ECONOMIC MOBILITY OF IMMIGRANTS IN AUSTRALIA*

The economic mobility of immigrants can be studied in terms of changes in various economic characteristics of the immigrant group as compared with the total population. The present study attempts to analyse three aspects of the degree of economic mobility on the part of immigrants in Australia: participation in various industries, distribution according to occupational status, and ownership of dwellings. This is obviously only a small selection of a large number of economic characteristics, but the choice was severely limited by the availability of statistical information.[1] Our aim is to provide a behavioural description of the process of immigrants' economic adjustment and no attempt is made to examine the relative merits of conformity or divergence.

The Model

The basis underlying a study of economic adjustment of immigrants is the contention that in most if not all aspects of economic behaviour immigrants are, to a varying degree, different from the total population. Since age is, by necessity, a factor which may account for some of the differences, the influence of age should be removed before comparisons are made. The working hypothesis embodied in the model is that the differences, after allowing for age, can be explained by

(i) the immigrants' length of stay in the country;
(ii) the fact that immigrants were, at the time of their arrival, essentially "different" from the native Australians by virtue of their economic, social and cultural background; and
(iii) a number of small random factors operating in an unsystematic way in either direction.[2]

Further, it is expected that the differences between immigrants and the total population are negatively correlated with both the length of residence in the country and the degree of similarity of backgrounds. In other words, it is expected that the longer the immigrants have been in Australia, and the more similar to Australians they are in terms of their economic, social and cultural background, the less economically distinguishable they are. This is the hypothesis which we try to test with respect to industrial distribution, distribution according to occupational status, and dwelling ownership.

* I wish to thank Prof. M. W. Reder for his helpful comments on an earlier draft of this paper.

[1] It is hoped that this article may help to stimulate interest in, and demand for, statistical data on some more pertinent economic features of immigration.

[2] Another systematic cause operating on the speed of economic adjustment is the age of the immigrant at his arrival in Australia; the older the immigrant on his arrival, the more difficult it may be for him to adjust. This was not considered explicitly because the age distribution of immigrants on arrival in Australia has been, with few minor exceptions, relatively constant in the past.

To be able to carry out the statistical test we also need to specify the form of the relationship. The choice lies between linear and non-linear form; linearity implies that the marginal influence of a factor on the dependent variable does not change with the size of the factor considered, whereas non-linearity allows for variation. It seems plausible to expect that the marginal effect of the length of stay in the country is likely to diminish with time. In other words, each additional adjustment on the part of the immigrant will be smaller than the previous adjustment made. This suggests the use of a logarithmic form in expressing the influence of the length-of-stay factor.[3] On the other hand, there appears to be no strong reason why the similarity of backgrounds should operate in a non-linear fashion.

The resulting model describing the differences between immigrants and the whole of the population with respect to aspect "a" then becomes

$$Y^{(a)} = \beta_0 + \beta_1 \log X_1 + \beta_2 X_2 + \epsilon ,$$

where $Y^{(a)}$ = variable measuring differences between immigrants and the total population with respect to aspect "a",

X_1 = variable measuring the length of stay in Australia by the immigrant group in question,

X_2 = variable measuring the degree of similarity of backgrounds between the immigrant group and Australians,

ϵ = random disturbance,

$\beta_0, \beta_1, \beta_2$ = behavioural parameters.

If $Y^{(a)} \gtrless 0$, and if $Y^{(a)} = 0$ indicates a lack of any differences, then we would expect β_1 and β_2 to be negative, and β_0 to be positive. The unit of observation is any specific group of immigrants with a given length of stay in the country and a given degree of similarity of backgrounds with Australians.

The decision concerned with the nature of operation of the independent variables X_1 and X_2 on the dependent variable $Y^{(a)}$ can be demonstrated by first partial derivatives:

$$\frac{\partial Y^{(a)}}{\partial X_1} = \frac{\beta_1}{X_1} ,$$

$$\frac{\partial Y^{(a)}}{\partial X_2} = \beta_2 .$$

That is, the marginal adjustment (i.e., decrease in the "standard difference") with respect to the period of residence is inversely related to its length, while the marginal adjustment with respect to the similarity of backgrounds is independent of the size of the variable.

