THE DEMAND FOR EDUCATED MANPOWER IN SRI LANKA

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ONE observes in South Asia a fairly visible problem of unemployment of educated manpower. There are some indications that this unemployment is increasing, whilst at the same time the number of people entering schools and universities is also growing, indicating a potential worsening of the situation in the future.

Sri Lanka is no exception to this trend. In 1973, out of a workforce of 4,600,000 some 793,000 were unemployed; nearly a quarter of the unemployed were graduates of secondary and third level education.

Such a level of unemployment represents a very real waste of resources that becomes especially obvious when the unemployed embody an investment of some ten to fifteen years of education [4]. Within Sri Lanka, the problem goes beyond such wasted investment, unemployed educated youth is a major political problem as well, with the 1971 insurrection on the island being largely an uprising of the young, educated jobless.

It is easy to assume, on looking at graduate unemployment, that Sri Lanka is producing too many graduates. However, a look at the figures shows that only 1 per cent of the total labor force hold a college degree and only 10.5 per cent have completed secondary education [3]. In view of this, one might reasonably wonder whether one is looking at a problem of structural unemployment or just a little slack in the jobs market for educated manpower that will be taken up with a couple of years economic growth. It has sometimes been argued that the problem in many Asian countries is a result of the expectations held by the educated that they should be able to obtain white collar government jobs, an expectation that leads to many of them remaining unemployed. If this is so the situation should resolve itself with a change in expectations. Not unrelated to this preference for government white collar jobs is the marked preference for the study of arts and humanities subjects. Within Sri Lanka, graduate unemployment is often thought to be unemployment of graduates in arts and humanities [5] [7].

This study attempts to examine these points by quantifying the demand for educated manpower in Sri Lanka up to the year 1985. A simultaneous equation model, first developed by Correa then modified by Tinbergen and Bos,[1] is used.

Acknowledgment is due to Professor Jan Tinbergen for his comments on some aspects of the model used, also to Dr. P. A. Cornelisse, Dr. Howard Doran, and Dr. Bill Griffiths. Remaining errors are our own.

[1] The model is outlined in [15] [8], but see also [11].

Within the study, we examine the demand for secondary graduates and third level graduates in both arts and sciences, we ignore educational levels below secondary graduation.

I. THE MODEL

The model used is the Tinbergen-Correa-Bos model which is a simultaneous equation model that attempts to link the educational system to the production system within the economy. It explicitly assumes a relationship between educated manpower and output in which educated manpower is treated as an input to production. It also allows for the fairly complicated relationships between the stock of educated manpower within the economy, the changes to the stock as a result of new graduates entering the work force, and retirements in the work force; the lagged effect on these changes of school and tertiary enrolments, and the necessity of the education system itself to absorb some of its own output in order to produce graduates.[2]

The model projects the demand flows for the various types of educated manpower identifying shortages and surplusses of specific types of educated manpower that may be present or likely to occur in the future. It is able to do this for different growth rates of GNP.

For the purpose of this study, two levels of education are identified, secondary and third level. The latter is subdivided into science (including technology) and arts (including all non-science and technology subjects). Primary education is disregarded.

Production is disaggregated into three sectors of production, industry, agriculture, and services. This allows for differing growth rates in the sectors together with different absorption rates for educated manpower.

The model consists of twelve variables and twenty seven coefficients (these are listed in Table I), grouped to form the nine equations below. Time periods t_i to t_{i+1} are six years.

$$N_t^2=\nu^{21}V_t^1+\nu^{22}V_t^2+\nu^{23}V_t^3+\mu\pi^2n_t^2 . \quad (1)$$

$$N_t^2=(1-\lambda^2)N_{t-1}^2+m_t^2 . \quad (2)$$

$$m_t^2=\alpha^2(\delta^2n_{t-1}^2+\sigma^3n_{t-1}^3+\sigma^4n_{t-1}^4-\gamma^3n_t^3-\gamma^4n_t^4) . \quad (3)$$

$$N_t^3=\nu^{31}V_t^1+\nu^{32}V_t^2+\nu^{33}V_t^3+\eta(1-\mu)\pi^2n_t^2+\pi^3n_t^3 . \quad (4)$$

$$N_t^3=(1-\lambda^3)N_{t-1}^3+m_t^3 . \quad (5)$$

[2] One thing that we do not have in the model is a system of prices. Essentially we are assuming that price relativities for the various types of labor remain constant. Given the situation in a country such as Sri Lanka, where the largest employer is government, and where government salaries are effectively a system of administered prices rather than market determined ones, we think that this is a reasonable simplification. It could be argued that if the market was allowed to determine labor prices in Sri Lanka with graduate unemployment. We would point out that salary levels in *all* countries tend to be sticky downwards, and a salary cut for government workers in Sri Lanka is unlikely to be considered as being within the bonds of political feasibility.

