The Pakistan Development Review
28 : 4 Part I (Winter 1989) pp. 385–411

Invited Lecture

The Interface between Population and Development Models, Plans and Policies

S. I. COHEN*

1. INTRODUCTION

Although policy issues in population economics and development economics are often discussed jointly, little attention has been given to their integration in more general frameworks. These policy issues can be fruitfully incorporated in development planning given the medium to long-term orientation of both.

In this paper we examine problems faced in the incorporation of POPECON variables (short for population economics) in development planning. This is done with the object of suggesting tentative solutions. The problems relate to:

(1) Conceptual issues in defining POPECON variables (Section 2);
(2) Modelling the relationship between POPECON variables (Section 3); and
(3) Operationalization of frameworks for decision making (Section 4).

Furthermore, we treat in Section 5 several controversial policy issues which have important population dimensions. We demonstrate there the insight gained form combining "economicsist" and "populationist" approaches.

2. CONCEPTUAL ISSUES IN DEFINING POPECON VARIABLES

Concensus on the scope of POPECON variables is not feasible. However, the following can be said. Population can be classified according to many criteria outside economics: age, sex, location, education, civil status, etc. Each category allows inclusion of the whole population. Typical for POPECON criteria are classifications such as per occupation, sector, employment status, income category, etc. These categories are not inclusive of the whole population. One of the few inclusive criteria in POPECON will be general activity which can be defined to fall into:

S = engagement in marketable labour;
O = engagement in own production;
M = home activities; and
E = presence at school.

*The author is Professor of Economics at the Erasmus University, Rotterdam.

These four activities form the basic chapters of population economics. They appear in relationships to each other in Table 1. The assignment of a person to a specific activity presupposes that all his/her time is spent at the site of activity. A person may have two joint activities if he/she spends parts of the reference time in the sites of the two activities. A generalized classification of activities for the whole population is to be done with reference to both time and place, therefore.

The distribution of the population on the four general activities and on time-sharing joint activities is well demonstrated in the Venn-diagram in Figure 1. For instance, S, with its marketable labour, is typically the modern sector employment, while O, which represents self-employment, is typically the informal sector employment. In between, SO is an intermediate sector, with modern and informal characteristics. The outlaying area between S and O, indicated by U, can be seen to represent unemployment. S, O and U together are the active population while the rest of the circle is the so-called nonactive population. Reference can be made here to alternative ways of treating the classification of human resources, in particular Hussmanns and Mehran (1989).

The diagram highlights a major conceptual problem, namely the handling of persons in time-sharing joint activities. For instance, category SOME in the centre of the diagram is very mobile. This category would stand for an "inconclusive" person who spends the morning in wage employment, is engaged in own production at noon, looks after the children at home in the afternoon, and follows educational courses in the evening. It is apparent that time/place budget surveys are essential tools in POPECON. Research progress in this area is little so that the conceptual integration of the whereabouts of persons in time and place is a major pending issue.

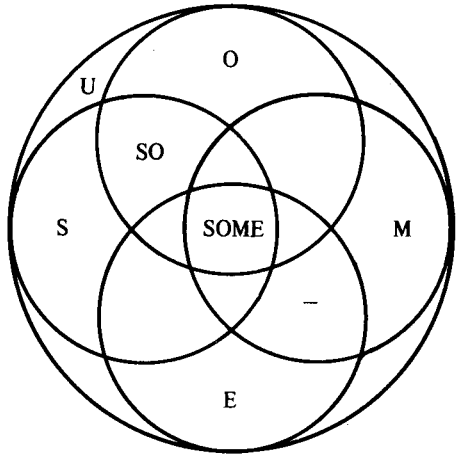
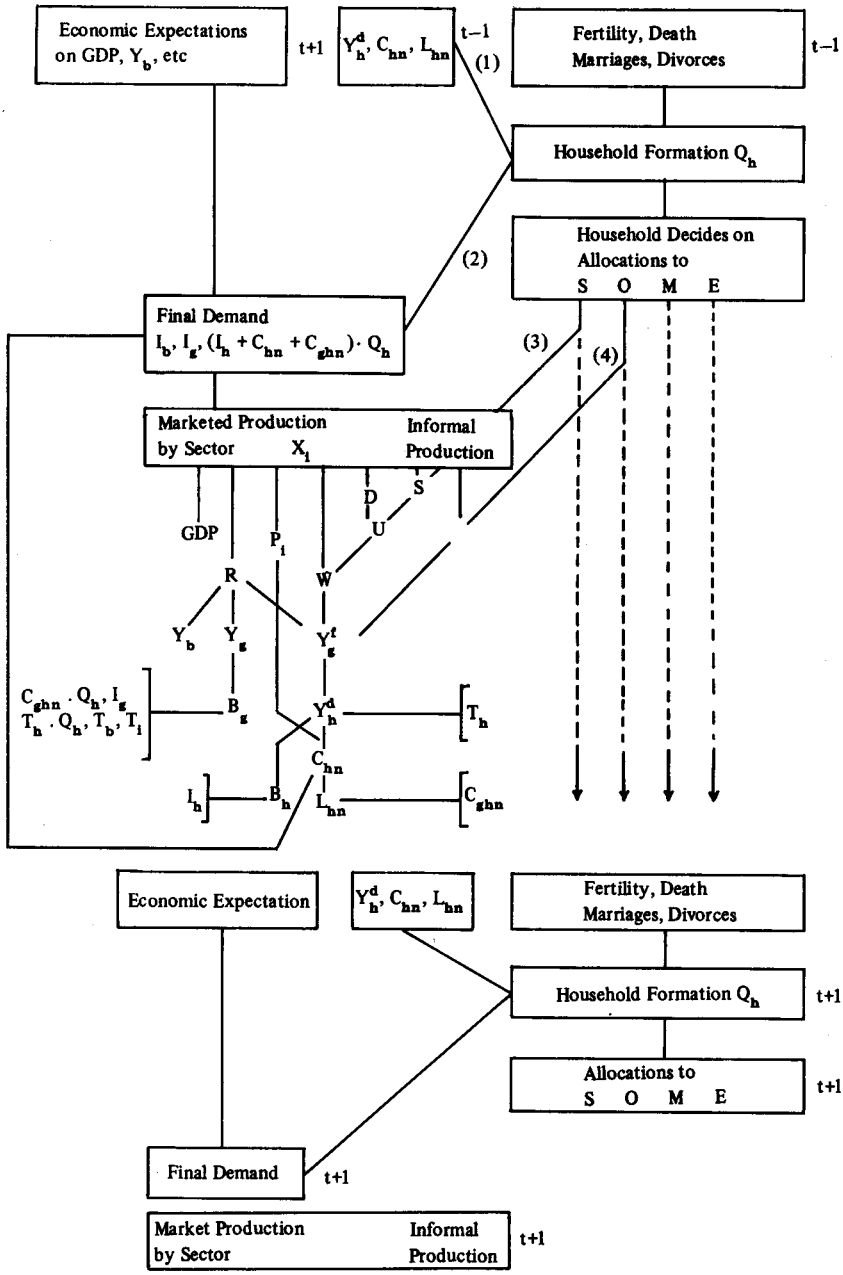


Figure 1. Distribution of the Population on General Activities.

