

ANNEXES

ANNEX I

EXAMPLE OF MODIFIED MULTIREGIONAL PROJECTION

The purpose of annex I is to provide a simple example of the use of multiregional methods for regional projections in a developing country. The multiregional method of projection has been developed by Rogers (1985) and also by Rees and Wilson (1977). The presentation usually begins with formal demography and uses matrix algebra to express the equations. A computer program written by Willekens and Rogers (1978) is available to carry out the projections. However, it is also possible to perform the projection using standard spreadsheet programs which are available for most personal computers.

In this example, the female population of Indonesia is divided into three regions (Sumatra, Java and the other islands) and a five-year projection is made for each region. The procedure could easily be modified for a larger number of regions and the process could be repeated for more time intervals and for males. However, three regions for one sex and time period are sufficient to illustrate the method. Using a spreadsheet program, it is easy to repeat a procedure by simply copying the spreadsheet and changing the input data.

The input data needed for the projection and their sources for this example are:

(a) *Age distribution for each region.* The age distributions were obtained from the 1980 census. The regional age distributions included some age ranges broader than five years, which were divided into conventional age groups by using the distribution of the national population within the broad age ranges;

(b) *Survival rates for each region.* Because age-specific mortality data were not available for the regions of Indonesia, United Nations model life-tables were used (United Nations, 1982). The South Asian models were selected as most appropriate for Indonesia and survey estimates of infant mortality by region published by Dasvarma (1984) were used to select the specific tables. The selected tables for the three regions were identified by the following life expectancies: Sumatra, 61 years; Java, 60 years; and the other islands, 57 years;

(c) *Age specific fertility rates by region.* Survey estimates of age-specific fertility rates by region were obtained from the Indonesian Central Bureau of Statistics (1982) and refer to the period 1974-1978;

(d) *Migration rates by age, origin and destination.* The total migration rates between regions published in the 1980 census are given in table 1 of this publication. These rates were combined into the three regions used in this example. Model age schedules were used to estimate migration rates by age. This procedure is described in the next section. The selected schedules are:

- (i) Sumatra to Java: Young labour force entry, low dependency;
- (ii) Sumatra to other: Average labour force entry, low dependency;
- (iii) Java to Sumatra: Average labour force entry, high dependency;
- (iv) Java to other: Average labour force entry, high dependency;
- (v) Other islands to Sumatra: Average labour force entry, low dependency;
- (vi) Other islands to Java: Young labour force entry, low dependency.

The rationale for these choices is that migration into Java from Sumatra and the other islands tends to be movement towards major cities, which is dominated by young people with few dependants. The movement from Java to Sumatra and other islands contains a large fraction of rural settlers that tend to be older families with children. Movement between Sumatra and other islands is mostly employment-related and is assumed to have average age but lower than average dependency.

A. USING MODEL AGE SCHEDULES FOR MIGRATION STREAMS

It is often possible to estimate the overall migration rate for migrants from each region to every other region, but age specific rates are lacking, as is the case in this example. An appropriate model schedule can be chosen for each stream and the rates from this schedule can be scaled so that the total is equal to the overall migration rate. This method is illustrated in annex table A.1.