TABLE I

VARIABLES AND COEFFICIENTS USED IN THE MODEL

Variables used:

V^1	Total volume of production in agriculture.
V^2	Total volume of production in industry.
V^3	Total volume of production in services.
N^2	The labor force with secondary education.
N^3	The labor force with non-scientific and non-technical third level education.
N^4	The labor force with a scientific and technical third level education.
n^2	The number of students in secondary education.
n^3	The number of students in third level education following non-scientific and non-technical courses.
n^4	The number of students in third level education following scientific and technical courses.
m^2	Those who have entered the labor force N^2 within the previous six years.
m^3	Those who have entered the labor force N^3 within the previous six years with a non-scientific and non-technical third level education.
m^4	Those who have entered the labor force N^4 within the previous six years with third level scientific and technical education.

Coefficients used:

ν^{21}	The ratio of secondary educated manpower in agriculture $N_{1973}{}^{21}$ to the volume of production in agriculture $V_{1973}{}^{1}$.
ν^{23}	The ratio of secondary educated manpower in industry $N_{1973}{}^{22}$ to the volume of production in industry $V_{1973}{}^{2}$.
ν^{23}	The ratio of secondary educated manpower in the service sector, *less* the teachers in the secondary schools with this level of education, to the total volume of production in the services sector $V_{1973}{}^{3}$.
ν^{31}	The ratio of third level educated manpower with non-scientific and non-technical degrees in the agricultural sector $N_{1973}{}^{31}$ to the volume of production in agriculture $V_{1973}{}^{1}$.
ν^{32}	The ratio of third level educated manpower with non-scientific and non-technical degrees in the industrial sector $N_{1973}{}^{32}$ to the volume of production in industry $V_{1973}{}^{2}$.
ν^{33}	The ratio of third level educated manpower with non-scientific and non-technical degrees in the service sector, *less* the teachers in secondary schools and universities with this level of education, to the volume of production in the services sector $V_{1973}{}^{3}$.
ν^{41}	The ratio of manpower with third level scientific and technical education in agriculture $N_{1973}{}^{41}$ to the level of output in agriculture $V_{1973}{}^{1}$.
ν^{42}	The ratio of manpower with third level scientific and technical education in industry $N_{1973}{}^{42}$ to the level of output in industry $V_{1973}{}^{2}$.
ν^{43}	The ratio of manpower with third level scientific and technical education, *less* the teachers in secondary schools and universities with this level of education, to the level of output in the services sector $V_{1973}{}^{3}$.
μ	Teachers with secondary education (teaching colleges) teaching at the second level.
η	Graduate teachers with arts degrees.
$(1-\eta)$	Graduate teachers with science degrees.
π^2	Pupil/teacher ratio at second level.
π^3	Pupil/teacher ratio in arts at third level.
π^4	Pupil/teacher ratio in science and technology, third level.
δ^2	Graduation rates, second level.
δ^3	Graduation rates, third level arts.

TABLE I (Continued)

δ^4	Graduation rates, third level science and technology.
γ^3	Third level entrance rate, arts.
γ^4	Third level entrance rate, science and technology.
σ^3	Third level attrition rate, arts.
σ^4	Third level attrition rate, science and technology.
α^2	The labor force participation rate for second level graduates.
α^3	The labor force participation rate for third level arts graduates.
α^4	The labor force participation rate for third level science graduates.
λ^2	Retirement rate for second level graduates.
λ^3	Retirement rate for third level arts graduates.
λ^4	Retirement rate for third level science graduates.

$$m_t^3=\alpha^3\delta^3 n_{t-1}^3 . \tag{6}$$

$$N_t^4=\nu^{41}V_t^1+\nu^{42}V_t^2+\nu^{53}V_t^3+(1-\eta)(1-\mu)\pi^2 n_t^2+\pi^4 n_t^4 . \tag{7}$$

$$N_t^4=(1-\lambda^4)N_{t-1}^4+m_t^4 . \tag{8}$$

$$m_t^4=\alpha^4\delta^4 n_{t-1}^4 . \tag{9}$$

These equations represent the following relationships:

Equation (1) relates to our stock of manpower with secondary education employed in agriculture, industry, and the service sector. The technical coefficients ν^{21}, ν^{22}, and ν^{23} assume a fixed linear relationship between this stock and the annual volume of production in these sectors. A certain proportion μ of secondary school teachers are assumed to be secondary school graduates and are included with the service sector.

Equations (2), (5), and (8): The labor force within each educational category consists of those who were already in it one time unit earlier together with those who have joined during the previous six years, minus a proportion λ who have retired in the six years.

Equation (3): This equation provides a link between third level education and secondary education, recognizing that third level students must come from the secondary graduates. In the equation $\delta^2 n_{t-1}^2$ represents, the number of secondary graduates during a six-year period whilst $\gamma^3 n_t^3$ and $\gamma^4 n_t^4$ represents that portion of the secondary graduates to follow the arts and scientific courses of study respectively. The dropout rate from third level education is given by the terms $\sigma^3 n_{t-1}^3$, for arts dropouts, and $\sigma^4 n_{t-1}^4$, for science dropouts—these dropouts revert to the category of secondary educated. The combination of these terms is multiplied by the secondary educated labor force participation rate α^2 to give us the new entrants m^2 into the stock of secondary level manpower during the six-year period.