Table 1

Structure of a Stylized Model of Population and Development



NOTATIONS

Indices

(1) b = business;
(2) g = government;
(3) h = type of household;
(4) i = type of sector;
(5) n = type of need, good or service; and
(6) t = time period.

Predetermined Variables

(1) C_{ghn} = consumption allocations by government to household type h by need category n;
(2) T_b = business taxes;
(3) T_h = income tax rate for household type h;
(4) T_i = indirect taxes;
(5) other lagged variables belonging to t−1; and
(6) future expectations pertaining to t+1

Endogenous Variables

(1) B_g = budgetary deficit (surplus) of government;
(2) B_h = budgetary deficit (surplus) of household type h;
(3) C_{hn} = consumption expenditure of household type h on needs category n;
(4) D = demand for labour;
(5) GDP = gross domestic product;
(6) I_b = investment by business;
(7) I_h = investment by household type h;
(8) I_g = investment by government;
(9) L_{hn} = living level attained by household type h of needs category n;
(10) P_i = price index of sector i;
(11) Q_h = number of households by household type h;
(12) R = profits;
(13) S,O,M,E = allocation of member-days of a household to marketable labour supply S, own informal production O, inactive at home M, and children in education E;
(14) U = unemployment;
(15) W = wages;
(16) X_i = production by sector i;
(17) Y_b = profit income of business;
(18) Y_g = profit income of government;
(19) Y_h^d = disposable income of household type h; and
(20) Y_h^f = factor income of household type h.

3. MODELLING THE RELATIONSHIP BETWEEN POPULATION AND THE ECONOMY

The second obstacle in the way of incorporating POPECON variables in development planning is the reaching of a consensus as to the kind of POPECON relationships to be considered. There is a large variety of POPECON models, many of which are untested. A review of the interactions between population and the economy can be found in Horlacher and MacKellar (1988).

Some of the main interactions between population and economic variables prevalent in the literature are depicted in Table 1, the notations used are in the following page. Many of the relationships in the table have been empirically investigated in Cohen (1975) and Cohen *et al.* (1984). On the right-hand side of the table it is noted that past tendencies in fertility, death, marriages and divorces result in the present day mix of households by type of household. As examples of types of households one may quote rural and urban and a further disaggregation based on the sex, age, status, occupation, etc., of the head of the household.

Each household is endowed with a diversity of member-days. Within each household four types of decisions regarding the utilization of endowments may be distinguished:

(a) Decisions on the allocation of household member-days to the marketable labour *supply*, S;
(b) Decisions on mobilizing member-days for own formal production, O;
(c) Decisions on the extent of inactives at *home*, M; and
(d) Decisions on keeping children in the *educational* system, E.

The study of these decisions has become the subject matter of new home economics though it is well recognized that the allocation of endowments is multi-disciplinary.

Decisions on S and O are directly relevant for the economic variables in the rest of the table. Decisions on M are indirectly relevant while those on E become more relevant at a later stage when students graduate and become eligible for entry in the labour force.

The population variables, and their variation over time, which have been just described can be very well integrated in a Demographic Accounting Matrix, DAM. Most of the transition rates in the DAM are usually exogenous, but as more empirical knowledge becomes accumulated it is possible to endogenize more of these transition rates.

Turning now to the economic variables in the left-hand side of Table 1, these can be categorized as belonging to either:

(a) Accounts of the inputs and production by sector;
(b) Accounts of income and expenditure by household type, firms and government;
(c) Detailed accounts of attained standards of living per household type; and
(d) When income, expenditure and living levels per household type are multiplied by the number of households in that type, aggregate values for the economy as a whole are obtained.

The factor market in this scheme in the form of interaction between demand and supply for labour and unemployment, respectively, D, S, U, resulting in wages, W, valuations of return to capital, R. The product market is also present in the form of sectoral prices which are endogenously determined as a result of demand and supply.

The economic variables described above and their interactions can be approximated by a Social Accounting Matrix, SAM. To be precise, the results at the end of a year of the factor and product markets are incorporated in the SAM but not the mechanisms which lead to the results.

4. THE OPERATIONALIZATION OF A FRAMEWORK FOR DECISION-MAKING

In the past, economic planners have interpreted socio-economic development and progress in the less developed world as a GNP growth process. A prevalent view, until the late sixties, was that investment in capital, if large enough, would alone be sufficient to induce such economic growth. Statistic systems, economic models and operational frameworks for development planning were devised accordingly.

In this respect, an important breakthrough in the operationalization of development planning was the system of planning in stages, mainly due to J.Tinbergen. In a macro stage growth targets and capital requirements are determined subject to consumption provisions and foreign trade. In a meso stage the distribution of growth, investment, consumption and foreign trade is determined ending up in sectoral targets. Finally, at a micro stage the sectoral targets are filled with appropriate projects making use of cost-benefit analysis.

The profession was openly confronted with the population dimension from the seventies onwards. The efforts to conceptualize and to model population issues are many, but there is as yet no synthesis as to the sort of planning in stages which should assure a logical and operational framework for integrating population issues in development planning as was, three decades ago, proposed by J. Tinbergen in the context of the more narrowly defined economic planning.

It is essential to recognize that the construction of a model which integrates population and development variables does not solve by itself the planning problem

of incorporating population variables in development plans. What is required here is to derive an operational scheme for planning purposes capable of guiding decision-making at various ministerial levels, some of which are horizontally and others are vertically related.

