

7 The Month-of-Birth Patterns of Migrants and Farmers

The second chapter provides evidence that the month-of-birth pattern is tied to the seasons of the years by comparing differences in the life span of people born in the Northern and the Southern Hemisphere. This idea is taken one step further in the analysis of the month-of-birth pattern of migrants. Two groups of migrants are explored. The first group moved from the Northern to the Southern hemisphere – more precisely, it consists of people who were born in Britain and who died in Australia. The second group consists of internal US migrants who moved between different regions of the US and, thus, died in a region other than the one in which they were born. The underlying idea is that migrants should be subject to the month-of-birth pattern of their region of birth rather than that of their region of residence. This chapter provides evidence that this conjecture is indeed true. However, the month-of-birth pattern of people who migrated from the South to the North of the US does not always lead to consistent results.

The second part of the chapter explores whether unobserved social differences exist in the month-of-birth pattern, and whether these unobserved social differences may explain the inconsistencies in the South to North migration patterns. The only socioeconomic information on US death certificates is education and usual occupation (for some states only). Education probably does not capture the main socioeconomic differences that affect early-life circumstances in the South at the beginning of the 20th century. At that time the South was still an agricultural society, with the majority of the population born in rural areas. The educational system was much less developed than in the industrialized North – a large majority of the population had only basic education. On the other hand, the rural population was far from being a homogenous group, since the social class relations in the South were structured along the lines of land ownership. In this social structure those who did not own land were particularly disadvantaged.

The second piece of socioeconomic information on the death certificates is “usual occupation”, which is generally difficult to relate to early-life cir-

cumstances. There is one exception, namely, the two occupations farmer and farm worker. Farmers and farm workers are generally born in rural areas, and Preston et al. (1998) showed that a rural place of birth and, particularly, a farming background increases the old-age survival of African-Americans. Thus, the conjecture is that the month-of-birth pattern of farmers and farm workers should differ from that of the remaining population, since their early-life circumstances were different in terms of nutrition and infectious disease environment. Furthermore, farm workers in the South who did not own land were at a particular disadvantage, and one can therefore expect that fluctuations in the month-of-birth pattern are larger for farm workers than for farmers.

If differences in the month-of-birth patterns of the urban and rural-born populations exist, and if there are differences in the pattern among the rural population associated with the ownership of land, then this might explain the inconsistencies in the month-of-birth pattern of migrants from the southern to the northern US. The question of whether the migrants of a particular region of the US came primarily from urban or rural areas and whether or not they owned land might have a significant influence on the month-of-birth pattern in mean age at death.

7.1 Data and Method

7.1.1 Migrants

The Australian death data provide information about the age at immigration and the country of origin. They contain a total of 43,074 British-born immigrants to Australia who died at ages 50+ with known age at immigration.

The United States consists of nine geographical regions according to the classification given in the death records. All decedents whose state of residence differed from their state of birth are treated as migrants (see Tables 7.1 and 7.2). The largest migration flow among US born decedents is from the North to the South: 438,061 decedents were born in the Middle Atlantic region and lived in the South Atlantic region at the time of their death; the second largest is from North to West: 330,396 migrants were born in the West North Central region and moved to the Pacific region; the third largest flow is from the South to the North: 283,129 decedents born in the East South Central region moved to the East North Central region.

In order to test the hypothesis that the age at death of migrants follows the month-of birth pattern of their birth region rather than of their resi-

dence region, regions with substantially different month-of-birth patterns are needed. This is true for the South and the North of the US.

Equation 7.1 is used to estimate the simultaneous effects of the characteristics of the decedents on their age at death.

$$x_j = \alpha_0 + \beta'Y_j + \gamma'I_j + u_j. \quad [7.1]$$

Let x_j be age at death, Y_j the matrix of the indicator variables month of birth, sex, education, migrant and marital status, and I_j the matrix of the two-way interactions between the variables; α_0 , β' , and γ' are the parameter estimates. The error term u_j follows a normal distribution with mean zero and variance σ^2 . The variable migrant indicates whether a person died in the birth region or has moved to another region. Of particular interest is the two-way interaction between the variables month-of-birth and migrant because the value of the F-statistics indicates whether the month-of-birth pattern of the migrants differs significantly from that of their birth or residence regions.