TABLE A.1 APPLICATION OF MODEL MIGRATION SCHEDULES TO INDONESIAN FEMALES

Age in 1980	Population in 1980 (1)	Migrants from Sumatra to Java			Migrants from Sumatra to other islands		
		Model migration rates (2)	Estimated migrants (3)	Scaled model rates (4)	Model migration rates (5)	Estimated migrants (6)	Scaled model rates (7)
Births after 1980 . . .	-	0.0418	-	0.0056	0.0418	-	0.0011
0-4	2 167.2	0.0649	140.6	0.0088	0.0649	140.6	0.0018
5-9	2 107.2	0.0460	96.9	0.0062	0.0454	95.7	0.0012
10-14	1 770.4	0.0957	169.4	0.0129	0.0386	68.4	0.0011
15-19	1 533.3	0.2199	337.1	0.0297	0.1365	209.3	0.0037
20-24	1 364.6	0.1729	236.0	0.0233	0.2182	297.7	0.0060
25-29	970.2	0.0997	96.7	0.0135	0.1464	142.0	0.0040
30-34	707.5	0.0585	41.4	0.0079	0.0835	59.0	0.0023
35-39	743.6	0.0379	28.2	0.0051	0.0502	37.4	0.0014
40-44	642.0	0.0278	17.8	0.0037	0.0338	21.7	0.0009
45-49	540.2	0.0228	12.3	0.0031	0.0257	13.9	0.0007
50-54	408.3	0.0203	8.3	0.0027	0.0218	8.9	0.0006
55-59	252.4	0.0191	4.8	0.0026	0.0198	5.0	0.0005
60-64	256.1	0.0185	4.7	0.0025	0.0188	4.8	0.0005
65-69	137.4	0.0182	2.5	0.0025	0.0184	2.5	0.0005
70-74	131.4	0.0181	2.4	0.0024	0.0181	2.4	0.0005
75+	128.7	0.0180	2.3	0.0024	0.0180	2.3	0.0005
TOTAL	13 860.5	1.0000	1 201.5	-	-	1 111.7	-
Calculated total rate	-	-	0.087	-	-	0.080	-
Desired total rate	-	-	0.0117	-	-	0.0022	-

Column (1) shows the age distribution of the population, which is needed to calculate the number of migrants implied by the model rates. Column (2) contains the model migration rates given in the tables A.3 and A.4 in annex II. Column (3) is obtained by multiplying the model migration rate in column (2) by the population in column (1). These estimated numbers of migrants are summed and the sum is divided by the total population to give the "calculated total rate". This calculation is compared with the desired rate, which in this case was based on the 1980 census, as shown in panel C of table 1. By taking the ratio of the desired total rate to the calculated rate, a scale factor is obtained ($0.0117/0.087 = 0.134$ in this example) which is then multiplied by the rates in column (2) to yield the scaled rates given in column (4). This procedure is repeated in columns (5), (6) and (7) for migrants from Sumatra to the other islands. The scaled rates are used in the population projection.

B. STEPS IN THE POPULATION PROJECTION

The calculation of a multiregional projection is illustrated for Indonesia in annex table A.2. The steps followed in this example are a simplification of the multiregional approach of Rogers (1985) in that survival, migration and births are calculated independently. The numbers shown in this example do not always sum exactly to the numbers shown in the table because the numbers in the table are rounded whereas the calculations actually used by the spreadsheet program involved more digits than are shown.

Step 1. Computation of survivors by region. Whereas the projection for a single region involves multiplying the population at the first time-point in each age group by a survival rate to obtain the survivors to the next age group at the second time-point, multiregional projection involves a compound survival rate which specifies the probability of surviving and being in a particular region at the second time-point. In this example, the compound survival rate for survival to one of the two other regions is simply the product of the survival rate and the out-migration rate to that region. For survival in the same region, the compound rate is the survival rate times one minus the sum of the out-migration rates to the other regions. For example, the number of

females aged 0-4 in Sumatra in 1980 is 2,167.2 (column (2)). The number of those surviving and remaining in Sumatra is $2,167.2 \cdot 0.9647 \cdot (1 - 0.0088 - 0.0018) = 2,068.7$. These persons are shown in column (6) at ages 5-9 in 1985. This procedure is repeated for each of the age groups in each of the regions;