In recent years the possibility of reaching a synthesized framework has been greatly enhanced by the appearance of the social accounting matrix, SAM, and the demographic accounting matrix, DAM, as frameworks for organizing multi-dimensional data of the economy and the population. The SAM integrated at one and the same time disaggregated data on production, income and expenditure by specific population groups, thereby allowing a systematic recording of diversified interactions between the economy and population. The DAM accounted for the yearly flow of the population from one category to another for a large number of categories. Both the SAM and the DAM are due to a large extent to R. Stone.

The objective of this Section is to present an operational framework for development planning based on the SAM and DAM. Going back to Table 1 it can be observed that there are four direct links between the right- and left-hand sides indicated by (1) to (4):

(1) Income, consumption and living standards attained by a household influence the size and age formation of the household;
(2) In turn, household composition influences the pattern of final demand;
(3) Household decisions on releasing member-days to the marketable labour supply S determine the working of the labour market and affects unemployment U and wages W; and
(4) Household decisions on self-employment O determine income from self-employment.

Furthermore, decisions on M and E can be based on economic expectations of opportunity costs of mother care and child education, respectively, but these are not explicited in the table.

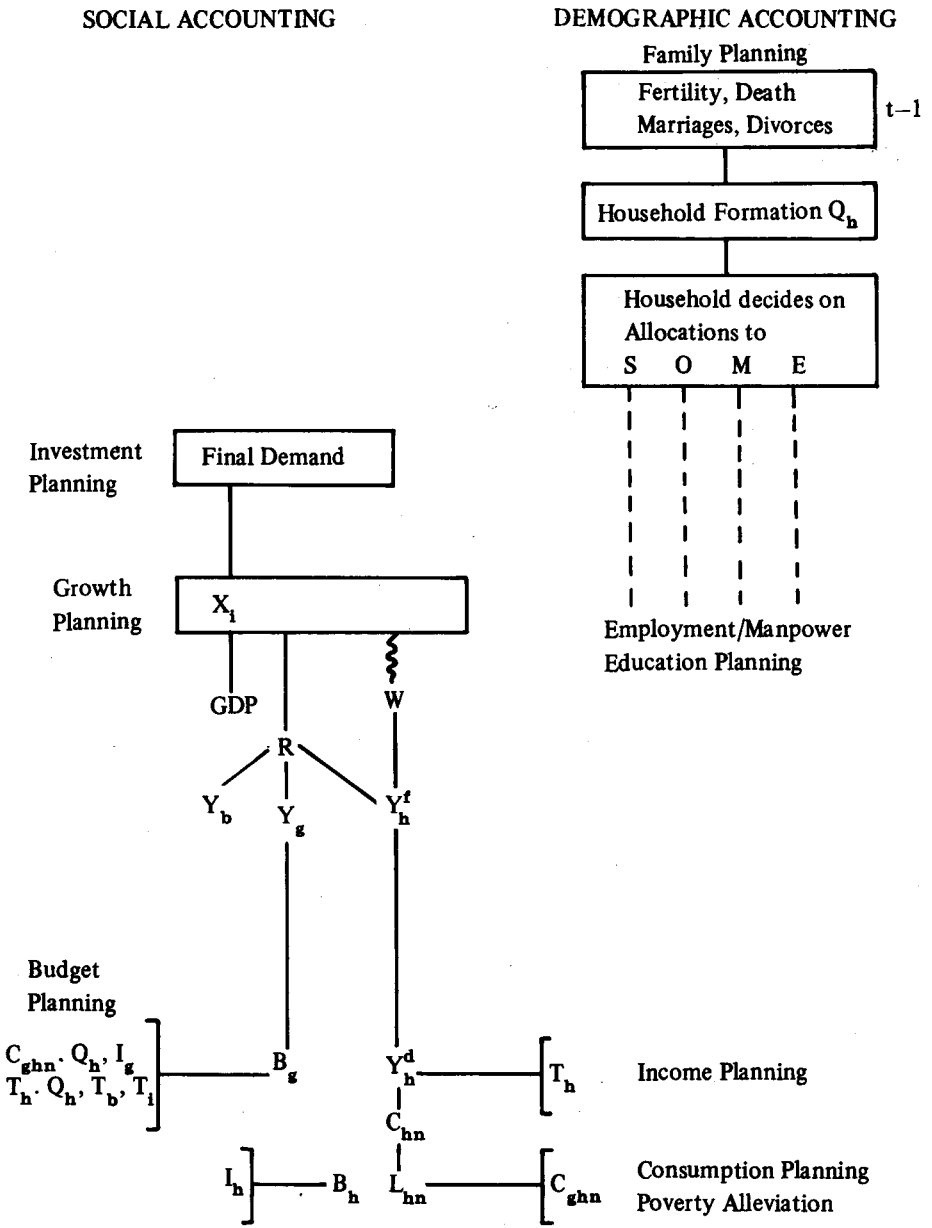
The introduction of simplifications regarding the four links mentioned above produces an operational scheme capable of handling effective decision-making in a simple planning system. Cutting off lines (1), (2), (3) and (4) reduces the model into the two independent matrices of DAM and SAM.

Table 2 is the outcome of eliminating the linkages. Via the introduction of appropriate lags the DAM and SAM can be mapped to each other in indirect ways at a later stage, [cf. Cohen, Correa and Zeeuw (1989)].

The table gives an opportunity to distinguish as well between several related planning activities which are treated elsewhere in the symposium: family planning, employment/manpower/education planning, and the planning of growth, income,

Table 2

Planning Phases in a Stylized Model of Population and Development



investment, consumption, and the government budget. Although these planning areas are interdependent with each other the table provides a rationale for treating each of them separately with a minimum use of feedbacks.

Special mention should be made here of the central role which the planning of growth and income play in determining the future course of the remainder of the economy. Because of (a) the primary position of final demand in shaping the development of most variables, and (b) the major role of household incomes in determining final demand, it follows that the setting of income plans by household units, whether this occurs voluntarily by the households or by the means of some directed plan, is very crucial for the development of the economy [Cohen (1975)].

5. EXAMPLES OF FORMAL TREATMENTS OF POLICY ISSUES

Introduction

This section examines four controversial policy issues in the development process:

(a) The social efficiency of interventions with fertility;
(b) The social efficiency of resource allocations to human development;
(c) The effective combination between agriculture and industry in promoting income growth and its more equitable distribution among the earning population groups; and
(d) The optimal combination between transfer payments and provisions in kind in guaranteeing minimum consumption needs for poverty groups.

