MODEL MIGRATION SCHEDULES

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PREFACE

Interest in human settlement systems and policies has been a central part of urban-related work at IIASA since its inception. From 1975 through 1978 this interest was manifested in the work of the Migration and Settlement Task, which was formally concluded in November 1978. Since then, attention has turned to the dissemination of the Task's results and to the conclusion of its comparative study: a quantitative assessment of recent migration patterns and spatial population dynamics in all of IIASA's 17 NMO countries.

This report is part of the Task's dissemination effort, focusing on the age patterns of migration exhibited in the data bank assembled for the comparative study. It begins with a comparative analysis of over 500 observed migration schedules and then develops, on the basis of this analysis, a family of hypothetical schedules for use in instances where migration data are unavailable or inaccurate.

Reports summarizing previous work on migration and settlement at IIASA are listed at the back of this report. They should be consulted for further details regarding the data base that underlies this study.

ANDREI ROGERS
Chairman
Human Settlements and Services Area

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SUMMARY

This report draws on the fundamental regularity exhibited by age profiles of migration all over the world to develop a system of hypothetical model schedules that can be used in multiregional population analyses carried out in countries that lack adequate migration data.

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1 INTRODUCTION

Most human populations experience rates of age-specific fertility and mortality that exhibit remarkably persistent regularities. Consequently, demographers have found it possible to summarize and codify such regularities by means of mathematical expressions called model schedules. Although the development of model fertility and mortality schedules has received considerable attention in demographic studies, the construction of model migration schedules has not, even though the techniques that have been successfully applied to treat the former can be readily extended to deal with the latter.

We begin this report with an examination of regularities in age profile exhibited by empirical schedules of migration rates and go on to adopt the notion of model migration schedules to express these regularities in mathematical form. We then use model schedules to examine patterns of variation present in a large data bank of such schedules. Drawing on this comparative analysis of "observed" model schedules, we develop several "families" of schedules and conclude by indicating how they might be used to generate hypothetical "estimated" schedules for use in Third World migration studies – settings where the available migration data are often inadequate or inaccurate.

2 AGE PATTERNS OF MIGRATION

Migration measurement can usefully apply concepts borrowed from both mortality and fertility analysis, modifying them where necessary to take into account aspects that are peculiar to spatial mobility. From mortality analysis, migration studies can borrow the notion of the life table, extending it to include increments as well as decrements, in order to reflect the mutual interaction of several regional cohorts (Rogers 1973a, b, 1975, Rogers and Ledent 1976). From fertility analysis, migration studies can borrow well-developed techniques for graduating age-specific schedules (Rogers et al. 1978). Fundamental to both "borrowings" is a workable definition of the migration rate.

2.1 Migration Rates and Migration Schedules

The simplest and most common measure of migration is the crude migration rate, defined as the ratio of the *number of migrants*, leaving a particular population located in space and time, to the average *number of persons* (more exactly, the number of person-years) exposed to the risk of becoming migrants. Data on nonsurviving migrants are often unavailable, therefore the numerator in this ratio generally excludes them.

Because migration is highly age selective, with a large fraction of migrants being young, our understanding of migration patterns and dynamics is aided by computing migration rates for each single year of age. Summing these rates over all ages of life gives the *gross migraproduction rate* (*GMR*), the migration analog of fertility's gross reproduction rate. This rate reflects the level at which migration occurs out of a given region.

The age-specific migration schedules of multiregional populations exhibit remarkably persistent regularities. For example, when comparing the age-specific annual rates of residential migration among whites and blacks in the United States during 1966–1971, one finds a common profile (Figure 1). Migration rates among infants and young children mirrored the relatively high rates of their parents, young adults in their late twenties. The mobility of adolescents was lower but exceeded that of young teens, with the latter showing a local low point around age 15. Thereafter migration rates increased, attaining a high peak at about age 22 and then declining monotonically with age to the ages of retirement. The migration *levels* of both whites and blacks were roughly similar, with whites showing a *GMR* of about 14 migrations and blacks one of approximately 15 over a lifetime undisturbed by mortality before the end of the mobile ages.

Although it has frequently been asserted that migration is strongly sex selective, with males being more mobile than females, recent research indicates that sex selectivity is much less pronounced than age selectivity and is less uniform across time and space. Nevertheless, because most models and studies of population dynamics distinguish between the sexes, most migration measures do also.

Figure 2 illustrates the age profiles of male and female migration schedules in four different countries at about the same point in time between roughly comparable areal units: communes in the Netherlands and Sweden, voivodships in Poland, and counties in the United States. The migration levels for all but Poland are similar, varying between 3.5 and 5.3 migrations per lifetime; and the levels for males and females are roughly the same. The age profiles, however, show a distinct, and consistent, difference. The high peak of the female schedule precedes that of the male schedule by an amount that appears to approximate the difference between the average ages at marriage of the two sexes.

Under normal statistical conditions, point-to-point movements are aggregated into streams between one civil division and another; consequently, the level of interregional migration depends on the size of the areal unit selected. Thus if the areal unit chosen is a

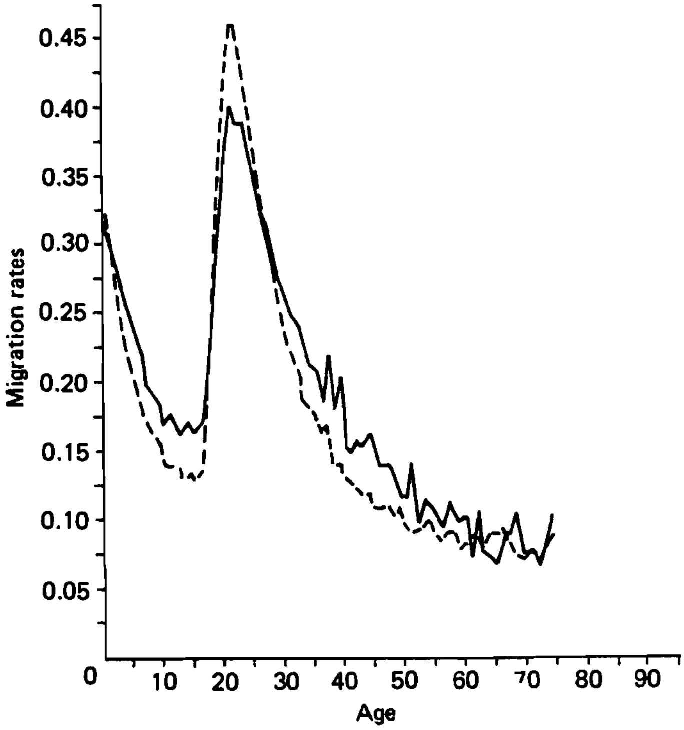


FIGURE 1 Observed annual migration rates by color (– – – white, —— black) and single years of age: the United States, 1966–1971.

minor civil division such as a county or a commune, a greater proportion of residential location will be included as migration than if the areal unit chosen is a major civil division such as a state or a province.

Figure 3 presents the age profiles of female migration schedules as measured by different sizes of areal units: (1) all migrations from one residence to another, (2) changes of residence within county boundaries, (3) migration between counties, and (4) migration between states. The respective four *GMR*s are 14.3, 9.3, 5.0, and 2.5. The four age profiles appear to be remarkably similar, indicating that the regularity in age pattern persists across areal delineations of different size.

Finally, migration occurs over time as well as across space; therefore, studies of its patterns must trace its occurrence with respect to a time interval, as well as over a system of geographical areas. In general, the longer the time interval, the larger the number of return movers and nonsurviving migrants and, hence, the more the count of *migrants* will understate the number of interarea *movers* (and, of course, also of moves). Philip Rees, for example, after examining the ratios of one-year to five-year migrants between the Standard Regions of Great Britain, found that

> . . . the number of migrants recorded over five years in an interregional flow varies from four times to two times the number of migrants recorded over one year. (Rees 1977, p. 247)

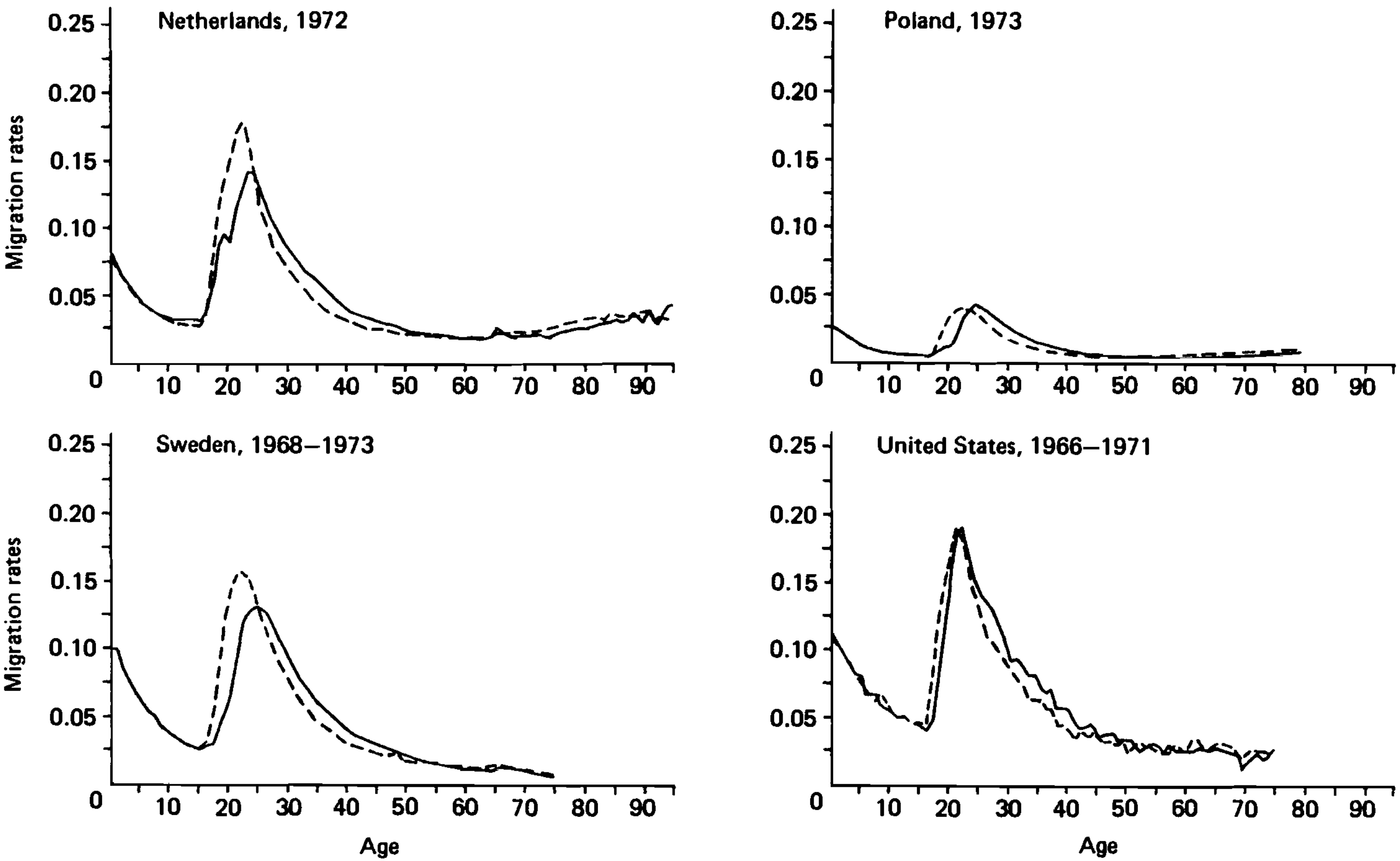


FIGURE 2 Observed annual migration rates by sex (– – – females, —— males) and single years of age: the Netherlands (intercommunal), Poland (intervoivodship), Sweden (intercommunal), and the United States (intercounty); around 1970.

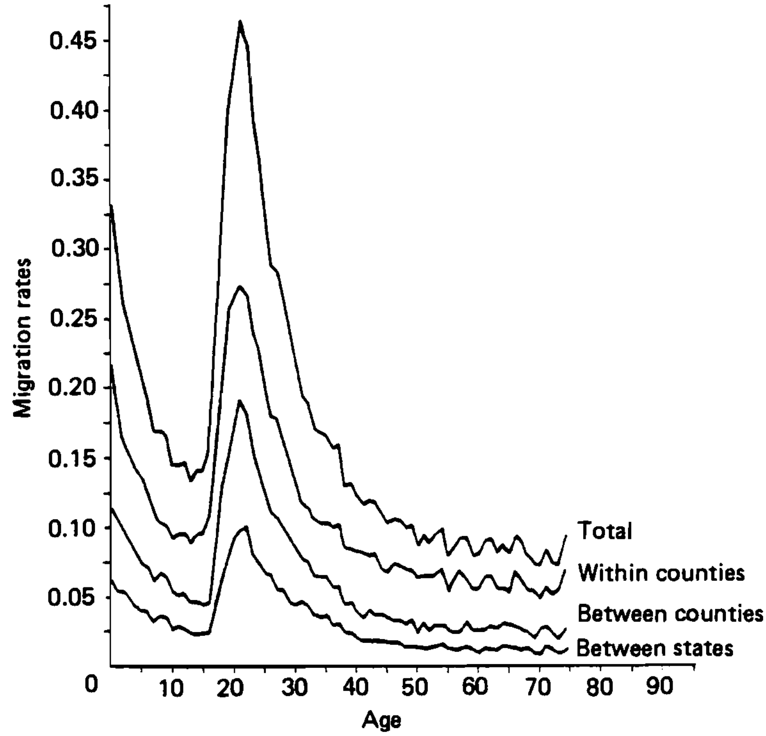


FIGURE 3 Observed average annual migration rates of females by levels of areal aggregation and single years of age: the United States, 1966–1971.

2.2 Model Migration Schedules

From the preceding section it appears that the most prominent regularity found in empirical schedules of age-specific migration rates is the selectivity of migration with respect to age. Young adults in their early twenties generally show the highest migration rates and young teenagers the lowest. The migration rates of children mirror those of their parents; hence the migration rates of infants exceed those of adolescents. Finally, migration streams directed toward regions with warmer climates and into or out of large cities with relatively high levels of social services and cultural amenities often exhibit a "retirement peak" at ages in the mid-sixties or beyond.

Figure 4 illustrates a typical *observed* age-specific migration schedule (the jagged outline) and its graduation by a *model* schedule (the superimposed smooth outline) defined as the sum of four components:

1. A single negative exponential curve of the *pre-labor force* ages, with its rate of descent α_1
2. A left-skewed unimodal curve of the *labor force* ages positioned at mean age μ_2 on the age axis and exhibiting rates of ascent λ_2 and descent α_2

α_1 = rate of descent of pre-labor force component
λ_2 = rate of ascent of labor force component
α_2 = rate of descent of labor force component
λ_3 = rate of ascent of post-labor force component
α_3 = rate of descent of post-labor force component
c = constant

x_l = low point
x_h = high peak
x_r = retirement peak
X = labor force shift
A = parental shift
B = jump

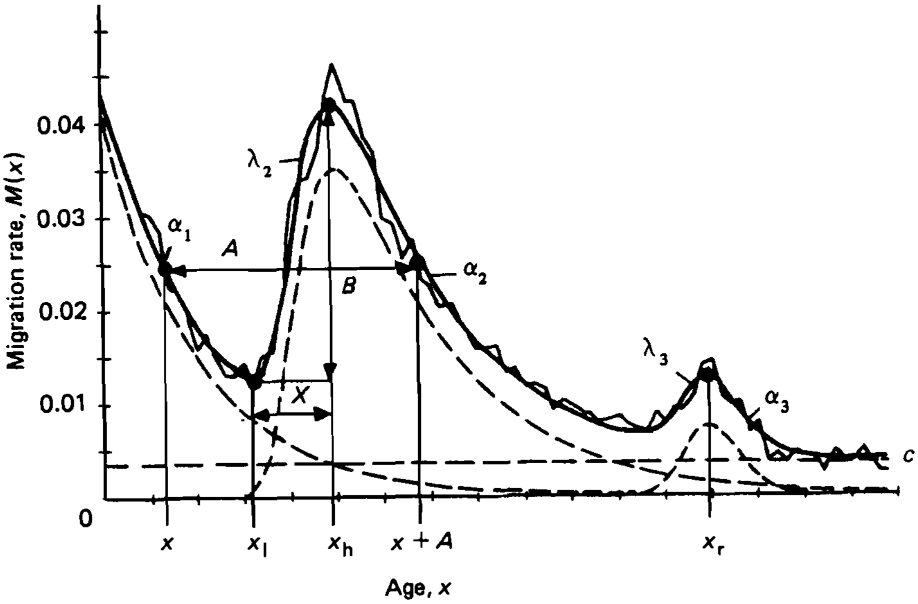


FIGURE 4 The model migration schedule.

3. An almost bell-shaped curve of the *post-labor force* ages positioned at μ_3 on the age axis and exhibiting rates of ascent λ_3 and descent α_3
4. A constant curve c, the inclusion of which improves the fit of the mathematical expression to the observed schedule

The decomposition described above suggests the following simple sum of four curves (Rogers et al. 1978):

$$\left.\begin{aligned} M(x) = {} & a_1 \exp(-\alpha_1 x) \\ & + a_2 \exp\{-\alpha_2(x-\mu_2) - \exp[-\lambda_2(x-\mu_2)]\} \\ & + a_3 \exp\{-\alpha_3(x-\mu_3) - \exp[-\lambda_3(x-\mu_3)]\} \\ & + c \end{aligned}\right\} \quad x = 0,1,2,\ldots,z \tag{1}$$

The labor force and the post-labor force components in eq. (1) adopt the "double exponential" curve formulated by Coale and McNeil (1972) for their studies of nuptiality and fertility.

The "full" model schedule in eq. (1) has 11 parameters: $a_1, \alpha_1, a_2, \mu_2, \alpha_2, \lambda_2, a_3, \mu_3, \alpha_3, \lambda_3$, and c. The *profile* of the full model schedule is defined by 7 of the 11 parameters: $\alpha_1, \mu_2, \alpha_2, \lambda_2, \mu_3, \alpha_3$, and λ_3. Its *level* is determined by the remaining 4 parameters: a_1, a_2, a_3, and c. A change in the value of the *GMR* of a particular model schedule alters proportionally the values of the latter but does not affect the former. As we shall see in the next section, however, certain aspects of the profile also depend on the allocation of the schedule's level among the pre-labor, labor, and post-labor force age components and on the share of the total level accounted for by the constant term c. Finally, migration schedules without a retirement peak may be represented by a "reduced" model with seven parameters, because in such instances the third component of eq. (1) is omitted.

Table 1 sets out illustrative values of the basic and derived measures presented in Figure 4. The 1974 data refer to migration schedules for an eight-region disaggregation of Sweden (Andersson and Holmberg 1980). The method chosen for fitting the model schedule to the data is a functional-minimization procedure known as the modified Levenberg–Marquardt algorithm (see Appendix A, Brown and Dennis 1972, Levenberg 1944, Marquardt 1963). Minimum chi-square estimators are used to give more weight to age groups with smaller rates of migration.

To assess the goodness-of-fit that the model schedule provides when it is applied to observed data, we calculate E, the mean of the absolute differences between estimated and observed values expressed as a percentage of the observed mean:

$$E = \frac{(1/n) \sum_x |\hat{M}(x) - M(x)|}{(1/n) \sum_x M(x)} 100 \qquad (2)$$

This measure indicates that the fit of the model to the Swedish data is reasonably good, the eight regional indices of goodness-of-fit E being 6.87, 6.41, 12.15, 11.01, 9.31, 10.77, 11.74, and 14.82 for males and 7.30, 7.23, 10.71, 8.78, 9.31, 11.61, 11.38, and 13.28 for females. Figure 5 illustrates graphically this goodness-of-fit of the model schedule to the observed regional migration data for Swedish females.

Model migration schedules of the form specified in eq. (1) may be classified into *families* according to the ranges of values taken on by their principal parameters. For example, we may order schedules according to their migration levels as defined by the values of the four level parameters in eq. (1), i.e., a_1, a_2, a_3, and c (or by their associated *GMR*s). Alternatively, we may distinguish schedules with a retirement peak from those without one, or we may refer to schedules with relatively low or high values for the rate of ascent of the labor force curve λ_2 or the mean age $\bar{n}$. In many applications, it is also meaningful to characterize migration schedules in terms of several of the fundamental measures illustrated in Figure 4, such as the low point x_l, the high peak x_h, and the retirement peak x_r. Associated with the first pair of points is the labor force shift X, which is defined to be the difference in years between the ages of the high peak and the low point, i.e., $X = x_h - x_l$. The increase in the migration rate of individuals aged x_h over those aged x_l will be called the jump B.

TABLE 1 Parameters and variables defining observed model migration schedules: outmigration from the 8

Parameters and variables[a]	Region: 1. Stockholm Male	1. Stockholm Female	2. East Middle Male	2. East Middle Female	3. South Middle Male	3. South Middle Female	4. South Male	4. South Female
GMR[b]	1.45	1.43	1.44	1.48	1.33	1.41	0.87	0.84
a_1	0.033	0.041	0.035	0.039	0.032	0.033	0.025	0.021
α_1	0.097	0.091	0.088	0.108	0.096	0.106	0.117	0.104
a_2	0.059	0.067	0.079	0.096	0.091	0.112	0.066	0.067
μ_2	20.80	19.32	20.27	18.52	19.92	18.49	21.17	19.88
α_2	0.077	0.094	0.090	0.109	0.104	0.127	0.115	0.129
λ_2	0.374	0.369	0.406	0.491	0.404	0.560	0.269	0.442
a_3	0.000	0.000						
μ_3	76.55	85.01						
α_3	0.776	0.369						
λ_3	0.145	0.072						
c	0.003	0.003	0.003	0.004	0.003	0.004	0.002	0.002
$\bar{n}$	31.02	29.54	29.17	28.38	28.29	27.96	28.26	28.14
%(0–14)	25.61	25.95	22.81	22.59	21.40	20.67	22.76	21.93
%(15–64)	64.49	65.10	70.38	69.48	72.47	71.73	70.73	70.76
%(65+)	9.90	8.94	6.81	7.94	6.13	7.60	6.51	7.31
δ_{1c}	13.56	13.06	12.14	9.79	12.26	8.90	13.27	9.93
δ_{12}	0.716	0.604	0.446	0.403	0.350	0.293	0.377	0.312
δ_{32}	0.003	0.003						
β_{12}	1.26	0.977	0.981	0.993	0.921	0.883	1.02	0.809
σ_2	4.86	3.94	4.52	4.49	3.88	4.40	2.34	3.43
σ_3	0.187	0.196						
x_l	16.39	14.81	15.92	14.80	15.41	15.07	14.52	15.61
x_h	24.68	22.70	23.78	21.46	23.12	21.06	24.16	22.58
x_r	64.80	61.47						
X	8.29	7.89	7.86	6.66	7.71	5.99	9.64	6.97
A	27.87	25.49	29.99	27.32	29.93	27.27	29.90	27.87
B	0.029	0.030	0.040	0.022	0.044	0.059	0.026	0.032

[a] All parameters and variables are briefly defined in Appendix B and discussed more comprehensively in the
[b] The *GMR*, its percentage distribution across the three major age categories (i.e., 0–14, 15–64, 65+), and

The close correspondence between the migration rates of children and those of their parents suggests another important shift in observed migration schedules. If, for each point x on the post-high-peak part of the migration curve, we obtain by interpolation the age (where it exists), $x - A_x$ say, with the identical rate of migration on the pre-low-point part of the migration curve, then the average of the values of A_x, calculated incrementally for the number of years between zero and the low point x_l, will be defined as the observed parental shift A.

An observed (or a graduated) age-specific migration schedule may be described in a number of useful ways. For example, references may be made to the heights at particular ages, to locations of important peaks or troughs, to slopes along the schedule's age profile, to ratios between particular heights or slopes, to areas under parts of the curve, and to both horizontal and vertical distances between important heights and locations. The various descriptive measures characterizing an age-specific model migration schedule may be conveniently grouped into the following categories and subcategories:

Swedish regions, 1974 observed data by single years of age.

5. West		6. North Middle		7. Lower North		8. Upper North	
Male	Female	Male	Female	Male	Female	Male	Female
0.80	0.82	1.22	1.33	1.33	1.46	1.03	1.24
0.021	0.022	0.031	0.027	0.034	0.031	0.024	0.023
0.090	0.106	0.104	0.102	0.123	0.119	0.135	0.128
0.046	0.055	0.084	0.116	0.109	0.141	0.079	0.116
20.36	19.36	19.75	18.18	19.62	17.93	19.47	17.62
0.091	0.114	0.103	0.139	0.118	0.148	0.114	0.143
0.416	0.442	0.437	0.561	0.427	0.701	0.449	0.711
0.001	0.002	0.002	0.004	0.003	0.004	0.003	0.004
28.49	28.39	28.09	28.17	28.24	27.93	29.91	28.99
23.54	23.18	21.52	19.40	19.84	18.26	18.29	16.40
70.34	69.03	72.51	72.45	73.61	73.65	73.46	74.56
6.12	7.79	5.97	8.15	6.55	8.09	8.25	9.04
14.42	10.11	13.34	7.27	11.38	7.41	8.29	5.84
0.457	0.395	0.369	0.237	0.310	0.219	0.305	0.198
0.979	0.926	1.00	0.730	1.04	0.801	1.19	0.890
4.55	3.87	4.23	4.03	3.63	4.74	3.95	4.95
16.11	15.23	15.56	14.71	15.19	15.07	15.21	14.77
23.80	22.30	22.93	20.60	22.56	20.12	22.47	19.85
7.69	7.07	7.37	5.89	7.37	5.05	7.26	5.08
29.57	27.42	29.92	27.01	30.15	26.94	31.61	28.30
0.023	0.027	0.042	0.059	0.053	0.077	0.040	0.063

following text.
the mean age $\bar{n}$ are all calculated with a model schedule spanning an age range of 95 years.

1. Basic measures (the 11 fundamental parameters and their ratios)
   heights: a_1, a_2, a_3, c
   locations: μ_2, μ_3
   slopes: $\alpha_1, \alpha_2, \lambda_2, \alpha_3, \lambda_3$
   ratios: $\delta_{1c} = a_1/c$, $\delta_{12} = a_1/a_2$, $\delta_{32} = a_3/a_2$, $\beta_{12} = \alpha_1/\alpha_2$, $\sigma_2 = \lambda_2/\alpha_2$, $\sigma_3 = \lambda_3/\alpha_3$

2. Derived measures (properties of the model schedule)
   areas: GMR, %(0–14), %(15–64), %(65+)
   locations: $\bar{n}, x_l, x_h, x_r$
   distances: X, A, B

A convenient approach for characterizing an observed model migration schedule (i.e., an empirical schedule graduated by eq. (1)) is to begin with the central labor force curve

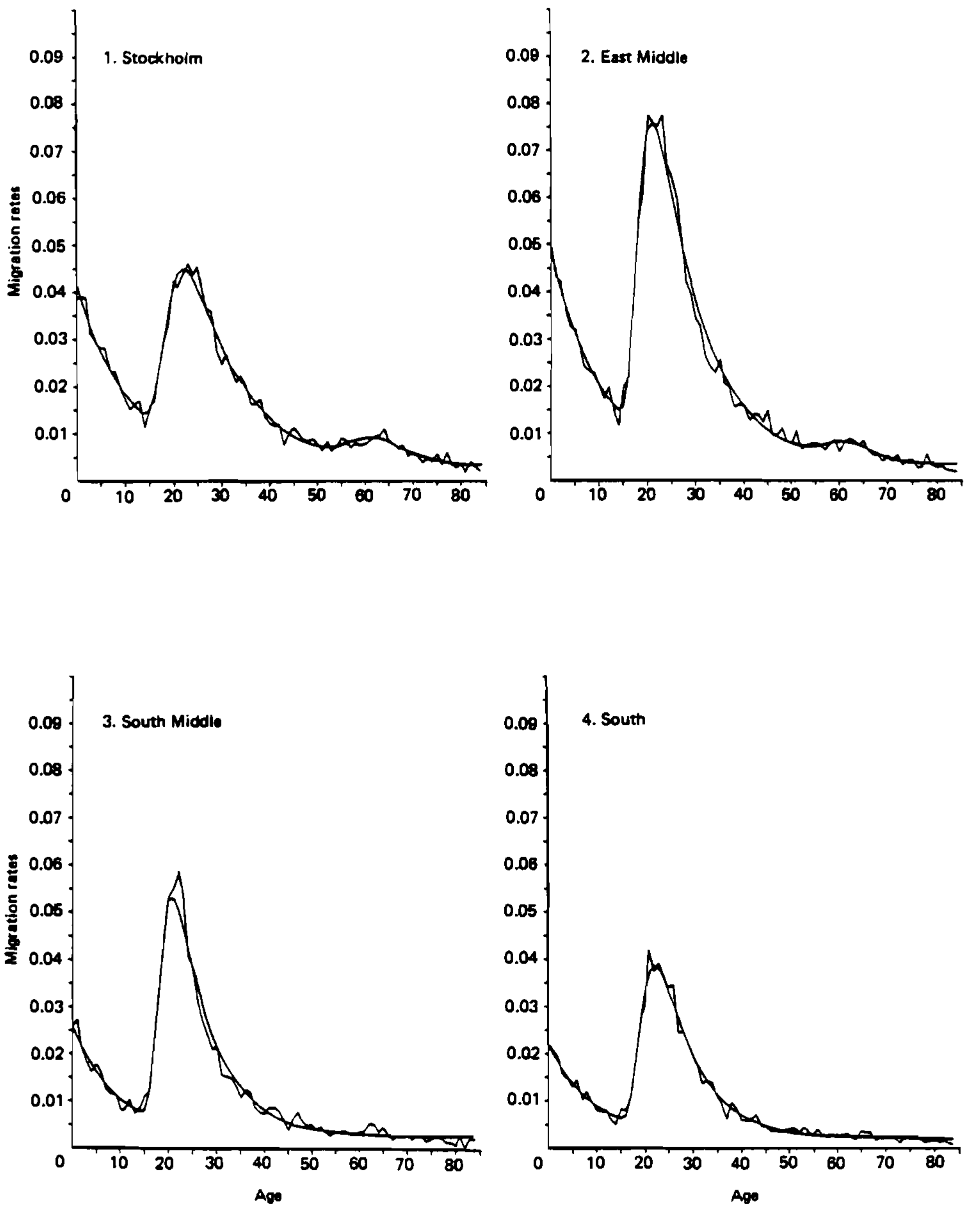


FIGURE 5 *continued on facing page.*

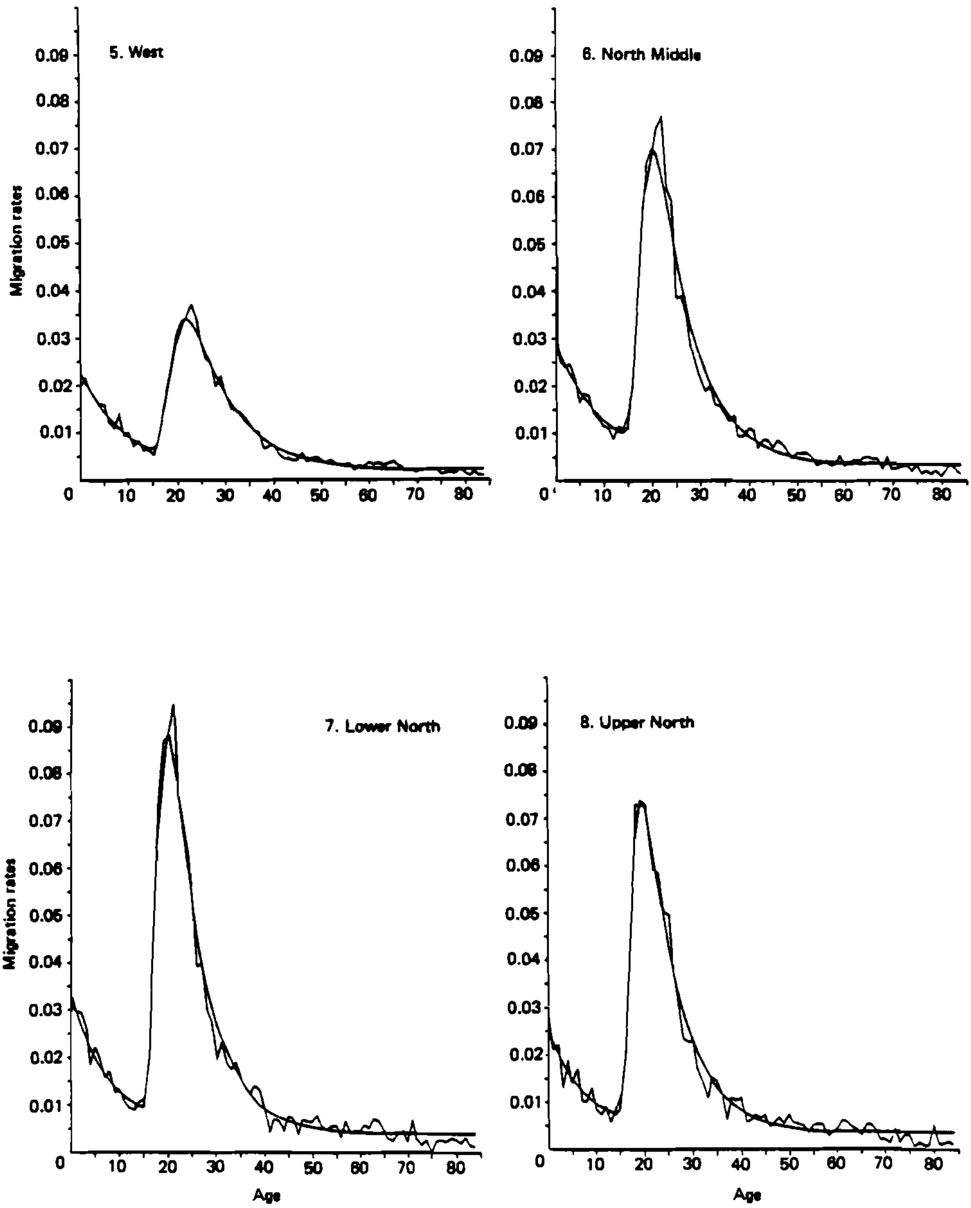


FIGURE 5 Observed (jagged line) and model (smooth line) migration schedules: females, Swedish regions, 1974.

and then to "add on" the pre-labor force, post-labor force, and constant components. This approach is represented graphically in Figure 6.

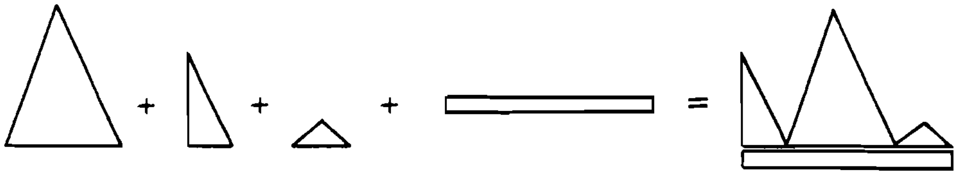


FIGURE 6 A schematic diagram of the fundamental components of the full model migration schedule.

One can imagine describing a decomposition of the model migration schedule along the vertical and horizontal dimensions; e.g., allocating a fraction of its level to the constant component and then dividing the remainder among the other three (or two) components. The ratio $\delta_{1c} = a_1/c$ measures the former allocation, and $\delta_{12} = a_1/a_2$ and $\delta_{32} = a_3/a_2$ reflect the latter division.

The heights of the labor force and pre-labor force components are reflected in the parameters a_2 and a_1, respectively, therefore the ratio a_2/a_1 indicates the degree of "labor dominance", and its reciprocal, $\delta_{12} = a_1/a_2$, the index of child dependency, measures the pace at which children migrate with their parents. Thus the lower the value of δ_{12}, the lower the degree of child dependency exhibited by a migration schedule and, correspondingly, the greater its labor dominance. This suggests a dichotomous classification of migration schedules into *child dependent* and *labor dominant* categories.

An analogous argument applies to the post-labor force curve, and $\delta_{32} = a_3/a_2$ suggests itself as the appropriate index. It will be sufficient for our purposes, however, to rely simply on the value taken on by the parameter α_3, with positive values pointing out the presence of a retirement peak and a zero value indicating its absence.

Labor dominance reflects the relative migration levels of those in the working ages relative to those of children and pensioners. *Labor asymmetry* refers to the shape of the left-skewed unimodal curve describing the age profile of labor force migration. Imagine that a perpendicular line, connecting the high peak with the base of the bell-shaped curve (i.e., the jump B), divides the base into two segments g and h as in Figure 7. Clearly, the ratio h/g is an indicator of the degree of asymmetry of the curve. A more convenient index, using only two parameters of the model schedule is the ratio $\sigma_2 = \lambda_2/\alpha_2$, the index of labor asymmetry. Its movement is highly correlated with that of h/g, because of the approximate relation

$$\sigma_2 = \lambda_2/\alpha_2 \propto \frac{B/g}{B/h} = h/g$$

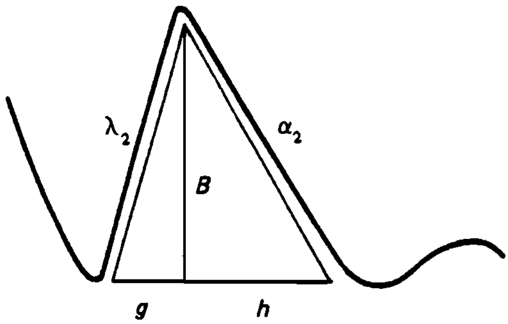


FIGURE 7 A schematic diagram of the curve describing the age profile of labor force migration.

where $\propto$ denotes proportionality. Thus σ_2 may be used to classify migration schedules according to their degree of labor asymmetry.

Again, an analogous argument applies to the post-labor force curve, and $\sigma_3 = \lambda_3/\alpha_3$ may be defined as the index of retirement asymmetry.

When "adding on" a pre-labor force curve of a given *level* to the labor force component, it is also important to indicate something of its *shape*. For example, if the migration rates of children mirror those of their parents, then α_1 should be approximately equal to α_2, and $\beta_{12} = \alpha_1/\alpha_2$, the index of parental-shift regularity, should be close to unity.

The Swedish regional migration patterns described in Figure 5 and in Table 1 may be characterized in terms of the various basic and derived measures defined above. We begin with the observation that the outmigration levels in all of the regions are similar, with *GMR*s ranging from a low of 0.80 for males in Region 5 to a high of 1.48 for females in Region 2. This similarity permits a reasonably accurate visual assessment and characterization of the profiles in Figure 5.

Large differences in *GMR*s, however, give rise to slopes and vertical relationships among schedules that are noncomparable when examined visually. Recourse then must be made to a standardization of the areas under the migration curves, for example, a general rescaling to a *GMR* of unity. Note that this difficulty does not arise in the numerical data in Table 1, because, as we pointed out earlier, the principal slope and location parameters and ratios used to characterize the schedules are not affected by changes in levels. Only heights, areas, and vertical distances, such as the jump, are level-dependent measures.

Among the eight regions examined, only the first two exhibit a definite retirement peak, the male peak being the more dominant one in each case. The index of child dependency δ_{12} is highest in Region 1 and lowest in Region 8, distinguishing the latter region's labor dominant profile from Stockholm's child dependent outmigration pattern. The index of labor asymmetry σ_2 varies from a low of 2.34, in the case of males in Region 4 to a high of 4.95 for the female outmigration profile of Region 8. Finally, with the possible exception of males in Region 1 and females in Region 6, the migration rates of children in Sweden do indeed seem to mirror those of their parents. The index of parental-shift regularity β_{12} is 1.26 in the former case and 0.730 in the latter; for most of the other schedules it is close to unity.

3 A COMPARATIVE ANALYSIS OF OBSERVED MODEL MIGRATION SCHEDULES

Section 2 demonstrated that age-specific rates of migration exhibit a fundamental age profile, which can be expressed in mathematical form as a model migration schedule defined by a total of 11 parameters. In this section we seek to establish the ranges of values typically assumed by each of these parameters and their associated derived variables. This exercise is made possible by the availability of a relatively large data base collected by the Comparative Migration and Settlement Study, recently concluded at IIASA (Rogers 1976a, 1976b, 1978, Rogers and Willekens 1978, Willekens and Rogers 1978). The migration data for each of the 17 countries included in this study are set out in individual case studies, which are listed at the end of this report.

3.1 Data Preparation, Parameter Estimation, and Summary Statistics

The age-specific migration rates that were used to demonstrate the fits of the model migration schedule in the last section were single-year rates. Such data are scarce at the regional level and, in our comparative analysis, are available only for Sweden. All other region-specific migration data are reported for five-year age groups only and, therefore, must be interpolated to provide the necessary input data by single years of age. In all such instances the region-specific migration schedules were first scaled to a *GMR* of unity (*GMR* = 1) before being subjected to a cubic-spline interpolation (McNeil et al. 1977).

Starting with a migration schedule with a *GMR* of unity and rates by single years of age, the nonlinear parameter estimation algorithm ultimately yields a set of estimates for the model schedule's parameters (see Appendix A for details). Table 1 in section 2 presented the results that were obtained using the data for Sweden. Since these data were available for single years of age, the influence of the interpolation procedure could be

TABLE 2 Parameters defining observed model migration schedules and parameters obtained after a cubic-

Parameters	Region and width of age group 1. Stockholm 1 yr	5 yr	2. East Middle 1 yr	5 yr	3. South Middle 1 yr	5 yr	4. South 1 yr	5 yr
a_1	0.029	0.028	0.026	0.026	0.023	0.023	0.025	0.025
α_1	0.091	0.089	0.108	0.106	0.106	0.105	0.104	0.106
a_2	0.047	0.049	0.065	0.070	0.080	0.087	0.080	0.085
μ_2	19.32	19.69	18.52	18.99	18.49	18.93	19.88	20.23
α_2	0.094	0.098	0.109	0.117	0.127	0.136	0.129	0.135
λ_2	0.369	0.313	0.491	0.351	0.560	0.375	0.442	0.367
c	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003
a_3	0.000	0.000						
μ_3	85.01	81.20						
α_3	0.369	0.364						
λ_3	0.072	0.080						

[a]Observed data are for single years of age (1 yr); the cubic-spline-interpolated inputs are obtained from observed

assessed. Table 2 contrasts the estimates for female schedules in Table 1 with those obtained when the same data are first aggregated to five-year age groups and then disaggregated to single years of age by a cubic-spline interpolation. A comparison of the parameter estimates indicates that the interpolation procedure gives generally satisfactory results.

Table 2 refers to results for rates of migration from each of eight regions to the rest of Sweden. If these rates are disaggregated by region of destination, then $8^2 = 64$ interregional schedules need to be examined for each sex, which will complicate comparisons with other nations. To resolve this difficulty we shall associate a "typical" schedule with each collection of national rates by calculating the mean of each parameter and derived variable. Table 3 illustrates the results for the Swedish data.

To avoid the influence of unrepresentative "outlier" observations in the computation of averages defining a typical national schedule, it was decided to delete approximately 10 percent of the "extreme" schedules. Specifically, the parameters and derived variables were ordered from low value to high value; the lowest 5 percent and the highest 5 percent were defined to be extreme values. Schedules with the largest number of low and high extreme values were discarded, in sequence, until only about 90 percent of the original number of schedules remained. This reduced set then served as the population of schedules for the calculation of various summary statistics. Table 4 illustrates the average parameter values obtained with the Swedish data. Since the median, mode, standard deviation-to-mean ratio, and lower and upper bounds are also of interest, they are included as part of the more detailed computer outputs reproduced in Appendix B.

The comparison, in Table 2, of estimates obtained using one-year and five-year age intervals for the same Swedish data indicated that the interpolation procedure gave satisfactory results. It also suggested, however, that the parameter λ_2 was consistently underestimated with five-year data. To confirm this, the results of Table 4 were replicated with the Swedish data base, using an aggregation with five-year age intervals. The results, set out in Table 5, show once again that λ_2 is always underestimated by the interpolation procedure. This tendency should be noted and kept in mind.

spline interpolation: Sweden, 8 regions, females, 1974.[a]

5. West		6. North Middle		7. Lower North		8. Upper North	
1 yr	5 yr	1 yr	5 yr	1 yr	5 yr	1 yr	5 yr
0.027	0.025	0.021	0.022	0.021	0.021	0.019	0.021
0.106	0.095	0.102	0.115	0.119	0.130	0.128	0.160
0.067	0.069	0.087	0.097	0.096	0.118	0.094	0.106
19.36	19.72	18.18	18.57	17.93	19.11	17.62	18.00
0.114	0.121	0.139	0.145	0.148	0.172	0.143	0.150
0.442	0.395	0.561	0.345	0.701	0.305	0.711	0.330
0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

data by five-year age groups (5 yr).

TABLE 3 Mean values of parameters defining the full set of observed model migration schedules: Sweden, 8 regions, 1974 observed data by single years of age until 84 years and over.[a]

	Males		Females	
Parameters	Without retirement peak (52 schedules)	With retirement peak (11 schedules)	Without retirement peak (58 schedules)	With retirement peak (5 schedules)
a_1	0.029	0.025	0.027	0.023
α_1	0.126	0.080	0.114	0.087
a_2	0.066	0.050	0.078	0.051
μ_2	21.09	21.52	19.13	19.20
α_2	0.113	0.096	0.133	0.101
λ_2	0.459	0.439	0.525	0.377
c	0.003	0.002	0.003	0.003
a_3		0.0012		0.0017
μ_3		75.45		72.07
α_3		0.797		0.688
λ_3		0.294		0.192

[a]Region 1 (Stockholm) is a single-commune region; hence there exists no intraregional schedule for it, leaving $8^2 - 1 = 63$ schedules.

TABLE 4 Mean values of parameters defining the reduced set of observed model migration schedules: Sweden, 8 regions, 1974 observed data by single years of age until 84 years and over.[a]

	Males		Females	
Parameters	Without retirement peak (48 schedules)	With retirement peak (9 schedules)	Without retirement peak (54 schedules)	With retirement peak (3 schedules)
a_1	0.029	0.026	0.026	0.024
α_1	0.124	0.085	0.108	0.093
a_2	0.067	0.051	0.076	0.055
μ_2	20.50	21.25	19.09	18.87
α_2	0.104	0.093	0.127	0.106
λ_2	0.448	0.416	0.537	0.424
c	0.003	0.002	0.003	0.003
a_3		0.0006		0.0001
μ_3		76.71		74.78
α_3		0.847		0.938
λ_3		0.158		0.170

[a]Region 1 (Stockholm) is a single-commune region; hence there exists no intraregional schedule for it, leaving $8^2 - 1 = 63$ schedules, of which 6 were deleted.

It is also important to note the erratic behavior of the retirement peak, apparently due to its extreme sensitivity to the loss of information arising out of the aggregation. Thus, although we shall continue to present results relating to the post-labor force ages, they will not be a part of our search for families of schedules.

TABLE 5 Mean values of parameters defining the reduced set of observed model migration schedules: Sweden, 8 regions, 1974 observed data by five years of age until 80 years and over.[a]

	Males		Females	
Parameters	Without retirement peak (49 schedules)	With retirement peak (8 schedules)	Without retirement peak (54 schedules)	With retirement peak (3 schedules)
a_1	0.028	0.026	0.026	0.026
α_1	0.115	0.088	0.108	0.077
a_2	0.068	0.052	0.080	0.044
μ_2	20.61	20.26	19.52	19.18
α_2	0.105	0.084	0.133	0.089
λ_2	0.396	0.390	0.374	0.341
c	0.002	0.001	0.002	0.002
a_3		0.0017		0.0036
μ_3		77.47		77.72
α_3		0.603		0.375
λ_3		0.148		0.134

[a]Region 1 (Stockholm) is a single-commune region; hence there exists no intraregional schedule for it, leaving $8^2 - 1 = 63$ schedules, of which 6 were deleted.

3.2 National Contrasts

Tables 4 and 5 of the preceding subsection summarized average parameter values for 57 male and 57 female Swedish model migration schedules. In this subsection we shall expand our analysis to include a much larger data base, adding to the 114 Swedish model schedules another 164 schedules from the United Kingdom (Table 6), 114 from Japan, 20 from the Netherlands (Table 7), 58 from the Soviet Union, 8 from the United States, and 32 from Hungary (Table 8). Summary statistics for these 510 schedules are set out in

TABLE 6 Mean values of parameters defining the reduced set of observed model migration schedules: the United Kingdom, 10 regions, 1970.[a]

	Males		Females	
Parameters	Without retirement peak (59 schedules)	With retirement peak (23 schedules)	Without retirement peak (61 schedules)	With retirement peak (21 schedules)
a_1	0.021	0.016	0.021	0.018
α_1	0.099	0.080	0.097	0.089
a_2	0.059	0.053	0.063	0.048
μ_2	22.00	20.42	21.35	21.56
α_2	0.127	0.120	0.151	0.153
λ_2	0.259	0.301	0.327	0.333
c	0.003	0.004	0.003	0.004
a_3		0.007		0.002
μ_3		71.11		71.84
α_3		0.692		0.583
λ_3		0.309		0.403

[a]No intraregional migration data were included in the United Kingdom data; hence $10^2 - 10 = 90$ schedules were analyzed, of which 8 were deleted.

TABLE 7 Mean values of parameters defining the reduced set of observed model migration schedules: Japan, 8 regions, 1970; the Netherlands, 12 regions, 1974.[a]

	Japan		Netherlands	
	Males	Females	Males	Females
Parameters	Without retirement peak (57 schedules)	Without retirement peak (57 schedules)	With retirement slope (10 schedules)	With retirement slope (10 schedules)
a_1	0.014	0.021	0.013	0.012
α_1	0.095	0.117	0.080	0.098
a_2	0.075	0.085	0.063	0.084
μ_2	17.63	21.32	20.86	20.10
α_2	0.102	0.152	0.130	0.174
λ_2	0.480	0.350	0.287	0.307
c	0.002	0.004	0.003	0.004
a_3			0.00001	0.00004
α_3			0.077	0.071

[a]Region 1 in Japan (Hokkaido) is a single-prefecture region; hence there exists no intraregional schedule for it, leaving $8^2 - 1 = 63$ schedules, of which 6 were deleted. The only migration schedules available for the Netherlands were the migration rates out of each region without regard to destination; hence only 12 schedules were used, of which 2 were deleted.

TABLE 8 Mean values of parameters defining the reduced set of observed total (males plus females) model migration schedules: the Soviet Union, 8 regions, 1974; the United States, 4 regions, 1970–1971; Hungary, 6 regions, 1974.[a]

	Soviet Union	United States	Hungary	
Parameters	Without retirement peak (58 schedules)	With retirement peak (8 schedules)	Without retirement slope (7 schedules)	With retirement slope (25 schedules)
a_1	0.005	0.021	0.010	0.015
α_1	0.302	0.075	0.245	0.193
a_2	0.126	0.060	0.090	0.099
μ_2	19.14	20.14	17.22	18.74
α_2	0.176	0.118	0.130	0.159
λ_2	0.310	0.569	0.415	0.274
c	0.004	0.002	0.004	0.003
a_3		0.002		0.00032
μ_3		81.80		
α_3		0.430		0.033
λ_3		0.119		

[a]Intraregional migration was included in the Soviet Union and Hungarian data but not in the United States data; hence there were $8^2 = 64$ schedules for the Soviet Union, of which 6 were deleted, $6^2 = 36$ schedules for Hungary, of which 4 were deleted, and $4^2 - 4 = 12$ schedules for the United States, of which 2 were deleted because they lacked a retirement peak and another 2 were deleted because of their extreme values.

