Economic Aspects of Singapore’s Selective Family Planning Policy

by David B. Evans

In the mid-1980s, Singapore followed a selective family planning policy. Poorly educated women were encouraged to practice family planning, while university graduates were discouraged from doing so. The first issue of public debate this raised was whether the offspring of university-educated mothers were more likely to attend universities than other children. The second was whether university graduates would economically benefit society more than would uneducated people.

This article, which focuses on the economic issue rather than on the eugenic rationale for the policy, attempts to show that a selective program based on the expected higher productivity of a particular group may not be economically viable. Training costs and the delays before the extra production takes place can, under a variety of reasonable assumptions, outweigh the gains in production.

Context of Singapore’s policy
In the decade before independence in 1959, Singapore’s population grew at an extremely high annual rate of 4.4 percent. This rapid growth led to serious social and economic problems in a country where population density was already high by world standards. Unemployment and pressures on housing, health, and education were particularly severe (Saw 1980). To alleviate these problems, the newly independent government introduced policies designed to increase the rate of economic growth, to restrict immigration, and to reduce the population’s rate of natural increase.
Efforts to reduce birth rates initially involved official support for the Singapore Family Planning Association. After partition from Malaysia in 1965, however, a statutory board, the Singapore Family Planning and Population Board, was constituted with the long-term aim of reducing fertility to replacement levels. Various incentives and disincentives aimed at encouraging small families were introduced progressively, culminating in the legalization of abortion in 1970 and legalized abortion on demand in 1974. These policies, described in Saw (1980, 1984) are well known, but it is important to note that they were not aimed at particular groups. All Singapore women were encouraged to have no more than two children.

The rate of population growth declined from 3.2 percent per annum at independence to 1.1 percent in 1984. Over the same period, the crude birth rate fell from close to 40 to less than 17 per thousand. As a result, the gross reproduction rate fell, and it has been below replacement levels since 1975.

Accompanying these changes was an impressive economic performance. Singapore's real gross domestic product grew at the compound rate of 12.7 percent annually from 1965 to 1973. Although it grew less dramatically over the next four years, it recovered to average more than 8.5 percent annually during 1977–83 (estimates derived from Lee 1984). Unemployment, which had risen during the 1960s, peaked at 10.1 percent in 1970 and fell to less than 3 percent of the work force in the early 1980s (Shantakumar 1984). Meanwhile significant improvements were made to social and economic infrastructure, in particular to housing and health and educational facilities. Thus by late 1983 it appeared that the problems that had beset Singapore at independence were no longer paramount. New problems, requiring new policies, were emerging.

One problem of concern to the government was the unbalanced pattern of procreation that had emerged under the original Family Planning Program. Educated women were postponing or forgoing marriage. Those who did marry generally chose to pursue their careers, and had few children. Uneducated women were not postponing marriage and were less likely to limit the size of their families.
The government believed that this pattern was not consistent with its attempts to restructure the economy toward more skill-intensive industries and would not produce future leaders of the caliber necessary to govern the country effectively. Accordingly, Singapore's population program was altered substantially toward the end of 1983.1

The new policy was selective, dependent on the prospective mother's educational qualifications. Women with little education were still encouraged to have small families, but women who were university graduates were encouraged both to marry and to have larger families.

Incentives and disincentives were introduced for both target groups (Far Eastern Economic Review [FEER], 21 June 1984, p. 31). For example, a S $10,000 grant, payable to an account with the centralized superannuation fund, was offered to women who agreed to be sterilized after the birth of their first or second child. Only women from low-income families who had fewer than two 0-level passes (scores on the public examination administered after ten years of schooling) were eligible. For a time graduates—that is, more-educated women—were offered priority enrollment for their children in the choice primary schools. This preferential treatment was discontinued in response to public pressure, though the minister of education claimed that it was cancelled because it had not induced the graduates to have more children (Straits Times, 26 March, 1985).

The new policy was based on two assumptions. The first was that children were more likely to proceed to a university education if their mothers were university graduates than if their mothers were not. The second was that the production of graduate offspring would benefit Singapore more than the production of uneducated offspring.

This article does not consider the validity of the eugenic assumption. It examines instead the benefits the government expected from its selective policy, focusing on the economic factors, which featured prominently in the official justification (FEER, 8 September 1983, p. 84). Specifically, my purpose is to evaluate the economic costs and benefits of a family planning program that prevents the birth of a person who will receive little education and to compare them with those of a program that would prevent the birth of a university graduate.

If the analysis reveals that it is profitable for a society to prevent the birth of the uneducated and to promote the birth of the educated, this finding would lend support to a selective policy of the type practiced in Singapore. In that case, the next step would be to consider noneconomic implications of the policy and to debate the government's theory of eugenics. The economic analysis, however, may not provide support for the selective policy. In that event, unless there are compelling social or political reasons for its introduction, the debate about eugenics is not particularly relevant.

Although the selective policy was revoked late in 1986—the official reason was fear of eventual shortages of skilled and unskilled labor—the economic assumptions of this type of program are still worthy of analysis because educated people are generally perceived to be economically more productive than the uneducated, and thus selective programs have some intuitive appeal.

**Cost–benefit analysis**

The economic impact of family planning programs can be examined by using either the growth model or the human investment approach. Growth models were first applied to family planning programs by Coale and Hoover (1958) and were refined by Enke and Zind (1969). They involve estimating a production function for an economy as a whole of the general form

\[ Y = Y(K, L, T), \]

where

- \( Y \) = national income,
- \( K \) = capital stock,
- \( L \) = labor inputs,
- \( T \) = level of technology.

Once the parameters have been estimated, national income or income per head can be projected into the future under a variety of assumptions.

For example, income per head can be estimated for some future date on the assumptions, first, that current fertility patterns do not alter, and second, that fertility declines at a particular rate owing to a family planning program. Income per head under the latter assumption will usually be higher than that under the former. The difference, the increase in the average standard of living, is an economic benefit of the program.

Growth models can be used only where it is possible to estimate the equation. This cannot be done in Singapore because time-series data...
on the stock of capital are not available (Toh 1985), and therefore the human investment approach is used here. Enke (1960a, 1960b) was the first to use this approach to examine the economic impact of family planning programs, and it was subsequently extended by Zaidan (1971) and Chao and Allen (1984), among others. It measures the net economic returns to society from investing in a family planning project. The project is defined as preventing a specific number of births, often 1,000, at a particular time. The costs and benefits to society from the project extend over the potential life span of the prevented births, and thus a cost-benefit framework is applied.

On the one hand, the direct costs of the project are the costs of preventing the births through the provision of family planning services. In addition, by preventing a birth, society loses the output the person would have produced over his or her lifetime. Thus the yearly value of this output, the marginal value product of labor, is another project cost. It begins from the time the person would have found employment and continues to the end of the project life.

On the other hand, people consume real resources over their lifetimes as well. By preventing the births, society saves the value of this consumption, and thus yearly savings in private consumption are considered to be a project benefit. Because people consume even during years in which they are unproductive, these savings accrue from the first year of the project.

Another benefit of preventing the births is that it saves government expenditure, which can then be used in other ways. Most important are government subsidies for education and health. Sometimes government savings in such areas as housing and social services have been included in the analysis as well (Chao and Allen 1984). They are excluded here because it is debatable if public housing in Singapore contains a subsidy element and the social service sector is very small.

To determine if the project is economically viable, it is necessary to compare costs and benefits, but the difference in their timing must be accounted for. To do this, it is customary to discount the anticipated future costs and benefits to obtain their values to society at the time the project begins.

Discounting is based on the principle that one dollar today is worth more than one dollar expected at some time in the future, even in the absence of inflation and uncertainty. The reason is that a dollar invested today would yield a return in excess of a dollar in the future. For example, it would be worth $1.05 after one year if the rate of return on investment were 5 percent per annum. In this case, $1.05 payable in one year would be worth $1.00 today. The future sum is discounted back to its value today, which is called its present value. The discount rate in this case is 5 percent.
(A concise description of the reasons for discounting and the techniques that are used is found in Drummond 1980. The present value of $X$ payable in $n$ years with a discount rate of $r$ percent is $\frac{X}{(1 + r)^n}$.)

To determine the economic viability of the project as a whole, the projected costs are subtracted from the projected benefits for each year of the project life separately. These yearly net benefits are then discounted back to their present values, again for each year separately. The sum of the yearly present values is known as the net present value of the project. If it is positive, the value of the expected benefits exceeds the value of the costs, and the project is viable.

Two practical problems must be confronted in any cost–benefit analysis.

The first involves the choice of the appropriate discount rate. This is a controversial topic, but most studies assume a real rate of between 5 and 10 percent. The former is commonly used in the analysis of health projects (Drummond, Stoddart, and Torrance 1987, p. 52). At these rates, payments after 30 to 35 years become insignificant, and most studies impose finite time horizons of 30 years on their analyses. For example, $1,000 payable in 35 years with a 10 percent discount rate has a present value of less than $36.

