

INVESTMENT IN EDUCATION AND HUMAN CAPITAL CREATION IN CUBA: where is the economic variable?

by

MANUEL E. MADRID-ARIS*
Florida International University
Department of Economics
inera@earthlink.net

This Draft: July 31,2002

**Paper Prepared for Presentation at Twelfth Annual Meeting of the Association for the Study
of the Cuban Economy (ASCE), Coral Gables, Florida, - August 1-3, 2002**

PRELIMINARY DRAFT: Please do not quote without author authorization

* I would like to express my deepest appreciation to Rodrigo Garcia for his helpful research assistance. The views expressed, opinions and conclusions reached in this paper are those of the author, and do not necessarily reflect those of the institutions with which the author is affiliated.

1. INTRODUCTION

This paper has four goals. The first goal is to provide detailed statistics regarding historical investment in education and the human capital structure in Cuba. The second goal is to compare the Cuban educational investment and human capital structure with other less developed countries (LDCs) as well developed countries. The third goal is to find some explanations to justify the abnormal distribution by field of specialization of the human capital in Cuba. The fourth goal is to find insights which could help explaining the negative relationship between human capital creation and decreasing long-term total factor productivity.

It is well known that one of the main problems faced by any government is allocating scarce resources across competing activities and sectors. The choice between alternative investment such as investment in education versus investment in physical infrastructure, or military investment depends on society's objectives and mainly on the analysis between cost of the investment versus the future benefit to be derived from that investment. Education is seen as an investment by economist, therefore, it must be allocated efficiency accordingly with the demand coming from the different sectors. Education is valued for its immediate as well as for its future benefits. Thus, the distribution of educational investment affects the future income distribution, hence, equity plays an important role in educational investment decisions. Different societies give different weight between the objectives of efficiency and equity in defining an educational investment.

Economist and policy makers normally estimate empirically the return on education for policy purposes and educational investment decisions. The estimates of return on education can be obtained by two different methodologies; first by the elaborate method or full discounting method; and second, by the "earning function," which can use an extended earning function, or the basic earning function (Mincer, 1974).¹ Unfortunately, Cuban statistics are very poor, and does not allow an empirical analysis to estimate return to education. Given that limitation, and the need to have a better understanding of the human capital in Cuba, this paper applies a simple comparative analysis with the purpose to draw conclusions regarding educational investment and human capital structure in Cuba. Several questions are presented in this paper, but this comparative analysis does not pretend to fully answer them. This paper only intends to address the increased educational investment in Cuba and find insights behind the creation of the uncommon human capital structure that the Cuban economy presents.

The remaining of this paper is organized as follows. Section 2 provides a brief review of the historical patterns of Cuban enrollment and educational investment. Section 3 contains a comparative analysis of the distribution of talents or human capital structure in Cuba. Section 4 contains a comparative analysis between Chile and Cuba regarding change in social indicators and the process of human capital creation in the field of medicine. Section 5 contains a summary regarding overinvestment in human capital. The final section contains the conclusions.

¹ For further details about rate of return estimation methodologies, see Psacharopoulos and Ng (1994), Herrera and Madrid-Aris (2000).

2. HUMAN CAPITAL AND EDUCATIONAL INVESTMENT IN CUBA

2.1 Enrollment and Education of the Labor Force

Table 2.1 contains data on enrollment per 1,000 habitants by educational levels in Cuba between 1958 and 1985.

TABLE 2.1: Student Enrollment by Level of Education (per 1,000 habitants)

Year	Primary Education	Secondary Education	Higher Education	Other Education	TOTAL ENROLLMENT
1958	104.9	11.8	3.8	0	120.5
1970	193.4	24.9	4.1	32.4	254.8
1975	205.2	57.1	9.0	31.3	302.6
1980	164.2	110.0	15.7	6.8	296.7
1985	116.8	110.0	23.2	2.0	252.0

Note: For Cuba, secondary education includes technical schools. Other types of education include the worker farm educational program developed after the revolution.

Source: see table A-1 in Appendix.

Cuba's rate of enrollment increased considerably during the period 1959-1985. The human capital accumulation has been quite rapid in Cuba during the last 35 years. Without looking at economic variables such as the amount invested in education and the return on human capital creation, it could be concluded that the Cuban government was successful in achieving a high rate of enrollment during this period. Table 2.2 shows the labor force composition in Cuba and other Latin American countries.