Appendix B; 206 are male schedules, 206 are female schedules, and 98 are for the combination of both sexes (males plus females).*

*This total does not include the 56 schedules excluded as "extreme" schedules. During the process of fitting the model schedule to these more than 500 interregional migration schedules, a frequently encountered problem was the occurrence of a negative value for the constant c. In all such instances

A significant number of schedules exhibited a pattern of migration in the post-labor force ages that differed from that of the 11-parameter model migration schedule defined in eq. (1). Instead of a retirement peak, the age profile took on the form of an "upward slope". In such instances the following 9-parameter modification of the basic model migration was introduced

$$\left.\begin{aligned} M(x) = {} & a_1 \exp(-\alpha_1 x) \\ & + a_2 \exp\{-\alpha_2(x-\mu_2) - \exp[-\lambda_2(x-\mu_2)]\} \\ & + a_3 \exp(\alpha_3 x) \\ & + c \end{aligned}\right\} \quad x = 0,1,2,\ldots,z \qquad (3)$$

The right-hand side of Table 7, for example, sets out the mean parameter estimates of this modified form of the model migration schedule for the Netherlands.

Tables 4 through 8 present a wealth of information about national patterns of migration by age. The parameters, given in columns, define a wide range of model migration schedules. Four refer only to migration level: a_1, a_2, a_3, and c. Their values are for a *GMR* of unity; to obtain corresponding values for other levels of migration, these four numbers need to be multiplied by the desired level of *GMR*. For example, the observed *GMR* for female migration out of the Stockholm region in 1974 was 1.43. Multiplying $a_1 = 0.029$ by 1.43 gives 0.041, the appropriate value of a_1 with which to generate the migration schedule having a *GMR* of 1.43.

The remaining model schedule parameters refer to migration age profile: α_1, μ_2, α_2, λ_2, μ_3, α_3, and λ_3. Their values remain constant for all levels of the *GMR*. Taken together, they define the age profile of migration from one region to another. Schedules without a retirement peak yield only the four profile parameters: α_1, μ_2, α_2, and λ_2, and schedules with a retirement slope have an additional profile parameter α_3.

A detailed analysis of the parameters defining the various classes of schedules is beyond the scope of this report. Nevertheless a few basic contrasts among national average age profiles may be usefully highlighted.

Let us begin with an examination of the labor force component defined by the four parameters a_2, μ_2, α_2, and λ_2. The national average values for these parameters generally lie within the following ranges:

$$0.05 < a_2 < 0.10$$

$$17 < \mu_2 < 22$$

$$0.10 < \alpha_2 < 0.20$$

$$0.25 < \lambda_2 < 0.60$$

---

the initial value of c was set equal to the lowest observed migration rate and the nonlinear estimation procedure was started once again.

In all but two instances, the female values for a_2, α_2, and λ_2 are larger than those for males. The reverse is the case for μ_2, with two exceptions, the most important of which is exhibited by Japan's females, who consistently show a high peak that is older than that of males. This apparently is a consequence of the tradition in Japan that girls leave the family home at a later age than boys.

The two parameters defining the pre-labor force component, a_1 and α_1, generally lie within the ranges of 0.01 to 0.03 and 0.08 to 0.12, respectively. The exceptions are the Soviet Union and Hungary, which exhibit unusually high values for α_1. Unlike the case of the labor force component, consistent sex differentials are difficult to identify.

Average national migration age profiles, like most aggregations, hide more than they reveal. Some insight into the ranges of variations that are averaged out may be found by consulting the lower and upper bounds and standard-deviation-to-mean ratios listed in Appendix B for each set of national schedules. Additional details are set out in Appendix C. Finally, Table 9 illustrates how parameters vary in several *unaveraged* national schedules, by way of example. The model schedules presented there describe migration flows out of and into the capital regions of each of six countries: Helsinki, Finland; Budapest, Hungary; Tokyo, Japan; Amsterdam, the Netherlands; Stockholm, Sweden; and London, the United Kingdom. All are illustrated in Figure 8.

The most apparent difference between the age profiles of the outflow and inflow migration schedules of the six national capitals is the dominance of young labor force migrants in the inflow, that is, proportionately more migrants in the young labor force ages appear in the inflow schedules. The larger values of the product $a_2\lambda_2$ in the inflow schedules and of the ratio $\delta_{12} = a_1/a_2$ in the outflow schedules indicate this labor dominance.

A second profile attribute is the degree of asymmetry in the labor force component of the migration schedule, i.e., the ratio of the rate of ascent λ_2 to the rate of descent α_2 defined as σ_2 in section 2. In all but the Japanese case, the labor force curves of the capital-region outmigration profiles are more asymmetric than those of the corresponding inmigration profiles. We refer to this characteristic as labor asymmetry.

Examining the observed rates of descent of the labor and pre-labor force curves, α_2 and α_1, respectively, we find, for example, that they are close to being equal in the outflow

TABLE 9 Parameters defining observed total (males plus females) model migration schedules for flows 1974; the United Kingdom, 1970.

	Finland		Hungary		Japan	
Parameters	From Helsinki	To Helsinki	From Budapest	To Budapest	From Tokyo	To Tokyo
a_1	0.037	0.024	0.015	0.008	0.019	0.008
α_1	0.127	0.170	0.239	0.262	0.157	0.149
a_2	0.081	0.130	0.082	0.094	0.064	0.096
μ_2	21.42	22.13	17.10	17.69	20.70	15.74
α_2	0.124	0.198	0.130	0.152	0.111	0.134
λ_2	0.231	0.231	0.355	0.305	0.204	0.577
c	0.000	0.003	0.003	0.003	0.003	0.002
a_3	0.00027		0.00001	0.00005	0.00002	0.00131
μ_3	99.32					
α_3	0.204		0.072	0.059	0.061	0.000
λ_3	0.042					

schedules of Helsinki and Stockholm and are highly unequal in the cases of Budapest, Tokyo, and Amsterdam. In four of the six capital-region inflow profiles $\alpha_2 > \alpha_1$. Profiles with significantly different values for α_2 and α_1 are said to be irregular.

In conclusion, the empirical migration data of six industrialized nations suggest the following hypothesis. *The age profile of a typical capital-region inmigration schedule is, in general, more labor dominant and more labor symmetric than the age profile of the corresponding capital-region outmigration schedule.* No comparable hypothesis can be made regarding its anticipated degree of irregularity.

3.3 Families of Schedules

Three sets of model migration schedules have been defined in this report: the 11-parameter schedule with a retirement peak, the alternative 9-parameter schedule with a retirement slope, and the simple 7-parameter schedule with neither a peak nor a slope. Thus we have at least three broad families of schedules.

Additional dimensions for classifying schedules into families are suggested by the above comparative analysis of national migration age profiles and the basic measures and derived variables defined in section 2. These dimensions reflect different locations on the horizontal and vertical axes of the schedule, as well as different ratios of slopes and heights.

Of the 524 model migration schedules studied in this section, 412 are sex-specific and, of these, only 336 exhibit neither a retirement peak nor a retirement slope. Because the parameter estimates describing the age profile of post-labor force migration behave erratically, we shall restrict our search for families of schedules to these 164 male and 172 female model schedules, summary statistics for which are set out in Tables 10 and 11.

An examination of the parametric values exhibited by the 336 migration schedules summarized in Tables 10 and 11 suggests that a large fraction of the variation shown by these schedules is a consequence of changes in the values of the following four parameters and derived variables: μ_2, δ_{12}, σ_2, and β_{12}.

from and to capital cities: Finland, 1974; Hungary, 1974; Japan, 1970; the Netherlands, 1974; Sweden,

Netherlands		Sweden		United Kingdom	
From Amsterdam	To Amsterdam	From Stockholm	To Stockholm	From London	To London
0.015	0.012	0.028	0.018	0.015	0.014
0.085	0.108	0.098	0.102	0.090	0.072
0.050	0.093	0.046	0.093	0.048	0.067
21.62	19.66	20.48	19.20	19.65	18.81
0.141	0.150	0.095	0.134	0.111	0.123
0.284	0.288	0.322	0.323	0.327	0.320
0.002	0.003	0.003	0.002	0.005	0.004
0.00229	0.00002	0.00004	0.00003	0.00003	
		80.32	73.19	81.13	
0.012	0.066	0.616	1.359	0.676	
		0.105	0.255	0.112	

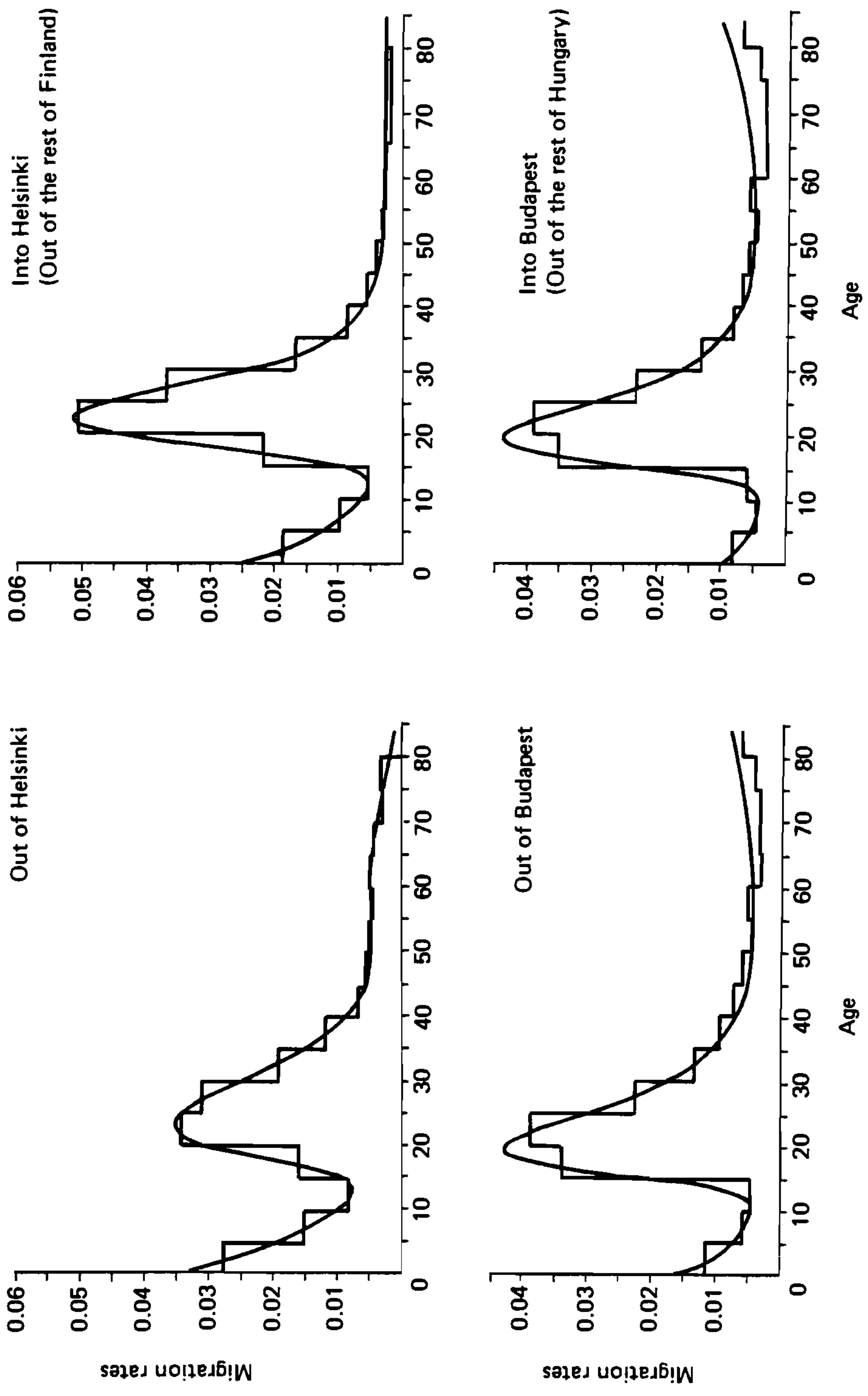


FIGURE 8 *continued on facing page.*

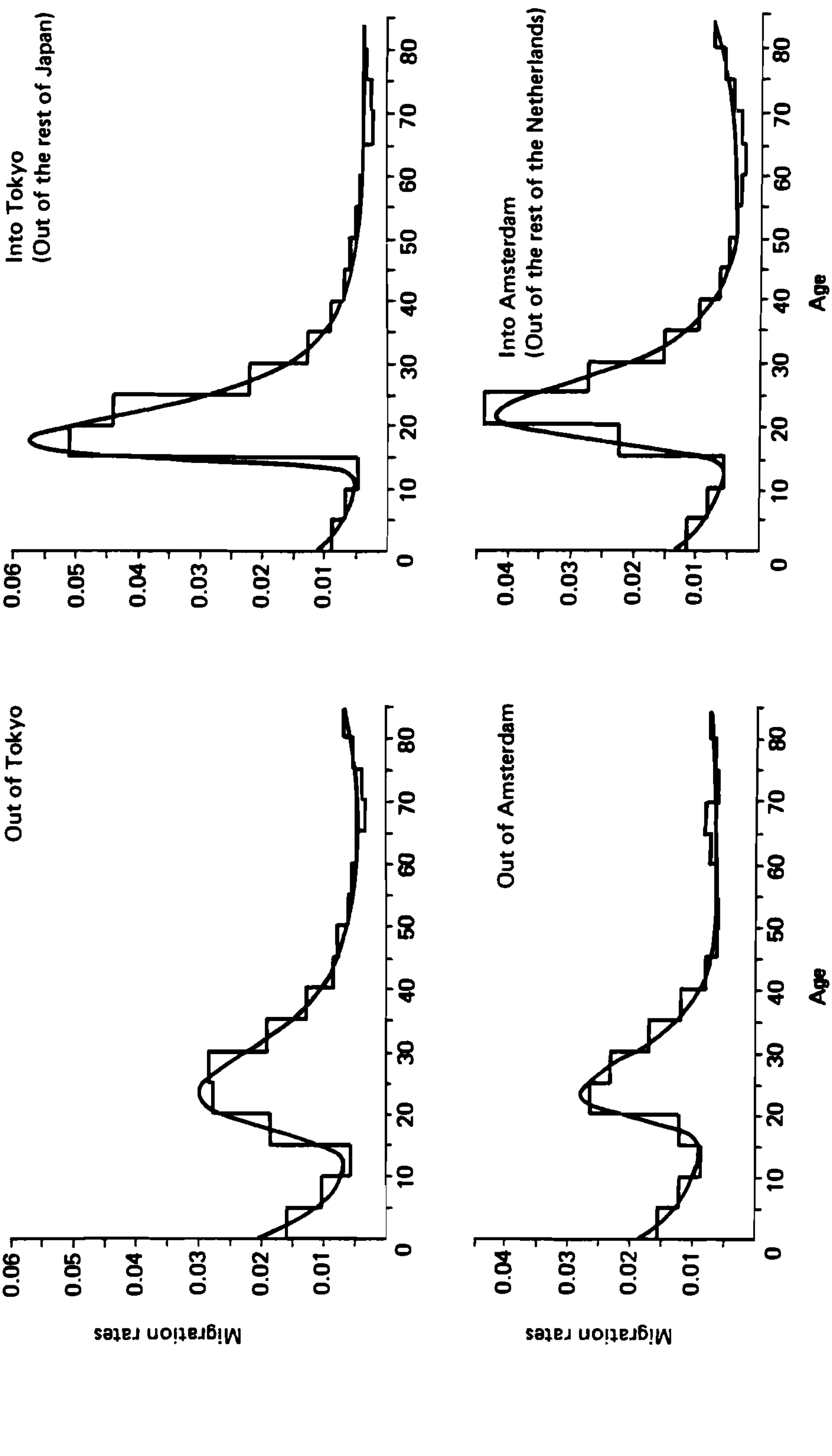


FIGURE 8 *continued overleaf.*

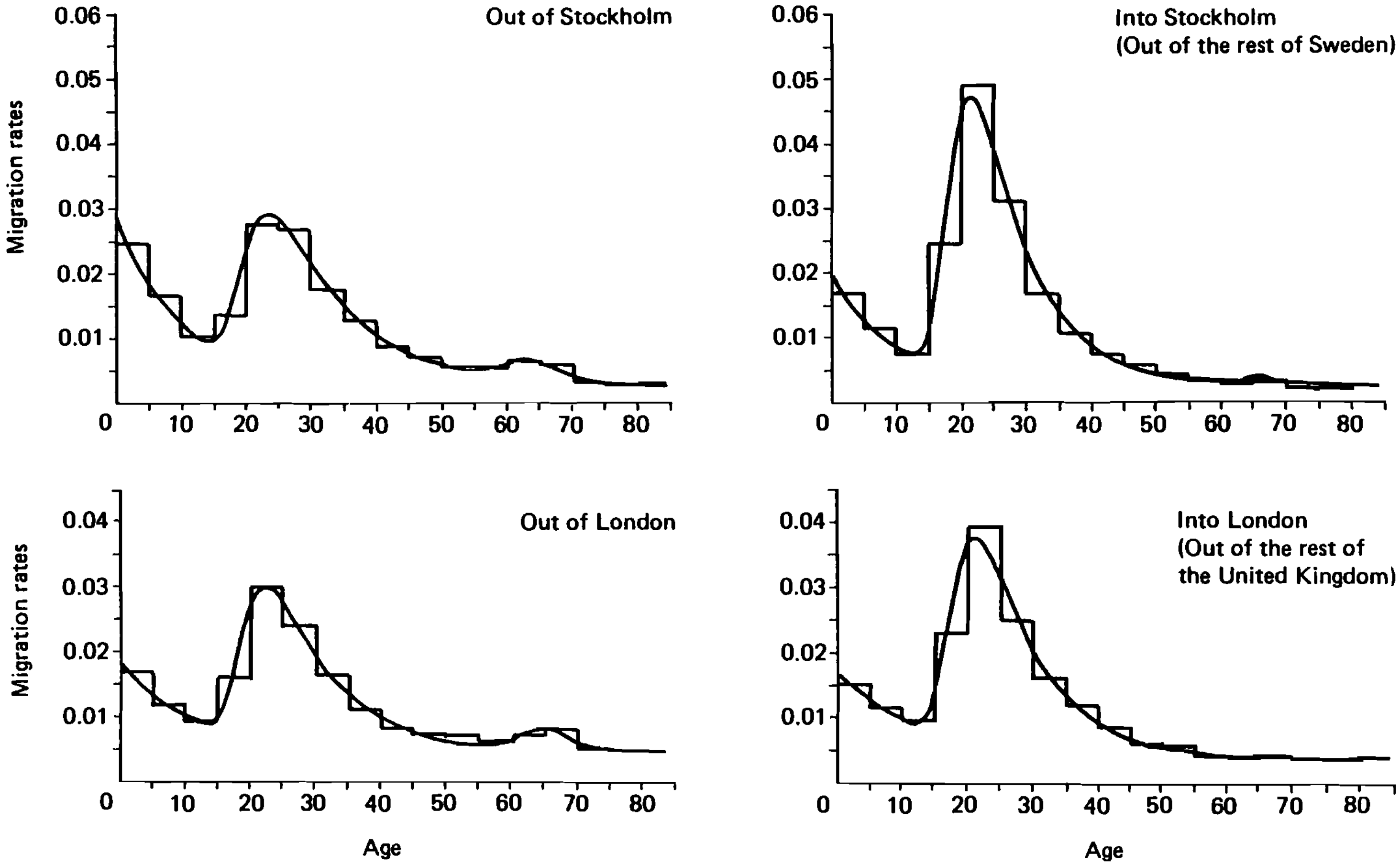


FIGURE 8 Migration age profiles of outflows from and inflows to capital cities: Helsinki, Budapest, Tokyo, Amsterdam, Stockholm, and London.

TABLE 10 Estimated summary statistics of parameters and variables associated with reduced sets of observed model migration schedules for Sweden, the United Kingdom, and Japan: males, 164 schedules.[a]

Parameters and variables	Summary statistics						
	Lowest value	Highest value	Mean value	Median	Mode	Standard deviation	Standard deviation/ mean
GMR (observed)	0.00539	1.81309	0.22642	0.13176	0.09578	0.27380	1.20928
GMR (model)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
E	4.75751	62.98674	16.22228	13.10527	13.49189	9.95789	0.61384
a_1	0.00173	0.04891	0.02084	0.01992	0.01824	0.00879	0.42204
α_1	0.00009	0.40526	0.10491	0.10390	0.10138	0.05358	0.51077
a_2	0.01559	0.22707	0.06716	0.06471	0.06846	0.02578	0.38391
μ_2	14.68744	43.96579	20.04227	19.67385	19.07919	3.95015	0.19709
α_2	0.03471	0.29735	0.11164	0.10618	0.10037	0.04389	0.39316
λ_2	0.06951	1.76712	0.39110	0.37244	0.31650	0.21146	0.54068
c	0.00003	0.00704	0.00266	0.00263	0.00248	0.00130	0.48947
$\bar{n}$	24.71596	40.53283	30.71751	30.41339	30.25187	2.72144	0.08860
%(0–14)	4.92484	29.69068	18.93871	19.02262	18.54605	4.91304	0.25942
%(15–64)	60.27293	86.29065	72.08085	71.29800	66.77736	5.10213	0.07078
%(65+)	1.35294	17.31658	8.98045	8.71650	8.53658	3.49047	0.38867
δ_{1c}	0.37762	712.88135	14.36314	6.79034	36.00280	56.75620	3.95152
δ_{12}	0.02274	1.53679	0.35774	0.33571	0.24985	0.20221	0.56523
β_{12}	0.00092	7.47530	1.11318	1.02442	1.12208	0.81866	0.73542
σ_2	0.30349	24.23831	4.27564	3.42123	3.89371	3.26113	0.76272
x_l	6.91004	18.26030	13.72508	13.34019	12.01766	2.14485	0.15627
x_h	17.11028	28.14053	22.50278	22.95041	23.17692	2.14731	0.09542
X	2.90007	16.93039	8.77770	8.38019	7.81068	2.28557	0.26038
A	22.33532	102.41312	32.97422	31.54365	34.34699	7.58660	0.23008
B	0.01107	0.07343	0.02994	0.02775	0.02666	0.01036	0.34609

[a] A list of definitions for the parameters and variables appears in Appendix B.

TABLE 11 Estimated summary statistics of parameters and variables associated with reduced sets of observed model migration schedules for Sweden, the United Kingdom, and Japan: females, 172 schedules.[a]

Parameters and variables	Summary statistics: Lowest value	Highest value	Mean value	Median	Mode	Standard deviation	Standard deviation/ mean
GMR (observed)	0.00388	1.59564	0.19909	0.11590	0.08347	0.24085	1.20973
GMR (model)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
E	4.17964	60.83579	15.42092	12.26192	7.01245	9.85544	0.63910
a_1	0.00526	0.04496	0.02259	0.02209	0.01916	0.00851	0.37664
α_1	0.01585	0.41038	0.10698	0.10883	0.11448	0.05091	0.47587
a_2	0.02207	0.18944	0.07426	0.06935	0.06391	0.02693	0.36263
μ_2	15.06610	37.76019	20.63237	19.88280	18.47021	3.50346	0.16980
α_2	0.05467	0.33556	0.14355	0.13434	0.12489	0.04993	0.34784
λ_2	0.08367	1.49869	0.40032	0.37870	0.29592	0.19248	0.48081
c	0.00012	0.00685	0.00347	0.00350	0.00315	0.00139	0.39940
$\bar{n}$	24.51402	37.86541	30.65265	30.53835	29.18701	2.69720	0.08799
%(0–14)	9.37675	31.87480	20.93872	20.68939	19.50087	4.26504	0.20369
%(15–64)	60.55278	81.17286	68.65491	68.07751	67.76981	4.34828	0.06334
%(65+)	1.46164	19.56255	10.40638	10.32867	9.60705	3.40400	0.32711
δ_{1c}	0.89359	192.60318	9.39987	5.95881	10.47907	16.22411	1.72602
δ_{12}	0.02828	0.90435	0.34847	0.32367	0.33490	0.17420	0.49989
β_{12}	0.09121	2.48385	0.81472	0.84944	0.92863	0.37720	0.46298
σ_2	0.38917	12.23371	3.26434	2.89784	2.16585	2.12718	0.65164
x_l	10.32012	21.79038	14.51330	14.75022	14.33471	1.95309	0.13457
x_h	17.03028	30.92059	22.49959	22.46040	21.89189	2.14262	0.09523
X	2.89007	15.09035	7.98629	7.61017	7.16017	2.11207	0.26446
A	23.73040	37.24700	28.50972	28.17807	27.10955	2.47098	0.08667
B	0.00831	0.09111	0.03118	0.02970	0.02901	0.01149	0.36845

[a]A list of definitions for the parameters and variables appears in Appendix B.

Migration schedules may be early or late peaking, depending on the location of μ_2 on the horizontal (age) axis. Although this parameter generally takes on a value close to 20, roughly three out of four observations fall within the range 17–25. We shall call those below age 19 early peaking schedules and those above 22 late peaking schedules.

The ratio of the two basic vertical parameters, a_1 and a_2, is a measure of the relative importance of the migration of children in a model migration schedule. The index of child dependency, $\delta_{12} = a_1/a_2$, tends to exhibit a mean value of about one-third with 80 percent of the values falling between one-fifth and four-fifths. Schedules with an index of one-fifth or less will be said to be labor dominant; those above two-fifths will be called child dependent.

Migration schedules with labor force components that take the form of a relatively symmetrical bell shape will be said to be *labor symmetrical.* These schedules will tend to exhibit an index of labor asymmetry ($\sigma_2 = \lambda_2/\alpha_2$) that is less than 2. Labor asymmetric schedules, on the other hand, will usually assume values for σ_2 of 5 or more. The average migration schedule will tend to show a σ_2 value of about 4, with approximately five out of six schedules exhibiting a σ_2 within the range 1–8.

Finally, the index of parental-shift regularity in many schedules is close to unity, with approximately 70 percent of the values lying between one-third and four-thirds. Values of $\beta_{12} = \alpha_1/\alpha_2$ that are lower than four-fifths or higher than six-fifths will be called irregular.

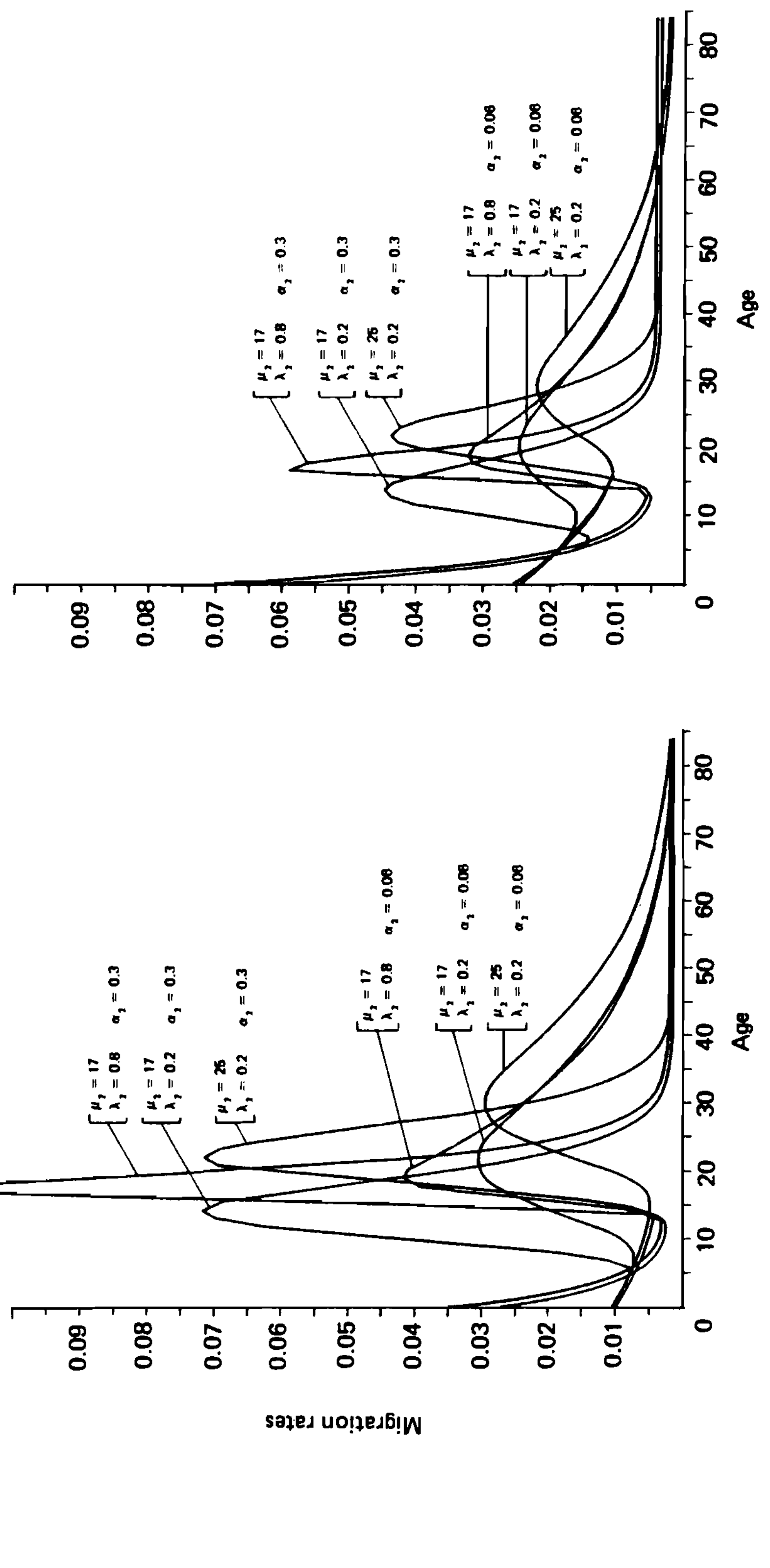
We may imagine a 3 X 4 cross-classification of migration schedules that defines a dozen "average families" (Table 12). Introducing a low and a high value for each parameter gives rise to 16 additional families for each of the three classes of schedules. Thus we may conceive of a minimum set of 60 families, equally divided among schedules with a retirement peak, schedules with a retirement slope, and schedules with neither a retirement peak nor a retirement slope (a reduced form).

TABLE 12 A cross-classification of migration schedules.

	Measures (average values)			
Schedule	Peaking ($\mu_2 = 20$)	Dominance ($\delta_{12} = 1/3$)	Asymmetry ($\sigma_2 = 4$)	Regularity ($\beta_{12} = 1$)
Retirement peak	+	+	+	+
Retirement slope	+	+	+	+
Reduced form	+	+	+	+

To complement the above discussion with a few visual illustrations, in Figure 9(a) we present six labor dominant profiles, with δ_{1c} fixed at 22. The tallest three exhibit a steep rate of descent $\alpha_2 = 0.3$; the shortest three show a much more moderate slope of $\alpha_2 = 0.06$. Within each family of three curves, one finds variations in μ_2 and in the rate of ascent λ_2. Increasing μ_2 shifts the curve to the right along the horizontal axis; increasing λ_2 raises the relative height of the high peak.

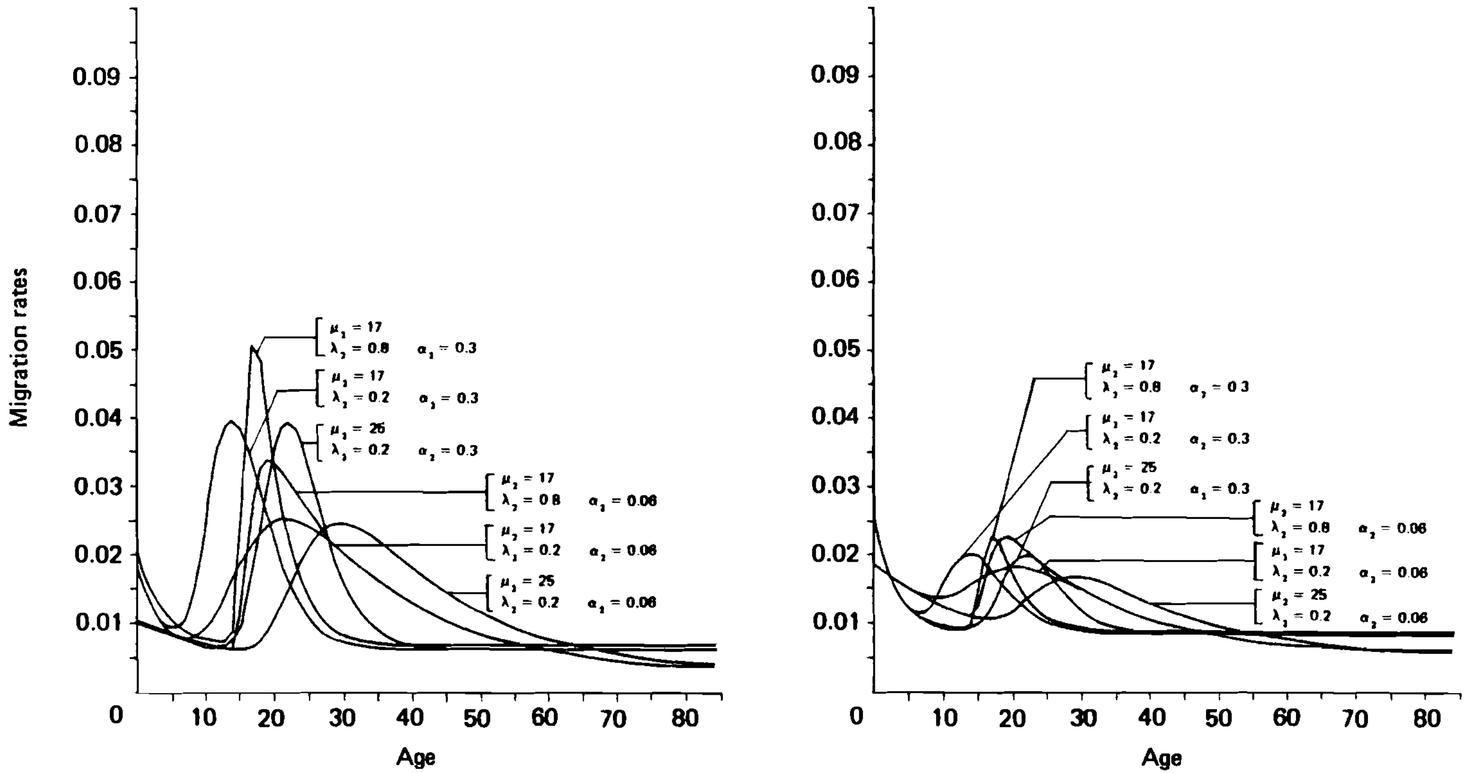
The six schedules in Figure 9(b) depict the corresponding two families of child dependent profiles. The results are generally similar to those in Figure 9(a), with the



(a) Labor dominant schedule with $\delta_{1c} = 22.0$ and $\delta_{12} = 0.2$

(b) Child dependent schedule with $\delta_{1c} = 22.0$ and $\delta_{12} = 0.8$

FIGURE 9 *continued on facing page.*



(c) Labor dominant schedule with $\delta_{1c} = 2.6$ and $\delta_{12} = 0.2$

(d) Child dependent schedule with $\delta_{1c} = 2.6$ and $\delta_{12} = 0.8$

FIGURE 9 Hypothetical model migration schedules with unit *GMR*s, $\beta_{12} = 1$, and different parameter combinations.

exception that the relative importance of migration in the pre-labor force age groups is increased considerably. The principal effects of the change in δ_{12} are: (1) a raising of the intercept $a_1 + c$ along the vertical axis, and (2) a simultaneous reduction in the height of the labor force component in order to maintain a constant area of unity under each curve.

Finally, the dozen schedules in Figures 9(c) and 9(d) describe similar families of migration curves, but in these profiles the relative contribution of the constant component to the unit *GMR* has been increased significantly (i.e., $\delta_{1c} = 2.6$). It is important to note that such "pure" measures of profiles as x_l, x_h, X, and A remain unaffected by this change, whereas "impure" profile measures, such as the mean age of migration $\bar{n}$, now take on a different set of values.

3.4 Sensitivity Analysis

The preceding subsections have focused on a comparison of the fundamental parameters defining the model migration age profiles of a number of nations. The comparison yielded ranges of values within which each parameter may be expected to fall and suggested a classification of schedules into families. We now turn to an analytic examination of how changes in several of the more important parameters become manifested in the age profile of the model schedule. For analytical convenience we begin by focusing on the properties of the double exponential curve that describes the labor force component:

$$f_2(x) = a_2 \exp\{-\alpha_2(x - \mu_2) - \exp[-\lambda_2(x - \mu_2)]\} \tag{4}$$

We begin by observing that if α_2 is set equal to λ_2 in the above expression, then the labor force component assumes the shape of a well-known extreme value distribution used in the study of flood flows (Gumbel 1941, Kimball 1946). In such a case $x_h = \mu_2$ and the function $f_2(x)$ achieves its maximum y_h at that point. To analyze the more general case where $\alpha_2 \neq \lambda_2$, we may derive analytical expressions for both of these variables by differentiating eq. (4) with respect to x, setting the result equal to zero, and then solving to find

$$x_h = \mu_2 - (1/\lambda_2) \ln (\alpha_2/\lambda_2) \tag{5}$$

an expression that does not involve a_2, and

$$y_h = a_2(\alpha_2/\lambda_2)^{\alpha_2/\lambda_2} \exp(-\alpha_2/\lambda_2) \tag{6}$$

an expression that does not involve μ_2.

Note that if $\lambda_2 > \alpha_2$, which is almost always the case, then $x_h > \mu_2$. And observe that if $\alpha_2 = \lambda_2$, then the above two equations simplify to

$$x_h = \mu_2$$

and

$$y_h = a_2/e$$

Since μ_2 affects x_h only as a displacement, we may focus on the variation of x_h as a function of α_2 and λ_2. A plot of x_h against α_2, for a fixed λ_2, shows that increases in α_2 lead to decreases in x_h. Analogously, increases in λ_2, for a fixed α_2, produce increases in x_h but at a rate that decreases rapidly as the latter variable approaches its asymptote.

The behavior of y_h is independent of μ_2 and varies proportionately with a_2. Hence its variation also depends fundamentally only on the two variables α_2 and λ_2. A plot of y_h against α_2, for a fixed λ_2, gives rise to a U-shaped curve that reaches its minimum at $\alpha_2 = \lambda_2$. Increasing λ_2 widens the shape of the U.

The influence of α_2 and λ_2 on the labor force component may be assessed by examining the proportional rate of change of the function $f_2(x)$:

$$\frac{f_2'(x)}{f_2(x)} = -\alpha_2 + \lambda_2 \exp[-\lambda_2(x - \mu_2)] \tag{7}$$

Equation (7) defines this rate of change as the sum of two components: $-\alpha_2$ and the exponential $\lambda_2 \exp[-\lambda_2(x - \mu_2)]$. To demonstrate how the actual rates of ascent and descent are related to λ_2 and α_2 we may take, for example, a typical set of parameter values such as $\alpha_2 = 0.1$, $\lambda_2 = 0.4$, and $\mu_2 = 20$ and then proceed to calculate the quantities presented in Table 13. The calculations indicate that, at ages above 30, the actual rate of descent is almost identical to $-\alpha_2$. The actual rates of ascent are very different from the λ_2 value, except for ages close to $x = \mu_2$.*

TABLE 13 Impacts of λ_2 and α_2 on the actual rates of ascent and descent of the labor force component: $\lambda_2 = 0.4$, $\alpha_2 = 0.1$, and $\mu_2 = 20$.

		Actual rates of ascent and descent	
Range of age	Age (x)	$g(x) = \lambda_2 \exp[-\lambda_2(x - \mu_2)]$	$-\alpha_2 + g(x)$
In this range the impact of α_2 can be ignored	0	1192	1192
	5	161	161
	10	22	22
	15	3	3
	16	1.98	1.88
	17	1.33	1.23
	18	0.89	0.79
	19	0.60	0.50
$x = \mu_2$ →	20	0.40	0.30
	21	0.27	0.17
	22	0.18	0.08
	23	0.12	0.02
x_{max} →	24	0.08	−0.02
	25	0.05	−0.05
In this range the impact of λ_2 can be ignored	30	0.007	−0.093
	35	0.001	−0.100

*We are grateful to Kao-Lee Liaw for suggesting the examination of eq. (7) and for pointing out that the parameters λ_2 and α_2 are not truly rates of ascent and descent, respectively.

The introduction of the pre-labor force component into the profile generally moves x_h to a slightly younger age and raises y_h by about $a_1 \exp(-\alpha_1 x_h)$, usually a negligible quantity. The addition of the constant term c, of course, affects only y_h, raising it by the amount of the constant. Thus the migration rate at age x_h may be expressed as

$$M(x_h) \approx a_1 \exp(-\alpha_1 x_h) + y_h + c$$

A variable that interrelates the pre-labor force and labor force components is the parental shift A. To simplify our analysis of its dependence on the fundamental parameters, it is convenient to assume that α_1 and α_2 are approximately equal. In such instances, for ages immediately following the high peak x_h, the labor force component of the model migration schedule is closely approximated by the function $a_2 \exp[-\alpha_2(x_2 - \mu_2)]$. Recalling that the pre-labor force curve is given by $a_1 \exp(-\alpha_2 x_1)$ when $\alpha_1 = \alpha_2$, we may equate the two functions to solve for the difference in ages that we have called the parental shift:

$$A = x_2 - x_1 = \mu_2 + (1/\alpha_2) \ln(1/\delta_{12}) \tag{8}$$

This equation shows that the parental shift will increase with increasing values of μ_2 and will decrease with increasing values of α_2 and δ_{12}. Table 14 compares the values of this analytically defined "theoretical" parental shift with the corresponding observed parental shifts presented earlier in Table 1 for Swedish males and females. The two definitions appear to produce similar numerical values, but the analytical definition has the advantage of being simpler to calculate and analyze.

Consider the rural-to-urban migration age profile defined by the parameters in Table 15. In this profile the values of α_2 and λ_2 are almost equal, making it a suitable illustration of several points raised in the above discussion.

First, calculating x_h with eq. (5) gives

$$x_h = 21.10 - (1/0.270) \ln(0.237/0.270) = 21.58$$

as against $x_h = 21.59$ set out in Table 15. Deriving y_h using eq. (6) gives

$$y_h = 0.187(0.878)^{0.878} \exp(-0.878) = 0.069$$

where $\alpha_2/\lambda_2 = 0.237/0.270 = 0.878$. Thus $M(21.59)$ is approximately equal to $y_h + c = 0.069 + 0.004 = 0.073$. The value given by the model migration schedule equation is also 0.073.

Since $\alpha_1 \neq \alpha_2$, we cannot adequately test the accuracy of eq. (8) as an estimator of A. Nevertheless, it can be used to help account for the unusually large value of the parental shift. Substituting the values for μ_2, α_2, and δ_{12} into eq. (8), we find

$$A = 21.10 + (1/0.237) \ln(1/0.011)$$

$$= 21.10 + 4.51/0.237 = 40.13$$

And although this is an underestimate of 45.13, it does suggest that the principal cause for the unusually high value of A is the unusually low value of δ_{12}. If this latter parameter

TABLE 14 Observed and theoretical values of the parental shift: Sweden, 8 regions, 1974.

Parental shift	Regions of Sweden							
	1. Stockholm	2. East Middle	3. South Middle	4. South	5. West	6. North Middle	7. Lower North	8. Upper North
Observed,[a] males	27.87	29.99	29.93	29.90	29.57	29.92	30.15	31.61
Theoretical, males	25.14	29.24	30.01	29.65	28.97	29.43	26.61	29.89
Observed,[a] females	25.49	27.32	27.27	27.87	27.42	27.01	26.94	28.30
Theoretical, females	24.68	26.85	28.16	28.91	27.51	28.54	28.19	28.95

[a]Source: Table 1.

TABLE 15 Parameters and variables defining observed total (males plus females) model migration schedules for urban-to-rural and rural-to-urban flows: the Soviet Union, 1974.

Parameters and variables[a]	Urban-to-rural	Rural-to-urban
GMR	0.74	3.41
a_1	0.005	0.002
α_1	0.313	0.431
a_2	0.127	0.187
μ_2	19.26	21.10
α_2	0.177	0.237
λ_2	0.286	0.270
c	0.005	0.004
$\bar{n}$	33.66	31.24
%(0–14)	8.63	5.59
%(15–64)	78.30	84.60
%(65+)	13.07	9.81
δ_{1c}	0.977	0.548
δ_{12}	0.038	0.011
β_{12}	1.77	1.82
σ_2	1.61	1.14
x_l	11.09	11.38
x_h	20.94	21.59
X	9.85	10.21
A	42.30	45.13
B	0.045	0.063

[a]A list of definitions for the parameters and variables appears in Appendix B.

had the value found for Stockholm's males, for example, the parental shift would exhibit the much lower value of 22.52.

4 ESTIMATED MODEL MIGRATION SCHEDULES

An estimated model schedule is a collection of age-specific rates derived from patterns observed in various populations other than the one being studied plus some incomplete data on the population under examination. The justification for such an approach is that age profiles of fertility, mortality, and geographical mobility vary within predetermined limits for most human populations. Birth, death, and migration rates for one age group are highly correlated with the corresponding rates for other age groups, and expressions of such interrelationships form the basis of model schedule construction. The use of these regularities to develop hypothetical schedules that are deemed to be close approximations of the unobserved schedules of populations lacking accurate vital and mobility registration statistics has been a rapidly growing area of contemporary demographic research.

4.1 Introduction: Alternative Perspectives

The earliest efforts in the development of model schedules were based on only one parameter and hence had very little flexibility (United Nations 1955). Demographers soon discovered that variations in the mortality and fertility regimes of different populations required more complex formulations. In mortality studies greater flexibility was introduced by providing families of schedules (Coale and Demeny 1966) or by enlarging the number of parameters used to describe the age pattern (Brass 1975). The latter strategy was also adopted in the creation of improved model fertility schedules and was augmented by the use of analytical descriptions of age profiles (Coale and Trussell 1974).

Since the age patterns of migration normally exhibit a greater degree of variability across regions than do mortality and fertility schedules, it is to be expected that the development of an adequate set of model migration schedules will require a greater number both of families and of parameters. Although many alternative methods could be devised to summarize regularities in the form of families of model schedules defined by several parameters, three have received the widest popularity and dissemination:

1. The regression approach of the Coale–Demeny model life tables (Coale and Demeny 1966)
2. The logit system of Brass (Brass 1971)
3. The double exponential graduation of Coale, McNeil, and Trussell (Coale 1977, Coale and McNeil 1972, Coale and Trussell 1974)

The regression approach embodies a *correlational* perspective that associates rates at different ages to an index of level, where the particular associations may differ from one "family" of schedules to another. For example, in the Coale–Demeny model life tables, the index of level is the expectation of remaining life at age 10, and a different set of regression equations is established for each of four "regions" of the world. Each of the four regions (North, South, East, and West) defines a collection of similar mortality schedules that are more uniform in pattern than the totality of observed life tables.

Brass's logit system reflects a *relational* perspective in which rates at different ages are given by a standard schedule whose shape and level may be suitably modified to be appropriate for a particular population.

The Coale–Trussell model fertility schedules are relational in perspective (using a Swedish standard first-marriage schedule), but they also introduce an analytic description of the age profile by adopting a double exponential curve that defines the shape of the age-specific first-marriage function.

In this study we mix the above three approaches to define two alternative perspectives for estimating model migration schedules in situations where only inadequate or defective data on internal (origin–destination) migration flows are available. Both perspectives rely on the analytic (double plus single exponential) graduation defined by the basic model migration schedule set out earlier in this study. Both ultimately depend on the availability of some limited data to obtain the appropriate model schedule, for example, at least two age-specific rates, such as $M(0-4)$ and $M(20-24)$, and informed guesses regarding the values of a few key variables, such as the low and high points of the schedule. They differ only in the method by which a schedule is identified as being appropriate for a particular population.

The first perspective, the regression approach, associates variations in the parameters and derived variables of the model schedule to each other and then to age-specific migration rates. The second, the logit approach, embodies different relationships between the model schedule parameters in several standard schedules and then associates the logits of the migration rates in a standard to those of the population in question.

4.2 The Correlational Perspective: The Regression Migration System

A straightforward way of obtaining an estimated model migration schedule from limited observed data is to associate such data with the basic model schedule's parameters by means of regression equations. For example, given estimates of the migration rates of infants and young adults, $M(0-4)$ and $M(20-24)$ say, we may use equations of the form

$$Q_i = b_0 [M(0-4)]^{b_1} [M(20-24)]^{b_2}$$

to estimate the set of parameters Q_i that define the model schedule. The parameters of the fitted model schedules are not independent of each other, however. Higher than average values of λ_2, for example, tend to be associated with lower than average values of a_1. The incorporation of such dependencies into the regression approach would surely improve the accuracy and consistency of the estimation procedure. An examination of empirical associations among model schedule parameters and variables, therefore, is a necessary first step.

Regularities in the covariations of the model schedule's parameters suggest a strategy of model schedule construction that builds on regression equations embodying these covariations. Given the values for δ_{12}, x_l, and x_h, for example, one can proceed to derive μ_2, λ_2, σ_2, and β_{12}. Since $\sigma_2 = \lambda_2/\alpha_2$ we obtain, at the same time, an estimate for α_2, which we then can use to find a_2. With a_2 established, a_1 may be obtained by drawing on the definitional equation $\delta_{12} = a_1/a_2$, and α_1 may be found with the similar equation $\beta_{12} = \alpha_1/\alpha_2$. An initial value for c is obtained by setting $c = a_1/\delta_{1c}$, where δ_{1c} is estimated by regressing it on δ_{12}, and a_1, a_2, and c are scaled to give a *GMR* of unity.

Conceptually, this approach to model schedule construction begins with the labor force component and then appends to it the pre-labor force part of the curve. The value given for δ_{12} reflects the relative weights of these two components, with low values defining a labor dominant curve and high values pointing to a family dominant curve. (The behavior of the post-labor force curve is assumed here to be treated exogenously.)

We begin the calculations with μ_2 to establish the location of the curve on the age axis; is it an early or late peaking curve? Next, we turn to the determination of its two slope parameters λ_2 and α_2 by resolving whether or not it is a labor symmetric curve. Values of σ_2 between 1 and 2 generally characterize a labor symmetric curve; higher values describe an asymmetric age profile. The regression of a_2 on α_2 produces the fourth parameter needed to define the labor force component. With values for μ_2, λ_2, α_2, and a_2 the construction procedure turns to the estimation of the pre-labor force curve, which is defined by the two parameters α_1 and a_1. Its relative share of the total unit area under the model migration schedule is set by the value given to δ_{12}. The retirement peak and the upward slope are introduced exogenously by setting their parameters equal to those of the "observed" model migration schedule.

The collection of regression equations given in Table 16 exemplifies a regression system that may be defined to represent the "child dependency" set, inasmuch as their central independent variable δ_{12} is the index of child dependency. It is also possible to replace this independent variable with others, such as σ_2 or β_{12} for example, to create a "labor asymmetry" or a "parental-shift regularity" set. The regression coefficients were obtained using the age-specific interregional migration schedules (scaled to unit *GMR*) of Sweden, the United Kingdom, and Japan. Of the three variants, the child dependency set gave the best fits in about half of the female schedules tested, whereas the parental-shift

TABLE 16 A basic set of regression equations.

Dependent variables		Regression coefficients of independent variables				
		Intercept	δ_{12}	x_l	x_h	α_2
μ_2	(males)	–3.26	3.28	–0.67	1.39	
	(females)	–7.69	–2.14	–0.53	1.63	
λ_2	(males)	1.31	0.15	0.08	–0.09	
	(females)	1.19	0.13	0.08	–0.09	
σ_2	(males)	16.43	5.59	0.89	–1.17	
	(females)	10.97	6.05	0.63	–0.85	
β_{12}	(males)	1.90	1.33	–0.03	–0.04	
	(females)	1.82	1.42	–0.04	–0.04	
a_2	(males)	0.03				0.30
	(females)	0.04				0.25
δ_{1c}	(males)	9.41	13.83			
	(females)	0.19	26.43			

regularity set was overwhelmingly the best fitting variant for the male schedules (see Rogers and Castro 1981).

