties on the age 65+ variable will likely change from one year to the next, the variance of the age 65+ variable across the counties at one point in time, say 2000, will be highly related to its variance at a latter point in time, say 2010.

Before presenting the results of the multiple regression equations, we show in Figure 3 a scatterplot for the 36 natural decrease counties of Greece portraying the relationship between population size (X-axis) and the rate of natural decrease (Y-axis) Notice that the rate of natural decrease for the counties of Greece is measured as births minus deaths in the 2001-10 period divided by population size at the beginning of 2001. The natural decrease rate shown in the vertical axis of the scatterplot ranges from a low value of -.006 to a high value of 0. Population size in 2001 is shown on the horizontal axis. The correlation coefficient is 0.36. This means that the larger the population of the county, the higher its rate of natural decrease (remember the “highest” value of the natural decrease rate is close to zero). On average, the larger the population of a natural decrease county in Greece, the closer its rate of natural decrease will be to zero. When we examine below the multivariate regression results, we need to keep in mind that a positive value for a coefficient, say population size, in the regression equation predicting the rate of natural decrease means that the larger the size of the population of the county, the closer its negative rate of population change will be to zero; and that a negative coefficient for an independent variable means the higher the value of the independent variable, the more negative the rate of natural decrease.

In Table 3 we present the results from OLS multivariate regression equations for all the European counties together (column 1), and then in columns 2 through 6 for the specific countries of Germany, Greece, Italy, Romania and the United Kingdom. In each equation the rate of natural decrease is regressed on the four independent variables of population size, population density, the per capita presence of tourism activity, and percentage of the population of age 65+. The regression coefficients for the tourism, population size, and density variables are hypothesized to be positively signed, and for the age 65+ variable negatively signed. Unstandardized (metric) coefficients (b's) are presented for each independent variable, and they are asterisked if they are statistically significant ($p < .05$); immediately below each metric coefficient is its standardized coefficient (= $b * (sd_x/sd_y)$).

Consider first the regression results for the combined counties for Europe (N = 622 natural decrease counties); they show that all four independent variables are signed as hypothesized, but only the tourism and the % 65+ variable are statistically significant. The age 65+ metric coefficient is -0.25; across the European counties, on average for every one percent increase in the county population 65+, the rate of natural decrease decreases by 0.25, that is, the magnitude of the negative value of the rate goes up by .25. Of the four independent variables in the equation, the age 65+ variable has by far the greatest relative effect on the rate of natural decrease; for every one standard deviation increase in the percentage 65+ in a county, there is an average .37 of a standard deviation decrease in the rate of natural decrease, that is, the negative rate becomes more than one-third of a standard deviation larger in magnitude. The other statistically significant variable in the equation, the tourism variable, has a standardized effect on the rate of natural decrease one-half the magnitude of the relative effect of the age 65+ variable.

The next five columns of Table 3 report the results of the country-specific multiple regressions for Germany (column 2), Greece (column 3), Italy (column 4), Romania (column 5), and the United Kingdom (column 6). In all five of the countries, the age 65+ variable has statistically significant and negatively signed coefficients. In two of the countries (Germany and the U.K.) one more of the independent variables is signed as hypothesized and is statistically significant: the tourism variable in Germany, and the population size variable in the U.K. In the other three countries (Greece, Italy and Romania), only the age 65+ variable is statistically significant.

The metric values of the age 65+ variable are -0.76 in Germany, -0.69 in Italy, -0.66 in Romania, -0.58 in Greece, and -0.34 in the U.K. Among the natural decrease counties of Germany, on average for every one percentage increase in the population aged 65 or more, the percentage rate of natural decrease changes by -0.76. Comparing the effects of this variable on natural decrease across the countries, its metric effect is roughly of a similar magnitude in Germany, Italy and Romania, slightly less in Greece, and much less in the U.K. And as was the case in the equation for all the European counties combined, in each of the country-specific equations the age 65+ variable has by far the greatest standardized effect on the rate of natural decrease.