Although these four issues may not seem to be much related yet they share the following characteristics. First, they belong consecutively to the indicated phases of planning in Table 2 namely (a) family planning, (b) employment, manpower and education planning, (c) income planning and (d) consumption planning. Second, it will be seen that the conventional treatment of these policy issues in a predominantly economic framework renders different policy prescriptions than when a populationist dimension is added to the framework.

Family Planning

The economically optimal size of the population or its rate of growth are much debated by economists. A report by the US National Research Council (1986) has gone in depth into many of the macro-economic consequences and policy issues involved. The results of the debate are mixed, for it can be always shown that significant economic growth has taken place in several countries characterized by high population growth, while the contrary can also be maintained for many other countries.

A treatment of the implications of a change in the size of population from the point of view of the *social welfare* of the concerned population brings the question of the optimal size in quite a new light. Such a welfare-populationist treatment was recently made by M. Nerlove (1987). In specifying a social welfare function one may choose between a total and an average formulation. In the classical utilitarian criterion which maximizes the sum of individual utilities, we may call W^T in Equation 1 the total social welfare function.

$$W^T(\mu^1, \ldots\ldots, \mu^n) = \sum_{h=1}^{n} \mu^h \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

The alternative is the maximization of average utility, i.e., per capita, as in Equation 2. We may call W^A the average social welfare function.

$$W^A(\mu^1, \ldots\ldots, \mu^n) = \frac{1}{h} \sum_{h=1}^{n} \mu^h \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Since scaling all utilities up or down by a constant multiplicative factor does not affect any essential property of W, if n is known, the two equations do not appear to differ. But in a situation in which different fertility choices by households produce a different population level then the two criteria can lead to different conclusions. For example, if for the population concerned the marginal utility from an additional birth is positive but less than the average, then adding the person will produce a greater total utility W^T but a smaller average utility W^A.

It is evident that the W^T social welfare function leads to a larger population than W^A. What is more significant is that if fertility decisions are taken in accordance with the maximization of parental satisfaction – which does not mean that the parents prefer too many or too little children but do act rationally – then the situation may yield a population larger than W^T or less than W^A. Thus welfare criteria offer no sure rationale for coercive interference with parental choice.

Human Resource Development and Utilization

The second group of policy issues we comment upon is concerned with the unresolved problem of the optimal investment in human resources. This is a debate on the "right" *quality* of the population as compared to that on the "right" *quantity* discussed in the previous section.

It is contended by many that investment in human capital accounts for most of the impressive risings in the real earnings per worker. According to this vision a major part of what we call consumption such as expenditure on education, health, constitutes deliberate investment in human capital whose growth is a decisive factor of economic development. There is indeed much evidence to support this

contention.

On the other hand, phenomena like the educated unemployment in many countries, mismatches between job requirements and school curriculum, parents spending the same levels on more able and less able children, uneconomic prolongation of written-off lives via expensive medical treatment and so on tend to throw doubts on whether these public expenditures on human resources are justifiable from the point of view of social efficiency.

The two opposite positions have been worked out empirically in the context of planning for educational and manpower development, cf. Cohen (1989). To start with, conventional methods for estimating returns to education rely on *human capital theory* which equates earnings to the marginal productivity of the worker and explains the latter in terms of the education attained by the worker. In contrast, *job competition theory,* asserts that wages are paid on the basis of the characteristics of a job or an occupation. Occupations differ in their intensities of using capital, handling information, and practicing leadership. More demanding occupations are paid higher wages. Productivity is considered to be an attribute of occupations and less so of the education of the person. In the job competition model workers are matched to occupations by certain worker characteristics which may well be identifiable with educational characteristics as well as other background characteristics. Applications made to Pakistan show returns to educational skills following the job competition model to be lower as compared to the human capital model, while the reductions are more pronounced for the higher educational skills. These results suggest that some shift in investment from higher to lowe skills would imply more returns. The results suggest also that a shift of future investment from human capital to physical capital is economically more efficient.

Income Planning

The third group of policy issues which we treat pertains to the effective allocation of resources between sectors in promoting economic growth and a more equitable income distribution among population groups.

It has been the conventional view of many development economists that a shift of resources from agriculture to industry is a prerequisite of the development process.

An examination of the issue of allocating resources between agriculture and industry from a populationist viewpoint can lead to results which differ from those of the conventional view. In the more populous third world countries about seventy percent of the population and the labour force live in rural areas and earn their living from self-employment in agriculture and agriculture-based activities. Many studies have shown now that future absorption in the modern modes of emloyment is limited. The structural ratio of 7 : 3 may become the new historical trend.

In terms of population-economic linkages the arguments can be set in favour of agriculture, too. Although, the agricultural based population is poorer than the industry based population as far as income per capita is concerned, yet the total generated income in agriculture is often high enough to surpass that of industry. Besides, a large share of industrial income is spent on food consumption which flows back to agriculture. Furthermore, past investments in agriculture have enhanced productivity significantly leading to an expansion of technological linkages in favour of agriculture.

Development models based on social accounting matrices, SAMs, – cf. Cohen (1987) – have been very functional in demonstrating the edge of agriculture on industry in promoting economic growth and its progressive distribution among population groups. In the remainder of this section we show the type of results obtained from applying a SAM model to a large sized country, namely Indonesia.

In fact, the SAM is nothing more or less than the transformation of the circular flow of Figure 2 into a matrix of transactions between the various agents, as in Table 3, for the case of Indonesia. In the rows of such a matrix we find the factors, the institutions consisting of households, firms and government as well as the institutions capital account, the activities and the rest of the world. The columns are ordered similarly. Transactions between these actors take place at the filled cells and in correspondence with the circular flow.

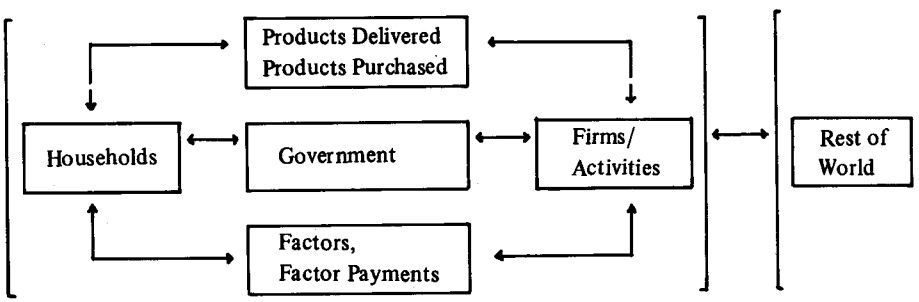


Figure 2. Circular Flow.