The second problem concerns the treatment of inflation. Two approaches can be used. The first requires future costs and benefits to be increased by the expected rate of inflation and the use of a higher, inflation-adjusted discount rate. The second does not inflate any future costs and benefits and uses a lower discount rate that does not allow for inflation. The former method measures costs and benefits in what are known as nominal prices as opposed to the constant (inflation-free) prices used in the latter. The higher discount rate is called the nominal rate, whereas the inflation-free rate is known as the real rate. (See Drummond, Stoddart, and Torrance 1987, p. 52, for details of the relationship between the two rates.)

Using reasonable assumptions, one can show that the two approaches give consistent answers (Drummond, Stoddart, and Torrance 1987). For example, if the net present value is positive in one, it will be positive in the other. The second method is simpler to apply and is used more commonly. It is also used here.

Cost–benefit analysis must be applied in a slightly different way to family planning programs than to other projects. The net present value must be modified to allow for the fact that some of the children whose births were prevented would not have survived to the end of the project life. Accordingly, the yearly discounted net benefits are multiplied by the probability that a person of a given age would be alive at the end of the year.

The probabilities used in this article were taken from life tables for Singapore. The sum of these adjusted net benefits is called the expected net present value here, in the same way that any value multiplied by the probability of its occurrence is called the expected value in statistics.

Cost–benefit analysis can be used to determine if a single project is justified on economic grounds. Sometimes there will be insufficient funds to complete all the viable projects, and in such cases the approach can be used to rank the alternatives. The one with the highest net present value should take precedence.

The advantages and disadvantages of applying this approach to family planning programs have been widely reported (Pitchford 1974; Havelman 1976). They are not discussed here at length, but two factors are important for the present study.

First, the approach relies on the assumption that any changes in fertility patterns as a result of the family planning program are marginal and will not affect other macroeconomic variables. The assumption is unlikely to have applied to Singapore at independence, when there was the potential to make large reductions in fertility rates. But it is appropriate to the analysis of current family planning programs in Singapore now that fertility is so low.

Second, Zaidan (1971) argues that the approach is biased toward showing that investment in family planning programs is viable in all societies at all times. This is because consumption streams begin at birth, whereas production is delayed for a considerable period. With realistic discount rates, the present value of the consumption savings would be expected to outweigh the present value of the forgone production.

This will certainly be true for most developing countries where the marginal value product of labor is low. At the extreme, if the marginal value product is zero, the only cost of the project is the initial cost of the family planning program. In
all subsequent years, only benefits accrue and the net present value is bound to be positive. In Singapore, however, it is not certain that the net present value would be positive because labor is relatively productive and private consumption as a proportion of gross domestic product is low (Asian Development Bank 1984). The costs in forgone production could well outweigh the benefits of savings in consumption.

Most studies have applied the human investment approach to the analysis of family planning programs in low-income developing countries (Chao and Allen 1984; Osteria 1976). These studies have considered family planning programs in general. Doing so requires the assumption that all the prevented births would have been of average people, who would have attended school for an average length of time and had average marginal value product and average marginal consumption. This assumption cannot be applied to the analysis of a selective family planning program.

The standard approach is therefore modified here. Instead of considering one project that prevents the birth of a set number of average children, let us consider two hypothetical projects. The first is a project to prevent the births of 1,000 persons who would have been university graduates. To allow the widest possible contrast, the second project is to prevent the births of 1,000 persons who would have received only primary education. The more usual case of children entering the work force after secondary education would fall somewhere between the two extremes discussed here.

The standard approach is also modified here in a second way. Previous studies have made no provision for real increases in labor productivity or consumption levels over time—that is, increases beyond those resulting from general inflation. For comparative purposes, the results of this type of static analysis are presented. Dynamic considerations, however, are also introduced that are based upon several assumptions about likely changes in the real values of costs and benefits.

The assumptions and the data

Details of the assumptions made here and the Singapore data are provided in the Appendix. Only information essential to interpreting the results is included in this section.

A time horizon of 30 years and a 10 percent discount rate are used, although the sensitivity of the results to these assumptions is considered. The base year is taken as 1977–78 because the only recent data on private consumption were found in the Household Expenditure Survey of that year (Singapore, Department of Statistics 1979).

The marginal value product of labor is estimated on the assumption that a competitive labor market exists. In this case, the cost to the employer of hiring labor equals the marginal value product. For consistency, pretax income figures are also taken from the Household Expenditure Survey. These data are adjusted for the employer’s contributions to the central superannuation fund and payroll tax to obtain the cost of hiring labor.

Once the base-year estimates of costs and benefits are made, they have to be projected over the life of the project. Constant prices are used. The static analysis is conducted assuming zero real growth of all costs and benefits. I call this the zero-growth scenario. Singapore, however, has generally had high real growth rates since independence, so that an outcome of no real growth over an extended period is not very likely. The assumption is made in order to determine a lower bound of possible outcomes.

As an upper bound, the real growth rates observed between 1972–73 and 1982–83 are used. This period includes the five years before and after the base year, when growth rates were significantly higher than earlier. Current indi-
cations are that similar growth is unlikely to be sustained continuously over the next 30 years, and therefore I call this the high-growth scenario.

For the high-growth calculations, separate growth rates are estimated for each cost and benefit. Details of the base-year values of each variable and the annual growth rates observed between 1972–73 and 1982–83 are found in the Appendix Table. Shadow prices are not used in the analysis because markets in Singapore are relatively free from imperfections and the adjustments would have been minor.

■ Results of the analysis
The expected net present values of preventing 1,000 births of both university and primary school graduates, using a 30-year time horizon and a 10 percent discount rate, are reported in Table 1. The sensitivity of the values to these assumptions is also included. The results are quite robust. The expected net present value for university graduates is almost always positive, implying that the benefits of preventing their birth outweigh the costs. On the other hand, the expected net present value for primary school leavers is often negative, suggesting that preventing the birth of children who will not progress as far academically could cost society more than it gains.

Moreover, for any given set of assumptions the expected net present value for preventing the birth of university graduates is significantly above that for preventing the birth of primary school graduates. This result is not important if we assume a 30-year time horizon, 5 percent discount rate, and high real economic growth, when neither family planning program should be pursued. But in the other cases it implies that society should first prevent the birth of the educated before considering the uneducated.

In fact, two cases support preventing the birth of university graduates while encouraging the birth of primary school graduates.

Two factors explain these results. First, the cost of university education is considerably higher than the cost of primary school education. Second, the timing of the flow of benefits differs between the two groups. University graduates are more productive than uneducated people in Singapore, but the uneducated begin contributing much earlier. At reasonable discount rates, the earlier contribution of the uneducated outweighs the greater contribution of the educated.

Clearly, the economic justification for a selective family planning program cannot rely simply on the greater potential productivity of one group of people. The costs of training them and the delay before they start producing must also be considered. Table 1 shows that under several reasonable assumptions these factors outweigh the effect of high productivity, to the point that it could make more sense to discourage rather than to encourage the birth of potentially productive people.

The question therefore arises whether there is any possible combination of assumptions that produces results favorable to Singapore's former selective policy. Consider the case of the 30-year time horizon and 5 percent discount rate in Table 1. The project to prevent the birth of university graduates is not justified if their productivity is assumed to grow at the high rate (expected net present value = $8.38 million). If at the same time the productivity of primary school graduates stagnated, the project to prevent the birth of

Table 1. Expected net present value of preventing 1,000 births (in $ $ million)

<table>
<thead>
<tr>
<th>Time horizon</th>
<th>Assumption</th>
<th>Real growth</th>
<th>Expected net present valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Discount rate</td>
<td>University</td>
<td>Primary</td>
</tr>
<tr>
<td>30 years</td>
<td>10</td>
<td>High</td>
<td>26.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zero</td>
<td>29.86</td>
</tr>
<tr>
<td>30 years</td>
<td>5</td>
<td>High</td>
<td>-8.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zero</td>
<td>25.57</td>
</tr>
<tr>
<td>35 years</td>
<td>10</td>
<td>High</td>
<td>14.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zero</td>
<td>26.96</td>
</tr>
</tbody>
</table>

aDetailed calculations are available from the author upon request. Results have been rounded to two decimal places.
primary-educated children would be viable (expected net present value = S $1.25 million).

This result is not very robust, however. For example, the table shows that the relative attractiveness of the two projects is reversed when a 10 percent discount rate is used. In addition, the result is critically dependent on high growth in graduate labor productivity combined with zero growth in the productivity of primary school leavers. Moderate growth, say at 2 percent per year, in the productivity of both groups also reverses the relative attractiveness of the two projects (results not shown).

