ECONOMIC IMPACT OF INVESTMENT IN ELECTRICITY GENERATION: BANGLADESH PERSPECTIVE

By

Md. Forhad Siddique

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTERS OF PUBLIC POLICY

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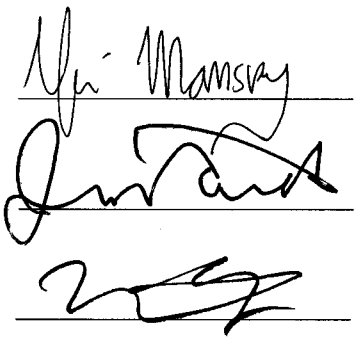

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ECONOMIC IMPACT OF INVESTMENT IN ELECTRICITY GENERATION: BANGLADESH PERSPECTIVE

Abstract: As a developing country, the main challenge ahead of Bangladesh is its economic development. This challenge put up an issue of prioritization of investment decisions to its decision makers. Since the resources are very limited, the country has to select the best option for investment which generates most benefit to its citizen. In Bangladesh, among sectors, Agriculture, Education, Health, Local government, and Energy get preference for investment historically. But often lack of understanding about the degree and dimension of economic impact due to policy intervention leads to policymakers' difficulty in reaching an optimum public investment decision. Considering that electricity is a basic necessity for the public for their everyday life and also for their commercial and industrial purpose, and since investment in this sector could generate comparatively higher multiplier impact, this study was conducted to evaluate whether an injection through government development budget (2007-2008) in the utility sector can generate total benefits (direct, indirect and induced) that are at least five folds of its initial input. To quantify the impact, I develop a Social Accounting Matrix (SAM) model for Bangladesh. The Bangladesh 1993-94 SAM database prepared by the "Iinternational Food Policy Research Institute (IFPRI)" was used for the study. The result showed that the initial impact of taka 382.8 billion is capable of generating a general equilibrium impact of taka 6783.941 billion in total, which is 18 times higher than the initial injection. The study also showed that, due to the injection of taka 382.8 billion, income increases in almost all sectors. Seven households and two labor categories are studied here, and I found that income increases across all household groups by between 72% to 91%. However, the relative shares of income in percentage term

remain unchanged across households. That is, the overall improvement of economy due to the injection does not have any measurable impact on income inequality among households.

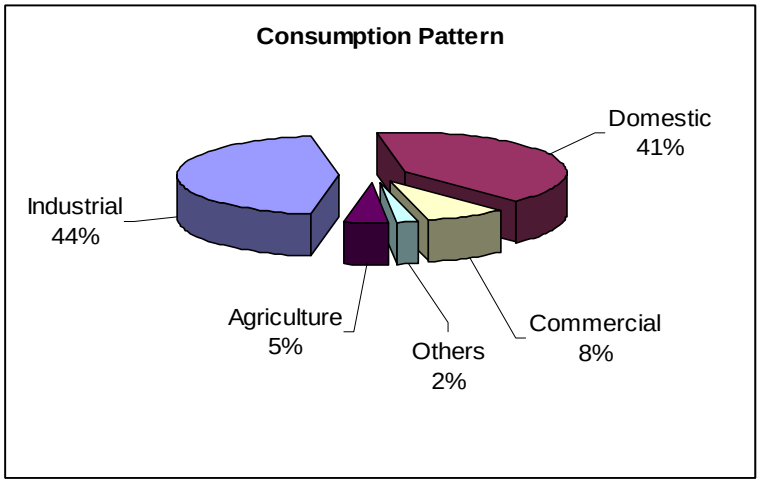
Introduction: Electricity is now the basic necessity of everyday life. One can not think of living without electricity in cities and villages now a day. Electricity is not only a consumer item but also an input to the industries. For that reason per capita electricity consumption of a nation is often taken as the indicator of development of any nation. Generating electricity, supplying it to proper destination and making it available to individual dueling places, commercial institutions and industrial unit is not an easy task. It requires investment of enormous resources, development of huge infrastructure.

Bangladesh presently produces around 5491 MW electricity with all its electricity generation plants. In the public sector the government produces around 3423 MW of electricity and the private sector produces 2068 MW of electricity. Most of the power generated from natural gas (4613 MW). Some plants use coal (220 MW), furnace oil (256 MW), High speed disel (172 MW0 and only one plant is run through hydro power (230 MW).

The country has around 5000 km. of transmission line and around 2,66,375 km of distribution line. With this capacity other than all cities and towns, the country can supply electricity to only 52,071 villages out of its 85000 villages. With the present electricity generation, transmission and distribution capacity, only 42% of the total population has access to electricity now. The per capita electricity generation presently is 165 kwh p. a.

Against the huge demand the country already has shortage of electricity. Moreover, as its economy is shifting from agriculture to manufacturing at a higher speed, its demand for electricity is increasing at a higher rate day bay day. To get an idea of the consumption

pattern of electricity in Bangladesh, we see the following graph 1[1] which shows us the consumption pattern in the year 2000.



Graph- 1: Total Consumption Pattern in 2000 (National)

Bangladesh needs an ever-increasing supply of electricity to meet its growing demand. Moreover, some age-old electricity generation plants are loosing their capacity and can not operate in full strength. So, setting up new electricity generation plant, transmission and distribution systems are very crucial for present need and future demand of electricity in Bangladesh. Setting up new generation plants, transmission and distribution systems require much investment. As there is other competing sectors for resources, like agriculture, health, education it is very important to have a good picture in the mind of policy maker about the comparative advantage of the investment in each of these sectors.

Investing in electricity sector has an increasing return to scale, which provides the rationale for the government to monopolize this sector. But recently because of the huge demand of electricity, government resource crisis and the reform program taken by the government,

[1] Prepared according to the information from "MAJOR ISSUES AND BENEFITS OF REGIONAL POWER TRADE", by Brig. Gen. M.A. Malek,

government is allowing private local and foreign investors to set up power plant to generate electricity. For this initiative, now roughly about 38% of the county's electricity is being generated by the private sector.

Even though Bangladesh is facing serious power shortage, its electricity generation capacity did not increase substantially over the period. While in many countries in the world the growth in the electricity generation was much faster, in Bangladesh the pace was relatively slower. Due to this historical reason now the country should increase its electricity production to maintain a modest economic growth and should invest in the power generation, transmission and distribution system. To get an idea about Bangladesh electricity production in the years 2001 to 2005 we can see table 1[2] below.

Table 1: Electricity generation from 2001-2005

Financial Year	**Generation Capacity (Mega Watt)**
2001-2002	4230
2002-2003	4710
2003-2004	4710
2004-2005	5025

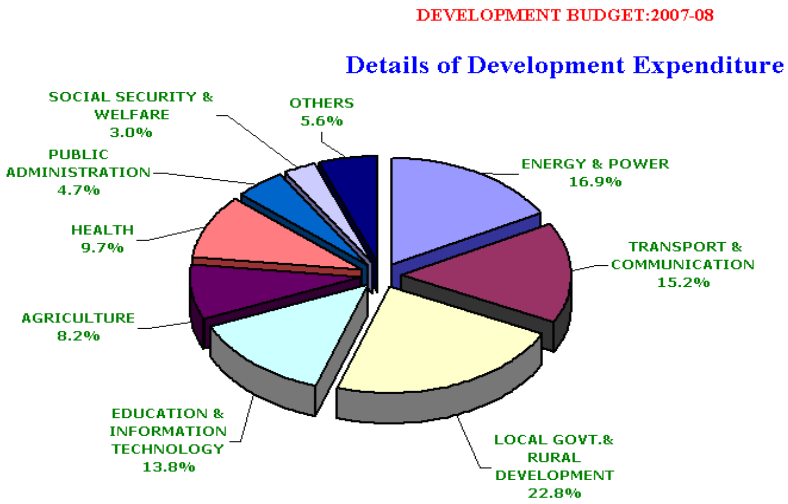
On the other hand, as Bangladesh is a developing country, to direct the country towards its desired development goal, the country also gives priority to social infrastructure related to human development such as health and education, agricultural sector, as well as physical

[2] Table produced from the information received from Bangladesh Economic Review-2006.

infrastructure such as roads and railway networks. All these sectors require huge amount of investments. Since Bangladeshi population is one of the largest in the world, its demand in any sector is tremendously high. Bangladesh also feels extra pressure due to its resource constraints. Because of all those factors, there are always competitions among sectors for resources from the national exchequer. Many times, in the absence of good empirical studies, the Government of Bangladesh has to depend on the judgment of its officials to make major investment decisions, which often involve high likelihood of errors. This study is conducted to show the relative importance of investments in the electric/utility sector and its potential impact on the entire economy including household income distribution.

Every year government set aside a development and revenue budget for the improvement of electricity /utility sector. The revenue budget is for the overall administration cost of the electricity sector, while the development budget is allocated to the development of new power plants, transmission and distribution systems and also for major overhauling of old plants. In 2007-2008 fiscal year the government of Bangladesh allocated taka 382.8 billion for the development of the electricity sector. To get an idea of the share of development budget for the electricity generation, transmission and distribution compared to other sectors, we can see the "graph-2: Development Budget 2007-08"[3] below.

[3] From the website of ministry of Finance, Government of Bangladesh.



Graph- 2: Development Budget 2007-08

The research question of this present study was to estimate the general equilibrium impact of the development budget of taka 382.8 billion injected in the utility sector and to see whether its general equilibrium impact (i.e. the direct, indirect, and induced impact) was five times greater than the direct impact. The study will quantify the magnitude of the economy-wide impact in Bangladesh due to an initial exogenous injection.

In this study, the Social Account Matrix has been utilized to estimate the general equilibrium impact. Social Account matrix of finding general equilibrium impact has a clear advantage over Keynesian model and Input output model. As we know Keynesian model is a single sector model, and therefore we can utilize it only for an economy which is very homogeneous, and mostly dominated by a single sector. Input-output model, by contrast, considers inter-industry exchanges along with final demand but does not consider household income distribution. Among the three, Social Accounting Matrix is the best for studying distributional impact because it includes factors of production, inter-industry exchanges, final

demand, value added, and also income distribution. Since a social accounting matrix can capture the direct, indirect and induced impacts, this study has utilized this framework.