TABLE 2.2: Labor Force Composition by Educational Level as Percentage of Total Labor Force(%)

COUNTRY	YEAR	Illiteracy	Primary Education	Secondary Education	University Education	Unspecified
Colombia	1950	37.7	54.8	5.4	1.1	1.0
	1960	27.1	63.7	6.1	0.8	2.3
	1970	4.5	56.6	30.6	8.6	0.0
Chile	1950	n.a	77.4	20.2	2.3	.1
	1960	n.a	75.1	22.3	2.6	0.0
	1970	8.3	52.2	31.5	3.3	4.7
	1990	6.0	45.0	41.0	13.0	0.0
Brazil	1950	48.3	44.0	6.6	1.1	0.0
	1960	41.5	50.5	6.8	1.2	0.0
	1970	28.3	58.1	11.7	1.9	0.0
Cuba	1960		63.7*	34.3	2.1	0.0
	1970		56.3*	40.7	3.0	0.0
	1980		37.6*	57.5	4.9	0.0
	1982		36.4*	57.7	5.9	0.0
	1986		24.3*	67.7	8.0	0.0
	1996		17.3*	70.0	12.7	0.0

Notes: *this figure includes illiteracy and primary education.

Source: Cuban figures estimated by the author using Anuarios Estadísticos de Cuba (several years). Figures from other Latin American countries, from Elias (1992, page 92), and UNESCO (several years).

As the previous table shows, the share of people with only primary education in the total labor force was initially large, but decreased considerably between 1960 and 1986. In addition, an uniform increase in university-educated workers is observed. Through the years, the quality of the labor force in Cuba has increased considerably.

2.2 Educational Investment in Cuba

Table 2.3 shows the historical investment in education and health in Cuba.

Table 2.3: Educational Investment in Education and Health in Cuba

	1960	1965	1970	1980	1987	1989	1992	1995	1998
Investment in Education (Constant Cuban \$ - millions)	83.7	260.4	351.1	1,340.8	1,600	1651	1427	1359	1510
Investment in Health (Constant Cuban \$ - millions)	51.3	148.9	216.4	440.2	810.2	905	938	1108	1345
Education Investment/GDP	0.031	0.057	0.062	0.091	0.088	0.079	0.087	0.059	0.058
Health Investment/GDP	0.02	0.033	0.038	0.030	0.045	0.044	0.057	0.048	0.052

Source:

Investment data for 1960-1987 from Rodriguez, 1990, p.218 and p.293

Investment data for 1889-1998 from Cepal (1998, Tables A-1 and A-8, and 1999, tables 1 and 26).

Cuba's investment in education increased considerably from 1960 to 1992. In 1960, it was only 3.1% of total output, and increased to a level of 9.1% in 1980. Following the end of the Cold war, the lack of Soviet subsidies led to the reduction of educational investment from 8.7% to a level of 5.8% of total output. With the purpose of having international references² regarding educational investment, data from other economies is presented in Table 2.4.

Table 2.4: Educational Investment in Education in Selected Countries (as % of GDP)

COUNTRY	EXPENDITURE IN EDUCATION AS % GDP				
	1960	1970	1980	1990*	1995
Cuba	3.1	6.2	9.1	8.7	5.8
Argentina	2.1	2.8	2.7	3.3	3.4
Brazil	1.9	N.A.	3.6	4.6	N.A.
Chile	2.7	3.0	4.6	3.0	3.2
Colombia	1.7	N.A.	1.9	3.5	N.A.
Mexico	1.2	3.5	4.7	4.1	5.3
Panama	3.6	5.2	4.9	5.5	5.4
Thailand	2.3	3.0	3.8	3.8	4.2
Hong-Kong	2.7	N.A.	2.8	3.0	2.9
United States	5.3	5.2	5.0	6.4	5.9

Source: UNESCO, Statistical yearbook (several years).

Notes: *data varies by country from 1989 to 1993.

Comparing investment in education in Cuba with respect to other countries, it is fair to say that the educational investment in Cuba has been extremely high during the period 1970-1990. Comparatively with other Latin economies, Cuba during the 70's and 80's invested more than double in

² Although educational investment relative to GDP can give a general idea about the relative amount invested in education, it is known that comparing investment figures across countries in education can lead to misleading results given accounting problems.

education. Even today, Cuba still invest a large percentage of its GDP (5.8%) in education compared with other Latin American economies.

Despite the large amount of resources invested in education during the 70's and 80's, the Cuban economy presents decreasing TFP (see Madrid-Aris, 1998), contrary to what an economist will expect. With the purpose of finding insight to this negative relationship between human capital and TFP, in the next sections of this paper an analysis of the Cuban human capital structure is presented.

2.3 Educational Investment, Social Indicators and Human Development Index in Latin America

Table 2.5 shows the historical pattern of some social indicators, human development index and educational investment in Cuba and other Latin American countries.