On economic grounds cost–benefit analysis suggests that a society may benefit more by preventing the birth of a potential university student than by preventing the birth of a potential primary school graduate.

In fact, the combination of growth rates required to support the selective program does not seem to be realistic. The productivity of unskilled labor in Singapore has never exhibited zero real growth for an extended period in the past, and the current economic downturn suggests that it would be difficult to sustain the high rate of growth in graduate labor productivity. The analysis therefore suggests that the selective family planning program was unlikely to result in major economic benefits of the type considered in this article.

- Conclusions

This result should be interpreted in the light of several qualifications.

The first is that the economic analysis was of necessity incomplete. For example, it is possible that educated people contribute more to technical change, and hence to increasing the standard of living, than others. This assumption might increase the attractiveness of the birth of potential graduates, although it might also imply that an increase in the number of university graduates would raise the productivity of unskilled labor.

Little evidence of this type of relationship exists, however, and therefore I did not incorporate it into the analysis. But it would be a useful avenue for further research and would also help to determine whether graduate labor productivity could grow rapidly while the productivity of the less educated stagnated. These were the only conditions under which Singapore's selective family planning policy appeared to be viable.

A second qualification is that the analysis has not considered the economic implications of the availability of labor from other Asian countries. Virtually unlimited supplies of unskilled people can be imported into Singapore without their dependents. These people arrive when they are productive and are expatriated when they become unproductive. The costs of their unproductive years are not met by Singapore. This may not be a feasible option with university graduates because there is more competition on the international market for their skills. Thus there may be economic reasons for encouraging the birth of Singaporean university graduates while relying on imported unskilled labor.

The third qualification of the results is that they depend on the quality of the data. Although higher-quality data may alter the values of the estimated expected net present values, it is unlikely that the relative attractiveness of the two projects would change. The reason is that the results are robust to changes in assumptions.

In any case, the analysis shows that a selective birth control program based purely on the potential high productivity of the offspring of a particular group need not necessarily be viable economically. Training costs, and differences in the timing of benefits, are vital to the analysis. I have attempted to show that, under a variety of reasonable assumptions, these factors could outweigh future gains in productivity. Indeed, under some assumptions and given the constraints of this type of analysis, a selective family planning program with the opposite characteristics of Singapore's might be warranted on purely economic grounds.

Finally, the analysis has focused on the economic benefits that might be expected from a selective family planning program. There may of course be other reasons for preferring the more educated to the less educated. However, further research is needed to establish that such benefits could be realized in practice because the lesson of this exercise is that benefits that seem feasible intuitively may not be attainable.

(Appendix begins on page 21.)
A Simplified Robust Estimate of the Birth Rate

by K. Venkatacharya and Tesfay Teklu

The following article shows Coale's robust birth rate estimate to be equivalent to the birth rate estimate obtainable by the well-known reverse-survival method. The authors suggest a simplified birth rate estimate that does not require reference to model stable populations or model life tables.

In a technical note appearing in the Asian and Pacific Census Forum, Ansley J. Coale suggested a simple method of estimating the birth rate for a population that experiences changes in fertility and mortality (Coale 1981). For a population that satisfies stability conditions, the birth rate is taken as that of a stable population selected by matching certain statistics of the observed population with those of model stable populations, such as the Coale–Demeny models (Coale and Demeny 1966). When these stable populations become destabilized, the stable birth rate will not necessarily give a good birth rate estimate. Many authors had previously attempted to adjust the stable birth rate to take into account the nonstable situation (Abou Ganim 1976; United Nations 1983, pp. 166–172).

Coale (1981) suggested a method of adjustment for the stable birth rate based on the reported proportion of the population under age 15 (for both sexes) and $l_s$ obtained by a Brass type of indirect estimation of mortality. Coale’s method is very robust and works well in many situations.

The purpose of this article is to show that other estimates of the birth rate can be derived from Coale’s robust estimate. Coale’s estimate is nearly equal to the birth rate obtainable from reverse survival or reverse projection of the proportion of a population under age 15 (both sexes), or $C(15)$, using a life table corresponding to $l_s$. As a sequel to this, we obtain a birth rate estimate that does not require reference to stable population models and results in computational economy and ease.

Moreover, taking advantage of the strong linear relation between $l_s$ and $y_0$, we derive a simple robust estimate of the birth rate that does not depend upon model stable populations or model life tables. After briefly presenting these methods, we illustrate their use with data from several Asian and African countries.

Coale’s method

Coale (1981) suggested using the observed $C(15)$ for both sexes and $l_s$ to locate an appropriate stable population from a family of stable models to represent the observed population and to use its birth rate as an estimate of the population under study. The estimate of $l_s$ can be obtained by any of the indirect methods like the Brass method. Coale observed that such methods yield birth rates that are not much affected even when the populations are not stable. He also suggested an adjustment for the stable birth rate for nonstability:

$$b_C = b_s \cdot \exp[7.5(r - r_s)]$$ (1)

where $b_C$ is the birth rate adjusted by Coale’s method, $b_s$ is the stable birth rate corresponding to $C(15)$ and $l_s$, and $r_s$ and $r$ are the rates of increase in the stable and the study populations respectively.

Coale explained the logic behind this adjustment by treating the estimation of the stable birth rate from $C(15)$ and $l_s$ as a form of reverse survival that yields an estimate of the average birth rate during the 15 years preceding the census. The persons under age 15, when

K. Venkatacharya is Demographer and Tesfay Teklu is Lecturer at the Regional Institute for Population Studies, Legon, Ghana.
reverse-survived by life table survival ratios corresponding to the estimated \( l_0 \), represent the births during the 15 years preceding the census.

To obtain the birth rate one needs the denominator, namely, the number of person-years lived. This is obtained by using the rate of increase, \( r \), which differs for a stable and a nonstable or observed population. For example, the number of person-years lived in the stable population is approximated as \( 15 \cdot p_0 \cdot \exp[-7.5 \cdot r] \) and for the nonstable (observed) population as \( 15 \cdot p_0 \cdot \exp[-7.5 \cdot r] \). The value 7.5 is the number of years before the census where the midpoint occurs and \( p_0 \) is the total current population. Thus the number of person-years in the stable situation and hence the stable birth rate can be adjusted by the factor \( \exp[7.5(r - r_L)] \) to take into account the nonstable situation. (For details see Coale 1981 or United Nations 1983:166–172.)

Various methods can be used to obtain the time reference of the mortality estimate, \( l_0 \), by providing years prior to the survey or census to which the \( l_0 \) estimate is applicable (United Nations 1983:77–78; Feeney 1981). Our calculations for the countries under study indicate that \( l_0 \) refers to about seven years prior to the survey. Since \( b_c \) is the average value for 15 years prior to the most recent census data, \( t \), and \( l_0 \) refers to the time of about seven years prior to \( t \), \( b_c \) should be considered to refer to the time \( (t - 7.5) \).

\[ b_R = \frac{C(15)}{15 \cdot l_0(t - 7.5) \cdot e^{-7.5r}} \]  

where the radix of the life table \( l_0 \) is taken as unity.

Equations (1) and (2) in the present form do not appear identical, although the logic behind them is the same. It can be shown easily that the two equations are identical for a certain order of approximation. Since we have obtained \( r_L \) and \( b_8 \) by matching observed \( C(15) \) and \( l_0 \) or \( 15 \cdot l_0(t - 7.5) \), we have the following identity:

\[ C(15) = b_8 \cdot \int_{0}^{0.5 \cdot r_L} p(x)dx \]

Two numerical approximations can be applied to the above integral, namely:

\[ C(15) \approx b_8 \cdot e^{-2.5r} \cdot l_0 - e^{-7.5r} \cdot l_5 + e^{-12.5r} \cdot l_{10} \]  

(3A)

or a simpler and less accurate one:

\[ C(15) \approx b_8 \cdot e^{-7.5r} \cdot 15 \cdot l_0 \]  

(3B)

Equation (3B) can be written as:

\[ C(15) \approx b_8 \cdot e^{-7.5r} \cdot 15 \cdot l_0 \]

(4)

Multiplying both sides of equation (4) by \( e^{7.5r} \) leads to

\[ b_R = b_c \]

indicating that Coale's adjusted birth rate is approximately equal to that obtainable by the reverse-survival method. In the following discussion we briefly examine the relationship between \( b_c \) and \( b_R \).

1. The approximate equality of Coale's estimation equation and that of the reverse-survival method rests on equation (3B). In analysis not shown here, we find that using equation (3B) to compute \( C(15) \) slightly understates the true values, whereas using equation (3A) almost reproduces the true value. As a consequence, \( b_R \) tends to be slightly higher than \( b_c \). For most practical considerations, however, this difference can be ignored.

