

CHAPTER-IV

ESTIMATION OF GAINS AND LOSSES FROM BRAIN-DRAIN

4.1 INTRODUCTION :

An attempt has been made in the earlier chapters to discuss the theoretical foundations of Brain-Drain while concluding the second chapter, it has been pointed out that the prevalent theories on Brain-Drain are not acceptable today, particularly in view of the problems faced by a country like India. Hence a new theoretical model has been suggested in the conclusion of the second chapter.

In this chapter, we resume the discussion of the model and then we attempt the actual quantification of the variables used in the model in the Indian context.

4.2 RESUME OF THE NEW MODEL :-

As has been suggested in the second chapter, the less developed countries enjoy certain gains while it has to bear with certain losses stemming from the brain drain.

We define the less developed countries first and then we to the quantification of the gains and losses.

The characteristic features of the less developed countries differ from country to country in so far as their geographical setting is concerned but most of their features are common. We define the less developed country as the country that fulfills the following conditions :-

- a) It is a labour surplus economy.
- b) The supply of skilled manpower is relatively inelastic.
- c) In spite of wide spread unemployment, remunerative jobs are not difficult to be obtained for the educated trained and skilled persons.
- d) The average income of a skilled worker in such a country is less than that of a similar worker in a developed country.

The country fulfilling above conditions for being called to be a less developed country will have the following effects of brain-drain.

- a) The incomes of those who remain behind will have no impact of the of the brain-drain.
- b) The income of those going abroad will be normally improved.
- c) The huge costs (particularly considering the time consumption involved in imparting higher education and wastages due to inefficiency in financing education), that are involved in educating the emigrants are not likely to be directly compensated.
- d) The sending country will lose the potential incomes of the emigrants for the period for which they migrate.
- e) The sending country will also lose the emigrants contribution to the tax revenue.

- f) The country will have to bear the loss of externalities of the emigrants, (the externalities are very difficult to be quantified), as they are not likely to be easily compensated through replacement.
- g) The country will gain from the brain-drain by way of inward remittances sent by the emigrants.

Apart from these effects, the other effects such as the loss of talent, research by the emigrants etc. can not be denied.

The receiving country which is usually a developed one, will be benefited from the Brain-Drain. The benefits received by such a country will accrue in the following ways :-

- a) The immigrant directly adds to the national income of the country.
- b) The receiving country is in a position to receive direct as indirect taxes from the immigrant.
- c) The country saves in respect of the investment required to be made in education and training of the skilled manpower.
- d) The country is directly benefited from the research and the like activities of the immigrant.

It is thus clear that the receiving country is usually benefited from the migration of skilled manpower.

The earlier analysis also makes it clear that the sending country is benefited in some respects while it has to bear certain losses as well.

We now turn to the formula that could be suggested for quantifying the gains and losses from the Brain-Drain to the less developed country. It will be followed by the actual calculations of the variables used in the formula in the context of the Brain-Drain from India to the United States. :

THE FORMULA :-

$$PIA + CEA + PTA = RA$$

where,

PIA = Potential income of 'A' the emigrant, had he not migrated.

CEA = Cost of educating 'A' before his migration in a given period.

PTA = Potential Tax Revenue from 'A' in the absence of his Migration.

RA = Total amount of remittances by 'A' in a given period of his stay abroad.

The left side of the above equation represents the losses from 'A's emigration, while the right side stands for the gains from it. Obviously, if the left side is greater than the right

right side, the country of emigration can impose the brain-drain tax and if it is otherwise, that is, if the gains are greater than the losses, there seems to be no economic rationale for the imposition of braindrain tax.

We now turn to the actual quantification of the variables used in the above equations.

4.3 QUANTIFICATION OF THE VARIABLES :- .

The quantification of the above variables is by no means an easy task and in order to simplify it, we are bound to make certain assumptions. Each of these variables, presents a different set of conditions and as such it is indeed difficult to attempt a meaningful precise and concrete quantification of the same.

Besides the specific assumptions of each variable, we present below the general assumptions, of our statistical exercise.:

- 1) The term brain-drain implies brain-migration, whether permanent or temporary.
- 2) In the absence of any clear distinction between the data relating to permanent and temporary brain-drain, the figures used here comprise both the categories.
- 3) It is assumed that the emigrant completes his higher

education upto post graduate degree level, mainly the engineering or medical education; and hence his age at the time of his migration, is taken to be twenty-five years.