For each migration flow, two models are estimated. The first model compares the non-migrants of the birth region with those who migrated, e.g. decedents born in the Middle Atlantic region who remained in their birth state with those who moved to the South Atlantic region. The second model compares the migrants with the non-migrants of the residence region, e.g. the migrants from Middle Atlantic to South Atlantic with those who were born and who died in South Atlantic.

7.1.2 Farmers, Non-Farmers and Farm Workers

Only a subset of the US states reports the usual occupation in their death records - in the North these are the states Indiana, Kansas, Maine, New Hampshire, New Jersey, Ohio, Rhode Island, Vermont and Wisconsin. In the South, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina and West Virginia provide the information and in the Mountain region, Colorado, Idaho, Nevada, New Mexico and Utah do so.

All people who died in their birth regions were extracted. In the North and the Mountain region the analysis is restricted to white males only because of the different month-of-birth pattern for blacks and whites. For the South the large number of black farmers allows for the estimation of a separate model for blacks. Females were excluded from the analysis because female farmers may be classified as housewives.

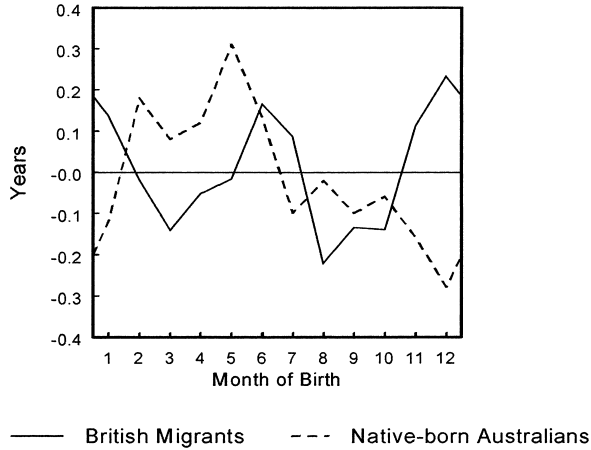


Figure 7.1. Deviation in the mean age at death by month of birth from average age at death of British immigrants and native-born Australians.

Occupations in the death records are classified according to the “Instruction Manual of the Alphabetical Index of Industries and Occupations, 1998”. The 1990 census code for farmer is 473, and the code for farm worker is 479. These two groups are compared to the residual group “non-farmers”; death records with unknown occupation are excluded.

In the North death records report farmer or farm worker as the usual occupation for 53,143 white males. That is about 9 per cent of the death records that contain information about the usual occupation. In the South there are 54,328 white male farmers (12 per cent) and in the mountain region 10,516 (14 per cent). Among blacks in the South 15,052 (13 per cent) are farmers.

A regression model similar to Equation [7.1] is estimated. The model includes the indicator variables region, marital status, education, month of birth and farmer, and the two-way interactions between the variables month of birth and farmer, and education and farmer. The variable farmer distinguishes farmers from all others, who are called non-farmers.

A second model with a similar specification is estimated which distinguishes between farmers and farm workers. Since farmers and farm workers have similar educational levels, education is not included in the latter model. Among whites there are 51,160 farmers and 1,983 farm workers in the North; 52,572 farmers and 1,576 farm workers in the South and 9,555

farmers and 961 farm workers in the Mountain region. Among blacks in the South there are 11,736 farmers and 3,316 farm workers.

7.2 Results

7.2.1 British Migration to Australia

The comparison of the month-of-birth pattern of British immigrants with the pattern of people born in Australia reveals a striking difference (Figure 7.1). The peak in mean age at death of British immigrants to Australia born between November and January is 0.36 years higher than the trough of their Australian-born counterparts (one sided t-test, $p < 0.001$). The life span of British immigrants born between March and May is 0.26 years lower than that of native Australians (one sided t-test: $p < 0.007$). However, the month-of-birth pattern of the migrants is bimodal, while the pattern for Austria, Denmark, or the total US is unimodal (see Fig. 2.1). One explanation may be that the month-of-birth pattern for the total population in Britain is bimodal, another, that migrants are not representative of the total population. They may be socially selected, and there is ample evidence that they are selected for better health status (Young 1987, Ringbäck et al. 1999, Razum et al. 1998, Swerdlow 1991, Kliewer 1992, Lechner & Mielck 1998).