TABLE 2.5: Social Indicators, Human Development Index and Educational Investment

COUNTRY	YEAR	Literacy Rate (%)	Fife Expectancy	Human Development Index (HDI)	Educational Investment as % GDP
Argentina	1970	94	66	0.781*	2.8
	1990	96	71	0.804	3.3
	1998	97	73	0.837	3.4
Chile	1970	89	62	0.702*	3.0
	1990	96	72	0.780	3.0
	1998	96	75	0.826	3.2
Colombia	1970	84	61	0.657*	N.A.
	1990	88	65	0.720	3.5
	1998	91	71	0.764	N.A.
Brazil	1970	70	59	0.639*	3.8
	1990	78	65	0.706	4.6
	1998	84	67	0.747	
Costa Rica	1970	91	67	0.732*	6.0
	1990	93	75	0.775	4.6
	1998	96	76	0.797	4.5
Cuba	1970	94	69	0.687*	6.2
	1990	96	74	0.757	8.7**
	1997	96	75	0.783	5.8

Source:

UNDP, Human Development Reports (several years), World Bank, World Development Reports (several years) and UNESCO, Statistical Yearbook (several years).

Notes:

Values of Human Development Index are based on new methodology values. For further information, see Human Development Report, year 1999, pages 159-163.

* HDI value is 1975 value instead of 1970; **Value is based on year 1992 instead 1990.

Data reveals that countries such as Costa Rica, and Chile have achieved similar levels of social indicators as Cuba, but with less investment in education. On the other hand, these countries present a higher Human Development Index than Cuba.

3. HUMAN CAPITAL STRUCTURE WITH HIGHER EDUCATION IN CUBA: a comparative analysis

One of the goals of this section is to determine the historical structure of human capital creation in Cuba, and draw some conclusions regarding human capital creation and the historical decreasing patterns of TFP.³

3.1 Historical Human Capital Structure with Higher Education

Table 3.1 shows the number of graduates by field of specialization in Cuba for the period 1965-1995.

Table 3.1: Number of University Graduates by Field of Specialization in Cuba

FIELD OF SPECIALIZATION	NUMBER OF UNIVERSITY GRADUATES BY FIELD OF SPECIALIZATION (numbers)						
	1965	1969	1976	1980	1986	1990	1995
Humanities	123	199	519	533	400	205	446
Education	422	376	2464	13691	11137	18817	10975
Fine Arts	60	45	92	152	178	242	139
Law	43	63	906	650	357	550	339
Social Sciences	173	288	118	383	1637	2401	1154
Economics/Business	540	680	1037	1659	1334	1508	1154
Natural Science	35	261	362	623	332	398	420
Engineering	334	805	439	2919	4131	3887	4626
Medicine	511	784	1515	2409	3536	5468	7328
Agricultural	104	190	902	1739	2313	1623	1769
Others	130	283	879	1140	1784	1660	2840
TOTAL	2475	3974	9233	25898	27139	36759	31193
Graduate as % population	0.032%	0.048%	0.11%	0.27%	0.27%	0.35%	0.28%

Source: Statistical Yearbook, UNESCO (several years), section Educational Attainment.

As shown in previous table, the number of university graduates increases considerably from 1965 to 1990. The number of graduates as percentage of total population decreases after 1990, from 0.35% to a level of 0.28%. This decrease is most likely a result of a lower amount invested in education after the end of the Cold War. Table 3.2 shows the relative weight in percentage basis of each field of specialization.

³ Normally a human capital distribution across different field of specialization which is compatible with the market demand has a positive relationship with total factor of productivity (TFP) growth. As example, an economy that over invest in producing doctors and does not produce sufficient engineers, will probably not present a high rate of technological change in industrial sector and as a whole.

Table 3.2: Cuban Graduates as Percentage of Total University Graduates

FIELD OF SPECIALIZATION	GRADUATES BY FIELD OF SPECIALIZATION (as % of total graduates)						
	1965	1969	1976	1980	1986	1990	1995
Humanities	5.0	5.0	5.6	2.1	1.5	0.6	1.4
Education	17.1	9.5	26.7	52.9	41.0	51.2	35.2
Fine Arts	2.4	1.1	1.0	0.6	0.7	0.7	0.5
Law	1.7	1.6	9.8	2.5	1.3	1.5	1.1
Social Sciences	7.0	7.3	1.3	1.5	6.0	6.5	3.7
Economics/Business	21.8	17.1	11.2	6.4	4.9	4.1	3.7
Natural Science	1.4	6.6	3.9	2.4	1.2	1.1	1.4
Engineering	13.5	20.3	6.8	11.3	15.2	10.6	14.8
Medicine	20.7	19.7	16.4	9.3	13.0	14.9	23.5
Agricultural	4.2	4.8	9.8	6.7	8.5	4.4	5.7
Others	5.2	7.0	7.4	4.3	6.7	4.7	9.0
TOTAL	100%	100%	100%	100%	100%	100%	100%

Source: estimations by the author based on UNESCO data.