To use the basic regression equations presented in Table 16, one first needs to obtain estimates of δ_{12}, x_l, and x_h. Values for these three variables may be selected to reflect informed guesses, historical data, or empirical regularities between such model schedule variables and observed migration data. For example, suppose that a fertility survey has produced a crude estimate of the ratio of infant to parent migration rates: $M = M(0\text{–}4)/M(20\text{–}24)$, say. A linear association between δ_{12} and this M ratio, with the regression equation forced through the origin, gives

$${}_F\hat{\delta}_{12} = 0.6M$$

for females, and

$${}_M\hat{\delta}_{12} = 0.7M$$

for males.

Figure 10 illustrates examples of the goodness-of-fit provided by the estimated schedules to the observed model migration data. Two sets of estimated schedules are shown: those obtained with the observed index of child dependency (δ_{12}) and those found with the estimated index ($\hat{\delta}_{12}$), both calculated using the above regressions. In each case x_l and x_h were set equal to the values given by the observed model migration schedules.

4.3 The Relational Perspective: The Logit Migration System

Among the most popular methods for estimating mortality from inadequate or defective data, is the so-called logit system developed by William Brass about twenty years ago

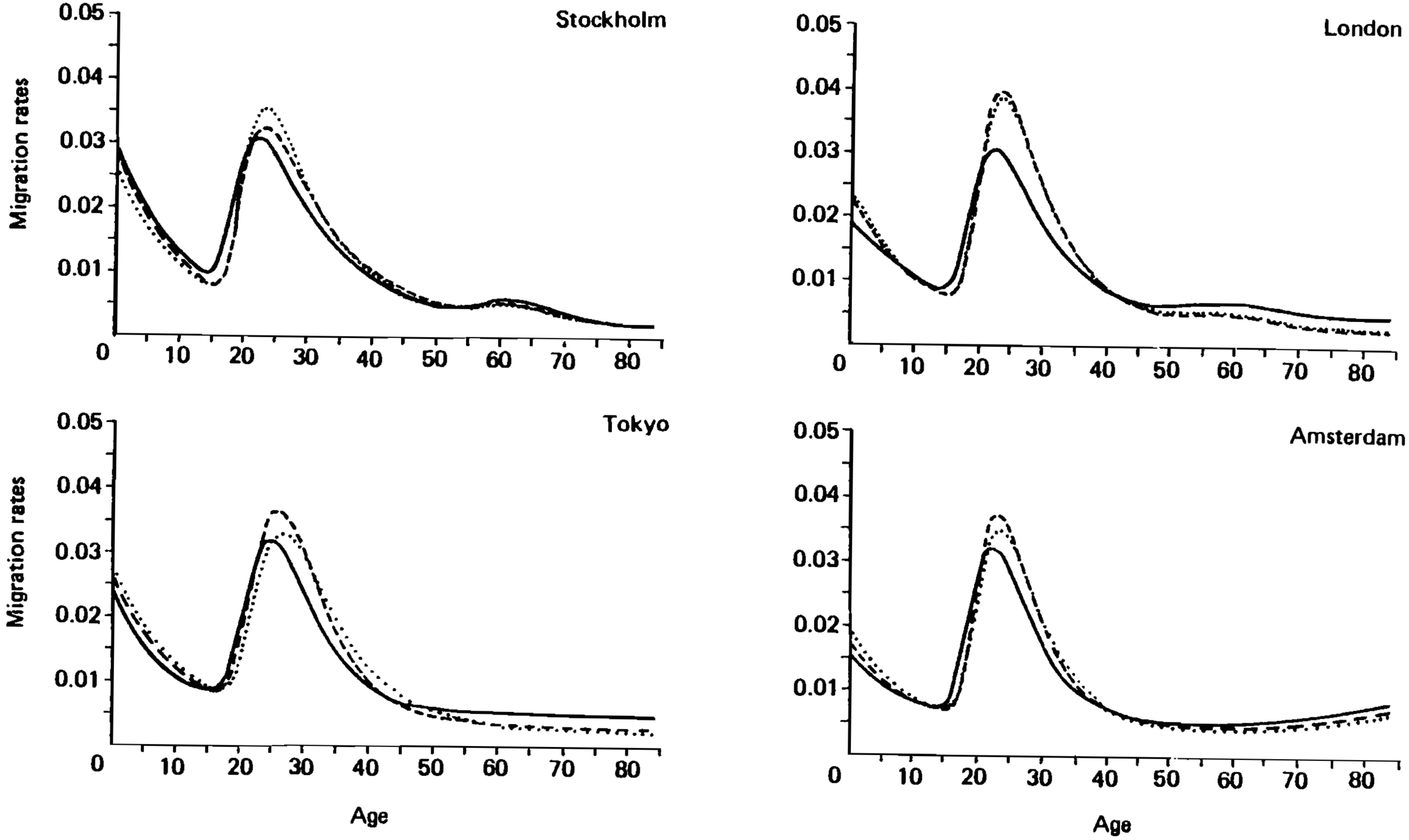


FIGURE 10 The fits of the correlational approach when using δ_{12} from the model migration schedule (– – –) and $\hat{\delta}_{12}$ from the observed M ratio (· · · ·) compared with the observed (———) data for the female populations of Stockholm, London, Tokyo, and Amsterdam.

and now widely applied by demographers all over the world (Brass 1971, Brass and Coale 1968, Carrier and Hobcraft 1971, Hill and Trussell 1977, Zaba 1979). The logit approach to model schedules is founded on the assumption that different mortality schedules can be related to each other by a linear transformation of the logits of their respective survivorship probabilities. That is, given an observed series of survivorship probabilities $l(x)$ for ages $x = 1,2,\ldots,\omega$, it is possible to associate these observed series with a "standard" series $l_s(x)$ by means of the linear relationship

$$\text{logit}\,[1 - l(x)] = \gamma + \rho\,\text{logit}\,[1 - l_s(x)]$$

where, say,

$$\text{logit}\,[y(x)] = (1/2)\ln\,[y(x)/(1 - y(x))] = Y(x) \qquad 0 < y(x) < 1$$

or

$$Y(x) = \gamma + \rho\, Y_s(x)$$

The inverse of this function is

$$l(x) = 1/\{1 + \exp[2Y(x)]\}$$

The principal result of this mathematical transformation of the nonlinear $l(x)$ function is a more nearly linear function in x, with a range of minus and plus infinity rather than unity and zero.

Given a standard schedule, such as the set of standard logits, $Y_s(x)$, proposed by Brass, a life table can be created by selecting appropriate values for γ and ρ. In the Brass system γ reflects the level of mortality and ρ defines the relationship between child and adult mortality. The closer γ is to zero and ρ to unity, the more the estimated life table is like the standard.

The logit perspective can be readily applied to migration schedules. Let ${}_uM(x)$ denote the age-specific migration rates of a schedule scaled to a unit *GMR*, and let ${}_uM_s(x)$ denote the corresponding standard schedule. Taking logits of both sets of rates gives the logit migration system

$${}_uY(x) = \gamma + \rho\; {}_uY_s(x)$$

and

$${}_uM(x) = \frac{1}{1 + \exp\{-2[\gamma + \rho\; {}_uY_s(x)]\}}$$

where, for example,

$$\text{logit}\,[{}_uM_s(x)] = {}_uY_s(x) = (1/2)\ln\,{}_uM_s(x)/[1 - {}_uM_s(x)]$$

The selection of a particular migration schedule as a standard reflects the belief that it is broadly representative of the age pattern of migration in the multiregional population system under consideration. (Our standard schedules will always have a unit *GMR*; hence the left subscript on ${}_{\mathrm{u}}Y_s(x)$ will be dropped.) To illustrate a number of calçulations carried out with several sets of multiregional data, we shall adopt the national age profile as the standard in each case and strive to estimate regional outmigration age profiles by relating them to the national one. Specifically, given an $m \times m$ table of interregional migration flows for any age x, we divide each origin–destination-specific flow $O_{ij}(x)$ by the population in the origin region $K_i(x)$ to define the associated age-specific migration rate $M_{ij}(x)$. Summing these over all origins and destinations gives the corresponding national rate $M..(x)$, and scaling all schedules to unit *GMR* gives ${}_{\mathrm{u}}M_{ij}(x)$ and ${}_{\mathrm{u}}M..(x)$, respectively.

Figure 11 presents national male standards for Sweden, the United Kingdom, Japan, and the Netherlands. (We shall deal only with graduated fits inasmuch as all of our non-Swedish data are for five-year age intervals and therefore need to be graduated first in order to provide single-year profiles by means of interpolation.) The differences in age profiles are marked. Only the Swedish and the United Kingdom standards exhibit a retirement peak. Japan's profile is described without such a peak because the age distribution of migrants given by the census data ends with the open interval of 65 years and over. The data for the Netherlands, on the other hand, show a definite upward slope at the post-labor force ages and therefore have been graduated with the 9-parameter model schedule with an upward slope.

Regressing the logits of the age-specific outmigration rates of each region on those of its national standard (the *GMR*s of both first being scaled to unity) gives estimated values for γ and ρ. Reversing the procedure and combining selected values of γ and ρ with a national standard of logit values, identifies the following important regularity: *whenever* $\gamma = 2(\rho - 1)$ *then the GMR of the estimated model schedule is approximately unity* (Rogers and Castro 1981). Linear regressions of the form

$$\gamma = d_0 + d_1 \rho$$

fitted to our data for Sweden, the United Kingdom, Japan, and the Netherlands, consistently produce estimates for d_0 and d_1 that are approximately equal to 2 in magnitude and that differ only in sign, i.e., $\hat{d}_0 = -2$, and $\hat{d}_1 = +2$. Thus

$$\gamma = -2 + 2\rho = 2(\rho - 1)$$

Differences in the national standard schedules illustrated in Figure 11 suggest that a single standard schedule may be a more restrictive assumption in migration analysis than in mortality studies. It therefore may be necessary to follow the Coale–Demeny strategy of developing families of appropriate schedules (Coale and Demeny 1966).

The comparative analysis of national and interregional migration patterns carried out in section 3 identified at least three distinct families of age profiles. First, there was the 11-parameter *basic model migration schedule* with a retirement peak that adequately described a number of interregional flows, for example, the age profiles of outmigrants leaving capital regions such as Stockholm and London. The elimination of the retirement peak gave rise to the 7-parameter *reduced form* of this basic schedule, a form that was used to describe a large number of labor dominant profiles and the age patterns of migration schedules with a single open-ended age interval for the post-labor force population,

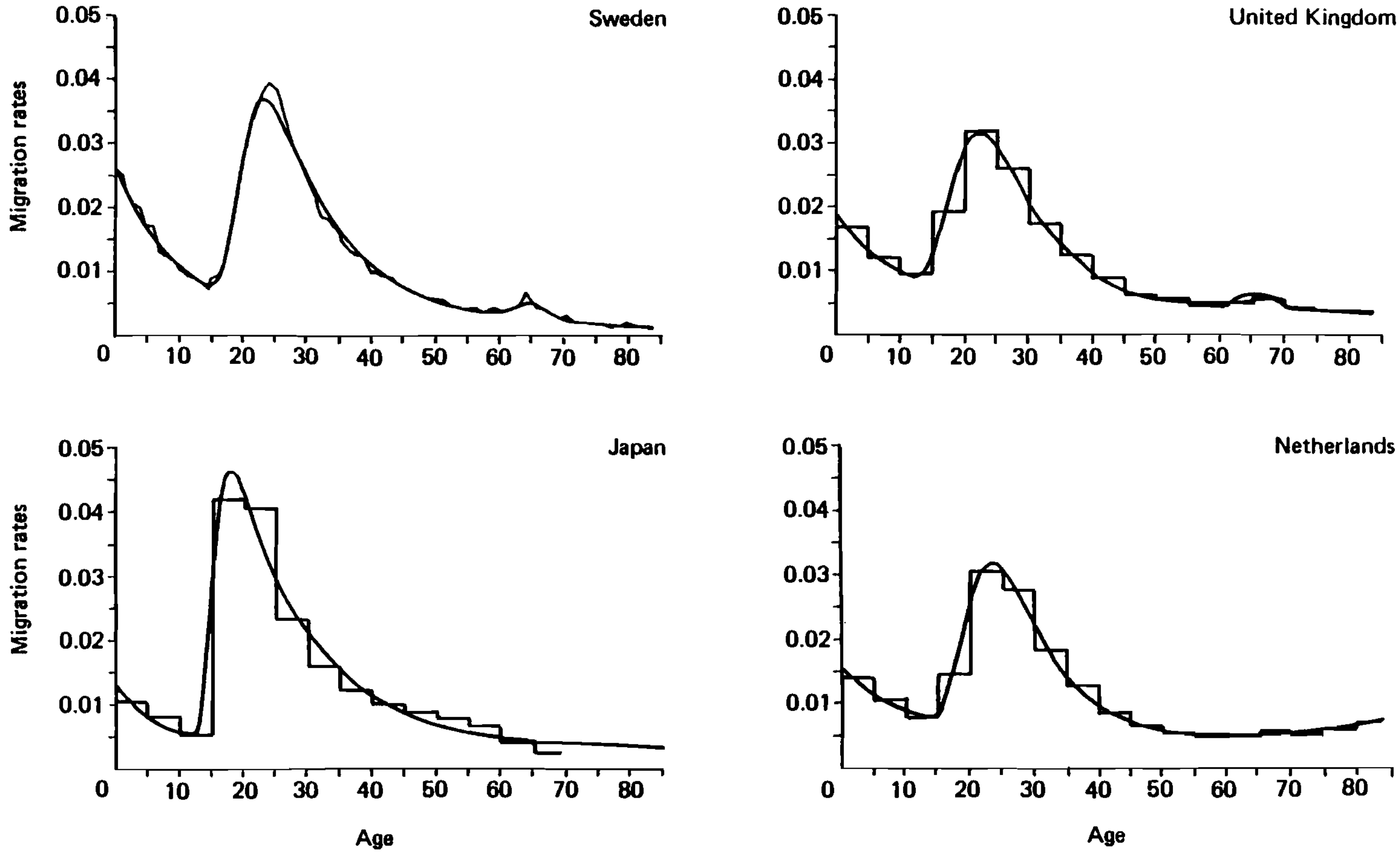


FIGURE 11 Observed (jagged line) and model (smooth line) national male standard migration schedules: Sweden, the United Kingdom, Japan, the Netherlands.

for example, Japan's migration schedules. Finally, the existence of a monotonically rising tail in migration schedules such as those exhibited by the Dutch data led to the definition of a third profile: the 9-parameter *model migration schedule with an upward slope.*

Within each family of schedules, a number of key parameters or variables may be put forward in order to further classify different categories of migration profiles. For example, in section 3 we identified the special importance of the following aspects of shape and location along the age axis:

1. Peaking: early peaking versus late peaking (μ_2)
2. Dominance: child dependence versus labor dominance (δ_{12})
3. Asymmetry: labor symmetry versus labor asymmetry (σ_2)
4. Regularity: parental-shift regularity versus parental-shift irregularity (β_{12})

These fundamental families and four key parameters give rise to a large variety of standard schedules. For example, even if the four key parameters are restricted to only dichotomous values, one already needs $2^4 = 16$ standard schedules. If, in addition, the sexes are to be differentiated, then 32 standard schedules are a minimum. A large number of standard schedules would make the logit approach a less desirable alternative. Hence we shall examine the feasibility of adopting only a single standard for both sexes and assume that the shape of the post-labor force part of the schedule may be determined exogenously. In tests of our logit migration system, therefore, we shall always set the post-labor force retirement peak or upward slope equal to observed model schedule values.

The similarity of the male and female median parameter values set out in Tables 10 and 11 (for Sweden, the United Kingdom, and Japan), suggests that one could use the average of the values for the two sexes to define a unisexual standard. A rough rounding of these averages would simplify matters even more. Table 17 presents the simplified basic standard parameters obtained in this way. The values of a_1, a_2, and c are initial values only and need to be scaled proportionately to ensure a unit *GMR*. Figure 12 illustrates the age profile of this simplified basic standard migration schedule.

TABLE 17 **The simplified basic standard migration schedule.**

Fundamental parameters	Fundamental ratios
$a_1 = 0.02$	$\delta_{12} = 1/3$
$\alpha_1 = 0.10$	$\sigma_2 = 4$
$a_2 = 0.06$	$\beta_{12} = 1$
$\mu_2 = 20$	$\delta_{1c} = 6$
$\alpha_2 = 0.10$	
$\lambda_2 = 0.40$	
$c = 0.003$	

We have noted before that when $\gamma = 0$ and $\rho = 1$, the estimated model schedule is identical to the standard. Moreover since the *GMR* of the standard is always unity, values of γ and ρ that satisfy the equality $\gamma = 2(\rho - 1)$ guarantee a *GMR* of unity for the estimated schedule. What are the effects of other combinations of values for these two parameters?

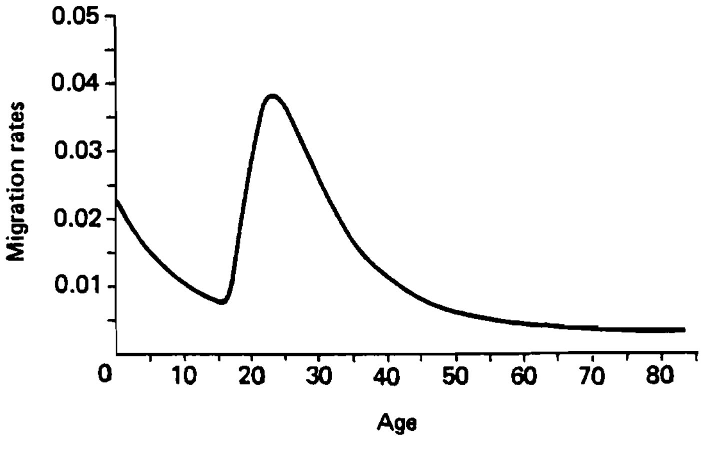


FIGURE 12 Simplified basic standard migration schedule.

Figure 13 illustrates how the simplified basic standard schedule is transformed when γ and ρ are assigned particular pairs of values. Figure 13(a) shows that fixing $\gamma = 0$ and increasing ρ from 0.75 to 1.25 lowers the schedule, giving migration rates that are smaller in value than those of the standard. On the other hand, fixing $\rho = 0.75$, and increasing γ from -1 to 0 raises the schedule, according to Figure 13(b). Finally, fixing $GMR = 1$ by selecting values of γ and ρ that satisfy the equality $\gamma = 2(\rho - 1)$ shows that as γ and ρ both increase, so does the degree of labor dominance exhibited by the estimated schedule. For example, moving from an estimated schedule with $\gamma = -0.5$ and $\rho = 0.75$ to one with $\gamma = 0.5$ and $\rho = 1.25$ does not alter the area under the curve ($GMR = 1$), but it does increase its labor dominance (Figure 13(c)).

Given a standard schedule and a few observed rates, such as $M(0\text{–}4)$ and $M(20\text{–}24)$, for example, how can one find estimates for γ and ρ, and with those estimates go on to obtain the entire estimated schedule?

First, taking logits of the two observed migration rates gives $Y(0\text{–}4)$ and $Y(20\text{–}24)$ and associating these two logits with the pair of corresponding logits for the standard gives

$$Y(0\text{–}4) = \gamma + \rho\, Y_s(0\text{–}4)$$

$$Y(20\text{–}24) = \gamma + \rho\, Y_s(20\text{–}24)$$

Solving these two equations in two unknowns gives crude estimates for γ and ρ, and applying them to the standard schedule's full set of logits results in a set of logits for the estimated schedule. From these one can obtain the migration rates, as shown earlier. Tests of such a procedure with the migration data for Sweden, the United Kingdom, Japan, and the Netherlands, however, indicate that the method is very erratic in the goodness-of-fits that it produces and, therefore, more refined procedures are necessary. Such procedures (for the case of mortality) are described in the literature on the Brass logit system (for example, in Brass 1975, Carrier and Goh 1972).

A reasonable first approximation to an improved estimation method for the case of migration is suggested by the regression approach described in subsection 4.2. Imagine a

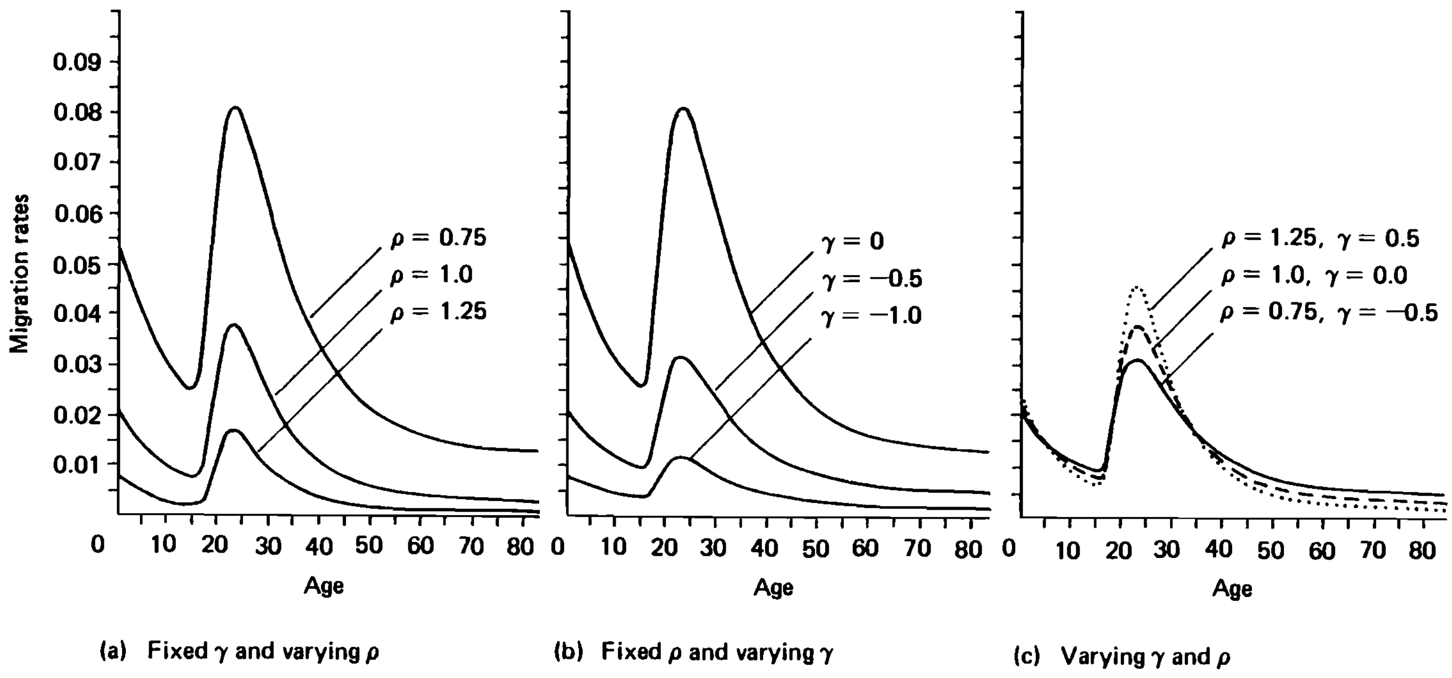


FIGURE 13 Sensitivity of the logit model migration schedule to variations in γ and ρ: simplified basic standard migration schedule.

regression of ρ on the M ratio, $M(0\text{–}4)/M(20\text{–}24)$. Starting with the simplified basic standard migration schedule and varying ρ within the range of observed values, one may obtain a corresponding set of M ratios. Associating ρ and the M ratio in this way, one may proceed further and use the relational equation to estimate $\hat{\gamma}$ from $\hat{\rho}$:

$$\hat{\gamma} = 2(\hat{\rho} - 1)$$

A further simplification can be made by forcing the regression line to pass through the origin. Since the resulting regression coefficient has a negative sign and the intercept exhibits roughly the same absolute value, but with a positive sign, the regression equations take on the form

$$\hat{\rho} = 2.1(1 - M)$$

where $M = M(0\text{–}4)/M(20\text{–}24)$.

Given a standard schedule and estimates for γ and ρ, one can proceed to compute the associated estimated model migration schedule. Figure 14 illustrates representative examples of the goodness-of-fit obtained using this procedure. Two estimated schedules are illustrated with each observed model migration schedule: those calculated with the interpolated 85 single-year-of-age observations and the resulting least-squares estimates of γ and ρ, and those computed using the above regression equations of ρ on the M ratio. Although the fits are moderately successful, it is clear that further study of this problem is necessary.

5 CONCLUSION

This report began with the observation that empirical regularities characterize observed migration schedules in ways that are no less important than the corresponding well-established regularities in observed fertility or mortality schedules. Section 2 was devoted to defining mathematically such regularities in observed migration schedules in order to exploit the notational, computational, and analytical advantages that such a formulation provides. Section 3 reported on the results of an examination of over 500 migration schedules that underscored the broad generality of the model migration schedule proposed and helped to identify a number of families of such schedules.

Regularities in age profiles lead naturally to the development of hypothetical model migration schedules that might be suitable for studies of populations with inadequate or defective data. Drawing on techniques used in the corresponding literature in fertility and mortality, section 4 develops procedures for inferring migration patterns in the absence of accurate migration data.

Of what use, then, is the model migration schedule defined in this study? What are some of its concrete practical applications?

The model migration schedule may be used to *graduate* observed data, thereby smoothing out irregularities and ascribing to the data summary measures that can be used for comparative analysis. It may be used to *interpolate* to single years of age, observed migration schedules that are reported for wider age intervals. Assessments of the *reliability*

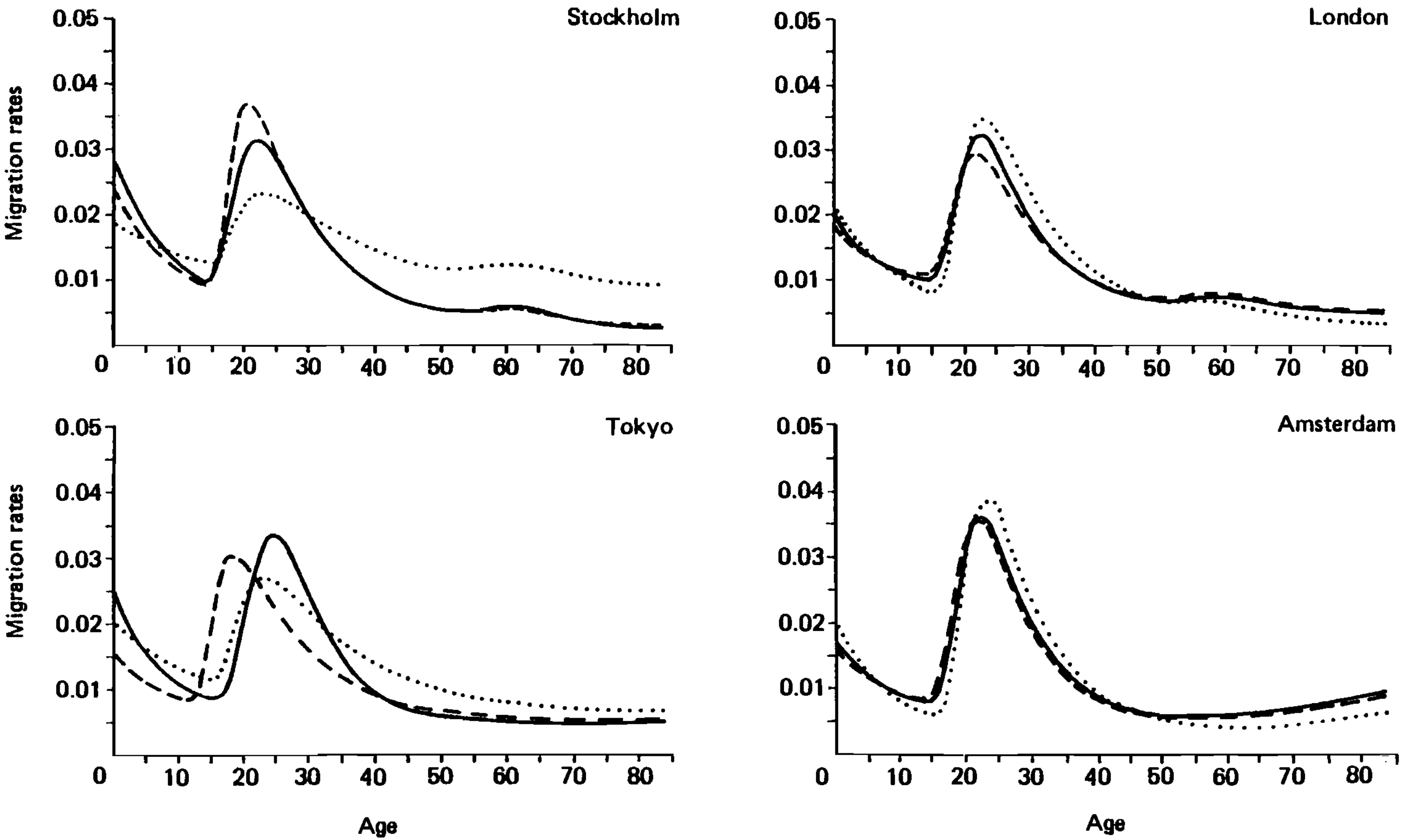


FIGURE 14 The fits of the relational approach when using the estimated parameters from 85 observations (– – –) and the $\hat{\rho}$ parameter from the observed M ratio (· · · ·) compared with the observed (———) data for the female populations of Stockholm, London, Tokyo, and Amsterdam.

of empirical migration data and indications of appropriate strategies for their *correction* are aided by the availability of standard families of migration schedules. Finally, such schedules also may be used to help resolve problems caused by *missing data.*

The analysis of national migration age patterns reported in this study seeks to demonstrate the utility of examining the regularities in age profile exhibited by empirical schedules of interregional migration. Although data limitations have restricted some of the findings to conjectures, a modest start has been made. It is hoped that the results reported here will induce others to devote more attention to this topic.

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APPENDIX A

NONLINEAR PARAMETER ESTIMATION WITH MODEL MIGRATION SCHEDULES

This appendix briefly illustrates the mathematical programming procedure used to estimate the parameters of the model migration schedule. The nonlinear estimation problem may be defined as the search for the "best" parameter values for the function

$$\begin{aligned} M(x) = {} & a_1 \exp(-\alpha_1 x) \\ & + a_2 \exp\{-\alpha_2(x-\mu_2) - \exp[-\lambda_2(x-\mu_2)]\} \\ & + a_3 \exp\{-\alpha_3(x-\mu_3) - \exp[-\lambda_3(x-\mu_3)]\} \\ & + c \end{aligned} \tag{A1}$$

in the sense that a pre-defined objective function is minimized when the parameters take on these values.

This problem is the classical one of nonlinear parameter estimation in unconstrained optimization. All of the available methods start with a set of given initial conditions, or initial guesses of the parameter values, in the search for better estimates following specific convergence criteria. The iterative sequence ends after a finite number of iterations, and the solution is accepted as giving the best estimates for the parameters.

The problem of selecting an effective method has been usefully summarized by Bard (1974, p. 84) as follows:

> . . . no single method has emerged which is best for the solution of all nonlinear programming problems. One cannot even hope that a "best" method will ever be found, since problems vary so much in size and nature. For parameter estimation problems we must seek methods which are particularly suitable to the special nature of these problems which may be characterized as follows:
>
> 1. A relatively small number of unknowns, rarely exceeding a dozen or so.
> 2. A highly nonlinear (though continuous and differentiable) objective function, whose computation is often very time consuming.
> 3. A relatively small number (sometimes zero) of inequality constraints. Those are usually of a very simple nature, e.g., upper and lower bounds.
> 4. No equality constraints, except in the case of exact structural models (where, incidentally, the number of unknowns is large) . . .

For computational convenience, we have chosen the Marquardt method (Levenberg 1944, Marquardt 1963). This method seeks out a parameter vector P^* that minimizes the following objective function:

$$\phi(P) = f_P \tag{A2}$$

where f_P is the residual vector. For the case of a model schedule with a retirement peak, vector P has the following elements:

$$P^T = [a_1, \alpha_1, a_2, \alpha_2, \mu_2, \lambda_2, a_3, \alpha_3, \mu_3, \lambda_3, c] \tag{A3}$$

where T denotes transposition. The elements of the vector f_P can be computed by either of the following two expressions:

$$f_P(x) = [M(x) - \hat{M}_P(x)]^2 \tag{A4}$$

or

$$f_P(x) = [M(x) - \hat{M}_P(x)]^2 / \hat{M}_P(x) \tag{A5}$$

where $M(x)$ is the observed value at age x and $\hat{M}_P(x)$ is the estimated value using eq. (A1) and a given vector P of parameter estimates.

By introducing eq. (A4) in the objective function set out in eq. (A2), the sum of squares is minimized; if, on the other hand, eq. (A5) is introduced instead, the chi-square statistic is minimized.

In matrix notation, the Levenberg–Marquardt method follows the iterative sequence

$$P_{q+1} = P_q - \{\mathbf{J}_q^T \mathbf{J}_q + \lambda_q \mathbf{D}_q\}^{-1} \mathbf{J}_q^T f_{P_q}$$

where λ is a non-negative parameter adjusted to ensure that at each iteration the function (A2) is reduced, $\mathbf{J}_q$ denotes the Jacobian matrix of $\phi(P)$ evaluated at the q iteration, and $\mathbf{D}$ is a diagonal matrix equal to the diagonal of $\mathbf{J}^T\mathbf{J}$.

The principal difficulty in nonlinear parameter estimation is that of convergence, and the method discussed here is no exception. The algorithm starts out by assuming some initial parameters, and then a new vector P is estimated according to the value of λ, which in turn is also modified following some gradient criteria. Once some given stopping values are achieved, vector P^* is assumed to be the optimum. In some cases, however, this P^* reflects local minima that may be improved with better initial conditions and a different set of gradient criteria.

Using the data described in this report, several experiments were carried out to examine the variation in parameter estimates that could result from different initial conditions (assuming Newton's gradient criteria).† Among the cases studied, the most significant differences were found for the vector P with 11 parameters, principally among the parameters of the retirement component. For schedules without the retirement peak, the vector P^* shows no variation in most cases.

†For a complete description of gradient methods, see Fiacco and McCormick 1968, Bard 1974.

The impact of the gradient criteria on the optimal vector $\boldsymbol{P}^*$ was also analyzed, using the Newton and the Steepest Descent methods. The effects of these two alternatives were reflected in the computing times but not in the values of the vector $\boldsymbol{P}^*$. Nevertheless, Bard (1974) has suggested that both methods can create problems in the estimation, and therefore they should be used with caution in order to avoid unrealistic parameter estimates. It appears that the initial parameter values may be improved by means of an interactive approach suggested by Benson (1979).

APPENDIX B

SUMMARY STATISTICS OF NATIONAL PARAMETERS AND VARIABLES OF THE REDUCED SETS OF OBSERVED MODEL MIGRATION SCHEDULES

Legend

gmr (obs)	Observed gross migraproduction rate
gmr (mms)	Unit gross migraproduction rate
mae%m	Goodness-of-fit index E (mean absolute error as a percentage of the observed mean)
a1	a_1, level of pre-labor force component
alpha1	α_1, rate of descent of pre-labor force component
a2	a_2, level of labor force component
mu2	μ_2, mean age of labor force component
alpha2	α_2, rate of descent of labor force component
lambda2	λ_2, rate of ascent of labor force component
a3	a_3, level of post-labor force component
mu3	μ_3, mean age of post-labor force component
alpha3	α_3, rate of descent of post-labor force component
lambda3	λ_3, rate of ascent of post-labor force component
c	c, constant component
mean age	$\bar{n}$, mean age of migration schedule
%(0–14)	Percentage of *GMR* in 0–14 age interval
%(15–64)	Percentage of *GMR* in 15–64 age interval
%(65+)	Percentage of *GMR* in 65 and over age interval
delta1c	$\delta_{1c} = a_1/c$
delta12	$\delta_{12} = a_1/a_2$
delta32	$\delta_{32} = a_3/a_2$
beta12	$\beta_{12} = \alpha_1/\alpha_2$
sigma2	$\sigma_2 = \lambda_2/\alpha_2$
sigma3	$\sigma_3 = \lambda_3/\alpha_3$
x low	x_l, low point
x high	x_h, high point
x ret.	x_r, retirement peak
x shift	X, labor force shift
a	A, parental shift
b	B, jump

Summary statistics for Swedish males without a retirement peak using single year of age data: 48 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.02478	0.83908	0.20509	0.15766	0.14693	0.16162	0.78806
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	6.32477	62.98674	26.09850	22.98794	20.49026	11.93332	0.45724
a1	0.01829	0.04891	0.02894	0.02750	0.02595	0.00708	0.24465
alpha1	0.06495	0.40526	0.12372	0.11137	0.11600	0.05466	0.44179
a2	0.03624	0.12465	0.06739	0.06832	0.06718	0.01913	0.28392
mu2	16.05688	23.99384	20.50230	20.36539	20.42221	1.43641	0.07006
alpha2	0.05701	0.18775	0.10439	0.10426	0.10277	0.02843	0.27233
lambda2	0.19407	1.76712	0.44762	0.38743	0.43003	0.26230	0.58598
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00704	0.00264	0.00279	0.00246	0.00134	0.50760
mean age	24.71596	36.54450	29.73375	29.58655	30.03880	2.05835	0.06923
%(0-14)	13.88474	27.75659	22.20945	22.27053	21.51425	3.36488	0.15151
%(15-64)	61.50196	77.42499	69.71529	69.65226	71.85192	3.44397	0.04940
%(65+)	1.35294	17.31658	8.07528	8.23866	8.53658	2.82110	0.34935
delta1c	0.00000	33.70855	9.43123	8.72132	8.42714	5.85991	0.62133
delta12	0.17064	0.89970	0.46595	0.45039	0.57162	0.17371	0.37280
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.66868	3.51656	1.22123	1.14700	0.81107	0.47585	0.38965
sigma2	1.16055	24.23831	4.86348	3.94838	2.31444	3.98036	0.81842
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	8.72009	18.26030	15.62129	15.72025	15.87525	1.67033	0.10693
x high	20.86036	26.19049	23.57146	23.67043	23.79193	1.25751	0.05335
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	2.90007	12.34028	7.95018	7.99018	8.09218	1.87450	0.23578
a	26.54375	37.28526	30.27044	29.85372	29.22913	2.00217	0.06614
b	0.01625	0.05504	0.03036	0.02954	0.02983	0.00762	0.25106

Summary statistics for Swedish males with a retirement peak using single year of age data: 9 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.05726	0.24937	0.16343	0.16041	0.23976	0.06846	0.41891
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	15.31033	39.60669	22.46128	18.73808	16.52515	8.75361	0.38972
a1	0.02010	0.03347	0.02644	0.02749	0.02745	0.00441	0.16694
alpha1	0.04069	0.12939	0.08476	0.08059	0.08061	0.02637	0.31112
a2	0.03431	0.08440	0.05139	0.04441	0.04182	0.01534	0.29844
mu2	19.79847	25.50892	21.24856	20.88873	20.08399	1.73551	0.08168
alpha2	0.07750	0.11222	0.09306	0.09343	0.07924	0.01123	0.12071
lambda2	0.16894	0.61686	0.41581	0.43068	0.41530	0.13718	0.32991
a3	0.00001	0.00390	0.00056	0.00013	0.00020	0.00126	2.26618
mu3	71.79685	85.71539	76.71105	75.07949	73.88464	4.57307	0.05961
alpha3	0.27276	1.26871	0.84724	0.94211	1.11932	0.35752	0.42198
lambda3	0.09179	0.20566	0.15819	0.18034	0.19997	0.04584	0.28979
c	0.00039	0.00453	0.00218	0.00181	0.00143	0.00126	0.57877
mean age	27.38409	34.12481	30.76871	30.73515	30.41742	2.07682	0.06750
%(0-14)	19.83781	26.52260	23.83921	24.40201	24.18293	2.06681	0.08670
%(15-64)	59.15461	74.10361	66.60196	67.11652	67.37656	4.57156	0.06864
%(65+)	6.05858	14.32279	9.55884	8.64010	6.47179	2.96092	0.30976
delta1c	6.06509	60.22449	17.91566	13.51922	14.18900	16.23569	0.90623
delta12	0.27933	0.80125	0.55066	0.53239	0.46200	0.16816	0.30538
delta32	0.00036	0.08854	0.01207	0.00240	0.00477	0.02871	2.37846
beta12	0.42608	1.46937	0.92460	0.81842	0.79123	0.31735	0.34323
sigma2	1.60498	7.95960	4.60178	4.48710	3.82910	1.83530	0.39882
sigma3	0.14795	0.41012	0.20853	0.18449	0.18728	0.07805	0.37427
x low	15.47024	17.78029	16.49360	16.42026	16.50976	0.75926	0.04603
x high	22.80041	27.76052	24.46156	23.97043	23.54443	1.50376	0.06147
x ret.	63.16779	68.95871	65.63027	64.87784	64.61552	2.00638	0.03057
x shift	6.01014	12.19028	7.96796	7.47017	7.55517	1.88117	0.23609
a	25.07877	30.40369	28.66785	29.00578	28.53997	1.68724	0.05885
b	0.01345	0.03986	0.02360	0.02375	0.01741	0.00789	0.33434

Summary statistics for Swedish females without a retirement peak using single year of age data: 54 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.02256	0.87818	0.20644	0.16573	0.15090	0.15964	0.77331
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	8.11708	60.83579	25.05564	20.65920	21.29676	11.07337	0.44195
a1	0.00952	0.04464	0.02648	0.02774	0.02884	0.00728	0.27500
alpha1	0.02108	0.19659	0.10800	0.11278	0.11761	0.03713	0.34382
a2	0.04018	0.18944	0.07616	0.06995	0.06257	0.02600	0.34134
mu2	17.33270	21.31304	19.09371	18.99365	18.72582	0.86976	0.04555
alpha2	0.07664	0.24522	0.12696	0.12185	0.11879	0.03726	0.29351
lambda2	0.25622	1.49869	0.53687	0.48282	0.44259	0.19779	0.36842
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00579	0.00288	0.00296	0.00318	0.00123	0.42521
mean age	24.51402	33.18372	28.98599	28.88618	28.41539	1.80056	0.06212
%(0-14)	9.37675	28.91071	22.04352	22.26965	20.12043	3.63470	0.16489
%(15-64)	61.93792	81.17286	69.30895	69.01508	68.67014	3.42040	0.04935
%(65+)	1.46164	14.17442	8.64754	8.77672	8.45367	2.40189	0.27775
deltalc	0.00000	34.70223	10.45738	8.68991	8.67556	7.10051	0.67899
delta12	0.05026	0.72119	0.38938	0.39909	0.41927	0.15910	0.40859
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.13332	1.53044	0.90442	0.92119	1.04145	0.33065	0.36559
sigma2	1.13861	12.23371	4.57128	3.97896	2.80288	2.14015	0.46817
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.19019	17.64029	15.25968	15.11023	14.74773	0.93022	0.06096
x high	18.83032	23.70043	21.72038	21.71038	21.50888	1.03422	0.04762
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	2.89007	8.59020	6.46070	6.65015	6.02514	1.17260	0.18150
a	23.73040	30.35461	27.22177	27.26609	26.71129	1.47430	0.05416
b	0.01932	0.09111	0.03586	0.03357	0.03009	0.01126	0.31401

Summary statistics for Swedish females with a retirement peak using single year of age data: 3 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.13278	0.47590	0.28125	0.23508	0.14994	0.17616	0.62633
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	10.57396	20.49792	15.52629	15.50700	11.07016	4.96201	0.31959
a1	0.01944	0.03060	0.02384	0.02149	0.02000	0.00594	0.24915
alpha1	0.08182	0.10413	0.09284	0.09256	0.08294	0.01116	0.12018
a2	0.04146	0.07787	0.05491	0.04541	0.04328	0.01998	0.36383
mu2	18.17883	19.33387	18.86767	19.09032	18.23658	0.60886	0.03227
alpha2	0.09427	0.12621	0.10640	0.09871	0.09587	0.01730	0.16262
lambda2	0.27430	0.58193	0.42440	0.41696	0.28968	0.15395	0.36275
a3	0.00001	0.00014	0.00009	0.00013	0.00013	0.00007	0.77509
mu3	73.38062	76.25882	74.78143	74.70483	73.52454	1.44063	0.01926
alpha3	0.90737	0.96737	0.93753	0.93784	0.91037	0.03000	0.03200
lambda3	0.15760	0.18530	0.17028	0.16794	0.15899	0.01400	0.08220
c	0.00269	0.00444	0.00337	0.00297	0.00278	0.00094	0.27921
mean age	28.79165	33.03862	30.71901	30.32676	29.00400	2.15048	0.07000
%(0-14)	19.06055	26.38641	23.02162	23.61790	19.42684	3.69915	0.16068
%(15-64)	62.63004	72.57767	66.03382	62.89375	63.12742	5.66867	0.08584
%(65+)	8.36178	13.75206	10.94456	10.71983	8.63129	2.70216	0.24690
delta1c	4.83614	10.29016	7.45207	7.22991	5.10884	2.73379	0.36685
delta12	0.24967	0.67379	0.48056	0.51823	0.27088	0.21455	0.44646
delta32	0.00019	0.00320	0.00214	0.00302	0.00305	0.00169	0.79014
beta12	0.73337	1.10458	0.88895	0.82889	0.75193	0.19275	0.21683
sigma2	2.77878	4.61088	3.93750	4.42285	2.87038	1.00788	0.25597
sigma3	0.16804	0.19155	0.18156	0.18508	0.16922	0.01214	0.06689
x low	13.17019	15.30024	14.44355	14.86023	13.27669	1.12450	0.07785
x high	20.74036	22.63040	21.90372	22.34040	20.83486	1.01788	0.04647
x ret.	64.39774	64.81783	64.60445	64.59778	64.41875	0.21012	0.00325
x shift	5.88013	9.17021	7.46017	7.33017	6.04463	1.64889	0.22103
a	25.02372	27.84035	26.11944	25.49425	25.16455	1.50881	0.05777
b	0.01454	0.04145	0.02575	0.02126	0.01589	0.01401	0.54391

Summary statistics for males of the United Kingdom without a retirement peak: 59 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.02521	1.05541	0.15658	0.09630	0.07672	0.18257	1.16594
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	5.59109	25.51109	11.66710	10.93198	10.57109	4.25471	0.36468
a1	0.00852	0.04154	0.02073	0.01979	0.01678	0.00665	0.32070
alpha1	0.02167	0.26591	0.09937	0.09878	0.10715	0.04812	0.48427
a2	0.01559	0.11192	0.05946	0.06078	0.06857	0.01676	0.28177
mu2	14.68744	43.96579	22.00013	20.11916	19.07919	5.36015	0.24364
alpha2	0.06427	0.27413	0.12654	0.11611	0.09575	0.04760	0.37617
lambda2	0.06051	0.90653	0.25947	0.24042	0.27202	0.15062	0.58048
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00587	0.00286	0.00280	0.00205	0.00155	0.54198
mean age	25.15435	36.36529	30.65815	30.45968	30.19927	2.60321	0.08491
%(0-14)	15.19911	29.69068	20.88979	20.46828	18.82200	3.45535	0.16541
%(15-64)	60.27293	78.68406	69.70760	69.30323	66.71683	3.85501	0.05530
%(65+)	1.35734	16.64217	9.40261	9.56441	6.70703	3.74348	0.39813
delta1c	0.00000	108.15191	10.09796	6.40383	5.40760	16.02651	1.58710
delta12	0.13305	1.53679	0.39065	0.34557	0.20324	0.22076	0.56511
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.08403	2.64845	0.89863	0.69816	0.46869	0.56755	0.63157
sigma2	0.30349	11.98600	2.50122	2.07064	0.88762	2.01686	0.80635
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	6.91004	17.19028	12.70424	12.61017	12.56417	1.82025	0.14328
x high	17.11028	28.14053	23.16957	22.82041	22.07389	1.81849	0.07849
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.50010	16.93039	10.46532	10.35024	10.09373	2.21174	0.21134
a	22.33532	34.75360	30.56486	30.77489	31.64904	2.64842	0.08665
b	0.01107	0.04390	0.02347	0.02331	0.02256	0.00595	0.25341

Summary statistics for males of the United Kingdom with a retirement peak: 23 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.04391	0.43105	0.14234	0.11835	0.06327	0.09731	0.68369
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	4.50555	11.74034	7.37499	7.19781	7.03773	1.81126	0.24559
a1	0.01006	0.02859	0.01629	0.01595	0.01099	0.00455	0.27924
alpha1	0.03347	0.13892	0.07963	0.07539	0.07038	0.02759	0.34650
a2	0.03143	0.07553	0.05305	0.05147	0.05127	0.01226	0.23102
mu2	16.66712	28.29313	20.42433	19.52551	19.57362	2.85049	0.13956
alpha2	0.07522	0.22997	0.11999	0.10031	0.09843	0.04072	0.33934
lambda2	0.13783	0.59710	0.30095	0.27547	0.25265	0.12285	0.40820
a3	0.00003	0.02391	0.00657	0.00036	0.00122	0.00821	1.25102
mu3	60.14665	78.18250	71.11082	72.81990	73.67355	5.26965	0.07410
alpha3	0.09157	1.46849	0.69225	0.73938	0.29811	0.39070	0.56440
lambda3	0.14822	0.79255	0.30877	0.20966	0.18044	0.19968	0.64670
c	0.00135	0.00581	0.00350	0.00319	0.00336	0.00120	0.34311
mean age	29.52324	39.42478	33.68306	33.08322	31.99862	3.02730	0.08988
%(0-14)	14.81974	24.25047	19.54684	19.24777	18.12050	2.41459	0.12353
%(15-64)	60.63728	73.54926	66.53702	66.50820	65.15647	3.79339	0.05701
%(65+)	5.96680	21.22636	13.91614	14.18742	14.35956	4.14668	0.29798
delta1c	1.97896	21.21980	5.66514	5.07938	2.94100	4.05781	0.71628
delta12	0.17540	0.54374	0.31838	0.31866	0.30432	0.09968	0.31309
delta32	0.00041	0.76076	0.14960	0.00712	0.03843	0.21305	1.42410
beta12	0.19783	1.38213	0.72606	0.71787	0.61234	0.31032	0.42740
sigma2	0.66296	6.31024	2.82047	2.64495	2.07478	1.49891	0.53144
sigma3	0.16168	8.65535	1.14756	0.20633	0.58636	2.04738	1.78411
x low	10.51013	16.36026	13.37237	13.18019	11.97266	1.77061	0.13241
x high	19.28033	26.80050	22.82693	22.69040	22.66441	1.60085	0.07013
x ret.	61.57806	68.02851	65.83775	66.87827	67.06094	2.13126	0.03237
x shift	5.77013	12.31028	9.45457	9.30021	8.71320	1.87231	0.19803
a	22.40042	35.62120	29.79299	29.76039	29.67185	2.67844	0.08990
b	0.01281	0.02976	0.02141	0.02178	0.02552	0.00515	0.24049

Summary statistics for females of the United Kingdom without a retirement peak: 61 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.02365	1.01236	0.14575	0.09184	0.07309	0.17830	1.22333
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	4.17964	35.50578	10.91377	9.55528	8.87856	4.72799	0.43321
a1	0.00813	0.04496	0.02104	0.01983	0.01365	0.00826	0.39241
alpha1	0.01585	0.41038	0.09690	0.08956	0.07503	0.06900	0.71205
a2	0.02207	0.11110	0.06266	0.06204	0.06213	0.01709	0.27274
mu2	17.63140	30.57491	21.34874	20.45384	19.57293	2.83357	0.13273
alpha2	0.05467	0.33556	0.15079	0.14175	0.12489	0.06028	0.39976
lambda2	0.09786	0.71288	0.32671	0.30048	0.25162	0.14006	0.42869
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00685	0.00348	0.00345	0.00308	0.00157	0.45136
mean age	25.52103	37.86541	31.58546	32.08269	32.31044	2.95593	0.09359
%(0-14)	14.64687	31.87480	21.59961	20.53595	18.95385	3.76920	0.17450
%(15-64)	62.06953	76.41191	66.97395	66.34695	65.65512	3.41943	0.05106
%(65+)	3.64517	19.56255	11.42645	11.65862	13.99147	3.93660	0.34452
delta1c	0.00000	72.47650	8.64625	5.24755	3.62383	10.60588	1.22665
delta12	0.08424	0.90435	0.36713	0.32109	0.28927	0.18290	0.49818
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.09121	2.48385	0.72317	0.67343	0.68937	0.46099	0.63746
sigma2	0.49564	10.36208	2.73345	2.09932	0.98896	2.07345	0.75855
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.32012	17.72029	14.24906	14.20021	15.13023	1.70798	0.11987
x high	20.83036	25.98048	22.94304	22.74041	22.63291	1.19496	0.05208
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	5.56013	13.55031	8.69397	8.44019	7.55767	1.93305	0.22234
a	23.79711	34.79032	28.09603	27.65704	27.64474	2.59165	0.09224
b	0.00831	0.04026	0.02497	0.02519	0.02269	0.00573	0.22964