Situation Analysis:

To get a better picture of the country's electricity generation situation, next I will discuss the historical development in the Power Sector below:

Historical Background of the Power Sector[4]

Year	Chronological Evolution in Power Sector
1901	Electricity was first installed at Ahsan Manjil, Dhaka City
1928	Sylhet, 50 K.W. MAN
1948	Electricity Directorate (ED)
1959	Water and Power Development Authority (WAPDA)
1962	Merger of Electricity Directorate with WAPDA
1960	EPWAPDA statutory organization
1972	Bangladesh Power Development Board(BPDB)
1978	Rural Electrification Board(REB)
1991	Dhaka Electricity Supply Authority(DESA)
2002	Ashuganj Power Supply Company Ltd.(APSCL)
2003	West Zone Power Distribution Company Ltd.(WZPDCO)
2005	North Zone Power Distribution Company Ltd(NZPDCO)
2006	Electricity Generation Company of Bangladesh Ltd(EGCB)
2007	North West Power Generation Company Ltd.(NWPGCL)
2008	Dhaka Power Distribution Company(DPDC)

[4] http://www.bpdb.gov.bd

Considering the source of energy (input to the power plant), Bangladesh's total installed electricity generation capacity (including independent Power Producers, (IPP)) has been shown below in the following table5:

Table 2: Electricity Generation According to Source

Type of power plant	Generation (MW)	Percentage
Electricity from Hydro power plant	230	4.19
Electricity from Steam turbine plant	2638	48.03
Electricity from Gas Turbine plant	997	18.15
Electricity from Combined Cycle plant	1359	24.74
Electricity from Diesel plant	269	4.89
Total	5493	100.00

Bangladesh has a long network of electricity transmission and distribution line. As of June 2009 the country has 1323 km of 230 KV Transmission line, and 3191.8 Km of 132 KV Transmission Lines. These transmission lines can bee seen in the following tables6;

[5] http://www.bpdb.gov.bd/generation.htm
[6] http://www.bpdb.gov.bd/xmission_line.htm

Table 3: List of 230 KV Transmission Lines (As on June 2009)

Sl. no.	Transmission Lines	Length in Route kilometers	Length in Ckt. kilometers
1	AES, Haripur to Haripur	2	4
2	Ashuganj to Comilla North	79	158
3	Ashuganj to Sirajganj	143	286
4	Baghabari to Sirajganj	38	76
5	Bogra to Barapukuria	106	212
6	Comilla North to Hathazari	151	302
7	Comilla North to Meghnaghat	58	116
8	East - West Interconnector	179	358
9	Ghorasal to Ashuganj	44	88
10	Ghorasal to Rampura	46	92
11	Haripur to Meghnaghat	12	24
12	Hasnabad to Aminbazar - Tongi	50	100
13	Ishurdi to Baghabari	55	110
14	Khulna to Ishurdi	185	370
15	Meghnaghat to Hasnabad	26	52
16	Rampura to Haripur	26	52
17	Raojan to Hathazari	22.5	45
18	Siddhirganj to Haripur	1.5	1.5
19	Sirajganj to Bogra	72	144
20	Tongi to Ghorasal	27	54
	Total	1323	2644.5

Table 4: List of the 132 KV Transmission Lines (As on June 2009)

Sl. no.	Transmission Lines	Length in Route kilometers	Length in Ckt. kilometers
1	Ashuganj to Jamalpur	166	332
2	Bagerhat to Mangla	31	31
3	Baghabari to Shahjadpur	7	14
4	Barapukuria to Rangpur	45	90
5	Barapukuria to Saidpur	36	72
6	Barisal to Bhan daria - Bagerhat	80	80
7	Barisal to Patuakhali	37	37
8	Bheramara to Faridpur to Barisal	225	450
9	Bogra to Noagaon	52	104
10	Bogra to Saidpur	140	280
11	Bogra to Sirajganj - Shahjadpur	100	200
12	Bogra Old to Bogra New	1	2
13	Chandpur to Chowmuhani	75	150
14	Comilla North to Comilla South	16	32
15	Comilla South to Chandpur	61	122
16	Dohazari to Cox's Bazar	87	174
17	Feni to Baraulia	90	90
18	Feni to Chowmuhani	32	64
19	Ghorasal to Joydebpur	26	52
20	Goalpara to Bagerhat	45	45
21	Goalpara to Ishurdi	169	338
22	Haripur to Maniknagar	12	12
23	Hasnabad to Shyampur - Haripur	40	80
24	Ishurdi to Baghabari to Shahjadpur	57	57
25	Ishurdi to Bogra	103	206
26	Ishurdi to Pabna to Shahjadpur	56	56
27	Joydebpur to Kabirpur	15	30
28	Julda to Shahmirpur	7	14
29	Kabirpur to Tangail	51	102
30	Kamrangirchar In to Out from Has-Kal	3	6
31	Kaptai to Baraulia	58	116

Sl. no.	Transmission Lines	Length in Route kilometers	Length in Ckt. kilometers
32	Khulna(C) to Khulna(S)	9	18
33	Khulna(S) to Satkhira	56	56
34	Kulshi to Baraulia	13	26
35	Kulshi to Halishahar	13	26
36	Kulshi to Bakulia	4	8
37	Kulshi to Halishahar (Open at Kulshi)	13	13
38	Madanhat to Kulshi	13	13
39	Madanhat to Kulshi	13	13
40	Madanhat to Sikalbaha	13	26
41	Madaripur to Gopalganj	45	45
42	Maniknagar to Narinda	5	10
43	Matuail In to Out from Hari-Manik	5.5	11
44	Moghbazar In Out Ullon to Ramp.	3	6
45	Mymensingh to Netrokona	34	68
46	Rajshahi to Natore	40	40
47	Rajshahi to Natore	40	40
48	Rajshahi to Nawabganj	47	94
49	Rampura to Gulshan U/G Cable	3.3	6.6
50	Rangpur to Lalmonirhat	38	38
51	Saidpur to Thakurgaon	64	128
52	Shahjibazar to Chatak	150	300
53	Siddhirganj to Kaptai	273	546
54	Siddhirganj to Maniknagar	10	10
55	Siddhirganj to Maniknagar	10	10
56	Siddhirganj to Shahjibazar	138	276
57	Siddhirganj to Ullon	16	32
58	Sikalbaha to Dohazari	35	70
59	Sikalbaha to Halishahar	13	13
60	Sikalbaha to Bakulia	4	8
61	Sikalbaha to Shahmirpur	9	18
62	Tongi to Kabirpur - Manikganj	56	112
63	Tongi to Mirpur - Kall.pur - Hasbad	49	98
64	Ullon to Dhanmondi	5.5	11

Sl. no.	Transmission Lines	Length in Route kilometers	Length in Ckt. kilometers
65	Ullon to Dhanmondi	5.5	11
66	Ullon to Rampura -Tongi	23	46
	Total	**3191.8**	**5684.6**

As the electricity has a strong co relation with GDP of a country, for the case of Bangladesh we can see the the Contribution of electricity in GDP and growth rate of electricity for the period 2001 to 2006 from the table bellow7:

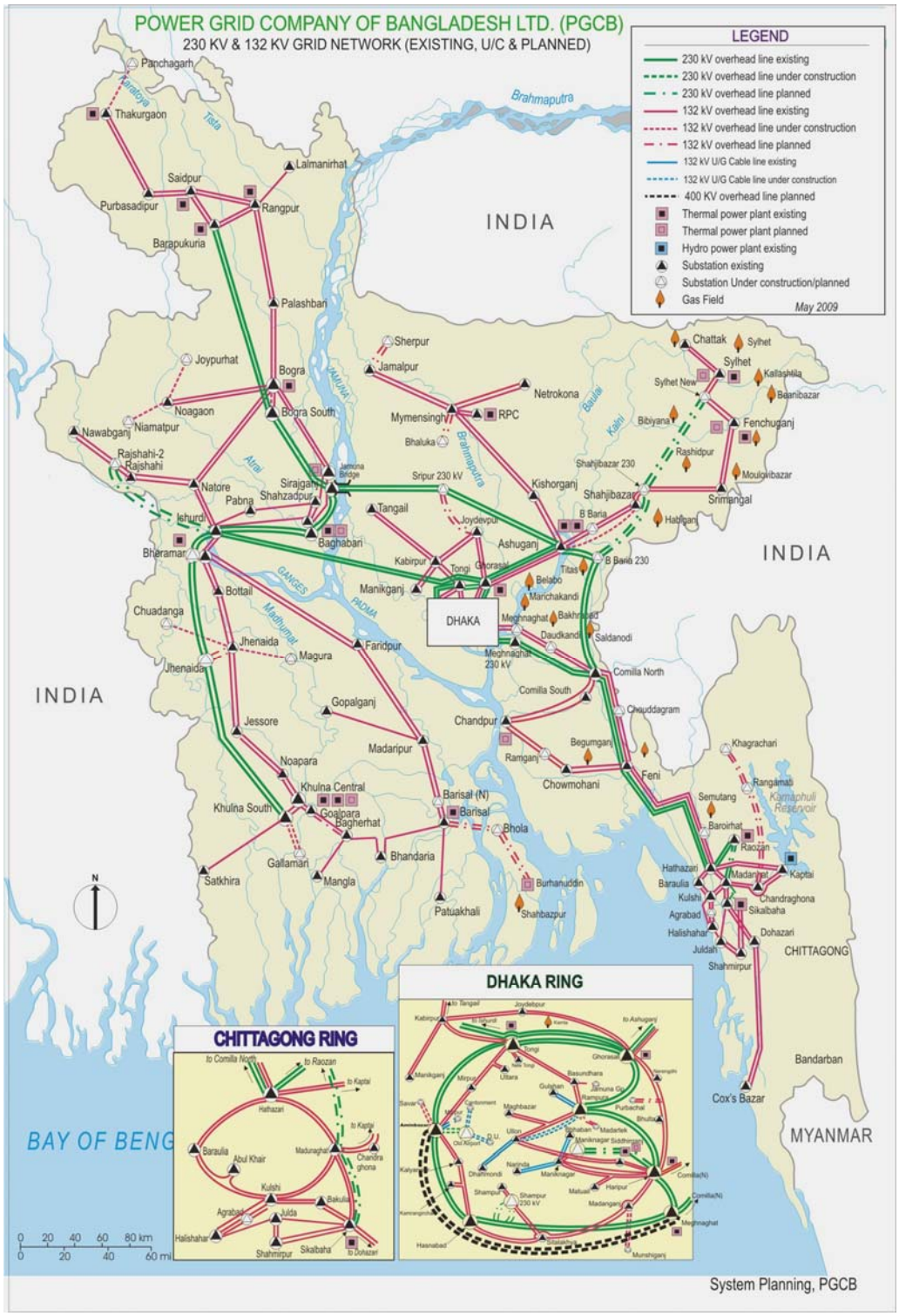
Table 5: Contribution of electricity in GDP and growth rate of electricity for the period 2001 to 2006

Year	Contribution of electricity in GDP (%)	Growth rate of electricity (%)
2001-02	1.27	7.78
2002-03	1.30	7.29
2003-04	1.34	9.19
2004-05	1.38	9.22
2005-06	1.30	1.08

[7] http://www.mof.gov.bd/en/budget/er/2008/c10.pdf

The major transmission line of the country can be seen in a map as follows8:

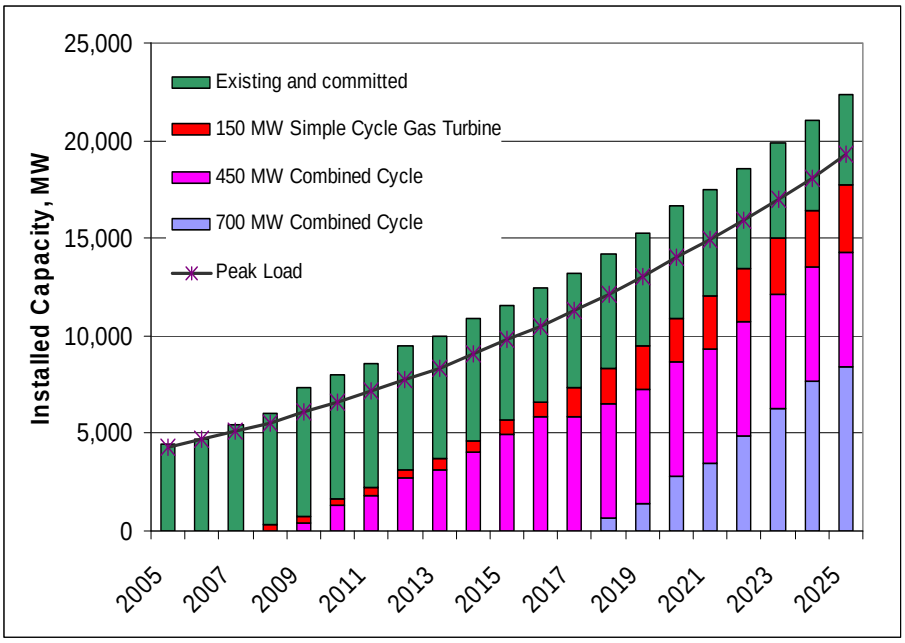
MAP-1



Power System Master Plan

[8] power grid company of Bangladesh

Power System Master Plan (PSMP) up to 2025 has been prepared and approved by the Government in April 2007. PSMP suggested 17700 MW new capacity addition will be required to meet 19312 MW demand in 2025. Capital Investment requirement for generation only will be about US $ 10.2 billion. Base, High and Low growth scenarios have been studied. Also limited gas-powered generation using domestic and imported coal has been examined. Generation additional requirement up to 2025 is shown below[9]:



Graph- 3: Base case generation results

9 A Report Card on Bangladesh Power Sector Development

Previous Studies: The concept that there is a strong correlation between electricity generation and economic growth is relatively well accepted. There should be empirical or scientific study about this for Bangladesh. But due to the limited scope of this study, the existence of such study could not be ascertained. Nonetheless, reports from two studies, one in the case of Indonesia, titled- "Electricity generation and economic growth in Indonesia", by Seung-Hoon Yooa, and Yeonbae Kim published in the Journal of Energy and the other one "The Role of Energy in Productivity Growth", by Dale W. Jorgenson, published in "The American Economic Review", Vol. 74, No. 2, were reviewed.

In the first paper Yooa and Kim tried to found out the causal relationship between electricity generation and economic growth analyzing time series data for Indonesia for two decades (1972-2002). In their study they have seen that there is a correlation exists between economic growth and electricity generation and concluded that economic growth leads to higher electricity generation. Their study also supports the idea that the electricity generation heavily influences the economic growth of Indonesia. In the case of Bangladesh, this finding could have a similar implication, as many features of Indonesian economy are common to Bangladesh economy.

In the second paper, Mr. Dale W. Jorgenson actually studied the role of energy in productivity growth in the perspective of the USA. Mr. Dale studied a wide range of industries in the whole economy of the USA and could come up with the conclusion that "electrification and productivity growth are interrelated".

These two study, though done in different time period and different economic situations but they gave us the similar conclusion that, for a country, electrification is very important for its economic growth. Considering the findings of these studies it can be expected that in the case

of Bangladesh, there is a strong likelihood that similar study will bring similar result. Since the purpose of the present study is to figure out the degree and dimension of the economic impact and in particular, to see the income distribution effect among the factors of productions and house holds, it would be reasonable to expect that a similar out come would be available.

Data: "The Social Accounting Matrix" table used in this study was found from the "International Food Policy Research Institute (IFPRI)". This was produced on the basis of Bangladesh Institute of Development Studies' (BIDS) 1993-94 "Input-output table, 1993=94 national accounts data, 1995-96 labor and household surveys, and information from an existing SAM fro 1993-94[10]. The SAM table used here was a 113 X 113 matrix. This included the production activities like agriculture, constructions, etc. factor of productions such as labor, land, and capital, and institutions such as, households and government.

For this study, since the area of interest was to see the impact of the injection of money into the utility sector and find out the general equilibrium impact on the over all economy, and also to see the impact on house hold income, so, the total 113 sectors were aggregated into 32 broad sectors. These are,

> **Production activities** — Agriculture, Retail, Chemical, Construction, Utility, Trade and Commerce, Transport, Accommodation, Health, Education, Public Administration, Finance, Others, Entertainment, Information and Communication;

[10] IFPRI- A Gendered 1993-94 Social Accounting Matrix Fro Bangladesh.- Marzia Fontana and Peter Wobst.

Factor of productions— Labor (into two subgroups- LEdu1 (0+1+2) (M+F) and LEdu3 (M+F) where L stands for labor, Edu for education, 0 for no education, 1 for elementary education and 2 for secondary education. Also M for Male and F for Female), Land, and Capital, and

Institutions—Households [seven sub-groups—Small (Landless + Marginal + Small), Large, NARP, NARR, LowEdu (Illitera + LowEdu), MedEdu, HighEdu, where N stands for Non, A stands for Agricultural, R stands for Rural, P for Poor, Edu for Education, and the urban household groups are lowEdu, MedEdu, HighEdu], Corporate tax, Income tax, TAR, Government, Rest of the World, and Savings and Investments.

In this study, the Government expenditure, Savings and Investments, Rest of the world and TAR are treated as exogenous, while the rest are endogenous. Here the study estimates the changes in the endogenous sectors due to the exogenous injection of money into the electricity/utility sectors. The exogenous shock came from the Government's budget.

Methodology: In this general equilibrium study, a Social Accounting Matrix (SAM) model has been utilized. This is a widely used method of estimating general equilibrium impact. Predecessor of the SAM is Input-Output model. Both of them are based on the single entry table. SAM may be considered as the extended Input-Out put model. In the SAM table the row represent the income of a particular sector while the column represents the outlay of a particular sector. Thus if we represent a cell in a SAM table as $Z_{ij,}$ it will mean that, the input "Z" to sector "j" from sector "i". In SAM the number of rows and number of columns are

same. The sectors generally can be divided in to three broad categories. These are factors of productions, institutions and production function.

Here the basic difference between the I-O and SAM is that, in I-O we can only deal with inter-industry transactions, final demand and value added, but in SAM, along with the inter industry exchange and final demand, we can also deal with the transaction among institutions and factor of productions. So, in SAM, we can deal with more endogenous variable that reflects more accurate impact than I-O model. Normally, in SAM, the "Government expenditure", "Capitals" and "Rest of the world" are taken as exogenous accounts.

In our case, we want to see the change in the endogenous account due to the exogenous shock. In case of Input-Output, we can measure only the direct impact and indirect impact of the shock. Input-Output model can not capture the induced impact. The advantage of SAM is that it counts the direct, indirect and induced impact due to an exogenous shock. Our main goal is to get the total impact in the economy due to the direct impact (exogenous) as the economy stabilizes (in equilibrium). To reach such a situation, mathematically, we have to find out an equilibrium solution of income expenditure identities. In that case, we get a solution of equations, which comes along with a factor that represents the economic impact due to an exogenous shock of one unit (one dollar or unit currency). This factor here is called the multiplier. If we get the multiplier, than we can get the total impact by multiplying the multiplier by any amount of exogenous shock.

Now, if Z_{ij} represent the value of a transaction in a cell in the SAM table, and X_j is the total value of output, then we can always have a value such as $a_{ij} = \frac{Z_{ij}}{X_j}$ (or we can write it as $Z_{ij} =$

$a_{ij}X_j$). This a_{ij} is called the technical co-efficient or input-output co-efficient. Let us now think a two sector economy, where the sectors are sector 1 and sector 2, and the final out put of sector 1 is X_1 and X_2. If the final demand in such an economy is d_1 and d_2, the income – expenditure identity equations are

$$X_1=a_{11}X_1 + a_{12}X_1+d_1$$

$$X_2=a_{21}X_2 + a_{22}X_2 + d_2$$

For a two sector economy like the above, we can get the solution for X_1 and X_2 by simple algebra. But if there are more than two sectors, then matrix algebra is convenient. In that case we can express the above two equations in matrix form as follows:

$$\begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} d_1 \\ d_2 \end{bmatrix}$$

Matrix is an array of row and column which can solve equations of large number of unknowns or variables. A matrix is identified by its number of row and number of column. In matrix, there is a special matrix called identity matrix and denoted by "I" in which all the diagonal values are 1 and all the other values are zero. This is a square matrix, where number of rows and number of columns are equal. We can then express the above system of equations in a generalized matrix form as $X= (I-A)^{-1}d$, where all terms are in matrix forms and "I" represents the Identity matrix. In such case the term $(I-A)^{-1}$ is the SAM multiplier. Once we compute the SAM multipliers, we can determine the total impact by multiplying the multipliers with the vector of exogenous variables.

To go forward with SAM, it is important to know the limitations of SAM. As in input-out model, SAM also assumes that there is no shortage of supply of input, which implies supply

always follows demand. It assumes that there is no economy of scale in the economy under consideration. The coefficients are stable over the period of study. Further, in SAM we often broadly define sectors, which include many businesses together in the same sector, but without recognizing the differences in their characteristics. SAM also assumes that prices are fixed throughout the period of study. It also does not take into account the import substitution. In reality, these assumptions are difficult to meet. But for short-run analyses, SAM provides good approximations. Thus, this model can be used if we are chiefly concerned about impact generated within a short period of time.

In this study, Bangladesh SAM table of 1993-94 provided a 113-sectors database. For convenience, these 113 sectors have been aggregated into 32 major sectors, mostly following the North American Industry Classification System (NAICS) classification, including two types of labor categories and seven household groups. Among 32 sectors, 28 sectors were considered as endogenous and rest four sectors such as Government, ROW, S-I, and TAR were considered as exogenous sectors. The exogenous positive shock was considered from the Government sector which comes from government budget. Then the multiplier $(I-A)^{-1}$ was calculated according to the procedure explained above. Multiplying this multiplier by the final demand shock matrix, we get the general equilibrium impact of the economy due to the initial, positive shock.

So the equation for multiplier we employed here to find out the impact of exogenous shock is

$$\mathbf{\Delta}X = (I-A)^{-1}\,\mathbf{\Delta}d$$

Where all terms are in matrix forms and "I" represents the Identity matrix, the term $(I-A)^{-1}$ is the SAM multiplier, and $\mathbf{\Delta}d$ is the exogenous shock or injection into the economy.

Results:

Result 1: According to the plan, if taka 382.8 billion is injected into the utility sector than the direct impact to the utility sector is taka 382.8 billion. The indirect impact would be taka 399.30 billion and the induced impact would be taka 49.45 billion in the same sector.

Table 6: General equilibrium impact on the utility sector

Impact to the utility sector	Taka in billion	% increase
Direct impact in the Utility sector	382.8	
Indirect impact in the utility sector	399.30	104.31
Induced impact in the utility sector	49.45	12.88

Result 2: Due to the injection of taka 382.8 billion in the utility sector, the total impact in the whole economy would be 6783.94, which can be broken drown into two components, direct, and indirect and induced, shown in table 3 below.