It is to be noted that the basic assumption underlying any generalizations from our model implies that all immigrants in certain circumstances react always in the same way, save for a random devia-

[3] In fact, both simple and logarithmic forms of the length-of-stay variable were tried on the data, and in each case it was found that the logarithmic form provides a better description of the situation.

tion. In particular, it has to be assumed that when a group of immigrants with a given similarity of background enters the n-th year of residence, it will behave in basically the same way as any other group of the same background in the n-th year of stay in Australia.

Finally, it remains to specify the statistical properties of the model. Here the independent variables X_1 and X_2 are taken as predetermined numbers (i.e., non-random variables) and ϵ is assumed to be a normally independently distributed random variable with zero mean, constant variance, and independent of X_1 and log X_2.

The Variables

The dependent variable $Y^{(a)}$ is supposed to measure the differences between immigrants and total population with respect to characteristic "a", the differences being measured after allowing for age. The required measurement of $Y^{(a)}$ may relate to differences in multi-class distributions, as in the case of industrial distribution, or it may relate to a difference in the proportion of those who possess a given attribute. In the case of occupational status and of ownership of dwellings, both types of measurement are possible and reasonably meaningful.[4] In either case it is necessary that the comparison should abstract from any differences in the respective age distributions of the two groups. This is achieved by comparing the actual distribution of immigrants according to a given characteristic with the distribution obtained by postulating that at each age immigrants behave in exactly the same way as the total population.[5] Any difference between the actual and the theoretical distribution has to be explained by factors other than age.

The second problem is that of choosing a reasonably descriptive measure of the differences between immigrants and the total population. If the aspect under consideration is such that a two-class grouping is adequate, a difference in respective proportions in one of the classes provides quite a satisfactory measure. If, however, more than two groups are necessary, a different measure has to be devised. The measure chosen for our purpose is given by the formula[6]

$$\sqrt{\frac{1}{t}\sum_{j=1}^{t}(a_j - e_j)^2}$$

[4] The distribution according to occupational status can be classified into the following groups: employer, self-employed, employee (wage- or salary-earner), helper (not on wage or salary), "not at work", and "not stated". Alternatively, persons in the work force could be classified dichotomously as independent (employers and self-employed) or dependent (non employers or self-employed). If the latter classification is adopted, it is necessary to compare only the proportion of, say, independent workers in the groups under study. The case of dwelling ownership is amenable to a similar treatment.

[5] For algebraic derivation of the postulated distribution, see Appendix I.

[6] The formula was decided upon after some experimentation. It has one advantage over a χ^2-type of formula in that it allows for the case where $e = 0$. Unlike a χ^2 formula, it does not weight the squares of differences by the respective expected values. In any case, the differences between the formula above and other measures attempted, including the χ^2 type, did not appear to be of substantial character.

where a_j = actual percentage of immigrants belonging to the j-th group;

e_j = percentage of immigrants expected to belong to group j if, at each age, immigrants behaved in exactly the same way as the total population;[7]

t = number of groups.

The formula is of a "standard deviation" type and, by convention, assumes only positive or zero values. It will be referred to in the rest of the text as the "standard difference".

The measures of the independent variables were considerably easier to find. The length of stay in the country can be measured by the period of residence in years as classified by the Commonwealth Statistician in the 1954 Census publications. The similarity of backgrounds between immigrants and Australians was thought to depend on the ethnic origin of immigrants. This can be, at least in the first approximation, measured by the percentage of British-born among each given group of migrants.[8]

The Data

All data have been derived from the results of the 1954 Census for total Australia. It is unfortunate that the data represent a somewhat unique sample of "potential history" because of the presence of recently arrived displaced persons—a phenomenon unlikely to be repeated in future. By the time of the 1954 Census a great majority of the displaced persons had already completed their employment obligation, but the fact that for two years they had virtually no choice in the selection of work probably retarded their initial economic adjustment. Also, the post-war non-British immigrants had only very few predecessors among the earlier arrivals—another pertinent feature which makes them distinguished from the current stream of immigrants. However, since the variables are measured independently of the actual number of immigrants in any given year, and since displaced persons appear only in two or three years (i.e., units of observation), the distortion is largely limited to the influence on the size of the disturbance term of our model.