Since 1965, the number of graduates in the field of economic/business has decreased considerable from 21.8% to a minimum level of 3.1% in 1995. The same phenomenon happened in the field of engineering, which decreased from a 13.5% in 1965 to a level of 10.6% in 1990. On the other hand, Cuba considerably increased the human capital in the field of education. Education graduates increased from 17.1% in 1965 to a level of 51.2% in 1990. From 1990 to 1995, the major changes are observed in education and medicine. A decreased of graduates from educational field from 51.2% to 35.2% is observed, and an increased in the field of medicine from 14.9% to 23.5%.

3.2 Gender Participation in the Human Capital Structure with Tertiary Education in Cuba

Table 3.3 shows women participation in the different field of specialization.

Table 3.3: Women Participation in Cuban University Graduates (as % of total graduates)

FIELD OF SPECIALIZATION	WOMEN PARTICIPATION IN DIFFERENT FIELD AS PORCENTAGE OF TOTAL GRADUATES (%)					
	1969	1976	1980	1986	1990	1995
Humanities	47.7	45.8	N.A.	75.7	65.8	73.9
Education	N.A.	41.0	N.A.	66.9	66.0	72.4
Fine Arts	40.0	N.A.	N.A.	47.8	71.1	40.6
Law	34.9	21.3	32.3	76.2	67.1	64.3
Social Sciences	32.3	35.6	36.0	52.5	47.1	63.8
Economics/Business	N.A.	42.4	44.6	65.3	61.5	41.3
Natural Science	39.5	61.6	61.0	62.6	61.6	55.5
Engineering	18.0	13.2	21.2	52.8	41.2	39.5
Medicine	41.6	N.A.	N.A.	67.8	58.8	70.4
Agricultural	30.5	21.1	29.0	40.3	38.6	46.6
Others	N.A.	N.A.	N.A.	19.8	27.6	23.7

Source: estimations by the author based on UNESCO data.

Evidence shows that the number of women graduating from Cuba's universities have increased considerably since 1965, and today more than two thirds of the graduates are women. Today, in most fields, the number of women graduating from the university is higher than the number of men, with the exemption of engineering and agricultural sciences

3.3 Comparative Analysis of Distribution of Talents

After analyzing the figures previously presented, the key questions are: Was there any need to allocate such magnitude of resources for education in Cuba during 1970-1992?, Has Cuba overinvested in human capital during the 70's and 80's?, Is a 40% of the university graduates coming from educational field a normal pattern?, Does any society need more than 23% of the graduates to be doctors in order to improve social indicators as those achieved by Cuba?

With the purpose of finding answers to the above questions, in this section, the Cuban human capital structure is analyzed and compare with the human capital structure of other economies. It is widely known that economies differ from each other, and each economy has a need of a human capital structure compatible with the demand in order to produce efficiency. For instance, an agricultural based economy will need more graduates from the agricultural field than from other fields. A services based economy will need more graduates from economics/business and social sciences than an agricultural society. Hence, for comparative purposes, human capital structures of several economies are being presented. Table 3.4 shows the distribution of university graduates in Southeast Asian countries.

Table 3.4: Graduates by Field of Specialization in Southeast Asia (as % of total graduates)

FIELD OF SPECIALIZATION	GRADUATES BY FIELD OF SPECIALIZATION (as percentage of total graduates)				
	Cuba (1995)	Indonesia (1996)	Hong-Kong (1991)	Singapore (1995)	South-Korea (1995)
Humanities	1.4	4	7	8	11
Education	35.2	17	9	7	8
Fine Arts	0.5	3	2	2	7
Law	1.1	7	1	1	2
Social Sciences	3.7	5	6	6	8
Economics/Business	3.7	18	29	22	20
Natural Science	1.4	1	4	11	4
Engineering	14.8	28	33	36	26
Medicine	23.5	3	4	4	7
Agricultural	5.7	10	0	0	4
Others	9.1	4	5	3	3
TOTAL	100%	100%	100%	100%	100%

Source: estimations by the author based on UNESCO data.