Table 7: General equilibrium impact on total economy

Impact to the whole economy	Taka in billion
Direct impact	382.8
Indirect and induced impact	6401.14

Result 3: Due to taka 382.8 billion injections in utility sector, the highest impact sectors and the percentage increases in incomes are shown in table 4 below:

Table 8: Highest impact Sectors

Highest impact sectors	Taka in billion	Increase in income (%)
Agriculture	744.69	66.699
Retail	754.84	63.82
Utility	831.55	947.30
CAPITAL	550.68	101.58
CORP	550.68	101.58

The least-impacted sectors and their percentage increases in income are shown in table 5 below -

Table 9: Least impact sectors

Least impact sectors	Taka in billion	Increase in income (%)
Health	21.31	53.15
Education	23.56	36.39
Public Administration	19.96	21.64
Information and Communication	13.99	63.24

Result 3: Income distribution among factors of production and percentage increase in their income after the general equilibrium impact is shown in table 6 below. Graph 3 compares income distribution among factors of production before and after the direct impact.

Graph- 4: Income distribution among factors of production before and after the impact

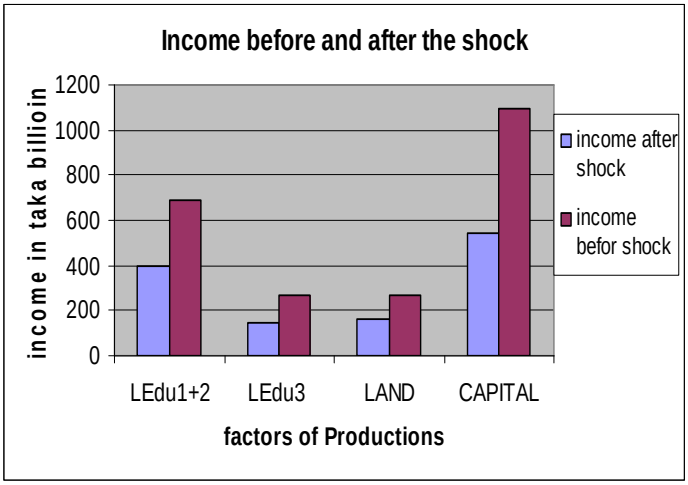


Table 10: Income distribution among factors of productions

Sectors of the economy	Equilibrium Impact	Initial total income (X)	Total income after impact when economy stabilizes (X')	% increase in income
LEdu1 (0+1+2)(M+F)	291.79	400.12	691.91	72.92
LEdu3 (M+F)	124.62	142.33	266.95	87.55
LAND	107.18	160.71	267.89	66.69
CAPITAL	550.68	542.14	1092.82	101.57

Result 4: Income distribution among household groups after impact is shown in the following graph 4 and table 7:

Graph- 5: Income distribution among households before and after the impact

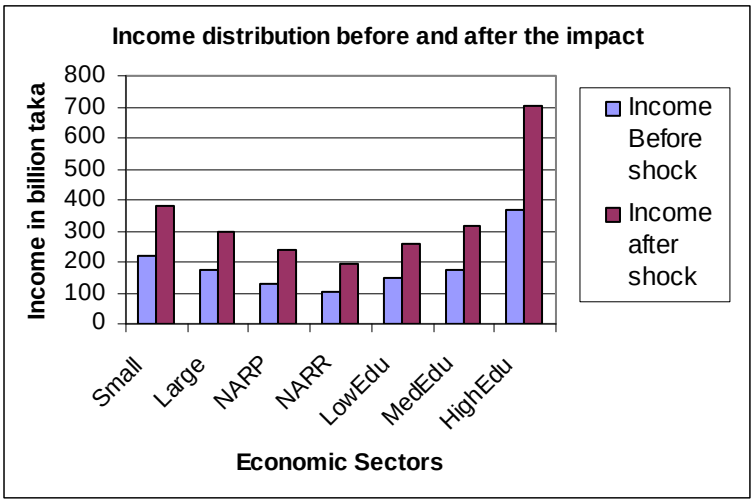


Table 11: Income distributions among seven Households categories and percentage increase in their income.

House holds type	(taka in billion)					
	Initial Income of the house hold	income after exogenous shock	Changes In Income due to shock	Income share Of household in Percentage (%)		change in Income in Percentage (%)
				Before impact	After Impact	
Small (Landless+ Marginal+Small)	221.774	382.17	160.40	16.83	16.04	72.32
Large	173.962	297.32	123.35	13.20	12.48	70.90
NARP	128.956	235.64	106.68	9.78	9.89	82.72
NARR	104.011	193.294	89.283	7.89	8.11	85.84
LowEdu (Illitera+Low Edu)	146.330	259.54	113.21	11.10	10.89	77.36
MedEdu	174.865	314.67	139.81	13.26	13.20	79.95
HighEdu	368.181	700.11	331.93	27.933	29.38	90.15
Total	1318.079	2382.74				

(N.B.-N-Non, A-Agricultural, R-Rural, P-Poor, lowEdu- Low Education, MedEdu- Medium education, High Edu- High education)

Result 5: Indirect and Induced impact of taka 382.8 billion injections in utility sector on other sectors (excluding Utility), which capture higher impacts are given below in table 8.

Table 12: Indirect and Induced Impact on some other sectors

Sectors	I-O impact	SAM impact	Induced impact
Agriculture	6.557	744.69	738.13
Retail	5.44	754.83	749.39
Chemical	38.97	145.43	106.46
Construction	32.25	143.64	111.39
Trade and Commerce	70.19	415.01	344.83
Transport	21.13	401.82	380.69
Accommodation	3.89	189.48	185.59
Finance	6.94	189.08	182.14
Others	1.45	87.32	85.87
Entertainment	0.09	36.84	36.75

Discussion and Conclusions

In our SAM general equilibrium impact analysis, we found that the total impact of the injection of taka 382.8 billion into the utility sector has a significant multiplier effect. This direct injection of money will eventually generate, at equilibrium, taka 6783.941 billion, as income for all the sectors of the economy. This is much higher than our hypothetical increase in income, taka 1914 billion. At the equilibrium, the total impact (direct, indirect, and induced) is 17.722 times the original injection, thus much higher than our maintained hypothesis of total impact that is five times the original injection.

In the utility sector itself, the injection of taka 382.8 billion generates an indirect impact which is more than the initial direct impact of the sector, about 104% increase, or taka 399.30 billion, and the induced impact is about 12.88% increase, or Taka 49.45 billion. Before the exogenous shock, that is before direct injection of taka 382.8 billion in the energy/utility sector, its income from all sector was only taka 87.78 billion. Injection of taka 382.8 billion produce direct, indirect and induced impact, and in the new equilibrium the total income rose to 919.33 which is about 947.30 % increase in income of its own sector.

Bangladesh still being predominantly an agrarian economy, employment and rural households are very much dependent on agriculture. Moreover, many small and medium scale industries also get inputs from agriculture. Our analysis shows that direct impact in the utility/power generation sector significantly improves the output of the agriculture sector; a 66% rise in output of the agriculture sector has been recorded in the study. This rise in agriculture income will ultimately can boost the rural economy, which is very important for Bangladesh.

The factors of production land, labor, and capital also gained from this exogenous shock tremendously. Land income increased by 66.69%, while capital income by 101.576 %. The other factor of production, labor, are broken down into two categories in our analysis. One with low education and the other with high education. According to our analysis, in both categories income rises, but the rise in income in higher educated labor is more than the rise in income of lower educated labor. The increase in income of higher educated labor is 87.553% while the income increase of lower educated labor is 72%. Since in both cases, income increases significantly, we can say that the standard of living of both labor classes will improve. We can also assume that for the high-income, higher educated labor, the savings will increase, which ultimately will help investment further.

Among the institutions, the corporate-tax sector's increase in receipts is 101.58 %, or a value of 550.68. The income-tax sector's increase in income is 179.80 % to a value of 75.80, which could be good news for the government as this receipts accrue to the government account. The above results can be very encouraging for policymakers and can motivate more emphasis in the energy/utility sector, and more allocation of resources into this sector.

One interesting result of this study is that due to the direct exogenous impact, almost all endogenous sectors benefited. But this could not reduce income disparity among the households. The income of all household groups, specifically for Small farmers, which include the landless, marginal and small farmers, has increased by 72%, for Large farmers who belong to rich house hold group, their income increased by 70%. The non-agriculture rural poor's income increases by 82% and non-agricultural rural rich's (NARR) income increases by 85%. By contrast, income among the urban population, specifically for lower-

educated urban household's increased by 77%, medium-educated households by 79%, and high-educated household by highest 90%.

In all cases, income increases by between 72% and 91%. However, income disparities remain almost same post-impact. As we can see, before the shock the small farmers' income share was 16.82%, and after the shock it is 16.03%. Likewise, the large farmers' income share before shock was 13.20%, and after shock 12.48%, slight decrease but not significant. The non-agriculture rural professional's income share before the shock was 9.78% and after shock it remains at 9.89%. NARR's income share before shock was 7.89, and after shock it is 8.11.

Among urban households, low education urban household's income share before shock was 11.101%, and after impact 10.892%, slight decrease but not significant. Urban medium-educated household's income share before impact was 13.266 and it remains at 13.206% after impact. The high-educated urban households' income share before impact was 27.933%, and after impact increases slightly to 29.382%.

From the above analysis we can conclude that even though this impact brings significant income improvements to all household groups, it does not reduce the existing gap between the poor or rich. It may even increase the gaps slightly but not significantly. We can instead say that the income disparity remain the same at a higher income level. The existing impact brings significant increase in income which definitely improves the standard of living of all categories of households. But, if we want to focus our attention more on promotion of more-balanced distribution then we have to find out other sectors where injection of money can reduce the existing gap between the poor and rich.

According to the above analysis, it is highly recommendable that the government injects money into the energy/utility sector, and the higher the injection the more benefits the economy would achieve. Here again it would be worthy to mention the limitations of this study, taking all the limitations of SAM into considerations. In particular, the credibility of this type of study is influenced by the time dimension. For a short-run analysis, it is reasonable to assume that prices are constant; SAM coefficients are constant, no returns to scale, and no substitution by imports.

For a long-run analysis these assumption would not be valid. In addition, the 1993-1994 SAM table was used. This is an outdated table and may loose its reliability after 14 years, as the structure of an economy most likely changes over that long period of time. Therefore, a further study based on more recent data would provide more-accurate approximation.

Another consideration is, in this study injection of money in to a single sector has been considered and the impact has been studied. Because of the single-sector scenario, there was no scope to compare results found in this study with those based on other options. If we could study the impact of injecting the money into multiple sectors simultaneously, then we may have a better understanding about which sector could give comparatively better result or which combination can come up with relatively better benefit. Further, the impact study was based on a static modelA further study of equilibrium impact using a dynamic model, such as a dynamic computable general equilibrium (CGE) model would provide a more realistic approximation.

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APPENDIX

All the Calculations for the Multiplier Effect Under SAM analysis (Including Grouped Data, Cooffecient Matrix,Identity Matrix, Multiplier, Direct Impact, Impact analysis, I-O analysis etc.)