Australian death data contain the amount of time that foreign-born citizens have lived in Australia before their death. In theory this information would allow for one to test whether the critical period early in life is *in-utero* or later. If the critical period is *in-utero* then the month-of-birth pattern of migrants that came during their first year of life should resemble the pattern of their birth countries overseas. Thus, the correlation with the month-of-birth pattern of native-born Australians should be negative. A positive correlation would be an indication that the critical period is the first year of life. In practice, one cannot distinguish between the period *in-utero* and the first year of life because age at immigration can only be calculated in full years. In other words, migrants who came during their first year of life may have spent a few weeks or almost a whole year in their birth country. A second problem is that only 358 British immigrants came during their first year of life. Among these migrants no significant month-of-birth pattern exists, with the exception of a particularly low mean age at death for those born in June. The correlation between the month-of-birth pattern of the migrants who came during their first year of life and the

Table 7.1. Number of deaths by region of birth and region of residence, US death records 1989-1997, whites.

Region of birth	Region of Residence									
	NE	MA	ENC	WNC	SA	ESC	WSC	M	P	TOTAL
NE	667,698	49,434	16,469	4,345	101,438	4,602	9,355	15,619	48,911	917,871
MA	81,430	1,942,430	124,060	16,551	429,699	17,058	36,256	62,723	150,729	2,860,936
ENC	13,796	47,736	1,981,961	87,133	242,174	41,024	66,930	114,219	233,541	2,828,514
WNC	5,684	14,938	118,286	1,035,654	62,914	15,037	90,713	150,613	326,102	1,819,941
SA	8,012	50,195	75,902	8,193	1,398,012	52,868	29,238	18,633	41,299	1,682,352
ESC	2,387	8,827	143,998	15,736	136,889	793,420	68,853	17,933	40,192	1,228,235
WSC	2,247	6,682	31,140	46,927	35,410	28,353	1,082,852	70,190	179,791	1,483,592
M	1,596	3,603	9,885	13,357	9,607	2,240	17,087	245,472	141,450	444,297
P	2,058	4,120	6,908	6,225	10,382	2,171	10,036	34,969	492,391	569,260

NE: New England; MA: Middle Atlantic; ENC: East North Central; WNC: West North Central; SA: South Atlantic; ESC: East South Central; WSC: West South Central; M: Mountain; P: Pacific

Table 7.2. Number of deaths by region of birth and region of residence, US death records 1989-1997, blacks.

Region of birth	Region of Residence										TOTAL
	NE	MA	ENC	WNC	SA	ESC	WSC	M	P		
NE	6,422	1,415	298	50	792	58	60	77	420		9,592
MA	1,250	69,531	3,473	235	8,362	351	477	516	2,550		86,745
ENC	334	2,869	54,100	1,524	2,484	1,185	879	811	4,537		68,723
WNC	104	779	6,054	17,499	735	358	816	1,043	4,294		31,682
SA	11,461	149,515	49,969	1,461	491,893	7,057	2,916	1,586	10,160		726,018
ESC	2,264	20,739	139,131	16,138	23,708	196,459	15,665	2,565	21,036		437,705
WSC	587	4,405	35,735	14,921	3,963	4,373	215,952	7,975	66,374		354,285
M	15	131	230	124	137	52	185	776	917		2,567
P	26	227	210	58	175	47	158	157	5,331		6,389

NE: New England; MA: Middle Atlantic; ENC: East North Central; WNC: West North Central; SA: South Atlantic; ESC: East South Central; WSC: West South Central; M: Mountain; P: Pacific

native-born Australians is negative ($\rho=-.209$, $p=.519$) but not significant. The same is true for those who came during their second ($\rho=-.265$, $p=.405$, $n=569$) and third year of life ($\rho=-.024$, $p=.940$, $n=778$). If one combines those who came during the first two years of life, there exists a negative correlation of $\rho=-.344$ at $p=.27$. The month-of-birth patterns of the migrants who came after their third year of life and the native-borns are un-systematic and statistically not significant.