TABLE A2. MULTIREGIONAL PROJECTIONS FOR FEMALES IN THREE REGIONS OF INDONESIA, 1980-1985

Age group	Population	Survival	Age-specific	Out-migration rate		Survivors to region			Population	
	in 1980	rate	fertility	To Java	To other	Sumatra	Java	other	In-migrants	in 1985
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Region 1: Sumatra										
	-	-	-	0.0056	0.0011	-	-	-	-	-
0-4	2 167.2	0.9647	-	0.0088	0.0018	2515.7	14.3	2.9	71.7	2 587.4
5-9	2 107.2	0.9924	-	0.0062	0.0012	2068.7	18.3	3.7	85.3	2 153.9
10-14	1 770.4	0.9947	-	0.0129	0.0011	2075.6	13.0	2.6	59.8	2 135.4
15-19	1 533.3	0.9930	0.101	0.0297	0.0037	1736.4	22.7	1.9	39.1	1 775.5
20-24	1 364.6	0.9919	0.270	0.0233	0.0060	1471.7	45.2	5.7	80.6	1 552.3
25-29	970.2	0.9904	0.249	0.0135	0.0040	1313.9	31.6	8.1	92.1	1 406.0
30-34	707.5	0.9880	0.210	0.0079	0.0023	944.1	12.9	3.9	50.5	994.7
35-39	743.6	0.9843	0.118	0.0051	0.0014	691.9	5.5	1.6	21.8	713.6
40-44	642.0	0.9784	0.060	0.0037	0.0009	727.1	3.7	1.0	14.6	741.7
45-49	540.2	0.9671	-	0.0031	0.0007	625.1	2.4	0.6	9.0	634.1
50-54	408.3	0.9470	-	0.0027	0.0006	520.4	1.6	0.4	6.0	526.4
55-59	252.4	0.9144	-	0.0026	0.0005	385.4	1.1	0.2	4.3	389.7
60-64	256.1	0.8662	-	0.0025	0.0005	230.1	0.6	0.1	2.4	232.5
65-69	137.4	0.7975	-	0.0025	0.0005	221.2	0.6	0.1	2.2	223.4
70-74	131.4	0.7024	-	0.0024	0.0005	109.3	0.3	0.1	1.1	110.4
75+	128.7	0.5008	-	0.0024	0.0005	156.3	0.2	0.0	0.9	157.2
TOTAL	13 860.5	-	-	-	-	15 792.9	174.0	32.9	541.5	16 334.3
Steps in computing population aged 0-4:										
1. Computed births, 1980				1,039.7;						
2. Computed births, 1985				1,286.1;						
3. Estimated births, 1980-1985				5,814.7;						
4. Female births, 1980-1985				2,836.4;						
5. Survival rate, birth to ages 0-4				0.893;						
6. Population 0-4 in 1985				2,532.9.						
B. Region 2: Java										
	-	-	0.0098	0.0028	-	-	-	-	-	-
0-4	5 929.5	0.9618	-	0.0146	0.0042	7 077.8	70.3	20.1	24.8	7 102.6
5-9	6 217.7	0.9918	-	0.0095	0.0027	5 595.6	83.5	23.9	31.2	5 626.8
10-14	5 325.7	0.9942	-	0.0072	0.0021	6 091.4	58.5	16.7	22.4	6 113.9
15-19	4 942.7	0.9924	0.121	0.0159	0.0045	5 245.6	38.2	10.9	29.2	5 274.8
20-24	4 398.9	0.9912	0.228	0.0202	0.0058	4 804.9	77.9	22.3	65.3	4 870.2
25-29	3 714.4	0.9896	0.205	0.0132	0.0038	4 246.8	88.2	25.2	60.1	4 306.9
30-34	2 708.4	0.9871	0.153	0.0078	0.0022	3 613.6	48.4	13.8	28.6	3 642.2
35-39	2 846.6	0.9833	0.084	0.0050	0.0014	2 646.7	20.9	6.0	12.0	2 658.7
40-44	2 457.6	0.9772	0.037	0.0036	0.0010	2 781.1	14.0	4.0	7.9	2 788.9
45-49	2 067.9	0.9656	-	0.0029	0.0008	2 390.4	8.7	2.5	4.7	2 395.2
50-54	1 738.7	0.9448	-	0.0026	0.0007	1 989.3	5.8	1.7	3.1	1 992.4
55-59	1 074.8	0.9113	-	0.0024	0.0007	1 637.3	4.2	1.2	2.0	1 639.3

TABLE A.2. (continued)