Equation (4): This relates to third level arts graduates employed in agriculture, industry, and the service sector. Their employment in these sectors is assumed to be proportional to production in these sectors. Some of our graduates are assumed to be absorbed into education as teachers; these teachers, both secondary and third level are included in the service sector and assumed to be proportional to student numbers.

Equations (6) and (9): These determine the number of new entrants m^3 and m^4 into our third level manpower stock, with $\delta^3 n_{t-1}{}^3$ and $\delta^4 n_{t-1}{}^4$, representing the graduate output in arts and science respectively and α^3 and α^4 being our third level graduate labor force participation rates.

Equation (7): This shows the labor force with third level scientific education employed in agriculture, industry, and services assuming that it is proportional to output in these sectors. A proportion $(1-\eta)$ of the stock of secondary teachers $(1-\mu)$ together with third level teachers of science and technical subjects are assumed to be graduates of science and technology and are included in the service sector.

The model traces out the growth path for the nine endogenous variables in relation to the exogenous variables, the sectoral volumes of production. The fixed input coefficients are interpreted as representing the maximum absorptive capacity for educated labor.[3] Therefore, it will show the maximum employment opportunities available in the economy for such manpower.

We assume an exponential growth of the variable over time, viz.,

$$Z_t = Z_0 \omega^t ,$$

where ω^t is the compounded growth rate for a six-year time period. This assumption provides a solution for the *initial* values of the educational variable as well as their development over time. The basis of the growth of the variable is that it should be regular and parallel to the growth of the economy.

An important feature of the model is that its basis is *not* the existing school enrolment but the existing stock of manpower. Thus we are able to determine whether enrolment rates in the base period are too high, too low, or sufficient, for future necessary changes in the manpower stock.

As the study is concerned with sectoral growth rates of production as well as an overall growth rate of GDP we need to allow for the sectors to grow such that

$$V_t{}^i = \overline{V}{}^i \omega^t + \overline{\overline{V}}{}^i \qquad (i=1, 2, 3) ,$$

where the constants $\overline{V}$ and $\overline{\overline{V}}$ are derived from the values of $V_t{}^i$ for $t=0$ and $t=1$ as follows:

for $t=0$	for $t=1$
$\overline{V}{}^1 + \overline{\overline{V}}{}^1 = V_0{}^1 ,$	$\overline{V}{}^1 \omega + \overline{\overline{V}}{}^1 = V_1{}^1 ,$
$\overline{V}{}^2 + \overline{\overline{V}}{}^2 = V_0{}^2 ,$	$\overline{V}{}^2 \omega + \overline{\overline{V}}{}^2 = V_1{}^2 ,$
$\overline{V}{}^3 + \overline{\overline{V}}{}^3 = V_0{}^3 ,$	$\overline{V}{}^3 \omega + \overline{\overline{V}}{}^3 = V_1{}^3 .$

In addition we assume a constant overall growth rate of the economy within each time period which requires that

[3] Not we believe an unrealistic assumption for Sri Lanka which has a larger number of graduates per unit of output by value than other countries we have looked at. Although it is a fairly subjective evaluation, we do not believe that increased absorption of educated manpower would be productive in Sri Lanka's case. Indeed the evidence is that existing educated manpower is underemployed.

$$\bar{\bar{V}}^1+\bar{\bar{V}}^2+\bar{\bar{V}}^3=0\,.$$

There seven equations determine all constants $\bar{V}^1, \bar{V}^2, \bar{V}^3, \bar{\bar{V}}^1, \bar{\bar{V}}^2, \bar{\bar{V}}^3$, and ω.

The balanced growth values of the variables of the model are determined by assuming that they grow according to the general formula

$$Z_t=\bar{Z}\omega^t+\bar{\bar{Z}}\,.$$

Once these expressions are substituted into the model we obtain two sets of linear equations. The first set by combining all terms with powers of ω, the second set by combining all the double barred quantities. Each set is solved simultaneously in terms of the production constants and the growth pattern of the variables determined by adding the results. The sets are:

SET I

$$\bar{N}^2=\nu^{21}\bar{V}^1+\nu^{22}\bar{V}^2+\nu^{23}\bar{V}^3+\mu\pi^2\bar{n}^2\,. \tag{I 1}$$

$$\bar{N}^2\omega=(1-\lambda^2)\bar{N}^2+\bar{m}^2\omega\,. \tag{I 2}$$

$$\bar{m}^2\omega=\alpha^2(\delta^2\bar{n}^2+\sigma^3\bar{n}^3+\sigma^4\bar{n}^4-\gamma^3\bar{n}^3\omega-\gamma^4\bar{n}^4\omega)\,. \tag{I 3}$$

$$\bar{N}^3=\nu^{31}\bar{V}^1+\nu^{32}\bar{V}^2+\nu^{33}\bar{V}^3+\eta(1-\mu)\pi^2\bar{n}^2+\pi^3\bar{n}^3\,. \tag{I 4}$$

$$\bar{N}^3\omega=(1-\lambda^3)\bar{N}^3+\bar{m}^3\omega\,. \tag{I 5}$$

$$\bar{m}^3\omega=\alpha^3\delta^3\bar{n}^3\,. \tag{I 6}$$

$$\bar{N}^4=\nu^{41}\bar{V}^1+\nu^{42}\bar{V}^2+\nu^{43}\bar{V}^3+(1-\eta)(1-\mu)\pi^2\bar{n}^2+\pi^4\bar{n}^4\,. \tag{I 7}$$

$$\bar{N}^4\omega=(1-\lambda^4)\bar{N}^4+m^4\omega\,. \tag{I 8}$$

$$\bar{m}^4=\alpha^4\delta^4\bar{n}^4\,. \tag{I 9}$$

SET II

$$\bar{\bar{N}}^2=\nu^{21}\bar{\bar{V}}^1+\nu^{22}\bar{\bar{V}}^2+\nu^{23}\bar{\bar{V}}^3+\mu\pi^2\bar{\bar{n}}^2\,. \tag{II 1}$$

$$\bar{\bar{N}}^2=(1-\lambda^2)\bar{\bar{N}}^2+\bar{\bar{m}}^2\,. \tag{II 2}$$

$$\bar{\bar{m}}^2=\alpha^2(\delta^2\bar{\bar{n}}^2+\sigma^3\bar{\bar{n}}^3+\sigma^4\bar{\bar{n}}^4-\gamma^3\bar{\bar{n}}^3-\gamma^4\bar{\bar{n}}^4)\,. \tag{II 3}$$

$$\bar{\bar{N}}^3=\nu^{31}\bar{\bar{V}}^1+\nu^{32}\bar{\bar{V}}^2+\nu^{33}\bar{\bar{V}}^3+\eta(1-\mu)\pi^2\bar{\bar{n}}^2+\pi^3\bar{\bar{n}}^3\,. \tag{II 4}$$

$$\bar{\bar{N}}^3=(1-\lambda^3)\bar{\bar{N}}^3+\bar{\bar{m}}^3\,. \tag{II 5}$$

$$\bar{\bar{m}}^3=\alpha^3\delta^3\bar{\bar{n}}^3\,. \tag{II 6}$$

$$\bar{\bar{N}}^4=\nu^{41}\bar{\bar{V}}^1+\nu^{42}\bar{\bar{V}}^2+\nu^{43}\bar{\bar{V}}^3+(1-\eta)(1-\mu)\pi^2\bar{\bar{n}}^2+\pi^4\bar{\bar{n}}^4\,. \tag{II 7}$$

$$\bar{\bar{N}}^4=(1-\lambda^4)\bar{\bar{N}}^4+\bar{\bar{m}}^4\,. \tag{II 8}$$

$$\bar{\bar{m}}^4=\alpha^4\delta^4\bar{\bar{n}}^4\,. \tag{II 9}$$

II. THE APPLICATION OF THE MODEL

The time unit in the model is six years, and in applying it to Sri Lanka, we have chosen 1973 as the base year with 1968–73 as the first time period. The model

TABLE II

VALUE OF THE COEFFICIENTS USED

Strategic coefficients:

	Agriculture	*Industry*	*Sciences*
Second level	$\nu^{21}=0.11$	$\nu^{22}=0.18$	$\nu^{23}=0.6$
Third level arts	$\nu^{31}=0.003$	$\nu^{32}=0.005$	$\nu^{33}=0.036$
Third level science	$\nu^{41}=0.002$	$\nu^{42}=0.008$	$\nu^{43}=0.010$

Secondary teaching force:

μ $=0.46$
η $=0.88$
$(1-\eta)=0.12$

Pupil teacher ratios:

π^2 $=0.05$
π^3 $=0.05$
π^4 $=0.1$

Graduation rates:

δ^2 $=1.74$
δ^3 $=2.5$
δ^4 $=1.8$

Third level entrance rates:

γ^3 $=2.3$
γ^4 $=1.5$

Third level attrition rates:

σ^3 $=0.22$
σ^4 $=0.35$

Labor force participation rates:

$\alpha^2=0.85$
$\alpha^3=\alpha^4=1.0$

Retirement rates:

T	3.4% p.a. $\omega=1.22$	6.0% p.a. $\omega=1.42$	8% p.a. $\omega=1.59$	12% p.a. $\omega=1.97$	15% p.a. $\omega=2.32$
$N\lambda_2{}^2=6.5$	0.08	0.05	0.03	0.012	0.006
$N\lambda_3{}_=\lambda_4{}^3=5.5$	0.11	0.07	0.05	0.02	0.013

has then been run for a further two time periods taking us up to 1985. In order to calculate all of the twenty-seven coefficients in the model a very wide range of data sources have been utilized, these are listed in Appendix. The calculated values of the coefficients are shown in Table II.