The description of the data on each of the three economic characteristics considered is given below:

(A) *Immigrants' participation in industries*

The detailed classification in the 1954 Census gives figures for some 335 industries; these have been congested into 18 groups in such

[7] See Appendix I. Note also that $a_j = 100\left(\frac{m_{.j}}{m}\right)$ and $e_j = 100\left(\frac{\hat{m}_{.j}}{m}\right)$ in the terminology of the appendix.

[8] "British-born" include persons born in England, Wales, Scotland, Northern Ireland, Republic of Ireland, and Ireland-undefined. The classification as well as the actual figures were taken from J. Zubrzycki, *Immigrants in Australia,* (Melbourne University Press, 1960), p. 48.

a way as to provide an interesting cross-section of immigrants' industrial activity.[9] Some adjustments of the official figures were necessary before applying the data to our model; these concerned immigrants of less than one year of residence in Australia.[10]

Compilation of the theoretical distribution (i.e., the distribution which would show the proportion of immigrants in each industrial class if, at each age, immigrants were joining various industries at the same rate as the total work force) requires a knowledge of the age distribution of immigrants in the work force. These data cannot be obtained and had to be estimated from the age distribution of all immigrants, whether in the work force or not. The details of the estimation procedure are given in Appendix II.

From the estimated age distributions of male and female immigrants of each specific period of residence in the work force, we can determine the theoretical distribution which removes the effect of age and, finally, calculate the "standard difference".

(B) *Distribution of immigrants according to occupational status*

A classification of immigrant male and female work force according to both period of residence and occupational status is not published, but was obtained on special request from the Commonwealth Statistician.[11] The theoretical distribution was derived by utilizing the estimated age distribution of male and female immigrants of specific period of residence participating in the work force.

(C) *Ownership of dwellings*

The information considered as relevant for the study of ownership of dwellings is that classifying immigrant householders by nature of occupancy.[12] The age distribution of immigrant householders had to be estimated[13] in order to determine the theoretical distribution. Having obtained the theoretical distribution, we calculated the "standard difference" and, as an alternative, the difference in the percentage of owners or purchasers by instalments among immigrants and among all householders.

[9] The explanation of the method and the details of the adopted industrial classification are given in Appendix III.

[10] Of all male immigrants of less than one year residence 28.1% appeared to be concentrated in the Transport, Storage and Communication industry; the corresponding percentage for male immigrants of 1 to 2 years of residence was 5%. The high concentration of immigrants of less than one year residence in this industry was no doubt due to a large number of foreign transport workers employed on visiting ships, aircrafts, etc., at the time of the Census. Further, both male and female immigrants of less than one year of residence showed an unduly high frequency of "industry not stated". Both anomalies were adjusted by assuming that the concentrations of immigrants of less than one year of residence were, in each case mentioned above, the same as those of immigrants of 1 to 2 years of residence.

[11] The author wishes to express his thanks to the Commonwealth Statistician for his highly co-operative attitude in this matter.

[12] Types of occupancy are: owner, purchaser by instalments, tenant, and other occupant. See 1954 Census, Part II, Vol. VIII, Table Nos. 15 and 21.

[13] See Appendix II.

The Results

The parameters of the regression equation specified by our model were estimated by the method of least squares. These estimates are, on the assumptions stated, unbiased, efficient, and of a maximum likelihood type.

A. *Male immigrants in industries*

The estimated regression equation describing how the male immigrants differ from the total male work force in their participation in various industries is given by

$$(I)\quad \hat{Y}^{(a)} = \underset{}{4{\cdot}001} - \underset{(\cdot 17)}{{\cdot}560}\log X_1 - \underset{(\cdot 15)}{{\cdot}022}\,X_2 \quad , \qquad (\cdot 0056)$$

$$R^2 = {\cdot}943 \quad .$$

Both regression coefficients, $\hat{\beta}_1$ and $\hat{\beta}_2$, are highly significant, and so is the F-statistic testing the existence of the relationship. We can conclude that both factors, the period of residence in the country and the proportion of British-born immigrants, are highly important in diminishing the difference between male immigrants and the total male work force with respect to the rate of joining various industries. It is to be noted, however, that owing to the size of the constant term, the process of completing the adjustment is rather slow. In fact, the estimated time required for a 100% British group of immigrants to participate in various industries at the same rate as the native Australians would be somewhat over 100 years.[14] This is not really so surprising as it may be expected that the immigrant group may display a certain inherent rigidity which even a very long period of exposure to the Australian industrial environment would not fully eradicate. It seems less likely that barriers with respect to entry into particular industries would persist over a very prolonged period of time.[15]