7.2.2 Internal US Migration

White North-to-South Migration

Part A of Figure 7.2 compares the month-of-birth pattern of the migrants from the regions *Middle Atlantic* to *South Atlantic* with the pattern of the non-migrants of their birth region (Middle Atlantic). Part B compares it with the pattern of the non-migrants of their residence region (South Atlantic). The month-of-birth pattern of the migrants does not differ significantly from the pattern of the non-migrants of the birth region; it differs significantly from the pattern of the non-migrants of the residence region. Results are similar for the two other North-South migration flows from *New England* to *South Atlantic* and from *East North Central* to *South Atlantic*.

White South-to-North Migration

The results are more complex for the South-North migration flows (Fig. 7.3). The month-of-birth pattern of migrants from *East South Central* to *East North Central* differs significantly from the pattern of their birth regions and their residence regions. Among the migrants, the difference between spring- and autumn-born is smaller than among the non-migrants of their southern birth region; it is larger than among the non-migrants of their northern residence region. The correlation between the month-of-birth pattern of migrants and of non-migrants of the birth region is larger ($\rho=0.811$, $p=0.001$) than between migrants and non-migrants of the residence region ($\rho=0.734$, $p=0.007$). The pattern of migrants from *South Atlantic* to *East North Central* differs neither from their birth nor from their residence region, and the same is true for migrants from *South Atlantic* to *Middle Atlantic*. For both migration flows, the correlation between the month-of-birth patterns is contrary to the expectation. The pattern of the