We now consider the results of the multiple regression equations for the U.S. and selected states. Table 4 presents in column 1 the results for all the natural decrease counties in the U.S. (N = 853), followed by the results of the state-specific analyses for Iowa (column 2), Kansas (column 3), Nebraska (column 4), Texas (column 5), Virginia (column 6) and West Virginia (column 7). In the equation modeling the rate of natural decrease among all the natural decrease counties in the U.S., three of the independent variables are signed as hypothesized and are statistically significant: the percentage of the population 65+, population size, and whether the county is dependent on recreation. The age 65+ variable has by far the greatest relative effect of all the independent variables on the rate of natural decrease. For every one standard deviation increase in the percent of the population 65+, there is a .70 standard deviation decrease in the rate of natural decrease, controlling for the effects on the dependent variable of the other X variables. That is, the older the U.S. county, the greater the negative value of its rate of natural decrease.

In the separate analyses of Iowa, Kansas, Nebraska, Texas and Virginia, this same result is obtained. The age 65+ variable is negatively signed, statistically significant, and has the greatest relative effect on the natural decrease rate of all the independent variables in the respective equations. Its metric effect is very similar from one state-specific equation to the other: -0.60 in Iowa, -0.60 in Kansas, -0.66 in Nebraska, -0.32 in Texas, and -0.33 in Virginia.

The regression results for West Virginia are somewhat puzzling; the only X variable that has the hypothesized effect and is statistically significant is population size; the larger the size of the county, the more positive the rate of natural decrease. The other three variables are either not signed as hypothesized or are not statistically significant.

To summarize these analyses of natural decrease in Europe and in the U.S., we showed earlier that there is a far greater amount of natural decrease in Europe than in the U.S. But the results here of our multivariate analyses are remarkably similar. Our consistent finding for all of Europe and for the five European countries, and for all of the U.S. and for five of the six states, is the overall importance of the effect of the percentage of the population 65+. The older the county, the more negative its rate of natural decrease. We will return in the last section of our paper for more reflections on this consistent finding.

We now conclude this section with an extended multivariate analysis of natural decrease in the U.S. As noted earlier, we have available a much richer dataset for the U.S. counties than for the European counties, enabling us to estimate most extensive regression equations for the U.S. natural decrease counties. We are not constrained in this extended analysis to select independent variables available for both the U.S. and the European counties. We introduce additional independent variables for this U.S. analysis, along with the age 65+ variable, to see if some of its effect on the natural decrease rate is modified.

We use five independent variables all shown in prior theoretical statements and analyses to be associated with natural population change (Hawley, 1950; Johnson, 2011b; Johnson and Lichter, 2008; Poston et al., 1972; Poston and Frisbie, 2005). The first is the percentage of the population of age 65+, a variable already demonstrated here and elsewhere (Johnson, 2011b) to have an overwhelming effect on natural population change, and specifically, on natural decrease change. The next three variables are percentage of the labor force employed in manufacturing, median income, and recreational activity, all of which have been shown to have important effects on demographic change (Beale and Johnson, 1998; Frisbie and Poston, 1978; Johnson, 1993; Johnson and Beale, 2002). Johnson (2006) has noted that historically, nonmetropolitan counties with high median incomes, with sustenance activities focusing on recreation, and with high employment in manufacturing have been able to attract more migrants than counties without these structural amenities. Since the in-migrants tend more to be younger than older, their addition to the populations of the counties will result in more births and less deaths, hence reducing the overall rate of natural decrease.

Finally, we include a variable measuring the percentage of the population that is Hispanic owing to this population's higher than average fertility rates. It should be an important variable in analyses of natural decrease because a heavy concentration in a county of Hispanic residents will tend to result in more births and fewer deaths, thus reducing the overall imbalance in the county of deaths over births.

The age 65+ variable is expected to be related negatively with the rate of natural decrease, and the other four variables, i.e., median income, recreation dependency, percent employed in manufacturing, and percent Hispanic, should be related positively with the natural decrease rate.

We present the results of the multivariate analyses in Table 5. The first column reports results from the OLS equation for all the natural decrease counties in the U.S. All five variables are signed as hypothesized, and all five are statistically significant. And as we have shown time and time again in this paper, the age 65+ variable has the strongest relative effect on the rate of natural decrease. Among the natural decrease counties in the U.S., for every one standard deviation increase in the percent of the population 65+, there is a .68 standard deviation decrease in the natural decrease rate, that is, it becomes more negative. The next most influential independent variable in this equation is median income with a standardized coefficient of 0.14; the standardized effect on the natural decrease rate of age 65+ is almost five larger than the standardized effect of median income.