B. *Female immigrants in industries*

The differences in the relative participation in various industries of the female immigrants and of the total female work force have been estimated by

$$(II)\quad \hat{Y}^{(b)} = \underset{}{5{\cdot}684} - \underset{(\cdot 64)}{{\cdot}457}\log X_1 - \underset{(\cdot 55)}{{\cdot}061}\,X_2 \quad , \qquad (\cdot 019)$$

$$R^2 = {\cdot}822 \quad .$$

It appears that here the coefficient attached to $\log X_1$ is not significant. In other words, the period of residence of female immigrants does not affect the degree to which the females adjust

[14] The value of $Y^{(a)}$ for the native Australian male work force is ·54.

[15] At this stage, it ought to be emphasized that our model attempts to describe the process of economic adjustments and not the reasons underlying its speed; that is, we are estimating the values of the parameter without trying to explain them. Such a task could be undertaken only by embarking upon a comprehensive study of the mobility of labour, relative earnings in various industries, labour institutions, etc.

themselves to the Australian industrial environment. The percentage of British-born is, however, relevant in decreasing the differences or, in our terminology, promoting mobility in this respect. A test reveals that the removal of log X_1 from the regression equation does not significantly reduce the strength of the relationship,[16] so that we can use a simple regression model relating the "standard difference" $Y^{(\bar{b})}$ and the percentage of British-born. This is, then,

$$\text{(III)}\quad \hat{Y}^{(\bar{b})} = \underset{(\cdot 582)}{5\cdot 891} - \underset{(\cdot 013)}{\cdot 073}\, X_2 \quad ,$$

$$R^2 = \cdot 805 \quad .$$

According to this model, a group of female immigrants with about 75% British-born among them will not basically differ from the native Australian women in the distribution over various industries.[17]

The value of the regression coefficient attached to the British-component variable is considerably greater with respect to the female industrial distribution than with respect to the corresponding male distribution; this is, at least partially, due to the insignificance of the period of residence in describing the female industrial adjustment process.

C. *Occupational status of male immigrants*

The economic mobility of male immigrants with respect to occupational status measured by the "standard difference" is estimated as

$$\text{(IV)}\quad \hat{Y}^{(c)} = \underset{(1\cdot 08)}{8\cdot 029} - \underset{(\cdot 96)}{2\cdot 537}\log X_1 - \underset{(\cdot 036)}{\cdot 064 X_2} \quad .$$

$$R^2 = \cdot 846 \quad .$$

The regression coefficient attached to X_2 is not significant: the proportion of British-born is not relevant in promoting the economic mobility of male immigrants as far as their occupational status is concerned. The value of R^2 is not significantly affected by removing the variable X_2;[18] the resulting simple regression equation is

$$\text{(V)}\quad \hat{Y}^{(\bar{c})} = \underset{(\cdot 549)}{6\cdot 351} - \underset{(\cdot 727)}{3\cdot 819}\log X_1 \quad ,$$

$$R^2 = \cdot 776 \quad .$$

The estimated period of residence in Australia necessary for the male immigrants to attain a distribution with respect to oc-

[16] The F-statistic for testing the reduction in the regression sum of squares is ·70 (with 1 and 7 degrees of freedom), which is definitely not significant.

[17] The value of $Y^{(\bar{b})}$ for native Australian women is ·40.