1993-94 Bangladesh SAM in Billions of Taka

PARAMETER SAM THAT IS THE FINAL DATA READ INTO THE CGE AFTER ALL FINAL DATA MANIPULATIONS IN BANGLA4.DAT

	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm	Ledu (0+1+2) (M+F)	Ledu 3 (M+F)	LAND	CAPITAL	Small (landless+ Marginal + Small)	Large	NARP (F+M)	NARR (F+M)	LowEdu (Illit+ LowEdu)	MedEdu	HighEdu	CORP	ITAX	TAR	S-I	GOV	ROW	TOTAL
Agricuture	636.792	237.626	1.333	29.507	0.000	0.000	0.000	0.000	0.151	0.000	0.000	0.279	0.000	8.280	0.000	0.000	0.000	0.000	0.000	44.334	33.314	23.368	14.134	21.678	18.778	38.951	0.000	0.000	0.000	0.000	0.000	8.046	1116.573
Retail	13.625	660.246	1.640	1.649	0.023	10.915	0.045	0.122	0.211	0.875	0.806	5.172	1.126	4.542	0.134	0.000	0.000	0.000	0.000	104.277	47.264	59.174	35.117	52.595	38.312	49.937	0.000	0.000	0.000	7.048	0.000	87.849	1182.702
Chemical	24.028	12.545	74.718	7.314	2.210	3.247	13.718	0.002	1.712	0.608	0.965	1.683	0.000	0.000	0.094	0.000	0.000	0.000	0.000	3.270	2.039	2.287	1.458	4.120	3.546	4.290	0.000	0.000	0.000	238.720	0.000	1.235	165.088
Consturction	5.612	22.665	8.804	366.137	1.215	10.058	6.294	7.510	0.094	1.558	6.365	1.788	1.713	0.300	0.123	0.000	0.000	0.000	0.000	1.219	2.086	0.677	0.432	0.707	0.601	1.457	0.000	0.000	0.000	2	0.000	1.604	687.740
Utility	0.814	13.919	1.922	10.330	44.650	3.120	0.141	0.000	0.178	0.612	0.490	0.888	0.055	0.838	0.096	0.000	0.000	0.000	0.000	0.857	0.547	0.664	0.397	1.574	1.893	3.794	0.000	0.000	0.000	0.000	0.000	0.000	87.781
Trade and Comm	119.069	35.661	2.638	18.386	3.399	266.909	37.359	19.078	6.291	4.357	0.000	19.816	0.000	1.118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	534.081
Transport	21.807	12.279	2.545	13.139	0.874	3.698	262.100	0.003	0.070	0.180	1.242	10.658	2.137	0.173	0.149	0.000	0.000	0.000	0.000	13.211	15.822	14.745	8.862	15.585	20.710	81.045	0.000	0.000	0.000	0.000	0.000	0.000	501.034
Acomodation	0.946	0.041	0.000	0.000	0.000	13.243	0.476	116.925	0.618	0.019	0.017	5.036	0.297	0.445	0.320	0.000	0.000	0.000	0.000	11.151	12.004	7.359	4.457	11.967	12.251	36.277	0.000	0.000	0.000	0.000	0.000	0.000	233.850
Health	0.318	0.038	0.010	0.035	0.000	0.000	0.029	0.000	20.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.105	3.030	1.498	0.910	1.349	1.688	2.546	0.000	0.000	0.000	0.000	6.491	0.000	40.094
Edu	0.000	0.000	0.004	0.040	0.000	0.000	0.000	0.000	0.000	32.365	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.209	1.813	1.299	0.790	1.346	2.285	5.534	0.000	0.000	0.000	0.000	18.059	0.000	64.745
PubAdm	0.981	0.581	0.276	0.681	0.099	4.363	3.670	0.002	0.108	0.711	47.294	0.180	0.000	0.190	0.000	0.000	0.000	0.000	0.000	0.082	0.072	0.056	0.034	0.062	0.068	0.166	0.000	0.000	0.000	0.000	32.587	0.000	92.261
FinS	0.419	3.809	4.490	1.952	0.128	7.989	0.425	2.506	0.190	0.120	1.015	118.463	0.000	0.019	0.045	0.000	0.000	0.000	0.000	14.582	12.729	9.779	5.864	10.593	11.759	29.809	0.000	0.000	0.000	0.000	0.000	0.000	236.686
OthS	0.476	0.000	0.000	0.000	0.000	3.715	4.017	0.000	0.000	0.189	0.004	1.982	54.291	0.000	0.073	0.000	0.000	0.000	0.000	6.780	5.884	4.549	2.735	4.946	5.436	13.506	0.000	0.000	0.000	0.000	0.000	0.000	108.581

Entertainment	0.000	0.010	0.000	0.000	0.000	0.000	0.566	0.000	0.000	0.090	0.178	0.383	0.000	22.883	0.017	0.000	0.000	0.000	0.000	3.224	1.956	3.458	2.069	4.251	2.058	4.852	0.000	0.000	0.000	0.000	0.000	0.000	45.996
Information and Comm	0.000	0.765	0.126	0.259	0.005	5.004	0.065	0.001	0.069	0.301	2.202	1.230	0.000	0.027	11.615	0.000	0.000	0.000	0.000	0.065	0.057	0.044	0.027	0.049	0.054	0.163	0.000	0.000	0.000	0.000	0.000	0.000	22.128
LEdu1(0+1+2) (M+F)	107.469	41.973	2.426	23.594	1.697	117.594	52.000	0.000	0.654	3.133	6.607	1.904	35.103	3.937	2.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	400.122
LEdu3 (M+F)	8.125	11.554	2.567	6.339	4.327	37.247	7.846	0.000	3.339	16.480	18.87 5	12.082	10.279	1.031	2.242	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	142.333
LAND	160.711	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000		0.000	0.000	0.000									160.711
CAPITAL	0.000	62.872	12.590	116.400	23.328	46.717	112.279	87.702	6.359	3.134	6.101	54.529	3.579	1.984	4.567	0.000	0.000			0.000		0.000	0.000	0.000									542.143
Small (Landless+ Marginal+Small)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	144.804	9.608	56.656	0.000	0.005	0.168	0.000	0.017	0.000	0.883	0.824	6.907	0.000	0.000	0.000	0.640	1.262	221.774
Large	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	41.545	12.138	104.05 6		0.000		0.000	0.002	0.000	0.088	0.096	12.673				1.134	2.231	173.962
NARP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	64.090	8.623	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.057	0.035	51.506	0.000	0.000	0.000	1.556	3.089	128.956
NARR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	30.798	21.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055	0.034	47.443	0.000	0.000	0.000	1.507	2.977	104.011
LowEdu (Illitera+ Low Edu)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	76.868	4.760	0.000	0.000	0.266	6.951	0.000	0.272	1.354	15.524	11.927	23.051	0.000	0.000		2.621	2.735	146.330
MedEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.945	5.681			0.000		0.000	0.000	0.000		0.094	106.85 5				8.839	17.451	174.865
HighEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.072	80.326			0.000		0.000	0.000	0.000			253.18 7				9.666	18.929	368.181
CORP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		542.143	0.000		0.000	0.000	0.000									542.143
ITAX	0.243	15.120	8.193	10.929	5.825	0.263	0.004	0.000	0.003	0.015	0.099	0.612	0.000	0.229	0.621	0.000	0.000			0.000		0.000	0.000	0.000									42.156
TAR	0.923	7.567	7.240	13.501	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000		0.000	0.000	0.000							12.17		29.232
S-I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			13.572	26.483	0.000	26.433	14.154	37.077	79.772	24.748				9	11.352	245.770
GOV	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			1.564	1.742	0.000	0.000	0.000	1.743	3.071	15.772	42.15 6	29.23 2				95.280
ROW	14.215	43.430	33.566	67.548	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000		0.000	0.000	0.000									158.760
TOTAL	1116.573	1182.70 2	165.088	687.740	87.781	534.081	501.034	233.850	40.094	64.745	92.26 1236.686	108.58 1	45.996	22.128	400.122	142.33 3	160.71 1	542.143		221.774	173.962	128.956	104.011	146.330	174.865	368.181	542.14 3	42.15 6	29.23 2	245.77 0	95.28 0	158.76 0	8796.06 7

Co-effecient Matrix

	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport on	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm	Ledu (0+1+2) (M+F)	Ledu 3 (M+F)	LAND	CAPITAL	Small (landless+ Marginal + Small)	Large	NARP (F+M)	NARR (F+M)	LowEdu (Illit+LowEdu)	Med Edu	High Edu	CORP	ITAX
Agricuture	0.570	0.201	0.008	0.043	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.001	0.000	0.180	0.000	0.000	0.000	0.000	0.000	0.200	0.192	0.181	0.136	0.148	0.107	0.106	0.000	0.000
Retail	0.012	0.558	0.010	0.002	0.000	0.020	0.000	0.001	0.005	0.014	0.009	0.022	0.010	0.099	0.006	0.000	0.000	0.000	0.000	0.470	0.272	0.459	0.338	0.359	0.219	0.136	0.000	0.000
Chemical	0.022	0.011	0.453	0.011	0.025	0.006	0.027	0.000	0.043	0.009	0.010	0.007	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.015	0.012	0.018	0.014	0.028	0.020	0.012	0.000	0.000
Consturction	0.005	0.019	0.053	0.532	0.014	0.019	0.013	0.032	0.002	0.024	0.069	0.008	0.016	0.007	0.006	0.000	0.000	0.000	0.000	0.005	0.012	0.005	0.004	0.005	0.003	0.004	0.000	0.000
Utility	0.001	0.012	0.012	0.015	0.509	0.006	0.000	0.000	0.004	0.009	0.005	0.004	0.001	0.018	0.004	0.000	0.000	0.000	0.000	0.004	0.003	0.005	0.004	0.011	0.011	0.010	0.000	0.000
Trade and Comm	0.107	0.030	0.016	0.027	0.039	0.500	0.075	0.082	0.157	0.067	0.000	0.084	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transport	0.020	0.010	0.015	0.019	0.010	0.007	0.523	0.000	0.002	0.003	0.013	0.045	0.020	0.004	0.007	0.000	0.000	0.000	0.000	0.060	0.091	0.114	0.085	0.107	0.118	0.220	0.000	0.000
Acomodation	0.001	0.000	0.000	0.000	0.000	0.025	0.001	0.500	0.015	0.000	0.000	0.021	0.003	0.010	0.014	0.000	0.000	0.000	0.000	0.050	0.069	0.057	0.043	0.082	0.070	0.099	0.000	0.000
Health	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.017	0.012	0.009	0.009	0.010	0.007	0.000	0.000
Edu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.010	0.010	0.008	0.009	0.013	0.015	0.000	0.000
PubAdm	0.001	0.000	0.002	0.001	0.001	0.008	0.007	0.000	0.003	0.011	0.513	0.001	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FinS	0.000	0.003	0.027	0.003	0.001	0.015	0.001	0.011	0.005	0.002	0.011	0.501	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.066	0.073	0.076	0.056	0.072	0.067	0.081	0.000	0.000
OthS	0.000	0.000	0.000	0.000	0.000	0.007	0.008	0.000	0.000	0.003	0.000	0.008	0.500	0.000	0.003	0.000	0.000	0.000	0.000	0.031	0.034	0.035	0.026	0.034	0.031	0.037	0.000	0.000
Entertainment	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.002	0.002	0.000	0.498	0.001	0.000	0.000	0.000	0.000	0.015	0.011	0.027	0.020	0.029	0.012	0.013	0.000	0.000
Information and Comm	0.000	0.001	0.001	0.000	0.000	0.009	0.000	0.000	0.002	0.005	0.024	0.005	0.000	0.001	0.525	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LEdu1(0+1+2) (M+F)	0.096	0.035	0.015	0.034	0.019	0.220	0.104	0.000	0.016	0.048	0.072	0.008	0.323	0.086	0.092	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LEdu3 (M+F)	0.007	0.010	0.016	0.009	0.049	0.070	0.016	0.000	0.083	0.255	0.205	0.051	0.095	0.022	0.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LAND	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAPITAL	0.000	0.053	0.076	0.169	0.266	0.087	0.224	0.375	0.159	0.048	0.066	0.230	0.033	0.043	0.206	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Small (Landless+Marginal +Small)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.362	0.068	0.353	0.000	0.000	0.001	0.000	0.000	0.000	0.005	0.002	0.013	0.000
Large	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.104	0.085	0.647	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.023	0.000
NARP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.160	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.095	0.000
NARR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.088	0.000
LowEdu (Illitera+ Low Edu)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.192	0.033	0.000	0.000	0.001	0.040	0.000	0.003	0.009	0.089	0.032	0.043	0.000

MedEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.197	0.000
HighEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.564	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.467	0.000
CORP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ITAX	0.000	0.013	0.050	0.016	0.066	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.005	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

I - Metrix

	Agriculture	Retail	Czhemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm	Ledu (0+1+2) (M+F)	Ledu 3 (M+F)	LAND	CAPITAL	Small (landless+ Marginal + Small)	Large	NARP(F+M)	NARR(F+M)	LowEdu (Illit+LowEdu)	MedEdu	HighEdu	CORP	ITAX
Agricuture	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemical	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consturction	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trade and Comm	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acomodation	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Health	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edu	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PubAdm	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FinS	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Entertainment	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Information and Comm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LEdu1(0+1+2) (M+F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledu3 (M+F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Small (Landless+Marginal+Small)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
NARP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
NARR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

LowEdu (Illitera+ Low Edu)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
MedEdu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
HighEdu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		
CORP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
ITAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		

I-A Matrix																												
	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm	Ledu (0+1+2) (M+F)	Ledu 3 (M+F)	LAND	CAPITAL	Small (landless+Marginal + Small)	Large	NARP (F+M)	NARR (F+M)	LowEdu (Illit+ LowEdu)	MedEdu	HighEdu	COR P	ITAX
Agricuture	0.430	-0.201	-0.008	-0.043	0.000	0.000	0.000	0.000	-0.004	0.000	0.000	-0.001	0.000	-0.180	0.000	0.000	0.000	0.000	0.000	-0.200	-0.192	-0.181	-0.136	-0.148	-0.107	-0.106	0.000	0.000
Retail	-0.012	0.442	-0.010	-0.002	0.000	-0.020	0.000	-0.001	-0.005	-0.014	-0.009	-0.022	-0.010	-0.099	-0.006	0.000	0.000	0.000	0.000	-0.470	-0.272	-0.459	-0.338	-0.359	-0.219	-0.136	0.000	0.000
Chemical	-0.022	-0.011	0.547	-0.011	-0.025	-0.006	-0.027	0.000	-0.043	-0.009	-0.010	-0.007	0.000	0.000	-0.004	0.000	0.000	0.000	0.000	-0.015	-0.012	-0.018	-0.014	-0.028	-0.020	-0.012	0.000	0.000
Consturction	-0.005	-0.019	-0.053	0.468	-0.014	-0.019	-0.013	-0.032	-0.002	-0.024	-0.069	-0.008	-0.016	-0.007	-0.006	0.000	0.000	0.000	0.000	-0.005	-0.012	-0.005	-0.004	-0.005	-0.003	-0.004	0.000	0.000
Utility	-0.001	-0.012	-0.012	-0.015	0.491	-0.006	0.000	0.000	-0.004	-0.009	-0.005	-0.004	-0.001	-0.018	-0.004	0.000	0.000	0.000	0.000	-0.004	-0.003	-0.005	-0.004	-0.011	-0.011	-0.010	0.000	0.000
Trade and Comm	-0.107	-0.030	-0.016	-0.027	-0.039	0.500	-0.075	-0.082	-0.157	-0.067	0.000	-0.084	0.000	-0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transport	-0.020	-0.010	-0.015	-0.019	-0.010	-0.007	0.477	0.000	-0.002	-0.003	-0.013	-0.045	-0.020	-0.004	-0.007	0.000	0.000	0.000	0.000	-0.060	-0.091	-0.114	-0.085	-0.107	-0.118	-0.220	0.000	0.000
Acomodation	-0.001	0.000	0.000	0.000	0.000	-0.025	-0.001	0.500	-0.015	0.000	0.000	-0.021	-0.003	-0.010	-0.014	0.000	0.000	0.000	0.000	-0.050	-0.069	-0.057	-0.043	-0.082	-0.070	-0.099	0.000	0.000
Health	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.009	-0.017	-0.012	-0.009	-0.009	-0.010	-0.007	0.000	0.000
Edu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.005	-0.010	-0.010	-0.008	-0.009	-0.013	-0.015	0.000	0.000
PubAdm	-0.001	0.000	-0.002	-0.001	-0.001	-0.008	-0.007	0.000	-0.003	-0.011	0.487	-0.001	0.000	-0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FinS	0.000	-0.003	-0.027	-0.003	-0.001	-0.015	-0.001	-0.011	-0.005	-0.002	-0.011	0.499	0.000	0.000	-0.002	0.000	0.000	0.000	0.000	-0.066	-0.073	-0.076	-0.056	-0.072	-0.067	-0.081	0.000	0.000
OthS	0.000	0.000	0.000	0.000	0.000	-0.007	-0.008	0.000	0.000	-0.003	0.000	-0.008	0.500	0.000	-0.003	0.000	0.000	0.000	0.000	-0.031	-0.034	-0.035	-0.026	-0.034	-0.031	-0.037	0.000	0.000
Entertainment	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	-0.001	-0.002	-0.002	0.000	0.502	-0.001	0.000	0.000	0.000	0.000	-0.015	-0.011	-0.027	-0.020	-0.029	-0.012	-0.013	0.000	0.000
Information and Comm	0.000	-0.001	-0.001	0.000	0.000	-0.009	0.000	0.000	-0.002	-0.005	-0.024	-0.005	0.000	-0.001	0.475	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LEdu1(0+1+2) (M+F)	-0.096	-0.035	-0.015	-0.034	-0.019	-0.220	-0.104	0.000	-0.016	-0.048	-0.072	-0.008	-0.323	-0.086	-0.092	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LEdu3 (M+F)	-0.007	-0.010	-0.016	-0.009	-0.049	-0.070	-0.016	0.000	-0.083	-0.255	-0.205	-0.051	-0.095	-0.022	-0.101	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LAND	-0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CAPITAL	0.000	-0.053	-0.076	-0.169	-0.266	-0.087	-0.224	-0.375	-0.159	-0.048	-0.066	-0.230	-0.033	-0.043	-0.206	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Small (Landless+Marginal+Small)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.362	-0.068	-0.353	0.000	1.000	-0.001	0.000	0.000	0.000	-0.005	-0.002	-0.013	0.000
Large	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.104	-0.085	-0.647	0.000	0.000	1.000	0.000	0.000	0.000	-0.001	0.000	-0.023	0.000
NARP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.160	-0.061	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	-0.095	0.000

NARR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.077	-0.149	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-0.088	0.000
LowEdu (Illitera+ Low Edu)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.192	-0.033	0.000	0.000	-0.001	-0.040	0.000	-0.003	0.991	-0.089	-0.032	-0.043	0.000
MedEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.090	-0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	-0.197	0.000
HighEdu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.015	-0.564	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.467	0.000
CORP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
ITAX	0.000	-0.013	-0.050	-0.016	-0.066	0.000	0.000	0.000	0.000	0.000	-0.001	-0.003	0.000	-0.005	-0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