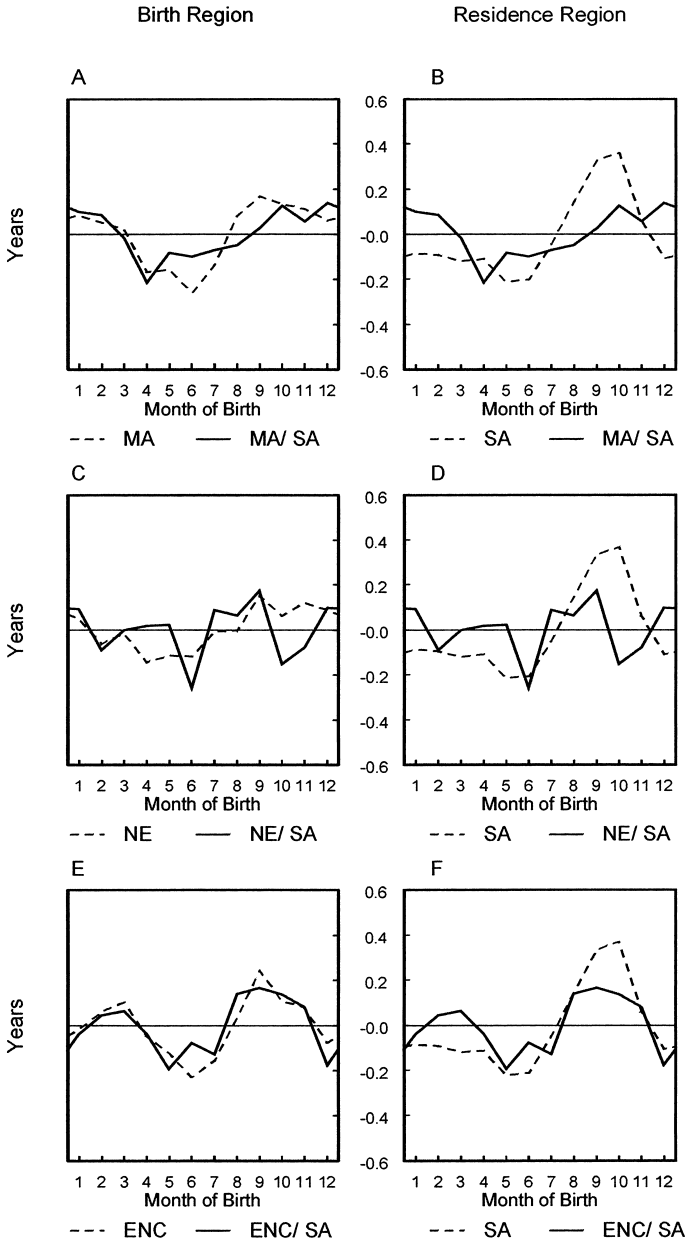


Figure 7.2. The month-of-birth pattern for white migrants from the North to the South: differences in mean age at death by month of birth from the average mean age at death at ages 50+. A,C,E) non-migrants' birth region (dashed lines), migrants (solid lines); B,D,F) non-migrants' residence region (dashed lines), migrants (solid lines).

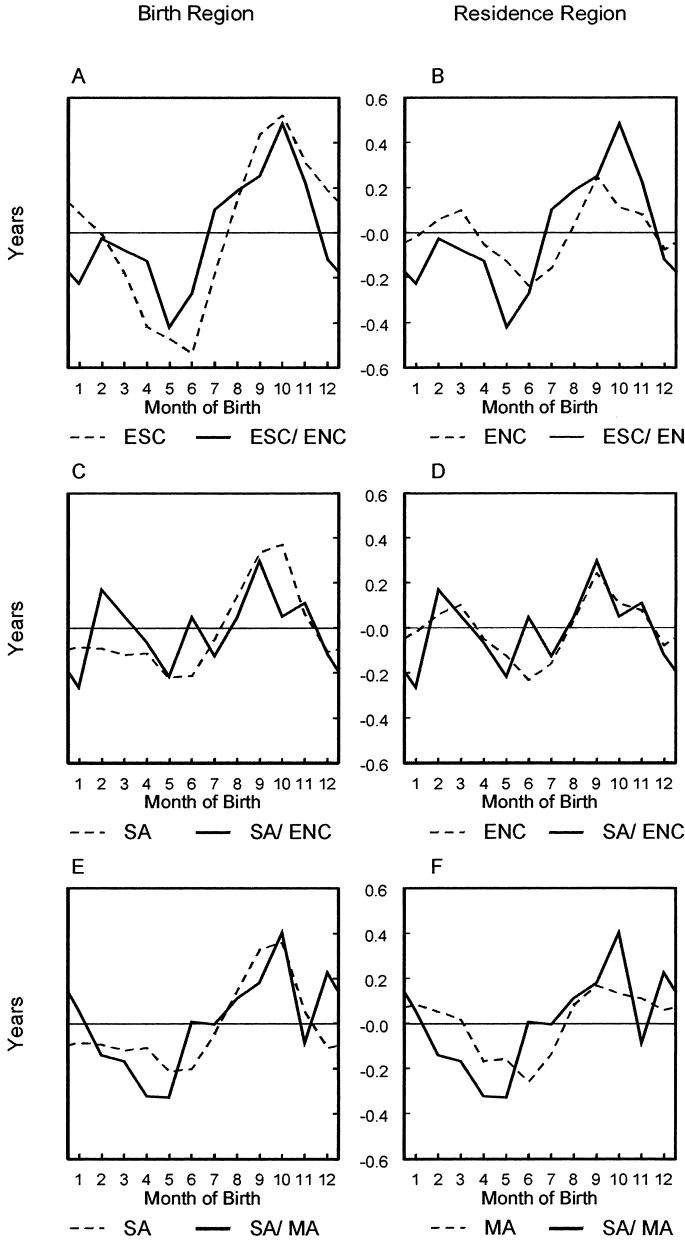


Figure 7.3. The month-of-birth pattern for white migrants from the South to the North: differences in mean age at death by month of birth from the average mean age at death at ages 50+. A,C,E) non-migrants' birth region (dashed lines), migrants (solid lines), B,D,F) non-migrants' residence region (dashed lines), migrants (solid lines).

migrants from *South Atlantic* to *East North Central* is significantly correlated with the pattern of the non-migrants of the residence region ($\rho=0.748$, $p=0.005$); it is not correlated with the pattern of the birth region ($\rho=0.413$, $p=0.183$). There is no difference in the correlation of the migrants from *South Atlantic* to *Middle Atlantic* with their birth region ($\rho=0.678$, $p=0.015$) and their residence region ($\rho=0.655$, $p=0.021$).