In the next six columns of Table 5 we report the results from the state-specific equations. In the regression equation for the natural decrease counties of Iowa (column 2), only two of the five independent variables are correctly signed and significant; they are the recreation variable and the age 65+ variable. And the relative effect of the age 65+ variable is 2.4 times greater than that of the recreation variable. The same two variables are the only ones with the expected signs and statistically significant in the equation predicting the natural decrease rate among the Kansas counties (column 3); and the standardized effect here of the age 65+ variable is 3.3 times greater than that of the recreation variable.

In the equations for Nebraska (column 4), Texas (column 5) and Virginia (column 6), there is only one independent variable that is signed as hypothesized and is statistically significant, namely, the age 65+ variable. And, finally, in the OLS equation for the natural decrease counties of West Virginia (column 7), two variables have the expected signs and are statistically significant, median income and percent age 65+; and the standardized effect on the natural decrease rate of the age 65+ variable is larger than the standardized effect of the median income variable.

The major finding of our extended analysis of natural decrease in the U.S. and in six comparable state-specific analyses is the overwhelming importance of the percentage of the county population of age 65+ in predicting the rate of natural decrease. The extended analyses enabled us to introduce several competing hypotheses, but the overpowering effect of the age variable was maintained.

Discussion and Conclusion

In our paper we first described the prevalence of natural decrease in Europe and in the U.S. Our evidence pointed clearly to the fact that in Europe there is a far greater amount of natural decrease than in the U.S. Recall that of the 22 European countries in our analysis (see the list in Table 1), 774 (or 59%) of their total of 1,315 counties experienced natural decrease. In eight of the European countries, more than one-half of its counties experienced natural decrease. All of Lithuania’s counties, and almost 91 percent of Croatia’s counties, and 82 percent of Germany’s counties, and 81 percent of Romania’s counties were natural decrease counties.

Almost 60 percent of the European counties experienced natural decrease; this is more than twice the magnitude of the percentage of all U.S. counties, 27%, experiencing natural decrease. Of the 52 states in the U.S., only four had more than half their counties showing natural decrease in the time period analyzed: West Virginia, North Dakota, Montana , and Kansas. And in six states, namely, Arkansas, Connecticut, District of Columbia, Delaware, Puerto Rico, and Utah, none of their counties experienced natural decrease. The U.S. has a good amount of natural decrease occurring in its counties, but its prevalence is nowhere as substantial and dramatic as in the counties and countries of Europe.

Despite this major difference in the much greater prevalence and magnitude of natural decrease in the European countries and counties than in the U.S. states and counties, the results of the multivariate analyses in the two countries are remarkably similar. When modeling the degree of natural decrease among all the natural decrease counties in Europe and in five specific countries, using the same four independent variables, the consistent finding in all of Europe and in the five countries pointed to the overall importance of the effect of the percentage of the population 65+. The older the county, the more negative its rate of natural decrease.

We next estimated similar regression equations among all the natural decrease counties in the U.S., and among the natural decrease counties in six specific states, using pretty much the same four independent variables. Finally, owing to the increased availability of data for U.S. analyses, we then estimated equations for the U.S. counties with a more theoretically and statistically appropriate set of independent variables. For the most part our regression results for the U.S. analyses were exactly the same as for the European analyses. The age 65+ variable emerged time and time again as statistically significant and as the most influential of all the X variables in the equations.

Kenneth Johnson (2011a:2-3) has noted that the major cause of natural decrease "is a local age structure that has few young adults of child-bearing age and a large surplus of older adults at high risk of mortality … [especially those with a] disproportionate share of older adults … Because age-specific mortality rates are much higher for older adults, their disproportionate concentration … accelerates natural decrease by increasing the number of deaths." The results of our multivariate analyses of natural decrease among the natural decrease counties in Europe and in the U.S. point to exactly the same conclusion. The older the county and the greater the concentration of older people in the county, the greater the degree of natural decrease; and this conclusion holds for U.S. states and counties and for European countries and counties.