$(I-A)^{-1}$ Multiplier

	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm	Ledu (0+1+2) (M+F)	Ledu 3 (M+F)	LAND	CAPITAL	Small (landless+ Marginal + Small)	Large	NARP(F+M)	NARR(F+M)	LowEdu (Illit+LowEdu)	MedEdu	HighEdu	CORP	ITAX
Agricuture	4.905253853	3.202351884	1.085870614	1.891215492	1.945368337	2.577946126	2.379085521	2.277093411	2.331651169	2.442560514	2.368819035	2.367642772	2.7129348	3.485621476	2.280556138	2.890251587	2.441241873	2.8508972	2.240839401	3.106184697	2.711899328	3.221707681	2.400990741	2.814082243	2.328544412	2.23352396	2.240839401	0
Retail	2.671470939	4.465793156	1.076538497	1.721176399	1.971867851	2.689597026	2.431515425	2.307759007	2.379434859	2.507767839	2.399762169	2.4566074	2.8163833	2.962077122	2.334639083	3.006560739	2.459074184	2.860516788	2.267697753	3.259794185	2.643119894	3.401096742	2.527665075	2.941543341	2.389881007	2.192566167	2.267697753	0
Chemical	0.454712512	0.39728537	1.988620412	0.299445574	0.379900895	0.388055131	0.448871163	0.336493568	0.497831959	0.389310961	0.385467971	0.378927319	0.3805717	0.402022982	0.3445374 5	0.394380233	0.350800181	0.376794442	0.327113748	0.403783954	0.362099305	0.436950993	0.327203228	0.411230771	0.349244112	0.336262951	0.327113748	0
Consturction	0.439094224	0.453531021	0.377101336	2.412866848	0.375231267	0.479450419	0.444069302	0.498908039	0.414678699	0.494925397	0.666514932	0.423399201	0.4659222	0.44996392	0.375287858	0.413200043	0.370275155	0.409052844	0.341475561	0.428959374	0.398214219	0.459034979	0.342682583	0.414557792	0.352587922	0.35541375	0.341475561	0
Utility	0.174421394	0.203403924	0.120989051	0.180823143	2.172277489	0.195003127	0.166884412	0.161910012	0.185396135	0.207925482	0.189088898	0.180421746	0.1768156	0.250294687	0.171043822	0.179982209	0.162718604	0.16888558	0.152505289	0.183915352	0.160702233	0.198560445	0.147915316	0.189426473	0.164142377	0.158863331	0.152505288	0
Trade and Comm	1.676914483	1.369257494	0.593279669	0.962425817	1.084153288	3.20848567	1.422393647	1.411611129	1.73888783	1.4163748	1.129756721	1.484959687	1.2372639	1.486102715	1.07519174	1.27901063	1.146036801	1.252768267	1.057189872	1.336568871	1.207140863	1.427951353	1.064335207	1.274712982	1.087701048	1.101810898	1.057189872	0
Transport	1.226804953	1.084848945	0.587930086	0.928208301	1.049693041	1.231047281	3.266858553	1.185924679	1.17533396	1.232594925	1.240824231	1.373257888	1.3021493	1.190732091	1.168185319	1.224601355	1.287407509	1.181197773	1.192903491	1.195028773	1.173667128	1.391021516	1.037477052	1.261705465	1.160440136	1.380978276	1.192903491	0
Acomodation	0.597251674	0.510557071	0.257391679	0.416252639	0.494980346	0.694365414	0.590005425	2.58876097	0.657018896	0.60558662	0.575776257	0.677325599	0.6211513	0.615162956	0.618081692	0.624115382	0.622487822	0.617221041	0.578144691	0.615978608	0.617897515	0.670954829	0.501290403	0.667275327	0.589056743	0.650449633	0.578144691	0
Health	0.074350709	0.061117717	0.029074506	0.048046124	0.055673498	0.07103895	0.067313473	0.065054017	2.065014935	0.068441731	0.066156319	0.065983062	0.074962	0.069452091	0.064722029	0.079548037	0.070686416	0.086679962	0.06518804	0.079543701	0.090565483	0.088224968	0.066004342	0.076872657	0.071044937	0.065583822	0.06518804	0
Edu	0.068986657	0.060050788	0.031101083	0.051180746	0.061547839	0.072802902	0.071160654	0.072317192	0.070282269	2.073241877	0.071141546	0.071890473	0.074643	0.068288649	0.06987183	0.075373473	0.078724145	0.074725248	0.074051574	0.070994193	0.076756718	0.085120832	0.063691182	0.077284757	0.078616843	0.083319234	0.074051574	0
PubAdm	0.067624961	0.058033687	0.032705139	0.046317832	0.052149288	0.089377987	0.089187058	0.057133126	0.074017449	0.103917105	2.105825701	0.064643488	0.0578619	0.07834373	0.050863693	0.058112921	0.054910361	0.056557775	0.050793483	0.059225781	0.05510511	0.065309596	0.048714748	0.058762721	0.051480386	0.054897659	0.050793483	0
FinS	0.599004471	0.524076129	0.349762189	0.423420867	0.493941062	0.657045596	0.585597523	0.613066096	0.604044332	0.601771084	0.61243532	2.581904875	0.6170734	0.581240499	0.560633723	0.639744929	0.608046608	0.632336066	0.563604544	0.648545923	0.623510191	0.708617395	0.528422347	0.64903066	0.580703701	0.610586425	0.563604544	0
OthS	0.280438237	0.238436479	0.119476434	0.193627749	0.228108728	0.307530196	0.30425709	0.268986418	0.270844462	0.289969496	0.267351697	0.307222225	2.2902315	0.269844628	0.273154891	0.29946449	0.286940434	0.295992813	0.266006402	0.302367579	0.292521907	0.332281611	0.247900107	0.30407108	0.273269642	0.289638348	0.266006402	0
Entertainment	0.11579186	0.099531533	0.049821495	0.081603256	0.096241681	0.121966684	0.120252268	0.112625915	0.112236081	0.123031945	0.121642765	0.120425066	0.128147	2.104076529	0.114671226	0.135570116	0.121207574	0.120670141	0.113046584	0.128757369	0.11626684 2	0.161339816	0.120256846	0.155648406	0.112945648	0.115537287	0.113046584	0
Information and Comm	0.051593976	0.046058953	0.023833592	0.03345539	0.036556689	0.083606923	0.047748491	0.045360054	0.059981985	0.067695045	0.143054401	0.068968139	0.0430156	0.050837496	2.14241376 8	0.044422689	0.040424887	0.04346695	0.037353762	0.046037126	0.042067552	0.049601443	0.036988211	0.044514909	0.038441037	0.039325114	0.037353762	0
LEdu1(0+1+2) (M+F)	1.208122558	1.008220934	0.431074075	0.724662838	0.762253109	1.33761154	1.12124791	0.874498198	0.988755021	1.014803212	0.993102677	0.954047779	1.5629009	1.204290846	0.988968313	1.943791566	0.849826496	0.921351522	0.784125806	0.984363035	0.887043276	1.05729169	0.787972476	0.940920501	0.804126108	0.819995945	0.784125806	0
LEdu3 (M+F)	0.320202295	0.28826512	0.159081976	0.219708311	0.325541908	0.424728834	0.318916178	0.273337501	0.470677632	0.803670653	0.68859465	0.392572594	0.4654876	0.34604958	0.457632615	0.283837041	1.260935824	0.277728641	0.241560608	0.291766188	0.270085536	0.31749755	0.236736474	0.285435042	0.249490719	0.255537252	0.241560608	0
LAND	0.706027061	0.460923564	0.156292429	0.272207995	0.280002367	0.371051077	0.342428508	0.327748495	0.335601148	0.351564643	0.340950824	0.340781521	0.3904804	0.501695358	0.328246895	0.416002086	0.351374847	1.410337697	0.322530353	0.447081949	0.39033134	0.463709499	0.345581388	0.405038816	0.335153983	0.321477421	0.322530353	0
CAPITAL	1.125451015	1.11170994	0.684904736	1.146586574	1.438569935	1.327208883	1.540783883	1.817849128	1.446958184	1.214820335	1.2507232	1.613364192	1.1889724	1.221899878	1.449300873	1.120425109	1.067361604	1.091397465	1.988928034	1.135696225	1.067277861	1.246682021	0.929734498	1.148006393	1.007165023	1.075747262	0.988928034	0
Small (Landless+Marginal +Small)	0.726094416	0.564656925	0.232603266	0.390998332	0.419015403	0.664944021	0.572257626	0.478581714	0.530909626	0.565552391	0.546520212	0.517228126	0.754242	0.655757507	0.527523285	0.887767538	0.535081581	0.867436164	0.444318247	1.551740705	0.49484888	0.587448809	0.437991575	0.520865861	0.447073378	0.446623676	0.444318247	0
Large	0.636551736	0.454035408	0.175730891	0.297356193	0.322241385	0.44680962	0.40179918	0.369304812	0.394369214	0.430387758	0.412275202	0.391370489	0.4830138	0.508339896	0.388570293	0.52196613	0.448720936	1.05834767	0.357859835	0.443460177	1.39313905	0.4666197	0.34779356	0.411475157	0.346122942	0.340809992	0.357859835	0
NARP	0.320013683	0.284744144	0.143851973	0.238475517	0.278687449	0.366287629	0.345521048	0.329578088	0.324574532	0.326863331	0.31982259	0.330104655	0.3917045	0.33014085	0.324040386	0.435189817	0.31413925	0.268256055	0.329444338	0.283415655	0.260002019	1.307216011	0.229025558	0.277242729	0.240075597	0.249277583	0.329444338	0
NARR	0.239339494	0.217984751	0.116902565	0.1889922	0.233236848	0.282560517	0.268848095	0.267332765	0.273036007	0.304314631	0.28864444 2	0.27330661	0.2938688	0.251345794	0.271314143	0.290128236	0.3468184	0.20794625	0.270628842	0.218770863	0.20205251	0.237944158	1.177404452	0.215561057	0.187648812	0.195555887	0.270628842	0

LowEdu (Illitera+ Low Edu)	0.37501203	0.324103997	0.155781365	0.258911348	0.295730536	0.41475193	0.379281909	0.346373217	0.353470672	0.361292876	0.352406945	0.354572245	0.4537484	0.377770349	0.352721127	0.5172473	0.343037144	0.329101895	0.33878726	0.322059297	0.332936419	0.346496085	0.260931347	1.320637957	0.357721748	0.309393613	0.33878726	0
MedEdu	0.343320241	0.321372036	0.180174111	0.300029518	0.365230033	0.398930505	0.417374448	0.448022768	0.393046912	0.362944996	0.363466268	0.419618044	0.3935404	0.363032709	0.393005522	0.406963742	0.337359985	0.309139782	0.472370448	0.324099412	0.300994625	0.353570198	0.263632525	0.322370746	1.280865228	0.296313435	0.472370448	0
HighEdu	0.724640168	0.697165466	0.416178885	0.670459939	0.867117517	0.879818336	0.916561479	1.016487327	0.956379801	1.036288898	0.987783372	0.989488059	0.8416814	0.784211763	0.950115131	0.712934609	1.222978356	0.680414704	1.077078466	0.709981123	0.664316503	0.777441123	0.579758008	0.711497857	0.623362028	1.659043977	1.077078466	0
CORP	1.125451015	1.11170994	0.684904736	1.146586574	1.438569935	1.327208883	1.540783883	1.817849128	1.446958184	1.214820335	1.2507232	1.613364192	1.1889724	1.221899878	1.449300873	1.120425109	1.067361604	1.091397465	1.988928034	1.135696225	1.067277861	1.246682021	0.929734498	1.148006393	1.007165023	1.075747262	1.988928034	0
ITAX	0.080842289	0.102118497	0.128876063	0.090605332	0.198006584	0.081125025	0.076306516	0.069578137	0.079470577	0.078938702	0.082518385	0.079477325	0.0787669	0.096597913	0.127553946	0.081450404	0.070028674	0.077765034	0.064935307	0.085775385	0.073403591	0.091177491	0.067945199	0.082212933	0.068654898	0.065289838	0.064935307	1

The 'L' stands for 'Labor', so the accounts that start with 'L' represent factors of production (they should NOT be aggregated with either A or C).

the 'Edu' stands for education level ('0' for no education, '3' for college educated), while 'M' stands for Male and 'F ' for female.

N = Non, A = Agriculture, R = Rural, P = Poor, F = Female headed. So for example, NARPM = Non-Agriculture Rural Professional Male-Headed households.

The other HH groups: Illitera, LowEdu, and HighEdu are urban households that are distinguished based on the education level of the HH head.

Finally: SI = Savings / Investments (or Capital Accounts, which we have discussed in class).

Direct Impact/Injection/exogenous shock

Δd=	
Agricuture	0
Retail	0
Chemical	0
Consturction	0
Utility	382.8
Trade and Comm	0
Transport	0
Acomodation	0
Health	0
Edu	0
PubAdm	0
FinS	0
OthS	0
Entertainment	0
Information and Comm	0
LEdu1(0+1+2) (M+F)	0
LEdu3 (M+F)	0
LAND	0
CAPITAL	0

Small (Landless+Marginal+Small)	0
Large	0
NARP	0
NARR	0
LowEdu (Illitera+ Low Edu)	0
MedEdu	0
HighEdu	0
CORP	0
ITAX	0

Sectors	Equilibrium Impact	Initial output (X)	Toal impact after economy stabilizes (X')	% increase in income
Agricuture	744.6869995	1116.573	1861.259509	66.69401161
Retail	754.8310135	1182.702	1937.533391	63.82256668
Chemical	145.4260628	165.088	310.5137951	88.09016926
Consturction	143.6385291	687.740	831.378038	20.88560091
Utility	831.5478228	87.781	919.3286853	947.2996714
Trade and Comm	415.0138786	534.081	949.0945478	77.70621602
Transport	401.8224962	501.034	902.8563085	80.19867849
Acomodation	189.4784764	233.850	423.3281598	81.02575708
Health	21.31181489	40.094	61.405596	53.15491404
Edu	23.56051262	64.745	88.30544126	36.3897422
PubAdm	19.9627473	92.261	112.2239553	21.63720563
FinS	189.0806385	236.686	425.7662404	79.88683597
OthS	87.32002106	108.581	195.901386	80.41897531
Entertainment	36.84131534	45.996	82.83723085	80.09692804
Information and Comm	13.99390043	22.128	36.12207475	63.24019428
LEdu1(0+1+2) (M+F)	291.7904901	400.122	691.9129547	72.92529563
LEdu3 (M+F)	124.6174425	142.333	266.950814	87.55321475
LAND	107.1849061	160.711	267.8963455	66.69401161
CAPITAL	550.6845709	542.143	1092.827192	101.575591
Small (Landless+Marginal+Small)	160.3990964	221.774	382.1728798	72.3255445
Large	123.3540022	173.962	297.3158976	70.90863313
NARP	106.6815554	128.956	235.6377139	82.72699545
NARR	89.28306534	104.011	193.2936807	85.84033952