Generally, in Southeast Asia graduates from education combined with humanities graduates are lower than 21% of total graduates. On the other hand, graduates from engineering ranges from 26% to 36%, value much larger than that observed in Cuba. Graduates from economics/business combined with social sciences ranges between 23% and 35%, value considerably superior than the low value of 7.4% observed in Cuba. In Southeast Asia graduates from medicine normally ranges from 4% to 7% whereas

in Cuba is 23.5%. Table 3.5 shows the distribution of university graduates in some Latin Countries and the U.S..

Table 3.5: Graduates (as percentage of total university graduates) in the U.S. and L.A.

GRADUATES BY FIELD OF SPECIALIZATION						
(as percentage of total graduates)						
FIELD	Cuba (1995)	Mexico (1990)	Brazil (1993)	Colombia (1991)	Chile (1995)	USA (1995)
Humanities	1.4	2	8	1	4	13
Education	35.2	16	9	20	13	10
Fine Arts	0.5	2	1	3	3	3
Law	1.1	7	10	8	2	2
Social Sciences	3.7	7	9	5	11	9
Economics/Business	3.7	21	22	26	28	24
Natural Science	1.4	3	2	1	2	3
Engineering	14.8	20	10	21	20	13
Medicine	23.5	10	10	9	8	12
Agricultural	5.7	4	3	3	4	1
Others	9.1	8	16	3	4	10
Total Graduates (#)	100%	100%	100%	100%	100%	100%

Source: estimations by the author based on UNESCO data.

Data from different Latin American economies and the U.S. suggest that there is a pattern in the distribution of the graduates. As example, in most countries the percentage of graduates from medicine ranges from 10 to 12%, in economics/business ranges from 21% to 28%, and education combined with humanities ranges from 17% to 23%. The level of graduates in Latin America and the U.S from the field of social sciences combined with business/economics range from 28% to 39%.

In sum, empirical evidence from South-East Asia, Latin America and the U.S. exhibit that a normal level of graduates from social sciences combined with business/economics graduates should be around 30%, rather than at the minimal level of 7.4% as Cuba presents.

The global evidence presented in this paper reveals that Cuba is generating an oversupply of graduates from the field of education and medicine. On the other hand, the number of graduates from social sciences, economics/business and engineering is extremely low in Cuba This is ironic, because Cuba's centrally planned revolutionary development strategy was oriented toward obtaining resources from agriculture to develop an industrial economy. But, the reality is that the Cuba's central planning system did not create sufficient engineers needed to create an industrial economy. As evidence shows, some newly industrialized countries (NICs) from Southeast Asia (e.g. South Korea) needed approximately 30% of the graduates from engineering to become an industrial economy.

The oversupply of labor in the specific fields of medicine and education seems to be the result of an inefficient educational policy implemented by the Cuban central planning system. Due to the oversupply of certain type of labor, the Cuban government normally send the excess labor force as volunteer workers worldwide as an alternative to reduce domestic unemployment. Thus, between 1963 and 1999, 41,400 physicians-nurses and 42,400 teachers were sent to give assistance in other countries

(Figueras, 2000). According to Brundenius (2000), the number of doctors and nurses sent out by Cuba in the period 1963-1999 surpasses those sent by the World Health Organization (WHO) within the same period. In other words, Cuba's international volunteer workers had been a natural outcome from the inadequate educational policies implemented in Cuba.

4. EDUCATIONAL INVESTMENT IN MEDICINE, SOCIAL INDICATORS AND EFFICIENCY: A comparative analysis

With the purpose of having better understanding of the Cuban human capital creation in the field of medicine, a comparative analysis between Cuba and Chile is presented in this section.

TABLE 4.1: Social Indicators and Number of Doctors in Cuba and Chile

YEAR OR PERIOD	Average Rate of Population Growth (%)	Infant Mortality (per 1000 births)	Life Expectancy (years)	Illiteracy Rate (%)	Doctors per 10,000 habitants
CUBA					
1959	1.4	35.0	64	21.0	9.2*
1960-1964	2.0	37.9	n.a	7	7.6
1965-1969	1.9	39.3	n.a.	6	7.8
1970-1974	1.7	32.3	n.a	5	7.6
1975-1979	1.1	15.8	n.a	4	13.2
1980-1988	1.0	16.4	n.a	4	21.4
1989-1995	0.9	14.0	75.4	4	32.8
CHILE					
1960	n.a.	119	57	n.a	n.a
1965	2.0	97	59	11	4.7
1974	1.9	74	64	8	6.8
1988	1.7	18	72	5	9.2
1995	1.6	12	75.1	4	11.8

Note: *this value corresponds to 1958 value.

Source:

For Cuba: CEE, Anuario Estadístico de Cuba, several years, Dominguez (1978), Rodriguez (1990), and Zimbalist and Brundenius (1989), Mesa-Lago (1994).