[18] The F-statistic of the reduction in the regression sum of squares is 3·19 (1 and 7 degrees of freedom); this is not significant.

cupational status which would be similar to that displayed by the native Australian males is approximately 30 years.[19]

This conclusion remains unaltered if we measure the differences in occupational status by the difference in the percentage of males with independent occupational status (employers or self-employed). The regression equation is

$$\text{(VI)}\quad \hat{Y}^{(\bar{c})} = \underset{}{-16{\cdot}512} + \underset{(3{\cdot}42)}{6{\cdot}730}\log X_1 + \underset{(3{\cdot}06)}{{\cdot}131}\,X_2 \quad , \qquad \underset{(\cdot 114)}{} \qquad R^2 = {\cdot}761 \quad .$$

The signs of the regression coefficients indicate an increase in $\hat{Y}^{(\bar{c})}$ corresponding to increases in the independent variables; since most values of $Y^{(\bar{c})}$ are negative, the positive signs of the regression coefficients indicate a reduction in the differences between immigrant males and total males. Here again, the British-component variable appears insignificant, but the relationship appears to be poorer than when the "standard difference" is used as a measure of integration.

D. *Occupational status of female immigrants*

The test of the relationship between "standard difference" of the distribution according to occupational status on one side and the period of residence and the percentage of the British-born component of female immigrants on the other, gives

$$\text{(VII)}\quad \hat{Y}^{(d)} = \underset{}{1{\cdot}650} + \underset{(1{\cdot}61)}{{\cdot}306}\log X_1 - \underset{(1{\cdot}37)}{{\cdot}002}\,X_2 \quad , \qquad \underset{(\cdot 047)}{} \qquad R^2 = {\cdot}011 \quad .$$

This relationship does not appear to be at all significant. The same conclusion can be drawn when the measure of the differences in the occupational status of female immigrants and total females is the percentage of females with independent occupational status:

$$\text{(VIII)}\quad \hat{Y}^{(\bar{d})} = \underset{}{-1{\cdot}888} + \underset{(4{\cdot}34)}{5{\cdot}344}\log X_1 - \underset{(3{\cdot}69)}{{\cdot}019}\,X_2 \quad , \qquad \underset{(\cdot 13)}{} \qquad R^2 = {\cdot}358 \quad .$$

That is, there is no evidence to suggest that either the length of stay in the country or the percentage of British-born among immigrant females would in any way account for the differences in the occupational status between immigrant and native Australian females.

E. *Dwelling ownership of immigrant householders*

Differences in dwelling ownership between immigrant and total householders can again be measured either by the "standard difference" which takes into account all four types of occupancy

[19] $Y^{(\bar{c})}$ for native Australian males is ·66.

by householders,[20] or by differences in the percentage of owners or purchasers by instalments. Adopting the former method we obtain

$$(IX)\quad \hat{Y}^{(e)} = \underset{(3\cdot3)}{9\cdot404} - \underset{(2\cdot9)}{19\cdot324}\log X_1 + \underset{(\cdot105)}{\cdot317}\,X_2 \quad ,$$
$$R^2 = \cdot884 \quad .$$

Both of the independent variables—period of residence and percentage of British-born—are significant in explaining the variations in the "standard difference". It is very interesting to find, however, that while the period of residence diminishes the differences between immigrants and natives, an increase in the British component tends to operate in the opposite direction. The higher the percentage of British immigrants, other things being equal, the greater the difference between immigrants and natives with respect to dwelling ownership. According to our model, it would take a group of immigrants with 50% British-born about 21 years to approximate the natives in this respect;[21] an immigrant group with no British-born among them would take about 3 years.

By using the proportion of owners or purchasers by instalments as a measure of the differences between immigrants and natives, we arrive at the same conclusion. The regression equation now is

$$(X)\quad \hat{Y}^{(\bar{e})} = \underset{(5\cdot2)}{-15.200} + \underset{(4\cdot6)}{32\cdot278}\log X_1 - \underset{(\cdot167)}{\cdot507}\,X_2 \quad ,$$
$$R^2 = \cdot895 \quad .$$

Again, both regression coefficients are significant and the difference between immigrants and total householders is diminished with the length of residence and increased with the percentage of British-born.[22] It appears that a group of immigrants of whom 50% are British-born would take close to 20 years to have purchased dwellings at the same rate as the native Australians;[23] a group with no British-born among them would take a little over 3 years to achieve the same pattern of home ownership.

Conclusion

Immigrants do, to a varying degree, differ from the native Australians in all three aspects of economic life considered above. The most striking differences are summarized below:

(a) *Industrial distribution*

(i) There is a high concentration of male immigrants, as compared to total males, in most of the manufacturing in-

[20] That is, owners, purchasers by instalments, tenants, and other occupants.