What might the future portend for Europe and the U.S. with regard to the effects and influence of natural decrease? One point is that natural decrease will not go away. The empirical literature is pretty consistent in showing that once it occurs it pretty much continues to occur. Beale (1969) showed this in his classic analysis of natural decrease counties in the U.S., as did Poston and his colleagues (1972) in their study of Texas counties. And Johnson (2011a: 4) has argued that among U.S. counties, once natural decrease begins in a county, "it is likely to reoccur. Nearly 90 percent of the counties that have experienced natural decrease once experience reoccurrences of it. The demographic forces stimulating natural decrease also increase the likelihood of it in the future." A similar point has been made with regard to the counties of Europe (EUROSTAT, 2011).

The major factor resulting in the occurrence of natural decrease in U.S. counties these days is *not* a low and below replacement fertility rate. Though such a cause was likely responsible for the outbreak of natural decrease in the U.S. in the 1930s, it does not appear to be a major factor among natural decrease counties in the U.S. in the past few decades. Beale (1969) noted more than forty years ago that the declining birth rates at that time, while contributing to the emergence of natural decrease, do not wholly explain it. And as Johnson (2011a) has noted, natural decrease first began to appear in large numbers of counties in the 1950s, a period when national fertility rates were increasing. Although fertility rates in natural decrease counties are not extremely high, in most cases they are of a more than sufficient magnitude for population replacement. Rather than inadequate or low fertility rates, the major cause of natural decrease is the distortion of county age structures because of rates of age-selective migration so high that the remaining population is unusually old in terms of average age. This is precisely the major finding of our research, that is, the most influential predictor, by far, of the rate of natural decrease is a county population with a concentration of older residents.

The future for U.S. natural decrease counties is not entirely a bleak one. The continuing levels of Hispanic immigration to the U.S. have resulted in their migrations to so-called “new destination” counties, many of them natural decrease counties. Also Hispanics in the U.S. have a much higher total fertility rate than non-Hispanics, 2.4 versus 1.8 (Martin et al., 2012: Table 8). Thus, given the higher fertility rates of Hispanics compared to non-Hispanics, the in-migration of Hispanics and other minority populations to a county will likely result in a disproportionately greater number of births, thus reducing the imbalance of deaths over births. Johnson (2011a: 5) has noted that this influx of Hispanic “immigrants and new minority groups to America is having a profound impact on natural increase and the age structure of the U.S. population.”

But unfortunately, a similar mildly positive prognosis is not possible for most of the counties and countries of Europe. The European situation compared to that of the U.S. is demographically different in two very important ways. First, Europe’s fertility rate is much lower than that of the U.S. The total fertility rate in 2012 in Europe was 1.6 versus 2.0 in the U.S.

And in only one European country, Ireland, was the total fertility at or above the replacement level (it was 2.1 in Ireland). Indeed, "between 2006 and 2008 practically all of the EU, EFTA and candidate countries, with the exception of Turkey and Iceland" had fertility rates well below replacement levels (Eurostat, 2011: 25).

In contrast, eleven of the states of the U.S. have total fertility rates of 2.1 or higher; Utah has the highest at 2.4, followed, in order, by Alabama, South Dakota, Idaho, Texas, Kansas, Hawaii, Nebraska, Oklahoma, and, finally, Arizona and New Mexico both at 2.1 (Martin et al., 2012: Table 12), and several of these states are among those U.S. states with the largest number of natural decrease counties.

Second, there is very little immigration to most of the European countries that would result in sizeable fertility advantages like the significant levels of Hispanic immigration to the U.S. There is some immigration of Muslims to a few European countries, especially, France, but nothing as considerable and as extensive as Hispanic immigration to the U.S.

As a consequence, there is virtually no population growth in Europe and in most of its countries. Indeed in many European countries there is population loss; the countries of Estonia, Latvia, Lithuania, Germany, Bulgaria, Hungary, Romania, Ukraine, Croatia, Serbia, Spain and several other smaller European countries all lost more people in 2012 via mortality and out-migration than they gained through fertility and in-migration (Population Reference Bureau, 2012). A continuation into future years for Europe and its countries of zero growth and, even worse, negative growth, does not at all bode well for those populations.