Black South-to-North Migration

A sizeable proportion of the South-to-North migration consists of African-Americans who moved north. Combining the three southern regions into the South and the four northern regions into the North, no significant differences are found between the month-of-birth patterns of the migrants, of those who remained in the South, and of those who were born in the North. The non-significant result is mainly caused by the large standard errors of the mean age at death of those born in the North. The correlation coefficients between the three groups show that the pattern of the migrants is more strongly correlated with that of the southern non-migrants ($\rho=0.804$, $p=0.002$) than with the pattern of those who were born in the North ($\rho=0.650$, $p=0.022$).

The evidence presented above suggests that both the month-of-birth

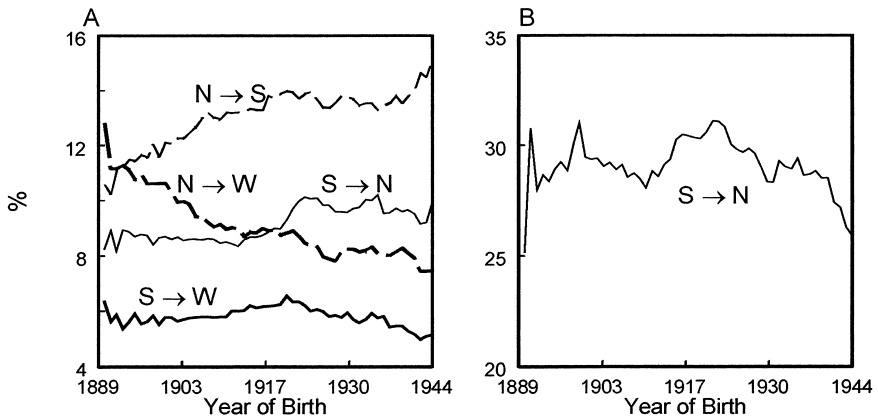


Figure 7.4. Proportion of migrants by year of birth and region of birth in the US death records 1889 to 1997 for whites (A) and for black South-to-North migrants (B).

patterns of migrants from Britain to Australia and of migrants within the US depends on their region of birth rather than on their region of residence. However, these results are not always consistent and in the remainder of the chapter we explore the possibility that unobserved social characteristics might be responsible for these inconsistencies.

In the North-to-South migration retirement migration has intensified over the years. This can be clearly seen in the proportion of migrants among the decedents of a given birth year (Fig. 7.4, solid line): 11 % of those who were born in 1880 were North-South migrants, as compared to almost 16% of those who were born in 1946. On average these migrants are more likely to be married, to have higher income and education levels and to be healthier than the non-migrant population (Biggar 1980, Speare & Mayer 1988). The above analysis accounts for the effects of family status and education and, thus, is able to compare the migrants with the average population of their birth region and their residence region.

South-to-North migration is labour-related migration. The death data clearly depict the different migration waves. Figure 7.4 shows the proportion of migrants among the decedents by year of birth. When one adds the average migration age (20–25 years) to the year of birth, then Figure 7.4 reflects the continuous South-North migration flow during the 1920s – a period of loss of agricultural jobs in the South – and during the Great Depression in the 1930s, which was a time of general impoverishment of the rural southern population. A migration upsurge occurred after World War II. The South-to-North migration peaked in the 1950's and a third wave occurred at the end of the 1960's.