[21] $Y^{(e)}$ for native Australian householders is ·61.

[22] All values of $Y^{(\bar{e})}$, except for that relating to over 15 years residence which is close to zero, are negative.

[23] For native Australians, $Y^{(\bar{e})} = \cdot90$.

dustries, in the building and construction sector (with the exception of male immigrants of over 8 years of residence), and in the hotel, boarding house and hotel service industries.

(ii) All the male immigrants tend to engage in farming and grazing in considerably smaller proportion than the total males.

(iii) All female immigrants of less than 15 years of residence tend to be concentrated in the food and clothing industries in considerably greater proportion than the total females in the work force.

(b) *Distribution by occupational status*

There are relatively more wage- or salary-earners, and relatively less employers or self-employed, among male immigrants of less than 7 years of residence and among female immigrants of less than 6 years of residence, than among total males and females.

(c) *Dwelling ownership*

The proportion of dwelling owners or purchasers by instalments among immigrant householders of up to 15 years residence is lower than among householders as a whole.

All the above statements remain true even if we allow for the differences in the respective age distributions.

We have attempted to explain these differences, and to measure the degree to which they are diminished, by examining the significance of the length of stay in Australia and of the British component. The main results are presented in Table 1.

The hypothesis that the differences between immigrants and natives diminish with the length of stay and with an increased percentage of British-born can be upheld only in the case of male industrial distribution.

The distribution of female immigrants over various industries depends only on the proportion of British-born and not on the period of residence. The irrelevance of the length-of-stay factor is an interesting conclusion; it may, in part, stem from the fact that the range of industries open to women is narrower than the entire range of industries which men can join. It may also indicate a lower degree of flexibility on the part of women, but other more complex reasons no doubt exist.

The economic mobility of male immigrants with respect to occupational status appears to be independent of the relative size of the British component. This may be due to a variety of causes which are characteristic of all immigrants regardless of ethnic origin. Among these, the ones which are likely to be most prominent are: quantity of capital brought into the country, attitude to entrepreneurship, and restrictions on the formation of new enterprises.

Differences in the occupational status between female immigrants and total females cannot be explained either by period of residence

TABLE 1

Economic Aspect		Regression Equation No.	Explanatory Variable				Coefficient of Determination (R^2)
			Period of Residence		% British-born		
			Sign*	Degree of** significance	Sign*	Degree of** significance	
Industrial distribution	M	I	—	H.S.	—	H.S.	·943
	F	II	—	N.S.	—	S.	·822
Distribution according to occupational status	M	IV	—	S.	—	N.S.	·846
	F	VII	+	N.S.	—	N.S.	·011
Purchasing of dwellings		IX	—	S.	+	S.	·884

* A + sign means that the difference between immigrants and natives is increased, and a — sign that it is reduced, as the independent variable is increased.

** S. = significant (i.e., at 5% level).
H.S. = highly significant (i.e., at 1% level).
N.S. = not significant.

or by the percentage of British-born. Other characteristics of foreign-born females and/or of economic environment are obviously responsible for the observed differences.[24]

The conclusion with respect to dwelling ownership is highly interesting. Both factors, period of residence as well as relative size of the British component, are significant in effecting adjustments on the part of the immigrants, but it appears that purchasing of dwellings is retarded rather than promoted by a higher proportion of British-born among the migrants.

If we wish to compare the relative speed of adjustment of immigrants in the three aspects of economic life considered, we may use the "elasticity of standard difference with respect to period of residence" as a measure.[25] The results are:

[24] The distortion to the fit of our regression model seems to be due mainly to the behaviour of the immigrant females of 6 to 15 years of residence, who appear more often than expected in employer or self-employed categories. A further study of the special characteristics of this group might indicate a more appropriate choice of the explanatory variables, but the data provided by the Commonwealth Statistician offer no further help in this respect.

[25] Estimate of the elasticity of standard difference with respect to period of residence is given by

$$\hat{\eta} = \frac{\hat{\beta}_1}{\bar{Y}}$$

where Y is measured at its mean value. This is a purely formal measure and was used solely because it is independent of the units in which Y is measured.