Summary statistics for females of the United Kingdom with a retirement peak: 21 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.04829	0.34301	0.14933	0.13736	0.09250	0.08348	0.55901
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	4.74971	22.13955	9.20055	8.84962	5.61920	4.27702	0.46487
a1	0.00805	0.04165	0.01794	0.01517	0.00973	0.00821	0.45765
alpha1	0.02459	0.24502	0.08924	0.09505	0.03561	0.05465	0.61239
a2	0.01233	0.07618	0.04833	0.04547	0.04106	0.01745	0.36113
mu2	18.00047	36.08138	21.55869	19.77335	18.90451	4.96641	0.23037
alpha2	0.08835	0.49309	0.15341	0.13615	0.10859	0.09143	0.59595
lambda2	0.09244	0.51326	0.33265	0.33593	0.28181	0.13022	0.39148
a3	0.00000	0.00854	0.00203	0.00017	0.00043	0.00289	1.42077
mu3	60.61970	90.38014	71.84245	70.90856	71.03586	8.32396	0.11586
alpha3	0.01154	1.62553	0.58313	0.40945	0.09224	0.46984	0.80572
lambda3	0.05481	1.56080	0.40293	0.20234	0.13011	0.42518	1.05522
c	0.00171	0.00692	0.00381	0.00389	0.00405	0.00133	0.35041
mean age	26.72770	40.77051	34.04731	34.46955	34.45125	3.48995	0.10250
%(0-14)	15.85610	31.41287	19.86567	18.90520	18.18962	3.63649	0.18305
%(15-64)	60.30930	71.40600	65.92708	65.93875	60.86414	3.32773	0.05048
%(65+)	6.56363	22.01840	14.20725	14.98109	15.06375	3.89729	0.27432
deltalc	1.17883	17.45453	5.77446	4.68926	1.99262	4.24057	0.73437
delta12	0.16936	0.87399	0.40947	0.34529	0.27505	0.20123	0.49145
delta32	0.00006	0.33792	0.04819	0.00499	0.01695	0.08349	1.73242
beta12	0.05347	2.77330	0.71114	0.65679	0.73343	0.57360	0.80659
sigma2	0.29251	5.73387	2.78827	2.95765	2.74112	1.53409	0.55019
sigma3	0.13237	93.39887	8.39149	0.18624	4.79570	21.50307	2.56249
x low	10.77013	15.86025	13.91878	13.92020	14.07871	1.26210	0.09068
x high	21.15037	24.31044	22.50659	22.30040	21.62438	0.91016	0.04044
x ret.	52.01966	70.26899	63.13780	62.21795	62.05679	4.21923	0.06683
x shift	6.01014	13.54031	8.58782	8.15019	7.89268	1.81185	0.21098
a	23.49932	37.58021	28.55560	28.10036	27.01954	3.23951	0.11345
b	0.01172	0.03499	0.02252	0.02300	0.02452	0.00594	0.26384

Summary statistics for Japanese males without a retirement peak: 57 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.00539	1.81309	0.31666	0.17186	0.09578	0.38464	1.21466
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	4.75751	37.80335	12.62047	11.18192	9.71439	5.62913	0.44603
a1	0.00173	0.02405	0.01412	0.01527	0.01624	0.00592	0.41931
alpha1	0.00009	0.25947	0.09480	0.09977	0.14275	0.05488	0.57890
a2	0.03492	0.22707	0.07492	0.06809	0.04453	0.03483	0.46486
mu2	15.10364	22.61861	17.62831	17.11779	15.47939	1.94362	0.11026
alpha2	0.03471	0.29735	0.10232	0.09257	0.07411	0.04706	0.45997
lambda2	0.16413	0.90290	0.47975	0.47975	0.49658	0.14115	0.29422
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00634	0.00247	0.00225	0.00159	0.00146	0.59006
mean age	26.02538	40.53283	31.60737	31.44515	31.10299	3.05673	0.09671
%(0-14)	4.92484	20.91126	14.16486	13.95493	12.11873	3.46604	0.24469
%(15-64)	62.99514	86.29065	76.52940	77.34460	75.80768	4.42163	0.05778
%(65+)	3.43647	16.09360	9.30574	8.72926	11.66360	3.64293	0.39147
delta1c	0.00000	712.88135	22.93119	5.58207	35.64407	94.88651	4.13788
delta12	0.02274	0.52642	0.23256	0.24896	0.24940	0.12682	0.54531
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.00092	7.47530	1.24426	1.16222	1.12208	1.16237	0.93419
sigma2	1.02508	12.92530	5.61729	5.00862	2.81011	2.82837	0.50351
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.91014	17.71029	13.18492	12.28017	11.93016	1.77209	0.13440
x high	17.64029	24.98046	20.91265	20.47035	18.74131	2.15590	0.10309
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.63011	12.96030	7.72772	7.58017	6.71266	1.57475	0.20378
a	0.00000	102.41312	37.74501	35.85357	35.84459	11.86458	0.31434
b	0.02035	0.07343	0.03630	0.03335	0.02831	0.01191	0.32812

Summary statistics for Japanese females without a retirement peak: 57 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.00388	1.59564	0.24922	0.11912	0.08347	0.33651	1.35027
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	5.01904	28.38801	11.11674	10.35964	6.18749	5.10822	0.45951
a1	0.00526	0.04003	0.02056	0.02091	0.02091	0.00874	0.42507
alpha1	0.01953	0.21084	0.11681	0.11836	0.12475	0.03604	0.30852
a2	0.03340	0.18839	0.08486	0.07980	0.07215	0.03158	0.37210
mu2	15.06610	37.76019	21.32339	21.16880	16.20080	4.98334	0.23370
alpha2	0.06431	0.28581	0.15151	0.14412	0.14184	0.04493	0.29654
lambda2	0.08367	0.80120	0.34973	0.32355	0.26305	0.16910	0.48352
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00012	0.00656	0.00401	0.00399	0.00366	0.00135	0.33511
mean age	25.92860	37.10249	31.23327	30.88583	28.72207	2.41142	0.07721
%(0-14)	10.63559	29.12714	19.18479	20.40160	20.80594	4.79971	0.25018
%(15-64)	60.55278	79.84567	69.83420	69.05502	65.37601	5.40643	0.07742
%(65+)	2.99108	16.75492	10.98102	10.64606	10.56119	2.97760	0.27116
delta1c	0.89359	192.60318	9.20455	5.02601	10.47907	25.26971	2.74535
delta12	0.02828	0.72176	0.28974	0.27999	0.06295	0.16540	0.57085
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.10464	1.52050	0.82773	0.85703	0.88336	0.29367	0.35478
sigma2	0.38917	7.64776	2.59435	2.25908	2.20382	1.57000	0.60516
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.36015	21.79038	14.08898	12.58017	11.88166	2.62811	0.18654
x high	17.03028	30.92059	22.76322	23.37042	23.28092	3.25665	0.14307
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.60011	15.09035	8.67423	8.58020	7.22267	2.24611	0.25894
a	25.13712	37.24700	30.17262	29.88948	29.37558	2.18864	0.07254
b	0.01296	0.06495	0.03339	0.02891	0.02596	0.01340	0.40134

Summary statistics for males of the Netherlands with a retirement slope: 10 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	3.17845	4.81395	3.91493	3.81677	3.58732	0.53446	0.13652
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	3.02542	6.41094	5.25190	5.30331	5.22601	1.04352	0.19869
a1	0.01065	0.01574	0.01265	0.01234	0.01090	0.00187	0.14779
alpha1	0.04667	0.10277	0.07955	0.08613	0.08874	0.01595	0.20047
a2	0.05424	0.07066	0.06319	0.06621	0.05506	0.00582	0.09204
mu2	19.46053	22.93296	20.86084	20.69522	20.32864	0.95922	0.04598
alpha2	0.11257	0.14982	0.12984	0.12854	0.11443	0.01338	0.10304
lambda2	0.22094	0.35961	0.28665	0.30015	0.29721	0.03995	0.13936
a3	0.00000	0.00005	0.00001	0.00001	0.00000	0.00002	1.38535
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.05744	0.10053	0.07651	0.07588	0.07683	0.01292	0.16892
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00104	0.00422	0.00343	0.00389	0.00343	0.00093	0.27251
mean age	37.73109	41.49833	38.94663	39.31461	37.91945	1.27571	0.03276
%(0-14)	13.69166	17.27305	15.41468	15.15449	17.09398	1.28401	0.08330
%(15-64)	59.97063	66.26878	63.02232	63.92394	60.28554	2.28423	0.03624
%(65+)	18.80301	25.63899	21.56301	22.35854	19.14481	2.27409	0.10546
delta1c	2.52201	14.47297	4.51612	3.75886	3.11956	3.55875	0.78801
delta12	0.15677	0.27627	0.20271	0.18714	0.17470	0.04189	0.20665
delta32	0.00001	0.00095	0.00020	0.00012	0.00006	0.00028	1.40678
beta12	0.41455	0.80146	0.61474	0.63704	0.62735	0.12439	0.20234
sigma2	1.49832	3.19446	2.23921	2.23897	2.26158	0.45391	0.20271
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.72018	14.77022	14.08921	14.21021	14.25771	0.53618	0.03806
x high	22.50040	24.86045	23.44342	23.38042	22.85441	0.75102	0.03204
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.19019	10.47024	9.35422	9.24021	9.21622	0.73500	0.07857
a	29.53608	33.37366	31.44317	32.11462	30.11172	1.41603	0.04503
b	0.02060	0.02722	0.02408	0.02394	0.02292	0.00213	0.08845

Summary statistics for females of the Netherlands with a retirement slope: 10 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	3.52109	4.92170	4.13650	4.26010	4.29143	0.47133	0.11394
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	5.40977	11.05379	8.04365	8.90725	5.69197	2.05565	0.25556
a1	0.00994	0.01413	0.01228	0.01273	0.01266	0.00128	0.10426
alpha1	0.06176	0.11502	0.09830	0.10605	0.11236	0.01628	0.16562
a2	0.06480	0.10439	0.08382	0.09071	0.06678	0.01317	0.15718
mu2	19.75573	20.57280	20.10061	20.04311	19.79658	0.27033	0.01345
alpha2	0.14553	0.20475	0.17375	0.18125	0.14849	0.01982	0.11408
lambda2	0.26334	0.35494	0.30683	0.30909	0.26792	0.02847	0.09280
a3	0.00000	0.00019	0.00004	0.00003	0.00001	0.00006	1.40559
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.03847	0.11854	0.07134	0.07127	0.05048	0.02375	0.33289
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00315	0.00457	0.00374	0.00374	0.00322	0.00063	0.16751
mean age	37.57629	39.77856	38.81507	39.19236	39.22799	0.78790	0.02030
%(0-14)	13.21536	16.78795	14.56102	14.46851	13.39399	1.27618	0.08764
%(15-64)	59.85442	65.44514	62.67490	63.07958	62.92931	1.63127	0.02603
%(65+)	20.13247	25.10497	22.76408	23.30609	23.36459	1.50698	0.06620
delta1c	2.17413	4.04725	3.36279	3.61493	3.95359	0.60866	0.18100
delta12	0.10707	0.20471	0.15107	0.13879	0.12172	0.03540	0.23431
delta32	0.00000	0.00202	0.00046	0.00030	0.00010	0.00064	1.38423
beta12	0.33449	0.65607	0.57057	0.60265	0.60783	0.09931	0.17406
sigma2	1.31773	2.34448	1.79960	1.77764	1.57442	0.35266	0.19596
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.75018	14.47022	13.49520	13.45019	12.83618	0.66204	0.04906
x high	21.24037	22.63040	21.86338	21.80038	21.30987	0.51774	0.02368
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.93018	9.06021	8.36819	8.35019	8.21269	0.32111	0.03837
a	27.02269	29.90750	28.73727	28.99037	29.18630	0.77992	0.02714
b	0.02568	0.03485	0.03036	0.03316	0.03347	0.00369	0.12143

Summary statistics for the total population of the Soviet Union without a retirement peak: 58 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.00815	3.90378	0.66532	0.19186	0.20293	1.00916	1.51681
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	10.18453	24.94810	17.93700	17.82011	15.35178	3.17316	0.17691
a1	0.00105	0.01283	0.00486	0.00437	0.00282	0.00262	0.53817
alpha1	0.17472	0.60651	0.30245	0.27777	0.28267	0.10223	0.33799
a2	0.06952	0.19473	0.12579	0.12539	0.12586	0.03256	0.25885
mu2	16.81462	23.78566	19.13940	18.96427	19.25448	1.68024	0.08779
alpha2	0.08706	0.29517	0.17642	0.17852	0.09747	0.05590	0.31684
lambda2	0.19184	0.44446	0.31015	0.30346	0.30552	0.06112	0.19708
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00146	0.00664	0.00427	0.00431	0.00483	0.00106	0.24795
mean age	28.33398	36.51470	32.81122	32.80619	32.83338	1.71835	0.05237
%(0-14)	3.47014	12.07090	8.23203	8.62854	9.06063	2.09048	0.25394
%(15-64)	72.46465	92.28165	80.16578	79.63146	77.41890	4.21266	0.05255
%(65+)	4.24821	17.13380	11.60220	11.85933	10.04673	2.50298	0.21573
delta1c	0.28231	3.81763	1.16415	0.99382	0.81261	0.64231	0.55174
delta12	0.00561	0.08434	0.04012	0.04178	0.04891	0.01967	0.49028
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.76316	6.05851	1.92186	1.69760	1.02793	1.06543	0.55438
sigma2	0.67698	4.52200	2.08855	1.57544	1.25373	1.14313	0.54733
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	9.82011	12.22017	11.23893	11.27014	11.14015	0.50767	0.04517
x high	19.57033	22.06039	20.81760	20.84036	20.93987	0.54317	0.02609
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.08018	11.72027	9.57867	9.48022	9.35421	0.73888	0.07714
a	30.17941	85.90950	45.68583	43.46015	38.53893	12.28768	0.26896
b	0.03600	0.06988	0.04773	0.04670	0.04786	0.00791	0.16568

Summary statistics for the total population of the United States with a retirement peak: 8 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.17654	0.67502	0.39920	0.46159	0.20146	0.17155	0.42974
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	6.35763	12.44090	8.76274	9.02917	6.66179	2.18925	0.24984
a1	0.01496	0.02682	0.02128	0.02078	0.02623	0.00461	0.21667
alpha1	0.03284	0.11438	0.07537	0.07852	0.11030	0.02920	0.38745
a2	0.04074	0.08871	0.05965	0.06023	0.06233	0.01414	0.23705
mu2	19.37771	21.05273	20.13819	20.12657	19.96397	0.54137	0.02688
alpha2	0.08742	0.17384	0.11764	0.10559	0.09174	0.03137	0.26662
lambda2	0.44557	0.75143	0.56910	0.62537	0.46086	0.11553	0.20299
a3	0.00003	0.00658	0.00192	0.00057	0.00036	0.00269	1.39900
mu3	71.87231	90.13589	81.80041	88.02872	72.78548	8.55974	0.10464
alpha3	0.21260	0.66147	0.43023	0.46137	0.23504	0.16264	0.37804
lambda3	0.08569	0.22924	0.11914	0.10588	0.10722	0.04554	0.38223
c	0.00103	0.00387	0.00233	0.00229	0.00202	0.00087	0.37436
mean age	28.73096	32.64307	30.83244	31.18867	32.44746	1.53949	0.04993
%(0-14)	20.08696	23.59063	21.67020	21.29156	20.26214	1.33968	0.06182
%(15-64)	63.85034	72.09166	67.76926	68.11514	64.26241	2.63248	0.03884
%(65+)	7.11183	13.39558	10.56054	11.47903	8.68277	2.24953	0.21301
deltalc	4.45463	18.98871	10.49483	10.30285	8.08815	4.77822	0.45529
delta12	0.24833	0.52458	0.36772	0.39712	0.28977	0.09357	0.25446
delta32	0.00045	0.11427	0.03477	0.01391	0.00614	0.04826	1.38804
beta12	0.21316	1.08323	0.67544	0.62885	0.60469	0.29015	0.42957
sigma2	2.56309	7.48964	5.19982	5.27043	7.24331	1.82038	0.35009
sigma3	0.17089	0.96724	0.34780	0.23084	0.21071	0.27618	0.79409
x low	16.27026	17.44028	16.70652	16.80027	16.32876	0.38767	0.02320
x high	22.18039	23.40042	22.80541	22.70041	22.48540	0.46221	0.02027
x ret.	62.74786	72.68951	68.93377	71.36922	71.19826	3.91673	0.05682
x shift	5.13012	7.07016	6.09889	6.43015	5.61513	0.66965	0.10980
a	25.06041	29.67035	28.01789	28.28370	29.43986	1.52249	0.05434
b	0.02010	0.04069	0.03144	0.03289	0.02731	0.00650	0.20663

Summary statistics for the total population of Hungary without a retirement peak: 7 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.13064	2.13464	0.71087	0.47229	0.23084	0.75975	1.06875
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	10.07720	18.81879	12.89946	10.86141	10.51428	3.68319	0.28553
a1	0.00330	0.01593	0.01045	0.01240	0.00393	0.00522	0.49965
alpha1	0.17236	0.37358	0.24483	0.24450	0.18242	0.07000	0.28591
a2	0.07082	0.10192	0.08996	0.09241	0.07237	0.01028	0.11428
mu2	15.62418	18.95611	17.22307	17.53528	15.79078	1.42781	0.08290
alpha2	0.09495	0.15195	0.13046	0.13107	0.14910	0.02138	0.16388
lambda2	0.24078	0.59629	0.41459	0.37163	0.32966	0.12926	0.31177
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00326	0.00428	0.00381	0.00373	0.00423	0.00042	0.11055
mean age	31.10266	33.15700	31.96349	32.00492	31.20538	0.71427	0.02235
%(0-14)	8.28110	13.84877	11.23482	12.43240	8.55948	2.46649	0.21954
%(15-64)	73.97253	81.60341	77.70294	77.24712	75.11716	2.94927	0.03796
%(65+)	9.90099	12.17871	11.06224	10.81083	12.06482	1.03134	0.09323
delta1c	0.79678	4.03978	2.73490	3.32747	0.95893	1.28987	0.47163
delta12	0.03906	0.16216	0.11447	0.12569	0.15600	0.05245	0.45818
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.14650	3.09410	1.95821	1.82489	1.24388	0.73893	0.37735
sigma2	1.58466	6.28032	3.40439	2.63601	2.28901	1.66463	0.48897
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.62013	13.09019	11.68301	11.67015	11.73166	0.77332	0.06619
x high	18.47031	20.99037	19.84177	20.33035	18.59631	1.08176	0.05452
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.64015	10.22023	8.15876	7.90018	6.81915	1.22065	0.14961
a	31.98261	55.53356	41.49559	35.42572	33.16016	9.56251	0.23045
b	0.03795	0.04959	0.04272	0.04177	0.04086	0.00373	0.08740

Summary statistics for the total population of Hungary with a retirement slope: 25 schedules.

	lowest value	highest value	mean value	median	mode	std. dev.	std. dev. / mean
gmr (obs)	0.08771	3.80248	0.92281	0.35561	0.27345	1.15148	1.24781
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000
mae%m	4.89345	12.97295	8.51940	8.36460	8.52923	2.26151	0.26545
a1	0.00505	0.02273	0.01497	0.01474	0.01477	0.00448	0.29931
alpha1	0.12606	0.33951	0.19268	0.17129	0.15808	0.05620	0.29168
a2	0.07316	0.12793	0.09908	0.09790	0.09781	0.01350	0.13624
mu2	17.23109	20.77004	18.73634	19.02641	19.17752	1.04162	0.05559
alpha2	0.09383	0.20285	0.15866	0.15747	0.14289	0.02715	0.17111
lambda2	0.20185	0.37486	0.27448	0.26804	0.26240	0.03984	0.14516
a3	0.00001	0.00178	0.00032	0.00019	0.00010	0.00039	1.22796
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00436	0.06211	0.03339	0.03045	0.03035	0.01448	0.43345
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00091	0.00486	0.00265	0.00240	0.00229	0.00098	0.37183
mean age	29.63155	39.95061	34.14457	33.49084	33.24322	2.51858	0.07376
%(0-14)	8.28035	18.86661	13.41424	13.58471	14.10279	2.80661	0.20923
%(15-64)	65.67160	75.63367	70.82892	71.06123	71.15075	2.70972	0.03826
%(65+)	10.51482	23.40787	15.75685	15.42784	15.02739	3.12025	0.19802
delta1c	1.32364	21.93596	6.97334	6.33304	6.47672	4.57756	0.65644
delta12	0.04552	0.24074	0.15406	0.15763	0.11385	0.05060	0.32847
delta32	0.00014	0.01554	0.00318	0.00167	0.00091	0.00367	1.15420
beta12	0.79696	2.00363	1.22783	1.17916	0.85729	0.32345	0.26343
sigma2	0.99508	3.58419	1.82030	1.70936	1.38345	0.59299	0.32577
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.22012	12.12016	11.19414	11.24014	11.64515	0.54132	0.04836
x high	19.65034	21.61038	20.62596	20.66036	20.14035	0.51739	0.02508
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.30019	10.64024	9.43182	9.30021	9.11921	0.52667	0.05584
a	27.61854	39.83525	32.99152	32.40030	36.78108	3.58805	0.10876
b	0.02970	0.04574	0.03738	0.03683	0.03692	0.00349	0.09324

APPENDIX C

NATIONAL PARAMETERS AND VARIABLES OF THE FULL SETS OF OBSERVED MODEL MIGRATION SCHEDULES

C.1	Sweden (1974)	C.5	Soviet Union (1974)
C.2	United Kingdom (1970)	C.6	United States (1970)
C.3	Japan (1970)	C.7	Hungary (1974)
C.4	Netherlands (1974)		

Legend

gmr (obs)	Observed gross migraproduction rate
gmr (mms)	Unit gross migraproduction rate
mae%m	Goodness-of-fit index *E* (mean absolute error as a percentage of the observed mean)
a1	a_1, level of pre-labor force component
alpha1	α_1, rate of descent of pre-labor force component
a2	a_2, level of labor force component
mu2	μ_2, mean age of labor force component
alpha2	α_2, rate of descent of labor force component
lambda2	λ_2, rate of ascent of labor force component
a3	a_3, level of post-labor force component
mu3	μ_3, mean age of post-labor force component
alpha3	α_3, rate of descent of post-labor force component
lambda3	λ_3, rate of ascent of post-labor force component
c	c, constant component
mean age	$\bar{n}$, mean age of migration schedule
%(0–14)	Percentage of *GMR* in 0–14 age interval
%(15–64)	Percentage of *GMR* in 15–64 age interval
%(65+)	Percentage of *GMR* in 65 and over age interval
delta1c	$\delta_{1c} = a_1/c$
delta12	$\delta_{12} = a_1/a_2$
delta32	$\delta_{32} = a_3/a_2$
beta12	$\beta_{12} = \alpha_1/\alpha_2$
sigma2	$\sigma_2 = \lambda_2/\alpha_2$
sigma3	$\sigma_3 = \lambda_3/\alpha_3$
x low	x_l, low point
x high	x_h, high point
x ret.	x_r, retirement peak
x shift	X, labor force shift
a	A, parental shift
b	B, jump

APPENDIX C.1 Sweden (1974).*

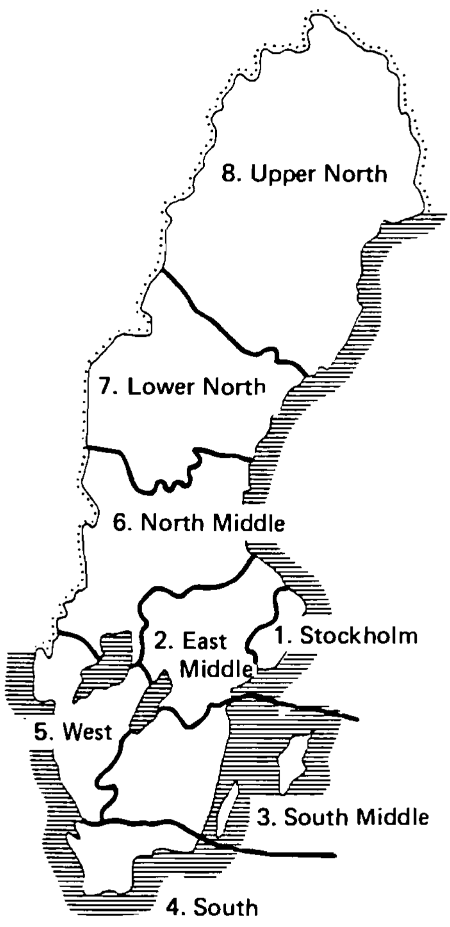

FIGURE C.1 Map of the regional aggregation of Sweden used for this study.

*Input data are for single years of age. This is the only country in the comparative study for which this is the case.

Males.

	1	2	3	4	5	6	7	8
gmr (obs)	0.49721	0.14028	0.18003	0.16041	0.23770	0.12798	0.11080	1.45443
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	14.38755	18.73808	18.38059	17.52322	16.05068	23.20831	19.79624	6.91029
a1	0.02932	0.02749	0.01617	0.02775	0.03131	0.02884	0.04425	0.02921
alpha1	0.10390	0.09740	0.06715	0.09068	0.12939	0.11569	0.15283	0.09737
a2	0.03624	0.03431	0.04539	0.04400	0.04067	0.04472	0.07344	0.04076
mu2	20.52766	21.48693	25.74848	20.15494	21.76578	22.73165	20.81563	20.80080
alpha2	0.06941	0.09232	0.14450	0.07750	0.08806	0.09838	0.10252	0.07706
lambda2	0.44182	0.31818	0.14625	0.61686	0.31284	0.25979	0.35142	0.37440
a3	0.00000	0.00016	0.00022	0.00390	0.00010	0.00000	0.00000	0.00014
mu3	0.00000	73.32459	74.92422	77.69675	76.69698	0.00000	0.00000	76.55451
alpha3	0.00000	0.94211	0.86034	0.27276	0.85776	0.00000	0.00000	0.77600
lambda3	0.00000	0.18034	0.16482	0.11187	0.14679	0.00000	0.00000	0.14487
c	0.00311	0.00453	0.00516	0.00181	0.00362	0.00472	0.00131	0.00215
mean age	31.75264	33.56488	35.86642	30.73515	34.12481	33.36843	26.14594	31.02171
%(0-14)	25.46029	26.52260	21.41147	24.18183	24.55616	25.12213	26.52485	25.60827
%(15-64)	63.88061	59.15461	61.85583	65.58600	61.27226	61.50196	69.22668	64.49210
%(65+)	10.65910	14.32279	16.73270	10.23217	14.17159	13.37591	4.24847	9.89963
delta1c	9.43177	6.06509	3.13523	15.29907	8.64841	6.10613	33.70855	13.55640
delta12	0.80899	0.80125	0.35630	0.63065	0.76989	0.64480	0.60261	0.71646
delta32	0.00000	0.00461	0.00490	0.08854	0.00240	0.00000	0.00000	0.00344
beta12	1.49699	1.05500	0.46474	1.17007	1.46937	1.17591	1.49074	1.26349
sigma2	6.36588	3.44651	1.01214	7.95960	3.55263	2.64070	3.42785	4.85854
sigma3	0.00000	0.19142	0.19158	0.41012	0.17113	0.00000	0.00000	0.18669
x low	16.76027	16.42026	13.35019	17.28028	16.41026	16.27026	15.72025	16.39026
x high	24.41044	24.97046	25.30046	23.33042	25.59047	26.19049	24.21044	24.68045
x ret.	0.00000	64.08767	64.86784	68.85869	64.60778	0.00000	0.00000	64.79782
x shift	7.65018	8.55020	11.95027	6.05014	9.18021	9.92023	8.49019	8.29019
a	28.53181	25.07877	28.46198	28.51704	29.00578	28.77503	29.61704	27.86707
b	0.01904	0.01345	0.01148	0.02602	0.01735	0.01625	0.03337	0.01991

1 sweden males 1 to 2
2 sweden males 1 to 3
3 sweden males 1 to 4
4 sweden males 1 to 5
5 sweden males 1 to 6
6 sweden males 1 to 7
7 sweden males 1 to 8
8 sweden males 1 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.44882	0.46135	0.15383	0.15250	0.23148	0.26972	0.08317	0.10183	1.44136
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	11.79447	11.87554	19.55754	19.08109	15.31033	14.72713	28.61857	22.77179	7.75375
a1	0.01885	0.02513	0.02750	0.02134	0.02479	0.02898	0.03509	0.03364	0.02454
alpha1	0.08413	0.10612	0.09468	0.04069	0.07769	0.11561	0.09006	0.10608	0.08796
a2	0.06903	0.07136	0.05142	0.04009	0.05771	0.04863	0.04295	0.06998	0.05508
mu2	19.81710	20.74837	20.99720	20.88873	20.65335	20.29992	20.67274	22.76923	20.27023
alpha2	0.10337	0.12122	0.08546	0.09550	0.09493	0.08310	0.05701	0.11486	0.08966
lambda2	0.43329	0.44707	0.35699	0.57927	0.42594	0.37255	0.40364	0.25322	0.40564
a3	0.00000	0.00000	0.00000	0.00001	0.00004	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	75.07949	73.71991	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	1.26871	1.13584	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.18770	0.19971	0.00000	0.00000	0.00000	0.00000
c	0.00217	0.00292	0.00241	0.00124	0.00165	0.00289	0.00000	0.00225	0.00202
mean age	29.45881	29.58655	29.99906	30.30155	28.90131	30.82533	28.31009	28.02732	29.16633
%(0-14)	18.64863	22.27053	24.12612	24.40201	23.35133	23.65187	26.63632	26.81819	22.81134
%(15-64)	74.56419	69.21748	67.97430	67.11652	69.99423	67.04594	68.71913	66.57432	70.38004
%(65+)	6.78719	8.51199	7.89958	8.48147	6.65444	9.30219	4.64455	6.60749	6.80862
delta1c	8.67208	8.60623	11.42894	17.21542	15.06980	10.02908	0.00000	14.96033	12.14336
delta12	0.27310	0.35221	0.53480	0.53239	0.42962	0.59591	0.81710	0.48074	0.44555
delta32	0.00000	0.00000	0.00000	0.00036	0.00070	0.00000	0.00000	0.00000	0.00000
beta12	0.81387	0.87545	1.10792	0.42608	0.81842	1.39118	1.57959	0.92351	0.98098
sigma2	4.19165	3.68807	4.17721	6.06593	4.48710	4.48313	7.07970	2.20451	4.52395
sigma3	0.00000	0.00000	0.00000	0.14795	0.17583	0.00000	0.00000	0.00000	0.00000
x low	15.50024	16.54026	16.20026	17.78029	16.47026	15.70024	16.69027	15.88025	15.92025
x high	23.01041	23.57043	24.74045	23.79043	23.97043	24.11044	25.07046	25.65047	23.78043
x ret.	0.00000	0.00000	0.00000	64.83783	64.87784	0.00000	0.00000	0.00000	0.00000
x shift	7.51017	7.03016	8.54020	6.01014	7.50017	8.41019	8.38019	9.77022	7.86018
a	31.63033	28.79039	29.85372	27.18375	29.28372	29.99037	30.29180	28.51042	29.98704
b	0.03500	0.03441	0.02375	0.02151	0.02832	0.02341	0.02187	0.02493	0.02768

1 sweden males 2 to 1
2 sweden males 2 to 2
3 sweden males 2 to 3
4 sweden males 2 to 4
5 sweden males 2 to 5
6 sweden males 2 to 6
7 sweden males 2 to 7
8 sweden males 2 to 8
9 sweden males 2 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.22279	0.27829	0.29545	0.34976	0.33738	0.07395	0.02427	0.04074	1.32718
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.81826	19.76009	16.83701	18.80753	18.06145	34.43987	65.50159	46.17618	12.02934
a1	0.01550	0.02803	0.02338	0.02032	0.02717	0.03347	0.03120	0.03448	0.02409
alpha1	0.03940	0.11992	0.05036	0.07682	0.11137	0.10996	0.17194	0.08780	0.09607
a2	0.08437	0.07861	0.04076	0.05961	0.07030	0.05573	0.00341	0.04905	0.06884
mu2	19.94683	20.15295	19.69622	19.55542	20.37078	21.07617	42.83605	20.27207	19.91879
alpha2	0.13853	0.12198	0.07157	0.09329	0.10354	0.09343	0.43459	0.05837	0.10435
lambda2	0.62864	0.37244	0.93646	0.41451	0.33839	0.43068	0.09271	0.49369	0.40439
a3	0.00000	0.00000	0.00821	0.00000	0.00000	0.00012	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	64.63842	0.00000	0.00000	74.08085	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.27775	0.00000	0.00000	1.13267	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	1.64049	0.00000	0.00000	0.20566	0.00000	0.00000	0.00000
c	0.00124	0.00269	0.00000	0.00219	0.00212	0.00251	0.00634	0.00000	0.00196
mean age	28.17307	28.63306	28.14944	29.52734	28.63773	30.27205	33.43046	28.57291	28.28833
%(0-14)	18.35129	22.13937	23.83321	20.30061	21.85455	25.29545	19.70188	24.45666	21.39600
%(15-64)	76.02036	70.17955	70.51842	72.64585	71.64287	65.05975	66.19437	71.09943	72.47239
%(65+)	5.62836	7.68108	5.64838	7.05354	6.50259	9.64480	14.10374	4.44392	6.13161
delta1c	12.45392	10.42499	0.00000	9.26599	12.80452	13.35583	4.92144	0.00000	12.26357
delta12	0.18373	0.35661	0.57357	0.34082	0.38657	0.60052	9.16108	0.70303	0.34997
delta32	0.00000	0.00000	0.20141	0.00000	0.00000	0.00214	0.00000	0.00000	0.00000
beta12	0.28444	0.98308	0.70366	0.82347	1.07562	1.17700	0.39564	1.50416	0.92063
sigma2	4.53795	3.05320	13.08435	4.44309	3.26830	4.60983	0.21334	8.45777	3.87523
sigma3	0.00000	0.00000	5.90629	0.00000	0.00000	0.18157	0.00000	0.00000	0.00000
x low	16.74027	15.18023	17.73029	15.20023	15.07023	16.98027	14.12021	16.85027	15.41024
x high	22.30040	23.04041	22.28040	22.97041	23.71043	24.45045	26.15048	24.27044	23.12041
x ret.	0.00000	0.00000	65.66801	0.00000	0.00000	65.73802	0.00000	0.00000	0.00000
x shift	5.56013	7.86018	4.55010	7.77018	8.64020	7.47017	12.03028	7.42017	7.71018
a	29.26702	28.70037	28.87369	30.77034	30.43036	28.39706	28.91473	31.49702	29.93369
b	0.04425	0.03428	0.02804	0.02954	0.03111	0.02584	0.03064	0.02533	0.03347

1 sweden males 3 to 1
2 sweden males 3 to 2
3 sweden males 3 to 3
4 sweden males 3 to 4
5 sweden males 3 to 5
6 sweden males 3 to 6
7 sweden males 3 to 7
8 sweden males 3 to 8
9 sweden males 3 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.18669	0.14428	0.20545	0.58375	0.21547	0.05748	0.02478	0.03378	0.86793
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	17.90503	25.11287	19.02630	15.50543	20.75154	35.25547	48.29742	41.58521	10.93030
a1	0.02136	0.02695	0.02644	0.02267	0.03298	0.03120	0.02568	0.04891	0.02861
alpha1	0.10034	0.12490	0.10059	0.10246	0.14833	0.10513	0.06762	0.14740	0.11726
a2	0.07544	0.08532	0.07130	0.05697	0.08796	0.05564	0.04265	0.08066	0.07587
mu2	20.05895	21.93276	21.33914	19.79724	22.50582	21.88145	18.88110	20.90952	21.17063
alpha2	0.11654	0.13676	0.12309	0.10374	0.12629	0.11205	0.07271	0.09079	0.11503
lambda2	0.36309	0.21836	0.31960	0.40962	0.21303	0.50253	0.49753	0.25343	0.26886
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00285	0.00326	0.00305	0.00360	0.00233	0.00433	0.00285	0.00000	0.00216
mean age	29.80396	29.77975	29.55778	31.30268	28.57587	31.37809	30.38947	24.71596	28.26020
%(0-14)	19.63763	21.56236	23.51498	21.49950	22.05305	25.92904	23.85927	26.43092	22.76177
%(15-64)	72.12371	69.39305	67.76852	67.96104	71.25178	62.64716	67.24651	72.21613	70.73129
%(65+)	8.23866	9.04459	8.71650	10.53946	6.69518	11.42380	8.89422	1.35294	6.50694
delta1c	7.49798	8.25829	8.66074	6.29003	14.18169	7.21011	8.99523	0.00000	13.27378
delta12	0.28314	0.31585	0.37077	0.39786	0.37499	0.56075	0.60207	0.60644	0.37703
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.86098	0.91326	0.81726	0.98763	1.17455	0.93825	0.93003	1.62339	1.01937
sigma2	3.11568	1.59669	2.59658	3.94838	1.68685	4.48492	6.84262	2.79128	2.33723
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.93023	13.53020	15.65024	15.39024	13.94020	18.24030	15.48024	14.29021	14.52022
x high	23.07041	23.92043	24.16044	23.00041	24.84045	24.75045	22.41040	24.77045	24.16044
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.14019	10.39024	8.51019	7.61017	10.90025	6.51015	6.93016	10.48024	9.64022
a	30.27750	29.55116	28.33373	29.08703	31.14039	27.06376	27.63704	31.16268	29.89610
b	0.03325	0.02771	0.02841	0.02702	0.03004	0.02549	0.02031	0.02998	0.02966

1 sweden males 4 to 1
2 sweden males 4 to 2
3 sweden males 4 to 3
4 sweden males 4 to 4
5 sweden males 4 to 5
6 sweden males 4 to 6
7 sweden males 4 to 7
8 sweden males 4 to 8
9 sweden males 4 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.14456	0.15766	0.13176	0.16788	0.83908	0.11354	0.03729	0.04940	0.80208
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	18.46101	16.36193	16.58056	16.99601	6.32477	18.85471	31.45989	25.26701	9.32050
a1	0.01852	0.02679	0.02540	0.02010	0.03128	0.03804	0.04257	0.03357	0.02602
alpha1	0.06495	0.09232	0.07356	0.05861	0.11522	0.14443	0.11601	0.09411	0.08951
a2	0.06457	0.06832	0.05347	0.04441	0.05475	0.06685	0.04732	0.05950	0.05692
mu2	20.21026	20.99600	21.02562	19.90371	20.77676	21.16585	19.60741	19.94070	20.36493
alpha2	0.09692	0.10759	0.11000	0.07835	0.08593	0.11041	0.06156	0.07786	0.09146
lambda2	0.41745	0.38743	0.45240	0.45754	0.37282	0.37456	0.59398	0.42721	0.41594
a3	0.00000	0.00000	0.00000	0.00013	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	82.28864	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.52459	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.10170	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00169	0.00200	0.00291	0.00149	0.00185	0.00275	0.00000	0.00000	0.00180
mean age	29.16209	28.16612	29.34510	30.88699	28.90808	28.81280	26.64668	25.65772	28.49074
%(0-14)	19.32409	23.57239	25.88244	21.35281	24.50504	25.74249	27.75659	25.44501	23.53576
%(15-64)	74.89941	70.31366	65.44968	70.00710	68.94920	66.25695	68.59250	72.53471	70.33982
%(65+)	5.77650	6.11395	8.66788	8.64010	6.54575	8.00056	3.65091	2.02029	6.12442
delta1c	10.97071	13.39457	8.72132	13.51922	16.89068	13.85357	0.00000	0.00000	14.41825
delta12	0.28688	0.39214	0.47503	0.45275	0.57131	0.56901	0.89970	0.56412	0.45722
delta32	0.00000	0.00000	0.00000	0.00294	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.67019	0.85804	0.66868	0.74805	1.34078	1.30808	1.88453	1.20869	0.97865
sigma2	4.30718	3.60080	4.11270	5.83983	4.33861	3.39231	9.64897	5.48706	4.54787
sigma3	0.00000	0.00000	0.00000	0.19387	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.78025	16.32026	17.07028	16.06025	16.12025	16.31026	16.73027	15.92025	16.11025
x high	23.55042	24.14044	23.95043	23.49042	24.52045	24.32044	23.18042	23.67043	23.80043
x ret.	0.00000	0.00000	0.00000	65.53798	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.77018	7.82018	6.88016	7.43017	8.40019	8.01018	6.45015	7.75018	7.69018
a	31.87034	29.22039	26.54375	30.40369	30.34037	28.76039	29.43748	29.76371	29.56704
b	0.03222	0.03151	0.02521	0.02375	0.02714	0.03017	0.02775	0.03031	0.02876

1 sweden males 5 to 1
2 sweden males 5 to 2
3 sweden males 5 to 3
4 sweden males 5 to 4
5 sweden males 5 to 5
6 sweden males 5 to 6
7 sweden males 5 to 7
8 sweden males 5 to 8
9 sweden males 5 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.28526	0.39119	0.05726	0.06849	0.22765	0.15697	0.10660	0.08057	1.21702
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	18.00820	15.38055	39.60669	40.26777	18.57688	26.72211	26.33018	29.42573	10.73805
a1	0.01859	0.02648	0.02810	0.02626	0.02444	0.02681	0.03192	0.03946	0.02544
alpha1	0.10376	0.10924	0.07782	0.09976	0.11295	0.10497	0.10674	0.11958	0.10380
a2	0.09088	0.07645	0.06116	0.04358	0.07994	0.04656	0.04120	0.07070	0.06899
mu2	19.31207	20.21748	25.50892	17.32828	20.45310	19.96216	19.27206	22.73706	19.75376
alpha2	0.12250	0.11721	0.10526	0.06017	0.12343	0.07881	0.06321	0.10426	0.10330
lambda2	0.51752	0.40102	0.16894	0.34878	0.36644	0.41541	1.13704	0.30610	0.43684
a3	0.00000	0.00000	0.00014	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	71.79685	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	1.07409	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.19816	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00213	0.00229	0.00237	0.00238	0.00285	0.00309	0.00176	0.00173	0.00191
mean age	28.46342	28.23425	30.74753	31.13234	29.44569	31.39447	29.72525	27.47707	28.08992
%(0-14)	16.41148	21.98790	25.05288	21.27886	20.61826	22.83481	24.29099	27.45868	21.51865
%(15-64)	77.42499	71.26087	67.12347	69.65226	71.24463	67.36741	68.18456	67.25638	72.50780
%(65+)	6.16353	6.75123	7.82365	9.06889	8.13712	9.79778	7.52446	5.28494	5.97356
delta1c	8.72491	11.54908	11.84362	11.04605	8.57114	8.66918	18.11756	22.86458	13.33818
delta12	0.20451	0.34634	0.45956	0.60262	0.30565	0.57570	0.77492	0.55811	0.36867
delta32	0.00000	0.00000	0.00228	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.84696	0.93201	0.73930	1.65792	0.91510	1.33196	1.68874	1.14700	1.00479
sigma2	4.22451	3.42123	1.60498	5.79623	2.96886	5.27116	17.98880	2.93600	4.22868
sigma3	0.00000	0.00000	0.18449	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.50024	15.59024	15.57024	12.81018	15.33024	15.82025	17.64029	16.97027	15.56024
x high	22.05039	23.17042	27.76052	21.90039	23.32042	23.73043	21.69038	26.08048	22.93041
x ret.	0.00000	0.00000	63.16779	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.55015	7.58017	12.19028	9.09021	7.99018	7.91018	4.05009	9.11021	7.37017
a	31.42365	29.10371	30.34711	30.79200	29.66703	30.16369	29.59698	29.50708	29.91702
b	0.04675	0.03549	0.01626	0.01937	0.03474	0.02301	0.02888	0.02841	0.03488

1 sweden males 6 to 1
2 sweden males 6 to 2
3 sweden males 6 to 3
4 sweden males 6 to 4
5 sweden males 6 to 5
6 sweden males 6 to 6
7 sweden males 6 to 7
8 sweden males 6 to 8
9 sweden males 6 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.37027	0.24937	0.05391	0.08544	0.13971	0.20182	0.17963	0.23127	1.33180
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	18.97245	24.40549	53.02048	62.98674	36.77934	29.75115	35.53116	23.28769	11.76225
a1	0.01969	0.02358	0.03298	0.02634	0.01874	0.03463	0.03205	0.03406	0.02522
alpha1	0.13054	0.08059	0.25450	0.18612	0.03460	0.16016	0.14934	0.15172	0.12281
a2	0.10143	0.08440	0.06929	0.10038	0.05547	0.06471	0.05118	0.10391	0.08149
mu2	19.24769	19.79847	16.05688	21.80620	19.30947	19.69341	20.36539	23.80138	19.61678
alpha2	0.14950	0.11222	0.07237	0.13694	0.09098	0.10618	0.09830	0.15343	0.11775
lambda2	0.70375	0.43200	0.21416	0.19407	1.55482	0.37807	0.79105	0.23748	0.42724
a3	0.00000	0.00040	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	85.71539	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.41659	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.09179	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00322	0.00039	0.00271	0.00496	0.00000	0.00363	0.00472	0.00263	0.00222
mean age	29.62311	27.38409	30.95752	32.61270	28.04067	30.51160	32.80505	28.87290	28.24110
%(0-14)	16.50127	19.83781	18.20335	16.78674	19.72814	22.66263	22.79895	22.25990	19.84127
%(15-64)	74.59553	74.10361	73.36386	71.53071	76.14981	67.22253	64.49696	70.48548	73.61060
%(65+)	8.90320	6.05858	8.43279	11.68255	4.12206	10.11485	12.70409	7.25462	6.54813
delta1c	6.10535	60.22449	12.14800	5.30830	0.00000	9.53883	6.79034	12.92696	11.38261
delta12	0.19410	0.27933	0.47590	0.26244	0.33794	0.53512	0.62619	0.32778	0.30953
delta32	0.00000	0.00468	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.87321	0.71811	3.51656	1.35910	0.38031	1.50841	1.51920	0.98888	1.04298
sigma2	4.70748	3.84963	2.95916	1.41718	17.08967	3.56080	8.04736	1.54783	3.62842
sigma3	0.00000	0.22035	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	16.31026	15.47024	8.72009	11.97016	18.01030	14.90023	17.92030	15.59024	15.19023
x high	21.43038	22.80041	21.06037	23.55042	21.10037	22.96041	22.96041	25.58047	22.56040
x ret.	0.00000	68.95871	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	5.12012	7.33017	12.34028	11.58027	3.09007	8.06018	5.04012	9.99023	7.37017
a	29.39033	29.79369	37.28526	33.41398	30.96697	29.41750	29.46701	30.76039	30.15368
b	0.05398	0.03986	0.02425	0.02812	0.03890	0.02871	0.02936	0.03551	0.03955

1 sweden males 7 to 1
2 sweden males 7 to 2
3 sweden males 7 to 3
4 sweden males 7 to 4
5 sweden males 7 to 5
6 sweden males 7 to 6
7 sweden males 7 to 7
8 sweden males 7 to 8
9 sweden males 7 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.26875	0.23209	0.05226	0.06520	0.13308	0.11073	0.17172	0.23786	1.03383
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	22.37707	26.54085	57.28117	48.79062	32.96115	40.98153	33.53604	22.98794	14.95188
a1	0.02127	0.02078	0.04884	0.01829	0.02194	0.03999	0.02623	0.03299	0.02336
alpha1	0.19777	0.08039	0.37792	0.07491	0.12937	0.40526	0.13381	0.16523	0.13534
a2	0.12465	0.06384	0.06175	0.05075	0.09340	0.08879	0.05882	0.07831	0.07670
mu2	19.38876	19.63455	30.73443	19.09658	19.54120	23.99384	21.10875	20.33439	19.46920
alpha2	0.16617	0.10773	0.19347	0.07291	0.13312	0.18775	0.09859	0.11341	0.11362
lambda2	0.46183	0.85778	0.12435	1.76712	0.36244	0.21789	0.68476	0.38107	0.44912
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00325	0.00294	0.00764	0.00300	0.00357	0.00704	0.00395	0.00279	0.00282
mean age	29.71777	29.87549	37.05132	32.24445	30.33252	36.54450	32.67766	29.52470	29.91274
%(0-14)	13.88474	20.58014	18.83870	17.39176	17.58356	16.75358	20.29725	20.74366	18.28846
%(15-64)	77.21950	70.99649	63.51167	73.32820	72.93925	65.92984	68.65950	71.29800	73.46371
%(65+)	8.89576	8.42338	17.64963	9.28004	9.47719	17.31658	11.04325	7.95834	8.24783
delta1c	6.53859	7.05980	6.39003	6.09238	6.13831	5.67665	6.63788	11.83138	8.28689
delta12	0.17064	0.32544	0.79092	0.36035	0.23485	0.45039	0.44583	0.42131	0.30465
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.19014	0.74620	1.95331	1.02751	0.97177	2.15851	1.35729	1.45693	1.19110
sigma2	2.77922	7.96217	0.64271	24.23831	2.72256	1.16055	6.94582	3.36017	3.95272
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.79022	17.36028	12.66018	17.96030	14.22021	13.52020	18.26030	15.37024	15.21023
x high	21.60038	21.99039	27.19051	20.86036	22.24039	24.69045	23.89043	23.46042	22.47040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.81016	4.63011	14.53033	2.90007	8.02018	11.17026	5.63013	8.09019	7.26017
a	31.51460	29.03035	37.07216	34.44691	30.36892	36.02877	32.36367	31.66034	31.61032
b	0.05504	0.03831	0.01966	0.03478	0.03758	0.02711	0.03321	0.03568	0.03833

1 sweden males 8 to 1
2 sweden males 8 to 2
3 sweden males 8 to 3
4 sweden males 8 to 4
5 sweden males 8 to 5
6 sweden males 8 to 6
7 sweden males 8 to 7
8 sweden males 8 to 8
9 sweden males 8 to the rest

Females.