Ben Wattenberg in his 2005 book, *Fewer: How the New Demography of Depopulation Will Shape Our Future*, makes a prescient observation most apropos to this discussion. He notes that the U.S. takes in more immigrants than all of the other countries of the world combined and that this leads to a host of positive economic, political, social and cultural advantages for the United States. These major benefits of immigration leads to his statement that the U.S. does immigration right (see also Wattenberg, 2012). Europe is not at all close to a similar demographic achievement

Endnote

1. The Population Reference Bureau (PRB) provides data on its *2012 World Population Data Sheet* for all the countries of the world. A geopolitical entity is defined by the PRB as a country if it has a population of at least 150,000 or more persons and/or if it is a member of the United Nations. Thus the PRB countries “include sovereign states, dependencies, overseas departments, and some territories whose status or boundaries may be undetermined or in dispute” (Population Reference Bureau, 2012).

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Table 1 Natural Decrease Counties in 22 Countries of Europe, Circa 2000-10

Country	Time Period	Total Counties	Natural Decrease Counties		Natural Decrease Counties Also Experiencing Population Loss	
			Number	Percent of all Counties	Number	Percent of all Counties
Austria	2002-2010	35	17	48.57	9	25.71
Belgium	2000-2009	44	14	31.82	0	0
Bulgaria	2000-2009	28	28	100	26	92.86
Croatia	2002-2010	21	19	90.48	14	66.67
Czech Republic	2002-2010	14	7	50	2	14.29
France	2000-2009	100	26	26	5	5
Germany	2000-2009	429	353	82.28	211	49.18
Greece	2001-2010	51	36	70.59	27	52.94
Hungary	2003-2010	20	20	100	17	85
Ireland	2002-2010	8	0	0	0	0
Italy	2002-2010	107	69	64.49	7	6.54
Lithuania	2000-2009	10	10	100	10	100
Netherlands	2003-2010	40	3	7.5	3	7.5
Norway	2001-2010	19	3	15.79	0	0
Poland	2001-2010	66	26	39.39	24	36.36
Portugal	2000-2009	30	19	63.33	12	40
Romania	2000-2009	42	34	80.95	32	76.19
Slovenia	2003-2010	12	7	58.33	4	33.33
Spain	2001-2010	59	22	37.29	6	10.17
Sweden	2000-2009	21	13	61.90	9	42.86
Switzerland	2000-2009	26	5	19.23	3	11.54
United Kingdom	2001-2009	133	43	32.33	10	7.52
Europe (22 countries)	Various	1,315	774	58.86	431	55.68

Table 2 Natural Decrease Counties in the States of the United States, 2000-09

State	Total Counties	Natural Decrease Counties		Natural Decrease Counties Also Experiencing Population Loss	
		Number	Percent of all Counties	Number	Percent of all Counties
Alabama	29	0	0	0	0
Alaska	67	20	29.85	12	17.91
Arkansas	75	25	33.33	15	20
Arizona	15	2	13.33	0	0
California	58	12	20.69	2	3.45
Colorado	64	9	14.06	6	9.375
Connecticut	8	0	0	0	0
District of Columbia	1	0	0	0	0
Delaware	3	0	0	0	0
Florida	67	22	32.84	1	1.49
Georgia	159	10	6.29	4	2.52
Hawaii	5	1	20	1	20
Iowa	99	42	42.42	38	38.38
Idaho	44	4	9.09	2	4.55
Illinois	102	38	37.25	30	29.41
Indiana	92	5	5.43	3	3.26
Kansas	105	54	51.43	52	49.52
Kentucky	120	21	17.5	15	12.5
Louisiana	64	3	4.6875	2	3.125
Massachusetts	14	2	14.29	2	14.29
Maryland	24	5	20.83	0	0
Maine	16	7	43.75	2	12.5
Michigan	83	26	31.33	22	26.51
Minnesota	87	26	29.89	22	25.29
Missouri	115	38	33.04	17	14.78
Mississippi	82	2	2.44	1	1.22
Montana	56	30	53.57	19	33.93
North Carolina	100	25	25	4	4
North Dakota	53	35	66.04	35	66.04
Nebraska	93	41	44.09	39	41.94
New Hampshire	10	2	20	1	10
New Jersey	21	1	4.76	1	4.76
New Mexico	33	6	18.18	4	12.12
Nevada	17	5	29.41	2	11.76
New York	62	9	14.52	3	4.84
Ohio	88	6	6.82	3	3.41
Oklahoma	77	25	32.47	13	16.88
Oregon	36	13	36.11	6	16.67
Pennsylvania	67	32	47.76	23	34.33
Puerto Rico	78	0	0	0	0
Rhode Island	5	1	20	1	20
South Carolina	46	2	4.35	1	2.17
South Dakota	66	27	40.91	25	37.88
Tennessee	95	28	29.47	4	4.21
Texas	254	61	24.02	32	12.60
Utah	29	0	0	0	0
Virginia	134	54	40.30	24	17.91
Vermont	14	4	28.57	3	21.43
Washington	39	9	23.08	2	5.13
Wisconsin	72	20	27.78	14	19.44
West Virginia	55	41	74.55	26	47.27
Wyoming	23	3	13.04	2	8.70
United States	3,221	854	26.51	536	16.64