A particular row gives receipts of the account while columnwise we read the expenditure of the actor. For instance, in the case of Indonesia 1975, the second row shows the receipts of households to consist of 8743 billion rupiahs (b.r.) of remunerations for the factors of production which they own, and transfers from various institutions adding together to a total of 9766 b.r. The second column gives the expenditure of households consisting of 210 b.r. of interhousehold transfers, 118 b.r. of taxes paid to government, 681 b.r. of savings wich accrue to the capital account, 7138 b.r. of consumption expenditure on goods and services and 1619 b.r. of transfers going to rest of world; also totalling 9766 b.r.

Table 3

Aggregate SAM, Indonesia 1975, in Billion Rupiahs

	1. Fact	2. Househ	3. Firms	4. Govt	5. Capt	6. Activ	7. ROW	Total
1 Factors						13323		13323
2 Households	8743	210	631	182				9766
3 Firms	3810		30				−62	3778
4 Government	59	118	1448	362		277	30	2294
5 Capital		681	1669	567			493	3410
6 Activities		7138		941	3410	7778	3937	23204
7 Rest of World	711	1619		242		1826		4398
Total	13323	9766	3778	2294	3410	23204	4398	60173

Table 3 is nothing else than a presentation of readily available national statistics in a matrix form. Once this table is constructed each cell can be extended on the basis of additional data from surveys of the labour force, household income and expenditure, input-output deliveries, finance, government, trade and other statistics to give a disaggregated SAM, which is really what we are after. For instance, disaggregated SAMs of Indonesia have been assembled from Biro Pusat Statistik (1982) for the calendar years of 1975 and 1980, respectively. The assembled version we shall adhere to is one which falls into an oversized chessboard of 28 rows and 28 columns. The factor incomes and household groups are divided into 10 types each. Firms, government capital and rest of the world are taken as they were published. Finally, the activities, which fall into 4 sectors of production, are taken as they were published.

The use of SAM as a model which generates multipliers can be demonstrated from a very simple example. Take the simplest Keynesian model which contains a consumption equation relating consumption to income Y, and an equation defining income as consumption plus an exogenous (given) investment, $\bar{I}$. (Equations 3 and 4).

$$C = c.Y \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$Y = C + \bar{I} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

This is a model of two equations in two endogenous (unknown) variables. The model can be written as a square matrix which is then inverted to give the Keynesian

multipliers i.e., the effect of an increase in $\bar{I}$ on Y (i.e., in this case $\frac{1}{1-c}$).

In this way models have been developed with their own characteristic multipliers. In one of the most frequently used models, the input-output, an endogenous vector of sectoral production (q) can be predicted from a matrix of input-output coefficients, A, and a vector of exogenous final demand, f, as in Equation 5.

$$q = Aq + f = (I - A)^{-1} f = M_1 f \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

where M_1 is the Leontief multiplier matrix.

Now the interesting case arises that the SAM is also a square matrix, and as such it represents a model of the economy. By appropriate manipulations of this square matrix, it is also possible to derive SAM-multipliers, which are more comprehensive than those of Keynes and Leontief together; because the SAM contains the whole circular flow.

In the input-output analysis an endogenous vector of sectoral production can be predicted from an inverted matrix of input-output coefficients, and a vector of exogenous final demand. The SAM can be used similarly with the obvious difference that the SAM contains more variables and relationships. To transform the social accounting matrix into an economy-wide model along the above lines requires performing several steps.

First, the accounts of the SAM need to be subdivided into endogenous and exogenous and regrouped accordingly so that the exogenous accounts would fail to the right and bottom of the endogenous accounts. The choice regarding subdivision into x exogenous and y endogenous variables can lead to lengthy discussions on alternative closure rules. Instead, we shall, *initially*, assume for a typical developing country variables, relating to expenditure and revenue of government, capital and rest of world as exogenous, the remaining variables are endogenous.

Secondly, each flow in the endogenous matrix is divided by its respective column total to give the matrix of average propensities, denoted by S.

The vector of endogenous variables y can now be solved from Equation 6:

$$y = Sy + x = (I - S)^{-1} . x = M_s x \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

where M_s is the SAM multiplier matrix.

SAM multipliers can be employed to tell us, among other things:

(a) What is the effect of an *exogenous additional injection in agriculture or*

industry (due to government action) on: *growth* of output and on the *generation* and *distribution* of income by population groups; and

(b) In a similar way, one can assess the effect of institutional transfers (by government) on growth of output and on the generation and distribution of income.

The multipliers in Table 4 give an indication of short-term effects of exogenous sectoral injections on output and income.[1] An injection of a million rupiahs in agriculture gives a potential increase in total output of 3.379 and in total income of 1.886, a major share of this income, 50 percent, goes to rural households and 24 percent to urban households. The impact of a unit injection in industry on total output is only 2.6, and on total income only 1.5, about 45 percent of which goes to rural households and 24 percent to urban households.

An improvement in income equality is represented by a higher share of the income multiplier for the poorer groups when compared to their actual income share in the first column of Table 2. This is not a comprehensive measure of redistributional bias but a sensible and operational one.

The results show that injections in agriculture lead to an overall progressive redistribution of income.[2] Injections in industry shift incomes from all household groups, except the urban rich, to corporate firms.[3]

Note that the narrower input-output framework, laying emphasis on inter-industry relationships, has always given higher values of multipliers for industry than for agriculture. The broader SAM framework which considers the whole circular flow gives different policy recommendations. The SAM would recommend expansion of agriculture at the cost of industry on both criteria of growth and equality.

Table 5 gives the output and income effects of another type of instruments: transfers to households (for brevity, transfers to only two types of households are shown which happen to be the richest and poorest). The transfers can be made by government or rest of the world. It is noted that a transfer to the poorest group, i.e., rural farm workers creates more output and income than a transfer to the richest group, i.e., urban upper income. As can be expected the rural transfer lifts up the

[1]The difference between the output and income effect is partly due to leakages such as intermediate inputs and imports.

[2]It is noted that rural farm workers would experience a relative increase in incomes of 5.12/4.54 = 1.14, while rural landowners experience a relative gain of 29.0/27.6 = 1.05. Regarding non-farm workers, the group of lower income increases its share by 1.0 percent while the group of upper income reduces its share by .04 percent. Also among urban households the better-off see a deterioration and the less-off an improvement.