	1	2	3	4	5	6	7	8
gmr (obs)	0.49345	0.13278	0.16631	0.15949	0.23508	0.12988	0.10997	1.42697
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	11.28757	20.49792	18.82178	16.58710	15.50700	20.65920	19.98289	7.29242
a1	0.03078	0.02149	0.01923	0.02456	0.03060	0.02809	0.03472	0.02854
alpha1	0.11330	0.08182	0.07126	0.08309	0.10413	0.07457	0.12062	0.09131
a2	0.04703	0.04146	0.04118	0.04745	0.04541	0.04018	0.08486	0.04722
mu2	19.65185	19.09032	20.16404	19.25090	19.33387	19.14319	19.33588	19.31926
alpha2	0.10289	0.09871	0.09475	0.08997	0.09427	0.09053	0.13434	0.09351
lambda2	0.37336	0.27430	0.25324	0.35824	0.41696	0.50686	0.45609	0.36888
a3	0.00000	0.00013	0.00037	0.00768	0.00014	0.00000	0.00000	0.00013
mu3	0.00000	73.38062	75.71075	60.29656	74.70483	0.00000	0.00000	85.01035
alpha3	0.00000	0.96737	0.47858	0.14923	0.90737	0.00000	0.00000	0.36935
lambda3	0.00000	0.18530	0.09788	0.34985	0.16794	0.00000	0.00000	0.07245
c	0.00390	0.00444	0.00358	0.00251	0.00297	0.00298	0.00216	0.00219
mean age	30.53835	33.03862	33.98676	30.79637	30.32676	28.92560	25.84219	29.54026
%(0-14)	26.68320	23.61790	21.69331	23.57702	26.38641	27.98090	25.80983	25.95387
%(15-64)	61.93792	62.63004	66.40550	66.31138	62.89375	62.94753	68.10368	65.10331
%(65+)	11.37887	13.75206	11.90118	10.11160	10.71983	9.07157	6.08649	8.94282
delta1c	7.89139	4.83614	5.37349	9.80393	10.29016	9.43742	16.07569	13.05533
delta12	0.65449	0.51823	0.46695	0.51767	0.67379	0.69929	0.40917	0.60433
delta32	0.00000	0.00320	0.00903	0.16192	0.00302	0.00000	0.00000	0.00279
beta12	1.10123	0.82889	0.75216	0.92352	1.10458	0.82374	0.89788	0.97650
sigma2	3.62888	2.77878	2.67287	3.98162	4.42285	5.59885	3.39513	3.94488
sigma3	0.00000	0.19155	0.20453	2.34431	0.18508	0.00000	0.00000	0.19616
x low	15.13023	13.17019	13.67020	14.56022	15.30024	15.82025	15.27024	14.81022
x high	22.85041	22.34040	23.54042	22.77041	22.63040	22.23039	21.92039	22.70041
x ret.	0.00000	64.39774	59.12847	62.22795	64.59778	0.00000	0.00000	61.46807
x shift	7.72018	9.17021	9.87023	8.21019	7.33017	6.41015	6.65015	7.89018
a	25.03611	25.49425	27.70195	27.15611	25.02372	23.73040	25.52705	25.48611
b	0.02046	0.01454	0.01449	0.02104	0.02126	0.01988	0.03873	0.02123

1 sweden females	1 to 2	5 sweden females	1 to 6
2 sweden females	1 to 3	6 sweden females	1 to 7
3 sweden females	1 to 4	7 sweden females	1 to 8
4 sweden females	1 to 5	8 sweden females	1 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.47590	0.48097	0.15941	0.15252	0.23546	0.27602	0.08433	0.10090	1.48453
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.57396	13.30655	19.84638	23.25052	15.09312	15.39976	26.61785	19.56568	8.28380
a1	0.01944	0.02963	0.02774	0.02367	0.02609	0.02987	0.03824	0.03979	0.02610
alpha1	0.09256	0.13876	0.12062	0.08157	0.10883	0.11567	0.13634	0.12555	0.10837
a2	0.07787	0.08077	0.06811	0.04391	0.06656	0.05547	0.05917	0.06953	0.06477
mu2	18.17883	18.98295	18.87794	18.35994	18.83864	18.39334	19.42144	20.15133	18.51928
alpha2	0.12621	0.13528	0.12185	0.07806	0.11020	0.09794	0.08909	0.11709	0.10914
lambda2	0.58193	0.45073	0.37843	0.62124	0.52503	0.44428	0.43253	0.40476	0.49057
a3	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	76.25882	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.93784	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.15760	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00269	0.00316	0.00361	0.00276	0.00273	0.00295	0.00211	0.00224	0.00267
mean age	28.79165	28.59048	29.65246	30.14259	28.63123	28.88618	27.93528	26.37369	28.38377
%(0-14)	19.06055	22.36243	23.07471	22.82880	22.26280	24.42451	25.38210	28.49266	22.58877
%(15-64)	72.57767	68.63758	66.76675	68.29680	69.73301	66.79877	67.98080	65.05048	69.47562
%(65+)	8.36178	8.99998	10.15854	8.87440	8.00419	8.77672	6.63710	6.45686	7.93561
delta1c	7.22991	9.37925	7.67984	8.58306	9.54351	10.13684	18.14487	17.74829	9.79088
delta12	0.24967	0.36682	0.40731	0.53902	0.39202	0.53837	0.64626	0.57223	0.40298
delta32	0.00019	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.73337	1.02571	0.98988	1.04496	0.98750	1.18094	1.53044	1.07222	0.99296
sigma2	4.61088	3.33189	3.10561	7.95876	4.76422	4.53604	4.85504	3.45680	4.49481
sigma3	0.16804	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.86023	14.79022	14.12021	15.52024	15.32024	14.47022	15.38024	15.75025	14.80022
x high	20.74036	21.58038	21.73038	21.49038	21.71038	21.61038	22.92041	23.07041	21.46038
x ret.	64.81783	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	5.88013	6.79016	7.61017	5.97014	6.39015	7.14016	7.54017	7.32017	6.66015
a	27.84035	26.79466	26.47323	28.05702	27.74369	26.53894	28.73368	25.72373	27.32465
b	0.04145	0.03757	0.02901	0.02522	0.03465	0.02714	0.02910	0.03097	0.03325

1 sweden females 2 to 1
2 sweden females 2 to 2
3 sweden females 2 to 3
4 sweden females 2 to 4
5 sweden females 2 to 5
6 sweden females 2 to 6
7 sweden females 2 to 7
8 sweden females 2 to 8
9 sweden females 2 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.22989	0.30099	0.31010	0.37153	0.37253	0.07139	0.02259	0.03903	1.40795
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.54972	19.01686	20.22930	18.19707	15.74948	36.97505	81.01860	52.75172	10.59490
a1	0.01826	0.02664	0.02522	0.01534	0.02788	0.03078	0.06652	0.03173	0.02335
alpha1	0.08605	0.13501	0.10050	0.02377	0.12120	0.11965	0.37097	0.07072	0.10619
a2	0.08985	0.08655	0.05501	0.07775	0.09039	0.05079	0.11906	0.05617	0.07970
mu2	18.30289	18.53965	18.08877	18.59457	19.21123	18.67773	25.23693	19.47601	18.48962
alpha2	0.14045	0.13392	0.09915	0.16697	0.14144	0.08143	0.42629	0.08147	0.12741
lambda2	0.53745	0.54388	0.65852	0.76076	0.43956	0.99623	0.23196	0.74376	0.56001
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00290	0.00296	0.00316	0.00055	0.00268	0.00298	0.00815	0.00109	0.00262
mean age	28.47035	28.35329	29.45487	29.25317	27.51992	30.02257	33.92778	26.59309	27.95831
%(0-14)	18.53241	20.27774	22.76306	19.13971	22.08801	22.82447	20.91049	25.78880	20.66912
%(15-64)	73.30567	71.40695	67.99854	72.76660	70.35699	68.28210	62.13239	70.04269	71.73227
%(65+)	8.16192	8.31531	9.23840	8.09369	7.55500	8.89344	16.95712	4.16851	7.59861
delta1c	6.30117	9.00033	7.97898	27.63815	10.41156	10.32108	8.16281	29.21142	8.89679
delta12	0.20324	0.30784	0.45855	0.19728	0.30843	0.60601	0.55875	0.56491	0.29293
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.61267	1.00812	1.01354	0.14235	0.85692	1.46936	0.87023	0.86811	0.83345
sigma2	3.82656	4.06125	6.64150	4.55624	3.10780	12.23371	0.54413	9.12939	4.39538
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.66022	14.98023	15.31024	15.88025	14.88023	16.78027	14.38021	17.05028	15.07023
x high	20.74036	21.07037	20.84036	20.56036	21.72038	21.11037	22.62040	22.28040	21.06037
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.08014	6.09014	5.53013	4.68011	6.84016	4.33010	8.24019	5.23012	5.99014
a	27.49750	27.62750	26.81369	26.15370	26.77037	29.03699	24.98469	27.39371	27.27369
b	0.04389	0.04329	0.03119	0.04156	0.04069	0.03218	0.04032	0.03041	0.04162

1 sweden females 3 to 1
2 sweden females 3 to 2
3 sweden females 3 to 3
4 sweden females 3 to 4
5 sweden females 3 to 5
6 sweden females 3 to 6
7 sweden females 3 to 7
8 sweden females 3 to 8
9 sweden females 3 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.18042	0.13072	0.20453	0.61675	0.21544	0.05309	0.02256	0.03112	0.83788
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	14.40119	19.37475	18.33923	12.02150	15.80896	31.33330	60.83579	40.55485	8.80887
a1	0.02210	0.02614	0.02579	0.02232	0.02538	0.03136	0.02439	0.03015	0.02490
alpha1	0.12149	0.11010	0.09188	0.10229	0.12121	0.10270	0.03429	0.08033	0.10419
a2	0.08829	0.07817	0.06822	0.06769	0.09239	0.06784	0.04536	0.06995	0.07989
mu2	20.44922	20.17112	18.99365	17.78308	20.01824	20.75632	19.94550	20.03119	19.88172
alpha2	0.13424	0.13263	0.12271	0.12741	0.14288	0.11969	0.07847	0.08720	0.12883
lambda2	0.38635	0.46770	0.60251	0.57422	0.40449	0.44516	0.71499	0.78722	0.44238
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00305	0.00316	0.00284	0.00370	0.00285	0.00316	0.00000	0.00000	0.00251
mean age	29.93616	29.21792	28.12748	29.73679	28.58059	28.84879	28.77427	25.45296	28.13918
%(0-14)	18.75384	22.44046	23.86271	21.53953	20.67719	25.77753	23.25254	23.18344	21.92926
%(15-64)	72.59032	68.66782	67.99608	67.92195	71.27039	65.59948	71.50774	75.35492	70.75705
%(65+)	8.65585	8.89172	8.14121	10.53851	8.05242	8.62299	5.23972	1.46164	7.31369
delta1c	7.25600	8.27304	9.06635	6.03278	8.90250	9.93441	0.00000	0.00000	9.93187
delta12	0.25031	0.33444	0.37808	0.32977	0.27465	0.46229	0.53770	0.43110	0.31166
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.90501	0.83012	0.74877	0.80289	0.84838	0.85807	0.43695	0.92119	0.80877
sigma2	2.87805	3.52647	4.90997	4.50695	2.83107	3.71925	9.11166	9.02729	3.43392
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.43024	16.11025	15.89025	14.51022	15.25023	16.66027	17.39028	17.64029	15.61024
x high	23.12041	22.79041	21.54038	20.32035	22.52040	23.57043	22.85041	22.73041	22.58040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.69018	6.68015	5.65013	5.81013	7.27017	6.91016	5.46012	5.09012	6.97016
a	30.22035	27.48372	25.76705	25.64893	28.09371	26.63041	29.25703	30.16368	27.87371
b	0.03900	0.03646	0.03573	0.03474	0.04041	0.03000	0.02394	0.04099	0.03792

1 sweden females 4 to 1
2 sweden females 4 to 2
3 sweden females 4 to 3
4 sweden females 4 to 4
5 sweden females 4 to 5
6 sweden females 4 to 6
7 sweden females 4 to 7
8 sweden females 4 to 8
9 sweden females 4 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.15428	0.15921	0.13656	0.17448	0.87818	0.11303	0.03708	0.04546	0.82011
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.38082	17.02829	17.16428	16.18052	8.11708	20.26192	31.61677	27.14839	9.29364
a1	0.02158	0.02934	0.02787	0.01969	0.02993	0.02958	0.03429	0.04002	0.02660
alpha1	0.10025	0.11485	0.11278	0.08799	0.11624	0.11635	0.08841	0.11192	0.10561
a2	0.07752	0.07220	0.06198	0.05794	0.05842	0.06665	0.06017	0.07237	0.06738
mu2	20.02990	19.72771	18.53814	19.09944	18.41290	19.30369	20.22464	19.62243	19.36184
alpha2	0.13088	0.12014	0.10655	0.11130	0.09545	0.11143	0.10131	0.10461	0.11411
lambda2	0.35837	0.40633	0.58481	0.78259	0.46171	0.36956	0.58891	0.36735	0.44206
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00348	0.00276	0.00289	0.00370	0.00226	0.00292	0.00176	0.00115	0.00263
mean age	30.26018	28.30129	28.69374	31.09493	27.86862	28.68593	26.25804	24.51402	28.39042
%(0-14)	20.50653	23.80562	23.18428	20.68939	23.92207	23.82170	28.24833	28.37042	23.17745
%(15-64)	69.71413	68.25367	68.38404	68.63347	69.01508	67.78326	66.47886	68.07751	69.03040
%(65+)	9.77934	7.94071	8.43168	10.67714	7.06284	8.39504	5.27281	3.55207	7.79215
delta1c	6.19670	10.62005	9.64629	5.31503	13.27175	10.13828	19.48135	34.70223	10.10850
delta12	0.27840	0.40635	0.44971	0.33986	0.51226	0.44382	0.56988	0.55295	0.39472
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.76594	0.95599	1.05841	0.79063	1.21783	1.04415	0.87267	1.06986	0.92552
sigma2	2.73815	3.38209	5.48842	7.03158	4.83713	3.31659	5.81302	3.51158	3.87385
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.80022	15.23023	15.39024	16.64027	14.60022	14.50022	17.18028	14.93023	15.23023
x high	22.73041	22.60040	21.34037	21.53038	21.66038	22.38040	23.05041	22.82041	22.30040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.93018	7.37017	5.95014	4.89011	7.06016	7.88018	5.87013	7.89018	7.07016
a	28.48752	27.22705	27.00036	27.97702	27.51036	27.26609	25.85040	26.20611	27.42037
b	0.03219	0.03264	0.03357	0.03448	0.03019	0.02896	0.03111	0.03065	0.03271

1 sweden females 5 to 1
2 sweden females 5 to 2
3 sweden females 5 to 3
4 sweden females 5 to 4
5 sweden females 5 to 5
6 sweden females 5 to 6
7 sweden females 5 to 7
8 sweden females 5 to 8
9 sweden females 5 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.33618	0.43132	0.06161	0.06545	0.25773	0.16573	0.09926	0.07833	1.32987
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	15.59799	17.27359	33.78354	40.24480	20.79439	19.67123	31.78105	34.57414	11.52391
a1	0.01065	0.01886	0.03088	0.01870	0.02169	0.03098	0.02873	0.04464	0.02066
alpha1	0.03065	0.08253	0.10830	0.08482	0.09983	0.12934	0.14194	0.13478	0.10173
a2	0.14574	0.09094	0.04282	0.05779	0.09787	0.06596	0.06425	0.07581	0.08715
mu2	18.40889	18.54142	18.60426	18.27238	18.82641	19.22969	18.65681	20.80035	18.17688
alpha2	0.22782	0.16136	0.07664	0.09480	0.15024	0.12451	0.09823	0.12054	0.13928
lambda2	0.66775	0.51842	0.40643	0.43585	0.42934	0.33092	0.45023	0.34688	0.56099
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00158	0.00345	0.00359	0.00399	0.00282	0.00389	0.00331	0.00243	0.00284
mean age	27.66525	29.07642	30.91828	31.86884	27.89493	29.86649	30.33460	26.52850	28.16997
%(0-14)	14.44986	20.19953	24.89964	18.96615	19.84502	24.54928	20.49949	28.91071	19.39806
%(15-64)	78.48260	70.05823	64.49407	70.13966	72.26749	64.60059	70.13815	64.47624	72.44738
%(65+)	7.06754	9.74224	10.60629	10.89420	7.88749	10.85013	9.36236	6.61305	8.15456
delta1c	6.75533	5.46391	8.60890	4.68960	7.67872	7.95778	8.68991	18.37580	7.27156
delta12	0.07304	0.20742	0.72119	0.32367	0.22161	0.46970	0.44724	0.58878	0.23707
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.13453	0.51147	1.41318	0.89473	0.66447	1.03881	1.44504	1.11812	0.73035
sigma2	2.93103	3.21275	5.30341	4.59766	2.85775	2.65782	4.58362	2.87766	4.02771
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.11023	14.75022	14.59022	14.12021	14.32021	13.90020	14.61022	15.68024	14.71022
x high	20.01034	20.73036	22.38040	21.60038	21.20037	22.02039	21.94039	23.70043	20.60036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.90011	5.98014	7.79018	7.48017	6.88016	8.12019	7.33017	8.02018	5.89013
a	25.71703	25.49467	26.57323	30.23605	26.84323	25.69731	30.35461	26.27897	27.01464
b	0.06796	0.04173	0.01932	0.02654	0.04247	0.02573	0.03118	0.02970	0.04440

1 sweden females 6 to 1
2 sweden females 6 to 2
3 sweden females 6 to 3
4 sweden females 6 to 4
5 sweden females 6 to 5
6 sweden females 6 to 6
7 sweden females 6 to 7
8 sweden females 6 to 8
9 sweden females 6 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.45491	0.27257	0.05167	0.08387	0.16087	0.20119	0.18893	0.23831	1.46339
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	20.04963	23.92752	65.23550	46.14219	34.15309	31.60828	27.76896	25.29143	11.38625
a1	0.00968	0.02370	0.02760	0.02956	0.01746	0.02199	0.03187	0.03474	0.02108
alpha1	0.02999	0.13414	0.24375	0.18285	0.02860	0.09747	0.17516	0.14701	0.11853
a2	0.17169	0.11043	0.07556	0.11420	0.07664	0.05848	0.06441	0.08705	0.09628
mu2	18.37997	18.82063	17.99653	19.71651	17.33270	18.34838	17.74540	18.77025	17.93298
alpha2	0.24957	0.18157	0.10880	0.19297	0.15611	0.10036	0.11511	0.12079	0.14796
lambda2	0.65818	0.53553	0.21829	0.41494	1.49869	0.57074	0.59249	0.48060	0.70132
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00157	0.00399	0.00622	0.00560	0.00086	0.00370	0.00443	0.00204	0.00285
mean age	27.30629	29.62359	34.16194	32.10992	27.89495	30.86072	31.12526	26.45053	27.92848
%(0-14)	13.17956	19.39787	17.72468	19.32931	20.20285	20.53079	21.08119	22.26965	18.26012
%(15-64)	79.99929	69.81290	67.90916	66.96500	72.55789	69.15604	66.93164	71.98780	73.64727
%(65+)	6.82114	10.78923	14.36615	13.70568	7.23926	10.31318	11.98717	5.74255	8.09261
delta1c	6.18192	5.93798	4.43589	5.27995	20.25869	5.94370	7.19662	17.00567	7.41025
delta12	0.05639	0.21464	0.36535	0.25885	0.22784	0.37598	0.49482	0.39909	0.21897
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.12016	0.73882	2.24024	0.94755	0.18320	0.97130	1.52170	1.21715	0.80107
sigma2	2.63730	2.94950	2.00628	2.15026	9.60044	5.68720	5.14719	3.97896	4.73979
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.97023	15.04023	9.90011	14.77022	15.94025	15.11023	14.54022	14.85023	15.07023
x high	19.85034	20.81036	21.15037	21.55038	18.83032	21.28037	20.46035	21.58038	20.12035
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.88011	5.77013	11.25026	6.78016	2.89007	6.17014	5.92014	6.73015	5.05012
a	25.86465	25.42370	33.19476	26.37180	24.75035	28.53368	27.88890	28.17320	26.94034
b	0.07611	0.04828	0.02255	0.04023	0.04797	0.03039	0.03319	0.04198	0.05253

1 sweden females 7 to 1
2 sweden females 7 to 2
3 sweden females 7 to 3
4 sweden females 7 to 4
5 sweden females 7 to 5
6 sweden females 7 to 6
7 sweden females 7 to 7
8 sweden females 7 to 8
9 sweden females 7 to the rest

APPENDIX C.1 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.38183	0.27340	0.05905	0.06969	0.14060	0.12371	0.18874	0.25696	1.23702
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	18.86098	21.69141	43.26056	46.54881	31.31375	43.11542	30.34428	21.47098	13.16657
a1	0.00952	0.02113	0.04062	0.01238	0.02119	0.03526	0.01626	0.02546	0.01864
alpha1	0.17886	0.13154	0.14295	0.08072	0.13550	0.19659	0.02108	0.10434	0.12774
a2	0.18944	0.08158	0.03878	0.10081	0.12901	0.07921	0.06907	0.08401	0.09407
mu2	17.65371	17.81669	16.58267	18.35035	21.31304	19.71756	19.94039	19.04004	17.61982
alpha2	0.24522	0.12533	0.06066	0.17240	0.22503	0.13245	0.15812	0.12736	0.14349
lambda2	0.80809	0.66636	0.34064	0.48282	0.25622	0.34455	0.59441	0.58394	0.71070
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00342	0.00349	0.00333	0.00579	0.00466	0.00514	0.00059	0.00236	0.00319
mean age	28.77055	29.84952	30.68956	33.18372	30.92452	32.20820	31.15082	27.40088	28.99005
%(0-14)	9.37675	17.46708	26.21319	15.91877	18.17363	20.65334	19.52086	21.35663	16.40032
%(15-64)	81.17286	72.92169	63.07484	69.90681	69.73167	66.46802	70.77214	71.97987	74.55523
%(65+)	9.45039	9.61123	10.71197	14.17442	12.09470	12.87864	9.70700	6.66350	9.04445
deltalc	2.78033	6.05847	12.18264	2.13755	4.54257	6.86314	27.38642	10.76773	5.83805
delta12	0.05026	0.25907	1.04744	0.12283	0.16424	0.44514	0.23547	0.30304	0.19817
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.72939	1.04957	2.35666	0.46819	0.60215	1.48427	0.13332	0.81921	0.89019
sigma2	3.29539	5.31678	5.61564	2.80053	1.13861	2.60143	3.75915	4.58478	4.95282
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.80022	14.85023	12.35017	14.12021	13.19019	14.19021	16.52026	15.75025	14.77022
x high	19.14032	20.29035	21.13037	20.45035	21.78038	22.45040	22.12039	21.58038	19.85034
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.34010	5.44012	8.78020	6.33014	8.59020	8.26019	5.60013	5.83013	5.08012
a	27.89746	29.19032	26.81923	27.29321	26.48809	29.40034	27.44704	27.48036	28.31461
b	0.09111	0.04401	0.01535	0.03873	0.03958	0.02971	0.03228	0.04328	0.05194

1 sweden females 8 to 1
2 sweden females 8 to 2
3 sweden females 8 to 3
4 sweden females 8 to 4
5 sweden females 8 to 5
6 sweden females 8 to 6
7 sweden females 8 to 7
8 sweden females 8 to 8
9 sweden females 8 to the rest

APPENDIX C.2 United Kingdom (1970).*

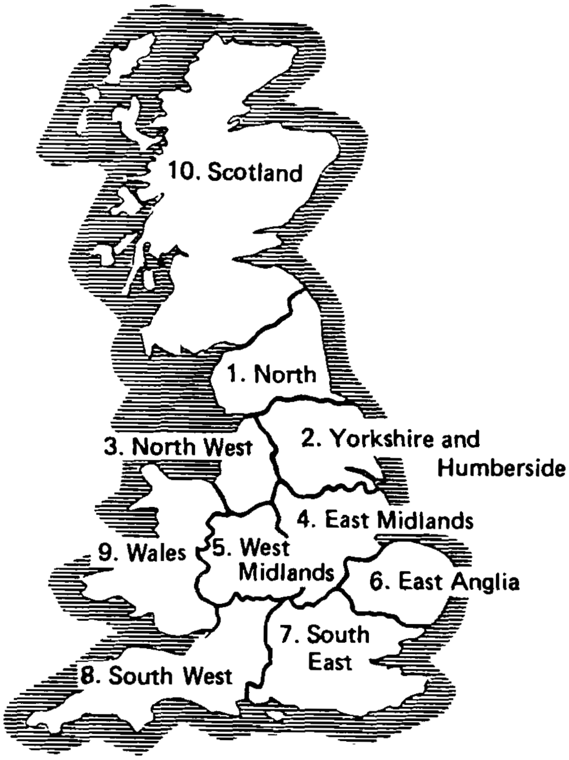

FIGURE C.2 Map of the regional aggregation of the United Kingdom used for this study.

*Due to lack of data, Northern Ireland has been omitted as a region. Despite this we refer to the nation as the United Kingdom (and not Great Britain) in order to maintain consistency with the IIASA case study report (Rees 1979).

APPENDIX C.2 (*continued*).

Males.

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.22294	0.16620	0.08821	0.08591	0.05676	0.36478	0.10290	0.02521	0.11497	1.22788
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	8.87696	6.75526	11.99752	12.86120	21.06260	10.22629	16.88076	19.15600	12.78098	6.98346
a1	0.01398	0.01306	0.01979	0.01664	0.02053	0.01633	0.02131	0.02772	0.02712	0.01722
alpha1	0.09541	0.07374	0.10925	0.09990	0.14345	0.11055	0.12469	0.11561	0.24512	0.12036
a2	0.06628	0.07168	0.07365	0.07791	0.00056	0.07916	0.04106	0.06319	0.01343	0.07683
mu2	20.11916	22.32955	28.09781	23.74563	48.79612	18.56093	15.79283	19.32491	38.26647	21.44651
alpha2	0.14082	0.14342	0.21653	0.14155	0.37431	0.12490	0.07294	0.07563	0.28446	0.14867
lambda2	0.26370	0.19365	0.14666	0.13557	0.06901	0.28018	0.39387	0.90653	0.08926	0.19537
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00493	0.00413	0.00440	0.00321	0.00577	0.00333	0.00327	0.00000	0.00603	0.00429
mean age	33.84627	32.87267	32.44616	30.45968	34.29527	30.41339	31.70033	27.21038	35.80907	32.37547
%(0-14)	18.20920	17.94328	20.46432	19.44295	21.21152	17.42621	20.80595	19.02262	19.61034	18.69842
%(15-64)	67.47767	69.89912	66.98512	71.20827	62.66923	72.78660	67.98071	78.68406	63.13290	68.80686
%(65+)	14.31313	12.15761	12.55056	9.34879	16.11925	9.78719	11.21334	2.29332	17.25676	12.49472
deltalc	2.83713	3.16411	4.49661	5.18967	3.55662	4.90917	6.51186	0.00000	4.49450	4.01125
delta12	0.21090	0.18215	0.26874	0.21353	36.58858	0.20632	0.51902	0.43875	2.01921	0.22407
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.67752	0.51414	0.50458	0.70573	0.38324	0.88513	1.70944	1.52852	0.86171	0.80959
sigma2	1.87260	1.35021	0.67731	0.95773	0.18437	2.24324	5.39983	11.98600	0.31380	1.31411
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.96018	12.43017	13.84020	9.96011	11.16014	11.92016	11.63015	17.19028	11.69015	11.80016
x high	22.36040	23.67043	25.31046	23.14042	24.16044	21.32037	19.79034	22.00039	25.27046	22.70041
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.40022	11.24026	11.47026	13.18030	13.00030	9.40022	8.16019	4.81011	13.58031	10.90025
a	29.43538	31.43704	29.46427	32.27370	27.86953	30.77489	29.40850	34.75360	30.37041	30.10947
b	0.02451	0.02359	0.02534	0.02275	0.01808	0.03165	0.02144	0.04390	0.01952	0.02516

1 u.k. males	1 to 2	6 u.k. males	1 to 7
2 u.k. males	1 to 3	7 u.k. males	1 to 8
3 u.k. males	1 to 4	8 u.k. males	1 to 9
4 u.k. males	1 to 5	9 u.k. males	1 to 10
5 u.k. males	1 to 6	10 u.k. males	1 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.21497	0.22672	0.20766	0.09340	0.06732	0.33401	0.09538	0.04966	0.05983	1.34894
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	9.54066	5.59109	6.44670	16.55759	11.39950	10.45287	6.99730	7.77756	14.56474	7.13612
a1	0.01992	0.01248	0.01460	0.02094	0.02588	0.01655	0.02161	0.01622	0.02518	0.01698
alpha1	0.08254	0.04351	0.07757	0.14504	0.07219	0.03993	0.16911	0.13892	0.18999	0.07931
a2	0.03995	0.04682	0.06071	0.06634	0.05471	0.06935	0.07285	0.07010	0.05645	0.05788
mu2	18.95272	19.77922	20.35999	17.77827	21.09718	18.57564	24.13058	26.28913	24.85241	19.41560
alpha2	0.10613	0.10065	0.12655	0.08766	0.10340	0.12475	0.15715	0.20789	0.11045	0.11054
lambda2	0.35652	0.41907	0.37500	0.25048	0.20079	0.36946	0.16173	0.13783	0.13012	0.29735
a3	0.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00774	0.00017	0.00000	0.00005
mu3	73.70760	0.00000	0.00000	0.00000	0.00000	0.00000	60.34847	74.15430	0.00000	73.78589
alpha3	1.46849	0.00000	0.00000	0.00000	0.00000	0.00000	0.02797	0.86607	0.00000	1.36737
lambda3	0.28066	0.00000	0.00000	0.00000	0.00000	0.00000	0.83640	0.17807	0.00000	0.25744
c	0.00465	0.00333	0.00433	0.00230	0.00205	0.00122	0.00299	0.00468	0.00446	0.00353
mean age	33.24051	33.05988	33.18350	30.07076	27.72434	27.51451	38.23311	33.75771	34.55931	31.67478
%(0-14)	23.46336	18.37930	18.93772	17.41665	26.71872	20.33934	16.17408	17.76985	19.36151	19.95467
%(15-64)	61.70139	70.30312	68.27869	74.99209	66.62426	73.95451	61.79879	67.62906	67.31863	68.73233
%(65+)	14.83526	11.31758	12.78359	7.59126	6.65702	5.70615	22.02713	14.60110	13.31985	11.31300
delta1c	4.28111	3.74980	3.37354	9.08818	12.65273	13.59888	7.22247	3.46378	5.64643	4.81194
delta12	0.49850	0.26664	0.24053	0.31559	0.47307	0.23870	0.29656	0.23136	0.44602	0.29343
delta32	0.00226	0.00000	0.00000	0.00000	0.00000	0.00000	0.10628	0.00238	0.00000	0.00080
beta12	0.77767	0.43227	0.61297	1.65450	0.69816	0.32009	1.07613	0.66823	1.72011	0.71747
sigma2	3.35921	4.16366	2.96321	2.85732	1.94182	2.96160	1.02919	0.66296	1.17806	2.68991
sigma3	0.19112	0.00000	0.00000	0.00000	0.00000	0.00000	29.90363	0.20561	0.00000	0.18827
x low	14.19021	15.31024	15.31024	10.96014	13.03018	13.44019	12.21017	11.19014	11.54015	13.40019
x high	22.04039	23.02041	23.14042	21.80038	23.76043	21.35037	24.23044	23.21042	26.01048	22.51040
x ret.	67.79846	0.00000	0.00000	0.00000	0.00000	0.00000	64.29771	65.26792	0.00000	67.23834
x shift	7.85018	7.71018	7.83018	10.84025	10.73025	7.91018	12.02028	12.02028	14.47033	9.11021
a	25.01183	31.35367	29.40037	34.55030	26.75273	28.47344	31.48871	30.04675	34.56491	29.40268
b	0.01699	0.02385	0.02727	0.02767	0.01663	0.03116	0.02309	0.02491	0.01698	0.02394

1 u.k. males 2 to 1
2 u.k. males 2 to 3
3 u.k. males 2 to 4
4 u.k. males 2 to 5
5 u.k. males 2 to 6
6 u.k. males 2 to 7
7 u.k. males 2 to 8
8 u.k. males 2 to 9
9 u.k. males 2 to 10
10 u.k. males 2 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.08110	0.13115	0.07629	0.11226	0.03473	0.35030	0.10867	0.12867	0.06100	1.08418
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	8.80924	10.97022	6.65980	10.71373	11.95995	11.41041	7.64629	9.75274	7.95409	6.22654
a1	0.01499	0.00852	0.01708	0.02039	0.01165	0.01284	0.00692	0.01150	0.02859	0.01301
alpha1	0.19049	0.08597	0.19157	0.13683	0.16197	0.09878	0.04270	0.12425	0.09678	0.11244
a2	0.06561	0.06176	0.07402	0.06057	0.02906	0.06078	0.05482	0.03555	0.05258	0.05976
mu2	19.37432	20.64613	24.25033	18.92210	32.98133	17.95181	24.66145	19.41898	21.08706	19.47471
alpha2	0.12636	0.13563	0.22722	0.09881	0.27413	0.10630	0.21359	0.10031	0.08618	0.12097
lambda2	0.26129	0.25569	0.19541	0.30832	0.09951	0.32299	0.15406	0.57327	0.36350	0.27220
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00008	0.00004	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	73.20111	72.81990	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.01919	1.01507	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.16724	0.16412	0.00000
c	0.00519	0.00568	0.00627	0.00348	0.00519	0.00410	0.00589	0.00581	0.00135	0.00499
mean age	35.14991	36.36529	36.48852	31.95397	34.19260	32.90668	36.64518	39.42478	29.52324	34.68196
%(0-14)	15.22722	15.19911	17.29455	17.96739	15.99718	16.29979	16.72345	15.94913	24.25047	16.78263
%(15-64)	69.63480	68.42731	64.64780	71.41927	69.08401	71.50500	65.57759	65.61382	69.78274	68.55070
%(65+)	15.13798	16.37358	18.05765	10.61335	14.91881	12.19521	17.69896	18.43705	5.96680	14.66667
delta1c	2.88968	1.50132	2.72565	5.86639	2.24401	3.13015	1.17381	1.97896	21.21980	2.60541
delta12	0.22850	0.13796	0.23075	0.33669	0.40093	0.21128	0.12618	0.32352	0.54374	0.21774
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00214	0.00069	0.00000
beta12	1.50754	0.63387	0.84312	1.38480	0.59085	0.92933	0.19992	1.23866	1.12299	0.92952
sigma2	2.06778	1.88518	0.85999	3.12042	0.36299	3.03861	0.72125	5.71492	4.21809	2.25010
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.16409	0.16168	0.00000
x low	12.01016	12.98018	13.30019	13.12019	9.40010	12.24017	10.53013	16.06025	16.36026	12.64017
x high	22.12039	23.02041	23.46042	22.49040	22.75041	21.26037	22.39040	22.40040	24.80045	22.33040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	62.37792	61.57806	0.00000
x shift	10.11023	10.04023	10.16023	9.37021	13.35031	9.02021	11.86027	6.34015	8.44019	9.69022
a	34.27030	33:28700	29.09886	32.69801	31.67259	32.51864	30.67037	32.80030	29.76039	31.81367
b	0.02634	0.02336	0.02550	0.02724	0.02656	0.02722	0.01909	0.02022	0.02537	0.02391

1 u.k. males 3 to 1
2 u.k. males 3 to 2
3 u.k. males 3 to 4
4 u.k. males 3 to 5
5 u.k. males 3 to 6
6 u.k. males 3 to 7
7 u.k. males 3 to 8
8 u.k. males 3 to 9
9 u.k. males 3 to 10
10 u.k. males 3 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.09736	0.28598	0.12533	0.22206	0.13878	0.43105	0.15945	0.05935	0.06961	1.58897
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	6.68189	6.67073	9.42898	6.27345	7.28509	6.54122	5.50763	11.74034	7.51728	4.39305
a1	0.02424	0.01834	0.02379	0.02233	0.01727	0.01754	0.01866	0.01580	0.03369	0.01965
alpha1	0.11290	0.06564	0.10278	0.08592	0.07266	0.07696	0.09379	0.06314	0.11310	0.08483
a2	0.07221	0.05282	0.07054	0.06179	0.04589	0.05046	0.05177	0.07553	0.05493	0.05471
mu2	19.39803	22.63552	24.48910	20.24434	19.52551	16.66712	17.53373	20.15185	19.77269	18.99803
alpha2	0.10510	0.11748	0.14317	0.08756	0.09616	0.07522	0.10509	0.22997	0.09527	0.09565
lambda2	0.22654	0.18838	0.15959	0.20658	0.20896	0.38495	0.30739	0.46534	0.41582	0.25293
a3	0.00000	0.01313	0.00003	0.00000	0.01523	0.00531	0.01210	0.00068	0.00000	0.00485
mu3	0.00000	66.90734	78.18250	0.00000	67.78575	69.69467	64.19685	75.09655	0.00000	70.95700
alpha3	0.00000	0.34880	0.87733	0.00000	0.40195	0.69464	0.09157	0.93510	0.00000	0.69842
lambda3	0.00000	0.46798	0.15096	0.00000	0.37583	0.38352	0.79255	0.20966	0.00000	0.28797
c	0.00203	0.00319	0.00317	0.00135	0.00340	0.00166	0.00281	0.00484	0.00203	0.00268
mean age	28.04778	32.49110	30.71807	28.44329	33.08322	29.56775	34.60312	33.97546	27.40510	30.79822
%(0-14)	21.32512	22.11421	22.85758	21.32663	21.29940	18.73011	19.73257	21.82602	27.02026	21.01307
%(15-64)	72.30276	64.76833	66.55785	73.46799	64.51318	73.54926	61.07491	60.63728	66.41678	68.45708
%(65+)	6.37212	13.11746	10.58456	5.20538	14.18742	7.72063	19.19253	17.53671	6.56297	10.52985
delta1c	11.95894	5.74342	7.51488	16.50515	5.07938	10.56185	6.64641	3.26628	16.61896	7.32314
delta12	0.33571	0.34716	0.33729	0.36133	0.37634	0.34768	0.36045	0.20915	0.61320	0.35910
delta32	0.00000	0.24853	0.00041	0.00000	0.33178	0.10524	0.23373	0.00903	0.00000	0.08872
beta12	1.07421	0.55878	0.71787	0.98124	0.75562	1.02307	0.89246	0.27455	1.18722	0.88687
sigma2	2.15539	1.60353	1.11468	2.35928	2.17303	5.11759	2.92508	2.02351	4.36479	2.64421
sigma3	0.00000	1.34168	0.17207	0.00000	0.93501	0.55212	8.65535	0.22421	0.00000	0.41231
x low	11.85016	13.40019	13.10019	12.26017	11.65015	12.19016	11.96016	15.83025	15.62024	12.33017
x high	22.52040	24.66045	24.87045	23.95043	22.69040	20.62036	20.74036	21.60038	23.11041	22.48040
x ret.	0.00000	67.48840	66.44817	0.00000	67.55841	68.02851	66.87827	67.95850	0.00000	67.81847
x shift	10.67024	11.26026	11.77027	11.69027	11.04025	8.43019	8.78020	5.77013	7.49017	10.15023
a	30.28400	29.17580	29.17811	32.14203	29.09949	32.05364	27.28582	22.40042	26.83705	29.67204
b	0.02645	0.01632	0.02064	0.02231	0.01534	0.02642	0.02135	0.02976	0.02733	0.02127

1 u.k. males 4 to 1
2 u.k. males 4 to 2
3 u.k. males 4 to 3
4 u.k. males 4 to 5
5 u.k. males 4 to 6
6 u.k. males 4 to 7
7 u.k. males 4 to 8
8 u.k. males 4 to 9
9 u.k. males 4 to 10
10 u.k. males 4 to the rest

APPENDIX C.2 (*continued*).

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.04936	0.07635	0.13899	0.17204	0.04391	0.35620	0.17610	0.10016	0.05089	1.16401
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.68363	8.70503	11.44903	8.03941	9.75715	9.39325	5.33904	6.82749	9.70032	4.98004
a1	0.01693	0.01577	0.02591	0.02972	0.01202	0.01489	0.01006	0.01157	0.01602	0.01577
alpha1	0.03232	0.04369	0.11241	0.11842	0.04622	0.04847	0.05333	0.05624	0.02671	0.05391
a2	0.04709	0.04639	0.04878	0.05600	0.06854	0.05452	0.03143	0.04509	0.04635	0.04641
mu2	20.41341	18.81785	18.99089	18.64734	16.79836	17.76805	17.64690	28.29313	23.98802	18.66254
alpha2	0.13263	0.08024	0.07262	0.06788	0.13621	0.08413	0.08771	0.16933	0.18915	0.08583
lambda2	0.18273	0.30424	0.21836	0.19720	0.30491	0.28950	0.26496	0.14346	0.16008	0.24559
a3	0.00000	0.00000	0.00000	0.00000	0.00005	0.00000	0.02391	0.01811	0.00000	0.00004
mu3	0.00000	0.00000	0.00000	0.00000	74.21849	0.00000	62.94621	60.14665	0.00000	77.36097
alpha3	0.00000	0.00000	0.00000	0.00000	0.93123	0.00000	0.31917	0.12468	0.00000	0.69859
lambda3	0.00000	0.00000	0.00000	0.00000	0.16277	0.00000	0.35319	0.70798	0.00000	0.12271
c	0.00214	0.00148	0.00203	0.00027	0.00318	0.00140	0.00471	0.00421	0.00222	0.00228
mean age	30.52016	30.31791	30.20394	27.50444	31.05492	29.28909	37.69732	39.28757	32.13730	31.57236
%(0-14)	23.96080	19.45400	22.33414	22.92942	19.60168	18.53567	17.77162	17.62050	22.99648	20.06045
%(15-64)	65.96537	73.40089	69.77203	73.36755	69.24969	75.24615	64.55030	62.18994	64.88725	70.52917
%(65+)	10.07383	7.14510	7.89384	3.70303	11.14863	6.21819	17.67808	20.18956	12.11627	9.41038
deltalc	7.90862	10.67477	12.76014	108.15191	3.77669	10.62163	2.13474	2.74653	7.22953	6.92492
delta12	0.35941	0.33986	0.53125	0.53063	0.17540	0.27320	0.32017	0.25670	0.34557	0.33985
delta32	0.00000	0.00000	0.00000	0.00000	0.00067	0.00000	0.76076	0.40165	0.00000	0.00096
beta12	0.24371	0.54448	1.54780	1.74464	0.33934	0.57609	0.60796	0.33216	0.14121	0.62804
sigma2	1.37775	3.79160	3.00678	2.90528	2.23856	3.44088	3.02072	0.84721	0.84631	2.86128
sigma3	0.00000	0.00000	0.00000	0.00000	0.17479	0.00000	1.10658	5.67828	0.00000	0.17566
x low	10.54013	13.07018	12.01016	11.18014	10.51013	11.65015	11.18014	14.49022	11.54015	11.77015
x high	21.58038	22.82041	23.53042	23.50042	19.28033	21.70038	21.38037	26.80050	22.52040	22.45040
x ret.	0.00000	0.00000	0.00000	0.00000	63.41775	0.00000	63.17779	62.56789	0.00000	62.73786
x shift	11.04025	9.75022	11.52026	12.32028	8.77020	10.05023	10.20023	12.31028	10.98025	10.68024
a	27.24041	32.52802	31.08870	32.01854	28.27035	33.30940	30.68035	31.06471	26.71133	31.30490
b	0.01369	0.02134	0.01825	0.02016	0.02704	0.02443	0.01281	0.01364	0.01355	0.01819

1	u.k. males	5 to 1	6 u.k. males	5 to 7
2	u.k. males	5 to 2	7 u.k. males	5 to 8
3	u.k. males	5 to 3	8 u.k. males	5 to 9
4	u.k. males	5 to 4	9 u.k. males	5 to 10
5	u.k. males	5 to 6	10 u.k. males	5 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.05899	0.11424	0.08190	0.21566	0.12636	0.95593	0.19056	0.06129	0.08329	1.88821
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	27.40051	14.70262	9.72690	12.31840	21.72359	8.13979	18.10026	18.38355	10.71077	6.98508
a1	0.00561	0.03024	0.03073	0.01549	0.01401	0.01947	0.01660	0.04154	0.03195	0.01971
alpha1	-0.00362	0.13279	0.07483	0.03467	0.02167	0.09434	0.05390	0.17102	0.11091	0.08881
a2	0.04787	0.04930	0.06925	0.04328	0.02765	0.05034	0.02965	0.04008	0.06790	0.05085
mu2	19.87450	16.94341	25.89662	19.81439	32.00511	18.99990	14.68744	20.16502	27.97781	19.33869
alpha2	0.10805	0.06427	0.10367	0.09421	0.25793	0.09458	0.09146	0.06457	0.21961	0.09740
lambda2	0.47378	0.32047	0.13935	0.34415	0.10198	0.25395	0.85556	0.29484	0.16325	0.23183
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00074	0.00103	0.00000	0.00193	0.00131	0.00364	0.00464	0.00255	0.00390	0.00357
mean age	42.56368	28.49302	25.53633	31.38336	31.50180	31.83249	32.58454	31.52439	29.85622	31.50874
%(0-14)	8.79131	21.78117	27.39969	20.49685	20.46828	21.13978	23.93802	25.13882	28.45695	21.88372
%(15-64)	68.64955	72.45959	71.24297	70.46066	68.66469	67.66784	61.97354	64.87994	60.27293	67.15668
%(65+)	22.55914	5.75924	1.35734	9.04248	10.86703	11.19238	14.08844	9.98124	11.27012	10.95959
delta1c	7.56029	29.43777	0.00000	8.01610	10.69091	5.34948	3.57651	16.27077	8.18516	5.51904
delta12	0.11715	0.61341	0.44372	0.35799	0.50676	0.38682	0.55990	1.03657	0.47058	0.38758
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	-0.03351	2.06621	0.72179	0.36798	0.08403	0.99743	0.58935	2.64845	0.50506	0.91175
sigma2	4.38470	4.98652	1.34409	3.65306	0.39538	2.68496	9.35399	4.56583	0.74339	2.38011
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	5.02000	12.05016	14.05021	14.58022	9.02009	12.42017	12.61017	14.76022	15.75025	12.18016
x high	23.02041	21.61038	27.28051	23.28042	22.60040	22.54040	17.11028	25.11046	25.96048	22.66040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	18.00041	9.56022	13.23030	8.70020	13.58031	10.12023	4.50010	10.35024	10.21023	10.48024
a	0.00000	31.54365	30.48758	30.54465	30.08928	29.49037	22.33532	34.34668	25.61761	28.96872
b	0.02485	0.02383	0.01785	0.02003	0.01873	0.01945	0.01817	0.01913	0.02144	0.01827

1 u.k. males 6 to 1
2 u.k. males 6 to 2
3 u.k. males 6 to 3
4 u.k. males 6 to 4
5 u.k. males 6 to 5
6 u.k. males 6 to 7
7 u.k. males 6 to 8
8 u.k. males 6 to 9
9 u.k. males 6 to 10
10 u.k. males 6 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.06000	0.07420	0.10359	0.11835	0.09805	0.16702	0.31744	0.05750	0.08268	1.07885
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	5.83271	7.38496	8.41947	6.69783	6.72153	4.50555	4.68979	7.19781	5.76557	5.06424
a1	0.01251	0.01950	0.01401	0.01885	0.01486	0.02112	0.01190	0.01051	0.01595	0.01520
alpha1	0.03347	0.07092	0.03983	0.07539	0.05967	0.12886	0.10054	0.09493	0.07481	0.08677
a2	0.07079	0.05147	0.04681	0.06071	0.05144	0.04125	0.03733	0.05094	0.05937	0.04780
mu2	21.51935	19.38480	19.50933	20.96864	18.87114	20.42344	19.18581	18.75728	19.65493	19.63392
alpha2	0.16919	0.09045	0.09462	0.12341	0.09009	0.09323	0.09719	0.09542	0.09863	0.09992
lambda2	0.25700	0.36555	0.59710	0.32642	0.34045	0.21362	0.23702	0.26372	0.27547	0.28373
a3	0.01334	0.00013	0.00008	0.00026	0.00007	0.01887	0.01918	0.00036	0.00972	0.00022
mu3	66.21512	76.09473	77.95498	77.57504	74.21283	66.15350	68.64459	77.64317	66.05274	79.38982
alpha3	0.30293	0.93178	0.78271	0.73938	1.37692	0.27590	0.31977	0.73503	0.27127	0.65376
lambda3	0.48507	0.18648	0.14822	0.15212	0.25955	0.21764	0.19586	0.15166	0.72368	0.12832
c	0.00257	0.00220	0.00205	0.00315	0.00256	0.00410	0.00506	0.00415	0.00248	0.00393
mean age	33.01301	30.28433	31.93402	31.87375	31.42825	36.31681	38.94732	36.03389	31.76651	34.87429
%(0-14)	18.32842	21.02692	18.56429	21.27191	18.37023	20.08238	16.84312	14.81974	18.03602	18.40761
%(15-64)	67.87358	70.06650	71.47316	66.50820	71.94803	62.58488	61.93052	68.84426	70.92965	66.17580
%(65+)	13.79800	8.90658	9.96255	12.21989	9.68175	17.33273	21.22636	16.33600	11.03433	15.41660
delta1c	4.87351	8.86625	6.85235	5.98498	5.79413	5.15624	2.34874	2.53601	6.43314	3.86666
delta12	0.17678	0.37884	0.29940	0.31042	0.28877	0.51202	0.31866	0.20641	0.26864	0.31807
delta32	0.18844	0.00254	0.00168	0.00432	0.00140	0.45745	0.51381	0.00712	0.16371	0.00458
beta12	0.19783	0.78409	0.42089	0.61087	0.66235	1.38213	1.03449	0.99495	0.75855	0.86841
sigma2	1.51897	4.04156	6.31024	2.64495	3.77908	2.29116	2.43865	2.76392	2.79307	2.83946
sigma3	1.60123	0.20013	0.18936	0.20574	0.18850	0.78883	0.61250	0.20633	2.66772	0.19628
x low	13.70020	14.59022	16.32026	15.36024	13.61020	12.83018	11.97016	11.89016	13.18019	13.44019
x high	23.00041	22.94041	22.47040	23.76043	22.53040	23.99043	22.66040	22.43040	23.13041	23.06041
x ret.	67.12832	67.32836	66.42817	67.11832	67.70844	64.93785	66.07809	67.16833	67.34837	66.60821
x shift	9.30021	8.35019	6.15014	8.40019	8.92020	11.16026	10.69024	10.54024	9.95023	9.62022
a	28.90039	29.91894	31.28366	28.31373	32.12263	29.61539	31.44218	35.62120	32.20727	30.82959
b	0.02508	0.02484	0.02766	0.02543	0.02455	0.01470	0.01422	0.02178	0.02506	0.02000

1 u.k. males 7 to 1
2 u.k. males 7 to 2
3 u.k. males 7 to 3
4 u.k. males 7 to 4
5 u.k. males 7 to 5
6 u.k. males 7 to 6
7 u.k. males 7 to 8
8 u.k. males 7 to 9
9 u.k. males 7 to 10
10 u.k. males 7 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.06452	0.09630	0.10696	0.08890	0.18434	0.07907	1.05541	0.10742	0.11342	1.89635
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	13.27858	11.37527	11.02086	9.86638	9.07446	10.93198	6.38007	8.44318	8.64010	5.34540
a1	0.02213	0.02857	0.01409	0.02205	0.01992	0.02318	0.01648	0.02262	0.01762	0.01738
alpha1	0.04602	0.11705	0.04402	0.06440	0.13337	0.18856	0.10221	0.10473	0.04514	0.08579
a2	0.05386	0.05411	0.07934	0.06424	0.06654	0.06028	0.06682	0.05171	0.08785	0.06461
mu2	19.53182	19.88111	24.65755	25.90015	18.85185	19.17024	19.67608	19.31091	20.76601	19.87180
alpha2	0.08682	0.09673	0.13938	0.15609	0.10291	0.11068	0.11611	0.10082	0.12991	0.11107
lambda2	0.31027	0.53814	0.16629	0.16958	0.29693	0.27421	0.24042	0.28325	0.25087	0.25405
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00280	0.00177	0.00299	0.00313	0.00447	0.00369	0.00371	0.00026	0.00316
mean age	26.47881	29.70070	30.04129	29.89884	31.09959	33.43036	31.81380	31.41025	25.74566	30.87166
%(0-14)	23.30060	23.80729	18.02760	25.18680	17.58805	18.12263	18.41298	22.38946	19.65072	19.41935
%(15-64)	73.87492	67.48685	75.40887	65.67078	72.84753	68.66145	70.57726	66.38984	78.03653	70.97009
%(65+)	2.82448	8.70586	6.56353	9.14242	9.56441	13.21593	11.00976	11.22070	2.31275	9.61057
deltalc	0.00000	10.19692	7.95104	7.36250	6.35929	5.18369	4.46326	6.10055	67.74433	5.49433
delta12	0.41094	0.52810	0.17764	0.34321	0.29929	0.38450	0.24663	0.43748	0.20061	0.26895
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.53006	1.21014	0.31584	0.41256	1.29605	1.70368	0.88025	1.03879	0.34751	0.77240
sigma2	3.57383	5.56361	1.19311	1.08644	2.88543	2.47749	2.07064	2.80944	1.93113	2.28733
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.99021	16.49026	12.88018	14.95023	12.78018	12.54017	12.17016	13.34019	13.18019	12.83018
x high	23.22042	22.95041	25.44047	25.99048	22.30040	22.41040	22.51040	22.67040	23.17042	22.89041
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.23021	6.46015	12.56029	11.04025	9.52022	9.87023	10.34024	9.33021	9.99023	10.06023
a	29.84345	28.54370	33.93203	28.21188	32.61699	32.30199	31.17702	28.12423	30.71652	30.76537
b	0.02331	0.03024	0.02549	0.01845	0.02922	0.02521	0.02515	0.02077	0.03329	0.02506

1 u.k. males 8 to 1
2 u.k. males 8 to 2
3 u.k. males 8 to 3
4 u.k. males 8 to 4
5 u.k. males 8 to 5
6 u.k. males 8 to 6
7 u.k. males 8 to 7
8 u.k. males 8 to 9
9 u.k. males 8 to 10
10 u.k. males 8 to the rest

APPENDIX C.2 (*continued*).