Table 3. Metric and Standardized (in parentheses) Coefficients from Regression of Rate of Natural Decrease on Four Independent Variables: Natural Decrease Counties in Europe and in Five Countries, circa 2000-2010 period

	Europe (N=622)	Germany (N=294)	Greece (N=24)	Italy (N=32)	Romania (N=32)	United Kingdom (N=41)
Percent 65 and Over	-.25* (-.37)	-.76* (-.71)	-.58* (-.77)	-.69* (-1.01)	-.66* (-.69)	-.34* (-.67)
Population Size (100,000)	.03 (.04)	.02 (.031)	-.36 (-.13)	-.02 (-.03)	-.10 (-.09)	.201* (.38)
Population Density (1,000)	.17 (.06)	.14 (.06)	-6.29 (-.12)	2.53 (.12)	15.71 (.28)	-.23 (-.19)
Number of Tourist accommodations (1,000)	.75* (.18)	1.19* (.16)	4.58 (.31)	1.04 (.15)	2.71 (.06)	-.38 (-.05)
Constant	2.07*	12.32	10.69*	12.5*	6.00*	4.81*

**p <.05*

Table 4. Metric and Standardized (in parentheses) Coefficients from Regression of Rate of Natural Decrease on Four Independent Variables: Natural Decrease Counties in the U.S. and in Six States, 2000-2009 period

	U.S.	Iowa	Kansas	Nebraska	Texas	Virginia	West Virginia
Percent 65 and Over	-.37* (-.70)	-.60* (-.79)	-.60* (-.81)	-.66* (-.84)	-.32* (-.64)	-.33* (-.68)	-.11 (-.19)
Population Size (100,000)	.275* (.10)	3.82 (.24)	2.43 (.06)	11.9 (.24)	-1.56 (-.09)	2.52* (.19)	1.25* (.46)
2010 Population Density (1,000)	-1.00* (-.12)	-29.5 (-.31)	-.02 (-.06)	-99.28 (-.26)	.03 (.26)	-.88* (-.29)	-3.31* (-.35)
Recreation Dependent	.34* (.07)	2.85* (.35)	--	.56 (.06)	.07 (.01)	-.55 (-.09)	-.94* (-.30)
Constant	5.35*	10.91*	9.77*	12.06*	4.35*	3.82*	.55