[3]Share of corporate firms increases from 27.9 percent to 30.8 percent.

Table 4

The Impact of Sectoral Injections on Output and Incomes by Population Groups, Demonstration of Results for Indonesia

	Actual (1975)	Sectoral Injections	
		Agriculture	Industry
Output Multiplier		3.379	2.637
Income Multiplier		1.886	1.464
Percent Distribution			
Over Income Groups			
1 Rural Land Owners	27.55%	28.97%	27.39%
2 Rural Farm Workers	4.54%	5.19%	4.27%
3 Rural Non-farm Workers. Upper	4.74%	4.32%	4.13%
4 Rural Non-farm Workers. Lower	10.43%	11.44%	9.86%
5 Urban Upper Income	12.43%	11.07%	11.51%
6 Urban Lower Income	12.42%	13.06%	12.09%
7 Firms	27.89%	25.95%	30.75%
Total	100.00%	100.00%	100.00%

Table 5

The Impact of Household Transfers on Output and Incomes by Population Groups, Demonstration of Results for Indonesia

	Actual (1975)	Household Injections	
		Urban Upper Income	Rural Farm Workers
Output Multiplier		1.897	3.006
Income Multiplier		2.185	2.734
Percent Distribution			
Over Income groups			
1 Rural Land Owners	27.55%	14.32%	17.94%
2 Rural Farm Workers	4.54%	2.58%	39.80%
3 Rural Non-farm Workers. Upper	4.74%	2.77%	2.98%
4 Rural Non-farm Workers. Lower	10.43%	5.87%	7.27%
5 Urban Upper Income	12.43%	52.66%	7.56%
6 Urban Lower Income	12.42%	8.70%	8.25%
7 Firms	27.89%	13.11%	16.20%
Total	100.00%	100.00%	100.00%

position of rural farm workers significantly at the cost of other groups. The share of the poorest in the additionally generated income will increase from 5 percent to 40 percent. The urban transfer favours urban upper income households at the cost of the rest of the nation. The share of this rich group in additionally generated income is increased from 12 percent to 53 percent.

To balance our exposition, we conclude this section by making explicit six limitations of the SAM-multiplier approach. However, it has been demonstrated elsewhere Cohen (1987) that incorporation of refinements to remedy the six limitations do not change the conclusions reached on the advantage of agriculture on industry with respect to growth and equity.

(1) Like the evaluation of the multipliers of any other economic model, the evaluation of the multipliers of the SAM-model cannot be done in isolation from the closure rules applied. The size of the multipliers depends on the choice of the exogenous and endogenous variables, which in turn depends on the problem studied.

(2) In the multiplier model, supplied amounts are supposed to adjust to demanded amounts. They will, but if the adjustment is not in quantities (whether or not due to restricted capacity) the result is inflation. This may require a revision downwards in the realized sizes of multipliers in the future.

(3) The SAM assumes constant shares of factor remunerations in total output, of household incomes in the various factor payments, of commodities in household expenditure, and of sectors in commodity production. However, with more information these shares can be made to vary.

(4) The available data on factor accounts stand in the way of linking household earnings to income by sectoral sources in more disaggregated and relevant ways. Here too, the SNA is undergoing revisions which will resolve these shortcomings.

(5) Income distribution was classified by socio-economic population groups in terms of residence, working status and ownership of human resources and land property. In the context of fiscal policy a classification by income deciles is more practical. The conversion of alternative classifications by population groups to each other is well-advanced in the literature, however.

(6) Both the input-output and the SAM frameworks are demand-oriented models. The potential effects which they simulate may not be realisable due to the limited scope for significant demand injections or supply constraints.

Consumption Planning

The fourth group of policy issues we treat belongs to consumption planning, see Table 2. Poverty groups is a phenomenon which exists in many societies irrespective of the aggregate level of economic development achieved. In the longer run, human resource development measures have proven to have selfsustained positive effects in eliminating poverty. In the short run, the policy issue faced is the optimal combination between income transfers and provisions of necessity goods in kind. Welfare theory shows that a money transfer would bring the consumers on a higher indifference curve and, talking welfare economics, is preferable to provision in kind. Incorporation of behavioural aspects of the consuming population may lead to contrary results in terms of social welfare. In this section we call upon a previous study of the author which deals with the policy issue of transfers versus provisions in the context of more socio-economic interactions, cf. Cohen (1977).

In that study we were particularly concerned with the calories consumed per capita per day by the lowest income group, K, as a measure of the incidence of poverty in South Korea. The derivation of calories from a certain amount of food expenditure would require knowledge of the average cost per one calorie. For example,

$$\text{Calories per capita} = \frac{\text{consumption expenditure on food per capita}}{\text{cost per calorie}}$$

Consumption expenditure on food by this poorest population group consists of a private component which can be expressed as a function of income Y (thus $a + bY$) plus public allocations of food directed to this group, denoted by Z. Population size of the group is denoted by P. The cost per calorie can be assumed to be a rising function of the general level of living of the group, represented by the income per capita of the group, (thus $c + d(\frac{Y}{P})$. Usually the unit cost tends to increase rapidly as the general level of living approaches higher levels, owing to the gradual shift in the pattern of food composition from cheap food articles to more expensive food articles with the same calorie content. As a result, the above equation can be written as (Equation 7)

$$K = \frac{\frac{((a + bY) + Z)}{P}}{c + d(\frac{Y}{P})} \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

A partial analysis can reflect upon the relative effectivity of using direct transfers (increasing Y) versus public allocation in kind (increasing Z) in the raising of the nutritional level. First in the case of an income transfer part of the income

increase will be spent on food and the rest will be spent on other goods and services and as such will be "redundant" in influencing calorie intake.

Second, equally important is that the cost per unit is a function of income per capita; and increases of income are bound to increase the cost and diminish the purchasable calories. As a result of both effects direct transfers can be shown to be less effective than public allocations in kind in raising calorie intake.

The magnitudes involved can be demonstrated by writing the equation with its estimated parameters, after multiplying by *P*. In passing it can be mentioned that the consumption and cost functions were tested separately using South Korean Data from the sixties and seventies. Both functions fitted very well. The slope coefficients were highly significant and were positive in accordance with *a priori* expectations.

$$K = \frac{.0343 + .3749Y + Z}{.0051P + .0489Y} \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

In the South Korean context an increase of one billion Korean won in income *Y* via an income transfer leads to an increase of 4.4 calories p.p.p.d. On the contrary, an increase of one billion won in public provisions of food in kind *Z* allows the consumption of 14.8 additional calories p.p.p.d., which is more effective, therefore.

