Econometric Approach to Planning Education

A Criticism

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During the last five years economists concerned with growth and development have become increasingly interested in the role of education in these processes. A large and expanding literature now exists on this subject.

Within this literature an article by J Tinbergen and H Correa has attracted widespread attention, for Tiber gen and Correa present an econometric model which they believe "can be used for the solution of a number of problems of long-term planning for education in developed as well as developing countries".

An attempt is made below to examine this claim.

T HE Tinbergen-Correa Model

(Henceforth called the T-C model) itself is very simple. It consists of a system of six linear difference equations: There are two demand equations, one expressing the demand for people with secondary education and another expressing the demand for people with third-level, i.e., university, training. Two other equations indicate the flow into the labour force of people with secondary and third-level education. Finally, we have two equations indicating the supply (stock) of manpower with secondary and third-level training.

The T-C model is concerned with establishing the necessary educational conditions to sustain a given (exogenously determined) rate of growth of output. The title of the article clearly indicates that T-C view the problem of planning education as one of adapting education to growth and not that of accelerating growth through education. The authors state, "(...) economic development must be accompanied by an expansion of education," and then go on to ask, "What structure of the educational system is needed in order to let the economy grow at a given rate ..."?

The T-C model, in our opinion, has an inappropriate focus. The model is not concerned with examining the influence of existing or potential educational systems upon the determination of the rate of growth of output. Yet this, it seems to us, is the crucial problem in planning education—at least in the underdeveloped nations. It well could be that the present techniques of production and growth of income are determined in part by the existing educational system. The mere expansion of an undesirable system may be neither necessary nor sufficient to accelerate growth. In fact, if traditional education is viewed as the prerogative of the privileged members of society and as an escape from manual labour, the marginal effects on economic and social progress of expanding such a system could be negative.

Equilibrium Expansion

In other words, T-Cs econometric model is concerned with the (equilibrium) expansion of a given (optimum) educational system. One might say it is concerned with growth but not development. One then is tempted to assert that the model applies primarily to developed industrial nations whose main problem merely is expanding an existing educational pyramid which already has been adapted to the needs of a modern technical society. This conclusion, however, would appear to be incorrect.

The model assumes that all the variables grow at the same rate; i.e., the number of persons with secondary education \(N^2\) grows at the same rate as the number of persons with university education \(N^3\), and these in turn grow at the same rate as the volume of production \(v\). Given the (assumed) once for all change in the correct (equilibrium) proportion of \(N^2\) to \(N^3\), the only problem is to expand the system to accommodate growth of output.

The demand for persons with secondary education depends rigidly upon the level of output:

\[
N_i^2 = \gamma^2 v_i
\]

Similarly, the demand for people with university education is dependent rigidly upon the volume of production and the fixed student teacher ratios:

\[
N_i^3 = \gamma^3 v_i + \pi^3 n_i^2 + \pi^3 n_i^3
\]

where \(n_i^3, n_i^2\) = number of students studying at the secondary (or university) level

\[\pi^3, \pi^2 = \text{teacher/student ratio at the secondary (or university) level}\]

The gamas in the above two equations are analogous to Tinbergen's universal assumption of fixed (sectoral) capital-output ratios. T-C merely have transformed the notion of a fixed capital-output ratio into the assumption of what may be called fixed (sectoral) education-output ratios. Such an assumption is both a cause and an effect of their fixation on the volume of education at each level as opposed to its composition and coordination with other policies.

In industrial countries, where technology is constantly changing, the demand for \(N^3\) is likely to grow considerably faster than the demand for \(N^2\). That is, the coefficients will change through time. First, the \(T\)'s and \(\pi\)'s in a growing economy will be affected by changing supply conditions, by technical improvements in the course of time. Secondly, rising incomes will be reflected in the educational composition of the work force. Thirdly, population growth will influence the value of the coefficients. The T-C model makes no assumption about the rate of increase of population or (consequently) the rate of growth of per capita income. Yet surely this is a relevant factor that educational planners should take into account. Changes in population size and per capita income also will be reflected in the techniques used in production and in the composition of final demand and this in turn will be reflected in the educational needs of a coun-
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try. Thus the T-C model does not appear to be very useful in long-term planning.