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.04453	0.06882	0.17775	0.07295	0.16836	0.03950	0.38492	0.22049	0.05209	1.22941
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	14.86221	14.73480	10.37785	7.48895	15.46997	18.49577	8.99503	8.28681	16.98272	6.46742
a1	0.02590	0.01942	0.03207	0.01945	0.01656	0.02837	0.01281	0.01408	0.01489	0.01724
alpha1	0.03759	0.14724	0.26591	0.07205	0.16268	0.16302	0.02631	0.07982	0.08364	0.10892
a2	0.05215	0.06948	0.05611	0.07564	0.06432	0.06578	0.10518	0.05982	0.11192	0.07350
mu2	21.35913	19.09846	18.58907	22.54169	25.43963	18.22945	20.37463	21.99571	24.04869	19.61499
alpha2	0.13066	0.14171	0.10843	0.11777	0.21307	0.09775	0.20192	0.14674	0.16720	0.13163
lambda2	0.17182	0.39854	0.26598	0.15995	0.14499	0.20912	0.29711	0.18638	0.21284	0.25275
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003	0.00007	0.00000	0.00023
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	70.54176	71.94368	0.00000	68.98553
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.21025	1.09282	0.00000	1.08736
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.20551	0.18689	0.00000	0.23986
c	0.00000	0.00498	0.00477	0.00170	0.00587	0.00294	0.00085	0.00463	0.00252	0.00376
mean age	25.15435	33.41851	33.65080	28.09419	35.16558	29.67155	29.36502	34.68768	30.07489	31.70537
%(0-14)	29.69068	18.47845	19.10428	21.13855	18.19299	21.80897	17.00618	19.24777	15.92676	18.56290
%(15-64)	66.28230	67.22566	66.82527	73.39342	65.16485	69.30323	75.40620	66.37491	76.80897	70.18353
%(65+)	4.02702	14.29589	14.07045	5.46803	16.64217	8.88780	7.58762	14.37732	7.26427	11.25358
deltalc	0.00000	3.90301	6.71718	11.41588	2.82270	9.65754	15.00028	3.03911	5.90501	4.58211
delta12	0.49661	0.27948	0.57154	0.25709	0.25745	0.43127	0.12176	0.23532	0.13305	0.23457
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00033	0.00116	0.00000	0.00306
beta12	0.28768	1.03900	2.45236	0.61176	0.76352	1.66775	0.13028	0.54393	0.50022	0.82745
sigma2	1.31494	2.81226	2.45305	1.35809	0.68048	2.13927	1.47139	1.27019	1.27297	1.92011
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.16981	0.17101	0.00000	0.22059
x low	11.44015	14.25021	11.75015	11.41015	11.13014	10.46012	13.24019	12.00016	14.47022	12.31017
x high	22.07039	21.64038	21.94039	24.02044	22.71041	21.65038	21.61038	23.01041	25.09046	22.04039
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	61.83801	62.47791	0.00000	62.63788
x shift	10.63024	7.39017	10.19023	12.61029	11.58027	11.19026	8.37019	11.01025	10.62024	9.73022
a	24.68860	28.50464	32.14940	31.83856	29.11948	30.04035	27.95653	28.98539	32.59037	29.68204
b	0.01280	0.03093	0.02371	0.02272	0.02227	0.02272	0.03823	0.01830	0.03812	0.02736

1 u.k. males 9 to 1
2 u.k. males 9 to 2
3 u.k. males 9 to 3
4 u.k. males 9 to 4
5 u.k. males 9 to 5
6 u.k. males 9 to 6
7 u.k. males 9 to 7
8 u.k. males 9 to 8
9 u.k. males 9 to 10
10 u.k. males 9 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.09454	0.06962	0.10850	0.07085	0.07212	0.03553	0.36742	0.08281	0.02684	0.92824
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	14.11027	12.45214	7.56567	6.22875	18.91117	25.51109	7.29819	10.97879	32.79396	6.97174
a1	0.01706	0.02393	0.02396	0.03048	0.02352	0.01218	0.01576	0.02059	0.01978	0.01939
alpha1	0.11140	0.06060	0.09429	0.10010	0.09094	0.07924	0.09952	0.08943	0.18042	0.09007
a2	0.07472	0.05508	0.01559	0.06776	0.07819	0.01641	0.08361	0.06620	0.01076	0.07247
mu2	25.88999	22.68012	43.96579	26.92472	24.65378	41.85244	19.83059	20.33858	68.12185	21.66901
alpha2	0.16973	0.10733	0.25252	0.13091	0.14121	0.17221	0.11848	0.14224	0.11167	0.11994
lambda2	0.16166	0.16624	0.07664	0.13973	0.14278	0.06051	0.23743	0.24298	0.03285	0.19141
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00463	0.00178	0.00232	0.00217	0.00243	0.00465	0.00246	0.00408	0.00000	0.00276
mean age	33.76117	27.90628	29.08770	28.33683	28.41570	33.60046	29.63773	31.02501	32.48024	29.98635
%(0-14)	18.73578	26.21401	22.77812	26.79263	23.01377	21.07672	16.42043	22.77896	18.88765	20.31649
%(15-64)	68.00159	67.58566	70.46665	66.57387	69.89328	65.76669	76.13954	65.35132	75.96676	71.32703
%(65+)	13.26263	6.20034	6.75523	6.63351	7.09295	13.15659	7.44003	11.86972	5.14559	8.35648
delta1c	3.68591	13.40721	10.32322	14.04074	9.66812	2.62008	6.40383	5.04160	0.00000	7.01303
delta12	0.22830	0.43451	1.53679	0.44979	0.30083	0.74234	0.18851	0.31104	1.83879	0.26752
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.65635	0.56456	0.37341	0.76465	0.64401	0.46013	0.83999	0.62871	1.61564	0.75091
sigma2	0.95244	1.54885	0.30349	1.06738	1.01109	0.35136	2.00396	1.70815	0.29420	1.59583
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.62020	12.78018	13.60020	14.36021	11.90016	6.91004	11.99016	12.92018	8.04007	12.33017
x high	25.45047	24.53045	28.14053	26.96050	24.35044	23.84043	22.61040	22.29040	30.58059	23.82043
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	11.83027	11.75027	14.54033	12.60029	12.45028	16.93039	10.62024	9.37021	22.54052	11.49026
a	31.54270	28.05543	32.24043	29.47582	29.97768	34.25704	33.19215	26.48207	44.75533	31.11205
b	0.02351	0.01487	0.02298	0.01852	0.02160	0.01107	0.03207	0.02221	0.01094	0.02388

1 u.k. males 10 to 1
2 u.k. males 10 to 2
3 u.k. males 10 to 3
4 u.k. males 10 to 4
5 u.k. males 10 to 5
6 u.k. males 10 to 6
7 u.k. males 10 to 7
8 u.k. males 10 to 8
9 u.k. males 10 to 9
10 u.k. males 10 to the rest

APPENDIX C.2 (*continued*).

Females.

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.21400	0.18181	0.09869	0.08296	0.04850	0.33332	0.08541	0.02993	0.12210	1.19672
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	12.52512	9.50414	13.64031	11.70459	15.96011	8.72454	13.05194	20.00457	9.10668	9.19358
a1	0.01255	0.01738	0.01519	0.01983	0.02339	0.00799	0.03061	0.05213	0.02593	0.01531
alpha1	0.02744	0.08559	0.18725	0.05638	0.11133	0.06013	0.31639	0.24129	0.17209	0.09978
a2	0.09059	0.04636	0.05022	0.07035	0.08493	0.09802	0.06534	0.00028	0.08774	0.07606
mu2	21.93612	19.77155	19.22537	20.34945	22.50157	22.34231	24.46429	46.15773	22.15394	20.39246
alpha2	0.30080	0.12709	0.14175	0.16083	0.19275	0.23369	0.21992	0.49109	0.18427	0.17087
lambda2	0.28530	0.37870	0.44664	0.42265	0.32685	0.20610	0.16674	0.08249	0.22885	0.28373
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00316	0.00533	0.00685	0.00305	0.00466	0.00476	0.00629	0.00488	0.00459	0.00507
mean age	32.64029	34.24154	37.86541	29.26378	32.08269	33.30120	35.90631	30.70637	32.18434	33.47692
%(0-14)	19.58761	21.95369	17.06611	24.02023	23.02774	15.17723	18.70259	27.13298	20.35320	19.03308
%(15-64)	67.16833	62.52325	63.37134	66.47674	63.70286	70.86909	63.31134	59.16213	66.39281	66.31562
%(65+)	13.24406	15.52306	19.56255	9.50303	13.26940	13.95367	17.98607	13.70489	13.25400	14.65130
delta1c	3.97036	3.26161	2.21903	6.49852	5.02188	1.67804	4.86463	10.68670	5.65220	3.02273
delta12	0.13857	0.37485	0.30251	0.28192	0.27536	0.08148	0.46857	184.24281	0.29555	0.20132
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.09121	0.67343	1.32100	0.35058	0.57758	0.25732	1.43867	0.49133	0.93391	0.58397
sigma2	0.94848	2.97973	3.15091	2.62787	1.69574	0.88191	0.75818	0.16798	1.24194	1.66053
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.20021	15.00023	14.75022	15.84025	16.44026	11.69015	11.57015	13.05018	13.48019	13.53020
x high	21.69038	22.47040	21.78038	22.51040	24.05044	21.67038	22.81041	24.51045	23.05041	22.08039
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.49017	7.47017	7.03016	6.67015	7.61017	9.98023	11.24026	11.46026	9.57022	8.55020
a	23.96899	25.76373	30.13033	24.83042	25.98376	29.16129	29.42855	25.40135	27.96578	27.17270
b	0.03089	0.01993	0.02365	0.02990	0.03095	0.03362	0.02331	0.02594	0.02987	0.02747

1 u.k. females	1 to 2	6 u.k. females	1 to 7
2 u.k. females	1 to 3	7 u.k. females	1 to 8
3 u.k. females	1 to 4	8 u.k. females	1 to 9
4 u.k. females	1 to 5	9 u.k. females	1 to 10
5 u.k. females	1 to 6	10 u.k. females	1 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.20557	0.20687	0.22067	0.09700	0.06787	0.34301	0.09401	0.03500	0.05294	1.32293
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	6.86912	5.18392	6.10101	12.50024	6.05857	14.27068	8.11063	9.25885	11.08178	6.73470
a1	0.01502	0.01629	0.02087	0.02581	0.02511	0.01452	0.01523	0.01804	0.02151	0.01655
alpha1	0.09505	0.10786	0.10208	0.11904	0.07424	0.05282	0.08610	0.12243	0.04333	0.07815
a2	0.04956	0.05916	0.06526	0.06697	0.04430	0.07618	0.07320	0.05811	0.02625	0.05955
mu2	18.33251	20.08730	19.77335	18.46343	20.04011	18.56927	21.14650	18.97346	18.86192	18.97633
alpha2	0.10616	0.14248	0.13744	0.10627	0.08945	0.13615	0.16949	0.09939	0.05408	0.12344
lambda2	0.39209	0.29737	0.34080	0.39535	0.48961	0.42678	0.26921	0.33477	0.80827	0.39956
a3	0.00537	0.00041	0.00597	0.00182	0.00000	0.00218	0.00000	0.00000	0.00000	0.00005
mu3	64.20721	74.94084	61.58718	64.39221	0.00000	65.29458	0.00000	0.00000	0.00000	78.78619
alpha3	0.32268	0.79576	0.24055	0.03644	0.00000	0.05627	0.00000	0.00000	0.00000	0.74000
lambda3	0.25668	0.19772	0.40021	1.22555	0.00000	1.56080	0.00000	0.00000	0.00000	0.14327
c	0.00451	0.00522	0.00394	0.00218	0.00234	0.00241	0.00490	0.00372	0.00071	0.00389
mean age	34.14443	34.75120	31.89460	29.46260	28.96846	30.34726	33.33884	32.54587	29.98178	31.93832
%(0-14)	18.39073	19.50133	21.52542	20.90268	25.86113	18.09901	19.68362	17.64724	24.44290	20.04651
%(15-64)	67.38979	64.10796	65.93875	69.31106	66.34695	71.17068	66.06663	71.04097	68.32845	67.61781
%(65+)	14.21949	16.39070	12.53583	9.78626	7.79192	10.73030	14.24975	11.31179	7.22865	12.33568
delta1c	3.33160	3.11844	5.29163	11.82692	10.74503	6.03252	3.10723	4.85021	30.12875	4.25702
delta12	0.30308	0.27540	0.31983	0.38537	0.56679	0.19055	0.20813	0.31039	0.81961	0.27799
delta32	0.10844	0.00699	0.09151	0.02723	0.00000	0.02859	0.00000	0.00000	0.00000	0.00076
beta12	0.89537	0.75699	0.74268	1.12017	0.82993	0.38791	0.50802	1.23178	0.80114	0.63308
sigma2	3.69354	2.08704	2.47961	3.72027	5.47340	3.13456	1.58837	3.36820	14.94503	3.23684
sigma3	0.79546	0.24847	1.66373	33.63388	0.00000	27.73760	0.00000	0.00000	0.00000	0.19361
x low	13.70020	13.81020	14.37021	13.92020	16.49026	14.02021	13.94020	13.56020	16.72027	14.33021
x high	21.51038	22.43040	22.30040	21.65038	23.26042	21.15037	22.74041	22.47040	21.87039	21.77038
x ret.	63.04781	67.87848	62.74786	66.81825	0.00000	67.24834	0.00000	0.00000	0.00000	67.13832
x shift	7.81018	8.62020	7.93018	7.73018	6.77015	7.13016	8.80020	8.91020	5.15012	7.44017
a	29.47958	27.69193	26.57896	28.61189	26.71374	28.10036	27.40963	32.57032	27.65703	27.62752
b	0.02375	0.02281	0.02687	0.03212	0.02366	0.03499	0.02586	0.02711	0.01806	0.02740

1 u.k. females 2 to 1
2 u.k. females 2 to 3
3 u.k. females 2 to 4
4 u.k. females 2 to 5
5 u.k. females 2 to 6
6 u.k. females 2 to 7
7 u.k. females 2 to 8
8 u.k. females 2 to 9
9 u.k. females 2 to 10
10 u.k. females 2 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.07934	0.12507	0.07542	0.11373	0.03495	0.32844	0.10511	0.12168	0.05646	1.04021
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	9.02247	5.08797	9.63653	9.05580	9.29101	10.41264	7.68624	13.92243	10.60628	6.37926
a1	0.01129	0.01469	0.00813	0.02590	0.01308	0.01204	0.01446	0.01272	0.02403	0.01224
alpha1	0.04496	0.03933	0.04164	0.21273	0.03157	0.04719	0.01585	0.07476	0.14081	0.06246
a2	0.06667	0.04132	0.07634	0.08367	0.06246	0.06204	0.02900	0.02338	0.08600	0.05448
mu2	19.78269	19.47022	20.63908	20.61229	24.98457	18.98447	19.03256	17.77303	21.47308	19.32369
alpha2	0.18547	0.09685	0.19329	0.18341	0.33556	0.12546	0.12759	0.05467	0.16173	0.13083
lambda2	0.49638	0.51326	0.35881	0.35789	0.18944	0.45986	0.57030	0.56652	0.25921	0.45593
a3	0.00017	0.00439	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	69.47646	65.00684	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	1.02016	0.01154	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.21584	1.07738	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00474	0.00171	0.00519	0.00533	0.00354	0.00345	0.00115	0.00499	0.00403	0.00481
mean age	34.43119	35.60436	35.31242	33.92331	32.54466	31.91283	35.39969	37.31621	31.26737	34.03160
%(0-14)	18.85730	18.68781	16.28852	19.05691	20.42582	17.67727	20.51687	18.15096	20.52040	18.64907
%(15-64)	66.16161	63.47242	67.87744	65.54810	66.15902	71.35597	64.15962	65.01492	67.82098	67.02964
%(65+)	14.98109	17.83978	15.83404	15.39500	13.41516	10.96676	15.32351	16.83412	11.65862	14.32129
delta1c	2.37994	8.60339	1.56871	4.86024	3.69223	3.49504	12.55246	2.54868	5.95881	2.54372
delta12	0.16936	0.35541	0.10655	0.30959	0.20946	0.19411	0.49864	0.54387	0.27940	0.22468
delta32	0.00256	0.10627	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.24242	0.40607	0.21544	1.15989	0.09407	0.37615	0.12422	1.36739	0.87062	0.47741
sigma2	2.67630	5.29964	1.85632	1.95137	0.56455	3.66533	4.46979	10.36208	1.60272	3.48492
sigma3	0.21157	93.39887	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.70024	15.86025	14.79022	14.84023	12.87018	14.74022	15.67024	14.74022	14.03021	15.11023
x high	21.71038	22.55040	22.31040	22.47040	21.86039	21.71038	21.54038	21.58038	23.21042	21.96039
x ret.	62.21795	68.34858	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.01014	6.69015	7.52017	7.63017	8.99021	6.97016	5.87013	6.84016	9.18021	6.85016
a	25.44373	29.37703	28.30323	28.18466	24.71042	29.69606	26.07372	33.30172	28.26039	28.06703
b	0.02946	0.02255	0.02983	0.03374	0.02601	0.03077	0.01522	0.01456	0.03089	0.02627

1 u.k. females 3 to 1
2 u.k. females 3 to 2
3 u.k. females 3 to 4
4 u.k. females 3 to 5
5 u.k. females 3 to 6
6 u.k. females 3 to 7
7 u.k. females 3 to 8
8 u.k. females 3 to 9
9 u.k. females 3 to 10
10 u.k. females 3 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.08785	0.27811	0.11590	0.20912	0.14221	0.42446	0.16018	0.05187	0.06640	1.53610
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	9.79257	6.24527	4.17964	8.53641	6.72373	11.00968	7.08140	15.57727	7.33874	5.95921
a1	0.02538	0.02567	0.01267	0.02078	0.02174	0.01315	0.01432	0.01740	0.04165	0.01849
alpha1	0.07242	0.17125	0.02458	0.09001	0.04434	0.03518	0.07554	0.18136	0.12861	0.09210
a2	0.05559	0.07222	0.06778	0.06571	0.02852	0.07653	0.02528	0.00012	0.06983	0.06027
mu2	18.93057	23.04140	26.36231	22.27494	16.96162	19.27554	31.82464	54.19686	23.15558	19.82969
alpha2	0.10632	0.17486	0.20964	0.13499	0.06385	0.17303	0.24193	0.40667	0.15638	0.12918
lambda2	0.33593	0.18168	0.15457	0.19395	0.30609	0.36200	0.10949	0.06511	0.16547	0.25906
a3	0.00006	0.00000	0.00000	0.00000	0.00368	0.00000	0.00854	0.00000	0.00007	0.00000
mu3	71.19465	0.00000	0.00000	0.00000	58.95318	0.00000	60.61970	0.00000	71.05727	0.00000
alpha3	1.10239	0.00000	0.00000	0.00000	0.00100	0.00000	0.22742	0.00000	1.13151	0.00000
lambda3	0.19264	0.00000	0.00000	0.00000	1.17614	0.00000	0.86151	0.00000	0.19595	0.00000
c	0.00183	0.00496	0.00170	0.00371	0.00007	0.00291	0.00583	0.00661	0.00239	0.00432
mean age	27.75458	33.05495	31.77008	31.05409	32.91177	31.02993	36.58940	37.31443	26.72770	32.11528
%(0-14)	25.59084	21.20710	18.39618	22.47904	24.09133	19.20912	21.39213	18.41409	31.41287	21.35295
%(15-64)	67.84553	64.39725	71.38181	66.60013	61.56136	69.88423	60.30930	62.82021	60.92595	65.95133
%(65+)	6.56363	14.39565	10.22202	10.92083	14.34731	10.90665	18.29857	18.76571	7.66117	12.69572
delta1c	13.85740	5.17458	7.46044	5.60632	295.30698	4.52065	2.45805	2.63291	17.45453	4.28464
delta12	0.45663	0.35548	0.18687	0.31619	0.76240	0.17184	0.56647	149.50015	0.59639	0.30685
delta32	0.00116	0.00000	0.00000	0.00000	0.12892	0.00000	0.33792	0.00000	0.00102	0.00000
beta12	0.68113	0.97937	0.11726	0.66684	0.69442	0.20330	0.31224	0.44596	0.82240	0.71294
sigma2	3.15955	1.03904	0.73730	1.43678	4.79398	2.09212	0.45257	0.16010	1.05807	2.00541
sigma3	0.17475	0.00000	0.00000	0.00000	1176.60681	0.00000	3.78810	0.00000	0.17317	0.00000
x low	13.86020	12.46017	12.33017	13.04018	12.05016	13.72020	12.40017	12.10016	12.79018	12.92018
x high	22.01039	23.16042	24.20044	23.83043	21.09037	21.22037	24.19044	26.02048	23.11041	22.28040
x ret.	62.06797	0.00000	0.00000	0.00000	61.66804	0.00000	62.15796	0.00000	62.09797	0.00000
x shift	8.15019	10.70024	11.87027	10.79025	9.04021	7.50017	11.79027	13.92032	10.32024	9.36021
a	25.57963	27.91873	30.80872	28.36118	25.19873	26.77423	26.61545	30.61209	23.49932	27.55540
b	0.02300	0.02305	0.02357	0.02050	0.01167	0.03045	0.01172	0.01785	0.01798	0.02185

1 u.k. females 4 to 1
2 u.k. females 4 to 2
3 u.k. females 4 to 3
4 u.k. females 4 to 5
5 u.k. females 4 to 6
6 u.k. females 4 to 7
7 u.k. females 4 to 8
8 u.k. females 4 to 9
9 u.k. females 4 to 10
10 u.k. females 4 to the rest

APPENDIX C.2 (*continued*).

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.04901	0.06951	0.13736	0.16715	0.04096	0.34624	0.19402	0.09370	0.04837	1.14633
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	18.97625	13.52192	8.84962	7.36534	12.35967	12.26192	4.74971	13.19653	14.46758	7.81483
a1	0.02836	0.02230	0.01517	0.02078	0.01996	0.01352	0.00805	0.01084	0.00955	0.01500
alpha1	0.10788	0.05773	0.05818	0.04542	0.03819	0.03332	0.02976	0.02459	0.03084	0.02864
a2	0.04488	0.05426	0.04394	0.05562	0.02207	0.05649	0.02868	0.04125	0.04398	0.05263
mu2	19.69723	18.03213	18.54572	19.51739	19.45717	17.63140	18.85316	19.55087	20.76096	19.45270
alpha2	0.08567	0.08244	0.09102	0.11240	0.06058	0.10364	0.10814	0.13693	0.11175	0.13073
lambda2	0.39981	0.24170	0.29608	0.45662	0.27759	0.41280	0.31985	0.46753	0.28929	0.31907
a3	0.00000	0.00000	0.00012	0.00000	0.00000	0.00000	0.00016	0.00000	0.00022	0.00013
mu3	0.00000	0.00000	71.85282	0.00000	0.00000	0.00000	72.38482	78.94814	70.90856	92.11662
alpha3	0.00000	0.00000	0.97287	0.00000	0.00000	0.00000	1.00876	0.85005	1.08648	0.22387
lambda3	0.00000	0.00000	0.17698	0.00000	0.00000	0.00000	0.17637	0.11252	0.20234	0.04584
c	0.00329	0.00058	0.00312	0.00121	0.00207	0.00150	0.00497	0.00340	0.00373	0.00119
mean age	30.78690	26.33766	32.94578	27.36766	32.11124	29.79236	39.27069	36.35325	36.55508	31.93938
%(0-14)	24.74078	24.00727	19.69921	24.05901	25.10686	18.00952	16.79429	17.98322	16.38950	19.78975
%(15-64)	65.05900	72.34756	69.29033	70.34268	64.13981	74.35451	64.94437	66.99525	69.39497	70.21273
%(65+)	10.20023	3.64517	11.01046	5.59830	10.75333	7.63597	18.26134	15.02153	14.21554	9.99752
delta1c	8.62090	38.47168	4.86682	17.24802	9.63670	9.01204	1.61997	3.19151	2.56381	12.63477
delta12	0.63198	0.41087	0.34529	0.37367	0.90435	0.23943	0.28066	0.26268	0.21725	0.28504
delta32	0.00000	0.00000	0.00274	0.00000	0.00000	0.00000	0.00546	0.00006	0.00499	0.00253
beta12	1.25926	0.70021	0.63918	0.40404	0.63033	0.32151	0.27523	0.17955	0.27595	0.21907
sigma2	4.66687	2.93176	3.25281	4.06233	4.58231	3.98290	2.95765	3.41433	2.58874	2.44076
sigma3	0.00000	0.00000	0.18191	0.00000	0.00000	0.00000	0.17484	0.13237	0.18624	0.20474
x low	15.46024	11.31014	12.72018	15.52024	14.15021	13.02018	13.02018	15.35024	14.14021	13.52020
x high	23.30042	21.86039	22.16039	22.39040	23.72043	20.83036	22.01039	22.08039	23.85043	22.04039
x ret.	0.00000	0.00000	62.13796	0.00000	0.00000	0.00000	62.47791	60.82818	62.57789	85.00214
x shift	7.84018	10.55024	9.44022	6.87016	9.57022	7.81018	8.99021	6.73015	9.71022	8.52020
a	27.65372	29.27856	29.98536	26.71039	25.59185	30.98416	30.35649	27.93371	33.02891	28.20961
b	0.02166	0.02021	0.01855	0.02742	0.00831	0.02821	0.01235	0.01952	0.01821	0.02134

1 u.k. females 5 to 1
2 u.k. females 5 to 2
3 u.k. females 5 to 3
4 u.k. females 5 to 4
5 u.k. females 5 to 6
6 u.k. females 5 to 7
7 u.k. females 5 to 8
8 u.k. females 5 to 9
9 u.k. females 5 to 10
10 u.k. females 5 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.05500	0.11507	0.09191	0.20002	0.10902	0.94260	0.16793	0.04799	0.06746	1.79701
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	22.13955	6.27442	11.85574	10.60507	6.14318	8.07300	14.42910	24.68377	17.68710	7.05357
a1	0.02702	0.02462	0.02957	0.02778	0.03826	0.01836	0.02385	0.02715	0.04371	0.02238
alpha1	0.24502	0.10767	0.07692	0.12283	0.15726	0.09459	0.06470	0.21149	0.12328	0.10204
a2	0.04701	0.04592	0.05187	0.04547	0.00208	0.06496	0.02740	0.03828	0.06675	0.05529
mu2	18.00047	21.71740	20.27872	19.31718	48.40627	20.15956	19.71295	16.49495	22.35429	20.05312
alpha2	0.08835	0.10637	0.09171	0.09758	0.31486	0.13994	0.07207	0.04724	0.12062	0.11997
lambda2	0.50659	0.25736	0.60718	0.47968	0.06708	0.28070	0.64787	0.27654	0.27011	0.30908
a3	0.00789	0.00000	0.00000	0.00513	0.00587	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	67.04560	0.00000	0.00000	66.87171	59.93228	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.09005	0.00000	0.00000	0.08048	0.11863	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.51434	0.00000	0.00000	0.57835	1.33824	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00399	0.00438	0.00113	0.00341	0.00269	0.00446	0.00330	0.00226	0.00200	0.00419
mean age	36.76263	32.85767	26.14247	33.05217	28.97298	32.31660	31.28817	35.08103	25.90645	31.82425
%(0-14)	15.85610	24.29453	27.57769	23.48115	27.13762	20.95922	26.85364	16.02444	31.87480	22.94744
%(15-64)	65.06975	62.61424	68.18102	61.05479	62.49874	66.03596	62.06953	71.87095	62.17348	64.70090
%(65+)	19.07415	13.09122	4.24129	15.46406	10.36364	13.00481	11.07683	12.10461	5.95173	12.35165
delta1c	6.76998	5.62235	26.13570	8.15349	14.24127	4.11537	7.23110	11.98644	21.84157	5.33612
delta12	0.57482	0.53609	0.57012	0.61094	18.40574	0.28265	0.87039	0.70916	0.65491	0.40467
delta32	0.16780	0.00000	0.00000	0.11282	2.82485	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	2.77330	1.01225	0.83877	1.25879	0.49948	0.67593	0.89768	4.47670	1.02199	0.85060
sigma2	5.73387	2.41949	6.62068	4.91598	0.21307	2.00589	8.98956	5.85384	2.23930	2.57636
sigma3	5.71168	0.00000	0.00000	7.18665	11.28111	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.17021	15.15023	17.34028	15.64024	12.00016	13.60020	17.12028	10.91014	16.00025	14.34021
x high	21.43038	24.86045	23.21042	22.48040	25.17046	22.46040	22.76041	22.75041	25.10046	22.90041
x ret.	70.26899	0.00000	0.00000	70.09895	61.74803	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.26017	9.71022	5.87013	6.84016	13.17030	8.86020	5.64013	11.84027	9.10021	8.56020
a	37.58021	27.58708	26.66373	26.80037	27.09044	27.36040	24.10708	42.72019	25.90042	26.87183
b	0.02688	0.01718	0.03013	0.02376	0.01967	0.02415	0.01606	0.01947	0.02444	0.02218

1 u.k. females 6 to 1
2 u.k. females 6 to 2
3 u.k. females 6 to 3
4 u.k. females 6 to 4
5 u.k. females 6 to 5
6 u.k. females 6 to 7
7 u.k. females 6 to 8
8 u.k. females 6 to 9
9 u.k. females 6 to 10
10 u.k. females 6 to the rest

APPENDIX C.2 (*continued*).

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.04829	0.07200	0.09957	0.11669	0.09184	0.16114	0.31923	0.05315	0.07428	1.03620
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	8.99942	8.74074	8.69925	6.92991	9.45552	5.04471	5.08563	9.55528	7.30295	5.06283
a1	0.02172	0.02109	0.01371	0.01905	0.02059	0.01965	0.00816	0.00829	0.01432	0.01507
alpha1	0.10671	0.12249	0.02812	0.08956	0.10974	0.11031	0.10231	0.02206	0.03091	0.08855
a2	0.07195	0.06632	0.04898	0.07016	0.05833	0.03916	0.04314	0.06772	0.06190	0.05065
mu2	21.62655	19.72382	19.63808	20.45384	19.13243	19.79182	21.10878	21.83313	22.31581	19.88078
alpha2	0.13922	0.13733	0.13281	0.15375	0.11271	0.10412	0.16279	0.23011	0.20601	0.12786
lambda2	0.24675	0.39795	0.55092	0.33991	0.39944	0.40692	0.26337	0.25664	0.26947	0.35358
a3	0.00004	0.00000	0.00000	0.00000	0.00000	0.00004	0.00002	0.00000	0.00000	0.00001
mu3	86.24116	0.00000	0.00000	0.00000	0.00000	82.75182	90.38014	0.00000	0.00000	91.84480
alpha3	0.38643	0.00000	0.00000	0.00000	0.00000	0.47935	0.40945	0.00000	0.00000	0.36267
lambda3	0.06484	0.00000	0.00000	0.00000	0.00000	0.08023	0.06354	0.00000	0.00000	0.05775
c	0.00311	0.00448	0.00247	0.00430	0.00392	0.00473	0.00692	0.00449	0.00332	0.00477
mean age	32.20114	32.36158	32.46232	31.77659	31.73974	35.86030	40.77051	36.40533	33.06323	35.54308
%(0-14)	20.49481	20.64176	20.04111	21.66739	20.53595	20.92563	16.09617	16.73290	21.50932	19.15673
%(15-64)	68.78252	66.31176	68.40372	65.76556	67.83284	63.43728	61.88543	66.12823	65.19626	65.20875
%(65+)	10.72268	13.04649	11.55516	12.56705	11.63121	15.63709	22.01840	17.13888	13.29442	15.63452
delta1c	6.99362	4.70828	5.55336	4.42783	5.24755	4.15667	1.17883	1.84657	4.32061	3.16214
delta12	0.30191	0.31803	0.27985	0.27157	0.35296	0.50177	0.18914	0.12239	0.23141	0.29757
delta32	0.00051	0.00000	0.00000	0.00000	0.00000	0.00103	0.00035	0.00000	0.00000	0.00029
beta12	0.76646	0.89198	0.21174	0.58253	0.97357	1.05940	0.62847	0.09588	0.15005	0.69252
sigma2	1.77239	2.89784	4.14821	2.21076	3.54382	3.90814	1.61781	1.11530	1.30804	2.76535
sigma3	0.16780	0.00000	0.00000	0.00000	0.00000	0.16738	0.15519	0.00000	0.00000	0.15923
x low	14.15021	14.97023	16.09025	14.89023	14.56022	15.45024	13.68020	13.33019	14.82022	14.66022
x high	23.78043	22.31040	22.13039	22.66040	22.17039	22.97041	22.84041	22.19039	23.16042	22.61040
x ret.	58.04865	0.00000	0.00000	0.00000	0.00000	60.11830	60.94816	0.00000	0.00000	59.21845
x shift	9.63022	7.34017	6.04014	7.77018	7.61017	7.52017	9.16021	8.86020	8.34019	7.95018
a	28.56611	27.53895	27.65704	26.39612	28.58465	27.34372	28.95577	27.91347	25.77472	27.76039
b	0.02544	0.02972	0.02546	0.02790	0.02768	0.01859	0.01526	0.02299	0.02060	0.02146

1	u.k. females	7 to 1	6	u.k. females	7 to 6
2	u.k. females	7 to 2	7	u.k. females	7 to 8
3	u.k. females	7 to 3	8	u.k. females	7 to 9
4	u.k. females	7 to 4	9	u.k. females	7 to 10
5	u.k. females	7 to 5	10	u.k. females	7 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.05551	0.09626	0.09801	0.08827	0.18236	0.06562	1.01236	0.09285	0.08119	1.77243
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	11.13289	6.34223	5.79112	8.16200	11.85289	7.20267	8.02589	6.94351	5.38445	6.11258
a1	0.02554	0.02050	0.01277	0.01818	0.01935	0.01464	0.01466	0.01825	0.02980	0.01593
alpha1	0.10257	0.08775	0.05650	0.06268	0.14714	0.02697	0.09906	0.17947	0.09325	0.08805
a2	0.07954	0.06116	0.06075	0.04453	0.05125	0.05741	0.06928	0.02220	0.05577	0.06175
mu2	25.39885	29.41678	22.55259	30.57491	17.98743	22.99182	19.58713	36.08138	21.62440	19.79077
alpha2	0.13277	0.30422	0.14737	0.17668	0.09877	0.25562	0.14774	0.27325	0.11665	0.13084
lambda2	0.15148	0.15078	0.25482	0.09786	0.31111	0.26606	0.31015	0.09244	0.33114	0.29503
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00007	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	84.41957	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.31151	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05481	0.00000	0.00000
c	0.00211	0.00405	0.00458	0.00326	0.00465	0.00321	0.00491	0.00389	0.00286	0.00449
mean age	28.76025	30.83423	34.14838	30.16189	33.77581	33.70362	33.48400	34.46955	28.72060	32.87231
%(0-14)	22.61685	22.66183	19.28901	23.88796	18.55322	22.31947	18.42365	16.19365	27.94860	19.65259
%(15-64)	71.01447	65.56864	66.91901	66.22997	67.65799	63.32986	67.31214	71.40600	63.39834	67.15348
%(65+)	6.36868	11.76952	13.79198	9.88207	13.78879	14.35068	14.26421	12.40036	8.65306	13.19393
delta1c	12.09310	5.06298	2.78722	5.57120	4.16260	4.55614	2.98770	4.68926	10.40173	3.54682
delta12	0.32109	0.33512	0.21021	0.40817	0.37759	0.25496	0.21163	0.82193	0.53424	0.25800
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00317	0.00000	0.00000
beta12	0.77253	0.28843	0.38340	0.35479	1.48972	0.10550	0.67053	0.65679	0.79935	0.67298
sigma2	1.14093	0.49564	1.72915	0.55388	3.14981	1.04084	2.09932	0.33830	2.83865	2.25498
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.17596	0.00000	0.00000
x low	13.41019	14.53022	15.00023	10.32012	12.35017	15.18023	13.43019	10.77013	16.37026	13.54020
x high	25.98048	24.64045	24.52045	23.87043	21.54038	23.01041	21.87039	24.31044	24.53045	22.38040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52.01966	0.00000	0.00000
x shift	12.57029	10.11023	9.52022	13.55031	9.19021	7.83018	8.44019	13.54031	8.16019	8.84020
a	31.42656	26.27616	29.51372	29.17042	31.09033	23.79711	28.17807	33.72036	25.93710	28.44961
b	0.02362	0.02910	0.02188	0.01438	0.02262	0.01875	0.02720	0.02460	0.02308	0.02429

1 u.k. females 8 to 1
2 u.k. females 8 to 2
3 u.k. females 8 to 3
4 u.k. females 8 to 4
5 u.k. females 8 to 5
6 u.k. females 8 to 6
7 u.k. females 8 to 7
8 u.k. females 8 to 9
9 u.k. females 8 to 10
10 u.k. females 8 to the rest

APPENDIX C.2 (*continued*).

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.03536	0.05321	0.20387	0.06474	0.17267	0.03748	0.36614	0.19399	0.04295	1.17039
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	35.50578	19.96043	10.79404	17.59876	13.32238	24.13642	13.95000	9.88207	15.61230	10.47847
a1	0.01887	0.04496	0.02550	0.03171	0.01204	0.02827	0.00936	0.01078	0.03456	0.01677
alpha1	0.03727	0.41038	0.16970	0.20517	0.09229	0.36197	0.02744	0.02637	0.11692	0.12889
a2	0.05443	0.06173	0.06373	0.08541	0.06288	0.07515	0.11110	0.01233	0.09092	0.07841
mu2	19.88280	19.54664	25.44642	23.33902	19.90735	27.43083	20.54686	30.70615	23.48164	20.24015
alpha2	0.08352	0.16522	0.22155	0.16565	0.16885	0.34375	0.24875	0.49309	0.18218	0.17202
lambda2	0.71288	0.59432	0.15354	0.17438	0.30048	0.20741	0.34180	0.14423	0.33743	0.29393
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	69.10982	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.62553	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25295	0.00000	0.00000
c	0.00000	0.00657	0.00547	0.00407	0.00613	0.00718	0.00326	0.00396	0.00318	0.00523
mean age	28.59029	36.05703	33.61654	31.27566	35.87149	37.95687	32.38882	35.04512	28.34656	33.82628
%(0-14)	19.60645	19.38582	21.88326	20.52125	18.29967	17.04199	15.87972	18.90520	28.12855	18.48226
%(15-64)	76.41191	62.25159	62.39882	67.89032	64.12856	63.20535	71.67616	65.57494	62.80445	66.41570
%(65+)	3.98164	18.36259	15.71792	11.58843	17.57177	19.75266	12.44411	15.51986	9.06701	15.10204
delta1c	0.00000	6.84362	4.66357	7.79516	1.96379	3.93892	2.87129	2.72523	10.85489	3.20554
delta12	0.34675	0.72830	0.40016	0.37128	0.19151	0.37621	0.08424	0.87399	0.38008	0.21394
delta32	0.00000·	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00145	0.00000	0.00000
beta12	0.44627	2.48385	0.76599	1.23853	0.54657	1.05299	0.11032	0.05347	0.64178	0.74931
sigma2	8.53512	3.59714	0.69305	1.05265	1.77955	0.60337	1.37410	0.29251	1.85213	1.70870
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.15561	0.00000	0.00000
x low	17.21028	15.68024	12.21017	12.21017	13.42019	15.26023	14.09021	12.77018	17.72029	13.56020
x high	22.77041	21.71038	22.97041	23.59043	21.72038	25.00046	21.45038	22.11039	25.23046	21.99039
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	61.73803	0.00000	0.00000
x shift	5.56013	6.03014	10.76025	11.38026	8.30019	9.74022	7.36017	9.34021	7.51017	8.43019
a	32.45698	33.33026	26.41208	29.97371	26.96654	30.20038	26.50039	24.41876	25.98379	27.52885
b	0.03227	0.03075	0.02162	0.02753	0.02302	0.03054	0.04026	0.02447	0.03403	0.02899

1 u.k. females 9 to 1
2 u.k. females 9 to 2
3 u.k. females 9 to 3
4 u.k. females 9 to 4
5 u.k. females 9 to 5
6 u.k. females 9 to 6
7 u.k. females 9 to 7
8 u.k. females 9 to 8
9 u.k. females 9 to 10
10 u.k. females 9 to the rest

	1	2	3	4	5	6	7	8	9	10
gmr (obs)	0.07106	0.06565	0.10618	0.06874	0.05976	0.02613	0.31964	0.07216	0.02365	0.81298
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.81905
mae%m	9.16043	7.09817	10.40557	11.75336	8.84351	15.07422	8.77298	7.38690	13.61625	5.48159
a1	0.03017	0.03991	0.01820	0.02809	0.03405	0.01868	0.01944	0.02485	0.00974	0.01876
alpha1	0.09635	0.11656	0.11693	0.05280	0.13630	0.08534	0.08600	0.09919	0.10877	0.08994
a2	0.07279	0.05264	0.05969	0.03944	0.07181	0.05013	0.08578	0.06082	0.07930	0.05667
mu2	23.41203	19.93013	30.38914	21.03768	19.52420	17.72740	20.16519	19.14946	21.98233	20.52069
alpha2	0.12107	0.07502	0.20621	0.09966	0.11356	0.06824	0.14291	0.10169	0.14642	0.12104
lambda2	0.22168	0.16689	0.11725	0.50977	0.24309	0.40104	0.26283	0.27056	0.17815	0.24281
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00177	0.00055	0.00431	0.00133	0.00218	0.00139	0.00274	0.00247	0.00463	0.00213
mean age	27.39830	25.52103	32.79805	26.54068	26.93507	30.06597	28.62317	28.63106	34.12550	28.67661
%(0-14)	26.26693	30.41049	19.21118	30.63025	25.33808	17.59880	20.43806	23.18692	14.64687	22.90644
%(15-64)	68.24979	65.83649	68.38385	63.81711	68.03619	75.95855	71.49069	69.10609	71.98289	69.22408
%(65+)	5.48328	3.75301	12.40498	5.55264	6.62572	6.44265	8.07125	7.70699	13.37024	7.86949
delta1c	17.06072	72.47650	4.22648	21.10043	15.58598	13.43114	7.10572	10.04466	2.10577	8.80598
delta12	0.41441	0.75819	0.30496	0.71214	0.47414	0.37255	0.22664	0.40854	0.12283	0.33112
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.79580	1.55386	0.56704	0.52977	1.20020	1.25050	0.60176	0.97544	0.74287	0.74308
sigma2	1.83092	2.22480	0.56861	5.11494	2.14057	5.87658	1.83911	2.66073	1.21672	2.00595
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	15.47024	11.86016	12.44017	17.68029	12.57017	13.41019	13.03018	12.90018	10.86013	13.26019
x high	25.86048	23.81043	25.42047	23.93043	22.42040	21.88039	22.31040	22.46040	22.98041	23.11041
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.39024	11.95027	12.98030	6.25014	9.85023	8.47019	9.28021	9.56022	12.12028	9.85023
a	29.01376	26.48541	31.32874	23.99045	27.10372	34.76490	28.27961	28.22705	34.79032	28.23347
b	0.02519	0.01353	0.02314	0.01996	0.02602	0.02738	0.03151	0.02389	0.02640	0.02055

1 u.k. females	10 to 1	6 u.k. females	10 to 6
2 u.k. females	10 to 2	7 u.k. females	10 to 7
3 u.k. females	10 to 3	8 u.k. females	10 to 8
4 u.k. females	10 to 4	9 u.k. females	10 to 9
5 u.k. females	10 to 5	10 u.k. females	10 to the rest

APPENDIX C.3 Japan (1970).*

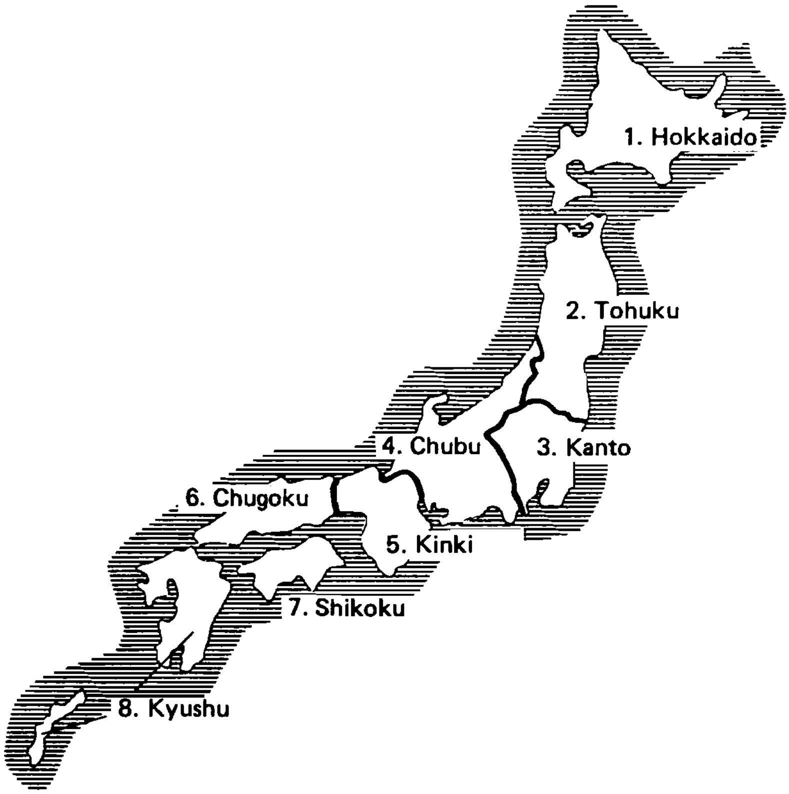

FIGURE C.3 Map of the regional aggregation of Japan used for this study.

*This regional aggregation of Japan varies slightly from the one used in the forthcoming IIASA case study report.

Males.