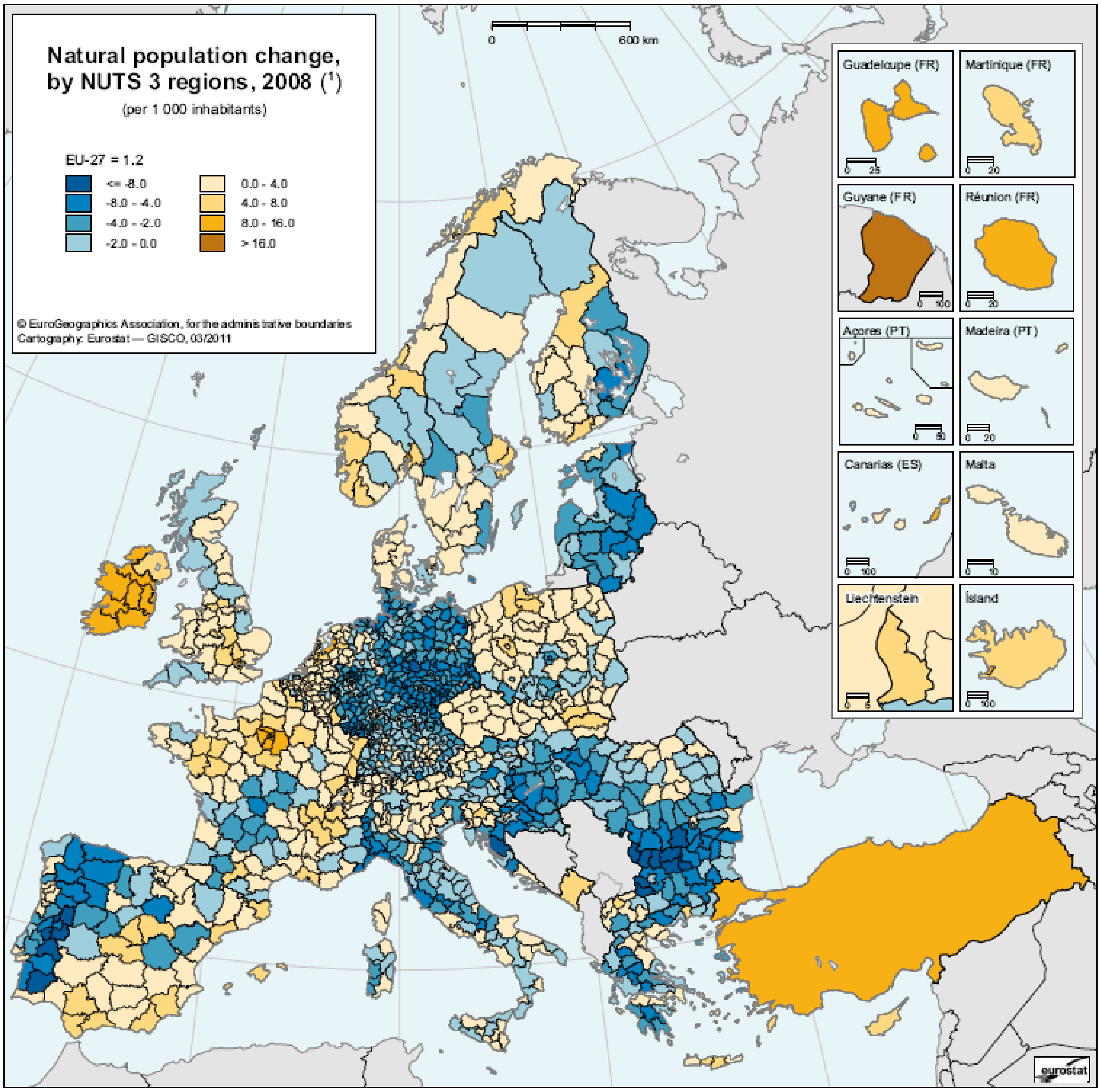
**p <.05*

Table 5. Metric and Standardized (in parentheses) Coefficients from Regression of Rate of Natural Decrease on Five Independent Variables: Natural Decrease Counties in the U.S. and in Six States, 2000-2009 period

	U.S.	Iowa	Kansas	Nebraska	Texas	Virginia	West Virginia
Recreation Dependent	.30* (.06)	2.26* (.28)	--	.64 (.07)	.11 (.02)	-.51 (-.09)	-.73 (-.23)
Median Household Income ($1,000)	.042* (.14)	.009 (.03)	.11* (.22)	.028 (.06)	.065 (.17)	.035 (.18)	.074* (.31)
Percent Employed in Manufacturing	.025* (.09)	.02 (.08)	-.02 (-.06)	-.07 (-.15)	.04 (.13)	.01 (.03)	-.01 (-.05)
Percent Hispanic	.031* (.11)	.096 (.13)	.06 (.06)	-.07 (-.08)	.03 (.16)	.13 (.16)	-.30 (-.26)
Percent 65 and Over	-.35* (-.68)	-.50* (-.66)	-.54* (-.73)	-.67* (-.85)	-.286* (-.57)	-.33* (-.68)	-.21* (-.36)
Constant	2.98*	7.66*	4.23	11.79*	.70	2.21	.10