2. In equations (1) and (2) the basic data used, namely, \( C(15) \), \( l_0 \), and \( r \), are the same. Both equations also
use the reverse-survival technique. In obtaining equation (2), we make the implicit assumption that the reverse-survival rate is not affected by differences in the age distributions of the study and the stationary populations under age 15. In the case of equation (1) we make the assumption that differences in the age distributions of the study and the stable populations under age 15 do not affect the reverse-survival rate. Calculations show that the effect of the differences in these assumptions on the estimated birth rates is very small.

3. While discussing equation (1), Coale (1981) made the interesting observation that estimates of $b_C$ are not much affected by the choice of a particular family from among the four tabulated models in the Coale–Demeny model life tables. Our computations show that even in the case of the new UN models and the OECD models, the same pattern is observed. This can be easily understood from equation (2), which we have shown to be nearly equal to $b_C$, and it illustrates that the change in the mortality pattern enters the calculation through $\gamma L_0$. Thus variations in $b_C$ by the choice of a particular model family are a function of $\gamma L_0$. Calculations have shown that once $\gamma$ is fixed, $\gamma L_0$ changes marginally from one family to another.

4. Another interesting feature of equation (2), compared with equation (1), is that it does not require the estimation of the stable parameters. The absence of $b_5$ and $r_5$ in equation (2) leads to some saving in computations.

5. Equation (2), however, still needs a life table for the study population at time $(t = 7.5)$, from which $\gamma L_0$ can be obtained. As life tables are rare in the developing countries, one must depend upon model life tables, such as the Coale–Demeny models. It is possible to simplify equation (2) further by exploiting the strong linear relationship between $\gamma$ and $\gamma L_0$. Thus if we express

$$\gamma L_0 = u + v \cdot \gamma$$

we reduce equation (2) to

$$b_V = \frac{C(15) \cdot e^{7.5r}}{(u + v \cdot \gamma)}$$

Equation (5) reduces the birth rate estimate to an explicit function of $C(15)$, $r$, and $\gamma$. The constants $u$ and $v$ are determined by the pattern of mortality assumed for the study population.

Table 1 presents the values of $u$ and $v$ obtained by fitting the linear function mentioned above to the Coale–Demeny (1966), the UN (1983), and the OECD (Clairin et al. 1980) life table families. Though one expects a linear relationship between $\gamma$ and $\gamma L_0$, in view of the linear assumption made in the computation of $L_X$ values, the observed close relationship seen in Table 1 is quite encouraging. A minor point of interest is that $(u + v)$ is nearly equal to 15; $(u + v)$ should be 15 for $\gamma = 1$ in the limiting case.

Though the constants $u$ and $v$ vary from one family to another, the resultant $\gamma L_0$ for a given $\gamma$ does not vary much. Thus if one is aware of the appropriate mortality pattern of a particular country, one can use equation (5) with the specific set of the values of $u$ and $v$ from Table 1. Our computations have shown that the values of $u$ and $v$ derived for the Coale–Demeny West family gave a minimum percentage of error in the

<table>
<thead>
<tr>
<th>Model life table family</th>
<th>$u$</th>
<th>$v$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coale–Demeny model life tables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>.365</td>
<td>14.599</td>
<td>.99997</td>
</tr>
<tr>
<td>North</td>
<td>.145</td>
<td>14.809</td>
<td>.99988</td>
</tr>
<tr>
<td>East</td>
<td>.309</td>
<td>14.663</td>
<td>.99998</td>
</tr>
<tr>
<td>South</td>
<td>.553</td>
<td>14.415</td>
<td>.99995</td>
</tr>
<tr>
<td>New UN model life tables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin American</td>
<td>.302</td>
<td>14.691</td>
<td>.99999</td>
</tr>
<tr>
<td>Chilcan</td>
<td>.284</td>
<td>14.712</td>
<td>.99999</td>
</tr>
<tr>
<td>South Asian</td>
<td>.511</td>
<td>14.475</td>
<td>.99999</td>
</tr>
<tr>
<td>Far Eastern</td>
<td>.024</td>
<td>15.018</td>
<td>.99999</td>
</tr>
<tr>
<td>General</td>
<td>.147</td>
<td>14.851</td>
<td>.99999</td>
</tr>
<tr>
<td>OECD model life tables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region A</td>
<td>.871</td>
<td>14.061</td>
<td>.99981</td>
</tr>
<tr>
<td>Region B</td>
<td>.708</td>
<td>14.246</td>
<td>.99996</td>
</tr>
<tr>
<td>Region C</td>
<td>.749</td>
<td>14.197</td>
<td>.99999</td>
</tr>
<tr>
<td>Region D</td>
<td>.512</td>
<td>14.451</td>
<td>.99997</td>
</tr>
<tr>
<td>Region E</td>
<td>.618</td>
<td>14.340</td>
<td>.99994</td>
</tr>
</tbody>
</table>
estimated birth rates. Thus one can use the values of \( u \) and \( v \) of the West family to obtain birth rates under all mortality conditions without making any significant error in the birth rate. Hence, the following equation can be used to obtain a robust estimate of the birth rate:

\[
b_V' = \frac{C(15) \cdot e^{7.5r}}{0.365 + 14.6 \cdot l_i}
\]

Equation (6), while retaining the robustness of the original Coale estimate, does away with the need to use either model stable populations or model life tables.

**Applications to Asian and African data**

To illustrate the four adjusted birth rates \( b_C, b_R, b_V, \) and \( b'_V \), we have selected nine African and four Asian countries having age-sex data for two censuses. The African data are believed to have larger errors than the Asian data, and thus the 13 countries represent a range of data quality. Table 2 shows some characteristics of the selected populations: estimated values of \( l_i \) that refer to about seven years prior to the more recent census date, \( C(15) \) for the censuses, the intercensal rates of growth, and the interpolated stable parameters. The result of applying equations (1), (2), (5), and (6) are shown in Table 3.

The birth rates estimated by \( b_C \) and \( b_R \) are expected to be nearly equal. We notice that the figures under \( b_R \) are marginally higher than those under \( b_C \), but, as we have already noted, for all practical considerations the difference is negligible.

A look at the values of birth rates obtained by using \( b_V \) and \( b'_V \) shows that they give almost identical results. In computing birth rates by \( b_V \), we have used the Coale–Demeny South model life tables for the Asian countries and the North model life tables for the African countries. In the case of \( b'_V \), we have used the

(continued on page 23)

### Table 2. Selected indices of mortality, age distribution, and growth between censuses for selected Asian and African countries

<table>
<thead>
<tr>
<th>Region and country</th>
<th>Period</th>
<th>( l_i )</th>
<th>First census, C(15)</th>
<th>Second census, C(15)</th>
<th>( r )</th>
<th>( r_s )</th>
<th>( b_s )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
<td>(8)</td>
</tr>
<tr>
<td>Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>1970–80</td>
<td>.991</td>
<td>24.0</td>
<td>23.6</td>
<td>1.12</td>
<td>.55</td>
<td>17.74</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1971–81</td>
<td>.948</td>
<td>35.8</td>
<td>25.5</td>
<td>2.36</td>
<td>.93</td>
<td>19.33</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1971–81</td>
<td>.898</td>
<td>39.0</td>
<td>36.9</td>
<td>1.57</td>
<td>2.35</td>
<td>32.36</td>
</tr>
<tr>
<td>India</td>
<td>1971–81</td>
<td>.773</td>
<td>42.0</td>
<td>39.2</td>
<td>2.24</td>
<td>2.20</td>
<td>39.30</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>1960–70</td>
<td>.792</td>
<td>47.1</td>
<td>48.2</td>
<td>2.88</td>
<td>.30</td>
<td>51.3</td>
</tr>
<tr>
<td>Liberia</td>
<td>1962–74</td>
<td>.777</td>
<td>37.8</td>
<td>41.8</td>
<td>3.07</td>
<td>2.29</td>
<td>42.3</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>1963–74</td>
<td>.621</td>
<td>37.1</td>
<td>41.0</td>
<td>1.87</td>
<td>1.46</td>
<td>48.6</td>
</tr>
<tr>
<td>Kenya</td>
<td>1969–79</td>
<td>.839</td>
<td>48.4</td>
<td>48.4</td>
<td>3.46</td>
<td>3.51</td>
<td>49.4</td>
</tr>
<tr>
<td>Malawi</td>
<td>1966–77</td>
<td>.679</td>
<td>43.9</td>
<td>44.7</td>
<td>2.70</td>
<td>2.28</td>
<td>51.5</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1967–78</td>
<td>.781</td>
<td>43.8</td>
<td>46.2</td>
<td>3.18</td>
<td>3.01</td>
<td>49.2</td>
</tr>
<tr>
<td>Lesotho</td>
<td>1966–76</td>
<td>.839</td>
<td>38.1</td>
<td>39.9</td>
<td>2.26</td>
<td>2.29</td>
<td>37.5</td>
</tr>
<tr>
<td>Swaziland</td>
<td>1966–76</td>
<td>.792</td>
<td>45.4</td>
<td>45.9</td>
<td>2.91</td>
<td>2.97</td>
<td>47.8</td>
</tr>
<tr>
<td>Libya</td>
<td>1964–73</td>
<td>.805</td>
<td>44.1</td>
<td>51.4</td>
<td>3.48</td>
<td>3.83</td>
<td>55.9</td>
</tr>
</tbody>
</table>

*Note: Figures in columns (4) to (7) are percentages.*
How Censuses Aid Policymakers

by Bryant Robey

MEASURING literacy, estimating fertility and mortality, and studying the elderly population are among the uses of census data in Asia and the Pacific.