One then is tempted to assert that this particular programming technique can be applied only in the short-run, when the coefficients are likely to remain fixed. This assertion, too, would be incorrect—even aside from the fact that changes in the educational system are unlikely to have a significant impact in the short-run. In the T-C model the discrete time interval (or period of adjustment) of t years is six years long. In a six year period, in a rapidly growing economy, all the (assumed fixed) coefficients are likely to change. The educational level of the work force continually will need to be up-graded.

Not Useful

Hence, (a) T-C's econometric model is not useful in underdeveloped countries because it implicitly assumes the existing educational system is desirable (optimum?) and need only be expanded, (b) The econometric model is not useful in growing industrialized nations because it assumes that for a given rate of growth the proportion of secondary school graduates to university graduates is fixed. That is, the coefficients do not change systematically through time, (c) The model is not useful for short-term programming because its time unit of six years is too long for the assumption of fixed coefficients to be credible. Beside in most cases it makes little sense to talk of short-term educational planning.

Finally, the T-C model is dangerous because of what it does not do as well as of what it does do. It seems to us that the model ignores most of the important problems of planning education, especially in an underdeveloped country.

The distinction between technical and agricultural training on the one hand and education in the classics, humanities, and law on the other is as fundamental as any division between secondary and third-level education; the composition of education at each level is a key policy variable. Not only must educational planners concern themselves with the type of training suitable for a given economy. They must also consider the quality of education they propose to give and the number of students who should reach each level—taking into account the restrictions imposed by the limited resources available to the country. In the underdeveloped countries there are many ways of using (what by European standards would be considered) "half-trained" people to achieve important tasks. For example: University graduates are not needed to implement long-term campaigns against illiteracy. The infant mortality rate can more easily and economically be reduced by providing several thousand midwives than by providing a score of well-trained registered nurses. Routine public health measures can be administered by persons with a minimum of medical training, etc.

Financial Costs Ignored

The financial costs of expanding education are ignored completely by T-C. Yet this probably is one of the most important problems of planning education in an underdeveloped country. In some countries it would be possible to obtain a better quality of education, in terms of its impact upon growth, for the same cost. In others it might be possible to reduce costs. The salaries of teachers and civil servants frequently are ten times higher than the incomes of rural workers. Hence any device for reducing—or at least limiting the rise of—expenditures per teacher would be welcomed. One possibility, which takes advantage of the fact that women usually are paid less than men for the same work, would be the greater use of female teachers in primary and secondary education. Another technique, which has not yet been attempted, would be to provide part of the salaries of rural instructors from the produce of a school-farm. If these instructors were a combination of teacher and extension worker, and if entrance to the civil service were contingent in part upon previous service in the countryside, several problems would be partially solved at once. The supply of teachers, especially in the rural areas where they are needed most, would increase; their cost would decline; the status of technicians would greatly rise.

In general, educational planning should consist of a careful delineation of the effects of various kinds of educational systems upon (i) the rate of growth of output, e.g., by improving agricultural productivity; (ii) the population growth rate, e.g., by spreading information about birth control techniques; (iii) sanitation and health; (iv) urban migration; (v) the cultural level of the population; (vi) changing attitudes toward physical labour; and (vii) the facility with which technical changes are introduced. Furthermore, the educational planner must consider the relationship of educational reform to other reforms, particularly the interdependence between education, land reform and reform of the civil service. Hence it is difficult to interpret T-C's purely quantitative model unless one is given simultaneously a wealth of information about qualitative and institutional changes.

It is only after an optimum educational system has been encountered (assuming one exists and that it is reasonably stable) that we should concern ourselves with mechanically expanding it to keep pace with the volume of production. Thus T-Cs claim that their model "can be used for the solution of a number of problems of long-term planning for education" is too ambitious. The types of problems the model is designed to solve are not the problems over which economists working in the underdeveloped countries are likely to lose much sleep.

Notes


2 Ibid, p 776; emphasis added.

3 Ibid, emphasis added.

4 It is interesting to note that Correa is from Ecuador. Presumably he believes his model applies in his own country.

5 Ibid, p 779. T-C also discuss the transition problems associated with once-for-all changes in the given rates of growth.

6 For the latest example of this of Tinbergen, J and H C Bos, "Mathematical Models of Economic Growth."

7 Some of these problems may have been foreseen by T-C in the closing paragraph of their article. Cf op cit, p 785.

8 Cf FAO, "Africa Survey", 1962, Ch 16. The proposals mentioned in this report may not be very relevant or applicable in countries which are not predominantly agricultural.
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