For Chile: Castañeda (1992), World Bank, World Development Report (several years), UNICEF (several years), IDB, Economic and Social Progress in Latin America (1996).

The average rate of population growth in Cuba was 1.9% during the 60's, 1.4% during the 70's and only 0.9% during the 80's. At the same time infant mortality was reduced considerably. The low Cuban rate of population growth could be explained by two factors: first, the emigration of Cuban people to other countries; second, by the fact that the women participation in labor force has increased considerably since 1965. Thus, today Cuba presents the lowest population growth rate over all Latin American countries.

The infant mortality in Cuba per 1,000 births was 37 in 1965, and it was reduced to 12 by 1995. The number of doctors per 10000 habitants in 1965 was 7.5 and thanks to the increased investment in medical education, this indicator rose to an extremely high level of 40 in 1995. Note that some statistics even argue that in 1998 the number of doctor per 10,000 people in Cuba was 51 (Informe Económico, 1998). This figure would imply that Cuba has the highest number of doctors per-capita in the world.

In 1965, Chile health indicators were much inferior to Cuba, and by the 1990 Chile had achieved the same level of social indicators as Cuba with only 11.8 doctors per 10,000 habitants, and with less than half of the investment in education (see table 4.2). Note that historically the intensity of physical capital in health sector which is normally measured by the number of beds per 10,000 habitants of Chile and Cuba have been similar.⁴ Given similar intensity of capital in health sector in both countries, it could be argue that the average productivity of a Chilean doctor with respect to the health indicators has been more three times the productivity of a Cuban doctor. The success of Chile in this area could be attributed to a better utilization of the doctors in the market place, and by an adequate educational policy in medicine which is designed to meet market demands.

The infant mortality and the number of doctors have been always mentioned as the success of the central planning system and its has been mention has indicators of achieving a high level of development. Given that the concept of development implies many other elements, the key question regarding doctors and infant mortality in Cuba should be: Was there any need to educate such a high number of doctors in Cuba?. The answer from the analysis presented in this paper is not.

TABLE 4.2: Doctors, Infant Mortality and Educational Investment in Selected Countries

COUNTRY	Number of Doctor (per 10000 habitants)			Infant Mortality (per 1000 live births)			Investment in Education (% of total output)	
	1965	1984	1995	1965	1984	1995	1965	1988
Japan	10.3	15.1	17.7	18	5	4	n.a.	5.0
USA	14.9	21.2	24.5	25	10	7	n.a.	5.7
Germany	15.6	26.3	31.0	24	8	5	4.0	6.2
Norway	12.6	22.2	24.0	17	8	4	4.2	6.6
Switzerland	14.1	14.1	30.1	18	7	5	n.a.	5.1
Netherlands	11.6	22.2	23.8	14	8	5	4.9	6.6
Canada	13.0	19.6	22.1	24	7	6	n.a.	7.2
AVERAGE	13.1	20.1	24.7	20	8	6	n.a	6.0
Cuba	7.5	20.4	40.0	38	15	11	5.5	8.8
Chile	4.7	n.a	12.0	97	n.a.	12	2.7	3.0
Middle Income Countries							2.3	3.3

Source:

- (1) Number of doctors per 10000 habitants from: World Bank, World Development Report (several years), session Health and Nutrition, and from UNDP, Human Development Report (several years), session profile of human development.
- (2) Infant mortality from World Bank, World Development Report (several years).
- (3) Educational Investment from UNESCO, statistical yearbook (several years).

Comparative data presented in Table 4.1 and 4.2 reveals that the high level of doctors per 10,000 people achieved by Cuba is a clear sign of educational planning without economic considerations. As shown in Table 4.2, the most developed countries in the world have much less doctors per-capita than Cuba. Empirical evidence confirms that there is no economic or technical reason for having more than 50 doctors per 10,000 habitants in Cuba. The education of such a high number of doctors has not been

⁴ During the 60's and 70's Cuba had between 10% to 15% more beds per 10,000 people than Chile, but during the 80's and 90s the ratio of beds per 10,000 has been similar.

free. In order to achieve the goal of having more doctors in Cuba than any other country in the world, the central planning system was forced to invest in some decades more than 8% of the total output in education. It is clear that the over-production of doctors in Cuba benefits the U.S. and as well as other countries given the number of immigrants arriving with a degree in medicine.

The oversupply of doctors is not only a Cuban problem, it has been a common denominator in all centrally planned economies. By 1995 the ratio of doctors per 10,000 persons in Russia was 38, Bulgaria was 33, Belarus was 38, Georgia was 43, Latvia was 30, Hungary was 34, Kazakhstan was 36, Azerbaijan was 39, Turkmenistan was 35, and Uzbekistan was 34.