Meeting last February in Sydney and Canberra, Australia, census directors and population experts from more than a dozen Asian and Pacific countries, Canada, and the United States discussed their experiences conducting the mid-decade round of censuses and their plans for the 1990 round. Discussion focused on the value of census data for analyzing social policy issues.

The Eleventh Asian and Pacific Population Census Conference was sponsored by the East-West Population Institute and hosted by the Australian Bureau of Statistics.

"It is only in the 1980s that censuses have been conducted throughout the world not only to count the numbers of people but also to discover the information about how they live and work that is required to support effective national policies for economic and social development," Australian Statistician Ian Castles said in his welcome to conference participants. He urged statistical agencies to take further steps to analyze and interpret census data.

Measuring Literacy

In the Philippines, population censuses are the traditional means of determining literacy rates. A decline in the literacy rate measured by the 1980 census, however, after decades of improvement in the rate, led officials there to question the validity of census data for this purpose, according to Louisa T. Engracia of the Philippines' National Census and Statistics Office. Between 1960 and 1970, the literacy rate rose 11 percentage points, but it dropped from 83.4 percent to 82.7 percent between 1970 and 1980.

Surprised by this finding, Philippine officials formed a committee to explore an alternative method of measuring literacy. But when the new method was compared with the census-based method in a sample survey of households, the differences in results using the two methods proved insignificant. "For the entire pilot area, the difference was less than one percentage point," Engracia reported.

"If the definition of literacy is confined to the possession of minimum reading and writing skills, then the census can adequately answer the basic needs for literacy statistics," she concluded.

Estimating Fertility and Mortality

Census data are also becoming more valuable in estimating fertility as fertility surveys that contain birth or pregnancy histories become more expensive to conduct, reported Lee-Jay Cho, East-West Population Institute director.

Henry Pardoko, member of the expert staff of Indonesia's National Family Planning Coordinating Board, said developing countries need to improve indicators of health and well-being, including strengthening vital registration systems. An ESCAP working group has recommended that fertility and mortality topics be included in the census in countries with poor vital registration systems and no alternative sources of reliable demographic estimates, Laurence H. Lewis, ESCAP regional adviser on population censuses and surveys, reported to the conference.

V. S. Verma, registrar general of India, observed that low literacy levels, a rural population, and inaccessible terrain make it difficult to collect reliable vital statistics in India, despite a system that in some areas is well organized and efficient. The population census is an alternative.
"It has to be borne in mind that indirect estimation techniques cannot be considered a substitute for a good civil registration system. However, in the interim period there may be very few options left," Verma said.

The 1981 census of India collected data on children ever born and children surviving, by sex, and tabulations were prepared by the age of mother, according to K. S. Natarajan, assistant registrar general. From these data, analysts prepared estimates of child mortality at the district level. The census is the only source of such estimates, he said.

■ Studying the Elderly

The number of people over age 65 will double in most Asian countries between 1980 and 2000, when Asia will be home to nearly half of the world’s elderly. Census data can play a valuable role in providing information to policymakers attempting to accommodate growing elderly populations, East-West Population Institute research associate Linda Marrin reported to the conference.

Most censuses in the region provide adequate population counts of the elderly population but could do a better job of providing information on older people’s living conditions and economic status, according to Martin. "Censuses can provide a regular, reliable flow of information that will be a foundation for designing programs for the growing elderly populations of Asia and the Pacific," she said.

■ Toward 1990

Many of the countries represented at the conference are completing the tabulation and publication of statistics from their mid-decade censuses. All are preparing for the 1990 round. Australia, New Zealand, and the United States are pursuing greater use of automation to conduct and tabulate the next census, the participants from these countries reported.

The conference included a tour of the Australia Data Transcription Center in Sydney, where hundreds of staff members are using innovative computer-based methods to process data from Australia’s 1986 census. Later, participants observed a demonstration of computer-
assisted coding in New Zealand, via interactive computer link between Canberra and Wellington, New Zealand.

Hong Kong Assistant Commissioner Benjamin Mok of the Census and Statistics Department reported that the 1986 Hong Kong census employed a new computer-assisted method of classifying households. Enumerators coded all household members by relationship with the household head, and those codes facilitated the tabulation of different types of households. The system appears complicated, he noted, but census enumerators were able to understand it, and the error rate was less than 1 percent.

Teik-Huat Khoo, chief statistician of Malaysia, said planning for his country's 1990 census centered on improving coverage, reducing costs, and releasing data on a more timely basis. Other representatives of census offices agreed that streamlining census procedures, obtaining a more accurate count, and making better use of data for policymaking were high priorities.

Papers and Presentations at Eleventh Asian and Pacific Population Census Conference and Conference Participants

A Summary Report of the conference, containing abstracts of the papers and presentations, is available from the East-West Population Institute. Readers wishing to obtain copies of the papers (those titles designated with an asterisk) should direct requests to the authors.

PAPERS AND PRESENTATIONS
*Speech of Welcome, by Ian Castles

Reports on mid-decade censuses
*1985 Population Census of Japan—Backgrounds and Some of the Measures Taken, by Senichi Okuyashi
*Brief Accounts of 1% Population Survey in China, by Jingxin Sun
*The Hong Kong 1986 By-Census, presented by Benjamin Mok
*The Australian Census of Population and Housing, 1986, presented by John Cornish
*Mid-Decade Census in New Zealand, by Population Census Division, Department of Statistics (presented by Michael A. Moore)
Mid-Decade Census in Fiji, presentation by Natibuka B. Navunibawa
*The 1986 Census of Canada: Current Status Report, by Statistics Canada (presented by Benoit Laroch)

Measurement problems
*Measuring Unemployment and Underemployment in Thailand, by Phonsri Sauvan-singha

Papers and Presentations
*Use of Census and Survey Data for Analysis and Projection of Labor Supply, by John Bauer and Andrew Mason
*A New Method of Classifying Household Composition by Computer, presented by Benjamin Mok
*Census Data for Studying the Elderly Populations of Asia and the Pacific, by Linda G. Martin
*Use of the Population Census for Measuring Literacy, by Luisa T. Engracia

Census automation
*Issues Related to Data Processing System of Population Census, by Tadatoshi Sakai
*Automation in the 1990 U.S. Census of Population and Housing, by Peter A. Bounpane
*Report on Investigations Being Made by Australia into Automation of Data Transcription, by John Cornish
*Computer-Assisted Coding (CAC)—Reference Paper, by Roy Wilson
*Processing the 1986 Census of Population and Dwellings in New Zealand, by Population Census Division, Department of Statistics (presented by Michael A. Moore and Brett M. Martin)
Demonstration of New Zealand's System of Computer-Assisted Coding, via Satellite Hookup to Christchurch, New Zealand, presented by Michael A. Moore and Brett M. Martin

Policy uses of census data
*Census and Survey Data Needed for Family Planning and Health Programs, with Reference to Developing Countries, by R. Henry Pardede

Enumerating minorities
*Enumerating Minorities in China, by Weiqun Du
*Census of Population Statistics on Minorities in Sri Lanka, by Raja Bertram Malgigase Korale
*Enumerating Minorities in the United States: Where a Statistical Society Meets a Litigious Society, by Bryant Robey
*Enumeration of the Aboriginal and Torres Strait Islander Population, by John Power and D. W. Black
*Census Questions Used to Enumerate Minority Groups in Canada, presented by D. Bruce Petrie

Fertility and Mortality
*Recent Developments in Vital Statistics in India, by Office of the Registrar General (presented by V. S. Verma)
*Districtwise Estimates of Child Mortality in Rajasthan—1981 Census Analysis, by K. S. Paranjpe
*Infant Mortality Trends and Differentials in Nepal, by Bhakti Gubhaju, Minja Kim Choe, Robert D. Reberford, and Shyam Thapa
*Reconstruction of Birth Histories from Census and Household Survey Data, by Norman Y. Luther and Lee-fay Cho