The coefficients in the model that are most critical are the strategic coefficients ν. As our model is to be broken down into three sectors, industry, services, and agriculture, we require nine strategic coefficients for Sri Lanka. We can best show how these are calculated by demonstrating how one set are calculated. The value of ν^2 is the ratio of manpower with secondary education $N_{1973}{}^2$ (in thousands), to the total value of production V_{1973} (in millions of 1973 U.S. dollars).[4] This

[4] Sri Lanka has a dual exchange rate system, the official exchange rate and a second rate known as the Foreign Exchange Entitlement Certificate Scheme (FEECS) rate. The latter is a preferential selling and penalty buying rate for foreign exchange. The rate is 65 per cent over the official rate and is used in this study as more accurately reflecting the scarcity value of foreign exchange in Sri Lanka.

we disaggregate into ν^{21}, ν^{22}, ν^{23} which are the ratios of manpower with secondary education to the output in agriculture, industry, and services. So ν^{21} is the ratio of $N_{1973}{}^{21}$ to $V_{1973}{}^{1}$.

We find on calculating these strategic coefficients that the bulk of the educated labor force is in the service sector. This can be accounted for by two reasons. The importance of government service as an employer, and the large amount of educated manpower that is absorbed into the education system itself [9] [10].

The strategic coefficients are fixed within the model. The implication of this is we rule out factor substitution between capital and labor within each sector. We are assuming fixed technical coefficients of production. Even more than this, in our interpretation of the results we shall be assuming that these labor-output relationships reflect the maximum absorption rates for educated labor in the sectors. These assumptions can be supported for the following reasons: although labor may be substitutable for capital, educated labor is almost bound to be a complement not a substitute. We require an educated workforce in modern, technically more advanced industries, in order to operate with the capital. Although capital deepening may replace some of this labor over time, starting from the present day situation in Sri Lanka the reverse seems unlikely. As we are interested in determining the *maximum* demand for educated labor, then we will not be allowing for capital deepening and increasing productivity. In sectors other than industry, it is an observable fact that the major employer of educated labor, government, has already absorbed a disproportionate amount of labor that appears to be both overqualified and underemployed [6]. Any further absorption is unlikely to increase output in this sector.

Of the other coefficients μ, η and $(1-\eta)$ all relate to our secondary level teachers. In Sri Lanka, this consists of both graduate teachers, with either arts degrees or science degrees, and teachers who have been through the non-university teaching colleges. The number of teachers that will be employed will of course depend in part upon staff/student ratios π^2, π^3, π^4. The ratios used in the study are those targetted for 1985 by the ministry of education. Thus we are making the most optimistic assumption of teacher employment here.

The coefficients δ^2, δ^3, and δ^4 graduation rates, are found by dividing the total secondary and third level graduates for the period by the total enrolments in second and third level. The figures produced look a little odd as they are all greater than one, thus appearing to indicate that graduation rates are higher than enrolment rates. This is a function of the arbitrary six-year time period chosen. Under the system prevailing in Sri Lanka until 1973, secondary education took four years and third level education from three years for art subjects to six years for medicine. So the effect of the arbitrary time period in the model is to give us coefficient of well over one. In the case of δ^3, graduation rates of arts students, as high as 2.5.

Before anyone graduates they have to enrol, and to get into a third level institution in Sri Lanka is fairly difficult. The first step requires the passing of A (advanced) level secondary examinations. In 1968 some 36,000 students sat for this examination but only 14,353 passed successfully [1] [2]. Of those who

passed A level only 3,600 obtained admission to university. These successful ones are represented by the coefficients γ^3 for those going into arts streams and γ^4 for those going into science streams. To find these coefficients, we calculate the number of new third level enrolments during the period and divide them by the total enrolments at the end of the period. For example, γ^3 will be the total new enrolments in arts over the period 1968–73 divided by the total arts enrolments in 1973. Once again, the shorter the courses of study, the higher the value of the coefficient.

Not everyone who enrols for third level education successfully graduates. Attrition rates at this level in Sri Lanka are low relative to the rates at lower levels of education [13] [14]. The coefficient representing dropout rates are σ^3 and σ^4.

Labor force participation rates α^2, α^3, and α^4 are found to be surprisingly high in Sri Lanka, especially for third level graduates where we get a participation rate of close to 100 per cent. It is somewhat lower for secondary graduates at 85 per cent. There seems little doubt that third level education is seen as a means to attain a desirable job by both males and females in the country, with very few females graduating from university not entering the work force [12]. Because the participation rate is a weighted average of males and females aged between fifteen and fifty-five, short-term movements, such as those of young females leaving the work force for childbearing are eliminated.