Those who left were mainly farm owners who had lost their land, share tenants, and sharecroppers who were displaced by the boll weevil infestation of cotton in the earlier years. In the later years, the mechanisation of agriculture and the reduction of cotton acreage led to there being a large rural surplus population that had no other options than to migrate (Fligstein 1981). Although the large majority of the South-to-North migrants were born in rural areas they were by no means a homogenous group. On the contrary, large social differences existed among them. Social-class relations in the South, particularly in the cotton growing regions, were structured along the lines of land ownership (Fligstein 1981). This system distinguished between plantation owners and merchants on the one hand and farm labourers, tenants, and small farm owners on the other hand. Farm labourers occupied the lowest rank in this class system. These people were wage labourers and worked under the direct supervision of a farm owner. Tenants were divided into sharecroppers, share tenants, and cash tenants. They are distinguished by the amount of control imposed by the plantation owner or merchant. Sharecroppers were often almost in the position of the

wage hand, as the landlord told the sharecropper what to plant and when to plant it. Share tenants were closer to being true renters – the landlord did not have the right to supervise their daily activity. Cash tenants had the greatest degree of independence.

For the analysis of the month-of-birth pattern it is important to recognize that farm labourers, sharecroppers, and to some extent also share tenants often did not have the means for subsistence farming and only planted cash crops. This implies that, for their food supply, they were fully dependent on their landlord or the merchant, which resulted in an extremely deficient diet well into the 1930s, known as the three m's: meat, meal (corn) and molasses (Levenstein 1993, 1998).

One can argue that the unobserved social differences in the rural South are the main reason for the inconsistencies in the South-North migration. This hypothesis is explored in the remainder of this chapter.

7.2.3 The Month-of-Birth Patterns of Farmers, Non-Farmers, and Farm Workers

Preston et al. (1998) showed that a rural place of birth and, in particular, a farming background positively influences the old-age survival of African-Americans. Since the US death certificates do not indicate whether one was born in a rural or urban area, indirect information is used. The usual occupation of the decedent offers alternative information. The occupation “farmer” usually implies a rural place of birth and in addition, the death records provide a distinction between farmers and farm workers.

Two competing hypotheses can be formulated concerning the month-of-birth pattern in urban and rural environments. The first hypothesis is based on the fact that infant mortality in rural areas was lower than in urban areas at the beginning of the 20th century (Preston & Hayens 1991). Infant mortality was mainly the result of infectious diseases, which spread more easily in urban areas due to crowded conditions in combination with the lack of sanitary infrastructure. Thus, if the month-of-birth pattern is primarily caused by infectious disease, then the swings in the pattern should be smaller in rural areas. On the other hand, nutrition was better in urban areas at the time (Dirks & Duran 2001) thanks to better means of preservation and transportation and because of the desperate situation of the sharecroppers and share tenants, particularly in the South. If nutrition plays a major role, then the differences should be larger among the rural population. The regression model that was fitted to the mean ages at death of farmers and non-farmers did not find any significant differences (results not shown). However, farmers tend to exhibit larger differences in the

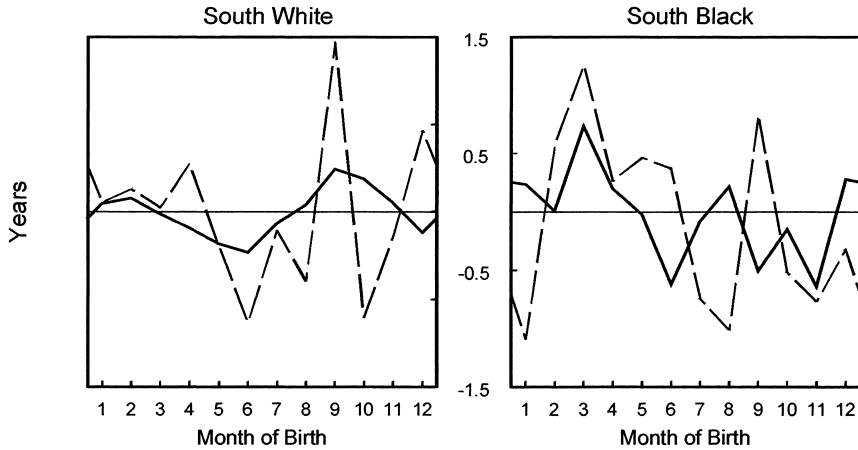


Figure 7.5. Age-adjusted differences in mean age at death of Southern farmer and farm workers by month of birth.

month-of-birth pattern than non-farmers both in the North and the South. No difference exists for blacks in the South.