Planning for the 1990 round of censuses
Improved Strategies for Disseminating Population Census Data in Canada. Presentation by D. Bruce Petrie

* Post 1980 Census Activities and Planning for the 1990 Census in Malaysia, by Department of Statistics (presented by Teik-Huat Kho)

* Problems Encountered in the 1980 Census of Population and Improvements over the 1970 Census [of Singapore], by Bee-Geok Leow

* New Directions in Census-Taking, by Jack Keane (presented by Peter A. Bounpane)

* Planning Considerations for the Next Population and Housing Census of Pakistan, by G. Mujtaba Mirza

* The 1990 U.S. Census of Population and Housing: Test Census Results and 1990 Plans, by Peter A. Bounpane

* Recommendations of the ESCAP Regional Working Group on the 1990 World Population and Housing Census Programme, by Laurence H. Lewis

Asian and Pacific Population Forum

New Directions for the Forum, presentation by Linda G. Martin

* EASTESPO—FERTILITY [microcomputer fertility estimation software available from the East-West Population Institute], by Robert D. Retherford

CONFERENCE PARTICIPANTS

Australia
Australian Bureau of Statistics (host)
P.O. Box 10
Belconnen A.C.T. 2616
Mr. Ian Castles
Australian Statistician
Dr. Ching Choi
Director, Demography Section
Mr. John Cornish
Assistant Statistician
Population Census and Demography Branch
Mr. John Paice
Director, Population Census Development and Field Organization
Mr. Roy Wilson
Director, Population Census Processing and User Service

Canada
Statistics Canada
26-N, R. H. Coats Building
Ottawa, Ontario K1A 0T6
Mr. Benoit Laroche
Director, Census Operations Division

Mr. D. Bruce Petrie
Assistant Chief Statistician of Canada
Social, Institutions and Labour Statistics Field

China
State Statistical Bureau
No. 2 Nanshuncheng, Xizhimen
Beijing
Mr. Jingxin Sun
Director, Department of Population Statistics
Mr. Weiqun Du
Deputy Division Chief
Department of International Statistics and Foreign Affairs

Fiji
Mr. Naibuka B. Navunisaravi
Acting Government Statistician
Census Commissioner
Bureau of Statistics
P.O. Box 221 Suva

Hong Kong
Mr. Benjamin Mok
Assistant Commissioner
Census and Statistics Department
Kai Tak Commercial Building
317 Des Voeux Road
Central

India
Mr. M. Holla
Director, Evaluation
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110001

Mr. K. S. Nararajan
Assistant Registrar General
Office of the Registrar General
4/19 Asaf Ali Road
New Delhi

Mr. V. S. Verma
Registrar General
Office of the Registrar General
Ministry of Home Affairs
2/A Mansingh Road
New Delhi 110011

Indonesia
Dr. R. Henry Pardoko
Expert Staff
National Family Planning Coordinating Board (BKKBH)
Jalan Haryono 9-11
PO. Box 186
Jakarta

Mr. Azwar Rasjid
Director General
Central Bureau of Statistics
Jalan Dr. Sunarto 8
Jakarta Pusat

Japan
Statistics Bureau
Management and Coordination Agency
19-1 Wakahatsucho, Shinjuku-ku
Tokyo 162

Mr. Senichir Oabayashi
Deputy Director, General Affairs Division
Mr. Tadatoshi Sakai
Councillor, Statistics Bureau and Statistics Center
Director-General's Secretariat
Management and Coordination Agency

Malaysia
Mr. Teik-Huat Kho
Chief Statistician
Department of Statistics
Jalan Young
Kuala Lumpur

Nepal
Mr. K. R. Sharma
Deputy Director
Central Bureau of Statistics
Ramshah Path
Kathmandu

New Zealand
Department of Statistics
Private Bag
Christchurch
Mr. Brett M. Martin
Senior Systems Analyst, EDP

Mr. Michael A. Moore
Director, Population Census Division

Pakistan
Mr. G. Mujtaba Mirza
Census Commissioner
Population Census Organization
Statistics Division
Government of Pakistan
P.O. Box 1026
Islamabad

Papua New Guinea
Mr. John Shadlow
National Statistician
National Statistical Office
Post Office Wards Strip
Waigani

Philippines
National Census and Statistics Office
P.O. Box 779
Manila

Dr. Luisa T. Engracia
Chief, National Censuses and Household Surveys Department
Mr. Agustin P. Perez
Chief, Electronic Data Processing

(continued on page 24)

In recent years the focus of demography, which has been primarily on fertility behavior, has expanded to include extensive work on international migration. The movements of political refugees, immigrants, temporary workers, students, tourists, and others crossing national boundaries have stimulated the interest of researchers and government planners. Global interest in the fate of these people has led to an ever-growing body of literature on international migration.

It is therefore surprising to find, as editors Fawcett and Carino note in their preface, that heretofore no publication has been available that “assesses comprehensively contemporary immigration flows in the Asian and Pacific region.” This book is designed to fill that gap.

Pacific Bridges is one of the products of a larger program in international migration at the East-West Population Institute. That program has as its goals the development of a comprehensive data base, the conduct of original research, and the dissemination of relevant findings to interested scholars and policymakers. An international conference on Asia-Pacific Migration to the United States was convened in September 1984. About half of the papers from that conference were revised and edited for this book.

The significance of international migration to the Pacific Basin is summarized by the editors in an introductory chapter. Part I, Factors Influencing International Migration Flows, provides a general framework for succeeding chapters.

Of particular importance is Chapter 2 by Mary M. Kritz, whose analysis of international migration flows worldwide since 1960 shows important shifts in permanent migration. Only a few countries still admit significant numbers of permanent immigrants, and the United States is the largest of these. Kritz identifies three factors shaping contemporary migration—temporary migration, interdependence among nations, and social networks linking sending and receiving areas. She rejects the view that economic inequalities between areas explain migration flows, and she sets forth the components of a new migration paradigm.

This theme is carried forward in Chapter 3 by Alejandro Portes, who also looks at explanations for migration in four areas—the origin of flows, the causes of their stability, the uses of immigrant labor, and migrant adaptations in a host society.

In Chapter 4 Michael S. Teitelbaum discusses the international relations of migration: the effect of foreign policy on migration, the effect of migration on foreign policy, and migration as an instrument of foreign policy. He uses such examples from recent Asian history as the refugee exodus prompted by U.S. policy in Indochina and the impact of the “Taiwanese lobby” on U.S. foreign policy.

Chapter 5 by Astri Suhrke and Frank Klink reminds us that understanding refugee flows is not a simple task. Through comparison of Vietnamese and Afghan cases, they show that the direction and size of refugee flows are influenced by policies in receiving countries.

Part II, Immigration Trends and Policies, looks at immigrant and refugee flows from the perspective of four major receiving countries—the United States, Australia, New Zealand, and Canada. The four countries have in common many factors related to Asian migration that are revealed in an examination of the historical development of their current immigration policies.

Chapter 6 by Fred Arnold, Urmil Minocha, and James T. Fawcett delineates the relationship between U.S. immigration policies and the number of immigrants from specific countries. Similar parallels are drawn by Charles A. Price for Australia in Chapter 8, Andrew D. Trlin for New Zealand in Chapter 9, and Daniel Kubat for Canada in Chapter 10.

Part III of Pacific Bridges provides a detailed look at Asian immigration to the United States. Recent U.S. census data and statistical sources are analyzed to present an Asian American socioeconomic
profile and to project the future growth of the Asian American population.

Chapter 11 by Peter S. Xenos and his colleagues compares Asian Americans with other major immigrant groups—blacks, Hispanics, and non-Hispanic whites. This chapter confirms the success story of Asian Americans while revealing differences within the group.

Leon F. Bouvier and Anthony J. Agresta project a sixfold increase in the Asian American population, from 3.5 million in 1980 to 20 million, by 2030. The cultural implications of this increase are pointed out by the authors in a discussion of an emerging multicultural society.

Part IV, Sending Country Perspectives, looks at explanations for the new Asian immigration as well as the impact of emigration on the home countries. The Philippine situation is the focus of Chapter 13 by Carino, and its colonial ties to the United States explain why it is the largest current source of Asian immigrants. In Chapter 14 on South Korea and East Asia, Ilsoo Kim suggests that a multiplicity of reasons has led South Koreans to emigrate to the United States. Urmil Minocha pulls together in Chapter 15 what little is known of Indian and Pakistani migrants, and in Chapter 16 John Connell surveys the situation in the Pacific Island nations.