In order to calculate the number of people leaving the workforce, we need to calculate death and retirement rates. In this study the former are ignored. Given the early retirement age and high life expectancy in Sri Lanka it is thought that this will not make a major difference to the results. In order to calculate retirement rates λ, we need to take into account the age composition of the labor force. This is done, following Tinbergen and Bos,[5] by replacing equation (2) by

$$N_t^2 = N_{t-1}^2 - m_{t-T}^2 + m_t^2 ,$$

where m_{t-T}^2 represents the number of those who have entered the second level labor force T times earlier where T is equal to the productive life of the individual. This can be shown to be equivalent to choosing

$$\lambda^2 = (\omega - 1)/(\omega^T - 1) ,$$

where ω is the growth rate of GDP. Using this method and assuming the average productive life of secondary graduates to be 15–55 and third level graduates 22–55 we are able to obtain a series of λ's for different growth rates. The higher the rate of growth the lower the value of λ as we get a younger stock of manpower in the workforce.

III. THE RESULTS

The model was run for three time periods, the initial period to which gives us the figures for our base year 1973, plus two other six-year periods which take

TABLE

BALANCED GROWTH OF THE EDUCATIONAL SYSTEM

Variable	Actual Values 1973	Number Employed 1973	Growth Rate at 3.4% t_0 (1973)	t_1 (1979)	t_2 (1985)	Growth Rate at 6% t_0 (1973)	t_1 (1979)	t_2 (1985)	Growth Rate t_0 (1973)	t_1 (1979)
N^2	546.3	364.3	347.4	423.8	517.0	358.2	508.6	722.2	361.5	712.2
N^3	44.8	28.4	19.6	23.9	29.2	20.1	28.5	40.5	21.8	42.9
N^4		8.9	8.4	10.2	12.5	8.9	12.6	17.9	11.1	21.9
n^2	467.4	—	83.8	102.2	124.7	117.0	166.1	235.9	249.9	492.3
n^3	10.1	—	3.7	4.5	5.5	4.6	6.5	9.3	10.1	19.9
n^4	5.5	—	1.5	1.8	2.2	2.2	3.1	4.4	5.4	10.6
m^2	n.a.	—	102.4	124.9	152.9	116.8	165.9	235.5	179.0	352.6
m^3	n.a.	—	6.3	7.7	9.4	6.8	9.7	13.7	10.8	21.3
m^4	n.a.	—	2.5	3.1	3.7	3.2	4.5	6.5	5.7	11.2
V^2	328.9	—	328.9	401.2	489.5	328.9	467.0	663.2	328.9	647.9
V^3	216.6	—	216.6	264.2	322.4	216.6	307.6	436.6	216.6	426.7
V^4	466.8	—	466.8	569.5	694.8	466.8	662.9	941.3	466.8	919.6
Production constants:			$\bar{V}^1 = 209.3$			$\bar{V}^1 = 249.2$			$\bar{V}^1 = 278.7$	
			$\bar{V}^2 = 187.1$			$\bar{V}^2 = 323.2$			$\bar{V}^2 = 280.8$	
			$\bar{V}^3 = 613.3$			$\bar{V}^3 = 439.4$			$\bar{V}^3 = 452.7$	
			$\bar{\bar{V}}^1 = 119.6$			$\bar{\bar{V}}^1 = 79.7$			$\bar{\bar{V}}^1 = 50.2$	
			$\bar{\bar{V}}^2 = 29.5$			$\bar{\bar{V}}^2 = -106.6$			$\bar{\bar{V}}^2 = -64.2$	
			$\bar{\bar{V}}^3 = -148.5$			$\bar{\bar{V}}^3 = 27.4$			$\bar{\bar{V}}^3 = 14.1$	

us up to 1985. It was run for growth rates of GDP from 3 to 22 per cent. The results from a selection of these growth rates is shown in Table III.

We can analyze the results in terms of two broad objectives. Firstly, we can compare the *actual* values for the variables in 1973 with those projected by the model in other to determine whether there is a disparity between the amount of educated manpower in the economy and the amount needed for the level of production in the economy. We can also compare the actual school enrolments with the level of enrolments indicated as necessary by the model for each growth rate of GDP. So we examine both current stocks of manpower and the future increments to this stock that are already in the system.

Secondly, we can take projected actual increases to the educated labor force and enrolment rates, and compare them to the demand for educated labor indicated by our model.

We examine the actual values not the models' projected values for 1973 first.