- 4) It is also assumed that the emigrant from India lives in the country of his immigration at least upto the age of fifty years and hence his actual working life in that country is taken to be of twenty-five years.
- 5) Although, the emigrants may include even the students seeking higher educations abroad, we assume for our model that the emigrants migrate for securing employment opportunity.
- 6) The brain-drain from India is multi-directed but most of it is to the United States as pointed out earlier and hence we are taking into account the brain-drain to the United States only for the purpose of our analysis.

We now switch over to the calculations of the values of variables.

a) PIA : POTENTIAL INCOME OF 'A' :-

By potential income of 'A' we mean the emigrants potential income in the absense of his migration. For calculating this we have taken the actual figures of per capita Net National product at current prices to from the basis of our calculation. The data relating to it have been taken for a period of seven years that is from 1974-75 to 1980-81. The figures have then been projected to give us the incomes of the emigrant for the

next twenty-five years. For this projection, the statistical method of least squares is followed. The annual figures for the twenty-five years thus obtained are then added together to give us the final figure of the total potential income. However, the incomes of highly educated persons are far above the national average and hence we have assumed that the incomes of such persons would be at least twenty times higher than the national average. (The multiplier '20' is based on the fact that in 1980-1981 when the per capita income of the average Indian was Rs. 124.5 per month, an engineer or a doctor was definitely earning between Rs. 2000 and 3000 per months.)

The calculations in this respect are detailed out below :

A) BASE DATA :-

Table No. 4.1

Per Capita Net National product at (current prices) and the trend values:

Year	Rs. P.C.N.N.P	X	XY	X ²	Trend values
1974-75	936	- 3	- 2808	9	920.6
1975-76	1029	-2	-2058	4	1016.2
1976-77	1094	-1	-1094	1	1111.8
1977-78	1210	- 0	0	0	1207.4
1978-79	1267	- 1	1267	1	1307.0
1979-80	1379	2	2758	4	1398.6
1980-81	1537	3	4611	9	1494.2
N= 7	$\sum Y = 845.2$	$\sum X = 0$	$\sum XY = 2676$	$\sum X^2 = 28$	

Source : The P.C.N.N.P. figures are taken from RBI Report on Currency and Finance Vol II-Statistical statements.81-82.

B) THE LEAST SQUARES EQUATION :

$$Y_c = a + b (X),$$

where,

$$Y_c = \text{Trend value of } Y$$

$$a = \sum Y/N$$

$$b = \frac{\sum XY}{\sum X^2}$$

hence,

$$a = 8452/7$$

$$= 1207.4 \quad \dots\dots (1)$$

and

$$b = 2676/28$$

$$= 95.6 \quad \dots\dots (2)$$

The trend values shown in the last column of the above table are calculated by using the values of a and b. 'X' represents the time deviation from the mid-point year. On the basis of these calculations and the values of 'a' and 'b' the trend values are projected for the next 25 years, which are presented in the following table. The trend values are then multiplied by '20' - the multiplier, to give us the final figures for the assumed years, of his emmigration.

Table No. 4.2Estimated Incomes of the Emigrants :

Year	Trend values (Rs.)	Multiplier	Estimated Income (Rs.)
1	2	3	4
1980-1981	1494.2	20	29884
1981-1982	1589.8	20	31796
1982-1983	1685.4	20	33708
1983-1984	1781.0	20	35620
1984-1985	1876.6	20	37532
1985-1986	1972.2	20	39444
1986-1987	2067.8	20	41356
1987-1988	2163.4	20	43268
1988-1989	2259.0	20	45180
1989-1990	2354.6	20	47092
1990-1991	2450.2	20	49004
1991-1992	2545.8	20	50916
1992-1993	2641.4	20	52858
1993-1994	2737.0	20	54740
1994-1995	2832.6	20	56652
1995-1996	2928.2	20	58564
1996-1997	3023.8	20	60476
1997-1998	3119.4	20	62388
1998-1999	3215.0	20	64300

Contd... Table 4.2

1	2	3	4
1999-2000	3310.6	20	66212
2000 -2001	3406.2	20	68124
2001 -2002	3501.8	20	70036
2002 -2003	3597.4	20	71948
2003 -2004	3693.0	20	73860
2004 -2005	3788.6	20	75772

It is to be concluded, therefore that the potential income of 'A' the emigrant, in the twenty five years of his migration would be Rs. 13,20,730.