Evidence from doctors in Cuba and other former centrally planned economies clearly reveals the inefficiency of a central planning system when it comes to talent allocation or human capital creation. In conclusion is apparent that Cuban central planners did not consider economic and efficiency factors in their investment in human capital creation in the field of medicine.

5. HAS CUBA OVERINVESTED IN HUMAN CAPITAL?

Brundenius (2000) presented a comparative international data about income per-capita and the educational level of the labor force. His data is presented in Table 5.1

Table 5.1 International Comparison of Educational Attainment and GDP per-capita (1995-1998)

COUNTRY	Highest Completed Level of Education in Labor Force		Average Number of Years of Schooling of Labor Force	GDP per-capita (US\$ PPP) 1998
	With Upper Secondary Education or more	With University Education or Equivalent		
United States (1995)*	86%	33%	13.5	29,605
Denmark (1995)*	62%	20%	12.4	24,214
Sweden (1995)*	75%	28%	12.1	20,659
United Kingdom (1995)*	76%	21%	12.1	20,336
Russia (1997)**	53%	20%	11.9	6,460
Cuba (1998)***	53%	14%	10.6	3,967
Taiwan (1995)	54%	9%	9.9	15,752
Chile (1992)	43%	18%	9.3	8,787
China (1997)	16%	3.5%	7.5	3,105

Source: Brundenius (2000), page 22.

*data refer to population aged 25-64 in 1995.

** data refer to occupied labor force.

***data refer to occupied civilian labor force

****data refer to economically active population

From the above table, it is clear that Cuba has a much higher qualified labor force than other countries with similar income per-capita. The above table suggests that there is an over-investment in education in Cuba. Although, Brundenius argues that the above evidence does not necessary mean that Cuba over-invested in human capital. His hypothesis is supported by two facts. First, he

argues that the Cuban labor force has not been utilized efficiently as result of slow population growth coupled with the aging population, thus, once these tendencies is reversed, it could be a shortage of labor. Second, he argues that Cuba is an internationalist country, in the sense that labor, specifically teachers and doctors, have been sent to poor countries worldwide to volunteer.

Regarding over-investment in human capital in Cuba is important to keep in mind the following facts. First, human capital depreciates rapidly and from the economic point of view there is no sense to invest scarce resources in human capital that will not be fully utilized in the short-term. The 50 years decreasing tendency in population growth observed in Cuba is not likely to change in the near future. Even, if the rate of population growth increases in the future, Cuba will not be able to absorb the large number of doctors and teachers already graduated. The number of doctors per-capita that Cuba has could not be fully utilized in a developed economy and it is not very likely that Cuba will be a developed country before that human capital depreciates. It would have had more sense to educate engineers, economist/business and social scientist to achieve a higher level of industrialization and in order to achieve better TFP and economic growth.

Second, it has no economic sense to invest in human capital that is utilized for volunteer work worldwide. Volunteer labor follows political agenda, instead of economic efficiency goals. The extensive evidence presented in this paper clearly suggest that Cuba became an internationalist country as result of a inadequate educational policy implemented which create an oversupply of some specific labor which could not be employ domestically. Finally, empirical evidence confirms that there is at least an over-investment in human capital creation in the field of medicine and education.

6. CONCLUSIONS

Investment in education figures show that Cuba has invested a larger proportion of their output in education compared with other less-developed countries. Evidence also reveals that there was an over-investment in education in the 70s and 80s in Cuba. Thus, allocation of resources in Cuban education have not been planned efficiency, since there is no reason why a less developed economy as Cuba needs to invest considerably much more resources in education than most economies.

With respect to gender and tertiary education, evidence from university graduates show that woman participation has increased considerably in the last 30 years in Cuba. Today the number of women graduating from the university is superior to men.

Data shows that most graduates from the field of education and medicine could not have been absorbed by the Cuban economy efficiently. This unsuitable distribution of talents could have directly resulted from a deliberately planned policy by the Cuban Central Government to achieve its own political agenda rather than efficiency goals. An oversupply of teachers, trained under socialist ideology, allows the central government to indirectly promote socialism to future generations with the purpose of perpetuating their socialist system.

Another possible reason for this disproportionate creation of human capital in Cuba could have resulted from the lack of knowledge of the central planners regarding the adequate human capital structure that an economy needs to achieve the high level of TFP and efficiency.

Evidence from Chile and other developed countries proves that there was no necessity to produce the large numbers of doctors observed in Cuba to achieve the actual Cuban health indicators. Educational resources allocated in the field of medicine and education were not efficiently allocated in Cuba. More resources should have been directed to the fields of engineering, economics/business, and social sciences in Cuba.