The actual value for the stock of secondary educated manpower N^2 in 1973 is 546,300 of whom only 364,300 were employed. During the period 1972–73, the actual growth rate of GDP in Sri Lanka was 3.4 per cent. Looking at the projected employment need for this type of manpower given a rate of growth of 3.4 per cent, we find that for t_0 (1973) the model gives a value of 347,400. This is 5 per cent below the actual number employed. In fact, for all growth rates up to and including 22 per cent, in the initial time period, we would not need to absorb a great deal more secondary educated manpower and could attain a growth

III

FOR SELECTED GROWTH RATES OF GDP

(Production V in millions of 1973 U.S.$, population in thousands)

at 12%	Growth Rate at 15%			Growth Rate at 18%			Growth Rate at 22%		
t_2 (1985)	t_0 (1973)	t_1 (1979)	t_2 (1985)	t_0 (1973)	t_1 (1979)	t_2 (1985)	t_0 (1973)	t_1 (1979)	t_2 (1983)
1402.9	364.1	844.7	1959.7	367.4	991.9	2678.3	373.5	1232.5	4067.4
84.6	23.2	53.8	124.9	24.9	67.2	181.5	28.1	92.7	306.0
43.1	12.9	29.9	69.4	15.1	40.8	110.1	19.4	64.0	211.3
969.8	354.7	822.9	1909.1	485.6	1311.1	3540.0	730.6	2410.9	7956.2
39.2	14.6	33.9	78.6	20.1	54.5	146.5	30.7	101.3	334.3
20.9	8.3	19.3	44.7	12.5	33.8	91.1	21.6	71.3	235.2
694.7	207.1	480.5	1114.7	231.9	626.1	1690.5	260.3	858.9	2834.6
41.9	13.2	30.6	71.0	15.7	42.4	114.5	19.5	64.4	212.4
22.1	7.5	17.4	40.4	9.7	26.2	70.7	13.7	45.2	149.2
1276.4	328.9	763.0	1775.6	328.9	888.0	2397.6	328.9	1085.4	3581.7
840.6	216.6	502.5	1165.8	216.6	584.8	1579.0	216.6	714.8	2358.8
1811.6	466.8	1082.9	2512.5	466.8	1260.4	3402.9	466.8	1540.4	5083.5
		$\bar{V}^1 =$ 285.9			$\bar{V}^1 =$ 292.1			$\bar{V}^1 =$ 294.6	
		$\bar{V}^2 =$ 271.8			$\bar{V}^2 =$ 267.6			$\bar{V}^2 =$ 263.7	
		$\bar{V}^3 =$ 455.2			$\bar{V}^3 =$ 458.6			$\bar{V}^3 =$ 458.7	
		$\bar{\bar{V}}^1 =$ 43.0			$\bar{\bar{V}}^1 =$ 36.8			$\bar{\bar{V}}^1 =$ 34.3	
		$\bar{\bar{V}}^2 =$ −55.2			$\bar{\bar{V}}^2 =$ −51.0			$\bar{\bar{V}}^2 =$ −47.1	
		$\bar{\bar{V}}^3 =$ 11.6			$\bar{\bar{V}}^3 =$ 8.2			$\bar{\bar{V}}^3 =$ 8.1	

rate of 15 per cent on the present level of employment, although absorption rates for subsequent time periods climbs quickly as the growth rate rises. If Sri Lanka only managed to maintain its 3.4 per cent growth rate of GDP however, it would not even absorb its current unemployed secondary graduates by time period t_2 (1985) much less the increments to the stock that will occur between 1973 and 1985.

The increments to the stock of secondary graduates will be a function of secondary school enrolments, n^2. The actual number of enrolments in 1973 are 467,400. These are people who will be coming into the labor market in subsequent time periods. When we look across our figures we find that it is not until we get to just under an 18 per cent growth rate of GDP that we could justify such an enrolment in terms of manpower needs. At growth rates less than this, and 18 per cent is quite outside the bounds of possibility, then the graduates from those presently enrolled in secondary schools will serve to swell the stock of educated unemployed. At current rates of growth, enrolments in secondary education are some 50 per cent above requirements.

To move from secondary education to third level.

For the actual values of science and arts graduates in the workforce in 1973, we have only an aggregate figure of some 44,800. This gives us some 7,500 unemployed graduates with 28,400 arts graduates being employed and 8,900 science graduates. Looking at the projected figures for a 3.4 per cent growth rate, we see a marked discrepancy between the number actually employed and

the number our model indicates as necessary for t_0 (1973). Some 19,600 in the model compared with 28,400 actually employed. In fact at this growth rate, we would not be *productively* employing these arts graduates until close to the end of time period t_2 (1985). Alternately, in order to be employing these productively in 1973, we would need to be looking at a growth rate of 22 per cent. This discrepancy between the numbers of arts graduates employed and the numbers who could, or should, be demanded as indicated by the model would appear to be a function of the very high number of arts graduates, fairly obviously under-employed and overqualified for the jobs they hold, within the public service.

Science graduates N^4, are in a quite dissimilar situation with the discrepancy between those actually employed and those shown by the projections of the model being only 5 per cent in 1973. In fact, if the economy of Sri Lanka had managed the 6 per cent growth rate targetted in the 1972–76 five-year plan, the number of science graduates employed and the numbers shown by the model are equal.