	1	2	3	4	5	6	7	8
gmr (obs)	0.16743	1.23077	0.28445	0.16103	0.02932	0.01349	0.08019	1.96667
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.68774	13.45336	9.71055	12.65566	20.68660	17.43085	21.06837	11.90650
a1	0.01036	0.00469	0.00917	0.01063	0.01729	0.01699	0.02495	0.00704
alpha1	0.04058	0.02197	0.04746	0.12113	0.06337	0.06703	0.06172	0.03663
a2	0.04290	0.09936	0.04355	0.07338	0.04591	0.07210	0.00023	0.06959
mu2	16.41261	16.46173	15.40624	17.13399	18.86104	22.29335	66.07513	16.08470
alpha2	0.08383	0.14978	0.07733	0.10852	0.06186	0.13736	0.31339	0.10998
lambda2	0.44840	0.47975	0.61984	0.41403	0.76354	0.42429	0.05242	0.53106
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00433	0.00369	0.00434	0.00452	0.00124	0.00460	0.00181	0.00367
mean age	34.27404	32.32303	34.11668	33.17442	31.44515	33.14957	29.12758	32.27902
%(0-14)	16.57357	11.33294	15.33434	13.06161	16.98163	19.83718	25.20244	13.13354
%(15-64)	70.10349	76.66982	71.61319	74.71610	75.98978	68.00319	69.36111	75.67094
%(65+)	13.32294	11.99725	13.05247	12.22228	7.02859	12.15963	5.43645	11.19553
delta1c	2.38926	1.27243	2.11457	2.35220	13.97167	3.69356	13.80953	1.91795
delta12	0.24139	0.04720	0.21062	0.14481	0.37666	0.23564	107.74816	0.10119
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.48409	0.14671	0.61371	1.11620	1.02442	0.48796	0.19694	0.33304
sigma2	5.34894	3.20311	8.01597	3.81526	12.34237	3.08883	0.16726	4.82874
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.24017	11.82016	12.31017	12.41017	16.41026	17.71029	15.77025	12.21017
x high	19.98034	18.88032	18.65031	20.32035	22.01039	24.86045	31.45061	19.01032
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.74018	7.06016	6.34015	7.91018	5.60013	7.15016	15.68036	6.80016
a	33.59694	35.84386	35.72521	35.85357	36.57024	29.82706	33.42381	35.52688
b	0.02137	0.04420	0.02494	0.03406	0.02978	0.02958	0.01713	0.03569

1 japan males 1 to 2
2 japan males 1 to 3
3 japan males 1 to 4
4 japan males 1 to 5
5 japan males 1 to 6
6 japan males 1 to 7
7 japan males 1 to 8
8 japan males 1 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.28040	0.52527	1.74588	0.26364	0.09419	0.01601	0.00539	0.02143	2.42693
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	12.08950	11.51803	15.06905	16.10538	35.05441	10.67559	11.44661	8.43004	15.34299
a1	0.00740	0.01740	0.00341	0.00333	-0.01238	0.01888	0.02405	0.03517	0.00320
alpha1	0.25947	0.15358	-0.00554	-0.00686	0.09849	0.09977	0.13945	0.16767	-0.00787
a2	0.03806	0.05396	0.12785	0.04664	0.05735	0.08967	0.06987	0.08322	0.09129
mu2	16.34628	16.07860	16.53250	15.75680	16.03065	20.86334	21.29762	30.72656	16.12955
alpha2	0.03471	0.06486	0.18779	0.08366	0.05962	0.12559	0.15507	0.18165	0.14217
lambda2	0.44864	0.46568	0.49075	0.70111	0.45623	0.35992	0.51061	0.13707	0.55985
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00159	0.00210	0.00225	0.00304	0.00255	0.00265	0.00634	0.00366	0.00237
mean age	40.53283	32.03585	36.54566	41.25540	0.00000	29.96431	34.87301	31.72617	38.54094
%(0-14)	4.92484	13.19736	8.23181	8.19601	-4.64591	17.33112	20.91126	22.55832	7.77064
%(15-64)	79.68277	78.26610	73.51883	70.15396	92.82899	75.15857	62.99514	67.50928	72.19482
%(65+)	15.39240	8.53654	18.24936	21.65003	11.81691	7.51031	16.09360	9.93239	20.03454
delta1c	4.65082	8.29685	1.51806	1.09623	-4.85193	7.12359	3.79282	9.60814	1.35055
delta12	0.19458	0.32236	0.02670	0.07143	-0.21594	0.21058	0.34422	0.42261	0.03503
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	7.47530	2.36778	-0.02949	-0.08205	1.65206	0.79440	0.89927	0.92306	-0.05533
sigma2	12.92530	7.17957	2.61332	8.38015	7.65278	2.86585	3.29281	0.75459	3.93792
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.89016	12.18016	5.02000	5.02000	0.00000	15.49024	17.40028	15.65024	5.02000
x high	22.05039	20.21035	18.50031	18.81032	0.00000	23.71043	23.60043	28.62054	18.60031
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.16023	8.03018	13.48031	13.79032	0.00000	8.22019	6.20014	12.97030	13.58031
a	102.41312	42.46013	0.00000	0.00000	0.00000	31.99034	27.55373	33.18708	0.00000
b	0.02458	0.03093	0.04869	0.02575	0.00000	0.03865	0.02951	0.02687	0.04003

1 japan males 2 to 1
2 japan males 2 to 2
3 japan males 2 to 3
4 japan males 2 to 4
5 japan males 2 to 5
6 japan males 2 to 6
7 japan males 2 to 7
8 japan males 2 to 8
9 japan males 2 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.05550	0.18560	1.81309	0.27030	0.17186	0.05512	0.02151	0.08464	0.84453
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	8.67614	15.29815	9.32037	7.94231	6.18281	6.03747	12.08855	5.59445	8.42122
a1	0.01527	0.01532	0.02105	0.01411	0.01916	0.02044	0.02213	0.02283	0.01574
alpha1	0.08922	0.15892	0.17995	0.10301	0.06581	0.08150	0.12890	0.11362	0.10516
a2	0.07029	0.03934	0.07850	0.04907	0.04909	0.05137	0.04203	0.05126	0.04860
mu2	18.14864	18.73384	22.61861	19.30083	19.41326	19.98803	19.82886	20.24656	19.38639
alpha2	0.08583	0.04488	0.12334	0.07181	0.06275	0.07012	0.06235	0.07742	0.06888
lambda2	0.32909	0.29679	0.16413	0.35967	0.49302	0.56156	0.55563	0.43421	0.38220
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00147	0.00286	0.00438	0.00375	0.00016	0.00123	0.00340	0.00292	0.00330
mean age	29.38956	38.60592	33.45847	35.14930	29.75835	30.55445	34.92460	32.50695	34.67368
%(0-14)	14.55829	11.43617	16.51688	14.69780	17.89258	18.55914	17.55348	19.14676	15.15302
%(15-64)	80.06683	74.11632	71.55068	73.18559	77.82458	75.39609	70.35868	71.20167	73.52961
%(65+)	5.37488	14.44752	11.93244	12.11661	4.28284	6.04478	12.08784	9.65157	11.31738
delta1c	10.37027	5.35392	4.80511	3.75965	121.60875	16.63011	6.50694	7.80694	4.77378
delta12	0.21722	0.38950	0.26808	0.28762	0.39036	0.39792	0.52642	0.44549	0.32394
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.03953	3.54120	1.45900	1.43452	1.04879	1.16222	2.06745	1.46753	1.52679
sigma2	3.83442	6.61352	1.33072	5.00862	7.85650	8.00797	8.91162	5.60830	5.54901
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.61017	12.95018	11.33014	14.28021	15.79025	16.73027	16.54026	16.10025	14.68022
x high	22.07039	24.98046	24.29044	23.63043	23.36042	23.53042	23.65043	24.07044	23.71043
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.46022	12.03028	12.96030	9.35021	7.57017	6.80016	7.11016	7.97018	9.03021
a	36.67859	56.28001	35.49942	40.15879	36.36693	35.30362	38.84356	34.72364	39.96737
b	0.03360	0.02035	0.02417	0.02411	0.02957	0.03114	0.02459	0.02697	0.02481

1 japan males 3 to 1
2 japan males 3 to 2
3 japan males 3 to 3
4 japan males 3 to 4
5 japan males 3 to 5
6 japan males 3 to 6
7 japan males 3 to 7
8 japan males 3 to 8
9 japan males 3 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.02860	0.06123	0.76236	0.46656	0.28178	0.03819	0.01609	0.06144	1.24970
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	9.51923	14.62149	12.99929	8.34610	10.62882	12.76985	9.21374	8.54049	12.57627
a1	0.01265	0.01597	0.00582	0.01527	0.01350	0.01912	0.02137	0.02253	0.01027
alpha1	0.15652	0.16876	0.02351	0.15397	0.15041	0.10371	0.07686	0.12710	0.15277
a2	0.08108	0.04208	0.13715	0.05604	0.08835	0.07518	0.05285	0.07254	0.09909
mu2	16.89764	15.79576	16.11796	15.42453	16.29744	17.93573	19.28392	19.62303	15.78278
alpha2	0.10983	0.04443	0.17938	0.06922	0.11045	0.09449	0.06545	0.11200	0.12546
lambda2	0.39885	0.49561	0.54897	0.58994	0.47119	0.38154	0.50212	0.32327	0.57245
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00377	0.00153	0.00226	0.00241	0.00284	0.00158	0.00003	0.00362	0.00339
mean age	31.73321	35.48758	28.67082	31.68022	29.52953	28.17549	28.81195	31.23837	29.78923
%(0-14)	12.68382	10.65071	11.35619	12.77210	12.53794	16.31617	18.45617	18.76638	11.60865
%(15-64)	76.87747	78.22839	80.13762	78.49864	79.45185	78.50732	78.10737	71.11207	79.22618
%(65+)	10.43871	11.12090	8.50619	8.72926	8.01021	5.17652	3.43647	10.12155	9.16516
delta1c	3.35685	10.45285	2.57013	6.34804	4.75933	12.09132	712.88135	6.21691	3.03045
delta12	0.15606	0.37944	0.04243	0.27251	0.15275	0.25431	0.40425	0.31062	0.10365
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.42521	3.79859	0.13104	2.22431	1.36182	1.09767	1.17435	1.13482	1.21766
sigma2	3.63163	11.15562	3.06042	8.52234	4.26620	4.03806	7.67179	2.88637	4.56271
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.98016	12.17016	12.01016	12.23017	12.10016	13.13019	15.73025	13.94020	12.17016
x high	20.10035	20.55036	18.15030	18.99032	19.34033	21.46038	23.13041	22.79041	18.42031
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.12019	8.38019	6.14014	6.76015	7.24017	8.33019	7.40017	8.85020	6.25014
a	36.42751	55.78328	31.73360	42.22345	35.73189	33.43722	35.59027	31.17496	35.34521
b	0.03795	0.02625	0.06075	0.03411	0.04462	0.03667	0.03175	0.02993	0.05076

1 japan males 4 to 1
2 japan males 4 to 2
3 japan males 4 to 3
4 japan males 4 to 4
5 japan males 4 to 5
6 japan males 4 to 6
7 japan males 4 to 7
8 japan males 4 to 8
9 japan males 4 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.02011	0.02293	0.39577	0.27016	1.00688	0.15006	0.07597	0.13534	1.07034
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	13.10527	14.57140	9.33477	8.32320	7.24850	7.09668	8.14622	4.75751	6.88829
a1	0.01355	0.01254	0.01712	0.01791	0.01474	0.02112	0.01790	0.02361	0.01867
alpha1	0.13641	0.09337	0.09313	0.11455	0.12958	0.13954	0.11618	0.11995	0.11123
a2	0.08477	0.03492	0.06547	0.05227	0.05919	0.06809	0.05508	0.05961	0.05889
mu2	17.22884	18.51671	16.84731	15.50012	17.50075	20.22708	19.67385	20.96512	17.27411
alpha2	0.10792	0.04619	0.07697	0.05726	0.08092	0.10653	0.09817	0.09825	0.07463
lambda2	0.39117	0.50672	0.39722	0.56379	0.30220	0.28517	0.40332	0.27896	0.36091
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00300	0.00342	0.00078	0.00034	0.00344	0.00412	0.00497	0.00385	0.00183
mean age	30.44643	37.88949	27.99488	29.57160	33.03647	32.92361	34.47334	32.58365	30.25580
%(0-14)	12.76497	13.15339	15.26092	13.91900	14.48646	17.59651	17.77464	20.18189	16.02601
%(15-64)	78.73419	72.25594	80.81866	81.06340	74.95909	70.91914	68.64829	68.76479	77.05957
%(65+)	8.50085	14.59068	3.92041	5.01760	10.55444	11.48435	13.57706	11.05332	6.91442
delta1c	4.51421	3.66659	22.00955	52.61811	4.28631	5.12097	3.60457	6.12674	10.18004
delta12	0.15983	0.35896	0.26146	0.34268	0.24896	0.31021	0.32504	0.39615	0.31697
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.26397	2.02149	1.20986	2.00073	1.60139	1.30979	1.18351	1.22094	1.49047
sigma2	3.62461	10.97090	5.16049	9.84686	3.73460	2.67681	4.10846	2.83935	4.83605
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.26017	14.97023	12.32017	12.32017	11.61015	13.80020	15.09023	14.64022	12.42017
x high	20.47035	23.04041	20.80036	19.39033	21.73038	23.58043	23.07041	24.53045	21.45038
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.21019	8.07018	8.48019	7.07016	10.12023	9.78022	7.98018	9.89023	9.03021
a	36.03691	48.64722	36.10025	40.92348	38.40296	33.44187	32.84365	32.15179	36.12526
b	0.03984	0.02060	0.03495	0.03349	0.02670	0.02706	0.02534	0.02358	0.02966

1 japan males 5 to 1
2 japan males 5 to 2
3 japan males 5 to 3
4 japan males 5 to 4
5 japan males 5 to 5
6 japan males 5 to 6
7 japan males 5 to 7
8 japan males 5 to 8
9 japan males 5 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.01691	0.02488	0.53678	0.18742	0.78384	0.61701	0.10972	0.21867	1.87821
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.13116	25.89611	15.75611	13.50549	12.10580	9.49476	10.29196	9.94802	12.87610
a1	0.00425	0.01587	0.00777	0.00842	0.00571	0.01725	0.02258	0.01610	0.00749
alpha1	0.06762	0.04833	0.03719	0.14963	0.01738	0.13224	0.09165	0.13505	0.02753
a2	0.13630	0.05796	0.13916	0.10864	0.13573	0.05424	0.07130	0.07120	0.11380
mu2	17.10550	17.33040	16.48124	15.89997	16.65762	15.59141	18.57564	15.66182	16.32595
alpha2	0.14625	0.08435	0.16569	0.14393	0.18477	0.06615	0.09245	0.09257	0.15344
lambda2	0.41743	0.60842	0.49016	0.57075	0.46602	0.51907	0.27408	0.54340	0.51315
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00219	0.00139	0.00139	0.00421	0.00215	0.00189	0.00120	0.00263	0.00186
mean age	27.94888	28.87664	26.02538	30.83747	29.84097	30.91900	27.14603	29.47733	28.40489
%(0-14)	7.76242	17.31359	11.74156	11.46495	11.07663	14.34613	20.04016	14.67392	12.27323
%(15-64)	86.29065	76.87386	83.22778	77.52082	79.31654	77.89323	75.69763	77.47961	80.25551
%(65+)	5.94693	5.81255	5.03066	11.01423	9.60683	7.76064	4.26221	7.84647	7.47126
delta1c	1.94073	11.40734	5.58207	2.00072	2.65418	9.14141	18.80500	6.11827	4.02620
delta12	0.03119	0.27379	0.05586	0.07754	0.04206	0.31812	0.31668	0.22608	0.06581
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.46238	0.57305	0.22449	1.03954	0.09405	1.99909	0.99131	1.45893	0.17940
sigma2	2.85424	7.21336	2.95837	3.96531	2.52213	7.84708	2.96459	5.87030	3.34428
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.85016	14.22021	12.06016	12.19016	11.76015	12.10016	12.29017	12.16016	12.10016
x high	19.61033	20.45035	18.68031	18.31030	18.64031	19.44033	22.26040	18.85032	18.66031
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.76018	6.23014	6.62015	6.12014	6.88016	7.34017	9.97023	6.69015	6.56015
a	38.18292	32.33599	31.19695	34.00190	32.94935	39.50684	31.50201	34.83356	32.24360
b	0.06000	0.03288	0.06235	0.05187	0.05590	0.03194	0.02917	0.03950	0.05288

1 japan males 6 to 1
2 japan males 6 to 2
3 japan males 6 to 3
4 japan males 6 to 4
5 japan males 6 to 5
6 japan males 6 to 6
7 japan males 6 to 7
8 japan males 6 to 8
9 japan males 6 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.02071	0.01336	0.50883	0.26321	1.29355	0.29650	0.39835	0.09618	2.49229
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	37.80335	21.79872	16.22446	17.88891	14.75879	10.61577	10.81065	8.95066	14.50877
a1	0.01314	0.00863	0.00516	0.00439	0.00479	0.01843	0.01612	0.00978	0.00526
alpha1	0.02646	0.00671	0.01762	0.00312	0.00529	0.15147	0.08921	0.14460	0.01042
a2	0.07869	0.00213	0.22707	0.09899	0.13996	0.06740	0.05199	0.09014	0.13246
mu2	15.32094	34.29626	18.93717	15.50040	16.41437	15.10364	16.85459	15.75823	16.29585
alpha2	0.10652	0.63010	0.29735	0.15066	0.19500	0.07727	0.06618	0.12414	0.18118
lambda2	0.90290	0.12576	0.30480	0.75643	0.50717	0.65291	0.37187	0.61392	0.52423
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00000	0.00217	0.00143	0.00253	0.00189	0.00118	0.00190	0.00418	0.00189
mean age	26.83075	36.49166	27.06978	34.27962	32.28432	27.97299	31.33546	31.30108	30.92058
%(0-14)	15.05817	13.08612	10.15966	9.74091	9.81077	13.97733	15.67762	12.08566	10.32734
%(15-64)	80.41034	69.26746	82.66295	75.41554	77.34460	81.10298	76.43403	76.80387	78.73573
%(65+)	4.53149	17.64642	7.17739	14.84355	12.84463	4.91969	7.88835	11.11047	10.93694
delta1c	0.00000	3.97124	3.61980	1.73646	2.54108	15.68045	8.50336	2.33853	2.78724
delta12	0.16694	4.04569	0.02274	0.04431	0.03424	0.27341	0.31000	0.10852	0.03972
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.24838	0.01065	0.05925	0.02070	0.02715	1.96020	1.34805	1.16490	0.05749
sigma2	8.47611	0.19959	1.02508	5.02095	2.60084	8.44949	5.61906	4.94559	2.89337
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.03018	10.87013	10.91014	12.27017	11.64015	12.19016	12.18016	12.40017	11.84016
x high	17.66029	21.46038	19.02032	17.64029	18.31030	18.31030	21.25037	18.35031	18.32030
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	4.63011	10.59024	8.11019	5.37012	6.67015	6.12014	9.07021	5.95014	6.48015
a	32.17562	27.81040	29.56032	43.59007	36.82837	38.21016	37.37523	34.81689	35.05658
b	0.04613	0.03690	0.07343	0.04878	0.05603	0.04231	0.02653	0.04652	0.05626

1 japan males 7 to 1
2 japan males 7 to 2
3 japan males 7 to 3
4 japan males 7 to 4
5 japan males 7 to 5
6 japan males 7 to 6
7 japan males 7 to 7
8 japan males 7 to 8
9 japan males 7 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.03365	0.01780	0.91160	0.46738	0.97875	0.24989	0.03597	0.81747	2.69505
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	11.18192	26.51394	16.76453	18.65621	17.13717	9.38432	14.66735	11.16185	16.34085
a1	0.01602	0.01241	0.00443	0.00173	0.00557	0.01625	0.01247	0.01449	0.00468
alpha1	0.09940	0.05878	0.00679	0.00009	0.00036	0.11805	0.05520	0.10954	0.00493
a2	0.07125	0.08373	0.14085	0.06573	0.07929	0.05279	0.05029	0.05345	0.08725
mu2	17.28231	18.87131	17.11779	15.29715	15.96399	15.78001	18.14141	15.89735	16.12027
alpha2	0.07921	0.10706	0.18538	0.10322	0.12273	0.05547	0.06337	0.06769	0.12832
lambda2	0.34974	0.77190	0.41636	0.73873	0.57989	0.51422	0.51359	0.49288	0.54574
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00063	0.00163	0.00173	0.00459	0.00087	0.00024	0.00108	0.00225	0.00198
mean age	28.28290	29.02914	31.49781	36.44346	35.95842	30.48429	31.78649	31.50854	34.04624
%(0-14)	13.80448	13.50076	9.08697	9.02899	8.94033	12.21906	13.40765	13.95493	9.37286
%(15-64)	82.55400	81.19608	79.63946	74.93193	75.25149	82.47110	80.01569	77.65881	77.25526
%(65+)	3.64152	5.30316	11.27357	16.03909	15.80818	5.30984	6.57667	8.38626	13.37189
delta1c	25.31219	7.59732	2.56393	0.37762	6.43140	67.57146	11.59484	6.43651	2.36195
delta12	0.22481	0.14827	0.03147	0.02637	0.07020	0.30792	0.24799	0.27108	0.05358
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.25478	0.54898	0.03660	0.00092	0.00297	2.12823	0.87102	1.61820	0.03843
sigma2	4.41513	7.20974	2.24592	7.15705	4.72493	9.27062	8.10413	7.28143	4.25292
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.10016	16.23026	11.35015	11.58015	11.54015	12.28017	14.50022	12.21017	11.80016
x high	21.37037	21.40038	19.06032	17.97030	18.65031	19.96034	22.05039	19.79034	18.78032
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.27021	5.17012	7.71018	6.39015	7.11016	7.68018	7.55017	7.58017	6.98016
a	38.07022	34.48026	38.05110	0.00000	62.58617	44.47677	40.96446	39.43184	45.69825
b	0.03601	0.04927	0.05465	0.03650	0.03892	0.03335	0.03043	0.03083	0.04212

1 japan males 8 to 1
2 japan males 8 to 2
3 japan males 8 to 3
4 japan males 8 to 4
5 japan males 8 to 5
6 japan males 8 to 6
7 japan males 8 to 7
8 japan males 8 to 8
9 japan males 8 to the rest

Females.

	1	2	3	4	5	6	7	8
gmr (obs)	0.12274	0.81643	0.26310	0.11914	0.01834	0.01162	0.06218	1.41354
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	13.57428	5.01904	22.63592	9.80660	8.49904	15.91917	10.99874	7.87757
a1	0.01377	0.01014	0.00930	0.01409	0.01132	0.02091	0.03190	0.01224
alpha1	0.08230	0.08728	0.02367	0.07105	0.05840	0.04084	0.09163	0.06886
a2	0.00008	0.05194	0.08298	0.04018	0.04903	0.04833	0.07716	0.04161
mu2	70.71729	15.50782	14.71241	15.02169	23.82629	25.31195	31.81717	14.77228
alpha2	0.27219	0.09397	0.16459	0.07326	0.09604	0.16769	0.21342	0.07514
lambda2	0.04320	0.51842	0.95520	0.94094	0.35127	0.54109	0.18552	0.78055
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00673	0.00542	0.00366	0.00423	0.00516	0.00402	0.00395	0.00442
mean age	36.84278	34.46325	31.98556	32.83047	37.10249	32.82603	31.13368	33.25758
%(0-14)	19.94828	15.85703	17.30789	17.99014	16.67266	25.88292	28.80454	17.47784
%(15-64)	63.03078	69.52030	69.57932	69.58736	68.76881	61.39814	60.55278	69.65860
%(65+)	17.02094	14.62267	13.11279	12.42249	14.55854	12.71894	10.64268	12.86356
delta1c	2.04575	1.86879	2.53811	3.33505	2.19610	5.19697	8.07335	2.76693
delta12	169.08086	0.19513	0.11208	0.35074	0.23097	0.43265	0.41343	0.29415
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.30236	0.92881	0.14380	0.96988	0.60808	0.24357	0.42936	0.91654
sigma2	0.15871	5.51715	5.80338	12.84448	3.65757	3.22671	0.86927	10.38861
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.61013	11.86016	12.46017	13.03018	18.41031	21.79038	20.80036	12.37017
x high	27.50051	18.70031	16.55026	17.62029	27.38051	27.37051	30.92059	17.65029
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	16.89039	6.84016	4.09009	4.59011	8.97021	5.58013	10.12023	5.28012
a	33.69042	33.13662	27.07530	30.78180	37.24700	26.73049	30.04717	32.11691
b	0.00878	0.02650	0.04365	0.02579	0.02155	0.02008	0.02304	0.02550

1 japan females 1 to 2
2 japan females 1 to 3
3 japan females 1 to 4
4 japan females 1 to 5
5 japan females 1 to 6
6 japan females 1 to 7
7 japan females 1 to 8
8 japan females 1 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.09666	0.33804	1.21585	0.18910	0.05934	0.00916	0.00388	0.01847	1.59243
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	12.09467	7.48789	11.65592	17.67876	22.10011	13.80179	22.99329	12.43543	10.96779
a1	0.01786	0.02052	0.00533	0.00754	0.00527	0.02349	0.02626	0.04003	0.00687
alpha1	0.27608	0.10233	0.09450	0.01953	0.10874	0.09760	0.10630	0.11836	0.12665
a2	0.11729	0.07558	0.18839	0.13387	0.08640	0.05791	0.06155	0.06298	0.15984
mu2	21.04212	19.50647	17.62378	15.30267	15.54127	34.94383	21.44862	22.24777	16.85883
alpha2	0.23366	0.10874	0.23334	0.18669	0.13299	0.26704	0.10700	0.09571	0.20134
lambda2	0.25720	0.23719	0.36375	0.76399	0.72475	0.11416	0.52995	0.39973	0.42514
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00669	0.00273	0.00379	0.00167	0.00590	0.00256	0.00397	0.00117	0.00406
mean age	35.40110	29.59417	29.02125	28.30133	33.97446	29.15670	31.82497	26.61131	29.70021
%(0-14)	14.09799	19.22553	10.78336	13.32674	11.62033	20.58182	22.29664	28.58230	11.29004
%(15-64)	69.03499	72.83615	79.38590	78.01120	73.75299	72.47914	67.00704	67.22710	78.18089
%(65+)	16.86702	7.93832	9.83074	8.66206	14.62668	6.93904	10.69632	4.19060	10.52908
deltalc	2.66896	7.51039	1.40717	4.50541	0.89359	9.17204	6.61221	34.12621	1.69443
delta12	0.15227	0.27146	0.02828	0.05632	0.06100	0.40561	0.42670	0.63553	0.04299
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.18155	0.94106	0.40499	0.10464	0.81769	0.36547	0.99340	1.23663	0.62902
sigma2	1.10077	2.18125	1.55892	4.09226	5.44969	0.42748	4.95262	4.17658	2.11150
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.34017	12.05016	11.40015	12.35017	12.58017	14.88023	17.90030	17.80029	11.69015
x high	21.42038	22.57040	18.84032	17.15028	17.87029	27.38051	24.38044	25.67047	18.61031
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.08021	10.52024	7.44017	4.80011	5.29012	12.50029	6.48015	7.87018	6.92016
a	30.17034	31.31202	29.64941	29.40028	35.59520	31.28757	29.78038	29.08375	30.41030
b	0.03627	0.02712	0.06488	0.06495	0.04334	0.03346	0.02997	0.03075	0.06066

1 japan females 2 to 1
2 japan females 2 to 2
3 japan females 2 to 3
4 japan females 2 to 4
5 japan females 2 to 5
6 japan females 2 to 6
7 japan females 2 to 7
8 japan females 2 to 8
9 japan females 2 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.03508	0.09779	1.59564	0.18750	0.12463	0.04006	0.01635	0.07272	0.57414
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	13.50488	5.79892	7.24872	6.20230	7.39255	10.35964	13.46437	7.83569	6.50278
a1	0.02017	0.02578	0.02164	0.02193	0.02329	0.03142	0.02748	0.01963	0.02311
alpha1	0.09991	0.13611	0.19170	0.12613	0.11046	0.12252	0.16243	0.12212	0.12106
a2	0.06356	0.08444	0.03443	0.07376	0.06935	0.07682	0.07766	0.07996	0.07518
mu2	22.18778	21.79240	33.21281	23.07742	24.10309	25.75635	21.62909	24.53657	23.28538
alpha2	0.13659	0.15757	0.28581	0.16097	0.14412	0.17586	0.14753	0.19442	0.15884
lambda2	0.32355	0.28525	0.11123	0.26990	0.25107	0.23707	0.40818	0.19309	0.25429
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00590	0.00484	0.00656	0.00601	0.00524	0.00506	0.00547	0.00620	0.00557
mean age	34.70906	32.33368	35.61066	34.85173	33.93269	32.53871	33.75098	34.88129	34.01875
%(0-14)	20.90361	21.12490	17.92651	20.62856	21.94827	25.67194	20.44427	19.69995	21.29762
%(15-64)	63.98947	66.03690	65.31857	63.78653	64.20841	61.04613	65.40488	64.36980	64.14049
%(65+)	15.10692	12.83821	16.75492	15.58491	13.84332	13.28193	14.15084	15.93025	14.56189
deltalc	3.41990	5.32990	3.30026	3.64767	4.44721	6.20893	5.02601	3.16769	4.15003
delta12	0.31728	0.30528	0.62862	0.29735	0.33587	0.40901	0.35380	0.24554	0.30739
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.73147	0.86378	0.67072	0.78357	0.76642	0.69669	1.10099	0.62812	0.76214
sigma2	2.36879	1.81030	0.38917	1.67672	1.74208	1.34806	2.76673	0.99314	1.60093
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	16.38026	15.04023	12.25017	15.88025	16.58027	17.57029	16.75027	14.13021	15.72025
x high	24.73045	23.80043	24.70045	24.91046	26.19049	26.91050	24.09044	24.40044	25.04046
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.35019	8.76020	12.45028	9.03021	9.61022	9.34021	7.34017	10.27024	9.32021
a	28.81041	28.19373	30.13374	28.87041	29.77709	27.90379	29.54371	28.49327	28.74042
b	0.02272	0.02900	0.02363	0.02406	0.02272	0.02344	0.03138	0.02299	0.02409

1 japan females 3 to 1
2 japan females 3 to 2
3 japan females 3 to 3
4 japan females 3 to 4
5 japan females 3 to 5
6 japan females 3 to 6
7 japan females 3 to 7
8 japan females 3 to 8
9 japan females 3 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.01671	0.03298	0.57411	0.35904	0.21855	0.02746	0.01295	0.05723	0.93998
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.93430	8.88063	9.44844	7.02314	7.06525	11.96549	8.63437	8.58961	8.29468
a1	0.03500	0.02038	0.00977	0.01800	0.01603	0.02267	0.02716	0.02654	0.01431
alpha1	0.21084	0.05726	0.14842	0.13169	0.11823	0.09950	0.13220	0.13579	0.14709
a2	0.07980	0.06090	0.11217	0.08912	0.10495	0.08097	0.08204	0.10290	0.10375
mu2	23.01160	20.63923	16.40168	17.71858	19.27689	21.16880	21.45365	19.99025	17.30556
alpha2	0.16124	0.10878	0.14891	0.12477	0.15730	0.13359	0.13218	0.16159	0.14325
lambda2	0.17308	0.32844	0.44823	0.31935	0.26922	0.30906	0.33636	0.36504	0.35223
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00525	0.00231	0.00401	0.00337	0.00395	0.00359	0.00360	0.00351	0.00387
mean age	32.63620	29.29474	30.63832	29.87614	30.62858	30.57299	30.75740	29.23967	30.45205
%(0-14)	21.39866	22.37625	12.34512	16.55660	16.34709	20.87570	21.07211	20.40160	14.44475
%(15-64)	64.90886	70.25679	76.85147	74.12564	73.00685	69.33620	69.05502	70.05296	75.12081
%(65+)	13.69247	7.36696	10.80341	9.31776	10.64606	9.78810	9.87287	9.54544	10.43444
delta1c	6.66212	8.81427	2.43292	5.33385	4.05393	6.31851	7.55238	7.55894	3.69288
delta12	0.43855	0.33460	0.08708	0.20198	0.15272	0.27999	0.33105	0.25795	0.13788
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.30762	0.52636	0.99667	1.05543	0.75161	0.74484	1.00014	0.84035	1.02683
sigma2	1.07345	3.01933	3.00996	2.55946	1.71154	2.31358	2.54461	2.25908	2.45890
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	12.05016	15.17023	11.76015	11.82016	11.98016	15.11023	15.80025	14.63022	11.67015
x high	23.37042	23.75043	18.85032	20.58036	21.20037	23.75043	24.15044	22.17039	19.82034
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	11.32026	8.58020	7.09016	8.76020	9.22021	8.64020	8.35019	7.54017	8.15019
a	28.92039	28.86373	32.85026	31.02578	29.88217	29.01706	29.93038	27.32038	31.40212
b	0.02310	0.02503	0.04875	0.03587	0.03629	0.03038	0.03290	0.04008	0.04175

1 japan females 4 to 1
2 japan females 4 to 2
3 japan females 4 to 3
4 japan females 4 to 4
5 japan females 4 to 5
6 japan females 4 to 6
7 japan females 4 to 7
8 japan females 4 to 8
9 japan females 4 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.01179	0.01218	0.26798	0.18350	0.85823	0.11912	0.06536	0.12261	0.78254
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	22.12844	13.79767	6.41872	7.19609	5.78641	5.13658	9.21773	5.28353	4.81641
a1	0.03564	0.02411	0.02208	0.01950	0.01555	0.02509	0.02209	0.02724	0.02247
alpha1	0.12347	0.13123	0.10399	0.11578	0.16031	0.12817	0.11766	0.14399	0.11308
a2	0.06321	0.03340	0.06935	0.08403	0.08812	0.07842	0.06560	0.08435	0.08275
mu2	21.10093	37.76019	28.93451	20.12739	22.23117	20.75924	19.96488	22.70716	23.02081
alpha2	0.12040	0.20318	0.19901	0.13509	0.17753	0.14451	0.12865	0.17085	0.15918
lambda2	0.40926	0.08367	0.13141	0.21580	0.19742	0.42386	0.56426	0.21942	0.19980
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00420	0.00471	0.00462	0.00400	0.00613	0.00462	0.00509	0.00510	0.00458
mean age	30.40351	33.10007	32.30339	31.06645	35.12310	32.01712	33.07037	32.47279	32.04726
%(0-14)	26.48080	20.93411	21.45457	18.99696	16.06873	21.15543	20.44180	21.68831	20.86518
%(15-64)	62.53955	66.68256	66.23101	70.14651	68.10283	66.48267	66.08070	64.86194	66.88760
%(65+)	10.97965	12.38333	12.31442	10.85652	15.82845	12.36191	13.47750	13.44975	12.24722
delta1c	8.48843	5.11524	4.77902	4.87713	2.53741	5.42787	4.34057	5.34665	4.90653
delta12	0.56376	0.72176	0.31840	0.23206	0.17644	0.31990	0.33675	0.32296	0.27150
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.02547	0.64588	0.52254	0.85703	0.90304	0.88692	0.91463	0.84277	0.71042
sigma2	3.39914	0.41183	0.66034	1.59745	1.11205	2.93315	4.38613	1.28428	1.25517
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	16.68027	12.24017	13.43019	11.60015	11.98016	16.19026	16.54026	13.94020	13.52020
x high	23.96043	26.96050	25.57047	22.13039	22.72041	23.24042	22.53040	23.75043	24.00043
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.28017	14.72034	12.14028	10.53024	10.74025	7.05016	5.99014	9.81022	10.48024
a	26.26708	32.28542	29.64735	30.04855	31.12036	27.94039	28.08370	27.78887	28.88503
b	0.02596	0.01769	0.02153	0.02677	0.02648	0.03293	0.03151	0.02554	0.02454

1 japan females 5 to 1
2 japan females 5 to 2
3 japan females 5 to 3
4 japan females 5 to 4
5 japan females 5 to 5
6 japan females 5 to 6
7 japan females 5 to 7
8 japan females 5 to 8
9 japan females 5 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.00631	0.01386	0.32589	0.11311	0.70285	0.46613	0.08105	0.15269	1.39575
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	24.51994	12.30600	10.69618	11.72753	10.06412	6.96881	7.28987	7.00913	8.59574
a1	0.02196	0.03383	0.01750	0.01631	0.00611	0.02116	0.03219	0.02062	0.01376
alpha1	0.14403	0.10288	0.15916	0.15823	0.10223	0.11496	0.13464	0.11773	0.15029
a2	0.09953	0.05981	0.11383	0.08186	0.15687	0.06751	0.08130	0.08180	0.10958
mu2	21.21478	29.20333	18.35597	15.49970	16.90454	16.73691	22.26298	21.49677	16.60332
alpha2	0.14096	0.09763	0.15995	0.10406	0.19438	0.09529	0.13437	0.14212	0.14534
lambda2	0.50362	0.10400	0.28461	0.56273	0.40983	0.35500	0.18028	0.19195	0.41852
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00435	0.00140	0.00385	0.00274	0.00366	0.00264	0.00305	0.00432	0.00359
mean age	32.31285	28.97122	30.05593	28.92150	29.14690	28.99750	28.73516	31.68656	29.56494
%(0-14)	16.65003	27.08500	15.73173	14.25770	11.12763	19.12057	24.07109	19.67212	13.95349
%(15-64)	72.49081	67.43401	73.93960	77.93995	79.21366	73.00977	67.46162	68.69307	76.37206
%(65+)	10.85915	5.48100	10.32867	7.80235	9.65871	7.86966	8.46729	11.63481	9.67445
deltalc	5.05265	24.16923	4.54273	5.95425	1.67154	8.00199	10.56894	4.77284	3.83319
delta12	0.22059	0.56561	0.15374	0.19923	0.03896	0.31340	0.39591	0.25208	0.12554
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.02182	1.05383	0.99502	1.52050	0.52593	1.20635	1.00199	0.82836	1.03405
sigma2	3.57290	1.06522	1.77930	5.40764	2.10842	3.72536	1.34163	1.35058	2.87965
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	17.14028	13.98021	11.39015	12.03016	11.55015	11.78016	12.48017	11.87016	11.78016
x high	23.73043	29.07055	20.34035	18.46031	18.72031	20.26035	23.67043	22.88041	19.10032
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.59015	15.09035	8.95020	6.43015	7.17016	8.48019	11.19026	11.01025	7.32017
a	32.23034	32.17043	30.04943	34.44356	31.02938	30.50578	28.27874	29.88948	31.19120
b	0.04309	0.01296	0.04039	0.04450	0.06053	0.03046	0.02361	0.02435	0.04732

1 japan females 6 to 1
2 japan females 6 to 2
3 japan females 6 to 3
4 japan females 6 to 4
5 japan females 6 to 5
6 japan females 6 to 6
7 japan females 6 to 7
8 japan females 6 to 8
9 japan females 6 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.00913	0.00900	0.31548	0.13968	1.01300	0.19008	0.29465	0.05973	1.73603
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	27.60073	28.38801	12.06607	13.34243	10.74830	10.66397	8.22838	5.91310	9.49843
a1	0.03926	0.02000	0.00790	0.01227	0.00526	0.01809	0.02285	0.02116	0.00917
alpha1	0.11792	0.05000	0.15816	0.12575	0.12044	0.11052	0.07185	0.23111	0.15737
a2	0.00040	0.09015	0.15475	0.09040	0.17026	0.09179	0.04817	0.00645	0.13703
mu2	55.48544	24.43313	17.09580	15.06610	17.14894	18.09050	15.47044	38.01075	16.64835
alpha2	0.37309	0.24493	0.18619	0.11970	0.21313	0.13003	0.06431	0.43712	0.17354
lambda2	0.06338	0.23714	0.38581	0.77571	0.39419	0.29284	0.49180	0.10542	0.42996
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00141	0.00450	0.00355	0.00326	0.00410	0.00319	0.00012	0.00671	0.00382
mean age	25.08721	31.52501	29.12490	28.95347	29.84775	29.21664	25.92860	35.83644	29.67910
%(0-14)	27.68680	23.30968	10.79291	14.03145	10.63559	17.74239	22.07081	16.32066	11.72289
%(15-64)	68.26564	64.51952	79.84567	77.12186	78.72223	73.48717	74.93811	66.57557	78.16459
%(65+)	4.04755	12.17080	9.36142	8.84669	10.64218	8.77044	2.99108	17.10378	10.11252
delta1c	27.94174	4.44666	2.22317	3.75843	1.28382	5.67636	192.60318	3.15210	2.39774
delta12	98.07555	0.22189	0.05103	0.13574	0.03091	0.19705	0.47442	3.27955	0.06691
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.31607	0.20415	0.84944	1.05058	0.56509	0.84997	1.11737	0.52871	0.90681
sigma2	0.16988	0.96822	2.07209	6.48060	1.84956	2.25208	7.64776	0.24117	2.47760
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.75020	15.72025	11.45015	12.44017	11.46015	11.69015	12.04016	12.76018	11.68015
x high	27.32051	24.15044	18.98032	17.45028	18.71031	20.75036	19.25033	24.52045	18.75031
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	13.57031	8.43019	7.53017	5.01011	7.25017	9.06021	7.21017	11.76027	7.07016
a	29.22816	25.13712	32.25301	32.27523	31.00120	29.95034	29.77531	29.21208	31.75028
b	0.02717	0.02498	0.05930	0.05143	0.06188	0.03465	0.02757	0.03080	0.05596

1 japan females 7 to 1
2 japan females 7 to 2
3 japan females 7 to 3
4 japan females 7 to 4
5 japan females 7 to 5
6 japan females 7 to 6
7 japan females 7 to 7
8 japan females 7 to 8
9 japan females 7 to the rest

APPENDIX C.3 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.01749	0.01036	0.58999	0.34801	0.74777	0.16428	0.02643	0.62524	1.90433
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	14.02071	11.91897	8.54619	18.97226	8.61834	11.09735	11.09142	7.46784	9.07453
a1	0.03939	0.02691	0.00895	0.00794	0.00768	0.01955	0.02632	0.01795	0.01078
alpha1	0.11781	0.10573	0.14815	0.02444	0.12112	0.13179	0.16014	0.12318	0.11751
a2	0.07709	0.05327	0.12694	0.12987	0.11991	0.07882	0.06480	0.06577	0.09735
mu2	23.99502	22.21686	16.72615	15.20293	15.93400	18.16344	22.53665	19.05868	15.43128
alpha2	0.13505	0.09261	0.16228	0.18471	0.15838	0.11736	0.13917	0.10658	0.12600
lambda2	0.28061	0.38841	0.41619	0.80120	0.53456	0.26599	0.22685	0.24845	0.63551
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00263	0.00350	0.00379	0.00205	0.00399	0.00382	0.00614	0.00449	0.00301
mean age	27.92160	32.11752	29.96013	28.03261	30.07642	30.88583	35.03150	33.02763	28.75644
%(0-14)	29.12714	23.01517	11.69631	14.15018	12.03158	18.10935	20.80804	17.72110	13.18692
%(15-64)	63.55435	66.68923	78.21330	77.32667	77.40143	71.41866	63.35246	69.95377	78.37339
%(65+)	7.31851	10.29559	10.09039	8.52315	10.56699	10.47198	15.83950	12.32513	8.43970
delta1c	14.94925	7.67731	2.36322	3.86379	1.92597	5.12191	4.28532	3.99765	3.58234
delta12	0.51097	0.50509	0.07050	0.06113	0.06406	0.24803	0.40612	0.27298	0.11070
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	0.87235	1.14175	0.91295	0.13232	0.76472	1.12302	1.15068	1.15579	0.93262
sigma2	2.07782	4.19420	2.56466	4.33751	3.37516	2.26650	1.63001	2.33113	5.04390
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	17.49029	17.60029	11.65015	12.43017	11.96016	11.36015	14.33021	11.90016	12.22017
x high	26.45049	25.75047	18.98032	17.03028	18.20030	21.11037	24.60045	22.30040	17.96030
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.96021	8.15019	7.33017	4.60011	6.24014	9.75022	10.27024	10.40024	5.74013
a	27.67044	31.12373	32.64391	28.49695	32.05481	30.85579	29.74325	32.27307	32.68524
b	0.02755	0.02466	0.05272	0.06458	0.05484	0.02891	0.02033	0.02374	0.05205

1 japan females 8 to 1
2 japan females 8 to 2
3 japan females 8 to 3
4 japan females 8 to 4
5 japan females 8 to 5
6 japan females 8 to 6
7 japan females 8 to 7
8 japan females 8 to 8
9 japan females 8 to the rest

APPENDIX C.4 Netherlands (1974).*

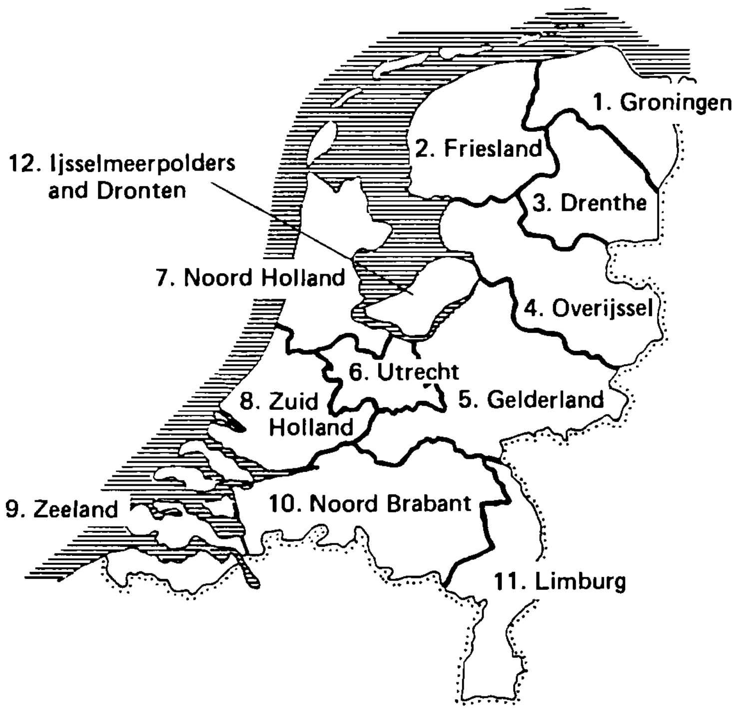

FIGURE C.4 Map of the regional aggregation of the Netherlands used for this study.

*All schedules are outmigration flows from each region to the rest of the country.

Males: outmigration from each region.

	1	2	3	4	5	6	7	8
gmr (obs)	4.75493	3.92735	3.67821	3.17845	3.81677	4.81395	4.39682	4.23647
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	5.30331	5.20980	5.40258	6.40490	6.34158	4.73144	4.16903	3.02542
a1	0.01574	0.01078	0.01212	0.01310	0.01070	0.01065	0.01365	0.01444
alpha1	0.08992	0.06953	0.08846	0.08561	0.08642	0.07597	0.10731	0.08613
a2	0.06656	0.06376	0.06759	0.06621	0.06826	0.05812	0.06196	0.05424
mu2	22.93296	21.04934	20.38829	20.53458	20.26918	20.42789	22.05448	21.90435
alpha2	0.14746	0.14982	0.14407	0.12240	0.13123	0.11925	0.12695	0.11478
lambda2	0.22094	0.28627	0.31668	0.30015	0.30101	0.30352	0.20297	0.25700
a3	0.00001	0.00001	0.00001	0.00000	0.00001	0.00000	0.00009	0.00002
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.07850	0.07551	0.07588	0.10053	0.06587	0.07535	0.04398	0.06183
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00355	0.00418	0.00389	0.00336	0.00393	0.00422	0.00373	0.00389
mean age	39.31461	40.05135	39.73194	38.02990	37.93359	37.91038	38.43335	37.73109
%(0-14)	17.17444	15.34456	14.95404	15.15449	14.13296	15.11558	15.49279	17.27305
%(15-64)	60.10563	61.14225	61.73774	64.91174	66.26878	65.81244	64.51496	63.92394
%(65+)	22.71992	23.51319	23.30822	19.93378	19.59825	19.07198	19.99225	18.80301
delta1c	4.43373	2.57695	3.11352	3.89330	2.72578	2.52201	3.66226	3.70920
delta12	0.23650	0.16905	0.17937	0.19784	0.15677	0.18334	0.22037	0.26615
delta32	0.00010	0.00012	0.00012	0.00001	0.00019	0.00008	0.00140	0.00028
beta12	0.60976	0.46411	0.61402	0.69945	0.65856	0.63704	0.84526	0.75034
sigma2	1.49832	1.91067	2.19805	2.45220	2.29371	2.54521	1.59876	2.23897
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	14.33021	14.21021	14.24021	14.20021	13.80020	14.14021	12.85018	14.77022
x high	24.60045	23.20042	22.78041	23.40042	22.94041	23.38042	24.22044	24.86045
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.27024	8.99021	8.54020	9.20021	9.14021	9.24021	11.37026	10.09023
a	30.07896	29.92180	30.10179	32.11462	32.74802	32.81604	33.49535	32.26036
b	0.02157	0.02322	0.02608	0.02634	0.02722	0.02394	0.02098	0.02060

1 netherlands males region = 1
2 netherlands males region = 2
3 netherlands males region = 3
4 netherlands males region = 4
5 netherlands males region = 5
6 netherlands males region = 6
7 netherlands males region = 7
8 netherlands males region = 8

	9	10	11	12
gmr (obs)	3.63964	3.49814	3.60536	6.10455
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	5.26467	4.42435	6.41094	33.06621
a1	0.01505	0.01161	0.01234	0.00170
alpha1	0.04667	0.06402	0.10277	0.04802
a2	0.05449	0.06205	0.07066	0.05272
mu2	19.46053	20.94606	20.69522	20.15953
alpha2	0.11257	0.12854	0.12823	0.28452
lambda2	0.35961	0.28208	0.23926	0.61428
a3	0.00005	0.00000	0.00000	0.00003
mu3	0.00000	0.00000	0.00000	0.00000
alpha3	0.05744	0.08839	0.08579	0.07284
lambda3	0.00000	0.00000	0.00000	0.00000
c	0.00104	0.00294	0.00328	0.00687
mean age	37.75279	41.49833	39.51237	54.18848
%(0-14)	16.91562	14.39038	13.69166	9.84636
%(15-64)	62.40010	59.97063	63.94981	45.59629
%(65+)	20.68428	25.63899	22.35854	44.55735
deltalc	14.47297	3.95485	3.75886	0.24693
delta12	0.27627	0.18714	0.17467	0.03217
delta32	0.00095	0.00006	0.00005	0.00053
beta12	0.41455	0.49807	0.80146	0.16878
sigma2	3.19446	2.19452	1.86595	2.15901
sigma3	0.00000	0.00000	0.00000	0.00000
x low	14.31021	14.17021	12.72018	16.37026
x high	22.50040	23.58043	23.19042	21.42038
x ret.	0.00000	0.00000	0.00000	0.00000
x shift	8.19019	9.41022	10.47024	5.05012
a	29.53608	31.48035	33.37366	29.13463
b	0.02355	0.02303	0.02522	0.01849

9 netherlands males region = 9
10 netherlands males region = 10
11 netherlands males region = 11
12 netherlands males region = 12

Females: outmigration from each region.

	1	2	3	4	5	6	7	8
gmr (obs)	4.92170	4.35758	3.99291	3.49217	3.93347	4.76774	4.26515	4.26010
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	5.57032	8.90725	9.83422	7.42851	7.66944	7.22708	5.54579	5.40977
a1	0.01413	0.00994	0.01251	0.01249	0.01273	0.01164	0.01353	0.01320
alpha1	0.11015	0.11311	0.10605	0.12274	0.10759	0.09932	0.09611	0.08771
a2	0.07648	0.09284	0.09417	0.10087	0.09170	0.07325	0.06611	0.06480
mu2	20.57280	19.75573	19.98286	20.65245	19.99189	19.91326	20.26254	20.23706
alpha2	0.16826	0.18906	0.18936	0.18754	0.17388	0.15139	0.14934	0.14553
lambda2	0.26334	0.29692	0.29169	0.25254	0.30909	0.35494	0.32392	0.33443
a3	0.00000	0.00001	0.00019	0.00001	0.00003	0.00000	0.00007	0.00001
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.11854	0.07400	0.03847	0.06928	0.06297	0.10061	0.05122	0.07127
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00451	0.00457	0.00321	0.00351	0.00317	0.00427	0.00374	0.00440
mean age	38.72398	37.79747	37.89417	37.42063	39.00070	39.32231	39.56654	37.57629
%(0-14)	16.13089	13.55699	14.03498	13.46208	13.50458	14.46851	15.60823	16.78795
%(15-64)	61.32296	65.44514	64.36825	65.69346	63.18933	62.78499	60.98086	63.07958
%(65+)	22.54615	20.99786	21.59677	20.84447	23.30609	22.74649	23.41092	20.13247
delta1c	3.13535	2.17413	3.90162	3.55805	4.01671	2.72376	3.61493	3.00319
delta12	0.18475	0.10707	0.13280	0.12384	0.13879	0.15884	0.20471	0.20377
delta32	0.00000	0.00007	0.00202	0.00012	0.00031	0.00001	0.00103	0.00011
beta12	0.65461	0.59827	0.56003	0.65445	0.61874	0.65607	0.64356	0.60265
sigma2	1.56509	1.57049	1.54044	1.34659	1.77764	2.34448	2.16903	2.29798
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	13.12019	12.78018	12.98018	12.51017	13.45019	14.32021	14.28021	14.47022
x high	22.18039	21.24037	21.42038	21.78038	21.80038	22.25039	22.57040	22.63040
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.06021	8.46019	8.44019	9.27021	8.35019	7.93018	8.29019	8.16019
a	28.33423	29.25703	28.51204	29.73870	29.20036	29.90750	29.07037	28.86609
b	0.02591	0.03316	0.03316	0.03423	0.03341	0.02930	0.02583	0.02568

1 netherlands females region = 1
2 netherlands females region = 2
3 netherlands females region = 3
4 netherlands females region = 4
5 netherlands females region = 5
6 netherlands females region = 6
7 netherlands females region = 7
8 netherlands females region = 8

	9	10	11	12
gmr (obs)	3.80067	3.52109	3.54463	6.29654
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	11.05379	9.69440	9.52443	17.46382
a1	0.01161	0.01082	0.01274	0.00547
alpha1	0.06176	0.08619	0.11502	0.03255
a2	0.08373	0.09071	0.10439	0.02616
mu2	19.80263	20.04311	20.44422	15.18870
alpha2	0.18463	0.18125	0.20475	0.10894
lambda2	0.30026	0.32388	0.26981	0.69389
a3	0.00001	0.00006	0.00003	0.00002
mu3	0.00000	0.00000	0.00000	0.00000
alpha3	0.07932	0.05432	0.06266	0.08343
lambda3	0.00000	0.00000	0.00000	0.00000
c	0.00318	0.00322	0.00315	0.00197
mean age	39.77856	39.29827	39.19236	60.38743
%(0-14)	15.04061	13.21536	13.26212	8.04937
%(15-64)	59.85442	63.21149	62.51197	35.69372
%(65+)	25.10497	23.57315	24.22591	56.25691
delta1c	3.64903	3.36197	4.04725	2.77502
delta12	0.13866	0.11925	0.12208	0.20906
delta32	0.00010	0.00066	0.00030	0.00081
beta12	0.33449	0.47555	0.56177	0.29878
sigma2	1.62627	1.78688	1.31773	6.36929
sigma3	0.00000	0.00000	0.00000	0.00000
x low	13.08018	13.72020	12.75018	12.32017
x high	21.33037	21.79038	21.42038	17.80029
x ret.	0.00000	0.00000	0.00000	0.00000
x shift	8.25019	8.07018	8.67020	5.48013
a	27.02269	28.99037	28.21204	30.90860
b	0.02866	0.03367	0.03485	0.01259

9 netherlands females region = 9
10 netherlands females region = 10
11 netherlands females region = 11
12 netherlands females region = 12

APPENDIX C.5 Soviet Union (1974).*

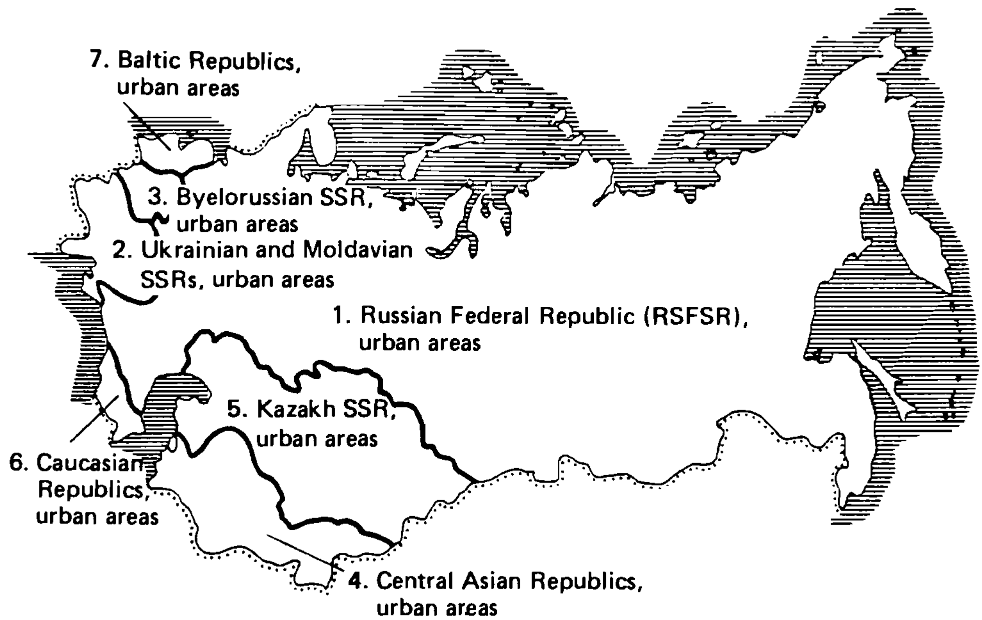

FIGURE C.5 Map of the regional aggregation of the Soviet Union used for this study.