Industrial distribution (male immigrants)	— ·203
Distribution according to occupational status (male immigrants)	— ·659
Dwelling ownership	— 1·971

It is to be concluded, then, that the economic adjustment is most rapid with respect to dwelling ownership, and slowest with respect to industrial distribution. A higher British component will increase the economic adjustment in the case of industrial distribution, slow it down in the case of dwelling ownership, and leave the distribution by occupational status unaffected.

All the conclusions are, of course, subject to the qualifying assumptions stated in the text; the results of the 1961 Census should provide a further testing ground.

J. KMENTA

University of Sydney.

APPENDIX I

*Derivation of theoretical distribution of immigrants based on the postulate of identical behaviour with that of the total population at each age.**

Let the total male (female) population be classified into t groups with respect to a given characteristic, and let

p = total male (female) population;
m = total male (female) immigrants of specific period of residence;
$p_{i.}$ = all males (females) of age i;
$m_{i.}$ = all male (female) immigrants of specific period of residence of age i;
$p_{.j}$ = total number of all males (females) belonging to group j;
$m_{.j}$ = total number of immigrant males (females) of specific period of residence belonging to group j;
p_{ij} = total number of all males (females) of age i belonging to group j;
m_{ij} = total number of immigrant males (females) of specific period of residence of age i belonging to group j.

The postulate of identical behaviour of immigrants and total population *at each age* implies that

$$(1) \qquad \frac{m_{ij}}{m_{i.}} = \frac{p_{ij}}{p_{i.}} \quad .$$

On the basis of this postulate we wish to derive the number of immigrants of specific period of residence theoretically belonging to group j, say, $\hat{m}_{.j}$.

Since by definition $m_{.j} = \sum_i m_{ij}$

we have, from (1) above,

$$\hat{m}_{.j} = \sum_i \left(\frac{p_{ij}}{p_{i.}}\right) . m_{i.}$$

This gives the theoretical distribution required.

APPENDIX II

Estimation of the Age Distribution of Immigrants in the Work Force.

Let $p_{i.}$ = all males (females) of age i;
$w_{i.}$ = number of males of age i in the work force;
$m_{i.}$ = all male (female) immigrants of specific period of residence and of age i;
$u_{i.}$ = number of immigrant males (females) of specific period of residence and of age i in the work force;
u = total number of immigrant males (females) of specific period of residence in the work force.

* The actual calculations were based on five-yearly age groups.

We assume that

$$(1) \qquad \frac{u_{i.}}{m_{i.}} = \frac{w_{i.}}{p_{i.}} \cdot k,$$

where k is the correction factor which is the same for each age group. Then

$$(1') \quad u_{i.} = \frac{w_{i.}}{p_{i.}} \cdot m_{i.} \cdot k$$

and, summing over all ages,

$$(2) \quad \sum_i u_{i.} = k \sum_i \left(\frac{w_{i.}}{p_{i.}}\right) \cdot m_{i.} \cdot .$$

Since $\sum_i u_{i.} = u$ which is known, the correction factor "k" is given by

$$(3) \quad k = \frac{u}{\sum_i \left(\frac{w_{i.}}{p_{i.}}\right) \cdot m_{i.}} \cdot$$

By substituting for "k" from (3) into (1') the estimate of $u_{i.}$ can be readily obtained.*

The above procedure was also adopted to obtain estimates of the age distribution of the immigrant householders.† The calculations were carried out for each specific period of residence.

A partial check of the reliability of the estimates is provided by the size of k; the closer k is to unity, the greater the expected degree of reliability. The results are summarized in table II:

TABLE II

PERIOD OF RESIDENCE	VALUE OF THE CORRECTION FACTOR k		
	Male immigrants in the work force	Female immigrants in the work force	Immigrant householders
Under 1 year	1·0009	1·1090	·3682
1 year and under 2 years	1·0042	1·3082	·7026
2 years and under 3 years	1·0089	1·4120	·7866
3 " " " 4 "	1·0061	1·4023	·9171
4 " " " 5 "	1·0049	1·5126	·9788
5 " " " 6 "	1·0021	1·5654	1·0238
6 " " " 7 "	·9986	1·3478	1·0214
7 " " " 8 "	·9939	1·3561	1·0024
8 " " " 15 "	·9721	1·0575	1·0413
15 years and over	·9983	1·0300	1·0829

Incidentally, the correction factor k provides a measure of participation of immigrants of specific period of residence in the work force and in the formation of households as compared to the total population, after allowing for differences in the respective age distribution. It appears that there is little difference in the participation in the work force between male immigrants and total males regardless of the period of residence. On the other hand, the female immigrants tend, without exception, to join the work force more frequently than total females (and, of course, more frequently than the native Australian females). This difference is most pronounced with respect to immigrant females of 4 to 6 years period of residence. Finally, immigrants of less than 5 years of residence lag behind the total population with regard to household formation.