$^*p < .05$

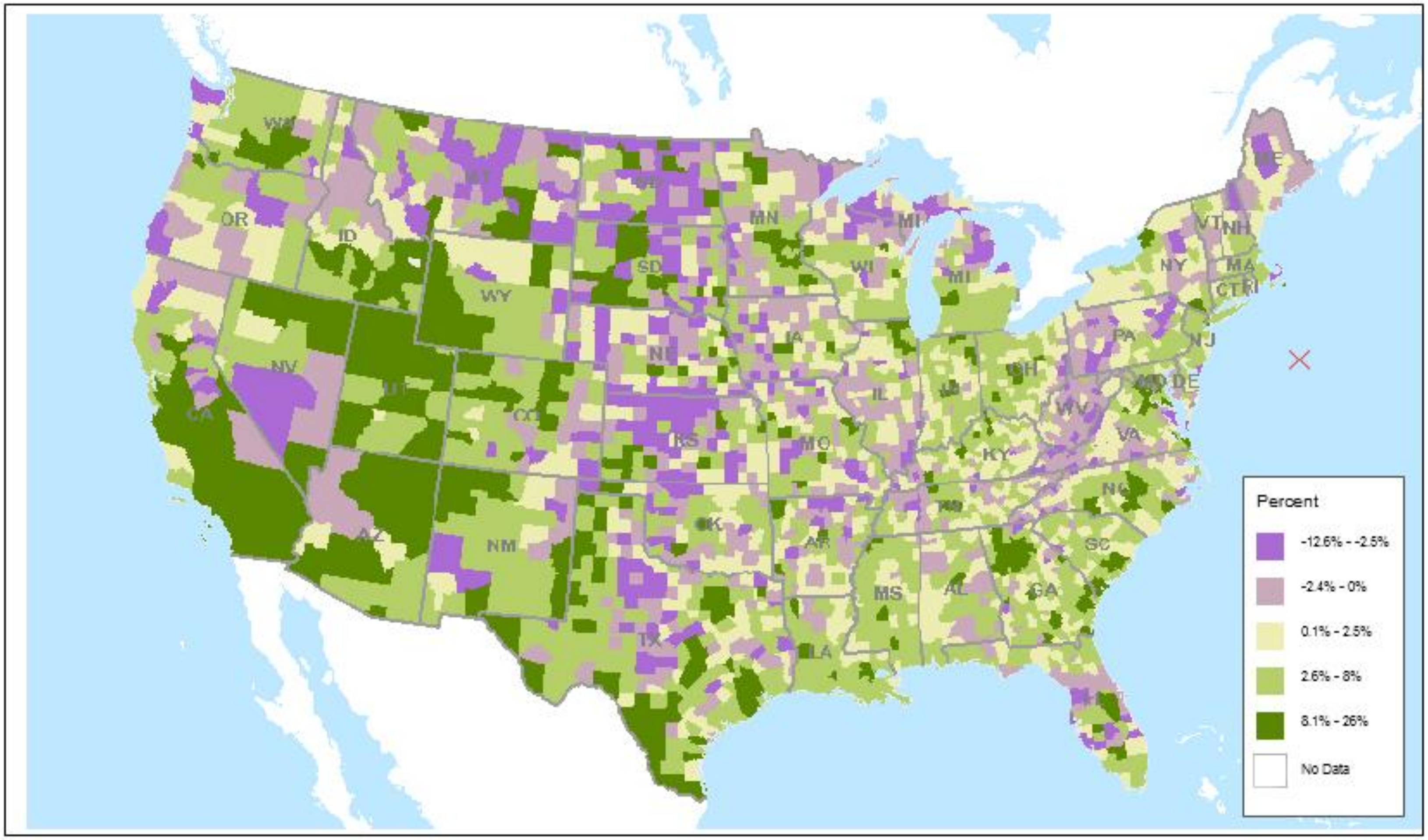
Figure 1. Natural Population Change, Counties of the European Countries, 2008.



(1) Belgium, 2007; United Kingdom, 2007 and NUTS 2 regions; Turkey, national level.

Source: Eurostat (online data code: demo_r_gind3 and demo_gind).

FIGURE 2



Natural population change rate, 2000-2010

Figure 3.

Scatterplot of Population Size on Rate of Natural Decrease:

36 Counties of Greece, 2001-010