The difference between farmer and farm worker may reflect the social stratification of the South better than education does. Since farm workers probably stem from landless rural families, their early-life environment must have been worse than that of farmers. The expectation therefore is that the peak-to-trough difference in the month-of-birth pattern of farm workers is larger than among farmers. In the North and the Mountain region the month-of-birth pattern does not differ significantly between the two occupational groups. In the South, however, the peak-to-trough difference for white farmer worker is significantly larger than for white farmer ($p=0.037$). There is no significant difference for black males (Fig. 7.5).

7.3 Conclusion

The month-of-birth pattern of migrants differs from the pattern of people born in their new residence region. British migrants to Australia and US internal migrants from the North to the South clearly show a distinctly different month-of-birth pattern than native-born Australians and US Southerners. However, the month-of-birth patterns of migrants also contain unexplained features such as the secondary summer peak in mean age at

death among the British migrants. In addition the pattern of the US South to North migrants does not conform to the expectation at all.

At least two possible explanations exist for these phenomena. First, a large body of literature suggests that migrants are selected for better health. Since month of birth may affect not only mortality but also health, the tendency to migrate may depend on the month of birth, which would confound the results.

The second explanation is that migrants are socially selected and therefore do not represent their population of origin. The US South to North migration is a good example. Throughout this analysis education is generally used to account for the effects of social stratification. Education, however, is a poor measure of social class for the South in the first part of the 20th century. The primarily agricultural South was stratified not by education but by land ownership. The overall month-of-birth pattern of Southern migrants may thus largely depend on whether farmers (or sons and daughters of farmers) dominated the migration flow, or landless labourers who worked as farm workers, or migrants from urban areas.

This latter explanation can only be explored indirectly on the basis of the US death records because they do not contain information related to the social class of the parents of the deceased. One possibility to circumvent this lack of information is to use the information about usual occupation, which a subset of the US states reports in their death certificates. One occupation, which tends to be largely inherited, is farmer. The assumption is that farmers were mainly born into a farming background and that the usual occupation of the decedent, therefore, reflects the social status of the parents and therefore his/her own social status early in life. The death records distinguish between farm workers and farmers and one would expect that landless farm workers rather stem from landless rural parents than from a family that had once own land.

The comparison of the month-of-birth patterns of farmers and farm workers with the residual group non-farmers does not lead to conclusive results. The mean ages at death tend to exhibit a larger peak-to-trough difference among farmers than among non-farmers, multivariate analysis, however, shows that this difference is not significant. In the North, the difference in the month-of-birth pattern between farmers and the rest of the decedents is mainly due to social differences reflected in education. As soon the model corrects for educational differences, no further differences remain. In the South and the mountain region no significant differences in the month-of-birth pattern between farmers and non-farmers exist and education has no impact on this difference.

The most likely explanation for this finding is that a considerable proportion of the residual group “non-farmer” may have actually been born on

farms or, more generally, in rural areas. Thus, existing differences cannot be identified based on the specification used in this study. This explanation might be particularly true for the South, where the boll weevil infestation, the Great Depression, and the transformation of Southern agriculture during the first part of the 20th century forced many small farm owners and tenants off their land.

In the agricultural South, significant differences in the month-of-birth pattern of white farmers and farm workers exist, as expected. White farm workers were particularly disadvantaged in the South in terms of their social position since the large majority of whites used to own their farm.

No significant differences in the month-of-birth pattern between farmer and farm worker exist for blacks. This can be explained by the fact that the large majority of black farmers were sharecroppers or share tenants with no freedom to decide what and when to plant. Like farm workers, they depended on their landlord for food and had no means for subsistence farming. In other words, among blacks there was not a lot of difference in the social status of farm workers and farmers.

Returning to the original question why the month-of-birth patterns of the South-to-North migration flows of whites does not follow the expectation it appears that unaccounted social differences may be largely responsible for the inconsistent results.