* A necessary condition of plausibility of $\hat{u}_i$ is that $\hat{u}_i \leqslant m_i$. This condition was not fulfilled with respect to female immigrants of 2 to 6 years residence in the age group of 15 to 19 years. The estimate of the age distribution in each of these cases was modified by assuming $u_{15-19.} = .95 m_{15-19.}$ and altering the correction factor "k" for the remaining age groups accordingly.

† With respect to householders, w_i stands for the number of householders of age i, and $u_{i.}$ for the number of immigrant householders of age i.

APPENDIX III

Industrial classification.

In condensing the 335 industrial categories of the 1954 Census* into a smaller, and therefore more manageable, number of groups, the following principles were being observed:

* See Tables 41 and 42 of Part I, Vol. VIII, *Census of the Commonwealth of Australia*, June, 1954.

(i) The relative frequencies of individual classes should be of a similar order of magnitude.
(ii) The classes should be constructed in such a way as not to obscure any significant concentrations of immigrants.
(iii) The classification should be the same for males as for females.
(iv) Maximum conformity with the Census classification by *major* industrial groups is desirable.

The industrial classes used in the study and the corresponding Census categories (shown in the brackets) are given below.

Class 1: *Primary Production—Farming and Grazing* (Farming, mixed and undefined; Wheat and sheep farming; Wheat growing; Grazing; Dairying; Pig farming; Poultry farming).
Class 2: *Primary Production—Other* (Fishing; Hunting and Trapping; Sugar growing; Fruit growing; Grape growing; Vegetable growing; Flower growing; Tobacco growing; Other agriculture; Beekeeping; Other farming; Forestry).
Class 3: *Mining and Quarrying* (as per Census—Group B).
Class 4: *Manufacturing—Founding, Engineering and Metalworking* (as per Census—Group C, Sub-Group 3).
Class 5: *Manufacturing—Motor Vehicles* (Motor vehicles, parts and accessories; Motor engineering; Motor bodies, caravans and trailers).
Class 6: *Manufacturing—Food, Textile and Clothing* (Manufacture of Textile and Fibrous Materials; Manufacture of Clothing and Knitted Goods; Manufacture of Boots, Shoes and Accessories; Manufacture of Food, Drink and Tobacco).
Class 7: *Manufacturing—Other* (residual of Group C—Manufacturing).
Class 8: *Electricity, Gas and Water* (Electricity, Gas, Water and Sanitary Services—Production, Supply and Maintenance).
Class 9: *Building* (Construction and Repair of Buildings).
Class 10: *Construction* (Construction Works other than Buildings).
Class 11: *Transport and Communication* (Transport and Storage—Group F, and Communication —Group G).
Class 12: *Commerce and Finance—Retail Trade* (Retail Trade—Group I, Sub-Group 3).
Class 13: *Commerce and Finance—Other* (Finance and Property Business—Group H; Wholesale Trade; Livestock and Primary Produce Dealing).
Class 14: *Public and Professional Activity—Health and Education* (Religion and Social Welfare; Health, Hospitals, etc.; Education).
Class 15: *Public and Professional Activity—Other* (Public Authority Activities n.e.i.; Defence: Enlisted Personnel; Defence: Civilian Employees; Law, Order and Public Safety; Other Professional).
Class 16: *Hotels, Boarding Houses and Restaurants* (as per Census—Group K, Sub-Group 3).
Class 17: *Recreation and Personal Services* (Amusement, Sport and Recreation; Private Domestic Service; Other Personal Services).
Class 18: *Other Industries* (Other Industries—Group L, and Industry Inadequately Described or Not Stated—Group M).