Age group	Population in 1980 (1)	Survival rate (2)	Age-specific fertility (3)	Out-migration rate		Survivors to region			Population	
				To Java (4)	To other (5)	Sumatra (6)	Java (7)	Other (8)	In-migrants (9)	in 1985 (10)
60-64	1 090.7	0.8620	-	0.0023	0.0007	976.4	2.3	0.7	1.1	977.5
65-69	585.3	0.7923	-	0.0023	0.0006	937.4	2.2	0.6	1.0	938.4
70-74	559.4	0.6960	-	0.0022	0.0006	462.3	1.0	0.3	0.5	462.8
75+	548.2	0.4895	-	0.0022	0.0006	655.8	0.9	0.2	0.4	656.2
TOTAL	46 206.6	-	-	-	-	51 152.6	525.1	150.0	294.3	51 446.9

Steps in computing population aged 0-4:

1. Computed births, 1980 3,106.9;
2. Computed births, 1985 3,515.4;
3. Estimated births, 1980-1985 16,555.7;
4. Female births, 1980-1985 8,075.9;
5. Survival rate, birth to age 0-4 0.8876;
6. Population aged 0-4 in 1985 7,168.2.

C. Region 3: Other islands

			0.0006	0.0042	-	-	-	-	-	-
0-4	2 067.3	0.9524	-	0.0009	0.0065	2 465.4	1.4	10.4	23.0	2488.4
5-9	2 085.5	0.9896	-	0.0006	0.0046	1 954.3	1.7	12.9	27.6	1981.9
10-14	1 668.9	0.9927	-	0.0005	0.0039	2 053.1	1.3	9.4	19.3	2072.4
15-19	1 475.4	0.9903	0.086	0.0019	0.0138	1 649.4	0.9	6.5	12.8	1662.2
20-24	1 313.1	0.9888	0.254	0.0030	0.0220	1 438.3	2.7	20.1	28.0	1466.2
25-29	1 079.7	0.9870	0.254	0.0020	0.0148	1 266.0	3.9	28.5	33.3	1299.3
30-34	787.3	0.9842	0.217	0.0011	0.0084	1 047.8	2.1	15.7	17.7	1065.5
35-39	827.4	0.9801	0.143	0.0007	0.0051	767.4	0.9	6.5	7.6	775.0
40-44	714.4	0.9735	0.080	0.0005	0.0034	806.3	0.6	4.1	5.0	811.3
45-49	601.1	0.9608	-	0.0004	0.0026	692.7	0.3	2.4	3.1	695.8
50-54	437.9	0.9381	-	0.0003	0.0022	575.8	0.2	1.5	2.0	577.9
55-59	270.7	0.9019	-	0.0003	0.0020	409.8	0.1	0.9	1.4	411.2
60-64	274.7	0.8497	-	0.0003	0.0019	243.6	0.1	0.5	0.8	244.4
65-69	147.4	0.7770	-	0.0003	0.0019	232.9	0.1	0.4	0.7	233.7
70-74	140.9	0.6774	-	0.0002	0.0018	114.3	0.0	0.2	0.4	114.6
75+	138.1	0.4739	-	0.0002	0.0018	160.5	0.0	0.2	0.3	160.8
TOTAL	14 029.8	-	-	-	-	15 877.7	16.3	120.3	182.9	16 060.6

Steps in computing population aged 0-4:

1. Computed births, 1980 1,081.0;
2. Computed births, 1985 1,252.3;
3. Estimated births, 1980-1985 5,833.2;
4. Female births, 1980-1985 2,845.5;
5. Survival rate, birth to age 0-4 0.8706;
6. Population aged 0-4 in 1985 2,477.3.

Step 2: calculation of in-migrants. The numbers of in-migrants, shown in column (9), are obtained by summing the out-migrants from other regions to this region. For example, the number of in-migrants to Sumatra that were aged 5-9 in 1985 is the sum of the number of out-migrants aged 5-9 from Java (column 6 of panel B) and the number of out-migrants aged 5-9 from the other islands (column (7) of panel C) or $83.5 + 1.7 = 85.2$;

Step 3: summing of survivors and in-migrants to obtain population aged 5 or over. The projected population in each group aged 5 or over, shown in column (10), is simply the sum of the survivors to the same region, column (6), and the number of in-migrants, column (9). For females aged 5-9 in Sumatra, this is $2,068.7 + 85.3 = 2,153.9$;

Step 4: calculation of births and survivors to ages 0-4 by region. Annual births are estimated by applying the age-specific birth rates assumed for each region to the number of women in each of the reproductive age groups. This step is done separately for 1980 and 1985, and the results are averaged and then multiplied by five to get the total number of births in that region for the five-year projection interval. In this example, the same age-specific rates are used for 1980 and 1985, although different rates could have been assumed.