B) CEA = COST OF EDUCATING 'A' :-

For calculating the cost of educating 'A' the per capita expenditure on education has been calculated. Financing of education is done from various sources such as Government funds, of Local Board Funds, Fees, Endowment and other private funds. Of these sources the contribution of the government funds is the largest one. The shares of various sources in the total expenditure are presented in the following table. (table No. 4.3)

Table No. 4.3.Sourcewise percentage Distribution of 'Expenditure on Education'::

Sr. No.	Sources	Percentage of Expenditure
1	Government Funds	80.00
2	Local Board Funds	5.00
3	Fees	12.00
4	Endowment and other private Funds	3.00
5	Total	100.00

Source : Trends in Expenditure on Education, Ministry of Education and Culture, Government of India, New Delhi, 1978-1979.

It is evident from the above table that the share of Government Funds is 80% of the total expenditure.

The Government expenditure consists of plan and Non-plan expenditure on education. The figures of plan and non-plan expenditure on education incurred by the Government of India are taken as basis for giving us the final figure of total expenditure on education in the country. Since, we have assumed that the emigrant migrates at the age of 25 in the year 1981, we have taken into account the expenditure during 1960-1961 to 1980-1981 incurred by the Government of India. These figures are shown in the following table :-

Table No. 4.4Expenditure on Education by Government of India (Rs. Dr.)

Year	Plan Expenditure	Non-plan Exp.	Total Exp.
1960-1961	90	144	234
1965-1966	178	259	437
1970-1971	115	731	846
1973-1974	225	1086	1311
1977-1978	324	1981	2315
1978-1979	413	2245	2658
1979-1980	520	3226	3746

Source : Draft Five year Plan 1978-1983 Government of India.

The figures of expenditure on education for the years intervening those years mentioned in the above table calculated by taking into account the average growth rate for the corresponding period.

The figures thus calculated for all the years from 1960-1961 to 1980-1981 are mentioned in the following table (table 4.5).



Table No. 4.5

Plan and Non-plan Expenditure of Education by
Government of India.

<u>Year</u>	<u>Total plan and Non-plan Expenditure (Rs.Cr.)</u>
1960-1961	234
1961-1962	275
1962-1963	315
1963-1964	356
1964-1965	396
1965-1966	437
1966-1967	519
1967-1968	601
1968-1969	682
1969-1970	764
1970-1971	846
1971-1972	1001
1972-1973	1156
1973-1974	1311
1974-1975	1562
1975-1976	1813
1976-1977	2064
1977-1978	2315
1978-1979	2658
1979-1980	3202
1980-1981	3746
Total	26253

The total plan and non-plan expenditure by the Government of India during the period 1960-1961 to 1980-1981, thus comes to be Rs. 26253^{Cr.} As pointed out earlier, the share of Government Funds in the total expenditures on education is 80% and taking Rs. 26,253^{Cr.} to be 80% of the total, the figure of the total expenditure on education is calculated to be Rs. 32816.25^{Cr.}

In order to calculate the per capita cost on education, the population which is formally educated in the age group of 5 to 34 in 1981 is taken as basis. These population figures are given in the following table : (table No. 4.6)

Table No. 4.6

Age-Groupwise population : Formally educated.

Age-groups	Total Population (Crores)	Formally Educated Population (crores)	(3) as % of (2)
5 - 99	14.20	2.55	17.96
10 - 14	13.09	1.77	13.52
15 - 19	9.79	0.42	4.29
20 - 24	8.63	0.33	3.82
25 - 29	7.64	0.29	3.79
30 - 34	6.40	0.25	3.90
Total	59.75	5.61	9.39

Source : Census of India 1981, Series I India, Part II
Special Government of India.

It is clear from the above table that the total population in the age group of 5 to 34, on which the Government has incurred the expenditure for education, is 5.61^{Cr} in 1981.

We are now in a position to calculate the final figure of per capita expenditure on education for the period 1960-1961 to 1980- 1981.

$$\begin{aligned} \text{Per capita Expenditure on Education} &= \frac{\text{Total Expenditure on Edu.}}{\text{Total Population-formally}} \\ &\quad \text{educated.} \\ &= \text{Rs. } \frac{32816.25}{5.61} \text{ Crores.} \\ &= \text{Rs. } 5849.6 \end{aligned}$$

hence,

Rs. 5849.6

This figure, however, is relating to the expenditure on general education. The person completing engineering, Medical or other special professional education, which enables him to migrate, usually receives more expenditure by the Government. Roughly we assume it to be at least 10 times greater and hence if we multiply the above figures by 10, we get the per capita cost on education of the emigrant to be Rs. 58,496.