The last part of the book, Research Issues, suggests gaps in knowledge and priorities for future research in both the sending and the receiving countries. In the final chapter Fawcett and Arnold note that the wide diversity in Asian and Pacific immigration poses a challenge to immigration theorists. They propose a broad migration-systems paradigm. Their paradigm requires the use of macro- and microdata, it presupposes a knowledge of history as well as of contemporary conditions at the origin and at alternative destinations, it seeks to explain both stability and different forms of mobility, it pays particular attention to the linkages between places, and it recognizes that the parts of a migration system are dynamically interconnected” (p. 471).

This well-written and comprehensive monograph contains references in each chapter, a list of contributors, and an index. It is worthwhile for all population collections, especially those with an Asian or Pacific focus. □

—Alice D. Harris


This new population journal is aimed at providing the countries of Asia and the Pacific with informational articles by population experts to assist government officials, planners, and scholars involved in population programs and policymaking within the region. The contents are a mixture of theory, methodology, and details of operation in the field of population and family planning in Asia and the Pacific. Individual issues are small and attractively designed so that they catch the reader’s eye.

The editors invite contributions from anyone knowledgeable about the region. Articles discuss population problems and strategies for their solution—whether successful or not—from which others may benefit. Examples from the first four issues are “Population and Urbanization” by Rafael M. Salas, late executive director of the United Nations Fund for Population Activities; “Population Growth and Economic Development” by Samuel H. Preston and Peter Donaldson; “Community-based Incentives: Increasing Contraceptive Prevalence and Economic Opportunity” by Donald Weeden et al.; and “An Overview of South Pacific Population Problems” by Penny Kane and David Lucas. The journal has a Book Review Section and a Demographer’s Notebook containing brief statistical notes.

Asia–Pacific Population Journal is a welcome addition to regional population literature and should be in all population libraries both within and outside the region. □

—Alice D. Harris


The basic premise of this collection of papers is that population theory—despite the vast amount of available literature on population dynamics—has not advanced appreciably since the time of Robert Thomas Malthus. In their introductory chapter, the editors quote from a 1984 paper by Nathan Keyfitz, who states that demography has “withdrawn from its own frontiers, and left a no-man’s land which other disciplines have infiltrated.”
Coleman and Schofield cite the emergence of such models as the "child survival hypothesis" and the "minority status hypothesis" as beginnings but argue that much more needs to be done to put these into a theoretical framework that can support demographic research and methodology. Since their opinion may run counter to that of other population specialists, this book should provoke theoretical discussion.

The question of what has happened to population theory since Malthus's time was the topic of a conference organized by the British Society for Population Studies in 1984. Most of the papers in the volume are from this conference, Forward from Malthus: The State of Population Theory in 1984. The papers relate population processes to present-day realities and to questions of scale and coherence in modern population theory. Among the questions raised are, how can large-scale populations be related to individual actions and perceptions, and can these perceptions be generalized across societies of different levels of complexity?

Following an introductory chapter by the editors are three chapters by Richard Stone, G. N. Von Tunzelmann, and Ronald Demos Lee that are devoted to an assessment of Malthus and his theory. Von Tunzelmann explores the dynamic properties of Malthus's demographic-economic theory, whereas Lee contrasts the approaches of Malthus and Boserup to population growth, showing how the relations between population, technology, and the standard of living predicted by both economists can be synthesized into a joint theory of considerable power and scope.

Philip Kreager also discusses the relationship between population, economic development, and cultural systems, as do several of the remaining contributors. Nancy Howell shows how small, sparse, but stable populations of the hunter-gatherer societies were the result of undernourishment and hence low fertility, which prevented exponential growth. By contrast, R. M. Smith demonstrates how familial relations must be taken into account when modeling the relations between population and economy in preindustrial England.

The work contained in this volume indicates that after decades of concentration on the "internal" mathematical theory of demography, much greater attention is now being paid to the "external" theory of initial conditions imposed by the social, economic, and moral context. This new approach has both methodological and substantive advantages. Theories derived from several disciplines such as economics, sociology, and history enhance the logical rigor of internal demographic theory.

Resulting hypotheses can then be subjected to the scientific procedures of scientific inference. "In this way demographers may hope to put their house in order and avoid the charge recently levelled by Wunsch that a substantial proportion of their research has lacked an adequate theoretical orientation" (p.11).

Each selection is accompanied by references, and the book contains an index and notes on the contributors. This is a scholarly, though

New Software Package

EASWESPOP—DATA ENTER, the second module of the East-West Population Institute's EASWESPOP microcomputer library, is a software package for accurate and consistent entry of population data. Its features include record definition, record verification, checks for range and data type, generation of constant data, and automatic increment and automatic fill of data items. Minimum system requirements of the program, which is copyrighted but not copy-protected, are IBM PC compatibility, MS-DOS 3.0 or higher, 256k RAM memory, and two disk or diskette drives.

A single copy of EASWESPOP—DATA ENTER software and documentation is available without charge to institutions engaged in population work in Asia or the Pacific. Institutions outside the Asia-Pacific region and individuals may purchase the package for US $10.00 per copy. (Please send check or international money order only; do not send cash.) Address requests and orders to: Data Analysis Officer, East-West Population Institute, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

A future module will include EASWESPOP—PARITY PROGRESSION PROJECTIONS.
perhaps controversial, book. It should certainly stimulate further work on population theory. Unfortunately, as with most books these days, the price of a copy is high and may be beyond the means of any but the biggest demographic or academic libraries. That is a shame because it is certainly worthwhile reading. □

—Alice D. Harris


This report is the most recent in a series of publications issued by the U.S. National Academy of Sciences on the relationship between population growth and economic development. The first report, appearing in 1963 as Growth of World Population, expressed the concerns of social scientists of that time about the implications of long-term population increase. The report was followed in 1971 by the two-volume report Rapid Population Growth: Consequences and Policy Implications.

By that time, the peak of the rate of growth of the world’s population had passed. The more developed countries now have annual rates of increase below 1 percent, and there has been a dramatic decline in the birth rates of most developing countries.

The present work should be of considerable interest to population and family planning specialists. Its conclusions fall midway between the prophets of doom and those who support rapid population growth on the grounds that it is good for economic development.

The report revises earlier NRC analyses casting population growth as one of the chief villains behind world social, environmental, and economic problems. The view now is that many of the detrimental effects of population increase can be overcome by the remarkable ability of individuals, government institutions, and markets to adapt to changing pressures. In particular the adaptability of the marketplace has been recognized as a positive factor in this report. The optimism of the new assessment is in keeping with recent United Nations prognostications on the future of world population.

The report covers eight policy areas: exhaustible resources, renewable resources, pollution, worker productivity, economies of scale and technological innovation, education, income distribution, and urban growth. Although slower population growth would alleviate some of the concerns in most of these areas, the Working Group suggests that other factors, such as government policies in those areas, might be more important. The group also places family planning programs within the framework of broader economic development programs and supports them on the basis of their contribution to individual health and welfare.

As with other National Research Council reports, this one is brief, well-organized, and inexpensive. Tables, references, and an index enhance its usefulness. A bargain at $5.00, it deserves to be on every population specialist’s reading list. □

—Alice D. Harris


Population aging is occurring rapidly as fertility falls in many of the less developed countries of Asia. Although the proportions of elderly in their populations are small compared with those in the more developed countries, the absolute numbers of elderly will double in the next twenty years. Accordingly, there is increasing interest in learning more about the elderly of Asia.

The World Health Organization-sponsored surveys of Fiji, South Korea, Peninsular Malaysia, and the Tagalog Region of the Philippines are an important part of the international effort to assess the needs and the resources of the elderly. The surveys, which were based on a common questionnaire, obtained data from elderly respondents on their demographic characteristics, economic resources, health, activities of daily living, smoking and drinking habits, social activities, housing, and mental state. They also elicited assessments from key informants and the interviewers.

In Fiji and Malaysia a small sample of the respondents was reinterviewed at a later date, and the comparison of responses provides
valuable insight into the reliability of different types of questions. Not surprisingly, income questions had rather poor reliability in both countries, as did questions on education and work experience in Fiji.

_Aging in the Western Pacific_, which is essentially a first report, provides basic tabulations of variables by country, sex, and age of respondent and only a few cross-tabulations otherwise. The authors are cautious about cross-country comparisons of variables that involve subjective assessments, since they tend to be influenced by culture. For example, Filipinos reported higher levels of satisfaction with their health than respondents from other countries, but they also had more health problems, such as accidents, injuries, or chronic illnesses.

Further analysis, in progress, will try to answer many interesting questions raised by the basic tabulations. One surprising finding is that urban elderly are more likely to live with their children than rural elderly in South Korea, Malaysia, and the Philippines. The authors offer as one possible explanation the migration of young people to cities, but multivariate analysis that controls for other socioeconomic variables is needed.

The final chapter on policy and program implications is essentially the standard laundry list of possible efforts to be made for the elderly. Given the book’s preliminary nature, this chapter could have been easily omitted, but no doubt the authors were under some obligation to make policy recommendations. Nevertheless, the book provides valuable baseline information to researchers and policymakers who will be involved in further development of the research agenda and ultimately in policy formulation for these countries.