Since this projection is only for females, the number of births is multiplied by the assumed proportion female, or 0.488 in this example. This number is then multiplied by the survival rate from birth to ages 0-4, which in this case was obtained from the model life-table. Lastly, the out-migration rates for migration from birth to ages 0-4 are applied to the number of survivors to obtain the migrants to each of the regions and one minus the sum of the migration rates is multiplied by the survivors to get the number that remain in the same region. These numbers are shown for age group 0-4 in columns (6), (7) and (8). The in-migrants born during the period are obtained by summing the out-migrants from the other regions to this region as described above in step 2 and these are added to the births surviving in the same region to get the projected population aged 0-4 in each region.

This projection process can be repeated for further time intervals, and the assumed levels of mortality, fertility and migration can be altered for each projection period, if desired.

ANNEX II

MODEL MIGRATION AGE SCHEDULES

Annex II provides a few model schedules of migration rates by age which may be of use when data on migration by age are unavailable or incomplete for regions of a country. The use of these models is similar to the use of model schedules of mortality and fertility. However, the equation which describes the migration schedules is more complex because migration rates typically decline from birth to some minimum, usually in the teenage years, then rise to a peak, usually in the twenties, and then fall again. In some countries, there is a secondary peak around the time of retirement. However, this peak is rarely observed in developing countries and will be ignored.

The basic model age equation contains seven parameters. As developed by Rogers and Castro (1981), the equation without a post-labour force peak or rise is as follows:

$$M(x) = a_1 \exp(-\alpha_1 x) + a_2 \exp\{-\alpha_2(x-\mu) - \exp(-\lambda(x-\mu))\} + c$$

where $M(x)$ = migration rate at age x , and a_1 , α_1 , a_2 , α_2 , μ , λ and c are constants.

While it is helpful to know that most distributions of migration rates by age fit this general form, it may be difficult to select appropriate model parameters in countries where there are little reliable data on migration by age. It may be more helpful to draw from their experience with a large number of age schedules to try to specify some specific alternatives which can be used especially for regional projections.

Using single-year migration rates for single years of age, Rogers and Castro (1981) compiled 164 schedules for males and 172 for females from Japan, Sweden and the United Kingdom of Great Britain and Northern Ireland. These schedules provide a range of estimates for the seven parameters given above in the equation. Using their results, a few combinations have been

selected. The first, which is identified as the "Western standard", is based on the average of each of the parameters. Two of the major sources of variation among schedules have then been used to produce variants. These main sources of variation are (a) the ratio of pre-labour force "dependants" to labour force migrants and; (b) the average age of entry into the labour force or marriage, which relates to the peak in the distribution. In choosing the variants, the standard deviations calculated by Rogers and Castro for key parameters were used.

Six alternatives are presented for each sex:

- (a) The average Western model;
- (b) Low dependency: a_1 approximately one standard deviation below average, a_2 adjusted upward to keep sum = 1;
- (c) High dependency: a_1 approximately one standard deviation above average, a_2 adjusted downward to keep sum = 1.
- (d) Young labour force entry: μ approximately one standard deviation below average;
- (e) Old labour force entry: μ approximately one standard deviation above average;
- (f) Low dependency and young labour force entry.

These alternatives are based on the range of experience observed by Rogers and Castro in three highly developed countries and may not represent the range for other countries. Schedules tested for Brazil, Indonesia and the Philippines appear to fall within this range, which suggests that they may apply to many developing countries.