CONCLUDING REMARKS

In this paper we discussed a selection of topics dealing with the interface between population economics and development policy. The objective was to review the state of the art and possible avenues for refinement. There are significant obstacles. These are the integration of the time and place dimensions in the classification of people by activity, the operationalization of POPECON models to meet the practical situations encountered in development planning and adjustment programmes, and the assessment of conflicts and complementarities between alternative policies in the light of alternative theoretical postulates and their empirical testing.

REFERENCES

Biro Pusat Statistik (1982) Social Accounting Matrix Indonesia 1975. Jakarta: BPS. 1.

Cohen, S. I. (1975) *Production, Manpower and Social Planning, Korean Applications.* Rotterdam: Rotterdam University Press.

Cohen, S. I. (1977) A Social-Economic Development Model; Korean Applications. *The Seoul National University Economic Review* 11 : 1.

Cohen, S. I. (1987) Input-output versus Social Accounting in the Macro-analysis of Development. *Industry and Development.* No. 22.

Cohen, S. I. (1989) Job Competition versus Human Capital in Estimating Returns to Education. *Quantitative Methods.* 10 : 31 June.

Cohen, S. I., H. Correa, and M. de Zeeuw (1989) A SAM-multiplier Model with Exogenous Demographic Developments, Internal Paper, Department of Microeconomics, Erasmus University Rotterdam.

Cohen, S. I., P. A. Cornelisse, R. Teekens, and E. Thorbecke (1984) *The Modelling of Socio-economic Planning Processes.* London: Gower Publishing.

Horlacher, D. E., and F. L. MacKellar (1988) Population Growth versus Economic Growth. In D. Salvatore (ed) *World Population Trends and Their Impact on Economic Development.* West Port: Greenwood Press.

Hussmanns, R., and M. Mehran (1989) Viable Approaches for Measuring Employment in the Informal Sector of Developing Countries. Paper presented at EUR/ILO Workshop, Erasmus University, Rotterdam.

Nerlove, M. (1987) Population Policy and Individual Choice, Invited Lecture at the First Annual Conference of the European Society for Population Economics, Erasmus University, Rotterdam.

US National Research Council (1986) Population Growth and Economic Development: Policy Questions. Washington, D. C.: National Academy Press.

Comments on "The Interface between Population and Development Models, Plans and Policies"

I must acknowledge that it is an interesting paper. Since the paper thoroughly discusses issues involved in economic demography it saves me from retrieving these issues. My brief observations about the paper are the following.

The subject of economic demography started with the *first Essay on Population* by Malthus in 1798 where he argued about the conflict between population and the standard of living. Many other economists, among them Ricardo and Mill, in the early and mid eighteenth century have examined the relationship between population and economic growth.

Early work on economic and demographic planning was usually carried out in isolation. Postwar economic demographic modelling, however, revived when the low income countries witnessed rapid growth in population. With this, interest has turned into macro economic-demographic modelling which provides a consistent and rational basis for the time paths for the variables rather than resorting to variously assumed "scenarios".

In their pioneering work on the Social Accounting Matrix (SAM), Pyatt and Thorbeck (1976) mentioned that "one can easily incorporate variables related to demography", and we have that augmented framework in Prof. Cohen's paper. The distinction between SAM and DAM helps clarify some of the issues discussed by Prof. Cohen. In his paper, Prof. Cohen, in particular, examines problems faced in the incorporation of POPECON variables in development planning and suggests some tentative solutions. This is a welcome addition to the body of literature on economic-demographic modelling.

To gain insights into the interdependencies within an economy so as to evaluate policy in a planning framework and to show its operational usefulness, the SAM-DAM framework can play a vital role. The beauty of this framework is that for any validated estimation of an economy-wide model a time series of SAM-DAM can be constructed provided the time series of the required data are available. Within the SAM-DAM framework the multiplier analysis can process the effects of exogenous injections in the economy. In this respect this framework can be treated as an alternate to the economy-wide economic-demo simulation models, such as the Bachue model of the ILO, and models of demo-economic policy, as developed by

Willekens and Rogers (1977) and Sanderson (1980). The available economic-demometric models are capable in guiding the policy-makers, but due to the lack of the required information these models are not widely used. If the data requirements for the SAM-DAM can easily be met compared with the data requirement of economic-demometric models and if we are sure that the SAM-DAM framework is less restrictive compared with the economic-demometric models then the proposed SAM-DAM will certainly prove to be a very useful framework for the presentation of alternative scenarios.

I have the following specific comments on the paper:

(i) Professor Cohen has correctly pointed out the disagreement among researchers about the classification of the whole population. It is not, however, clear why he has preferred to select S, O, M, E, division of population as demographic variables in the DAM.

(ii) Using the choice of time allocation, Professor Cohen has divided total population into four parts: S, O, M, E. Based on this division he presents a venn-diagram which requires clarification. To me he should either include unemployment (U) in the division of total population or bypass the presentation of the venn-diagram. If unemployed, in the earlier division, are part of the four categories, then the outlying area in the venn-diagram can not be explained by S, O, M, E.

(iii) On page 3 of the paper, all the endogenous variables associated with the labour market are present which form the stock of population, but I do not see any endogenous variable which is strictly demographic in nature and which contribute to growth in population, for example, fertility and mortality. Is the incorporation of the labour market variables sufficient for an economic-demographic model?

At the end I must add that this study is doubly valuable: it highlights the issues involved in the definition of POPECON variables and modelling the relationship between them, and it provides a framework which can open new avenues for future research.

Zafar Mahmood

Pakistan Institute of
Development Economics,
Islamabad

REFERENCES

Pyatt, F. G., and E. Thorbeck (1976) *Planning Techniques for a Better*

Future. Geneva: ILO

Sanderson W. C. (1980) *Economic-Demographic Simulation Models: A Review of Their Usefulness for Policy Analysis*. Laxenburg: International Institute for Applied System Analysis.

Willekens F., and A. Rogers (1977) *Normative Modelling in Demo-Economics*. Laxenburg: International Institute for Applied Systems Analysis.