It is to be concluded, therefore that the,

CEA = Rs. 58,496 (2)

c) PTA; POTENTIAL TAX REVENUE FROM 'A' :

The potential tax revenue from 'A' is the total amount of

tax revenue that he would contribute to his home country in the absence of his migration. For calculating this, the data relating to the per capita tax burden (inclusive of direct and indirect taxes) have been taken as basis, which are then projected for the next 25 years to give us the potential tax revenue from 'A' in that period.

Table No. 4.7

Per capita Burden of Taxes.

<u>Year</u>	<u>Per Capita Burden</u>	<u>Trend values</u>
1961-1962	10.89	6.64
1962-1963	12.55	9.49
1963-1964	14.67	12.34
1964-1965	16.14	15.19
1965-1966	17.36	18.04
1966-1967	18.95	20.89
1967-1968	21.06	23.74
1968-1969	23.55	26.59
1969-1970	25.62	29.44
1970-1971	28.24	32.29
1971-1972	30.65	35.14
1972-1973	34.14	39.99
1973-1974	39.96	40.34
1974-1975	48.73	43.69
1975-1976	56.47	46.54

On the basis of the above table, on applying the least squares equation, the projected trend values of the subsequent years have been calculated and they are given in the following table (table No. 4.8).

Table No. 4.8

Per capita Burden of Taxes (Projected trends)

Year	Trend values
1976-1977	49.39
1977-1978	52.24
1978-1979	55.09
1979-1980	57.94
1980-1981	60.79
1981-1982	63.64
1982-1983	66.49
1983-1984	69.34
1984-1985	72.19
1985-1986	75.04
1986-1987	77.89
1987-1988	80.74
1988-1989	83.59
1989-1990	86.44
1990-1991	89.29
1991-1992	92.14
1992-1993	94.99
1993-1994	97.84
1994-1995	100.69
1995-1996	103.54
1996-1997	106.39
1997-1998	109.24
1998-1999	112.09
1999-2000	114.94
2000-2001	117.79
2001-2002	120.64
2002-2003	123.49
2003-2004	126.34
2000-2005 Total	2988.26

Source: Patil J.F. Taxation for Development in Maharashtra.
Contiental prakashan Pune, 1983, PP. 116-7

It is thus clear from the above tabel, that the per capita tax burden for the period 1980-1981 to 2004 to 2005 is Rs. 2415.74. We had multiplied the per capita income by 20 to give us the figure of the income earned by highly educated person. On the same grounds, the per capita tax figure has to be multiplied by 20 since, the person who earns more, will obiviously pay more taxes both direct as well as indirect. The figure, thus obtained is Rs. 48314.8.

Hence,

$$PTA = 48314.8 \quad (3)$$

D) RA = REMITTANCE OF 'A' :-

It has been observed that the remittances of those who migrate are quite substantial and they represent the gain from the brain-drain to the sending country.

The average annual remittances in India are first taken into account while calculating the per capita inward remittances. Since we have projected the brain-Drain from India to the United States of America, which is 41% of the total brain-drain from India, the total inward remittances are then reduced to 41% to match the figures of brain-drain. These per capita inward remittances are then multiplied by 25, to give us the estimated amount of total inward remittances of 'A' into India.

The relevant data are put in the following table :-

Table No. 4.9

Inward Remittances of the Emigrants.

Particulars	Amount in (Rs.) (Cr.)
Total Remittances	2361.7
Average Annual Remittances	472.34
Average Annual Remittances from U.S.A.	193.66
Total Estimated Immigrants of U.S.A. from India.	73989.0
Per capita Remittances in one year (Thousand)	38.8
Per capita Remittances in 25 years (Lacks)	9.20

The final figure of total inward remittance of 'A' in a span of twenty five years is thus calculated to be 9,20,000.

Hence,

$$RA = \text{Rs. } 9,20,000 \quad \dots \dots \dots (4)$$

4.4 CONCLUSION :-

On the basis of the above calculations if we take into account the values of the variables in the equation, the results in the form of net losses of gains can be calculated.

The formula :

$$PAI = CEA + PTA = RA.$$

Replacing the variables by their values we get,

$$Rs. 13,20,730 + 58,496 + 49,314.8 \neq 9,20,000.$$

$$\therefore 14,27,540.0 \neq 9,20,000$$

The difference between the two sides is of Rs. 5,07,540.8 and it represents the net loss per emigrant for India since the losses (left side) are greater than the gains (right side.)

It is thus to be concluded that there is definitely a strong case to be made for imposing a brain-drain Tax.

The calculations made above are only the rough estimates and are based on several assumptions. However, they certainly serve our purpose of attempting an equation to count the gains and losses from Brain-Drain for a country like India.