Following Rogers and Castro, the model schedules are expressed in terms of migration rates which sum to 1.0. This is somewhat analogous to total fertility, although it is more sensitive to the upper age-limit of the distribution because migration rates do not fall to zero above some age the way fertility does. Nevertheless, the use of schedules based on rates and summing to 1.0 is useful because the schedules are independent of the actual age distribution and can be scaled to match any observed level of migration.

Although Rogers and Castro work with single-year data, projections are often made with five-year age data and five-year time intervals. Even if single-year age data were available for migrants by region in a developing country, it might be very difficult to use because of problems of age-heaping. Thus, there is a need for model schedules that cover five-year age groups and five-year time periods.

Over a five-year time period, any five-year age cohort will pass through a total of nine single age groups. For example, those aged 10 at the beginning of the period will pass through ages 10, 11, 12, 13 and 14 and enter age 15 by the end of the period. Those aged 14 will be 19 at the end of the period. Thus, a total of nine different single-year migration rates will be experienced by the age cohort during the projection period. These rates, however, will not be experienced in equal amounts. The rate for those aged 10-11 will be experienced only once by one of the five single year cohorts within the five-year cohort. The same is true for the migration rate from 18 to 19. However, each of the five cohorts will experience the rate for ages 14-15. The five-year rate for any five-year cohort is the following sum of single-year rates:

$${}_5M_x = {}_1M_x + 2 {}_1M_{x+1} + 3 {}_1M_{x+2} + 4 {}_1M_{x+3} + 5 {}_1M_{x+4} \\ + 4 {}_1M_{x+5} + 3 {}_1M_{x+6} + 2 {}_1M_{x+7} + {}_1M_{x+8}$$

where ${}_5M_x$ = five-year migration rate for five-year age group beginning with age x ;

${}_1M_x$ = single year migration rate for one-year age group aged x .

Using this formula, five-year migration rates have been computed from the single-year rates derived from the equation for model schedules using the combination of parameters described above. Minor adjustments had to be made for those born during the interval and for those that were already in the highest age group but survived the interval.

The results are shown in annex tables A.3 and A.4 along with the model age parameters used to derive the single-year rates which they are based. In using these models, it is important to be clear about whether a particular cohort is referred to by the age at the beginning of the period or the age at the end of the period. Projections often work with the age at the beginning of the interval. However, censuses usually tabulate migrants by age at the time of the census, which would be equivalent to the age at the end of the period. Thus, the age of peak migration may appear to be older in census measures of migration than in the corresponding single-year model.

TABLE A.3 FIVE-YEAR MODEL MIGRATION RATES FOR MALES

<i>From ages</i>	<i>To ages</i>	<i>Western standard</i>	<i>Low dependency</i>	<i>High dependency</i>	<i>Young labour force entry</i>	<i>Old labour force entry</i>	<i>Low dependency low labour force entry</i>
Birth	0-4	0.0547	0.0353	0.0741	0.0547	0.0547	0.0354
0-4	5-9	0.0824	0.0546	0.1104	0.0826	0.0826	0.0547
5-9	10-14	0.0544	0.0379	0.0710	0.0566	0.0545	0.0405
10-14	15-19	0.0443	0.0356	0.0532	0.1107	0.0379	0.1124
15-19	20-24	0.1293	0.1394	0.1188	0.1946	0.0438	0.2152
20-24	25-29	0.1894	0.2123	0.1659	0.1526	0.1496	0.1698
25-29	30-34	0.1375	0.1541	0.1204	0.0971	0.1796	0.1074
30-34	35-39	0.0868	0.0966	0.0768	0.0619	0.1233	0.0678
35-39	40-44	0.0557	0.0613	0.0501	0.0414	0.0778	0.0447
40-44	45-49	0.0378	0.0410	0.0346	0.0296	0.0506	0.0316
45-49	50-54	0.0275	0.0293	0.0258	0.0229	0.0349	0.0240
50-54	55-59	0.0216	0.0226	0.0207	0.0191	0.0259	0.0197
55-59	60-64	0.0183	0.0188	0.0178	0.0169	0.0208	0.0172
60-64	65-69	0.0163	0.0167	0.0161	0.0156	0.0178	0.0158
65-69	70-74	0.0152	0.0154	0.0152	0.0149	0.0162	0.0150
70-74	75+	0.0146	0.0147	0.0147	0.0145	0.0152	0.0145
75+	-	0.0143	0.0143	0.0144	0.0143	0.0147	0.0143
TOTAL		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Parameters							
a_1		0.0215	0.0128	0.0303	0.0215	0.0215	0.0128
α_1		0.1050	0.1050	0.1050	0.1050	0.1050	0.1050
a_2		0.0694	0.0804	0.0582	0.0691	0.0691	0.0800
α_2		0.1120	0.1120	0.1120	0.1120	0.1120	0.1120
μ		20.0400	20.0400	20.0400	16.0900	23.9900	16.0900
λ		0.3910	0.3910	0.3910	0.3910	0.3910	0.3910
c		0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
Age at minimum		15	14	15	11	18.5	11
Age at maximum		23	23	23	19	27	19
Ratio of pre-labour force to labour force		0.298	0.154	0.477	0.254	0.328	0.138
Labour asymmetry		0.443	0.431	0.467	0.454	0.443	0.427