*Total (male plus female) flows only. Regions 1–7 refer to the urban areas of the region; region 8 includes *all* rural areas of the Soviet Union.

	1	2	3	4	5	6	7	8	9
gmr (obs)	3.90378	0.26384	0.03529	0.08091	0.10665	0.02118	0.03368	0.74666	1.28820
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	15.43382	13.97125	14.46018	17.19613	16.17655	19.10940	12.66977	15.77127	15.13050
a1	0.00740	0.01027	0.01283	0.00955	0.01018	0.00261	0.00941	0.00669	0.00806
alpha1	0.25542	0.22269	0.19168	0.22322	0.21732	0.27777	0.22316	0.27713	0.24947
a2	0.12476	0.13803	0.15321	0.12242	0.12071	0.11152	0.09174	0.12811	0.13036
mu2	19.37082	19.91893	19.36453	19.19405	19.48024	18.17423	25.15442	19.50022	19.62549
alpha2	0.17544	0.20040	0.20086	0.15816	0.17651	0.13280	0.29121	0.17940	0.18426
lambda2	0.27116	0.24813	0.26071	0.29122	0.27809	0.32370	0.16128	0.27206	0.26470
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00475	0.00443	0.00336	0.00397	0.00485	0.00379	0.00590	0.00477	0.00466
mean age	33.12405	31.85361	29.18485	31.93547	33.08696	32.58033	34.52554	33.22263	32.80618
%(0-14)	9.76629	11.20723	12.07090	9.69270	11.14441	6.73093	12.61459	9.28182	9.95290
%(15-64)	77.60664	76.93344	78.81831	79.63146	75.96701	83.03870	71.85881	78.04827	77.63486
%(65+)	12.62706	11.85933	9.11079	10.67583	12.88858	10.23037	15.52660	12.66991	12.41225
delta1c	1.55935	2.31922	3.81763	2.40569	2.09692	0.68710	1.59392	1.40206	1.72924
delta12	0.05934	0.07440	0.08373	0.07801	0.08434	0.02337	0.10253	0.05221	0.06181
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.45586	1.11122	0.95429	1.41139	1.23120	2.09166	0.76632	1.54480	1.35391
sigma2	1.54557	1.23818	1.29793	1.84134	1.57544	2.43754	0.55383	1.51655	1.43654
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.14014	11.05014	11.10014	11.77015	11.70015	11.01014	10.43012	11.15014	11.19014
x high	20.98037	20.78036	20.36035	21.29037	21.12037	20.94036	21.49038	21.04037	21.00037
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.84023	9.73022	9.26021	9.52022	9.42022	9.93023	11.06025	9.89023	9.81022
a	38.18932	33.49847	31.40577	37.82660	34.90209	52.99454	31.13035	39.23112	36.85479
b	0.04389	0.04617	0.05220	0.04577	0.04230	0.04624	0.03803	0.04489	0.04502

1 ussr migration flow 1 to 1
2 ussr migration flow 1 to 2
3 ussr migration flow 1 to 3
4 ussr migration flow 1 to 4
5 ussr migration flow 1 to 5
6 ussr migration flow 1 to 6
7 ussr migration flow 1 to 7
8 ussr migration flow 1 to 8
9 ussr migration flow 1 to the rest

APPENDIX C.5 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.74295	3.22573	0.03461	0.03150	0.05294	0.01769	0.02588	0.74597	1.65154
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	17.30169	15.39872	15.24740	19.14019	18.33680	19.83373	12.41132	17.83611	17.43248
a1	0.00602	0.00856	0.01090	0.00805	0.00844	0.00172	0.00757	0.00535	0.00593
alpha1	0.25019	0.21649	0.18493	0.21458	0.20793	0.29489	0.21958	0.27283	0.25578
a2	0.12443	0.14021	0.15735	0.12180	0.12076	0.10677	0.12539	0.12812	0.12673
mu2	18.51724	18.87225	18.63266	18.54950	18.66835	17.74494	21.34220	18.66712	18.61592
alpha2	0.16647	0.18987	0.19647	0.15069	0.16749	0.12669	0.24243	0.17045	0.16923
lambda2	0.31416	0.29037	0.29502	0.33258	0.32041	0.36602	0.21619	0.31362	0.31235
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00455	0.00426	0.00326	0.00371	0.00466	0.00375	0.00579	0.00457	0.00454
mean age	32.74375	31.52018	28.95403	31.52636	32.74770	32.64215	34.34806	32.82865	32.72173
%(0-14)	9.02934	10.35562	11.15127	8.80433	10.28457	6.22074	11.76062	8.57336	8.90437
%(15-64)	78.86940	78.23232	80.02923	81.18977	77.35104	83.61852	72.98672	79.29259	79.01865
%(65+)	12.10126	11.41206	8.81950	10.00591	12.36439	10.16074	15.25265	12.13406	12.07699
delta1c	1.32343	2.00749	3.34882	2.16853	1.81104	0.45824	1.30741	1.17121	1.30453
delta12	0.04838	0.06102	0.06929	0.06611	0.06990	0.01609	0.06034	0.04178	0.04675
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.50296	1.14023	0.94125	1.42400	1.24143	2.32761	0.90575	1.60061	1.51140
sigma2	1.88722	1.52935	1.50159	2.20713	1.91296	2.88908	0.89176	1.83995	1.84569
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.37015	11.27014	11.29014	12.01016	11.89016	11.25014	10.75013	11.37015	11.38015
x high	20.55036	20.34035	20.01034	20.93036	20.69036	20.65036	20.81036	20.62036	20.59036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.18021	9.07021	8.72020	8.92020	8.80020	9.40022	10.06023	9.25021	9.21021
a	39.74110	34.45845	31.88303	39.33019	36.03571	58.33173	32.31031	40.91108	39.81747
b	0.04670	0.04944	0.05578	0.04868	0.04511	0.04722	0.04068	0.04769	0.04723

1 ussr migration flow 2 to 1
2 ussr migration flow 2 to 2
3 ussr migration flow 2 to 3
4 ussr migration flow 2 to 4
5 ussr migration flow 2 to 5
6 ussr migration flow 2 to 6
7 ussr migration flow 2 to 7
8 ussr migration flow 2 to 8
9 ussr migration flow 2 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.84880	0.25583	3.38349	0.02896	0.04914	0.01023	0.13446	0.79702	2.12445
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	17.82011	13.78570	13.79104	16.47050	15.44687	20.60185	13.88206	19.40097	14.95314
a1	0.00475	0.00562	0.00878	0.00521	0.00513	0.00210	0.00380	0.00469	0.00285
alpha1	0.28273	0.31129	0.22236	0.29642	0.32583	0.20063	0.39775	0.28467	0.43442
a2	0.09011	0.12529	0.14294	0.10477	0.10804	0.08058	0.07519	0.08741	0.11377
mu2	17.52632	19.67572	18.99844	18.64510	19.35196	16.45198	24.70615	17.33772	19.35604
alpha2	0.13220	0.21323	0.20797	0.15220	0.19025	0.09206	0.31647	0.12355	0.19393
lambda2	0.36707	0.26359	0.27894	0.32742	0.29481	0.46355	0.17016	0.38709	0.28354
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00502	0.00606	0.00469	0.00534	0.00664	0.00292	0.00785	0.00466	0.00648
mean age	34.62718	35.08406	31.99901	34.76283	36.48198	32.64874	38.25883	34.26372	36.27256
%(0-14)	9.13685	10.47530	11.17833	9.00827	10.40155	5.88439	11.77189	8.62854	9.63470
%(15-64)	77.06323	73.70399	76.32208	76.92258	72.46465	85.22771	68.24343	78.39834	73.59016
%(65+)	13.79992	15.82071	12.49959	14.06915	17.13380	8.88790	19.98468	12.97313	16.77514
delta1c	0.94694	0.92799	1.87115	0.97529	0.77313	0.71935	0.48368	1.00701	0.44045
delta12	0.05275	0.04486	0.06141	0.04971	0.04749	0.02607	0.05048	0.05367	0.02509
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	2.13856	1.45990	1.06918	1.94759	1.71266	2.17941	1.25681	2.30415	2.24012
sigma2	2.77656	1.23619	1.34126	2.15130	1.54962	5.03545	0.53769	3.13320	1.46209
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.42015	10.78013	11.03014	11.67015	11.40015	11.61015	9.57010	11.54015	10.61013
x high	20.32035	20.49035	20.05034	20.99037	20.85036	19.95034	21.07037	20.30035	20.71036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.90020	9.71022	9.02021	9.32021	9.45022	8.34019	11.50026	8.76020	10.10023
a	46.64735	36.78024	32.82301	44.10832	39.68656	63.18620	35.19250	48.89095	45.22012
b	0.03936	0.04121	0.04846	0.04073	0.03702	0.04375	0.03171	0.04024	0.03858

1 ussr migration flow 3 to 1
2 ussr migration flow 3 to 2
3 ussr migration flow 3 to 3
4 ussr migration flow 3 to 4
5 ussr migration flow 3 to 5
6 ussr migration flow 3 to 6
7 ussr migration flow 3 to 7
8 ussr migration flow 3 to 8
9 ussr migration flow 3 to the rest

APPENDIX C.5 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.81042	0.10792	0.01158	2.28019	0.20570	0.01830	0.01056	0.78857	1.95304
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.36504	20.09077	15.88228	22.83461	23.17047	20.80673	23.05523	20.74260	23.39912
a1	0.00281	0.00273	0.00246	0.00362	0.00341	0.00179	0.00286	0.00278	0.00220
alpha1	0.49997	0.29510	0.33518	0.21287	0.23634	0.57948	0.27677	0.49304	0.28915
a2	0.07616	0.10031	0.15076	0.08274	0.07642	0.09224	0.06952	0.07473	0.07846
mu2	16.96264	17.81606	20.04278	17.51655	17.35113	16.90253	17.06651	16.85721	17.17540
alpha2	0.09113	0.12653	0.20627	0.09261	0.09369	0.09565	0.09508	0.08706	0.09332
lambda2	0.37651	0.35350	0.25441	0.40816	0.42365	0.37327	0.39915	0.39241	0.41983
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00326	0.00379	0.00452	0.00263	0.00348	0.00204	0.00424	0.00302	0.00328
mean age	33.84592	33.01665	32.63004	32.80481	34.00835	31.38017	35.14887	33.73206	33.74567
%(0-14)	6.08737	6.89080	7.70615	5.56025	6.46757	4.51009	7.52218	5.68420	5.75610
%(15-64)	83.88099	82.34645	80.29090	86.17969	83.13242	88.90569	79.99117	84.77604	84.34225
%(65+)	10.03164	10.76275	12.00295	8.26006	10.40002	6.58423	12.48666	9.53976	9.90165
deltalc	0.86085	0.71969	0.54423	1.37589	0.97939	0.87728	0.67333	0.92319	0.67156
delta12	0.03689	0.02720	0.01632	0.04376	0.04462	0.01943	0.04111	0.03726	0.02808
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	5.48607	2.33220	1.62495	2.29843	2.52272	6.05851	2.91096	5.66354	3.09836
sigma2	4.13136	2.79371	1.23340	4.40713	4.52200	3.90257	4.19803	4.50761	4.49862
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.54013	11.25014	10.39012	12.13016	12.11016	10.14012	11.44015	10.69013	11.67015
x high	20.74036	20.73036	20.88036	21.16037	20.92036	20.56036	20.67036	20.71036	20.77036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.20023	9.48022	10.49024	9.03021	8.81020	10.42024	9.23021	10.02023	9.10021
a	77.89963	54.32088	43.46015	59.77655	60.45321	85.90950	62.13349	80.34959	68.06976
b	0.03947	0.04505	0.05072	0.04335	0.04011	0.04708	0.03600	0.03986	0.04134

1 ussr migration flow 4 to 1
2 ussr migration flow 4 to 2
3 ussr migration flow 4 to 3
4 ussr migration flow 4 to 4
5 ussr migration flow 4 to 5
6 ussr migration flow 4 to 6
7 ussr migration flow 4 to 7
8 ussr migration flow 4 to 8
9 ussr migration flow 4 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	1.41594	0.26158	0.03253	0.25463	3.24671	0.01573	0.01607	0.95578	2.95226
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	21.61075	15.34025	15.64809	17.74339	16.75016	20.98951	15.74293	22.86763	21.65283
a1	0.00456	0.00344	0.00672	0.00366	0.00314	0.00328	0.00194	0.00437	0.00478
alpha1	0.28232	0.39391	0.25995	0.37259	0.41210	0.42631	0.58017	0.27414	0.26737
a2	0.07775	0.12794	0.14547	0.10658	0.10757	0.07263	0.07051	0.07578	0.07957
mu2	16.98397	19.90734	19.54174	18.93031	19.44199	16.32335	25.92217	16.87382	17.01580
alpha2	0.10164	0.20772	0.20776	0.15532	0.17852	0.07831	0.32309	0.09591	0.10305
lambda2	0.41400	0.25868	0.26216	0.31315	0.29634	0.40644	0.16014	0.43276	0.41309
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00402	0.00593	0.00470	0.00554	0.00646	0.00230	0.00769	0.00373	0.00392
mean age	34.05502	35.11594	32.37814	35.23263	36.51470	33.08001	38.16673	33.88333	33.77938
%(0-14)	7.70707	9.36415	9.82615	8.51753	9.35920	5.31695	10.86187	7.23988	7.72610
%(15-64)	80.73326	75.21132	77.72881	77.00342	74.00200	86.55075	69.61584	81.83045	81.00541
%(65+)	11.55967	15.42453	12.44505	14.47906	16.63879	8.13230	19.52230	10.92967	11.26849
delta1c	1.13303	0.58040	1.43010	0.65994	0.48632	1.42162	0.25178	1.17265	1.21934
delta12	0.05864	0.02688	0.04620	0.03433	0.02921	0.04510	0.02745	0.05769	0.06005
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	2.77766	1.89641	1.25122	2.39879	2.30843	5.44375	1.79571	2.85826	2.59447
sigma2	4.07325	1.24537	1.26187	2.01614	1.65998	5.19002	0.49567	4.51212	4.00857
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.62015	10.42012	10.80013	11.30014	11.16014	10.59013	8.80009	11.75015	11.68015
x high	20.38035	20.77036	20.44035	21.18037	21.16037	20.39035	21.55038	20.36035	20.38035
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.76020	10.35024	9.64022	9.88023	10.00023	9.80022	12.75029	8.61020	8.70020
a	55.59813	42.30017	35.74026	49.06188	47.09646	80.37959	40.47522	57.81446	53.92543
b	0.03929	0.04214	0.04869	0.04023	0.03760	0.04042	0.03300	0.03970	0.04004

1 ussr migration flow 5 to 1
2 ussr migration flow 5 to 2
3 ussr migration flow 5 to 3
4 ussr migration flow 5 to 4
5 ussr migration flow 5 to 5
6 ussr migration flow 5 to 6
7 ussr migration flow 5 to 7
8 ussr migration flow 5 to 8
9 ussr migration flow 5 to the rest

APPENDIX C.5 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.49872	0.12434	0.01042	0.04449	0.02638	1.68190	0.01052	0.26806	0.98293
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	20.79895	14.23162	14.98932	18.40946	16.24944	24.94810	22.26801	22.06684	20.22377
a1	0.00364	0.00288	0.00534	0.00320	0.00236	0.00190	0.00532	0.00355	0.00376
alpha1	0.30360	0.42778	0.26899	0.41946	0.51047	0.19729	0.17883	0.29977	0.29875
a2	0.10404	0.13412	0.15616	0.13776	0.13523	0.09250	0.08815	0.10082	0.10993
mu2	18.17587	23.32381	22.42364	20.57639	21.96799	17.33011	17.69685	17.96126	18.44110
alpha2	0.12856	0.27061	0.26144	0.18317	0.23858	0.09646	0.11662	0.12126	0.13684
lambda2	0.33415	0.19184	0.20021	0.27485	0.22801	0.38898	0.33901	0.35316	0.32193
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00366	0.00531	0.00412	0.00462	0.00594	0.00221	0.00364	0.00339	0.00372
mean age	32.80619	34.04960	31.33650	33.76804	35.49295	31.74539	32.90876	32.56586	32.69172
%(0-14)	6.87864	8.48463	8.65126	7.00704	8.52652	4.59769	8.74702	6.44278	7.00571
%(15-64)	82.75321	77.53228	80.34999	80.77261	76.02892	88.48264	80.55811	83.84788	82.51522
%(65+)	10.36814	13.98309	10.99875	12.22036	15.44456	6.91967	10.69487	9.70934	10.47907
delta1c	0.99382	0.54169	1.29747	0.69162	0.39758	0.85977	1.45954	1.04703	1.01045
delta12	0.03500	0.02145	0.03420	0.02320	0.01748	0.02050	0.06035	0.03521	0.03419
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	2.36150	1.58081	1.02886	2.28999	2.13956	2.04526	1.53347	2.47219	2.18317
sigma2	2.59911	0.70893	0.76579	1.50052	0.95570	4.03254	2.90696	2.91256	2.35250
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.28014	9.82011	10.31012	11.47015	10.45012	11.51015	11.46015	11.45015	11.27014
x high	21.04037	21.54038	21.10037	22.06039	21.78038	20.92036	20.84036	21.00037	21.11037
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.76022	11.72027	10.79025	10.59024	11.33026	9.41022	9.38021	9.55022	9.84023
a	52.44910	40.41799	35.41027	48.90553	45.21014	63.93801	45.02194	54.43634	50.22823
b	0.04533	0.04723	0.05400	0.04823	0.04364	0.04677	0.04065	0.04596	0.04621

1 ussr migration flow 6 to 1
2 ussr migration flow 6 to 2
3 ussr migration flow 6 to 3
4 ussr migration flow 6 to 4
5 ussr migration flow 6 to 5
6 ussr migration flow 6 to 6
7 ussr migration flow 6 to 7
8 ussr migration flow 6 to 8
9 ussr migration flow 6 to the rest

	1	2	3	4	5	6	7	8	9
gmr (obs)	0.47795	0.12159	0.05184	0.01464	0.01628	0.00815	3.17145	0.79717	1.48763
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	16.62291	14.75313	14.61459	17.87389	17.62901	21.79218	10.18453	17.10256	16.67365
a1	0.00418	0.00682	0.00917	0.00631	0.00658	0.00239	0.00659	0.00349	0.00427
alpha1	0.26717	0.21620	0.17472	0.20642	0.21821	0.20229	0.20163	0.29741	0.27105
a2	0.14225	0.15678	0.17553	0.13318	0.14042	0.10181	0.13539	0.14752	0.14727
mu2	18.69174	18.97563	18.67719	18.31773	19.01538	16.81462	20.25211	18.96427	18.85492
alpha2	0.20288	0.22405	0.22895	0.17834	0.20925	0.11916	0.25247	0.21081	0.20941
lambda2	0.30988	0.29089	0.29911	0.34070	0.30576	0.44446	0.24101	0.30346	0.30434
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00504	0.00457	0.00351	0.00448	0.00518	0.00351	0.00572	0.00507	0.00496
mean age	33.09775	31.68408	29.00556	32.17664	33.17437	31.86658	33.92292	33.18422	32.90334
%(0-14)	9.08924	10.27342	11.11928	9.35592	10.21479	6.58682	11.89336	8.67734	9.00576
%(15-64)	77.59209	77.50744	79.37590	78.73714	76.13875	83.88265	72.92715	77.95373	77.85927
%(65+)	13.31867	12.21915	9.50482	11.90694	13.64646	9.53053	15.17949	13.36893	13.13497
delta1c	0.83085	1.49128	2.60978	1.40973	1.27010	0.68274	1.15205	0.68903	0.85908
delta12	0.02942	0.04350	0.05224	0.04739	0.04684	0.02352	0.04870	0.02367	0.02896
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	1.31689	0.96497	0.76316	1.15745	1.04280	1.69760	0.79861	1.41082	1.29435
sigma2	1.52742	1.29834	1.30646	1.91038	1.46120	3.72993	0.95462	1.43951	1.45335
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.12014	11.14014	11.23014	11.78016	11.60015	11.70015	10.73013	11.06014	11.11014
x high	20.07034	19.88034	19.57033	20.22035	20.26035	19.78034	20.06034	20.17035	20.09035
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	8.95020	8.74020	8.34019	8.44019	8.66020	8.08018	9.33021	9.11021	8.98021
a	38.00657	32.76210	30.17941	36.41115	33.93301	52.49817	31.08032	39.20656	37.56294
b	0.04986	0.05316	0.06023	0.05013	0.04821	0.04914	0.04399	0.05087	0.05099

1 ussr migration flow 7 to 1
2 ussr migration flow 7 to 2
3 ussr migration flow 7 to 3
4 ussr migration flow 7 to 4
5 ussr migration flow 7 to 5
6 ussr migration flow 7 to 6
7 ussr migration flow 7 to 7
8 ussr migration flow 7 to 8
9 ussr migration flow 7 to the rest

APPENDIX C.5 (*continued*).

	1	2	3	4	5	6	7	8	9
gmr (obs)	2.08243	0.64151	0.15750	0.15997	0.19186	0.06921	0.10956	2.08784	3.41203
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	19.77567	17.85011	17.58186	20.27826	20.61487	22.12993	12.39695	20.18340	19.13835
a1	0.00146	0.00309	0.00451	0.00239	0.00284	0.00197	0.00325	0.00105	0.00201
alpha1	0.50371	0.34371	0.25227	0.41417	0.39042	0.28812	0.36425	0.60651	0.43109
a2	0.18230	0.19182	0.19473	0.18634	0.18197	0.14781	0.15448	0.18617	0.18745
mu2	20.73207	21.85970	22.74473	20.71696	20.71533	18.54066	23.78566	20.73124	21.10195
alpha2	0.22417	0.26324	0.29446	0.22185	0.22889	0.14269	0.29517	0.22754	0.23748
lambda2	0.28591	0.24150	0.21644	0.30128	0.30283	0.32645	0.19983	0.29337	0.26999
a3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00371	0.00350	0.00285	0.00349	0.00396	0.00146	0.00431	0.00370	0.00367
mean age	31.47373	30.59669	28.82425	31.13516	31.85790	28.33398	32.27386	31.45947	31.23992
%(0-14)	5.42096	5.94196	6.19805	5.29621	6.02050	3.47014	7.12047	5.24957	5.58680
%(15-64)	84.67352	84.65729	86.10035	85.37239	83.45343	92.28165	81.28725	84.87692	84.60210
%(65+)	9.90552	9.40075	7.70161	9.33140	10.52608	4.24821	11.59229	9.87350	9.81110
delta1c	0.39421	0.88259	1.58089	0.68326	0.71795	1.34693	0.75544	0.28231	0.54813
delta12	0.00802	0.01609	0.02314	0.01280	0.01562	0.01331	0.02105	0.00561	0.01072
delta32	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
beta12	2.24698	1.30570	0.85671	1.86684	1.70569	2.01921	1.23402	2.66553	1.81524
sigma2	1.27539	0.91741	0.73504	1.35799	1.32303	2.28786	0.67698	1.28935	1.13689
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.34015	11.28014	11.19014	12.09016	12.22017	11.18014	10.77013	11.26014	11.38015
x high	21.59038	21.51038	21.33037	21.74038	21.65038	21.08037	21.84039	21.61038	21.59038
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.25023	10.23023	10.14023	9.65022	9.43022	9.90023	11.07025	10.35024	10.21023
a	49.78097	39.39203	34.62119	46.00677	43.49181	54.95270	38.12025	53.52818	45.12650
b	0.06237	0.06474	0.06988	0.06473	0.06238	0.06245	0.05719	0.06378	0.06315

1 ussr migration flow 8 to 1
2 ussr migration flow 8 to 2
3 ussr migration flow 8 to 3
4 ussr migration flow 8 to 4
5 ussr migration flow 8 to 5
6 ussr migration flow 8 to 6
7 ussr migration flow 8 to 7
8 ussr migration flow 8 to 8
9 ussr migration flow 8 to the rest

APPENDIX C.6 United States (1970).*

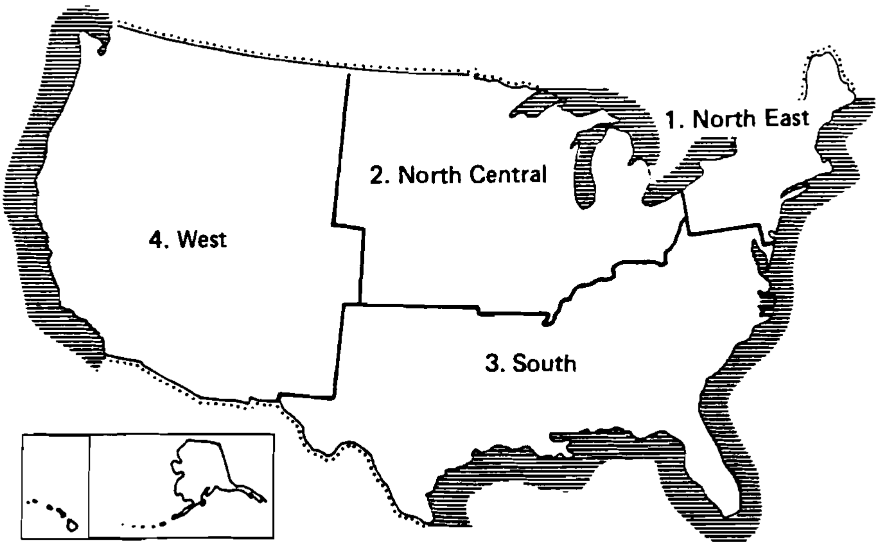

FIGURE C.6 Map of the regional aggregation of the United States used for this study.

*Total (male plus female) flows only.

APPENDIX C.6 (*continued*).

	1	2	3	4
gmr (obs)	0.24702	0.59576	0.27675	1.11952
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	9.53522	10.99835	6.73047	6.71692
a1	0.02698	0.01889	0.01496	0.01790
alpha1	0.06009	0.04951	0.03284	0.05498
a2	0.05313	0.04676	0.06023	0.04999
mu2	20.72440	20.45247	21.05273	20.60194
alpha2	0.09066	0.09880	0.15405	0.11070
lambda2	0.45290	0.48690	0.47373	0.49466
a3	0.00000	0.00016	0.00256	0.00039
mu3	0.00000	103.01308	71.97796	84.99503
alpha3	0.00000	0.25885	0.32041	0.35017
lambda3	0.00000	0.04643	0.11812	0.07572
c	0.00029	0.00007	0.00229	0.00237
mean age	25.51274	34.22953	32.45057	32.51121
%(0-14)	26.84051	19.65163	20.40582	21.15610
%(15-64)	70.76598	66.47354	68.11514	67.16240
%(65+)	2.39352	13.87483	11.47903	11.68150
deltalc	92.29872	256.66367	6.51939	7.56496
delta12	0.50782	0.40394	0.24833	0.35804
delta32	0.00000	0.00343	0.04259	0.00777
beta12	0.66286	0.50109	0.21316	0.49671
sigma2	4.99590	4.92829	3.07523	4.46862
sigma3	0.00000	0.17938	0.36866	0.21623
x low	16.86027	16.72027	16.90027	16.86027
x high	24.01044	23.53042	23.33042	23.47042
x ret.	0.00000	65.15790	62.74786	64.14768
x shift	7.15016	6.81016	6.43015	6.61015
a	27.83707	28.53706	27.28374	28.07706
b	0.02765	0.02439	0.02745	0.02547

1 u. s. total 1 to 2
2 u. s. total 1 to 3
3 u. s. total 1 to 4
4 u. s. total 1 to the rest

	1	2	3	4
gmr (obs)	0.17654	0.67502	0.46159	1.31315
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	12.44090	6.35763	9.43004	7.20855
a1	0.01947	0.01841	0.02078	0.01898
alpha1	0.05505	0.04745	0.07332	0.05565
a2	0.05756	0.04074	0.05233	0.04596
mu2	19.37771	20.29695	20.12657	19.99313
alpha2	0.09713	0.09973	0.09538	0.09586
lambda2	0.65000	0.44927	0.50268	0.51699
a3	0.00658	0.00057	0.00546	0.00027
mu3	71.91898	81.91788	71.87231	85.60316
alpha3	0.23700	0.42864	0.21260	0.39679
lambda3	0.22924	0.09895	0.10588	0.08527
c	0.00103	0.00235	0.00202	0.00214
mean age	28.73096	32.35604	31.18867	31.45516
%(0-14)	20.79651	22.54251	21.26366	21.86411
%(15-64)	72.09166	65.14907	68.91833	67.34246
%(65+)	7.11183	12.30842	9.81801	10.79343
deltalc	18.98871	7.83986	10.30285	8.85518
delta12	0.33832	0.45183	0.39712	0.41298
delta32	0.11427	0.01391	0.10441	0.00577
beta12	0.56678	0.47576	0.76875	0.58056
sigma2	6.69236	4.50484	5.27043	5.39323
sigma3	0.96724	0.23084	0.49804	0.21489
x low	16.48026	16.33026	16.51026	16.49026
x high	22.18039	23.40042	23.27042	23.06041
x ret.	71.36922	66.67822	64.00765	66.88827
x shift	5.70013	7.07016	6.76015	6.57015
a	29.40702	27.33374	29.31705	28.34039
b	0.03405	0.02010	0.02810	0.02471

1 u. s. total 2 to 1
2 u. s. total 2 to 3
3 u. s. total 2 to 4
4 u. s. total 2 to the rest

	1	2	3	4
gmr (obs)	0.34037	0.53631	0.50417	1.38084
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	9.02917	6.46604	10.52257	6.42383
a1	0.01723	0.02625	0.02192	0.01998
alpha1	0.07852	0.10932	0.04341	0.06182
a2	0.06093	0.08871	0.04156	0.05881
mu2	20.01309	20.64876	19.66720	19.97921
alpha2	0.12798	0.17384	0.09183	0.12799
lambda2	0.62537	0.44557	0.83685	0.64390
a3	0.00003	0.00006	0.00000	0.00003
mu3	88.02872	89.54675	0.00000	86.30420
alpha3	0.66147	0.57017	0.00000	0.74832
lambda3	0.11304	0.10207	0.00000	0.13138
c	0.00387	0.00323	0.00107	0.00288
mean age	32.64307	30.27998	28.00959	30.05793
%(0-14)	20.08696	23.38397	25.09613	23.13003
%(15-64)	66.51746	63.85034	69.01042	66.55681
%(65+)	13.39558	12.76569	5.89346	10.31316
delta1c	4.45463	8.13684	20.52768	6.92488
delta12	0.28273	0.29589	0.52731	0.33965
delta32	0.00045	0.00070	0.00000	0.00047
beta12	0.61351	0.62885	0.47273	0.48298
sigma2	4.88659	2.56309	9.11293	5.03079
sigma3	0.17089	0.17902	0.00000	0.17556
x low	16.92027	16.27026	17.46029	17.03028
x high	22.48040	22.70041	22.17039	22.39040
x ret.	72.32943	72.68951	0.00000	72.94956
x shift	5.56013	6.43015	4.71011	5.36012
a	27.78705	25.06041	26.62372	26.09040
b	0.03289	0.03806	0.02651	0.03203

1 u. s. total 3 to 1
2 u. s. total 3 to 2
3 u. s. total 3 to 4
4 u. s. total 3 to the rest

	1	2	3	4
gmr (obs)	0.22811	0.49888	0.71901	1.44600
gmr (mms)	1.00000	1.00000	1.00000	1.00000
mae%m	10.83948	8.80822	7.23007	9.47799
a1	0.02682	0.02631	0.01976	0.02157
alpha1	0.11438	0.09210	0.05079	0.08481
a2	0.06655	0.05016	0.04271	0.04853
mu2	20.01781	19.57191	20.10705	19.88227
alpha2	0.10559	0.08742	0.09973	0.09896
lambda2	0.75143	0.65478	0.63703	0.68499
a3	0.00006	0.00004	0.00808	0.00000
mu3	90.13589	89.00475	55.80827	0.00000
alpha3	0.46137	0.55014	0.11234	0.00000
lambda3	0.08569	0.10011	0.51079	0.00000
c	0.00190	0.00193	0.00189	0.00348
mean age	29.49303	29.51719	31.32500	31.20384
%(0-14)	21.29156	23.59063	22.92102	22.59724
%(15-64)	69.90682	67.60524	67.63663	66.92564
%(65+)	8.80161	8.80413	9.44234	10.47712
delta1c	14.09844	13.61792	10.47233	6.19920
delta12	0.40298	0.52458	0.46259	0.44451
delta32	0.00093	0.00086	0.18913	0.00000
beta12	1.08323	1.05347	0.50927	0.85702
sigma2	7.11637	7.48964	6.38777	6.92172
sigma3	0.18572	0.18198	4.54667	0.00000
x low	17.44028	16.80027	17.23028	17.17028
x high	22.57040	22.51040	22.86041	22.60040
x ret.	70.09895	71.54926	58.29861	0.00000
x shift	5.13012	5.71013	5.63013	5.43012
a	29.67035	28.28370	26.93373	27.98038
b	0.04069	0.03021	0.02445	0.02875

1 u. s. total 4 to 1
2 u. s. total 4 to 2
3 u. s. total 4 to 3
4 u. s. total 4 to the rest

APPENDIX C.7 Hungary (1974).*

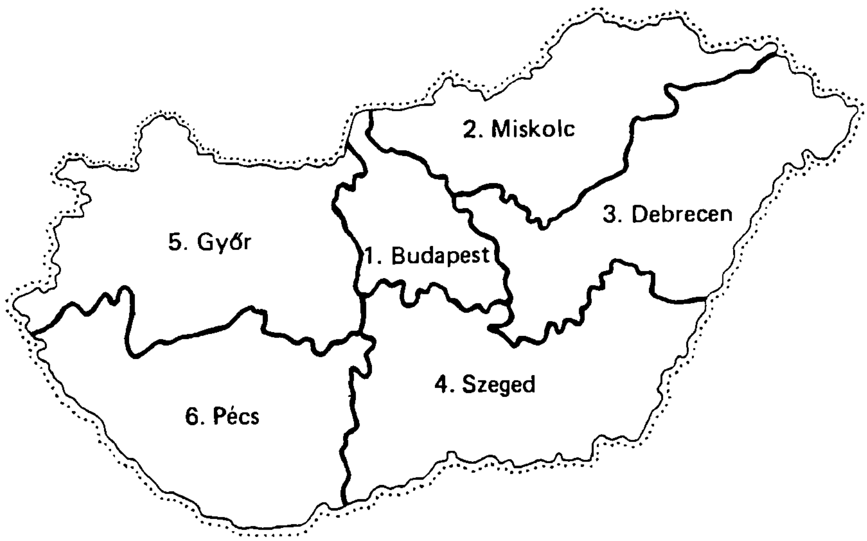

FIGURE C.7 Map of the regional aggregation of Hungary used for this study.

*Total (male plus female) flows only.

	1	2	3	4	5	6	7
gmr (obs)	1.53971	0.53010	0.95200	0.44711	0.51326	0.32258	2.76505
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	5.25780	12.45141	12.42464	8.14604	8.86041	8.63387	9.78965
a1	0.02551	0.00890	0.00919	0.01135	0.01248	0.01118	0.01049
alpha1	0.12519	0.24450	0.18270	0.27986	0.24982	0.31191	0.26916
a2	0.05870	0.07082	0.08057	0.08106	0.10156	0.10000	0.08204
mu2	18.22084	15.62418	15.45047	17.23475	19.86622	19.55839	16.44076
alpha2	0.09145	0.09495	0.10364	0.13968	0.18086	0.18045	0.12191
lambda2	0.24420	0.59629	0.64817	0.37486	0.25428	0.26657	0.44995
a3	0.00036	0.00000	0.00000	0.00003	0.00008	0.00009	0.00002
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.03408	0.00000	0.00000	0.05548	0.04616	0.02840	0.04607
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00011	0.00326	0.00286	0.00432	0.00376	0.00486	0.00382
mean age	35.53704	32.00492	30.22683	37.44696	37.67174	35.60691	33.73262
%(0-14)	18.59192	9.39894	10.19170	10.85203	10.87484	11.31484	10.39406
%(15-64)	63.55333	80.70007	81.31631	69.50406	68.78525	72.20003	75.92824
%(65+)	17.85475	9.90099	8.49199	19.64391	20.33991	16.48514	13.67770
delta1c	226.31602	2.72645	3.20756	2.62911	3.32328	2.29990	2.74814
delta12	0.43451	0.12569	0.11402	0.13998	0.12288	0.11176	0.12784
delta32	0.00619	0.00000	0.00000	0.00034	0.00077	0.00086	0.00025
beta12	1.36894	2.57512	1.76285	2.00363	1.38130	1.72850	2.20787
sigma2	2.67029	6.28032	6.25399	2.68376	1.40592	1.47722	3.69084
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.52015	12.07016	12.24017	11.57015	11.42015	11.24014	11.72015
x high	21.98039	18.71031	18.27030	19.87034	21.21037	21.03037	19.35033
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.46024	6.64015	6.03014	8.30019	9.79022	9.79022	7.63017
a	30.48035	47.72670	41.41178	36.78275	34.33252	36.83025	41.08016
b	0.02197	0.04325	0.04867	0.03599	0.03679	0.03720	0.04170

1 hungary migration 1 to 1
2 hungary migration 1 to 2
3 hungary migration 1 to 3
4 hungary migration 1 to 4
5 hungary migration 1 to 5
6 hungary migration 1 to 6
7 hungary migration 1 to the rest

APPENDIX C.7 (*continued*).

	1	2	3	4	5	6	7
gmr (obs)	1.36410	3.12803	0.47229	0.13482	0.20952	0.08893	2.26965
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.22931	6.89538	10.40858	18.81879	10.86141	9.73715	9.98846
a1	0.00330	0.02273	0.01417	0.01593	0.01240	0.01001	0.00782
alpha1	0.37358	0.16662	0.20866	0.27062	0.17430	0.15497	0.27707
a2	0.08451	0.09590	0.09241	0.09825	0.10192	0.10604	0.08859
mu2	16.08011	18.01274	17.53528	18.16941	18.95611	19.65939	16.70313
alpha2	0.12074	0.14661	0.13107	0.14830	0.15195	0.18085	0.12730
lambda2	0.47621	0.26804	0.34550	0.32251	0.24078	0.25908	0.39689
a3	0.00000	0.00005	0.00000	0.00000	0.00000	0.00010	0.00000
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.04403	0.00000	0.00000	0.00000	0.03903	0.00000
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00414	0.00256	0.00351	0.00428	0.00373	0.00367	0.00400
mean age	33.15700	30.93939	31.10266	32.37042	31.26282	35.47256	32.56859
%(0-14)	8.39499	18.13784	12.51663	12.43240	13.77093	11.85914	9.95238
%(15-64)	79.55819	69.19407	77.24712	75.42102	75.41824	70.88039	78.39197
%(65+)	12.04682	12.66809	10.23624	12.14658	10.81083	17.26047	11.65565
delta1c	0.79678	8.86830	4.03978	3.71950	3.32747	2.72681	1.95576
delta12	0.03906	0.23703	0.15336	0.16216	0.12170	0.09439	0.08832
delta32	0.00000	0.00049	0.00000	0.00000	0.00000	0.00093	0.00000
beta12	3.09410	1.13652	1.59194	1.82489	1.14709	0.85688	2.17646
sigma2	3.94404	1.82823	2.63601	2.17480	1.58466	1.43254	3.11766
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.14014	10.99014	11.69015	11.67015	10.62013	11.56015	11.25014
x high	18.97032	20.19035	20.33035	20.58036	20.84036	21.03037	19.57033
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	7.83018	9.20021	8.64020	8.91020	10.22023	9.47022	8.32019
a	55.53356	28.67035	35.42117	35.42572	33.60030	32.43031	42.85194
b	0.04493	0.03538	0.04177	0.04085	0.03795	0.03818	0.04326

1 hungary migration 2 to 1
2 hungary migration 2 to 2
3 hungary migration 2 to 3
4 hungary migration 2 to 4
5 hungary migration 2 to 5
6 hungary migration 2 to 6
7 hungary migration 2 to the rest

	1	2	3	4	5	6	7
gmr (obs)	2.13464	0.44009	2.55881	0.27298	0.25194	0.08996	3.18962
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	10.07720	11.11025	5.80526	7.74481	7.33388	11.44342	9.10435
a1	0.00378	0.01474	0.02065	0.01514	0.01592	0.01715	0.00921
alpha1	0.26979	0.23032	0.16503	0.18847	0.15500	0.21865	0.21968
a2	0.08786	0.09351	0.10902	0.12766	0.08585	0.10396	0.08604
mu2	15.62485	17.90124	17.90246	19.18099	18.24955	20.71630	15.93513
alpha2	0.11590	0.13653	0.15747	0.19026	0.12000	0.18821	0.11221
lambda2	0.54923	0.31982	0.27478	0.24200	0.27661	0.25921	0.46871
a3	0.00000	0.00046	0.00062	0.00066	0.00021	0.00000	0.00027
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.00000	0.01285	0.02198	0.01182	0.03002	0.00000	0.02144
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00346	0.00292	0.00094	0.00218	0.00188	0.00480	0.00222
mean age	31.58114	32.58323	31.45789	30.49688	32.98071	33.31239	32.11340
%(0-14)	8.28110	12.05432	16.09770	14.06630	13.40834	14.45614	9.57393
%(15-64)	81.60341	75.63367	70.30581	74.55080	73.63125	71.79228	79.18343
%(65+)	10.11549	12.31201	13.59649	11.38289	12.96041	13.75158	11.24264
delta1c	1.09128	5.05131	21.93596	6.95376	8.46865	3.57497	4.14981
delta12	0.04303	0.15763	0.18940	0.11863	0.18548	0.16497	0.10707
delta32	0.00000	0.00492	0.00571	0.00521	0.00250	0.00000	0.00309
beta12	2.32781	1.68692	1.04801	0.99056	1.29173	1.16177	1.95776
sigma2	4.73885	2.34246	1.74496	1.27191	2.30514	1.37728	4.17699
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	11.50015	11.52015	10.85013	10.59013	11.38015	12.57017	11.48015
x high	18.47031	20.56036	19.88034	20.16035	21.22037	21.94039	18.99032
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	6.97016	9.04021	9.03021	9.57022	9.84023	9.37021	7.51017
a	50.77908	36.48751	29.34034	30.64033	34.87482	31.28200	42.72347
b	0.04959	0.04015	0.04032	0.04512	0.03510	0.03758	0.04574

1 hungary migration 3 to 1
2 hungary migration 3 to 2
3 hungary migration 3 to 3
4 hungary migration 3 to 4
5 hungary migration 3 to 5
6 hungary migration 3 to 6
7 hungary migration 3 to the rest

APPENDIX C.7 (*continued*).

	1	2	3	4	5	6	7
gmr (obs)	1.03456	0.13064	0.27575	2.89358	0.25232	0.21486	1.90814
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	7.75207	17.44952	12.11837	5.12878	9.53853	12.97295	9.12225
a1	0.00861	0.01469	0.02042	0.01819	0.01268	0.01703	0.01208
alpha1	0.18542	0.17236	0.19381	0.12606	0.14835	0.15552	0.18896
a2	0.08924	0.09396	0.12793	0.09299	0.10579	0.09790	0.09998
mu2	17.43157	18.57153	19.16553	17.36615	20.77004	19.26316	18.51746
alpha2	0.13708	0.15033	0.18042	0.14373	0.18615	0.15828	0.15655
lambda2	0.31512	0.37163	0.26017	0.28038	0.22667	0.27056	0.27922
a3	0.00084	0.00000	0.00002	0.00024	0.00012	0.00010	0.00029
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.02218	0.00000	0.04636	0.03385	0.03214	0.04452	0.02869
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00158	0.00427	0.00256	0.00159	0.00358	0.00254	0.00280
mean age	37.09032	32.26546	29.63155	32.75817	33.97644	35.44706	35.09956
%(0-14)	9.48545	13.84877	15.03129	17.30205	13.58471	13.97981	11.70120
%(15-64)	71.57917	73.97253	74.45389	67.11803	71.26022	67.87555	71.65627
%(65+)	18.93538	12.17871	10.51482	15.57992	15.15507	18.14464	16.64253
delta1c	5.45103	3.44301	7.96669	11.46821	3.53747	6.69890	4.30683
delta12	0.09652	0.15630	0.15962	0.19560	0.11987	0.17392	0.12078
delta32	0.00936	0.00000	0.00018	0.00257	0.00117	0.00102	0.00285
beta12	1.35263	1.14650	1.07416	0.87707	0.79696	0.98255	1.20700
sigma2	2.29870	2.47203	1.44200	1.95081	1.21768	1.70936	1.78357
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.88013	13.09019	11.34015	10.67013	11.63015	11.96016	11.18014
x high	20.08035	20.99037	20.55036	19.65034	21.61038	21.20037	20.58036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	9.20021	7.90018	9.21021	8.98021	9.98023	9.24021	9.40022
a	38.46357	31.98261	29.81398	28.61034	31.19216	30.68216	34.75299
b	0.03798	0.04069	0.04574	0.03456	0.03662	0.03551	0.03824

1 hungary migration 4 to 1
2 hungary migration 4 to 2
3 hungary migration 4 to 3
4 hungary migration 4 to 4
5 hungary migration 4 to 5
6 hungary migration 4 to 6
7 hungary migration 4 to the rest

	1	2	3	4	5	6	7
gmr (obs)	0.93843	0.13267	0.17778	0.16579	3.10018	0.35561	1.77028
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	8.58517	8.97152	8.22733	8.36460	4.89345	8.68655	8.33027
a1	0.00769	0.01472	0.01491	0.01441	0.02053	0.01451	0.01103
alpha1	0.22120	0.11656	0.13169	0.19794	0.15795	0.25131	0.19673
a2	0.10086	0.06858	0.07316	0.08399	0.09605	0.11470	0.09517
mu2	19.22001	16.90255	17.23109	17.58621	18.41512	19.02641	18.36112
alpha2	0.17414	0.09423	0.09383	0.12691	0.15054	0.19091	0.15126
lambda2	0.25506	0.35337	0.33629	0.33538	0.22901	0.26889	0.28489
a3	0.00056	0.00016	0.00005	0.00076	0.00008	0.00178	0.00068
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.02944	0.03903	0.05280	0.01292	0.04733	0.00436	0.02369
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00219	0.00102	0.00091	0.00240	0.00206	0.00229	0.00198
mean age	39.95061	34.35888	34.37377	33.49084	33.39685	32.90005	36.83879
%(0-14)	8.47520	13.03028	11.91381	12.48294	17.47263	12.86977	10.33891
%(15-64)	68.11694	72.24844	73.69665	73.97733	66.01612	73.22737	70.78792
%(65+)	23.40787	14.72128	14.38954	13.53973	16.51125	13.90286	18.87317
deltalc	3.51834	14.46399	16.38572	5.99954	9.95416	6.33304	5.57855
delta12	0.07625	0.21461	0.20374	0.17155	0.21376	0.12652	0.11594
delta32	0.00555	0.00231	0.00068	0.00910	0.00079	0.01554	0.00713
beta12	1.27027	1.23693	1.40358	1.55967	1.04924	1.31638	1.30062
sigma2	1.46469	3.75001	3.58419	2.64260	1.52126	1.40845	1.88346
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.70013	11.69015	11.71015	11.66015	10.22012	11.07014	11.12014
x high	20.73036	20.54036	20.94036	20.47035	20.16035	20.30035	20.59036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.03023	8.85020	9.23021	8.81020	9.94023	9.23021	9.47022
a	37.37028	36.00388	37.64932	36.19751	29.04034	32.40030	36.26527
b	0.03688	0.03282	0.03464	0.03721	0.03253	0.04230	0.03759

1 hungary migration 5 to 1
2 hungary migration 5 to 2
3 hungary migration 5 to 3
4 hungary migration 5 to 4
5 hungary migration 5 to 5
6 hungary migration 5 to 6
7 hungary migration 5 to the rest

APPENDIX C.7 (*continued*).

	1	2	3	4	5	6	7
gmr (obs)	0.84305	0.08771	0.10437	0.23001	0.56997	3.80248	1.83512
gmr (mms)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
mae%m	7.68481	12.76937	11.53180	8.73548	6.60432	5.12441	6.97967
a1	0.00505	0.01734	0.01988	0.01440	0.01425	0.02013	0.01111
alpha1	0.33951	0.16465	0.17129	0.17583	0.16659	0.12791	0.20626
a2	0.11098	0.08770	0.09668	0.10287	0.11181	0.08363	0.11010
mu2	19.94069	18.08908	19.15297	19.23494	20.71163	18.23812	19.89202
alpha2	0.19442	0.13443	0.14527	0.16886	0.20285	0.14595	0.18672
lambda2	0.24216	0.32608	0.27337	0.24998	0.20185	0.25502	0.23205
a3	0.00015	0.00029	0.00022	0.00001	0.00019	0.00026	0.00027
mu3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
alpha3	0.03854	0.02808	0.03008	0.06211	0.03045	0.02994	0.02994
lambda3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
c	0.00382	0.00238	0.00224	0.00346	0.00307	0.00237	0.00304
mean age	38.28280	33.84722	32.84320	34.70221	33.40453	32.86229	35.66032
%(0-14)	8.28035	13.89340	14.73857	13.67954	14.63457	18.86661	11.30144
%(15-64)	71.16774	71.06123	71.44287	69.43501	69.93759	65.67160	71.03381
%(65+)	20.55191	15.04538	13.81856	16.88544	15.42784	15.46178	17.66476
deltalc	1.32364	7.28508	8.86652	4.16046	4.63804	8.48951	3.65617
delta12	0.04552	0.19770	0.20565	0.13994	0.12743	0.24074	0.10089
delta32	0.00134	0.00327	0.00222	0.00014	0.00167	0.00314	0.00250
beta12	1.74622	1.22479	1.17916	1.04125	0.82123	0.87643	1.10465
sigma2	1.24552	2.42560	1.88184	1.48039	0.99508	1.74730	1.24274
sigma3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x low	10.22012	12.12016	12.02016	11.14014	10.39012	11.00014	10.73013
x high	20.86036	20.77036	21.43038	20.78036	20.66036	20.30035	20.83036
x ret.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
x shift	10.64024	8.65020	9.41022	9.64022	10.27024	9.30021	10.10023
a	39.83525	32.53696	31.76365	31.24396	29.98035	27.61854	34.06029
b	0.03946	0.03649	0.03683	0.03641	0.03734	0.02970	0.03894

1 hungary migration 6 to 1
2 hungary migration 6 to 2
3 hungary migration 6 to 3
4 hungary migration 6 to 4
5 hungary migration 6 to 5
6 hungary migration 6 to 6
7 hungary migration 6 to the rest

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