Cuba's decreasing pattern of TFP growth for the period 1962-1989 (see, Madrid-Aris, 1998), together with the empirical evidence of human capital presented in this paper, suggest that the TFP growth observed during the 80's in Cuba, may have been the result of improper allocation of resources in human capital creation. The Cuban economy historically has lacked of human capital graduating from economics/business and engineering. On the other hand, it is widely known from empirical growth studies that investment in this type of human capital is fundamental for having technological change in an economy.

Finally, it could be concluded that governmental creation of institutional mechanisms to plan tertiary education may not always be an efficient way of creating the adequate human capital structure that the economy needs which would ultimately lead to technological change and growth.

REFERENCES

- Banco Central de Cuba, "Informe Económico," La Habana: Ediciones Pontón Caribe, 1998.
- Becker, Gary. *Human Capital: A Theoretical and Empirical Analysis With Special Reference to Education*. NBER: The University of Chicago Press, 1963.
- Brundenius, Claes, "The Role of Human Capital in Cuban Economic Development, 1959-1999," Working Paper, Center for Development Research, Copenhagen, November 2000.
- Central Intelligence Agency (CIA), Directorate of Intelligence. *The Cuban Economy: A Statistical Review*. Washington D.C., 1984, 1989.
- Comité Estadístico Estatal (CEE), Anuario Estadístico de Cuba, Havana, several years
- Elias, Victor. *Sources of Growth: A Study of Seven Latin American Economies*. San Francisco: ICS Press, 1992.
- Figueras, Miguel. *Aspectos Estructurales de la Economía Cubana*. Editorial de Ciencias Sociales, La Habana, Cuba, 1994.
- Figueras, Miguel. "Colaboración Internacional: doctrinas y políticas cubanas," paper presented to Latin American Studies Association, XXII International Congress, Miami, 16-18 March, 2000.
- Henandez-Cata, Ernesto, "The Fall and Recovery of the Cuban Economy in the 1990s: Mirage or Reality?," International Monetary Fund, working paper, 2000.
- Herrera, Victor, and Manuel Madrid-Aris, "Earnings Profiles and Return to Education in Panama" paper presented in LACEA Annual Meeting, Catholic University of Rio de Janeiro, October 12-14, 2000.
- Inter-American Development Bank, Economic and Social Progress in Latin America, Washington D.C., 1996.
- Jimenez, Georgina. *Hablemos de Educación, Recopilación de Artículos, Comentarios y Reportajes sobre Educación*. La Habana: Editorial Pueblo y Educación, 1985.
- Madrid-Aris, Manuel, "Growth and Technological Change in Cuba," in *Cuba in Transition*, Volume 7, published by the Association for the Study of the Cuban Economy, Washington D.C., 1997.
- Madrid-Aris, Manuel, "Investment, Human Capital, and Technological Change: Evidence from Cuba and its Implications for Growth Models," in *Cuba in Transition*, Volume 8, published by the Association for the Study of the Cuban Economy, Washington D.C., pp. 465-481, 1998.
- Madrid-Aris, Manuel, "Education's Contribution to Economic Growth in Cuba" in *Cuba in Transition*, Volume 10, published by the Association for the Study of the Cuban Economy, Washington D.C., 2000.
- Mesa-Lago, Carmelo y Jorge Perez-Lopez, "A Study of Cuba's Material Product System, its Conversion to the System of National Accounts, and Estimation of GDP per Capita and Growth Rates," *World Bank Staff Working Papers*, Number 770, 1985.
- Mincer, Jacob. *Schooling, Experience and Earnings*. New York: Columbia University Press, 1974.
- Perez-Lopez, Jorge. *Measuring Cuban Economic Performance*. Austin: University of Texas Press, 1987.
- Psacharopoulos, George, "Returns to Investment in Education: A Global Update," *World Development*, 22(9):1325-134, 1994.

Psacharopoulos, George. *Economics of Education: Research and Studies*. New York: Pergamon Press, 1987.

Psacharopoulos, George, and Y.C. Ng, "Earnings and Education in Latin America: Assessing priorities for schooling investment," *Education Economics*, Vol 2, pp. 1325-1343, 1994. .

Schultz, T. Paul. "Education Investment and Return." In *Handbook of Development Economics*, eds. H. Chenery and T.N. Srinivasan, eds, Chapter 13. New York: North Holland, 1988.

United Nations Development Program. *Human Development Report*. New York: Oxford University Press, several years.

UNESCO. *Statistical Yearbook* , several years.

World Bank. *World Development Report*, Oxford University Press, several years.