LowEdu (Illitera+ Low Edu)	113.2056491	146.330	259.5361198	77.36300487
MedEdu	139.8100567	174.865	314.675131	79.95310515
HighEdu	331.9325855	368.181	700.1131479	90.15483686
CORP	550.6845709	542.143	1092.827192	101.575591
ITAX	75.79692033	42.156	117.9532203	179.799746
Total Impact	**6783.9411**			

I-O Analysis

A Matrix for I-O

	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm
Agricuture	0.570	0.201	0.008	0.043	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.001	0.000	0.180	0.000
Retail	0.012	0.558	0.010	0.002	0.000	0.020	0.000	0.001	0.005	0.014	0.009	0.022	0.010	0.099	0.006
Chemical	0.022	0.011	0.453	0.011	0.025	0.006	0.027	0.000	0.043	0.009	0.010	0.007	0.000	0.000	0.004
Consturction	0.005	0.019	0.053	0.532	0.014	0.019	0.013	0.032	0.002	0.024	0.069	0.008	0.016	0.007	0.006
Utility	0.001	0.012	0.012	0.015	0.509	0.006	0.000	0.000	0.004	0.009	0.005	0.004	0.001	0.018	0.004
Trade and Comm	0.107	0.030	0.016	0.027	0.039	0.500	0.075	0.082	0.157	0.067	0.000	0.084	0.000	0.024	0.000
Transport	0.020	0.010	0.015	0.019	0.010	0.007	0.523	0.000	0.002	0.003	0.013	0.045	0.020	0.004	0.007
Acomodation	0.001	0.000	0.000	0.000	0.000	0.025	0.001	0.500	0.015	0.000	0.000	0.021	0.003	0.010	0.014
Health	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000
Edu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000
PubAdm	0.001	0.000	0.002	0.001	0.001	0.008	0.007	0.000	0.003	0.011	0.513	0.001	0.000	0.004	0.000
FinS	0.000	0.003	0.027	0.003	0.001	0.015	0.001	0.011	0.005	0.002	0.011	0.501	0.000	0.000	0.002
OthS	0.000	0.000	0.000	0.000	0.000	0.007	0.008	0.000	0.000	0.003	0.000	0.008	0.500	0.000	0.003
Entertainment	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.002	0.002	0.000	0.498	0.001
Information and Comm	0.000	0.001	0.001	0.000	0.000	0.009	0.000	0.000	0.002	0.005	0.024	0.005	0.000	0.001	0.525

I Matix															
	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm
Agricuture	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Retail	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chemical	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Consturction	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utility	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Trade and Comm	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transport	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acomodation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Edu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
PubAdm	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
FinS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
OthS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Entertainment	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Information and Comm	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

(I-A) matrix															
	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm
Agricuture	0.430	-0.201	-0.008	-0.043	0.000	0.000	0.000	0.000	-0.004	0.000	0.000	-0.001	0.000	-0.180	0.000
Retail	-0.012	0.442	-0.010	-0.002	0.000	-0.020	0.000	-0.001	-0.005	-0.014	-0.009	-0.022	-0.010	-0.099	-0.006
Chemical	-0.022	-0.011	0.547	-0.011	-0.025	-0.006	-0.027	0.000	-0.043	-0.009	-0.010	-0.007	0.000	0.000	-0.004
Consturction	-0.005	-0.019	-0.053	0.468	-0.014	-0.019	-0.013	-0.032	-0.002	-0.024	-0.069	-0.008	-0.016	-0.007	-0.006
Utility	-0.001	-0.012	-0.012	-0.015	0.491	-0.006	0.000	0.000	-0.004	-0.009	-0.005	-0.004	-0.001	-0.018	-0.004
Trade and Comm	-0.107	-0.030	-0.016	-0.027	-0.039	0.500	-0.075	-0.082	-0.157	-0.067	0.000	-0.084	0.000	-0.024	0.000
Transport	-0.020	-0.010	-0.015	-0.019	-0.010	-0.007	0.477	0.000	-0.002	-0.003	-0.013	-0.045	-0.020	-0.004	-0.007
Acomodation	-0.001	0.000	0.000	0.000	0.000	-0.025	-0.001	0.500	-0.015	0.000	0.000	-0.021	-0.003	-0.010	-0.014
Health	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000
Edu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000
PubAdm	-0.001	0.000	-0.002	-0.001	-0.001	-0.008	-0.007	0.000	-0.003	-0.011	0.487	-0.001	0.000	-0.004	0.000
FinS	0.000	-0.003	-0.027	-0.003	-0.001	-0.015	-0.001	-0.011	-0.005	-0.002	-0.011	0.499	0.000	0.000	-0.002
OthS	0.000	0.000	0.000	0.000	0.000	-0.007	-0.008	0.000	0.000	-0.003	0.000	-0.008	0.500	0.000	-0.003
Entertainment	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	-0.001	-0.002	-0.002	0.000	0.502	-0.001
Information and Comm	0.000	-0.001	-0.001	0.000	0.000	-0.009	0.000	0.000	-0.002	-0.005	-0.024	-0.005	0.000	-0.001	0.475

$(I-A)^{-1}$ (I-O multiplier)

	Agriculture	Retail	Chemical	Construction	Utility	Trade & Commerce	Transport	Accomodation	Health	Education	Public Ad	Finance	Others	Entertainment	Information & Comm
Agricuture	2.382049574	1.101379609	0.084585048	0.23179693	0.017116188	0.060802298	0.024926028	0.027599208	0.059101766	0.056182072	0.062296546	0.076594216	0.0313067	1.077688531	0.021132703
Retail	0.096430821	2.319387314	0.056997984	0.030363939	0.014215355	0.104281038	0.023969392	0.024095089	0.065412663	0.083296604	0.054397086	0.126617078	0.0501532	0.497506647	0.033252483
Chemical	0.110646901	0.105678645	1.845652348	0.063111029	0.101792207	0.035415475	0.114571748	0.011052696	0.173481844	0.049749364	0.057177656	0.050301436	0.0088564	0.068238195	0.021951273
Consturction	0.073686092	0.145863453	0.227312674	2.1652065	0.08423981	0.109768437	0.094252656	0.15883764	0.074693304	0.137779537	0.321545782	0.079309176	0.0760097	0.098066075	0.037270341
Utility	0.017859851	0.069778906	0.05480362	0.071516317	2.043103387	0.032704245	0.012356536	0.010605185	0.035242775	0.050892191	0.037252373	0.028052244	0.0063155	0.097373837	0.021684146
Trade and Comm	0.550416364	0.418992596	0.129745706	0.196189215	0.183353253	2.064257575	0.339527474	0.358858403	0.686549684	0.31100109	0.062061358	0.419912114	0.030396	0.398887616	0.028868918
Transport	0.118207451	0.116791511	0.087224333	0.106029563	0.05520657	0.050353172	2.116123673	0.019727504	0.036982416	0.033241574	0.084947239	0.210988426	0.0892249	0.088260505	0.036301094
Acomodation	0.033181049	0.025029828	0.011569585	0.011538498	0.010168522	0.106949474	0.022461021	2.020548861	0.098863031	0.018759988	0.009634191	0.108703735	0.0128461	0.061778104	0.063145342
Health	0.001396481	0.00081726	0.000316445	0.000375765	3.85157E-05	6.28743E-05	0.000288798	3.72068E-05	1.999898377	6.15469E-05	8.89928E-05	9.09461E-05	4.042E-05	0.000673921	2.49912E-05
Edu	1.42977E-05	2.2351E-05	0.000123093	0.000252727	1.50484E-05	1.45039E-05	1.68728E-05	1.88771E-05	1.77129E-05	1.99956585	4.00416E-05	1.17769E-05	9.221E-06	1.48793E-05	5.44581E-06
PubAdm	0.016016255	0.013986683	0.010779819	0.010156968	0.009212811	0.03610034	0.038251355	0.00688668	0.024222098	0.051576469	2.055303278	0.014086252	0.0021632	0.028025505	0.001351257
FinS	0.026718221	0.036221325	0.106933384	0.022876886	0.0181359	0.068537188	0.022112505	0.056032167	0.052824947	0.022641475	0.053376253	2.021893614	0.0026688	0.02433217	0.012588771
OthS	0.012112767	0.009332608	0.005117364	0.005055368	0.003786847	0.031016059	0.039111182	0.006325651	0.011232841	0.017164322	0.00403255	0.043353977	2.001931	0.008377349	0.015039158
Entertainment	0.000433989	0.000492138	0.000594475	0.000362264	0.00022557	0.000541614	0.004989599	0.000264282	0.000382883	0.005916169	0.0084325	0.007084171	0.0002197	1.990497661	0.003378532
Information and Comm	0.012359249	0.012850001	0.007536393	0.00653262	0.004811578	0.043573973	0.009741153	0.008240906	0.022983181	0.028833645	0.105522554	0.031482644	0.0009061	0.012861786	2.105625927

I-O Impact for 382.2 billion taka			
	I-O impact	**SAM impact**	**Induced impact**
Agricuture	6.552076777	744.6869995	738.1349227
Retail	5.441637798	754.8310135	749.3893757
Chemical	38.96605681	145.4260628	106.460006
Consturction	32.24699913	143.6385291	111.39153
Utility	782.0999765	831.5478228	
Trade and Comm	70.18762517	415.0138786	344.8262534
Transport	21.13307505	401.8224962	380.6894212
Acomodation	3.892510328	189.4784764	185.5859661
Health	0.014743824	21.31181489	21.29707106
Edu	0.005760544	23.56051262	23.55475208
PubAdm	3.526663929	19.9627473	16.43608337
FinS	6.942422589	189.0806385	182.1382159
OthS	1.449605079	87.32002106	85.87041598
Entertainment	0.086348305	36.84131534	36.75496704
Information and Comm	1.841871934	13.99390043	12.1520285

Impact In the Utility sector	
Direct impact in the Utility sector	382.8
Indirect impact in the utility sector	399.2999765
Induced impact in the utility sector	49.44784629

House holds type	(taka in billion)					
	Initial Income of the house hold	income after exogenous shock	Changes In Income due to shock	Income share of household in Percentage (%)		change in Income in Percentage (%)
				Before impact	After Impact	
Small (Landless+						
Marginal+Small)	221.774	382.1728798	160.3990964	16.82554688	16.03918794	72.32547386
Large	173.962	297.3158976	123.3540022	13.1981467	12.47787536	70.9085905
NARP	128.956	235.6377139	106.6815554	9.783632089	9.889340083	82.72709715
NARR	104.011	193.2936807	89.28306534	7.891105161	8.112228355	85.84002206
LowEdu (Illitera+Low Edu)	146.33	259.5361198	113.2056491	11.10176249	10.89231817	77.36325367
MedEdu	174.865	314.675131	139.8100567	13.26665549	13.20641477	79.95313911
HighEdu	368.181	700.1131479	331.9325855	27.9331512	29.38263532	90.15472974
Total	1318.079	2382.744571				