Comments on "The Interface between Population and Development Models, Plans and Policies"

I am honored to be asked to comment on Suleiman Cohen's paper, although I must say that I am also a little puzzled by the request. Those who know me know that I am not an expert on social accounting matrices. Moreover, this ignorance notwithstanding, I am also something of a critic of SAMs and their use for policy analysis. I hope, therefore, that the audience and especially Suleiman will forgive me if I do not stick too closely to the paper. I will begin my comments with some general concerns about SAMs, then turn to a discussion of some of the propositions underlying Suleiman's model.

My general concerns about SAMs and SAM-related analytical approaches are echoed in a number of critiques published over the last decade (refs.). SAMs and their demographic counterparts, DAMs, can be a useful element in a larger policy analysis framework. As their name implies, they are accounting frameworks that force various elements of an economy to add up. SAMs can, in turn, force analysts to recognize the constraints under which economies operate, as well as highlight the interconnectedness of social and economic systems. However, their usefulness as a basis for policy analysis is hampered by two fundamental characteristics: No matter how cleverly constructed SAMs are static snapshots of highly dynamic systems, built on essentially arbitrary divisions and aggregations of frequently continuous characteristics.

Policy analysis often deals with fairly fundamental changes in the environment in which individuals and other economic entities operate. As one moves from one policy regime to another – or tries to simulate such changes – one essentially moves from one underlying set of SAM relationships to another and herein lies the rub. SAMs are good at dividing up the economic pie in consistent ways but they are much less suited to understanding the underlying mechanisms that generate observed relationships and interactions on which SAMs rest. These two unavoidable features of SAMs – their static nature and the need to divide a continuous world into often arbitrary categories – make them problematic as a base for understanding the costs and benefits of policy alternatives.

There is also a serious practical problem with SAMs and DAMs. They are large and intensive users of one of the world's – especially the developing world's –

scarcest commodities: good and detailed economic and social data. Data limitations almost always drive the constructors of SAMs to much higher levels of aggregation than they would like and that would provide a useful disaggregation of an economic system. By "useful" I mean one for which the innat heterogeneity in target variables (welfare, education, income) within each grouping is less than that among the different groups, and one for which available policy levers bear mainly or wholly on one group and not another. Such disaggregations are theoretically possible but real world data constraints make them a very rare reality indeed.

I should perhaps reemphasize the point with which I began this discussion: SAMs *can* be a useful tool in a policy analyst's tool kit. The problem is that they can also be easily misused. SAMs, and the computable general equilibrium models that flow from them, are often considerably more easy to deal with – more consistent and complete – than actual country data, so it is often a temptation to see SAMs as more real than the economy they are meant to represent. SAMs and CGEs can easily be used to produce data where none previously existed and too frequently those data become a substitute for real information. As with all economic tools SAMs can be misused in the hands of the unsophisticated, so those who use and promote this technology must ensure that recipients clearly understand *both* its strengths and its limitations.

Let me turn now to several more specific comments on Suleiman's paper. I have to say that the paper as it is now written is difficult to follow for anyone not closely associated with Suleiman's work. The paper appears to try to condense a great deal of past and ongoing work into a very few pages and in doing so leaves the novice reader thoroughly confused at many points. The paper would be much more effective if it began with a clear statement of the underlying policy issues, the motivation for this particular approach to those issues, and how the completed work will contribute to our understanding of development and will influence policy.

Two points on Dr Cohen's treatment of demographic-economic interactions. First, Dr Cohen indicates that "most of the [demographic] transition rates in the DAM are usually exogenous but as more empirical knowledge becomes accumulated it is possible to endogenize more of these transition rates". This statement and the modeling that flows from it may miss the basic philosophy of the long-standing population and development debate. In short, this debate has concerned and continues to concern two broad issues: (1) how population growth affects economic development, and (2) how economic growth influences population growth. Without firm (or even assumed) answers to these two questions I do not see how one can effectively and meaningfully incorporate demographic considerations into a SAM-like framework. Further, the quite casual reference to "endogenizing more of these transition rates" belies the now well-recognized difficulty of understanding and quantifying economic-demographic interactions.

While on the topic of population let me raise another concern about Dr Cohen's discussion of demographic relationships. As he rightly recognizes a key policy issue in discussions of the role of societies and governments in influencing individual fertility is whether or not the costs society as a whole bears for children exceeds the costs parents themselves bear. A principal justification for family planning interventions is that parents do not bear the full cost of their children and therefore tend, on average, to produce too many offspring. Unfortunately negative externalities needed to justify government intervention in the family planning area have proven very difficult to identify both theoretically or empirically. An often-cited "externality"– that parents do not take into account the effect of additional children on the (future) wages of other people's children – is not an externality but the straightforward workings of the labour market. No market failure here, although such a relationship may have implications for welfare policies aimed explicitly at raising the incomes of the poor.

I will end my comments by focusing on Suleiman's discussion of human capital. For those who have heard – or read – my paper for this meeting, it will come as no surprise that I do not agree with the conclusion stated in Suleiman's paper that "a shift of future investment from human capital to physical capital is economically more efficient". I confess that as presented in the paper I was not able to follow Dr Cohen's SAM/DAM model sufficiently well to understand how this results arises, but I believe it to be inherently wrong.

One potential source of this result may be the treatment of skilled workers in the model. Suleiman cites such phenomena as the educated unemployed and mis-matches between school curricula and job requirements as evidence of the low "social efficiency" of public expenditures on human resources. This observations seems to be based on the now discredited notion of manpower planning in which skills are produced with specific job slots in mind. In fact, as T. W. Schultz pointed out several decades ago, education's fundamental role is to prepare the recipient not for some specific job slot, but to deal with transition and uncertainty. The history of manpower planning models strongly attests to the proposition that the one thing we economists are not good at is forecasting. Rather than try to predict the future demand for skills, and be almost assuredly wrong, better to prepare individuals to deal with and benefit from unavoidable uncertainty. What the manpower planning approach to educational planning fails to recognize is that well-educated individuals, when provided the right incentives, *create* jobs as well as fill them. We should no more characterize human capital as a series of specific skills than we should characterize physical capital as a series of specific machines. Both human and physical capital must move and adapt to high returns activities in order to produce growth and economic development.

Suleiman would do his readers a great service by providing a stronger context

in which to judge his model and a few more details regarding the specifics of the model. Of course, not even Suleiman can collapse a book into 30 or so pages, but as the paper now stands it runs the risk of falling between two stools: it serves neither the specialist nor the uninformed well. I hope that in his revisions Dr Cohen will choose to provide more in the way of motivation for his models and more on the types of policy questions the models can address.

Dennis de Tray

The World Bank
Washington, D. C.,
USA