TABLE A.4 FIVE-YEAR MODEL MIGRATION RATES FOR FEMALES

<i>From ages</i>	<i>To ages</i>	<i>Western standard</i>	<i>Low dependency</i>	<i>High dependency</i>	<i>Young labour force entry</i>	<i>Old labour force entry</i>	<i>Low dependency low labour force entry</i>
Birth	0-4	0.0605	0.0418	0.0792	0.0605	0.0605	0.0418
0-4	5-9	0.0916	0.0649	0.1183	0.0916	0.0916	0.0649
5-9	10-14	0.0611	0.0454	0.0767	0.0615	0.0611	0.0460
10-14	15-19	0.0471	0.0386	0.0584	0.0957	0.0432	0.0957
15-19	20-24	0.1256	0.1365	0.1283	0.1966	0.0485	0.2199
20-24	25-29	0.1923	0.2182	0.1635	0.1538	0.1591	0.1729
25-29	30-34	0.1296	0.1464	0.1064	0.0898	0.1765	0.0997
30-34	35-39	0.0751	0.0835	0.0631	0.0538	0.1087	0.0585
35-39	40-44	0.0462	0.0502	0.0404	0.0357	0.0635	0.0379
40-44	45-49	0.0319	0.0338	0.0291	0.0268	0.0404	0.0278
45-49	50-54	0.0248	0.0257	0.0235	0.0223	0.0290	0.0228
50-54	55-59	0.0213	0.0218	0.0207	0.0201	0.0234	0.0203
55-59	60-64	0.0196	0.0198	0.0193	0.0190	0.0206	0.0191
60-64	65-69	0.0188	0.0188	0.0186	0.0185	0.0192	0.0185
65-69	70-74	0.0183	0.0184	0.0183	0.0182	0.0186	0.0182
70-74	75+	0.0181	0.0181	0.0181	0.0181	0.0182	0.0181
75+		0.0180	0.0180	0.0180	0.0180	0.0181	0.0180
TOTAL		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Parameters							
a_1		0.0233	0.0149	0.0318	0.0233	0.0233	0.0149
α_1		0.1070	0.1070	0.1070	0.1070	0.1070	0.1070
a_2		0.0766	0.0900	0.0632	0.0766	0.0766	0.0900
α_2		0.1436	0.1436	0.1436	0.1436	0.1436	0.1436
μ		20.6320	20.6320	20.0400	17.1320	24.1320	17.1320
λ		0.4003	0.4003	0.4003	0.4003	0.4003	0.4003
c		0.0036	0.0036	0.0036	0.0036	0.0036	0.0036
Age at minimum		15	15	15	11	19	12
Age at maximum		23	23	22	19	26	19
Ratio of pre-labour force to labour force		0.368	0.208	0.576	0.311	0.408	0.188
Labour asymmetry		0.503	0.482	0.455	0.449	0.405	0.408