It should also be valuable to researchers from other countries, since it points out pitfalls of trying to translate standard elderly survey techniques from Western to Eastern cultures. The authors and their colleagues on the survey project are to be congratulated for the speedy publication of a very useful volume. —Linda G. Martin

---

**ECONOMIC ASPECTS . . .**  
(continued from page 8)

**APPENDIX: Data Sources and Method of Calculation**

**Data sources**


Singapore, DOS, _Report of the Household Expenditure Survey 1977/78_ (September 1979): private consumption expenditure per household, by educational status of head, income per household by education of head, average household size by education, average number of income earners per household.


SFPPB, private correspondence: estimates of the number of births prevented by its program during 1975–82.

**The calculations**

_Direct Costs of Family Planning_. The SFPPB provided estimates of the number of births prevented by its program during the eight years 1975–82. The board’s yearly costs were converted into real costs with 1977–78 as the base. Then the yearly real costs were divided by the annual estimates of the number of births prevented. Because it is sometimes difficult to allocate births prevented to a given year’s expenditure, the average cost per birth prevented over the eight years was taken as the direct project cost. The same figure was used for both university and primary school graduates.

There are two possible sources of bias. The cost per birth prevented could be correlated with the mother’s education. No information on mother’s education was available. The costs of the SFPPB do not include some family planning activities, such as some abortions that are performed in government hospitals. The estimated costs therefore underestimate actual costs somewhat.

_Labor Productivity_. Primary education lasts six years and is compulsory, secondary education is for four years, preuniversity is for two years, and university education lasts three years. The Household Expenditure Survey gives average household income by the educational status of the head, but no details of the number of income earners per household by education are avail-
able. The average for the whole survey, 2.5, was therefore used to calculate income per earner for each group. The way this was converted to estimate marginal value product is described in the text. The marginal value product for years 12–15 inclusive is assumed to be a quarter of the adult marginal value product, but clearly this applied only to primary school leavers.

Growth rates in marginal value product are not available from the Household Expenditure Survey. Accordingly, I have assumed that real marginal value product in the period denoted in the Appendix Table would grow at the same rate as real average weekly earnings (deflated by the consumer price index).

Possibilities of error exist in using these data. One is the implicit assumption that the education of secondary income earners in the household is correlated with the education of the head. As explained in the text, however, no other assumption was possible given the available data.

Private Consumption per Head. Private consumption per head for the two educational groups is taken directly from the survey. Although this probably overestimates marginal consumption, the use of average figures is standard for want of better data.

The growth rate is based on the assumed rate of growth of marginal value product. An average of 44 percent of any increase in marginal value product has to be paid to the central superannuation fund. Two percent is payroll tax, and personal income tax is assumed to be between 5 and 10 percent on average. Allowing for a marginal propensity to consume from the remaining income of 0.8, real consumption would increase by about 1.4 percent when marginal value product rises by 4 percent.

Age-specific consumption and income data are not available, so that apart from the adjustment in marginal value product for years 12–15, a constant stream over the project life has been assumed. Both private consumption and marginal value product will therefore be overestimated in the early years and underestimated in the later years.

Government Savings. Observed recurrent government expenditures on health per capita and education per pupil are used as estimators of marginal government savings. Capital expenditures are omitted to correct the upward bias of using average rather than marginal expenditures.

This estimate of expenditure on education does not represent the full cost of education estimated elsewhere (Asher 1984). Full costs include a private component already incorporated into private consumption expenditure. Real growth rates have been estimated by deflating actual expenditure by the gross domestic product deflator.

Base-year values of all the variables and the growth rates used in the calculations of the high-growth scenario are reported in the Appendix Table.

Appendix Table. Base-year estimates ($) and growth rates (%): Singapore

<table>
<thead>
<tr>
<th>Costs and benefits</th>
<th>Base year ($)</th>
<th>Annual growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family planning services per birth prevented</td>
<td>56.00</td>
<td></td>
</tr>
<tr>
<td>Marginal value product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school education</td>
<td>5,265</td>
<td>4</td>
</tr>
<tr>
<td>Tertiary (university) education</td>
<td>17,849</td>
<td></td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savings in private consumption per head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school education</td>
<td>1,578.24</td>
<td>1.4</td>
</tr>
<tr>
<td>Tertiary (university) education</td>
<td>4,360.80</td>
<td></td>
</tr>
<tr>
<td>Savings in government health expenditure per head</td>
<td>66.71</td>
<td>6</td>
</tr>
<tr>
<td>Savings in government education expenditure per pupil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>453.18</td>
<td>11</td>
</tr>
<tr>
<td>Secondary</td>
<td>579.17</td>
<td>14</td>
</tr>
<tr>
<td>Tertiary (university)</td>
<td>4,820.80</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTES

The first draft of this article was written while I was on the faculty of the Department of Economics and Statistics, National University of Singapore. Ms. S. C. Goh helped to collect some of the data. The comments of two anonymous referees are appreciated.

1. Reasons for the policy change are summarized in the Far Eastern Economic Review (FEER, 8 September 1983, p. 23).

2. Accordingly, all women are now encouraged to have at least two children, and more if they can afford to (Asia Yearbook 1987, FEER, p. 235).

3. Let us assume that the value of the production of a worker (price times quantity of output) has risen by 10 percent. If all prices in the economy have also risen by 10 percent, the observed increase in production would have been due simply to inflation. However, if prices have risen by only 5 percent, some of the increase in the value of production would be due to an increase in the worker's physical output. In this case real production would be said to have increased, whereas only nominal production would have increased in the first case.
A Simplified Estimate . . .

(continued from page 12)

West model for all countries. A comparison of $b_V$ with $b_R$ and $b_C$ indicates that they are very close to one another. It is heartening to find such close agreement between the various birth rate estimates even when we have not adjusted the reported data for possible errors.

We conclude that the simplified robust estimate of the birth rate given in equation (6), which is close to Coale's method, offers two advantages. First, it simplifies the computational work by not requiring reference to model stable populations or model life tables. Second, it avoids marginal errors due to approximations that are inevitable in numerical work dealing with stable population models and model life tables.

ACKNOWLEDGMENTS

We are very grateful to Professor Ansley J. Coale for his valuable comments on an earlier draft of this article. We also wish to thank the anonymous reviewers. The views expressed here are our own and do not necessarily reflect those of the United Nations or the Regional Institute for Population Studies.

REFERENCES


---


---


---

CONFERENCE . . .
(continued from page 16)

Republic of Korea
National Bureau of Statistics
Economic Planning Board
90 Gyeongun-dong, Jongro-gu
Seoul 110

Mr. Il-Hyun Kim
Director, Population Statistics Division
Mr. Myong-Hyun Sohn
Director General

Singapore
Mrs. Bee-Geok Leow
Deputy Director
Data Administration
Department of Statistics
P.O. Box 3010

Sri Lanka
Mr. Raj Bertram Maligaspe Korale
Director, Department of Census and Statistics
No. 6, Albert Crescent
Colombo 7

Thailand
National Statistical Office
244 Ratchadamnoen Avenue
Bangkok 10300

Mrs. Wiwit Siripak
Director, Population Survey Division
Mrs. Phunsej Suwansingha
Deputy Secretary-General

United States
Dr. Peter A. Bourseau
Assistant Director of Demographic Censuses
Bureau of the Census
U.S. Department of Commerce
Washington, D.C. 20233

ESCAP
Mr. Laurence H. Lewis
Regional Adviser on Population Censuses and Surveys
Economic and Social Commission for Asia and the Pacific (ESCAP)
The United Nations Building
Rajadamnern Avenue
Bangkok 10200, Thailand

South Pacific Commission
Dr. Peter N. D. Pirie
Demographer, South Pacific Commission
B.P. D5
Noumea, New Caledonia

East-West Center
1777 East-West Road
Honolulu, Hawaii 96848
United States
Dr. John Bauer
Research Associate, Population Institute
Dr. Lee-Jay Cho
Director, Population Institute
Dr. Linda G. Martin
Research Associate, Population Institute
Dr. Robert D. Retherford
Assistant Director, Population Institute
Mr. Bryant Robey
Director, Public Affairs
Ms. Valerie C. Wong
Program Officer, Population Institute

---

To Our Readers

This issue marks several personnel changes. Mr. P. Padmanabha, former Registrar General of India and Executive Director of the Family Planning Foundation of India, has resigned as associate editor of the Forum. His advice and support have been valuable and will be missed. Replacing David Ellis as managing editor is Ms. Sandra E. Ward, East–West Population Institute Senior Editor. She brings to her assignment eighteen years of editorial experience and expertise in the field of population.