A spatial and temporal analysis of immigrant behavior in northern Orkney, 1851-1901.

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Many demographic studies focus on migration in modern human populations. Often the findings of these studies are used to make policy decisions that deal with the health and social inequalities of migrants. However in historical demographic studies migration has often taken a back seat to the documentation of how fertility and mortality rates change over time in response to changing social and economic conditions. A better understanding of the causes and consequences of migration in historical populations will increase our understanding of the dynamics of populations and increase our knowledge of how these populations changed into our present population.

This study focuses on two aspects of migration within the rural, non-industrial setting of Westray, Orkney, Scotland. In the first segment spatial and temporal dimensions of population movement are analyzed within a single parish of Scotland. In the second part, the differences in fertility of immigrants and non-immigrants are analyzed.

The island of Westray, centered at 59˚N 3˚W has a surface area of approximately 65 km^2. Settlement is extremely discontinuous, with individual farmsteads scattered across the landscape and clustered into higher-order settlements, traditionally called “townships” that are purely rural in character. The primary data for this study are the decennial censuses of Westray, Orkney, Scotland from the period 1851 to 1901. The census data represent the entire population of the island and consist of individual level records indicating household membership, relationship to household head, age, sex, marital status, occupation, birthplace and amount of land held. These data are geo-coded and linked in a

GIS to the township to which they belong and to spatial data on land type and quality. Next, the individual level census data are collapsed into households and household-level variables are constructed. In total 12,276 individuals, merged into 2,520 households, are represented in the data.

The first analysis tests the effects of chain- and density-dependent migration using the townships as an aggregate level of analysis. A general linear model framework is employed to test if migrants are selectively drawn to particular townships over others in response to township population density, prior immigrant population, total area of township and total land quality. It is hypothesized that while current demographic conditions will play some role in migrant settlement, prior demographic conditions will be the most important. To incorporate the effects of prior knowledge of township demographic circumstances, population density, immigrant population and total population are lagged by one census period. Hence, the proportion of migrants in a given year is regressed on the previous period's demographic structure.

The second analysis focuses on fertility differentials between migrants and non-migrants. Two hypotheses are tested 1) migrants have higher fertility than non-migrants because of increased access to resources brought about by migrating and 2) migrant fertility is limited because migration is only temporary in response to local labor conditions. The fertility measure employed is the number of sons and daughters (in relation to household head) under age 10. This should represent the total net fertility of the household since the last census enumeration. Using an ordinal logistic regression, net fertility is regressed on household family structure (nuclear vs. extended), number of unrelated servants in the household, age of household head, land held by the household, township of residence, immigrant status of head, census year, local land quality and occupation of household head.

Results of the first analysis indicate that prior demographic circumstances have a significant effect on the current period's migration dynamics and this varies over time. In general, migrants appear to select areas of lower population density with higher concentrations of other migrants. This behavior likewise varies as the population densities of the townships change over time, so that different townships are more attractive to migrants. This pattern is representative of what is expected under a chain-migration model responding to increased labor needs. Results from the second analysis indicate that regardless of time period, immigrant status has a negative impact on household net fertility, suggesting support for the idea that increased fertility is seen as costly for immigrant families. In addition, age of household head, number of servants and extended family structure show negative impacts on net fertility.

These results indicate that migrants display highly adaptive behavior, in that they limit their fertility and choose a highly mobile lifestyle that allows them to move to different townships as labor conditions dictate. Although this pattern might be expected in a rural to urban migration situation, this is significant in a completely rural setting. Future analysis will examine the migration patterns across the Orkney archipelago to see how migration between islands affects the system-wide population dynamics during the late 19^{th} to early 20^{th} centuries.