When we look at the enrolments at third level, we find, once again, some marked discrepancies. The figures required, according to the model, for the current growth rate are arts enrolments, n^3 3,700, and science enrolments n^4 1,500. The actual figures are 10,100 and 5,500 respectively. In fact, we would need a growth rate of 12 per cent to justify such enrolment figures. This may seem surprising for the science graduates but the Sri Lanka economy is able to absorb very little increase of these graduates without a very large expansion in the industry sector into which most of them go.

So confining ourselves to the figures for the variables in the model, we find that in order to utilize the manpower that will be generated by present enrolment rates we would need a growth of GNP of 12 per cent to absorb third level graduates and a massive 18 per cent to absorb secondary graduates. Not even the lowest of these figures seems remotely attainable. If it was, the existing discrepancy between total manpower stocks and employed manpower could be easily absorbed within a couple of time periods, due to the very large overall expansion of manpower demand. Looking at more realistic figures of GDP growth, say between the 3.4 per cent attained and the 6 per cent targetted, one can only see a very large increase in graduate unemployment at all levels between 1973 and 1985.

If we step outside the confines of the model to use supply projections for secondary and third level graduates given by government sources we come up with two sets of the projections shown in Table IV. One projection gives us a figure of 108,700 third level graduates by 1985 the other 119,800. To absorb this number of graduates, a growth rate between 10 and 11.5 per cent is necessary. For secondary graduates, the projected government figures are between 2,534,900 and 2,337,800. To absorb this number, a growth rate of GDP between 16.5–18 per cent would be necessary. In terms of orders of magnitudes the figures generated wholly within the model produces very similar results to using these externally generated supply figures, whichever ones we use, the prospects for productively absorbing all of the educated manpower that will be produced by 1985 seems very unlikely indeed.

TABLE IV

ALTERNATIVE PROJECTIONS FOR THE CUMULATIVE ADDITION TO THE STOCK OF EDUCATION MANPOWER AND SCHOOL ENROLMENTS, 1979 AND 1985

(In thousands)

Level	Alternative 1		Alternative 2	
	1979	1985	1979	1985
Cumulative addition to stock:				
Second level	1610.6	2534.9	1610.8	2337.8
Third level	70.2	108.7	73.0	110.8
School enrolments:				
Second level	614.1	810.0	604.0	784.6
Third level	26.1	35.9	29.2	45.5

IV. CONCLUSIONS

There can be little doubt from the results of the study that the problem of graduate unemployment in Sri Lanka is a major one. Not only does the country have many more graduates today than it can productively absorb but the problem, once those presently enrolled enter the labor market, is going to get much worse. There is no foreseeable rate of growth that the economy can attain that will be able to absorb its stocks of educated manpower.

In 1973, the problem seemed to be largely one of unemployed secondary graduates and third level arts graduates. These people will continue to find it hard to get jobs but they will increasingly be joined by graduates from the sciences. The present rate of output of science graduates cannot be absorbed unless there is a high rate of expansion in the industrial sector.

There is little evidence that an adjustment of expectations would alter the overall level of unemployment in Sri Lanka. If third level graduates adjust their expectations downwards and take jobs at present held by secondary graduates, it would merely cause unemployment to rise amongst these graduates, and so on, down through the job market. There is, quite simply insufficient productive employment for the labor force in Sri Lanka, this is particularly obvious for that part of the labor force which embodies a substantial investment in education. An investment that would appear to represent a large misallocation of resources and one that is unlikely to show a positive return.

If the problem was confined to Sri Lanka it would not be great cause for concern. It is, after all, a relatively small country. But it shares, with many other countries of Asia, a number of features, not least its poverty but also its provision of free education. It differs from these other countries only in having provided such free education for the past twenty-five years, a lead of ten to fifteen years on most countries. Today, urged on by the encouragement and funding of international agencies and richer countries, most poor Asian countries are in a period of rapid and massive educational expansion. The provision of such education may be per se good but it does represent a substantial investment of scarce resources, an investment that can provide no return if the graduates

of the education system are not employed. The situation in Sri Lanka today should give countries who are currently expanding educational opportunities pause for thought. At least some of the resources that are being put into schools and universities may better be used to expand the job opportunities for the graduates from these institutions.

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APPENDIX

DATA SOURCES

There is a great deal of data available for Sri Lanka, both the Central Bank of Ceylon and the statistical office collect and disseminate a mass of figures relating to the economy. Many of the figures are inconsistent. For the purpose of this study the two most useful sources were:

Central Bank of Ceylon. *Survey of Sri Lanka's Consumer Finances, 1973,* Part 1 and 2 (Colombo, 1974).

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There were supplemented with two wider statistical series:

Department of Census and Statistics. *Socio-Economic Survey, 1969–70* (Colombo: Government Press, 1973).

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